MULTI V III™

Heat Pump and Heat Recovery
Outdoor VRF Condensing Units

Installation and Operation Manual

Variable Refrigerant Flow Outdoor Units
6.0 to 36.0 Tons

Heat Pump 208 / 230V & 460V	**Heat Recovery 208 / 230V & 460V**
ARUN072BT3 / ARUN072DT3	ARUB072BT3 / ARUB072DT3
ARUN096BT3 / ARUN096DT3	ARUB096BT3 / ARUB096DT3
ARUN121BT3 / ARUN121DT3	ARUB121BT3 / ARUB121DT3
ARUN144BT3 / ARUN144DT3	ARUB144BT3 / ARUB144DT3
ARUN168BT3 / ARUN168DT3	ARUB168BT3 / ARUB168DT3
ARUN192BT3 / ARUN192DT3	ARUB192BT3 / ARUB192DT3
ARUN216BT3 / ARUN216DT3	ARUB216BT3 / ARUB216DT3
ARUN240BT3 / ARUN240DT3	ARUB240BT3 / ARUB240DT3
ARUN264BT3 / ARUN264DT3	ARUB264BT3 / ARUB264DT3
ARUN288BT3 / ARUN288DT3	ARUB288BT3 / ARUB288DT3
ARUN312BT3 / ARUN312DT3	ARUB312BT3 / ARUB312DT3
ARUN336BT3 / ARUN336DT3	ARUB336BT3 / ARUB336DT3
ARUN360BT3 / ARUN360DT3	ARUB360BT3 / ARUB360DT3
ARUN384BT3 / ARUN384DT3	ARUB384BT3 / ARUB384DT3
ARUN408BT3 / ARUN408DT3	ARUB408BT3 / ARUB408DT3
ARUN432BT3 / ARUN432BT3	ARUB432BT3 / ARUB432BT3

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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 possibily 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 4.

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

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"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.*

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, 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 an installed unit, always contact the dealer or an authorized service provider.
There is risk of fire, electric shock, explosion, 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 outdoor unit at specified positions on its base. Also, support the outdoor 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.*

Install the unit in such a way as to prepare for any possible strong winds or earthquakes.
Improper installation may cause the unit to fall over, resulting in physical injury or death.

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits 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 outdoor unit, causing fire, electric shock, and physical injury or death.

The heat recovery unit must be installed indoors; do not install the heat recovery unit in a location where rain may enter.
There is risk of product failure, property damage, and physical injury or death due to electric shock.

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 outdoor unit.
This prevents water damage and abnormal vibration.

When installing, properly insulate all piping 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 outdoor unit or heat recovery unit in a location where its operating 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.

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 outdoor units.
Auto-addressing should also be performed after an indoor unit PCB has been changed.

OPERATION

WARNING

Do not use unspecified power wiring or damage the power wiring.
There is risk of fire, electric shock, 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 outdoor 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.

To avoid physical injury, take care when cleaning or performing maintenance on the air conditioner.

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.

UNIT NOMENCLATURE

Outdoor and Heat Recovery Control Units

Outdoor Units (ODU)

ARU	N	072	B	T	3

Family
ARU = Multi V Outdoor Unit (Refrigerant R410A)

Type
N = Inverter Heat Pump
B = Inverter Heat Recovery

Nominal Capacity
Nominal cooling capacity in Btu/h

072 = 72,000	168 = 168,000	264 = 264,000	360 = 360,000
096 = 96,000	192 = 192,000	288 = 288,000	384 = 384,000
121 = 121,000	216 = 216,000	312 = 312,000	408 = 408,000
144 = 144,000	240 = 240,000	336 = 336,000	432 = 432,000

Electrical Ratings
B = 208–230V/60Hz/1Ph
D = 460V/60Hz/1Ph

Airflow Configuration
T = Top Discharge

Generation
3 = Third

Heat Recovery Units (HRU)

PRHR	02	1A

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

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

Series Number
1A = Series Number

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

Single-Frame 208-230V Heat Pump Units

Combination Unit Model Number	6.0 Ton ARUN072BT3	8.0 Ton ARUN096BT3	10.0 Ton ARUN121BT3	12.0 ARUN144BT3
Individual Component Model Numbers	-	-	-	-
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Rated Cooling Capacity (Btu/h)[2]	69,000	92,000	114,000	138,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Rated Heating Capacity (Btu/h)[2]	77,000	103,000	129,000	154,000
Operating Range				
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor				
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Constant Quantity	-	1	1	1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)				
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1	0.6 x 2	0.6 x 2	0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct			
Operating Range (RPM)	80–950	80–950	80–950	80-950
Maximum Air Volume (CFM)	6,300	7,400	8,500	8,800
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max Number Indoor Units/System[3]	13	16	20	23
Sound Pressure dB(A)[4]	57	58	58	58
Net Unit Weight (lbs)	418	617	617	617
Shipping Weight (lbs)	441	650	650	650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Fins per inch	2/17	2/17	2/17	2/17
Piping[7]				
Liquid Line Connection (in, OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Vapor Line Connection (in, OD)	3/4 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
Factory Charge lbs of R410A	12.1	20.7	20.7	20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 15 for detailed electrical data.

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

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

MULTI V III

Dual-Frame 208-230V Heat Pump Units

Combination Unit Model Number	14.0 Ton ARUN168BT3	16.0 Ton ARUN192BT3	18.0 Ton ARUN216BT3	20.0 ARUN240BT3	22.0 ARUN264BT3	24.0 ARUN288BT3
Individual Component Model Numbers	ARUN072BT3x1 + ARUN096BT3x1	ARUN072BT3x1 + ARUN121BT3x1	ARUN072BT3x1 + ARUN144BT3x1	ARUN096BT3x1 + ARUN144BT3x1	ARUN121BT3x1 + ARUN144BT3x1	ARUN144BT3 x 2
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	168,000	192,000	216,000	240,000	264,000	288,000
Rated Cooling Cap. (Btu/h)[2]	160,000	184,000	206,000	228,000	250,000	274,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	189,000	216,000	243,000	270,000	297,000	324,000
Rated Heating Cap. (Btu/h)[2]	180,000	206,000	240,000	256,000	282,000	308,000
Operating Range						
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Constant Quantity	1	1	1	2	2	2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80-950
Maximum Air Volume (CFM)	13,700	14,800	15,100	16,200	17,300	17,600
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[2]	29	32	35	39	42	45
Sound Pressure dB(A)[3]	61	61	61	61	61	61
Net Unit Weight (lbs)	418 + 617	418 + 617	418 + 617	617 + 617	617 + 617	617 + 617
Shipping Weight (lbs)	441 + 650	441 + 650	441 + 650	650 + 650	650 + 650	650 + 650
Communication Cables[4,5]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[6]						
Liquid Line Conn. (in., OD)	3/8 + 3/8 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Vapor Line Conn. (in., OD)	3/4 + 7/8 Braze	3/4 + 1-1/8 Braze	3/4 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7	12.1 + 20.7	12.1 + 20.7	20.7 + 20.7	20.7 + 20.7	20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)

Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).

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

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 15 for detailed electrical data.

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

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

Triple Frame 208-230V Heat Pump Units

Combination Unit Model Number	26.0 Ton ARUN312BT3	28.0 Ton ARUN336BT3	30.0 Ton ARUN360BT3	32.0 ARUN384BT3	34.0 ARUN408BT3	36.0 ARUN432BT3
Individual Component Model Numbers	ARUN072BT3x1 + ARUN096BT3x1 + ARUN144BT3x1	ARUN072BT3x1 + ARUN121BT3x1 + ARUN144BT3x1	ARUN072BT3x1 + ARUN144BT3x2	ARUN096BT3x1 + ARUN144BT3x2	ARUN121BT3x1 + ARUN144BT3x2	ARUN144BT3 x 3
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	312,000	336,000	360,000	384,000	408,000	432,000
Rated Cooling Cap. (Btu/h)[2]	296,000	320,000	342,000	366,000	390,000	414,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	351,000	378,000	405,000	432,000	459,000	486,000
Rated Heating Cap. (Btu/h)[2]	334,000	361,000	387,000	412,000	437,000	462,000
Operating Range						
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3
Constant Quantity	2	2	2	3	3	3
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80-950
Maximum Air Volume (CFM)	22,500	23,600	23,900	25,000	26,100	26,400
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	52	55	58	61	64	64
Sound Pressure dB(A)[4]	62	62	62	63	63	63
Net Unit Weight (lbs)	418 + 617 + 617	418 + 617 + 617	418 + 617 + 617	617 + 617 + 617	617 + 617 + 617	617 + 617 + 617
Shipping Weight (lbs)	441 + 650 + 650	441 + 650 + 650	441 + 650 + 650	650 + 650 + 650	650 + 650 + 650	650 + 650 + 650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8+3/8+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	1/2+1/2+1/2 Braze	1/2+1/2+1/2 Braze
Vapor Line Conn.(in, OD)	3/4+7/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	7/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230 (AHRI Standard 1230 does not apply to units larger than 300,000 Btu/h).

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 15 for detailed electrical data.

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

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

MULTI V III

Single Frame 460V Heat Pump Units

Combination Unit Model Number	6.0 Ton ARUN072DT3	8.0 Ton ARUN096DT3	10.0 Ton ARUN121DT3	12.0 ARUN144DT3
Individual Component Model Numbers	-	-	-	-
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Rated Cooling Capacity (Btu/h)[2]	69,000	92,000	114,000	138,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Rated Heating Capacity (Btu/h)[2]	77,000	103,000	129,000	154,000
Operating Range				
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor				
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Constant Quantity	-	1	1	1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)				
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1	0.6 x 2	0.6 x 2	0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct			
Operating Range (RPM)	80–950	80–950	80–950	80-950
Maximum Air Volume (CFM)	6,300	7,400	8,500	8,800
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max Number Indoor Units/System[3]	13	16	20	23
Sound Pressure dB(A)[4]	57	58	58	58
Net Unit Weight (lbs)	418	594	594	594
Shipping Weight (lbs)	441	628	628	628
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Fins per inch	2/17	2/17	2/17	2/17
Piping[7]				
Liquid Line Connection (in, OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Vapor Line Connection (in, OD)	3/4 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
Factory Charge lbs of R410A	12.1	20.7	20.7	20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 15 for detailed electrical data.

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

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

Dual Frame 460V Heat Pump Units

Combination Unit Model Number	14.0 Ton ARUN168DT3	16.0 Ton ARUN192DT3	18.0 Ton ARUN216DT3	20.0 ARUN240DT3	22.0 ARUN264DT3	24.0 ARUN288DT3
Individual Component Model Numbers	ARUN072DT3x1 + ARUN096DT3x1	ARUN072DT3x1 + ARUN121DT3x1	ARUN072DT3x1 + ARUN144DT3x1	ARUN096DT3x1 + ARUN144DT3x1	ARUN121DT3x1 + ARUN144DT3x1	ARUN144DT3 x 2
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	168,000	192,000	216,000	240,000	264,000	288,000
Rated Cooling Cap. (Btu/h)[2]	160,000	184,000	206,000	228,000	250,000	274,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	189,000	216,000	243,000	270,000	297,000	324,000
Rated Heating Cap. (Btu/h)[2]	180,000	206,000	240,000	256,000	282,000	308,000
Operating Range						
Cooling (ºF DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (ºF WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Constant Quantity	1	1	1	2	2	2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80-950
Maximum Air Volume (CFM)	13,700	14,800	15,100	16,200	17,300	17,600
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	29	32	35	39	42	45
Sound Pressure dB(A)[4]	61	61	61	61	61	61
Net Unit Weight (lbs)	418 + 594	418 + 594	418 + 594	594 + 594	594 + 594	594 + 594
Shipping Weight (lbs)	441 + 628	441 + 628	441 + 628	628 + 628	628 + 628	628 + 628
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8 + 3/8 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Vapor Line Conn. (in, OD)	3/4 + 7/8 Braze	3/4 + 1-1/8 Braze	3/4 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7	12.1 + 20.7	12.1 + 20.7	20.7 + 20.7	20.7 + 20.7	20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)

Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).

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

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 15 for detailed electrical data.

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

HEAT PUMP OUTDOOR UNIT SPECIFICATIONS

MULTI V III

Triple Frame 460V Heat Pump Units

Combination Unit Model Number	26.0 Ton ARUN312DT3	28.0 Ton ARUN336DT3	30.0 Ton ARUN360DT3	32.0 ARUN384DT3	34.0 ARUN408DT3	36.0 ARUN432DT3
Individual Component Model Numbers	ARUN072DT3x1 + ARUN096DT3x1 + ARUN144DT3x1	ARUN072DT3x1 + ARUN121DT3x1 + ARUN144DT3x1	ARUN072DT3x1 + ARUN144DT3x2	ARUN096DT3x1 + ARUN144DT3x2	ARUN121DT3x1 + ARUN144DT3x2	ARUN144DT3 x 3
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	312,000	336,000	360,000	384,000	408,000	432,000
Rated Cooling Cap. (Btu/h)[2]	296,000	320,000	342,000	366,000	390,000	414,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	351,000	378,000	405,000	432,000	459,000	486,000
Rated Heating Cap. (Btu/h)[2]	334,000	361,000	387,000	412,000	437,000	462,000
Operating Range						
Cooling (ºF DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (ºF WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3
Constant Quantity	2	2	2	3	3	3
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	22,500	23,600	23,900	25,000	26,100	26,400
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	52	55	58	61	64	64
Sound Pressure dB(A)[4]	63	63	63	63	63	63
Net Unit Weight (lbs)	418 + 594 + 594	418 + 594 + 594	418 + 594 + 594	594 + 594 + 594	594 + 594 + 594	594 + 594 + 594
Shipping Weight (lbs)	441 + 628 + 628	441 + 628 + 628	441 + 628 + 628	628 + 628 + 628	628 + 628 + 628	628 + 628 + 628
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8+3/8+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	1/2+1/2+1/2 Braze	1/2+1/2+1/2 Braze
Vapor Line Conn. (in, OD)	3/4+7/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	7/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft.
of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230 (AHRI Standard 1230 does not apply to units larger than 300,000 Btu/h).

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. Sew page 15 for detailed electrical data.

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

208-230V, 60Hz, 3-Phase Heat Pump Units

Nom. Tons	Unit Model Nos.	Comp. Qty.	Compressor Motor RLA (Ea.) Frame 1 Comp. A	Frame 1 Comp. B	Frame 2 Comp. A	Frame 2 Comp. B	Frame 3 Comp. A	Frame 3 Comp. B	Condenser Fan Qty.	FLA (Ea.) Frame 1	FLA Frame 2	FLA Frame 3	MSC	MCA Frame 1	MCA Frame 2	MCA Frame 3	MOCP Frame 1	MOCP Frame 2	MOCP Frame 3
6.0	ARUN072BT3	1	15.4	-	-	-	-	-	1	4.0	-	-	-	23.3	-	-	35	-	-
8.0	ARUN096BT3	2	11.0	20.5	-	-	-	-	2	6.0	-	-	150.2	42.6	-	-	60	-	-
10.0	ARUN121BT3	2	12.5	20.5	-	-	-	-	2	6.0	-	-	150.2	44.1	-	-	60	-	-
12.0	ARUN144BT3	2	18.3	20.5	-	-	-	-	2	6.0	-	-	150.2	49.9	-	-	70	-	-
14.0	ARUN168BT3	3	11.0	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	42.6	23.3	--	60	35	-
16.0	ARUN192BT3	3	12.5	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	44.1	23.3	-	60	35	
18.0	ARUN216BT3	3	18.3	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	49.9	23.3	-	70	35	
20.0	ARUN240BT3	4	18.3	20.5	11.0	20.5	-	-	4	6.0	6.0	-	180.9	49.9	42.6		70	60	
22.0	ARUN264BT3	4	18.3	20.5	12.5	20.5	-	-	4	6.0	6.0	-	180.9	49.9	44.1		70	60	
24.0	ARUN288BT3	4	18.3	20.5	18.3	20.5	-	-	4	6.0	6.0	-	180.9	49.9	49.9		70	70	
26.0	ARUN312BT3	5	18.3	20.5	11.0	20.5	15.4	-	5	6.0	6.0	4.0	191.1	49.9	42.6	23.3	70	60	35
28.0	ARUN336BT3	5	18.3	20.5	12.5	20.5	15.4	-	5	6.0	6.0	4.0	191.1	49.9	44.1	23.3	70	60	35
30.0	ARUN360BT3	5	18.3	20.5	18.3	20.5	15.4	-	5	6.0	6.0	4.0	191.1	49.9	49.9	23.3	70	60	35
32.0	ARUN384BT3	6	18.3	20.5	18.3	20.5	11.0	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	42.6	70	70	60
34.0	ARUN408BT3	6	18.3	20.5	18.3	20.5	12.5	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	44.1	70	70	60
36.0	ARUN432BT3	6	18.3	20.5	18.3	20.5	18.3	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	49.9	70	70	70

For component model nos. see the specification tables on page 9-11.

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MSC = Maximum Starting Current.

MCA = Minimum Circuit Ampacity.

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

460V, 60Hz, 3-Phase Heat Pump Units

Nom. Tons	Unit Model Nos.	Comp. Qty.	Compressor Motor RLA (Ea.) Frame 1 Comp. A	Frame 1 Comp. B	Frame 2 Comp. A	Frame 2 Comp. B	Frame 3 Comp. A	Frame 3 Comp. B	Condenser Fan Qty.	FLA (Ea.) Frame 1	FLA Frame 2	FLA Frame 3	MSC	MCA Frame 1	MCA Frame 2	MCA Frame 3	MOCP Frame 1	MOCP Frame 2	MOCP Frame 3
6.0	ARUN072DT3	1	10.2	-	-	-	-	-	1	2.1	-	-	-	14.9	-	-	25	-	-
8.0	ARUN096DT3	2	9.6	9.5	-	-	-	-	2	2.6	-	-	58.5	24.1	-	-	30	-	-
10.0	ARUN121DT3	2	10.5	9.5	-	-	-	-	2	2.6	-	-	58.5	25.2	-	-	35	-	-
12.0	ARUN144DT3	2	12.4	9.5	-	-	-	-	2	2.6	-	-	58.5	27.6	-	-	40	-	-
14.0	ARUN168DT3	3	9.6	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	24.1	14.9	--	30	25	-
16.0	ARUN192DT3	3	10.5	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	25.2	14.9	-	35	25	
18.0	ARUN216DT3	3	12.4	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	27.6	14.9	-	40	25	
20.0	ARUN240DT3	4	12.4	9.5	9.6	9.5	-	-	4	2.6	2.6	-	72.5	27.6	24.1		40	30	
22.0	ARUN264DT3	4	12.4	9.5	10.5	9.5	-	-	4	2.6	2.6	-	72.5	27.6	25.2		40	35	
24.0	ARUN288DT3	4	12.4	9.5	12.4	9.5	-	-	4	2.6	2.6	-	72.5	27.6	27.6		40	40	-
26.0	ARUN312DT3	5	12.4	9.5	9.6	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	24.1	14.9	40	30	25
28.0	ARUN336DT3	5	12.4	9.5	10.5	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	25.2	14.9	40	35	25
30.0	ARUN360DT3	5	12.4	9.5	12.4	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	27.6	14.9	40	40	25
32.0	ARUN384DT3	6	12.4	9.5	12.4	9.5	9.6	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	24.1	40	40	30
34.0	ARUN408DT3	6	12.4	9.5	12.4	9.5	10.5	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	25.2	40	40	35
36.0	ARUN432DT3	6	12.4	9.5	12.4	9.5	12.4	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	27.6	40	40	40

For component model nos. see the specification tables on page 12-14.

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MSC = Maximum Starting Current.

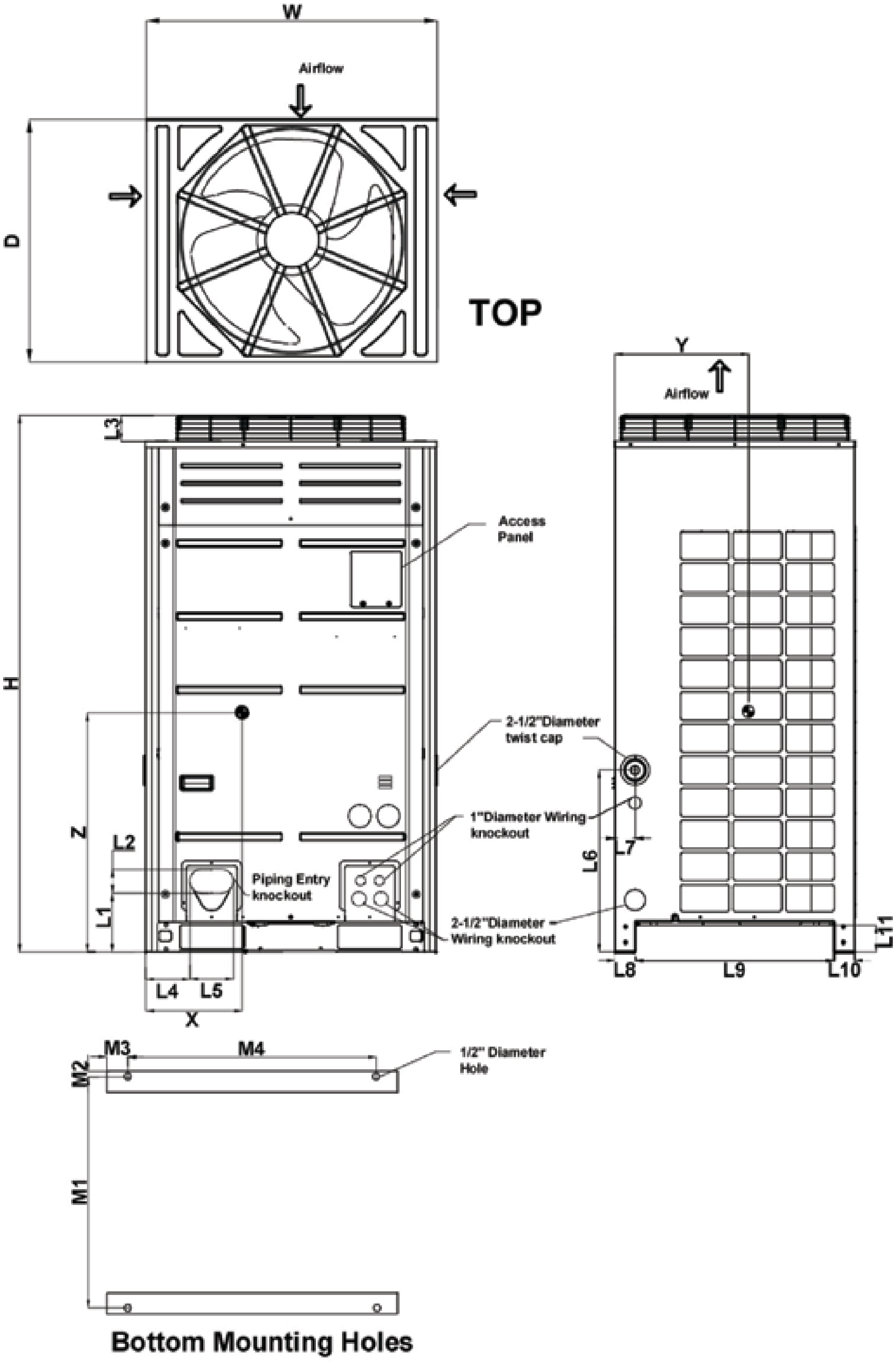
MCA = Minimum Circuit Ampacity.

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

HEAT PUMP OUTDOOR UNIT DIMENSIONS

MULTI V III

ARUN072BT3 / ARUN072DT3



W	36-1/4"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16"
L7	2-9/16"
L8	2-9/16"
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	1-3/8"
M4	31-3/16"

Center of Gravity

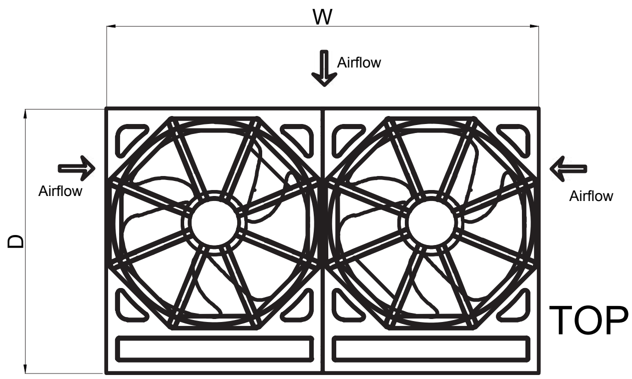
X	11-1/2"
Y	17-13/16"
Z	29-5/16"

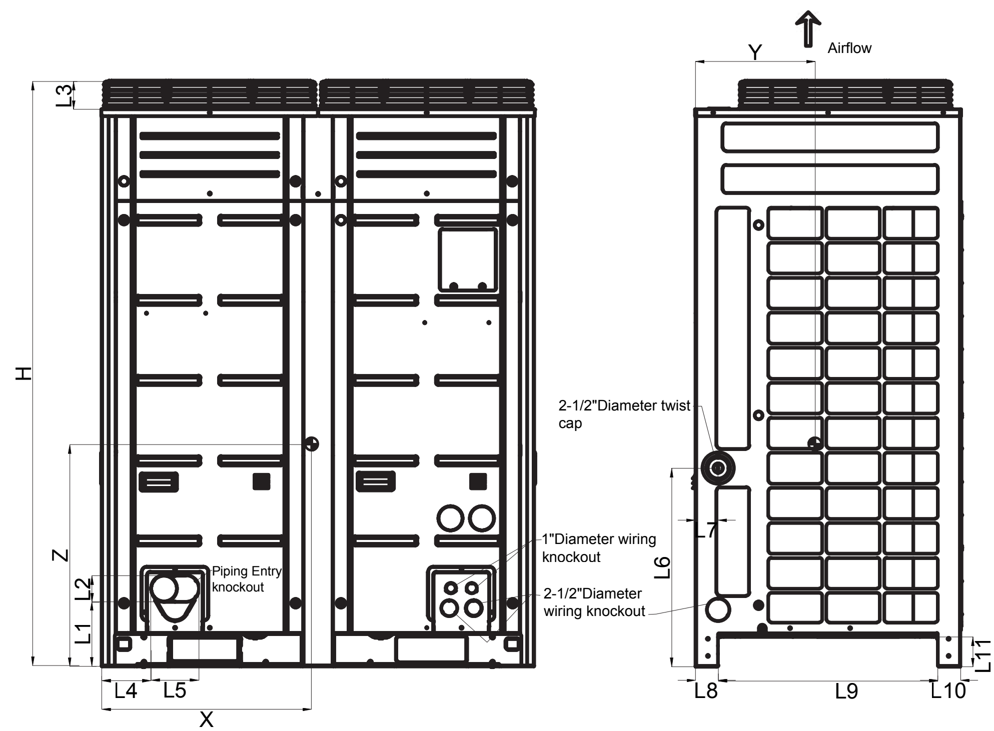
Note - All dimensions have a tolerance of ± 0.25 in.

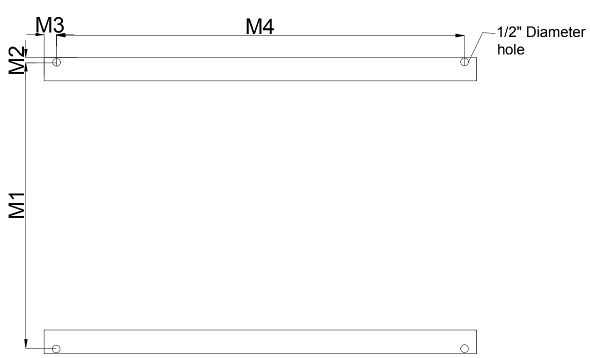
= Center of gravity

HEAT PUMP OUTDOOR UNIT DIMENSIONS

ARUN096BT3 / ARUN096DT3, ARUN121BT3 / ARUN121DT3,
ARUN144BT3 / ARUN144DT3







Bottom Mounting Holes

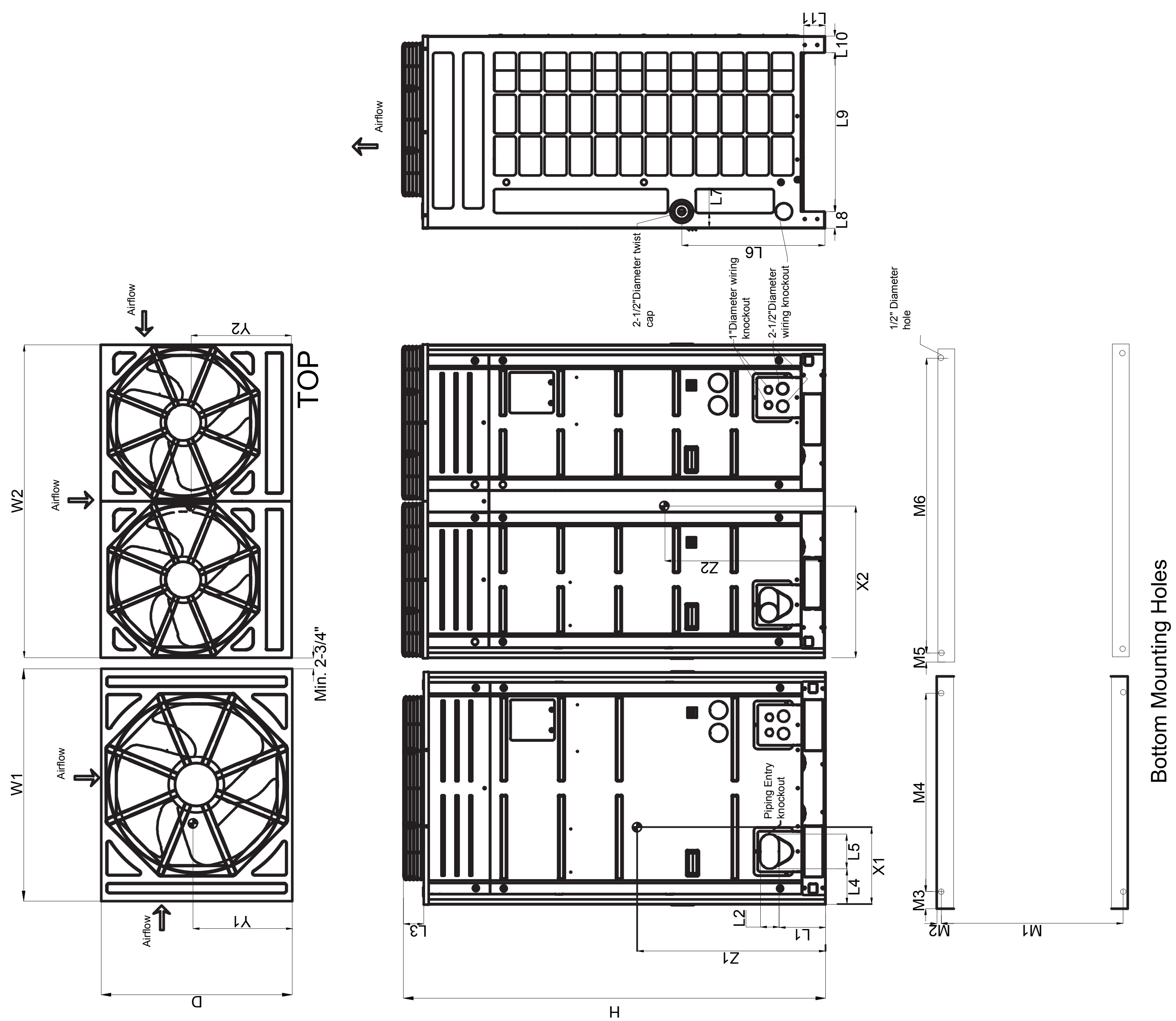
X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"

HEAT PUMP OUTDOOR UNIT DIMENSIONS

MULTI V III

ARUN168BT3 / ARUN168DT3, ARUN192BT3 / ARUN192DT3, ARUN216BT3 / ARUN216DT3

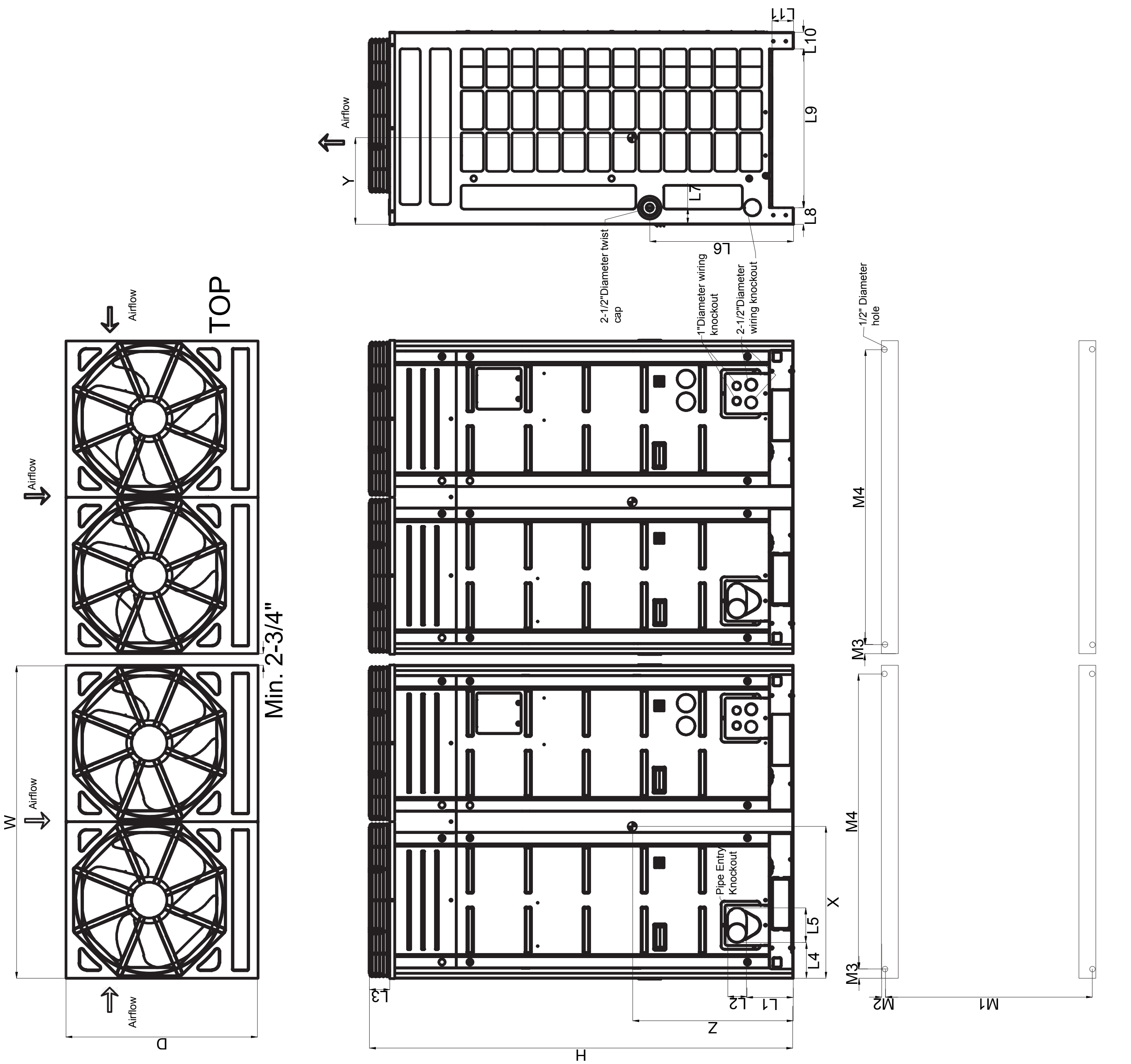
X1	11-1/2"
X2	23-1/8"
Y1	17-13/16"
Y2	14-5/8"
Z1	29-5/16"
Z2	25-13/16"
W1	36-1/4"
W2	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	31-3/16"
M5	2-5/8"
M6	43-3/8"



HEAT PUMP OUTDOOR UNIT DIMENSIONS

ARUN240BT3 / ARUN240DT3, ARUN264BT3 / ARUN264DT3, ARUN288BT3 / ARUN288DT3

X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"

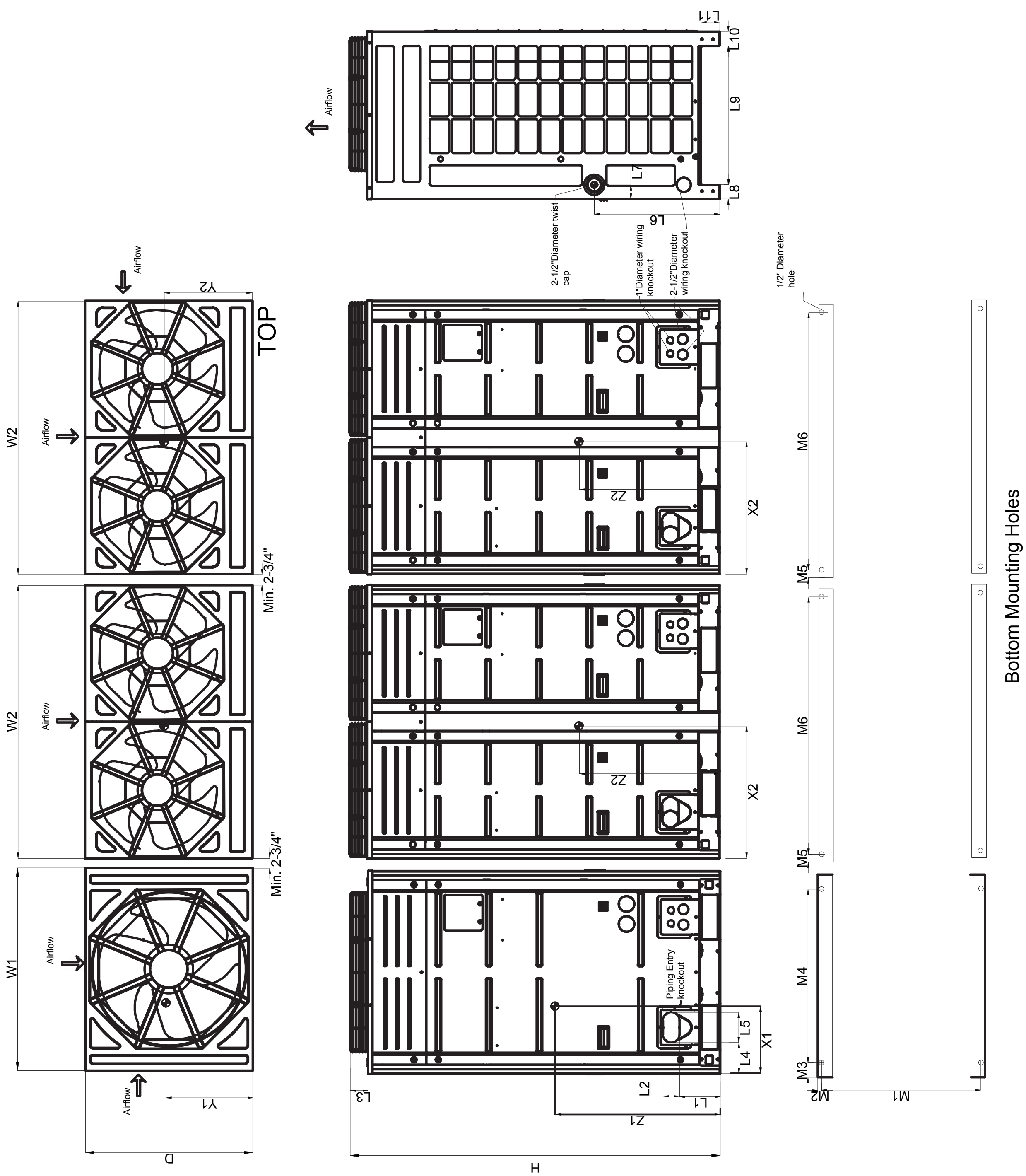


HEAT PUMP OUTDOOR UNIT DIMENSIONS

MULTI V III

ARUN312BT3 / ARUN312DT3, ARUN336BT3 / ARUN336DT3, ARUN360BT3 / ARUN360DT3

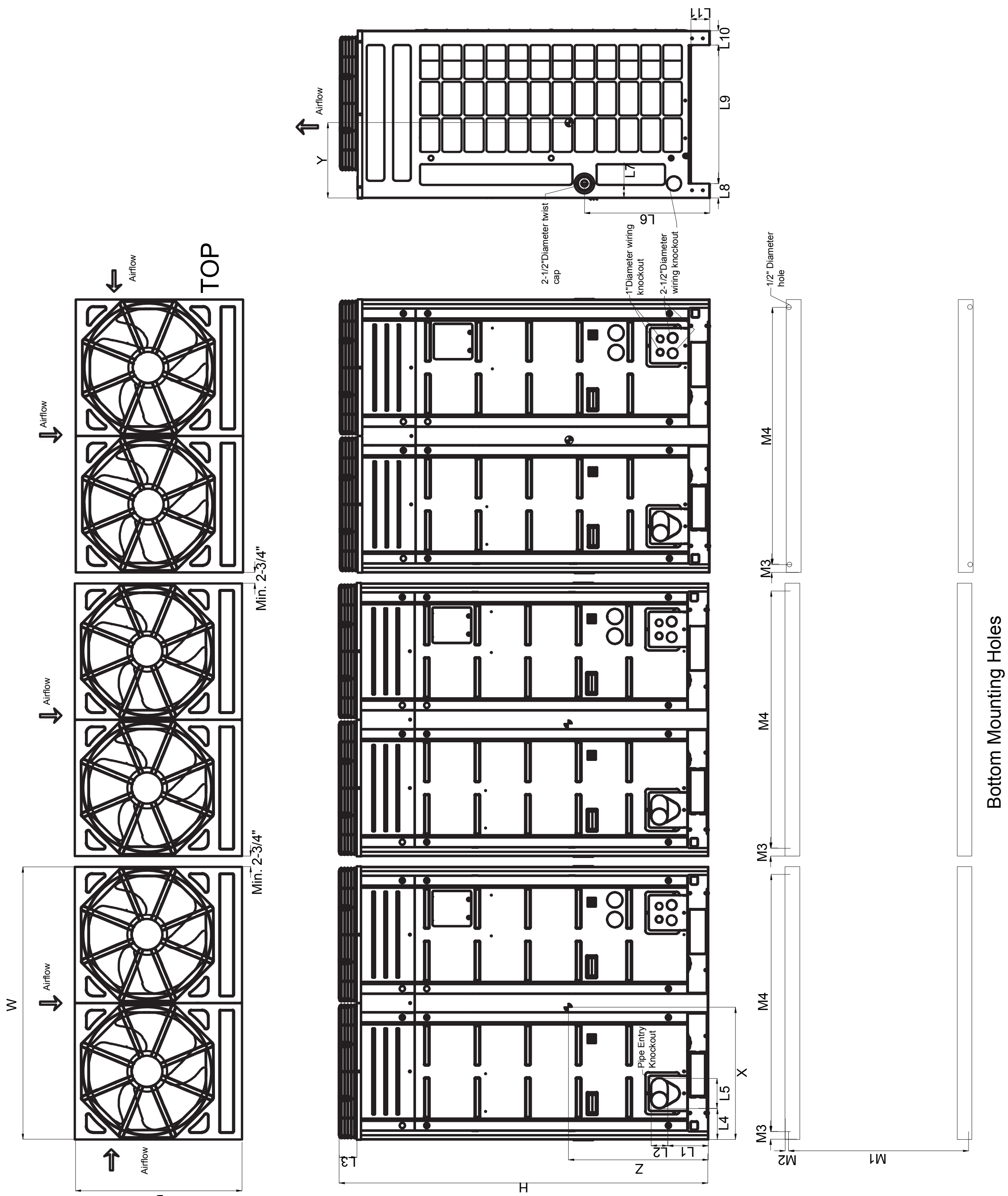
X1	11-1/2"
X2	23-1/8"
Y1	17-13/16"
Y2	14-5/8"
Z1	29-5/16"
Z2	25-13/16"
W1	36-1/4"
W2	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	31-3/16"
M5	2-5/8"
M6	43-3/8"



HEAT PUMP OUTDOOR UNIT DIMENSIONS

ARUN384BT3 / ARUN384DT3, ARUN408BT3 / ARUN408DT3, ARUN432BT3 / ARUN432DT3

X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"

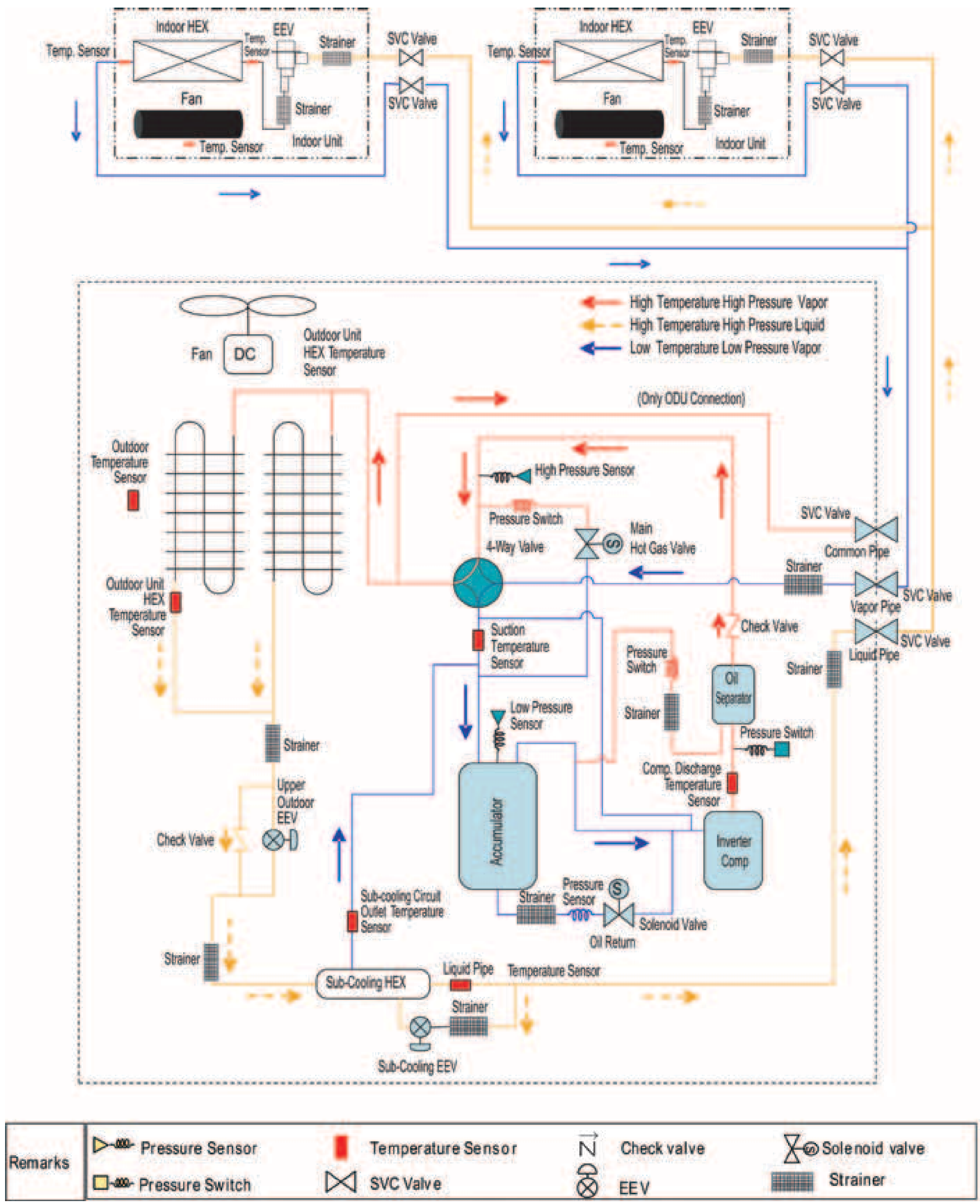


HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

MULTI V III

Cooling Mode

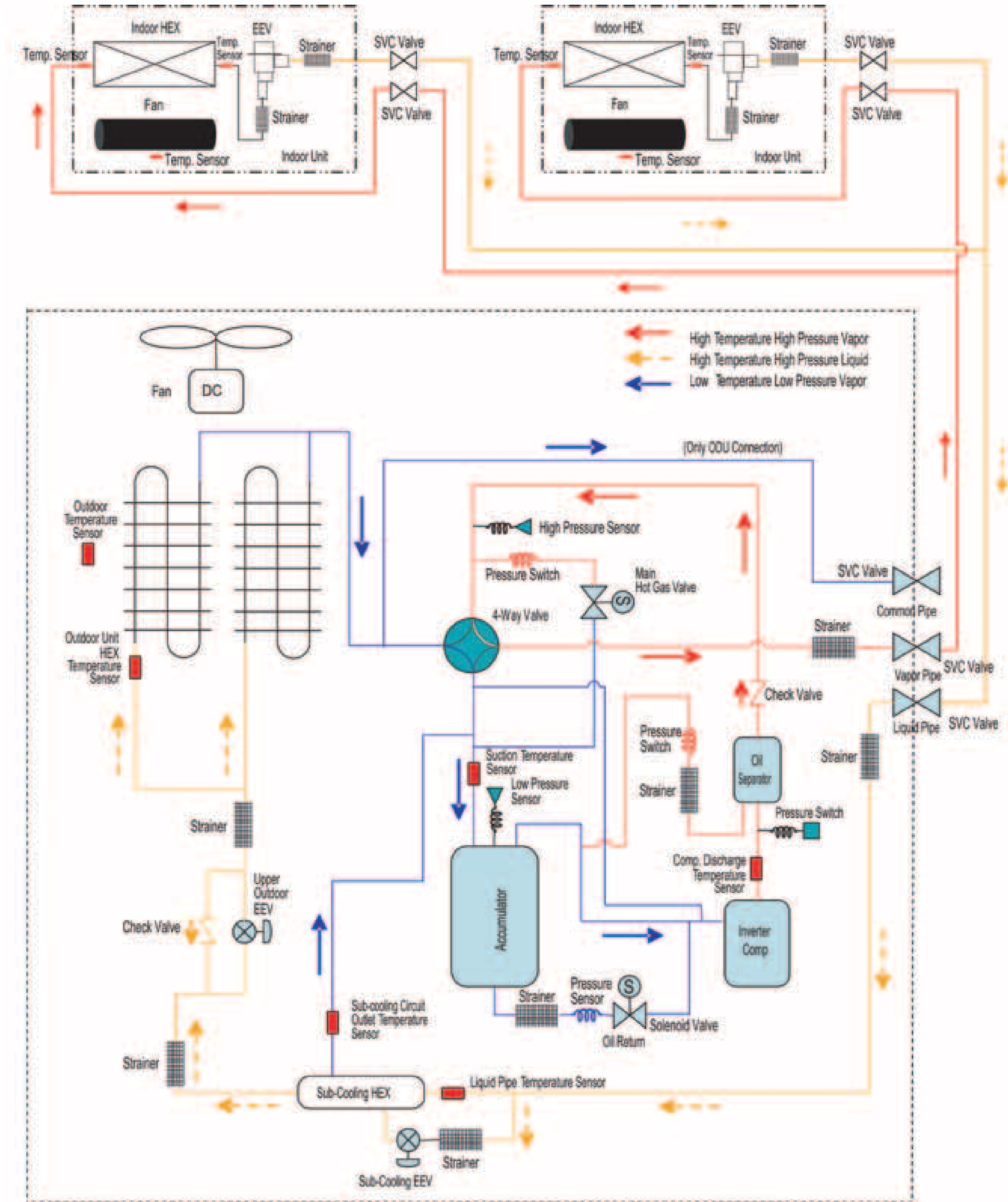
ARUN072BT3 / ARUN072DT3



HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

ARUN072BT3 / ARUN072DT3

Heating Mode



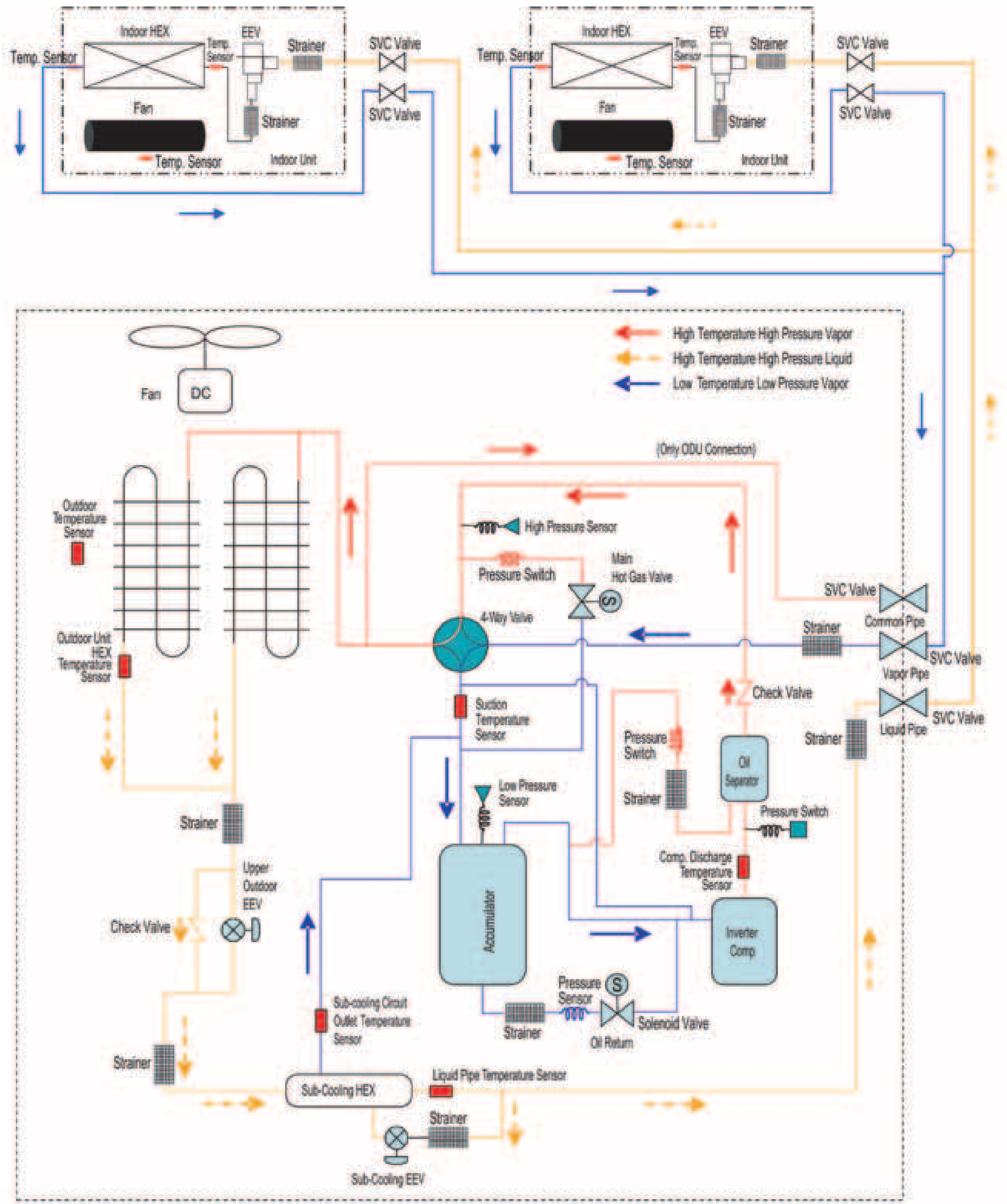
Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

MULTI V III

Oil Return & Defrost Operation

ARUN072BT3 / ARUN072DT3

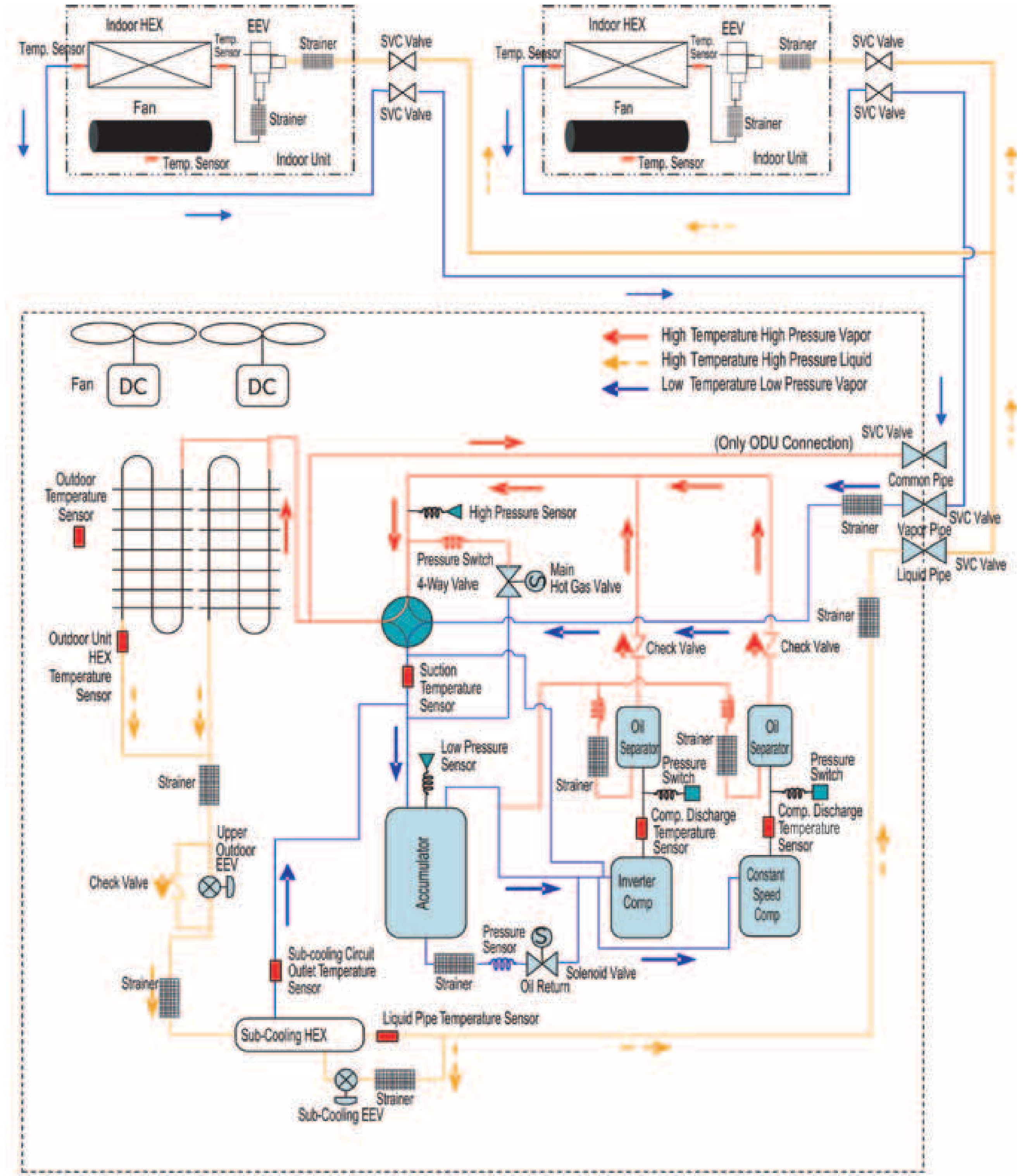


Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

ARUN096BT3 / ARUN096DT3, ARUN121BT3 / ARUN121DT3, ARUN144BT3 / ARUN144DT3

Cooling Mode



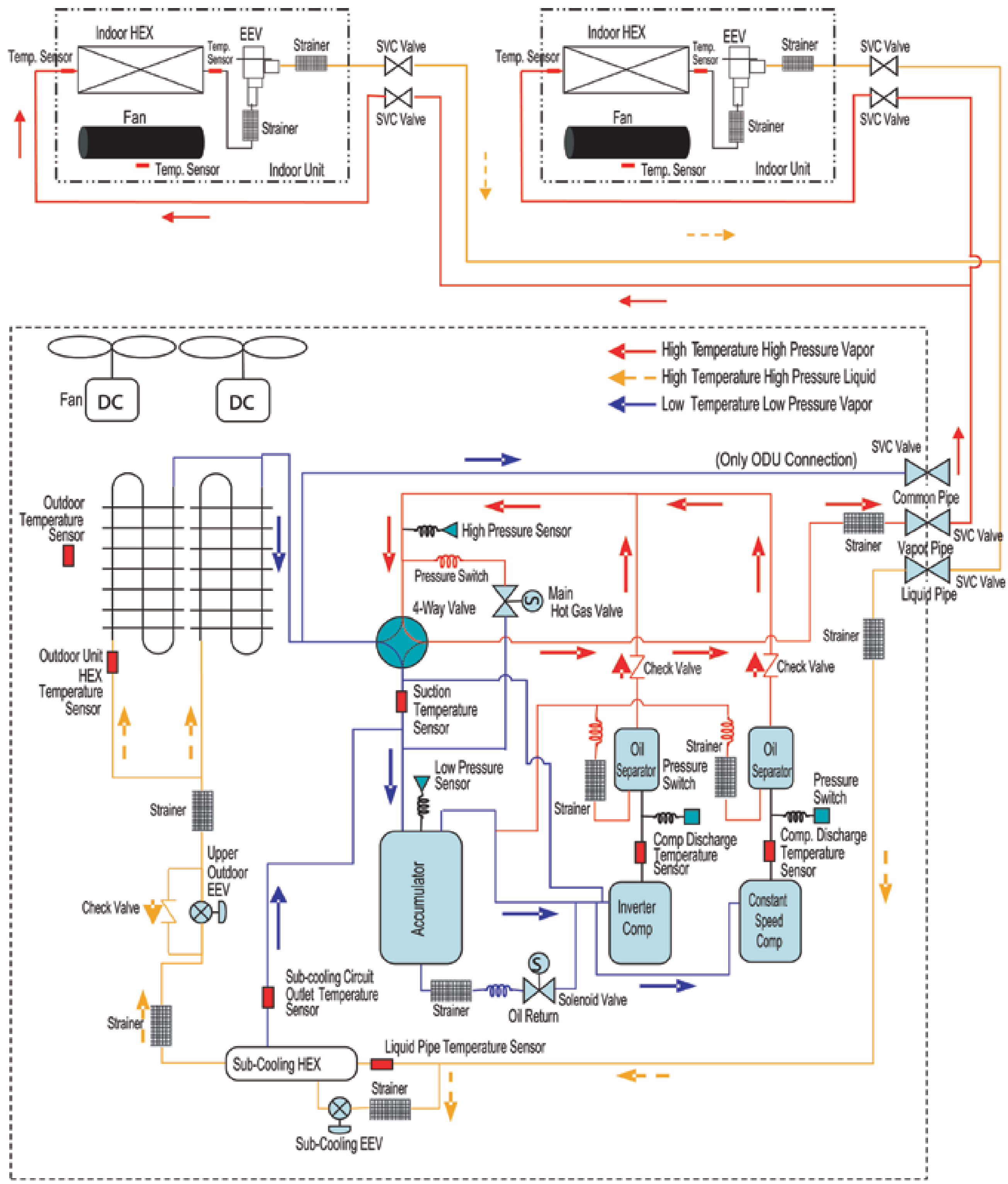
Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

Due to our policy of continuous product innovation, some specifications may change without notification.

HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

MULTI V III

Heating Mode ARUN096BT3 / ARUN096DT3, ARUN121BT3 /ARUN121DT3, ARUN144BT3 / ARUN144DT3

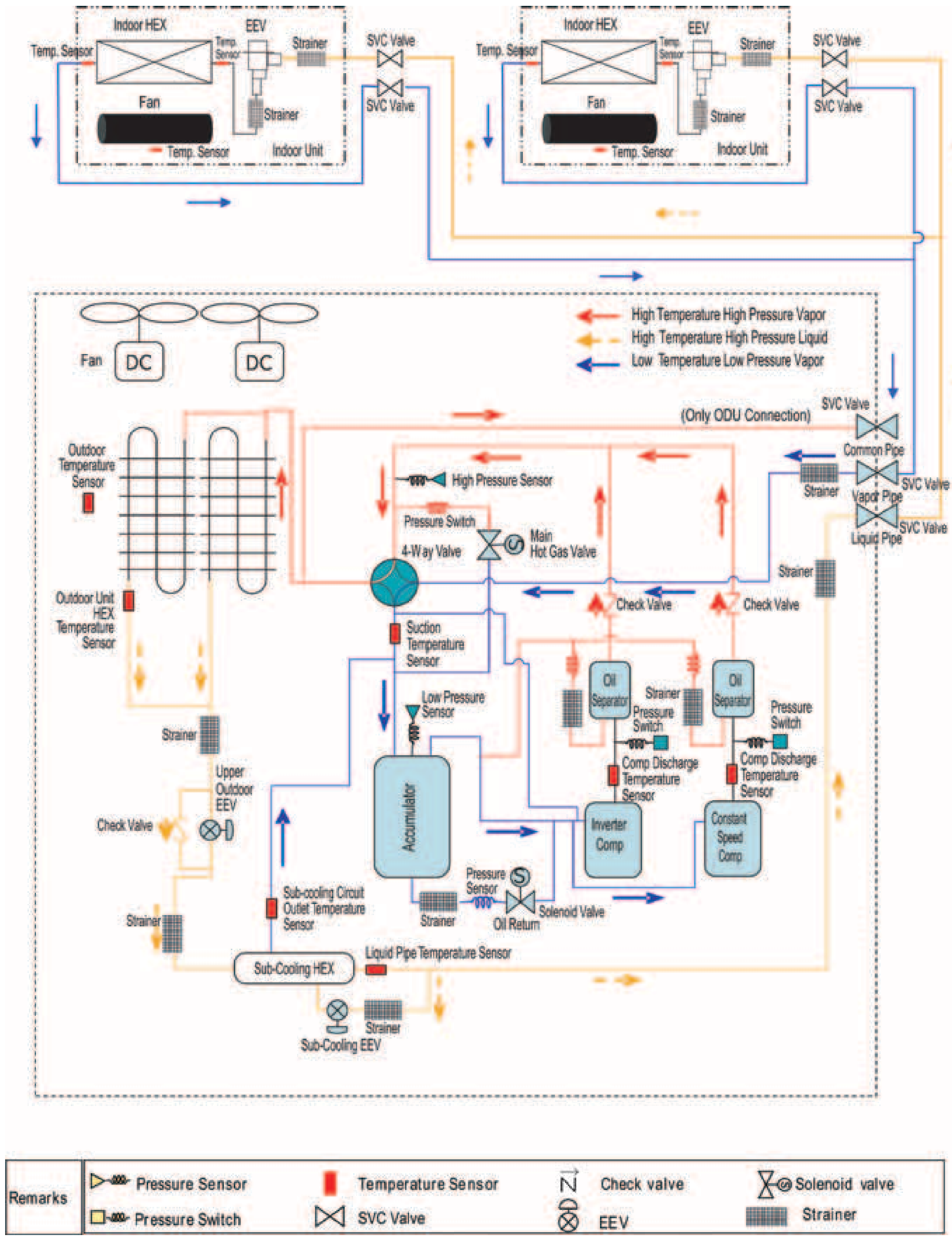


Remarks	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT PUMP OUTDOOR UNIT REFRIG. CIRCUIT

ARUN096BT3 / ARUN096DT3, ARUN121BT3 / ARUN121DT3, ARUN144BT3 / ARUN144DT3

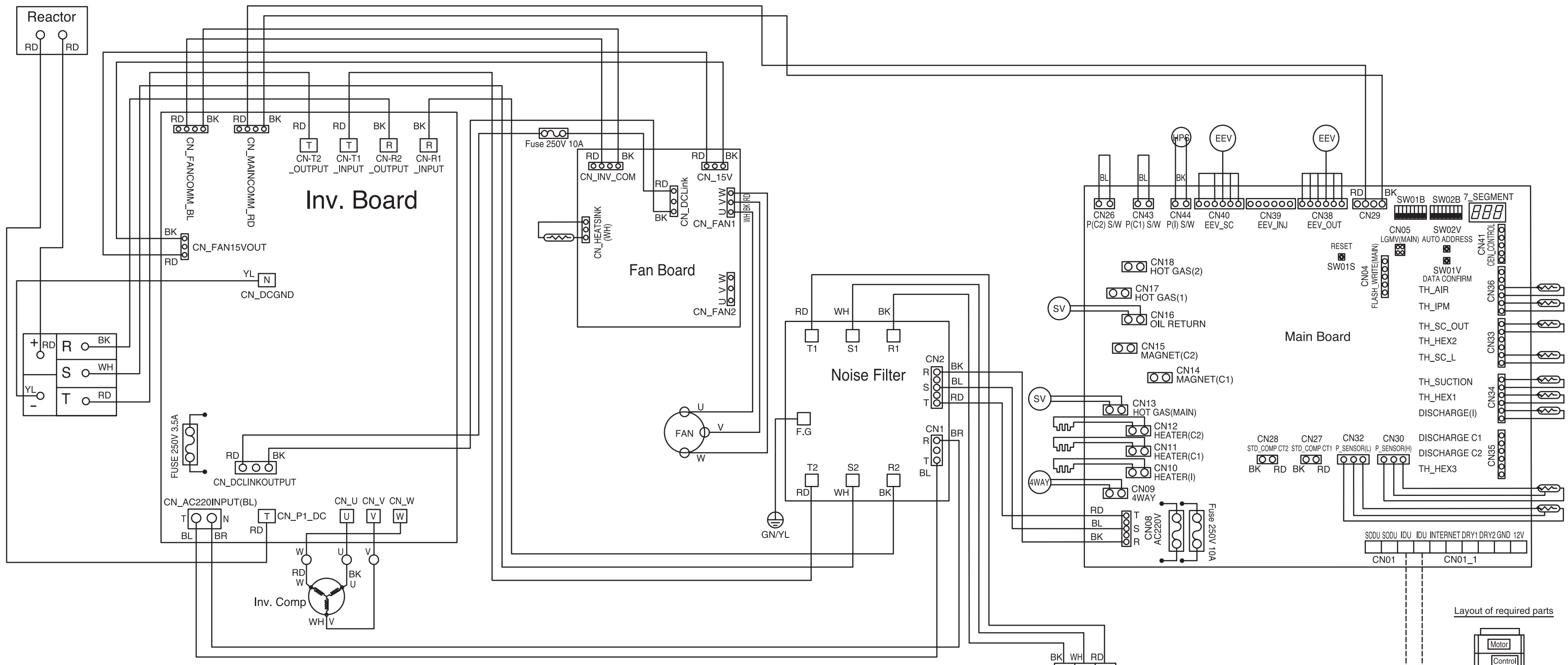
Oil Return & Defrost Operation

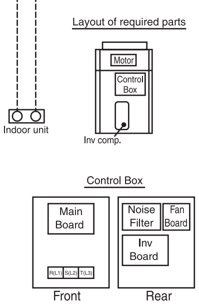


HEAT PUMP OUTDOOR UNIT WIRING DIAGRAMS

MULTI V III

ARUN072BT3 208-230V





Main Board Note (1)

SYMBOL	DESCRIPTION
CN04	TERMINAL FOR ON-BOARDING
CN05	TERMINAL FOR LGMV JIG
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP CRANK HEATER
CN11	CONS. COMP 1 CRANK HEATER
CN12	CONS. COMP 2 CRANK HEATER
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONS. COMP 1 MAGNETIC SWITCH
CN15	CONS. COMP 2 MAGNETIC SWITCH
CN16	OIL RETURN SOLENOID VALVE
CN16	INVERTER COMP. LIQUID INJECTION VALVE
CN17	HOT GAS BYPASS VALVE(UPPER)
CN18	HOT GAS BYPASS VALVE(LOWER)
CN26	CONS.COMP 2 HIGH PRESSURE SWITCH
CN27	CONS.COMP 1 CT SENSOR
CN28	CONS.COMP 2 CT SENSOR
CN29	TRANSMISSION WITH INVERTER PCB
CN30	HIGH PRESSURE SENSOR
CN32	LOW PRESSURE SENSOR

Main Board Note (2)

SYMBOL	DESCRIPTION
CN33(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE THERMISTOR
CN34(DIACHARGE(I))	INVERTER COMP. DISCHARGE PIPE THERMISTOR
CN34(SUCTION)	SUCTION PIPE THERMISTOR
CN35(DISCHARGE C1)	CONS. COMP 1 DISCHARGE PIPE THERMISTOR
CN35(DISCHARGE C2)	CONS. COMP 2 DISCHARGE PIPE THERMISTOR
CN36(IPM)	INV IPM THERMISTOR
CN36(AIR)	OUTDOOR AIR THERMISTOR
CN38	ELECTRIC EXPANSION VALVE (Main)
CN39	ELECTRIC EXPANSION VALVE(INJECTION)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLING)
CN41	TERMINAL FOR CENTRAL CONTROL UNIT
CN43	CONS. COMP 1 HIG PRESSRE SWITCH
CN44	INV. COMP. HIGH PRESSURE SWITCH
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING BUTTON

Inv. Board Note

SYMBOL	DESCRIPTION
CN_FANCOMM_BL	TRANSMISSION WITH FAN PCB
CN_MAINCOMM_RD	TRANSMISSION WITH MAIN PCB
CN_FAN15VOUT	DC 15V
CN_DCLINKOUTPUT	DC LINK 700V
CN_AC220 INPUT(BL)	AC POWER 220V
CN_U	TERMINAL FOR OUTPUT U
CN_V	TERMINAL FOR OUTPUT V
CN_W	TERMINAL FOR OUTPUT W
CN-T2_OUTPUT	T PHASE OUTPUT
CN-T1_INPUT	T PHASE INPUT
CN-R2_OUTPUT	R PHASE OUTPUT
CN-R1_INPUT	R PHASE INPUT

Notes)
1. This circuit diagram is applied only to the outdoor unit.
2. R S T: Terminal Block, O O: Connector, ⏚: Grounding.
3. When installation for field wiring, refer to the installation manual.

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERTER BOARD
CN 15V	DC 15V INPUT
CN DC LINK	DC LINK 700V

COLOR

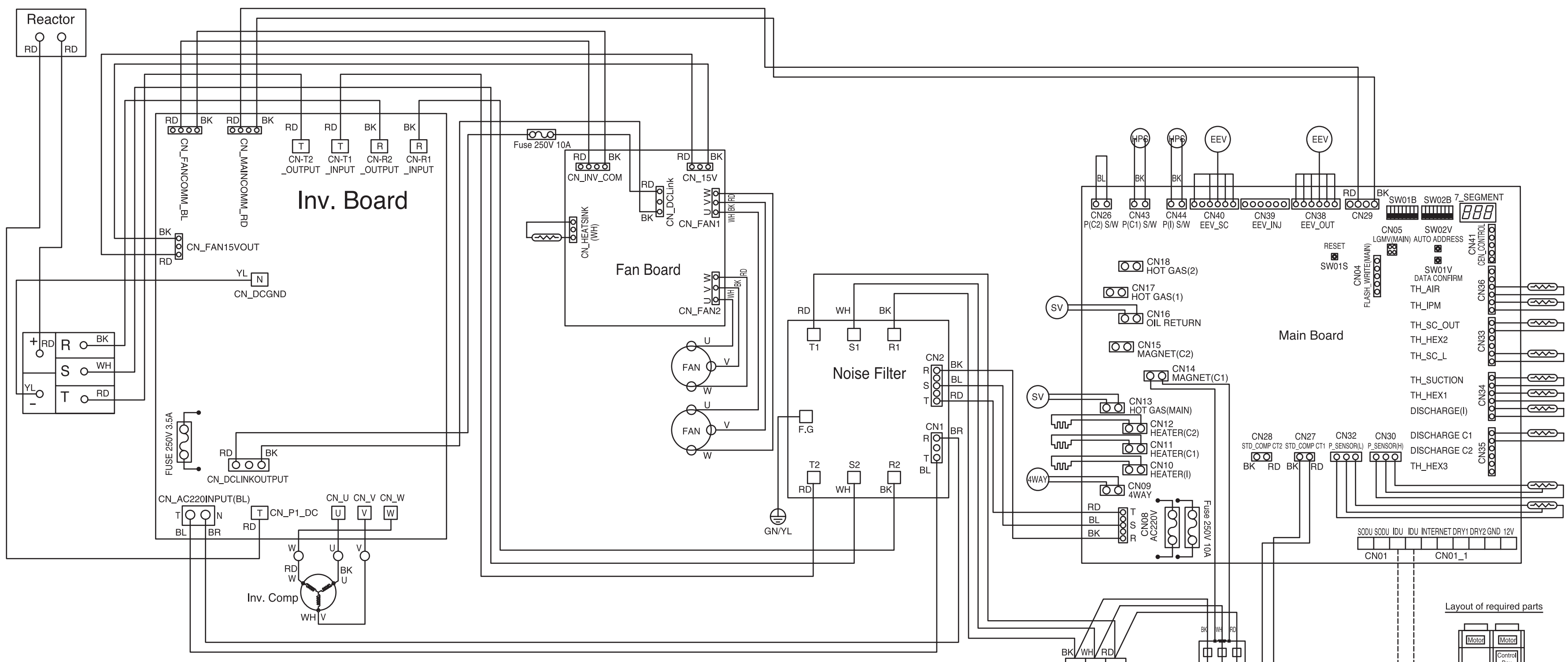
SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

Note

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

HEAT PUMP OUTDOOR UNIT WIRING DIAGRAMS

ARUN096BT3, ARUN121BT3, ARUN144BT3 208-230V



Main Board Note (1)

SYMBOL	DESCRIPTION
CN04	TERMINAL FOR ON-BOARDING
CN05	TERMINAL FOR LGMV JIG
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP CRANK HEATER
CN11	CONS. COMP 1 CRANK HEATER
CN12	CONS. COMP 2 CRANK HEATER
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONS. COMP 1 MAGNETIC SWITCH
CN15	CONS. COMP 2 MAGNETIC SWITCH
CN16	OIL RETURN SOLENOID VALVE
CN16	INVERTER COMP. LIQUID INJECTION VALVE
CN17	HOT GAS BYPASS VALVE(UPPER)
CN18	HOT GAS BYPASS VALVE(LOWER)
CN26	CONS.COMP 2 HIGH PRESSURE SWITCH
CN27	CONS.COMP 1 CT SENSOR
CN28	CONS.COMP 2 CT SENSOR
CN29	TRANSMISSION WITH INVERTER PCB
CN30	HIGH PRESSURE SENSOR
CN32	LOW PRESSURE SENSOR

Main Board Note (2)

SYMBOL	DESCRIPTION
CN33(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE THERMISTOR
CN34(DIACHARGE(I))	INVERTER COMP. DISCHARGE PIPE THERMISTOR
CN34(SUCTION)	SUCTION PIPE THERMISTOR
CN35(DISCHARGE C1)	CONS. COMP 1 DISCHARGE PIPE THERMISTOR
CN35(DISCHARGE C2)	CONS. COMP 2 DISCHARGE PIPE THERMISTOR
CN36(IPM)	INV IPM THERMISTOR
CN36(AIR)	OUTDOOR AIR THERMISTOR
CN38	ELECTRIC EXPANSION VALVE (Main)
CN39	ELECTRIC EXPANSION VALVE(INJECTION)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLING)
CN41	TERMINAL FOR CENTRAL CONTROL UNIT
CN43	CONS. COMP 1 HIG PRESSRE SWITCH
CN44	INV. COMP. HIGH PRESSURE SWITCH
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING BUTTON

Inv. Board Note

SYMBOL	DESCRIPTION
CN_FANCOMM_BL	TRANSMISSION WITH FAN PCB
CN_MAINCOMM_RD	TRANSMISSION WITH MAIN PCB
CN_FAN15VOUT	DC 15V
CN_DCLINKOUTPUT	DC LINK 700V
CN_AC220 INPUT(BL)	AC POWER 220V
CN_U	TERMINAL FOR OUTPUT U
CN_V	TERMINAL FOR OUTPUT V
CN_W	TERMINAL FOR OUTPUT W
CN-T2_OUTPUT	T PHASE OUTPUT
CN-T1_INPUT	T PHASE INPUT
CN-R2_OUTPUT	R PHASE OUTPUT
CN-R1_INPUT	R PHASE INPUT

Notes)
1. This circuit diagram is applied only to the outdoor unit.
2. R S T : Terminal Block, ◯◯ : Connector, ⏚ : Grounding.
3. When installation for field wiring, refer to the installation manual.

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERTER BOARD
CN 15V	DC 15V INPUT
CN DC LINK	DC LINK 700V

COLOR

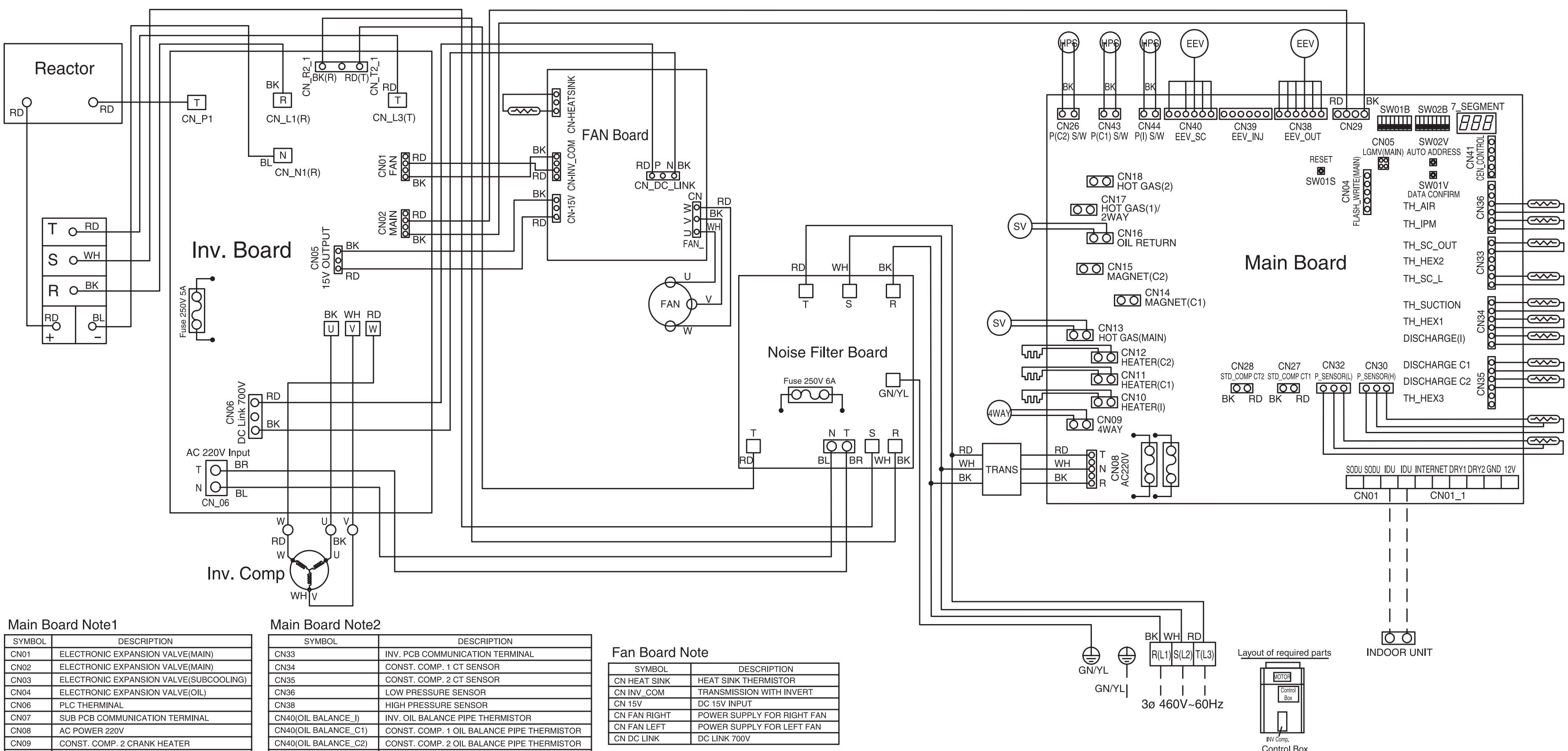
SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

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

HEAT PUMP OUTDOOR UNIT WIRING DIAGRAMS

MULTI V III

ARUN072DT3 460V



Main Board Note1

SYMBOL	DESCRIPTION
CN01	ELECTRONIC EXPANSION VALVE(MAIN)
CN02	ELECTRONIC EXPANSION VALVE(MAIN)
CN03	ELECTRONIC EXPANSION VALVE(SUBCOOLING)
CN04	ELECTRONIC EXPANSION VALVE(OIL)
CN06	PLC THERMINAL
CN07	SUB PCB COMMUNICATION TERMINAL
CN08	AC POWER 220V
CN09	CONST. COMP. 2 CRANK HEATER
CN10	CONST. COMP. 1 CRANK HEATER
CN11	INV. COMP. CRANK HEATER
CN12	4WAY REVERSING VALVE
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONST. COMP.1 MAGNETIC SWITCH
CN15	CONST. COMP.2 MAGNETIC SWITCH
CN16	OIL RETURE VALVE
CN26	HOT GAS BYPASS VALVE(HIGH)
CN27	HOT GAS BYPASS VALVE(LOW)
CN30	CONST. COMP.2 HIGN PRESSURE SWITCH
CN31	CONST. COMP.1 HIGN PRESSURE SWITCH
CN32	INV. COMP. HIGN PRESSURE SWITCH

Main Board Note2

SYMBOL	DESCRIPTION
CN33	INV. PCB COMMUNICATION TERMINAL
CN34	CONST. COMP. 1 CT SENSOR
CN35	CONST. COMP. 2 CT SENSOR
CN36	LOW PRESSURE SENSOR
CN38	HIGH PRESSURE SENSOR
CN40(OIL BALANCE_I)	INV. OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C1)	CONST. COMP. 1 OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C2)	CONST. COMP. 2 OIL BALANCE PIPE THERMISTOR
CN41(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN41(HEX_HIGH)	ODU HEX HIGH PIPE THERMISTOR
CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
CN42(AIR)	OUTDOOR AIR THERMISTOR
CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
CN43(HEX)	ODU HEX LOW PIPE THERMISTOR
CN43(DISCHARGE_I)	INV. COMP. DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C1)	CONST. COMP. 1 DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERT
CN 15V	DC 15V INPUT
CN FAN RIGHT	POWER SUPPLY FOR RIGHT FAN
CN FAN LEFT	POWER SUPPLY FOR LEFT FAN
CN DC LINK	DC LINK 700V

Inv. Board Note

SYMBOL	DESCRIPTION
CN01	TRANSMISSION WITH FAN PCB
CN02	TRANSMISSION WITH MAIN PCB
CN04	THERMINAL FOR ON-BOARDING
CN06	DC 15V
CN12	DC LINK 700V
CN13	AC POWER 220V
CN14	THERMINAL FOR OUTPUT U.V.W
CN_L1(R)	R PHASE INPUT
CN_L2(S)	S PHASE INPUT
CN_L3(T)	T PHASE INPUT

Note

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

COLOR

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

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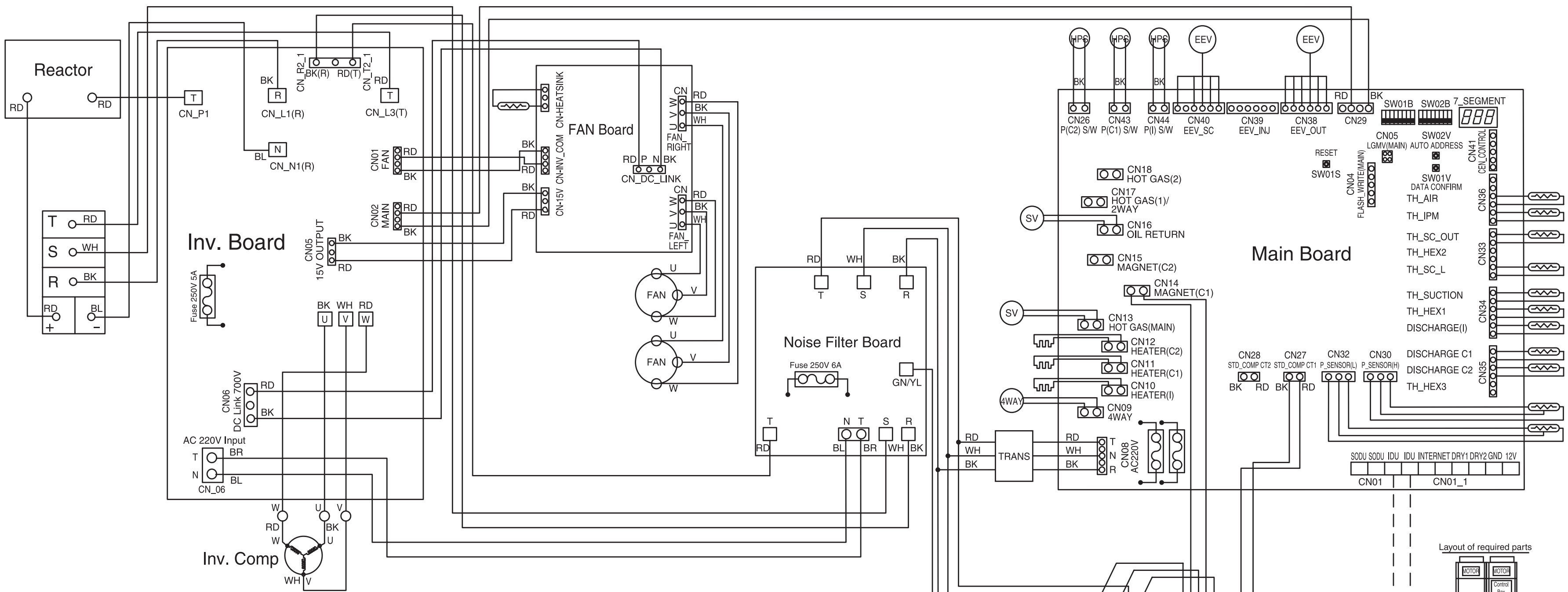
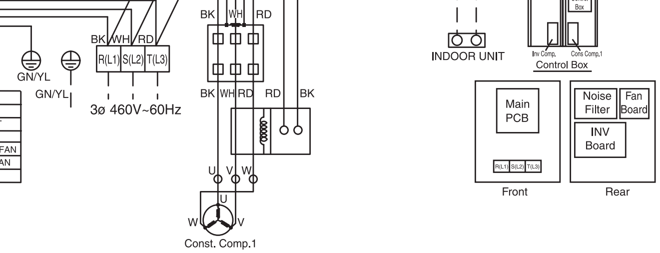
HEAT PUMP OUTDOOR UNIT WIRING DIAGRAMS

ARUN096DT3, ARUN121DT3, ARUN144DT3 460V





Main Board Note1

SYMBOL	DESCRIPTION
CN01	ELECTRONIC EXPANSION VALVE(MAIN)
CN02	ELECTRONIC EXPANSION VALVE(MAIN)
CN03	ELECTRONIC EXPANSION VALVE(SUBCOOLING)
CN04	ELECTRONIC EXPANSION VALVE(OIL)
CN06	PLC THERMINAL
CN07	SUB PCB COMMUNICATION TERMINAL
CN08	AC POWER 220V
CN09	CONST. COMP. 2 CRANK HEATER
CN10	CONST. COMP. 1 CRANK HEATER
CN11	INV. COMP. CRANK HEATER
CN12	4WAY REVERSING VALVE
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONST. COMP.1 MAGNETIC SWITCH
CN15	CONST. COMP.2 MAGNETIC SWITCH
CN16	OIL RETURE VALVE
CN26	HOT GAS BYPASS VALVE(HIGH)
CN27	HOT GAS BYPASS VALVE(LOW)
CN30	CONST. COMP.2 HIGN PRESSURE SWITCH
CN31	CONST. COMP.1 HIGN PRESSURE SWITCH
CN32	INV. COMP. HIGN PRESSURE SWITCH

Main Board Note2

SYMBOL	DESCRIPTION
CN33	INV. PCB COMMUNICATION TERMINAL
CN34	CONST. COMP. 1 CT SENSOR
CN35	CONST. COMP. 2 CT SENSOR
CN36	LOW PRESSURE SENSOR
CN38	HIGH PRESSURE SENSOR
CN40(OIL BALANCE_I)	INV. OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C1)	CONST. COMP. 1 OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C2)	CONST. COMP. 2 OIL BALANCE PIPE THERMISTOR
CN41(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN41(HEX_HIGH)	ODU HEX HIGH PIPE THERMISTOR
CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
CN42(AIR)	OUTDOOR AIR THERMISTOR
CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
CN43(HEX)	ODU HEX LOW PIPE THERMISTOR
CN43(DISCHARGE_I)	INV. COMP. DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C1)	CONST. COMP. 1 DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Inv. Board Note

SYMBOL	DESCRIPTION
CN01	TRANSMISSION WITH FAN PCB
CN02	TRANSMISSION WITH MAIN PCB
CN04	THERMINAL FOR ON-BOARDING
CN06	DC 15V
CN12	DC LINK 700V
CN13	AC POWER 220V
CN14	THERMINAL FOR OUTPUT U.V.W
CN_L1(R)	R PHASE INPUT
CN_L2(S)	S PHASE INPUT
CN_L3(T)	T PHASE INPUT

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERT
CN 15V	DC 15V INPUT
CN FAN RIGHT	POWER SUPPLY FOR RIGHT FAN
CN FAN LEFT	POWER SUPPLY FOR LEFT FAN
CN DC LINK	DC LINK 700V

Note

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

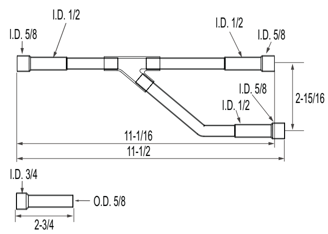
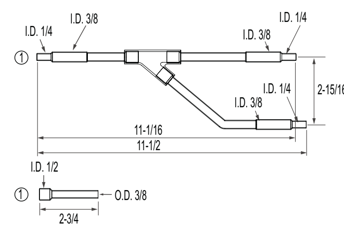
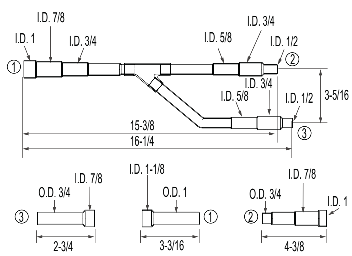
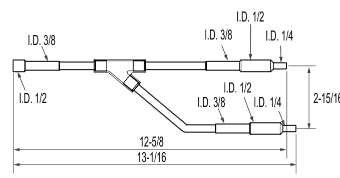
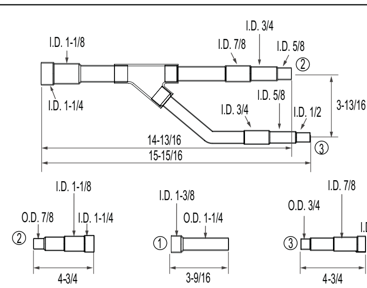
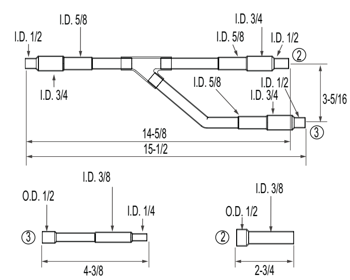
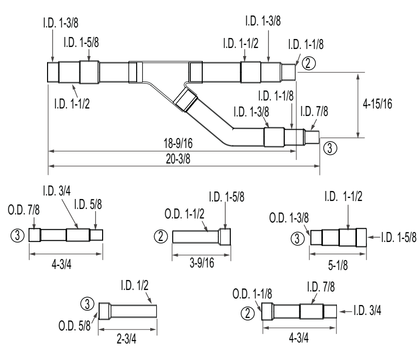
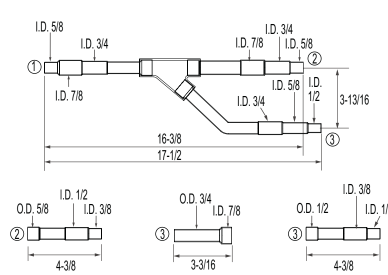
COLOR

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

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 Frame		Use to Combine Three Frames
	ARCNN21		ARCNN21
			ARCNN31

Y-branches (for indoor unit connection)

Unit: Inch

Models	Vapor pipe	Liquid pipe
ARBLN01621		
ARBLN03321		
ARBLN07121		
ARBLN14521		

Due to our policy of continuous product innovation, some specifications may change without notification.

Headers (for indoor unit connection)

Unit: inch

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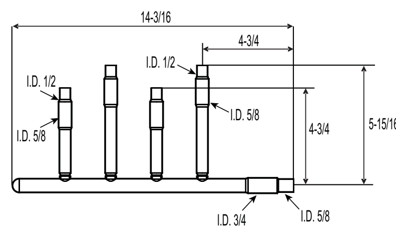
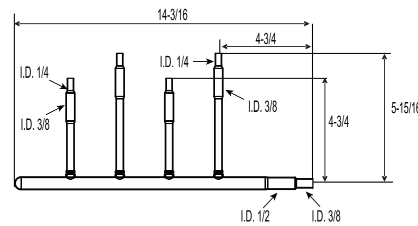
<tr><td>4 branch
ARBL054</td><td>
</td><td>
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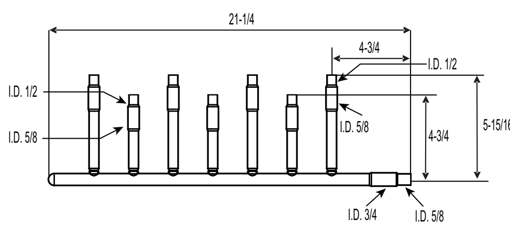
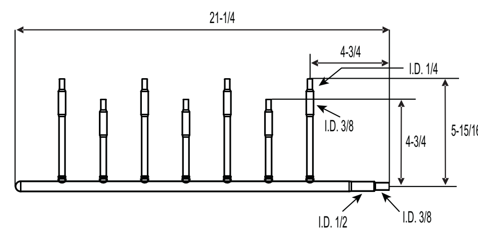
ARBL057</td><td>
</td><td>
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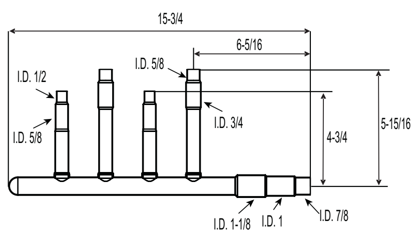
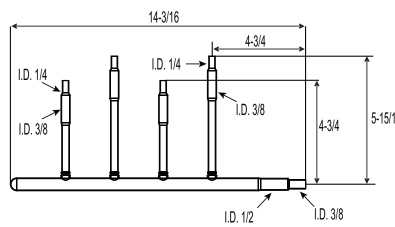
ARBL104</td><td>
</td><td>
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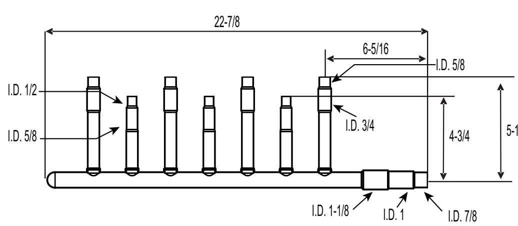
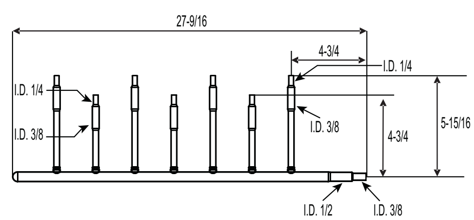
ARBL107</td><td>
</td><td>
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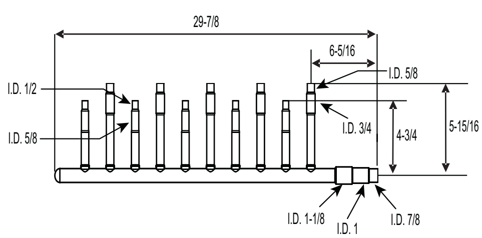
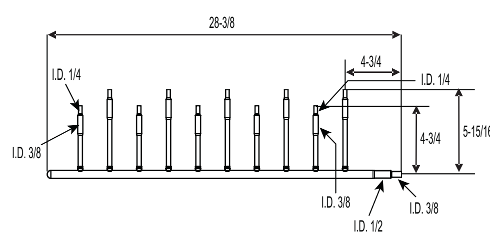
ARBL1010</td><td>
</td><td>
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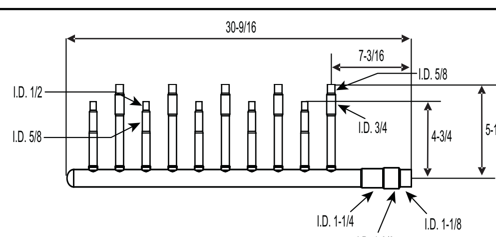
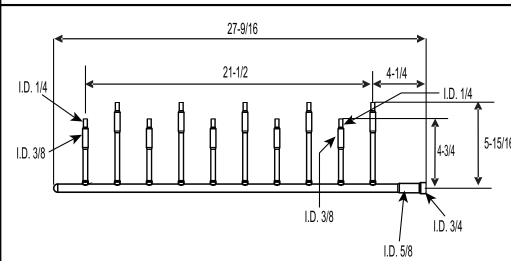
ARBL2010</td><td>
</td><td>
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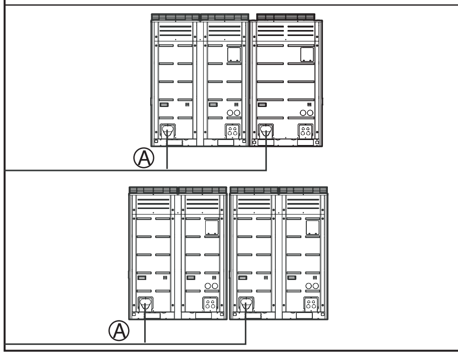
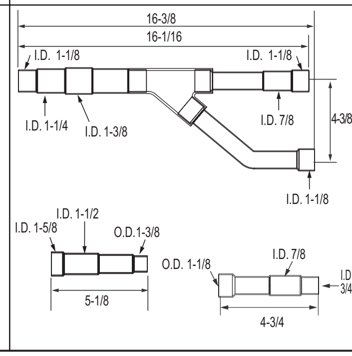
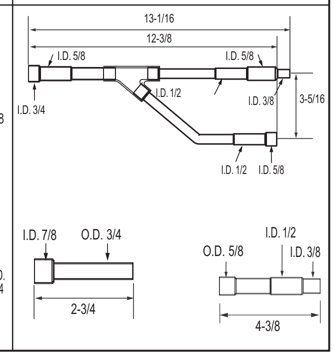
Product Data

Multi-frame Connectors (for heat pump outdoor unit connection)

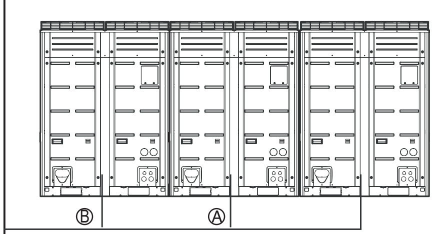
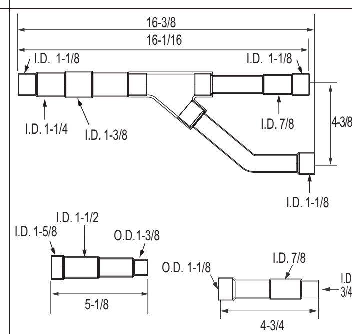
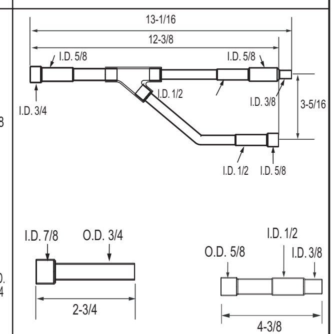
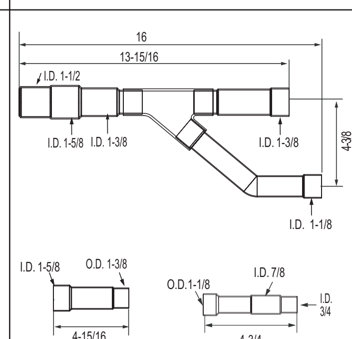
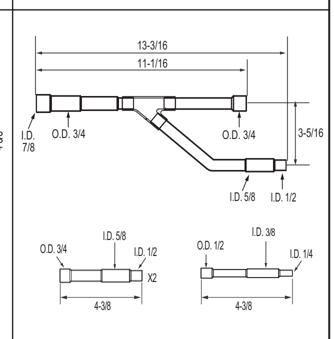
Two outdoor units

Unit: inch

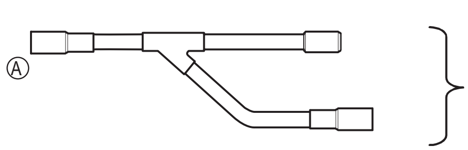
Combination	Multi-Frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		

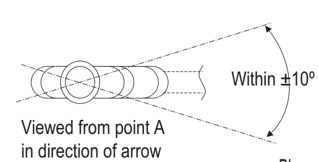
Three outdoor units

Unit: inch

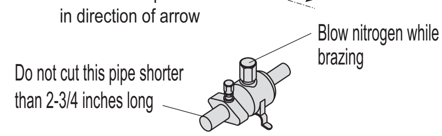
Combination specification	Multi-Frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		
	Ⓑ ARCNN31		

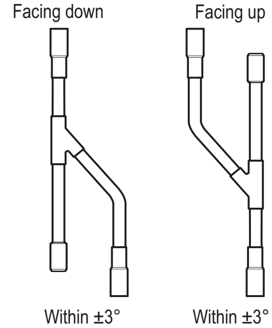
Install the branch pipe between the outdoor units so that the outlet pipe is parallel with the surface.





Ⓐ To branch piping or indoor unit
Ⓑ To outdoor unit





HEAT RECOVERY OUTDOOR UNIT SPECIFICATIONS

Single-Frame 208-230V Heat Recovery Units

Combination Unit Model Number	6.0 Ton ARUB072BT3	8.0 Ton ARUB096BT3	10.0 Ton ARUB121BT3	12.0 ARUB144BT3
Individual Component Model Numbers	-	-	-	-
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Rated Cooling Capacity (Btu/h)[2]	69,000	92,000	114,000	138,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Rated Heating Capacity (Btu/h)[2]	77,000	103,000	129,000	154,000
Operating Range				
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor				
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Constant Quantity	-	1	1	1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)				
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1	0.6 x 2	0.6 x 2	0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct			
Operating Range (RPM)	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	6,300	7,400	8,500	8,800
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max Number Indoor Units/System[3]	13	16	20	23
Sound Pressure dB(A)[4]	57	58	58	58
Net Unit Weight (lbs)	418	617	617	617
Shipping Weight (lbs)	441	650	650	650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Fins per inch	2/17	2/17	2/17	2/17
Piping[7]				
Liquid Line Connection (in, OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Low Pressure Vapor Line Conn. (in, OD)	3/4 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
High Pressure Vapor Line Conn. (in, OD)	5/8 Braze	3/4 Braze	3/4 Braze	7/8 Braze
Factory Charge lbs of R410A	12.1	20.7	20.7	20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

HEAT RECOVERY OUTDOOR UNIT SPECIFICATIONS MULTI V III

Dual-Frame 208-230V Heat Recovery Units

Combination Unit Model Number	14.0 Ton ARUB168BT3	16.0 Ton ARUB192BT3	18.0 Ton ARUB216BT3	20.0 ARUB240BT3	22.0 ARUB264BT3	24.0 ARUB288BT3
Individual Component Model Numbers	ARUB072BT3x1 + ARUB096BT3x1	ARUB072BT3x1 + ARUB121BT3x1	ARUB072BT3x1 + ARUB144BT3x1	ARUB096BT3x1 + ARUB144BT3x1	ARUB121BT3x1 + ARUB144BT3x1	ARUB144BT3 x 2
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	168,000	192,000	216,000	240,000	264,000	288,000
Rated Cooling Cap. (Btu/h)[2]	160,000	184,000	206,000	228,000	250,000	274,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	189,000	216,000	243,000	270,000	297,000	324,000
Rated Heating Cap. (Btu/h)[2]	180,000	206,000	240,000	256,000	282,000	308,000
Operating Range						
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Constant Quantity	1	1	1	2	2	2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	13,700	14,800	15,100	16,200	17,300	17,600
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	29	32	35	39	42	45
Sound Pressure dB(A)[4]	61	61	61	61	61	61
Net Unit Weight (lbs)	418 + 617	418 + 617	418 + 617	617 + 617	617 + 617	617 + 617
Shipping Weight (lbs)	441 + 650	441 + 650	441 + 650	650 + 650	650 + 650	650 + 650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8 + 3/8 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Low Pressure Vapor Line Conn. (in, OD)	3/4 + 7/8 Braze	3/4 + 1-1/8 Braze	3/4 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
High Pressure Vapor Line Conn. (in, OD)	5/8 + 3/4 Braze	5/8 + 3/4 Braze	5/8 + 7/8 Braze	3/4 + 7/8 Braze	3/4 + 7/8 Braze	7/8 + 7/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7	12.1 + 20.7	12.1 + 20.7	20.7 + 20.7	20.7 + 20.7	20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

MULTI V III HEAT RECOVERY OUTDOOR UNIT SPECIFICATIONS

Triple-Frame 208-230V Heat Recovery Units

Combination Unit Model Number	26.0 Ton ARUB312BT3	28.0 Ton ARUB336BT3	30.0 Ton ARUB360BT3	32.0 ARUB384BT3	34.0 ARUB408BT3	36.0 ARUB432BT3
Individual Component Model Numbers	ARUB072BT3x1 + ARUB096BT3x1 + ARUB144BT3x1	ARUB072BT3x1 + ARUB121BT3x1 + ARUB144BT3x1	ARUB072BT3x1 + ARUB144BT3x2	ARUB096BT3x1 + ARUB144BT3x2	ARUB121BT3x1 + ARUB144BT3x2	ARUB144BT3 x 3
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	312,000	336,000	360,000	384,000	408,000	432,000
Rated Cooling Cap. (Btu/h)[2]	296,000	320,000	342,000	366,000	390,000	414,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	351,000	378,000	405,000	432,000	459,000	486,000
Rated Heating Cap. (Btu/h)[2]	334,000	361,000	387,000	412,000	437,000	462,000
Operating Range						
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3
Constant Quantity	2	2	2	3	3	3
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	22,500	23,600	23,900	25,000	26,100	26,400
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	52	55	58	61	64	64
Sound Pressure dB(A)[4]	62	62	62	63	63	63
Net Unit Weight (lbs)	418 + 617 + 617	418 + 617 + 617	418 + 617 + 617	617 + 617 + 617	617 + 617 + 617	617 + 617 + 617
Shipping Weight (lbs)	441 + 650 + 650	441 + 650 + 650	441 + 650 + 650	650 + 650 + 650	650 + 650 + 650	650 + 650 + 650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8+3/8+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	1/2+1/2+1/2 Braze	1/2+1/2+1/2 Braze
Low Pressure Vapor Line Connection (in, OD)	3/4+7/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	7/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze
High Pressure Vapor Line Connection (in, OD)	5/8 + 3/4 + 7/8 Braze	5/8 + 3/4 + 7/8 Braze	5/8 + 3/4 + 7/8 Braze	3/4 + 7/8 + 7/8 Braze	3/4 + 7/8 + 7/8 Braze	7/8 + 7/8 + 7/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230 (AHRI Standard 1230 does not apply to units larger than 300,000 Btu/h).

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

HEAT RECOVERY OUTDOOR UNIT SPECIFICATIONS MULTI V III

Single-Frame 460V Heat Recovery Units

Combination Unit Model Number	6.0 Ton ARUB072DT3	8.0 Ton ARUB096DT3	10.0 Ton ARUB121DT3	12.0 ARUB144DT3
Individual Component Model Numbers	-	-	-	-
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Rated Cooling Capacity (Btu/h)[2]	69,000	92,000	114,000	138,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Rated Heating Capacity (Btu/h)[2]	77,000	103,000	129,000	154,000
Operating Range				
Cooling (°F DB)	23 - 122	23 - 122	23 - 122	23 - 122
Heating (°F WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor				
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Constant Quantity	-	1	1	1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)				
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1	0.6 x 2	0.6 x 2	0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct			
Operating Range (RPM)	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	6,300	7,400	8,500	8,800
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max Number Indoor Units/System[3]	13	16	20	23
Sound Pressure dB(A)[4]	57	58	58	58
Net Unit Weight (lbs)	418	617	617	617
Shipping Weight (lbs)	441	650	650	650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Fins per inch	2/17	2/17	2/17	2/17
Piping[7]				
Liquid Line Connection (in, OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Low Pressure Vapor Line Conn. (in, OD)	3/4 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
High Pressure Vapor Line Conn. (in, OD)	5/8 Braze	3/4 Braze	3/4 Braze	7/8 Braze
Factory Charge lbs of R410A	12.1	20.7	20.7	20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

Dual-Frame 460V Heat Recovery Units

Combination Unit Model Number	14.0 Ton ARUB168DT3	16.0 Ton ARUB192DT3	18.0 Ton ARUB216DT3	20.0 ARUB240DT3	22.0 ARUB264DT3	24.0 ARUB288DT3
Individual Component Model Numbers	ARUB072DT3x1 + ARUB096DT3x1	ARUB072DT3x1 + ARUB121DT3x1	ARUB072DT3x1 + ARUB144DT3x1	ARUB096DT3x1 + ARUB144DT3x1	ARUB121DT3x1 + ARUB144DT3x1	ARUB144DT3 x 2
Cooling Performance						
Nominal Cooling Cap.(Btu/h)[1]	168,000	192,000	216,000	240,000	264,000	288,000
Rated Cooling Cap. (Btu/h)[2]	160,000	184,000	206,000	228,000	250,000	274,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	189,000	216,000	243,000	270,000	297,000	324,000
Rated Heating Cap. (Btu/h)[2]	180,000	206,000	240,000	256,000	282,000	308,000
Operating Range						
Cooling (ºF DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (ºF WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Constant Quantity	1	1	1	2	2	2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.75 x 1 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2	0.6 x 2 + 0.6 x 2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	13,700	14,800	15,100	16,200	17,300	17,600
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	29	32	35	39	42	45
Sound Pressure dB(A)[4]	61	61	61	61	61	61
Net Unit Weight (lbs)	418 + 617	418 + 617	418 + 617	617 + 617	617 + 617	617 + 617
Shipping Weight (lbs)	441 + 650	441 + 650	441 + 650	650 + 650	650 + 650	650 + 650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8 + 3/8 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Low Pressure Vapor Line Conn. (in, OD)	3/4 + 7/8 Braze	3/4 + 1-1/8 Braze	3/4 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
High Pressure Vapor Line Conn. (in, OD)	5/8 + 3/4 Braze	5/8 + 3/4 Braze	5/8 + 7/8 Braze	3/4 + 7/8 Braze	3/4 + 7/8 Braze	7/8 + 7/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7	12.1 + 20.7	12.1 + 20.7	20.7 + 20.7	20.7 + 20.7	20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230.

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

Product Data

HEAT RECOVERY OUTDOOR UNIT SPECIFICATIONS MULTI V III

Triple-Frame 460V Heat Recovery Units

Combination Unit Model Number	26.0 Ton ARUB312DT3	28.0 Ton ARUB336DT3	30.0 Ton ARUB360DT3	32.0 ARUB384DT3	34.0 ARUB408DT3	36.0 ARUB432DT3
Individual Component Model Numbers	ARUB072DT3x1 + ARUB096DT3x1 + ARUB144DT3x1	ARUB072DT3x1 + ARUB121DT3x1 + ARUB144DT3x1	ARUB072DT3x1 + ARUB144DT3x2	ARUB096DT3x1 + ARUB144DT3x2	ARUB121DT3x1 + ARUB144DT3x2	ARUB144DT3 x 3
Cooling Performance						
Nominal Cooling Cap. (Btu/h)[1]	312,000	336,000	360,000	384,000	408,000	432,000
Rated Cooling Cap. (Btu/h)[2]	296,000	320,000	342,000	366,000	390,000	414,000
Heating Performance						
Nominal Heating Cap. (Btu/h)[1]	351,000	378,000	405,000	432,000	459,000	486,000
Rated Heating Cap. (Btu/h)[2]	334,000	361,000	387,000	412,000	437,000	462,000
Operating Range						
Cooling (ºF DB)	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122	23 - 122
Heating (ºF WB)	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60	-4 - +60
Compressor						
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3	HSS DC Scroll x 3
Constant Quantity	2	2	2	3	3	3
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Fan (Top Discharge)						
Type	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)	Propeller (BLDC)
Motor Output (kW) x Qty.	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.75x1+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2	0.6x2+0.6x2+0.6x2
Motor/Drive	Brushless Digitally Controlled/Direct					
Operating Range (RPM)	80–950	80–950	80–950	80–950	80–950	80–950
Maximum Air Volume (CFM)	22,500	23,600	23,900	25,000	26,100	26,400
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max No. Indoor Units/System[3]	52	55	58	61	64	64
Sound Pressure dB(A)[4]	62	62	62	63	63	63
Net Unit Weight (lbs)	418 + 617 + 617	418 + 617 + 617	418 + 617 + 617	617 + 617 + 617	617 + 617 + 617	617 + 617 + 617
Shipping Weight (lbs)	441 + 650 + 650	441 + 650 + 650	441 + 650 + 650	650 + 650 + 650	650 + 650 + 650	650 + 650 + 650
Communication Cables[5,6]	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18	2 x 18
Heat Exchanger						
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic					
Rows/Fins per inch	2/17	2/17	2/17	2/17	2/17	2/17
Piping[7]						
Liquid Line Conn. (in, OD)	3/8+3/8+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	3/8+1/2+1/2 Braze	1/2+1/2+1/2 Braze	1/2+1/2+1/2 Braze
Low Pressure Vapor Line Conn. (in, OD)	3/4+7/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	3/4+1-1/8+1-1/8 Braze	7/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze	1-1/8+1-1/8+1-1/8 Braze
High Pressure Vapor Line Conn. (in, OD)	5/8 + 3/4 + 7/8 Braze	5/8 + 3/4 + 7/8 Braze	5/8 + 3/4 + 7/8 Braze	3/4 + 7/8 + 7/8 Braze	3/4 + 7/8 + 7/8 Braze	7/8 + 7/8 + 7/8 Braze
Factory Charge lbs of R410A	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	12.1 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7	20.7 + 20.7 + 20.7

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%. (Nominal capacity is outside the scope of AHRI Standard 1230.)
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 1230 (AHRI Standard 1230 does not apply to units larger than 300,000 Btu/h).

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

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

[5]All communication cable to be minimum 18 AWG, 2-conductor, stranded, shielded, and must comply with applicable local and national codes.

[6]Power wiring cable is field provided and must comply with the applicable local and national codes. See page 41 for detailed electrical data.

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

208-230V, 60Hz, 3-Phase Heat Recovery Units

Nom. Tons	Unit Model Nos.	Compressor (Comp.) Comp. Qty.	Motor Amps Motor RLA (Ea.) Frame 1 Comp. A	Frame 1 Comp. B	Frame 2 Comp. A	Frame 2 Comp. B	Frame 3 Comp. A	Frame 3 Comp. B	Condenser Fan Motor(s) Fan Qty.	Amps FLA (Ea.) Frame 1	FLA (Ea.) Frame 2	FLA (Ea.) Frame 3	MSC	MCA Frame 1	MCA Frame 2	MCA Frame 3	MOCP Frame 1	MOCP Frame 2	MOCP Frame 3
6.0	ARUB072BT3	1	15.4	-	-	-	-	-	1	4.0	-	-	-	23.3	-	-	35	-	-
8.0	ARUB096BT3	2	11.0	20.5	-	-	-	-	2	6.0	-	-	150.2	42.6	-	-	60	-	-
10.0	ARUB121BT3	2	12.5	20.5	-	-	-	-	2	6.0	-	-	150.2	44.1	-	-	60	-	-
12.0	ARUB144BT3	2	18.3	20.5	-	-	-	-	2	6.0	-	-	150.2	49.9	-	-	70	-	-
14.0	ARUB168BT3	3	11.0	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	42.6	23.3	--	60	35	-
16.0	ARUB192BT3	3	12.5	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	44.1	23.3	-	60	35	
18.0	ARUB216BT3	3	18.3	20.5	15.4	-	-	-	3	6.0	4.0	-	160.4	49.9	23.3	-	70	35	
20.0	ARUB240BT3	4	18.3	20.5	11.0	20.5	-	-	4	6.0	6.0	-	180.9	49.9	42.6		70	60	
22.0	ARUB264BT3	4	18.3	20.5	12.5	20.5	-	-	4	6.0	6.0	-	180.9	49.9	44.1		70	60	
24.0	ARUB288BT3	4	18.3	20.5	18.3	20.5	-	-	4	6.0	6.0	-	180.9	49.9	49.9		70	70	
26.0	ARUB312BT3	5	18.3	20.5	11.0	20.5	15.4	-	5	6.0	6.0	4.0	191.1	49.9	42.6	23.3	70	60	35
28.0	ARUB336BT3	5	18.3	20.5	12.5	20.5	15.4	-	5	6.0	6.0	4.0	191.1	49.9	44.1	23.3	70	60	35
30.0	ARUB360BT3	5	18.3	20.5	18.3	20.5	15.4	-	5	6.0	6.0	4.0	191.1	14.9	49.9	23.3	70	60	35
32.0	ARUB384BT3	6	18.3	20.5	18.3	20.5	11.0	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	42.6	70	70	60
34.0	ARUB408BT3	6	18.3	20.5	18.3	20.5	12.5	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	44.1	70	70	60
36.0	ARUB432BT3	6	18.3	20.5	18.3	20.5	18.3	20.5	6	6.0	6.0	6.0	211.6	49.9	49.9	49.9	70	70	70

For component model nos. see the specification tables on pages 35-37.

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MSC = Maximum Starting Current.

MCA = Minimum Circuit Ampacity.

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

460V, 60Hz, 3-Phase Heat Recovery Units

Nom. Tons	Unit Model Nos.	Compressor (Comp.) Comp. Qty.	Motor Amps Motor RLA (Ea.) Frame 1 Comp. A	Frame 1 Comp. B	Frame 2 Comp. A	Frame 2 Comp. B	Frame 3 Comp. A	Frame 3 Comp. B	Condenser Fan Motor(s) Fan Qty.	Amps FLA (Ea.) Frame 1	FLA (Ea.) Frame 2	FLA (Ea.) Frame 3	MSC	MCA Frame 1	MCA Frame 2	MCA Frame 3	MOCP Frame 1	MOCP Frame 2	MOCP Frame 3
6.0	ARUB072DT3	1	10.2	-	-	-	-	-	1	2.1	-	-	-	14.9	-	-	25	-	-
8.0	ARUB096DT3	2	9.6	9.5	-	-	-	-	2	2.6	-	-	58.5	24.1	-	-	30	-	-
10.0	ARUB121DT3	2	10.5	9.5	-	-	-	-	2	2.6	-	-	58.5	25.2	-	-	35	-	-
12.0	ARUB144DT3	2	12.4	9.5	-	-	-	-	2	2.6	-	-	58.5	27.6	-	-	40	-	-
14.0	ARUB168DT3	3	9.6	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	24.1	14.9	--	30	25	-
16.0	ARUB192DT3	3	10.5	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	25.2	14.9	-	35	25	
18.0	ARUB216DT3	3	12.4	9.5	10.2	-	-	-	3	2.6	2.1	-	63.0	27.6	14.9	-	40	25	
20.0	ARUB240DT3	4	12.4	9.5	9.6	9.5	-	-	4	2.6	2.6	-	72.5	27.6	24.1		40	30	
22.0	ARUB264DT3	4	12.4	9.5	10.5	9.5	-	-	4	2.6	2.6	-	72.5	27.6	25.2		40	35	
24.0	ARUB288DT3	4	12.4	9.5	12.4	9.5	-	-	4	2.6	2.6	-	72.5	27.6	27.6		40	40	-
26.0	ARUB312DT3	5	12.4	9.5	9.6	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	24.1	14.9	40	30	25
28.0	ARUB336DT3	5	12.4	9.5	10.5	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	25.2	14.9	40	35	25
30.0	ARUB360DT3	5	12.4	9.5	12.4	9.5	10.2	-	5	2.6	2.6	2.1	77.0	27.6	27.6	14.9	40	40	25
32.0	ARUB384DT3	6	12.4	9.5	12.4	9.5	9.6	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	24.1	40	40	30
34.0	ARUB408DT3	6	12.4	9.5	12.4	9.5	10.5	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	25.2	40	40	35
36.0	ARUB432DT3	6	12.4	9.5	12.4	9.5	12.4	9.5	6	2.6	2.6	2.6	86.5	27.6	27.6	27.6	40	40	40

For component model nos. see the specification tables on page 38-40.

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

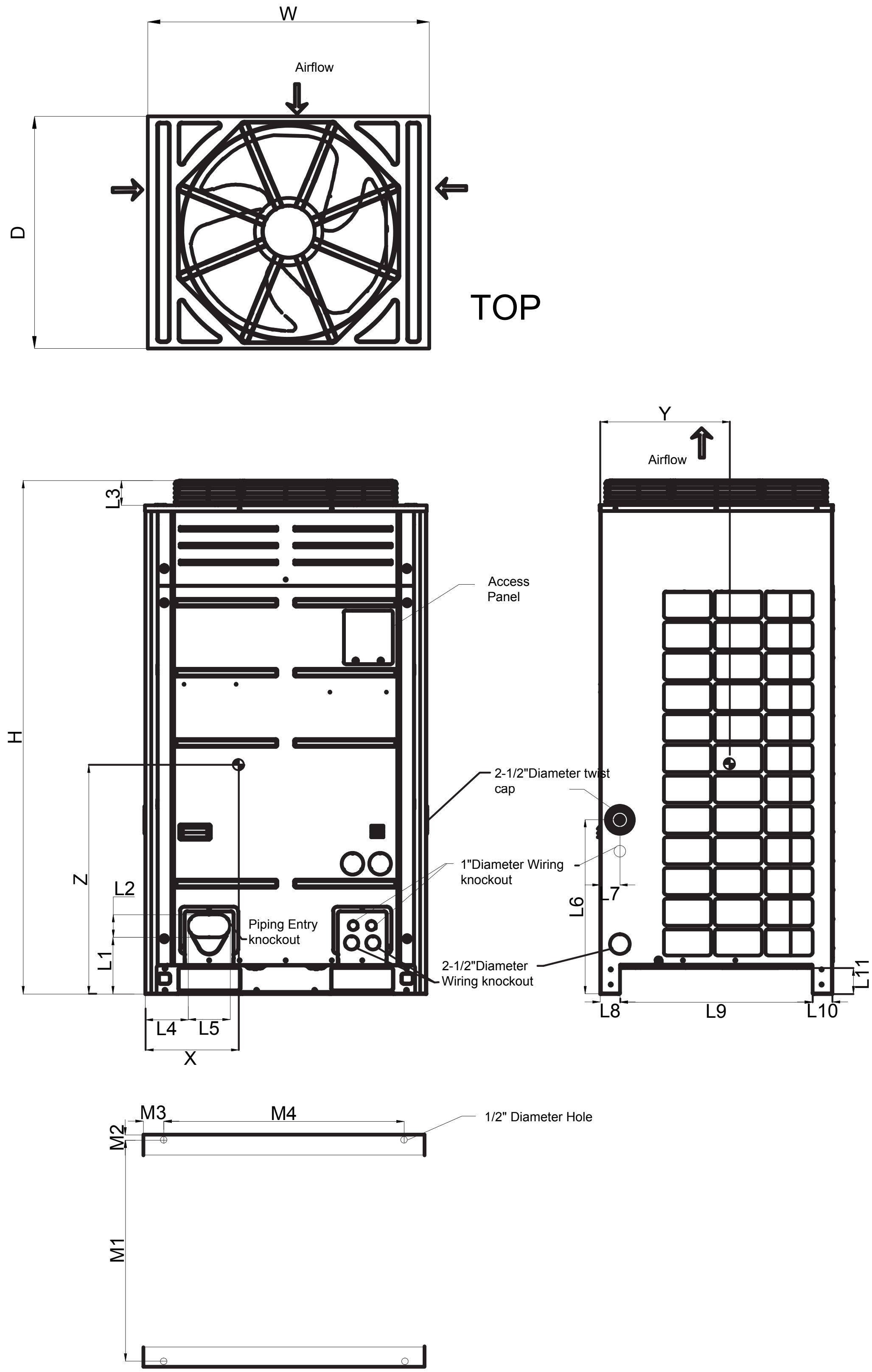
MSC = Maximum Starting Current.

MCA = Minimum Circuit Ampacity.

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

HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

ARUB072BT3 / ARUB072DT3

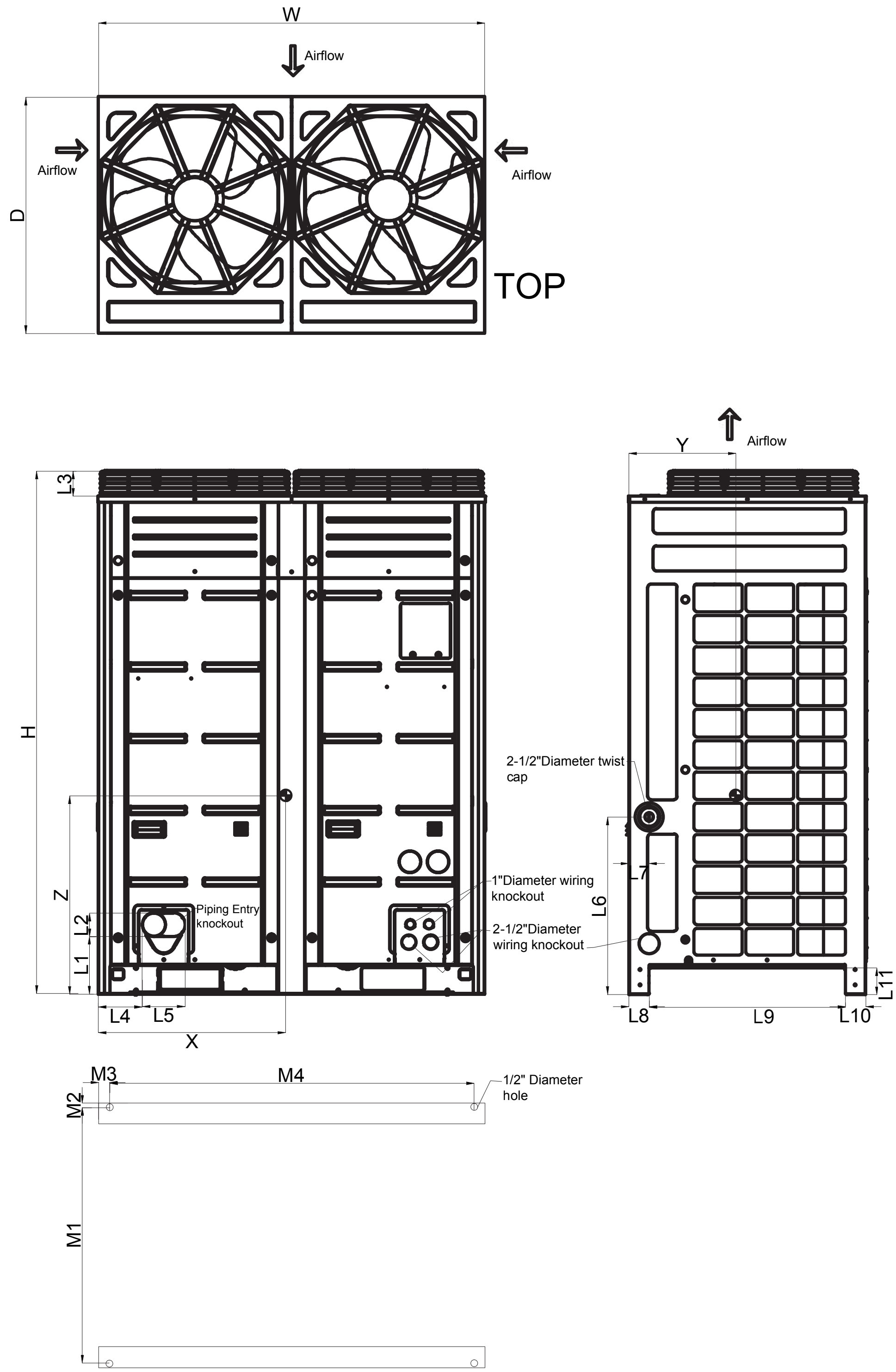


Bottom Mounting Holes

X	11-1/2"
Y	17-13/16"
Z	29-5/16"
W	36-1/4"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16"
L7	2-9/16"
L8	2-9/16"
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	31-3/16"

HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3



Bottom Mounting Holes

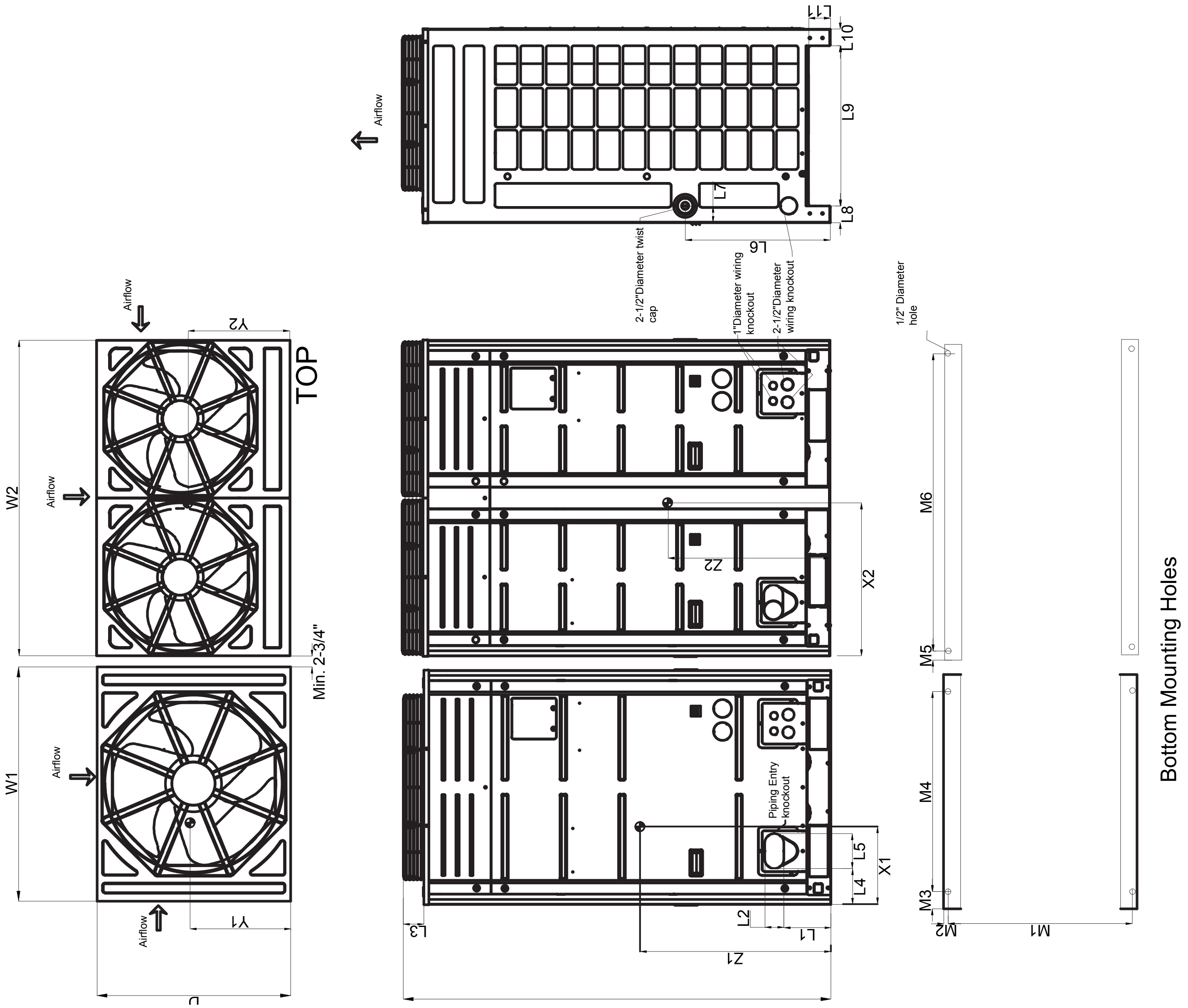
X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"

HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

MULTI V III

ARUB168BT3 / ARUB168DT3, ARUB192BT3 / ARUB192DT3,
ARUB216BT3 / ARUB216DT3

X1	11-1/2"
X2	23-1/8"
Y1	17-13/16"
Y2	14-5/8"
Z1	29-5/16"
Z2	25-13/16"
W1	36-1/4"
W2	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	31-3/16"
M5	2-5/8"
M6	43-3/8"

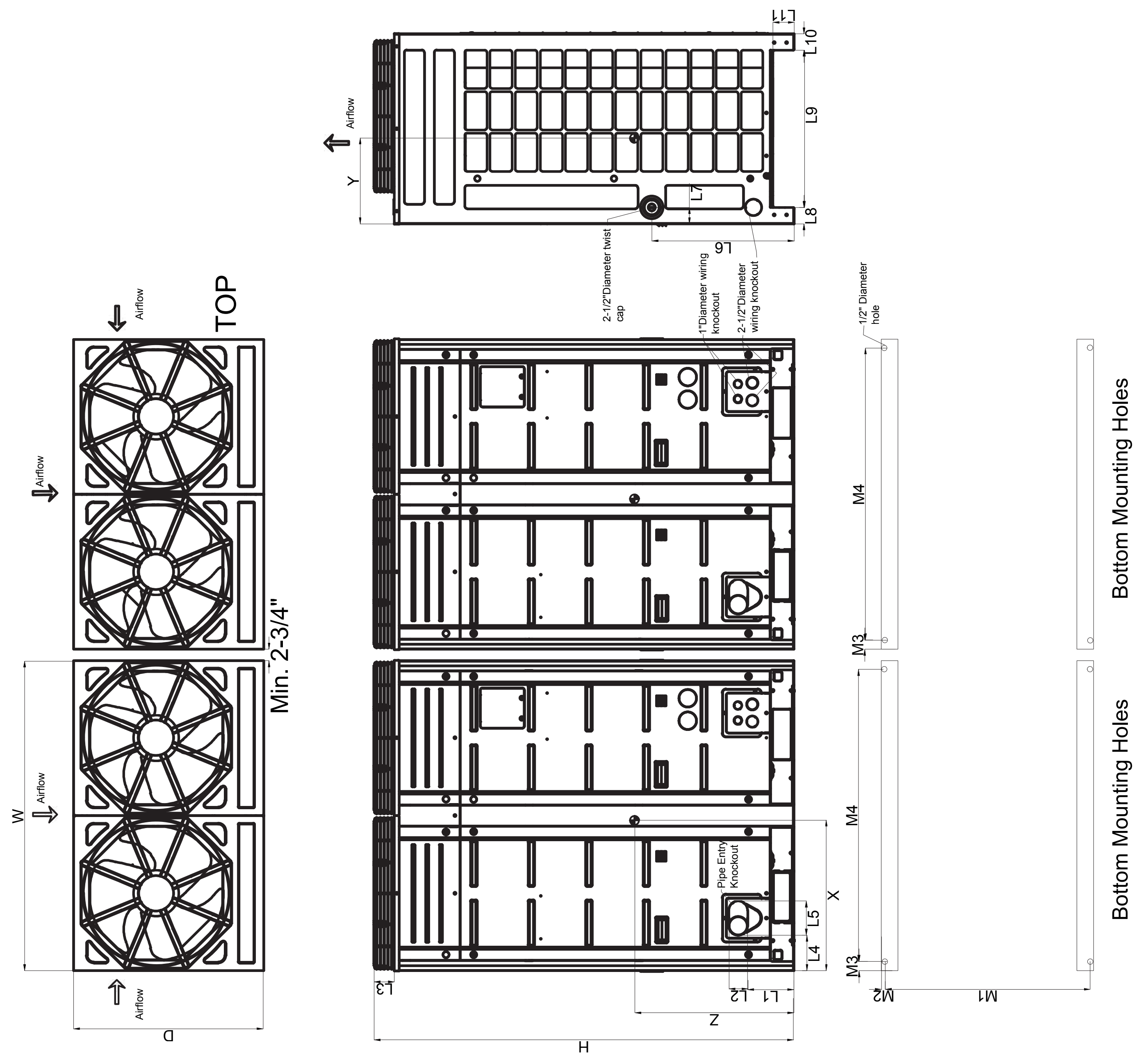


Due to our policy of continuous product innovation, some specifications may change without notification.

HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

ARUB240BT3 / ARUB240DT3, ARUB264BT3 / ARUB264DT3, ARUB288BT3 / ARUB288DT3

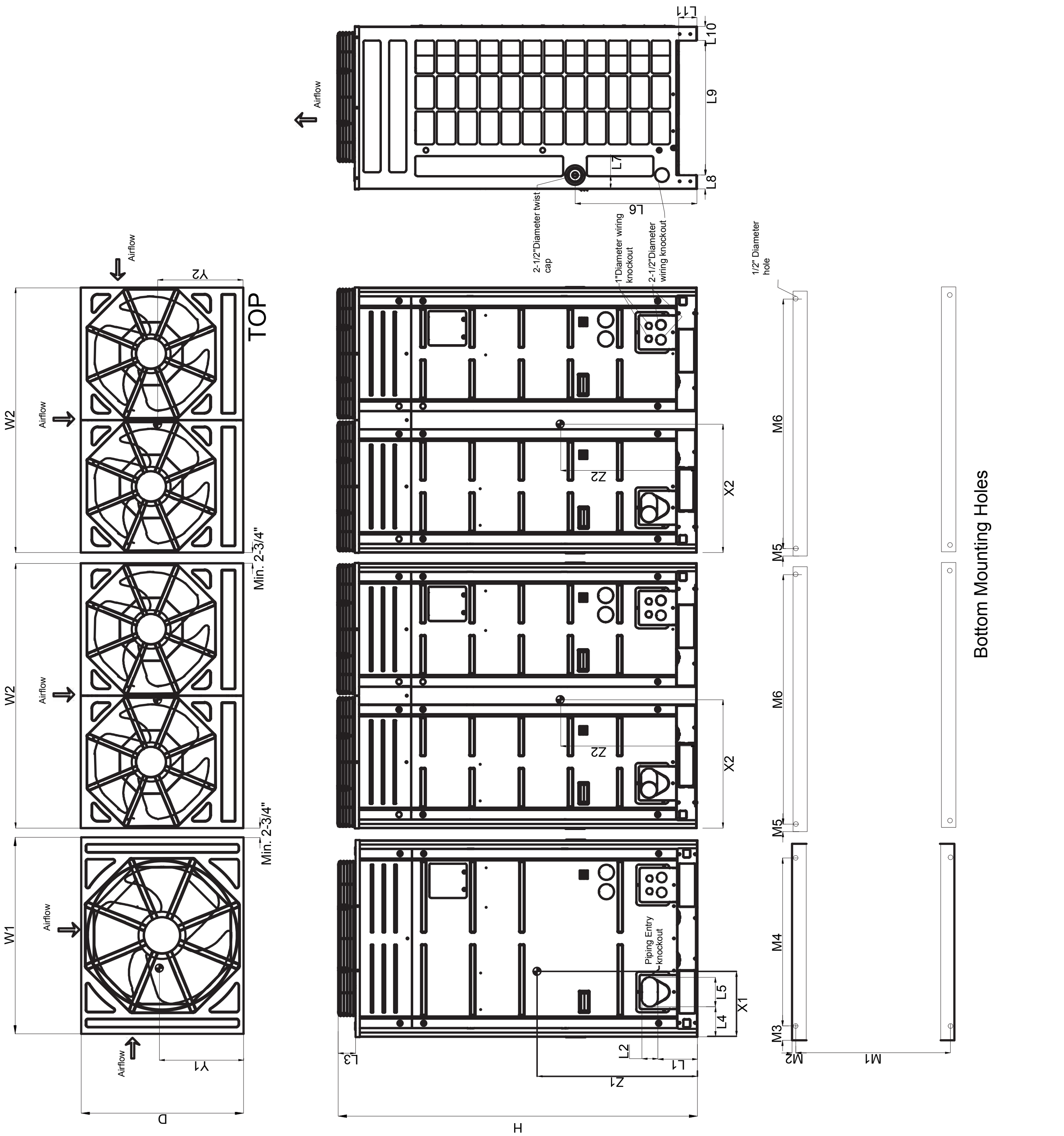
X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"



HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

ARUB312BT3 / ARUB312DT3, ARUB336BT3 / ARUB336DT3,
ARUB360BT3 / ARUB360DT3

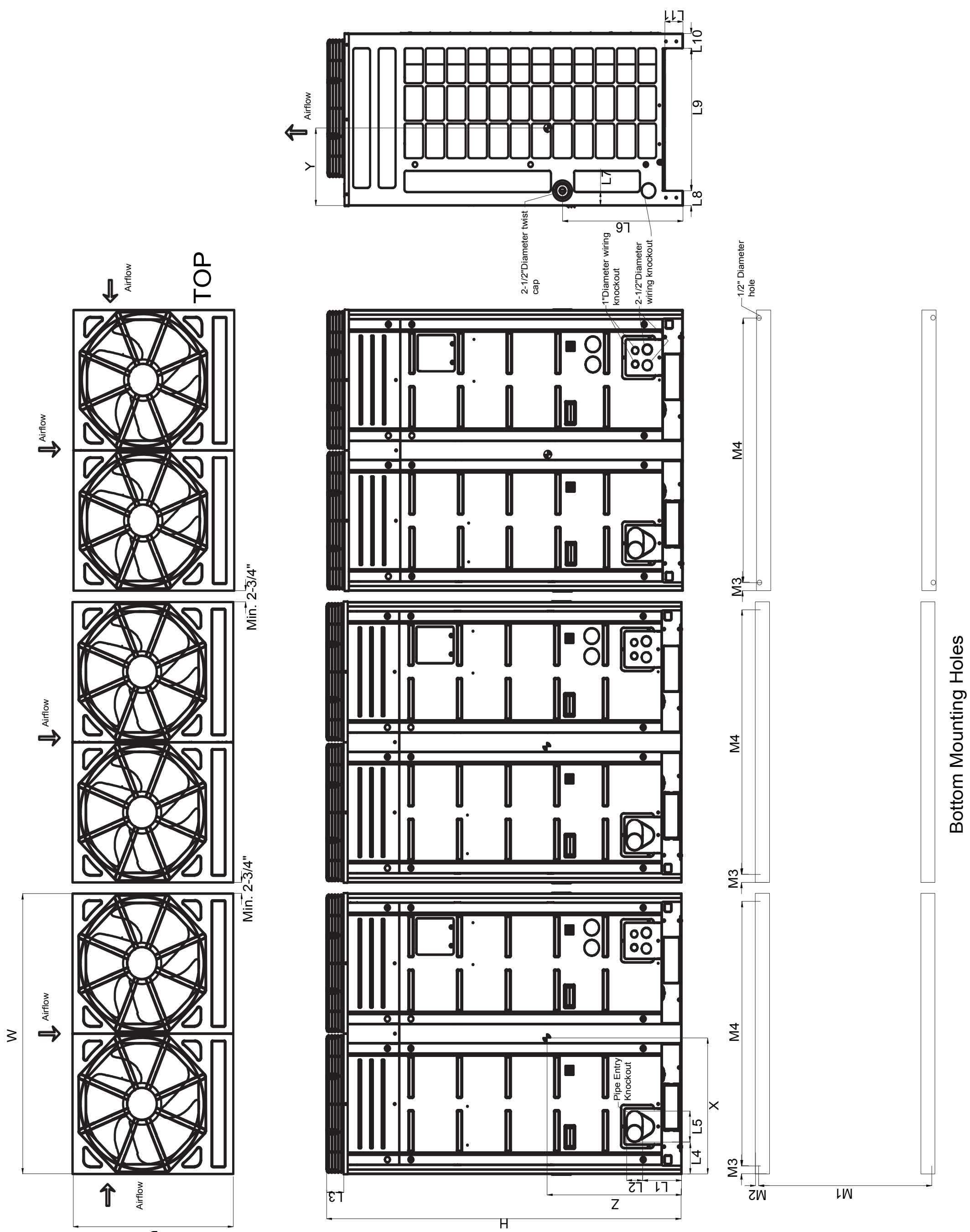
X1	11-1/2"
X2	23-1/8"
Y1	17-13/16"
Y2	14-5/8"
Z1	29-5/16"
Z2	25-13/16"
W1	36-1/4"
W2	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	31-3/16"
M5	2-5/8"
M6	43-3/8"



HEAT RECOVERY OUTDOOR UNIT DIMENSIONS

ARUB384BT3 / ARUB384DT3, ARUB408BT3 / ARUB408DT3, ARUB432BT3 / ARUB432DT3

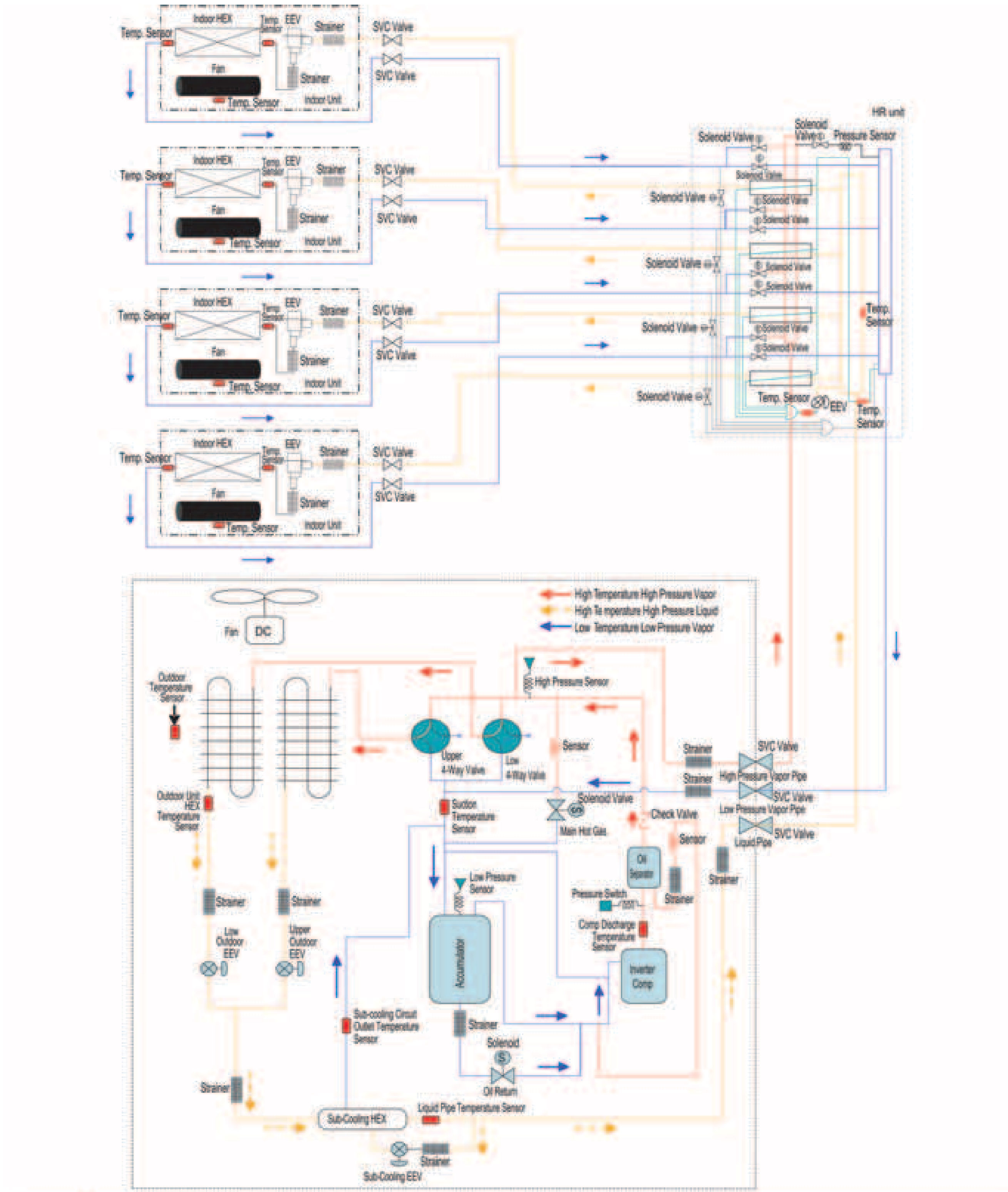
X	23-1/8"
Y	14-15/16"
Z	25-13/16"
W	48-13/16"
D	29-15/16"
H	66-1/8"
L1	7-1/4"
L2	2-15/16"
L3	3-1/8"
L4	5-1/2"
L5	5-3/8"
L6	22-7/16
L7	2-9/16
L8	2-9/16
L9	24-3/16"
L10	2-9/16"
L11	3-5/16"
M1	29-1/16"
M2	7/16"
M3	2-5/8"
M4	43-3/8"



HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

Cooling Mode

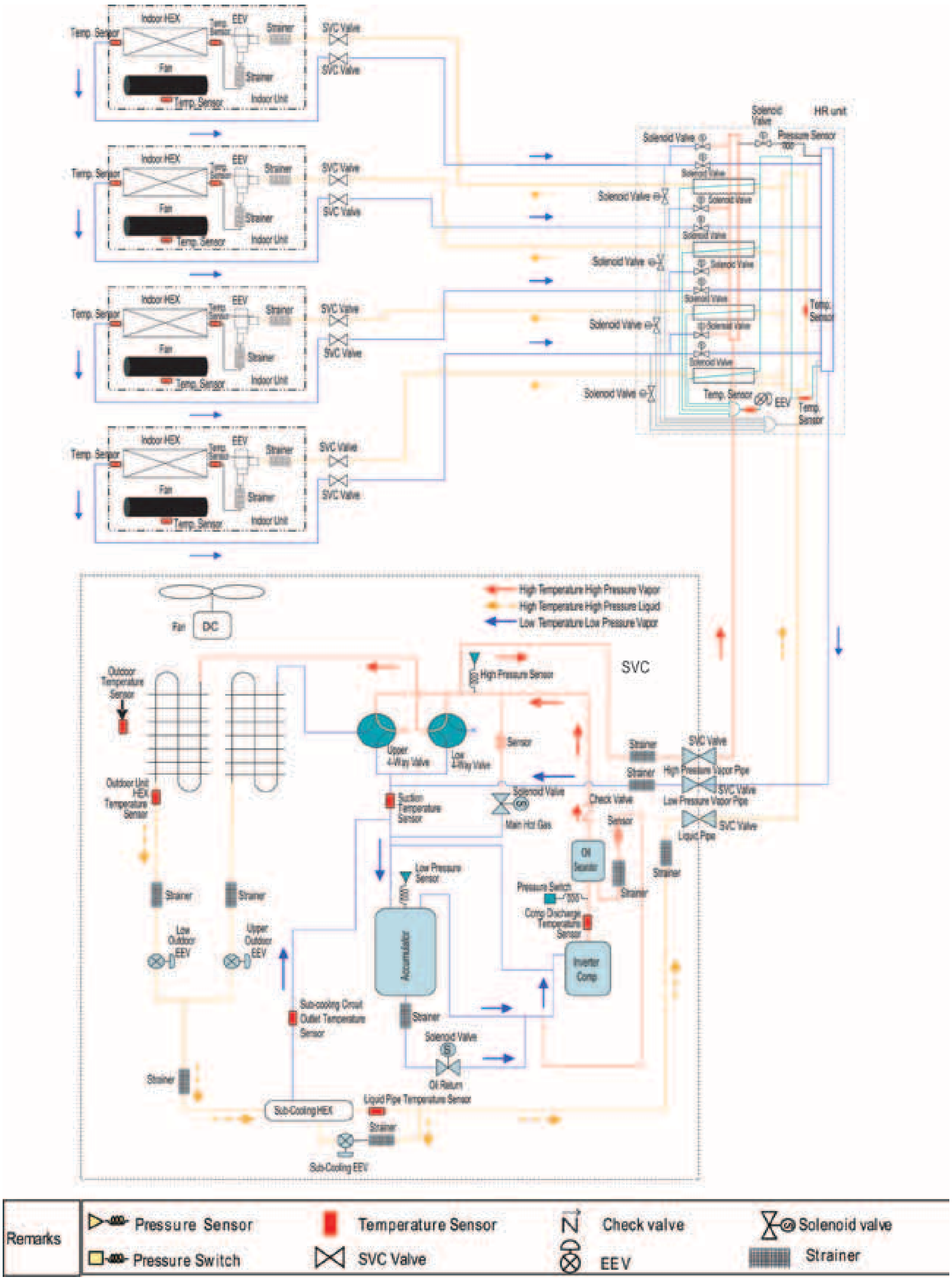
ARUB072BT3 / ARUB072DT3



Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

ARUB072BT3 / ARUB072DT3

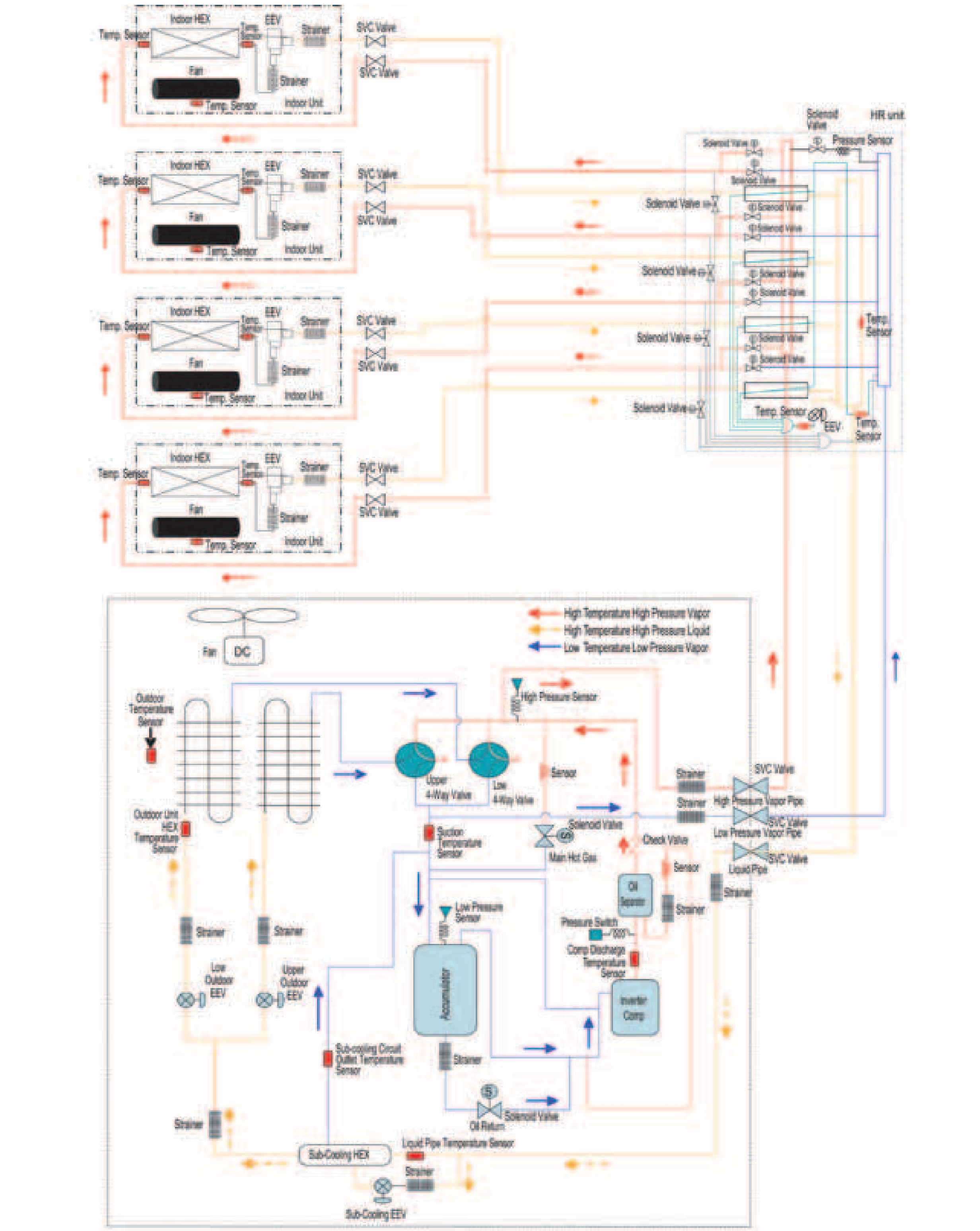
Cooling at Low Ambient Temperatures



HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT MULTI V III

Heating

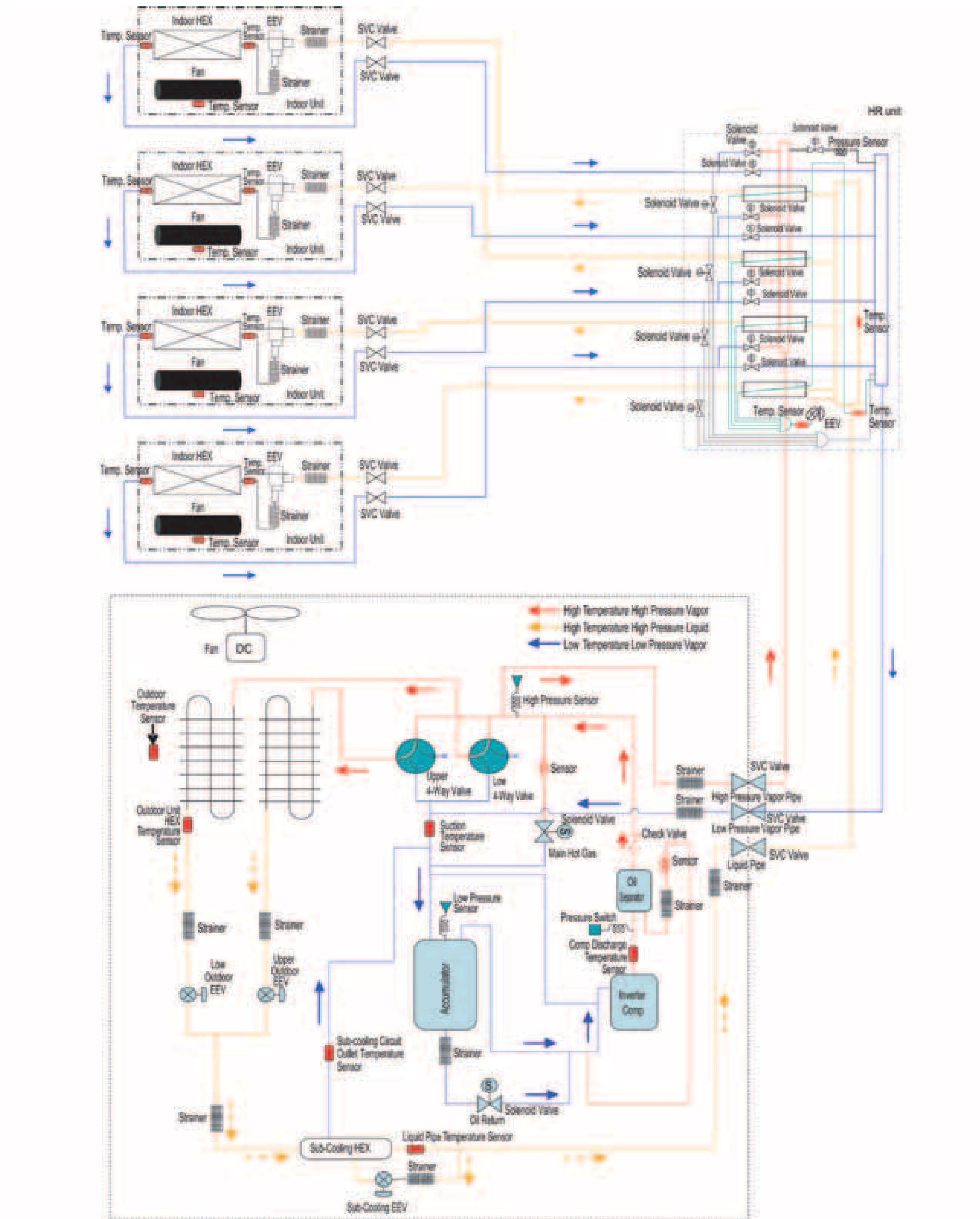
ARUB072BT3 / ARUB072DT3



Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

ARUB072BT3 / ARUB072DT3

Oil Return & Defrost Operation



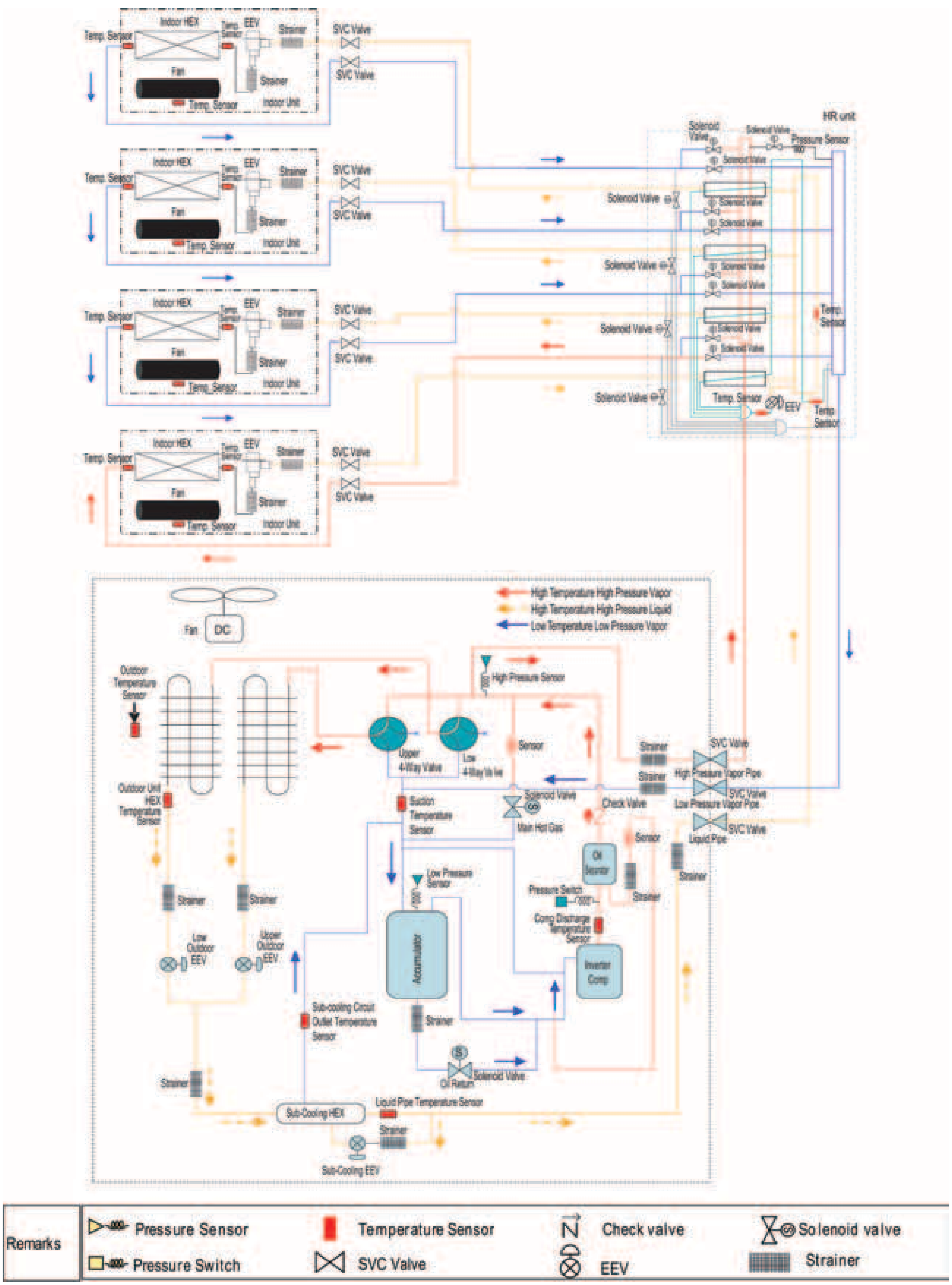
Remarks	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

MULTI V III

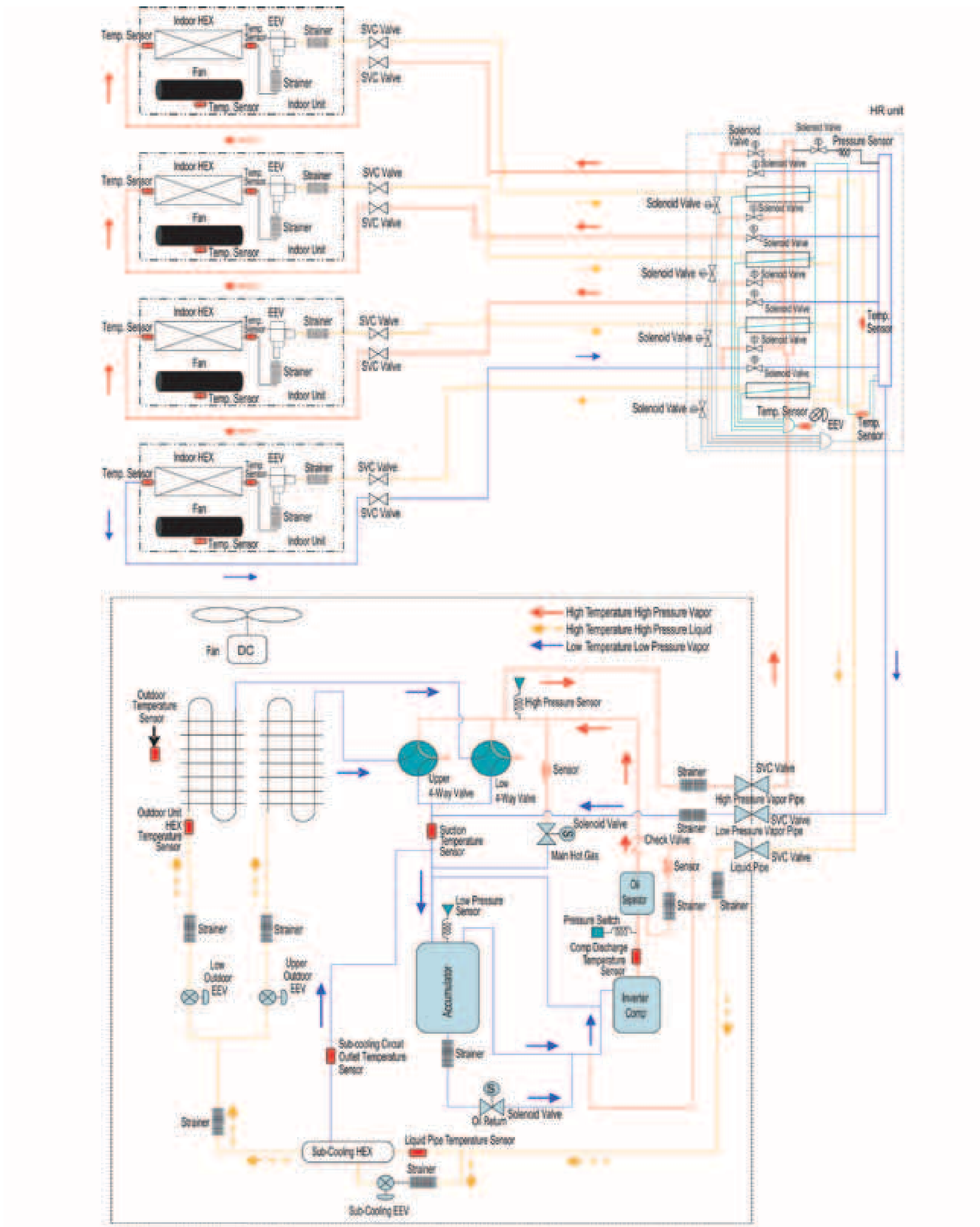
Cooling-based Simultaneous Operation

ARUB072BT3 / ARUB072DT3



ARUB072BT3 / ARUB072DT3

Heating-based Simultaneous Operation

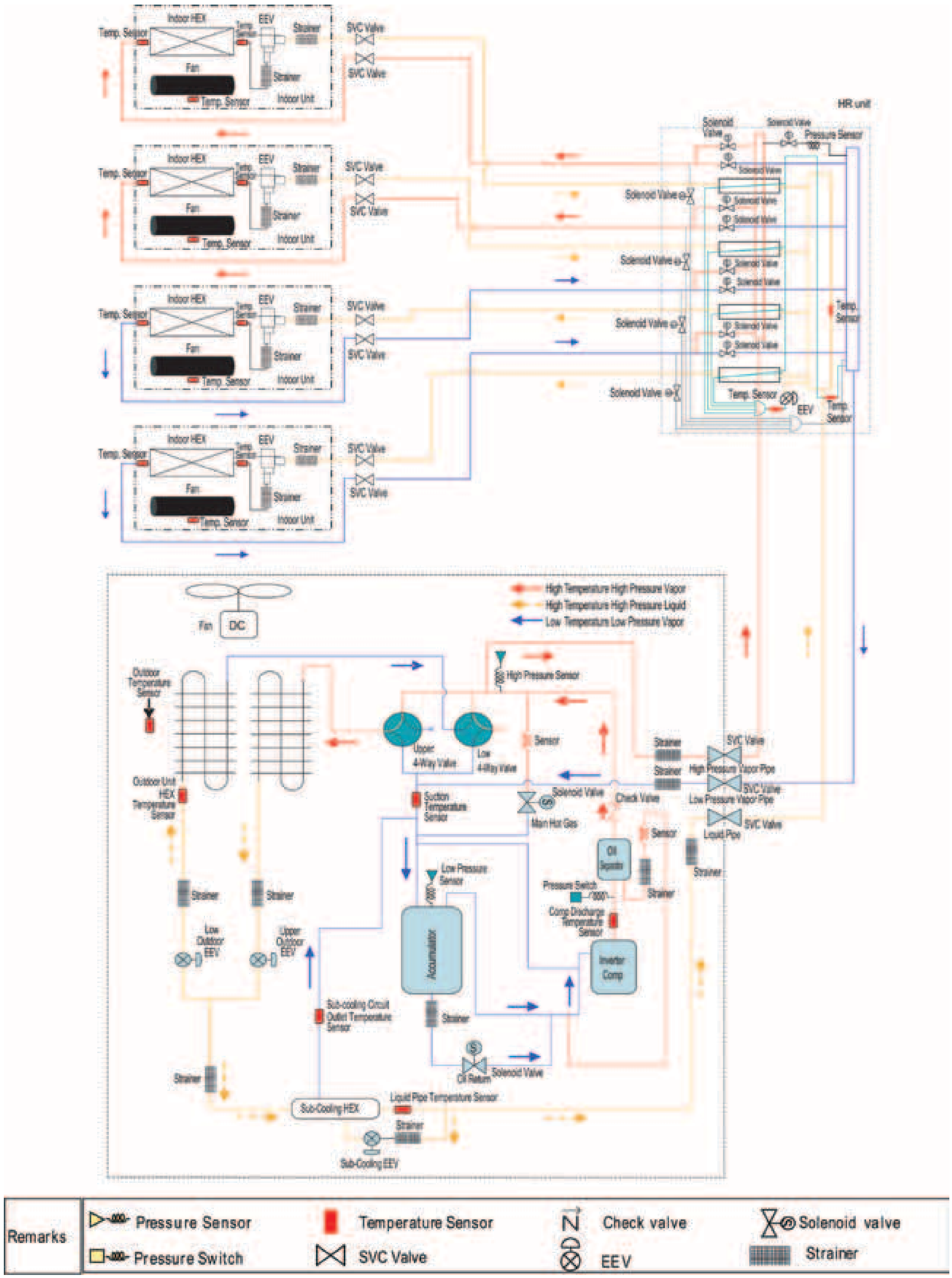


Remarks	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT MULTI V III

Balanced Simultaneous Operation

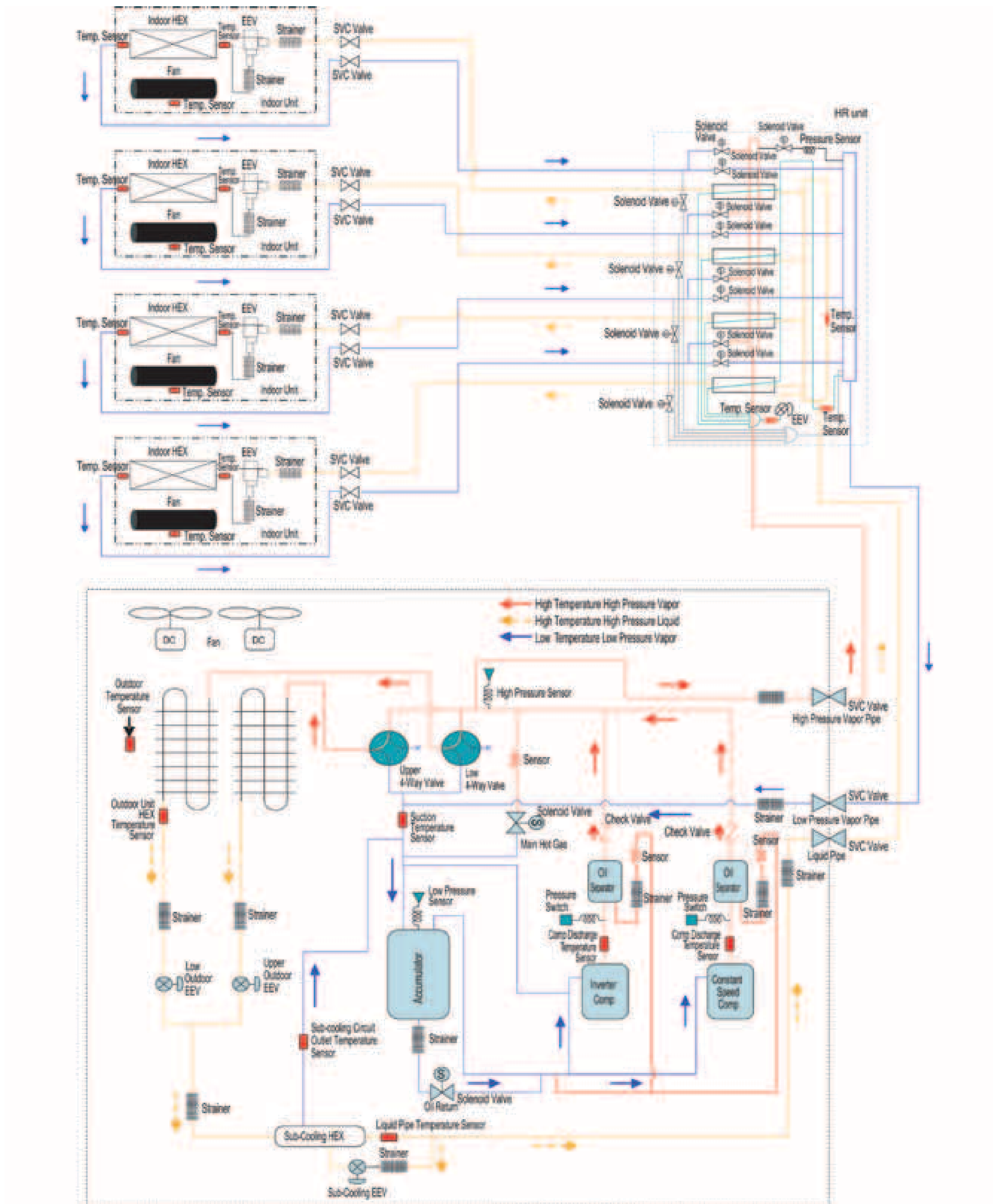
ARUB072BT3 / ARUB072DT3



MULTI V III HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3

Cooling Mode

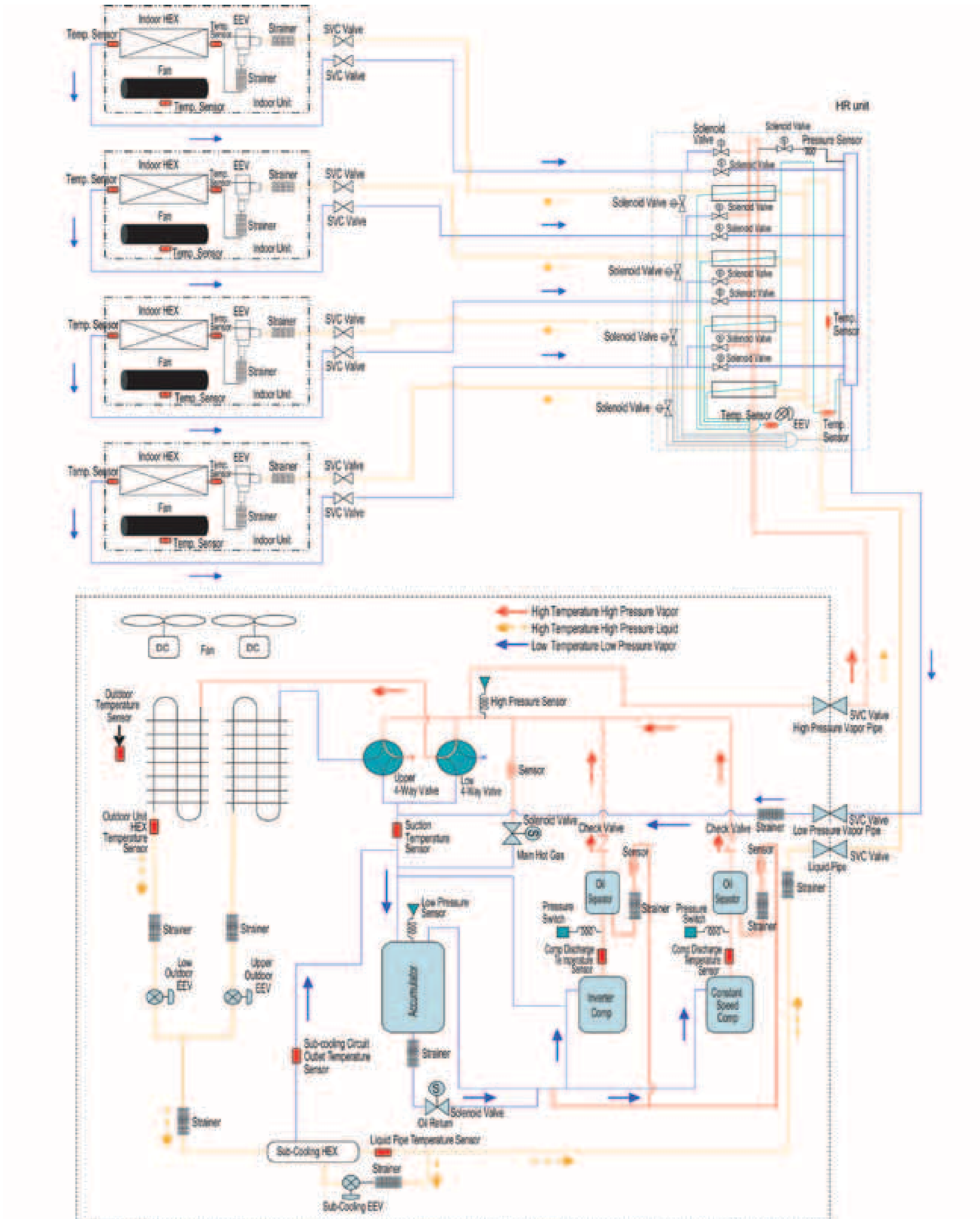


Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT MULTI V III

Cooling at Low Ambient Temp.

ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3



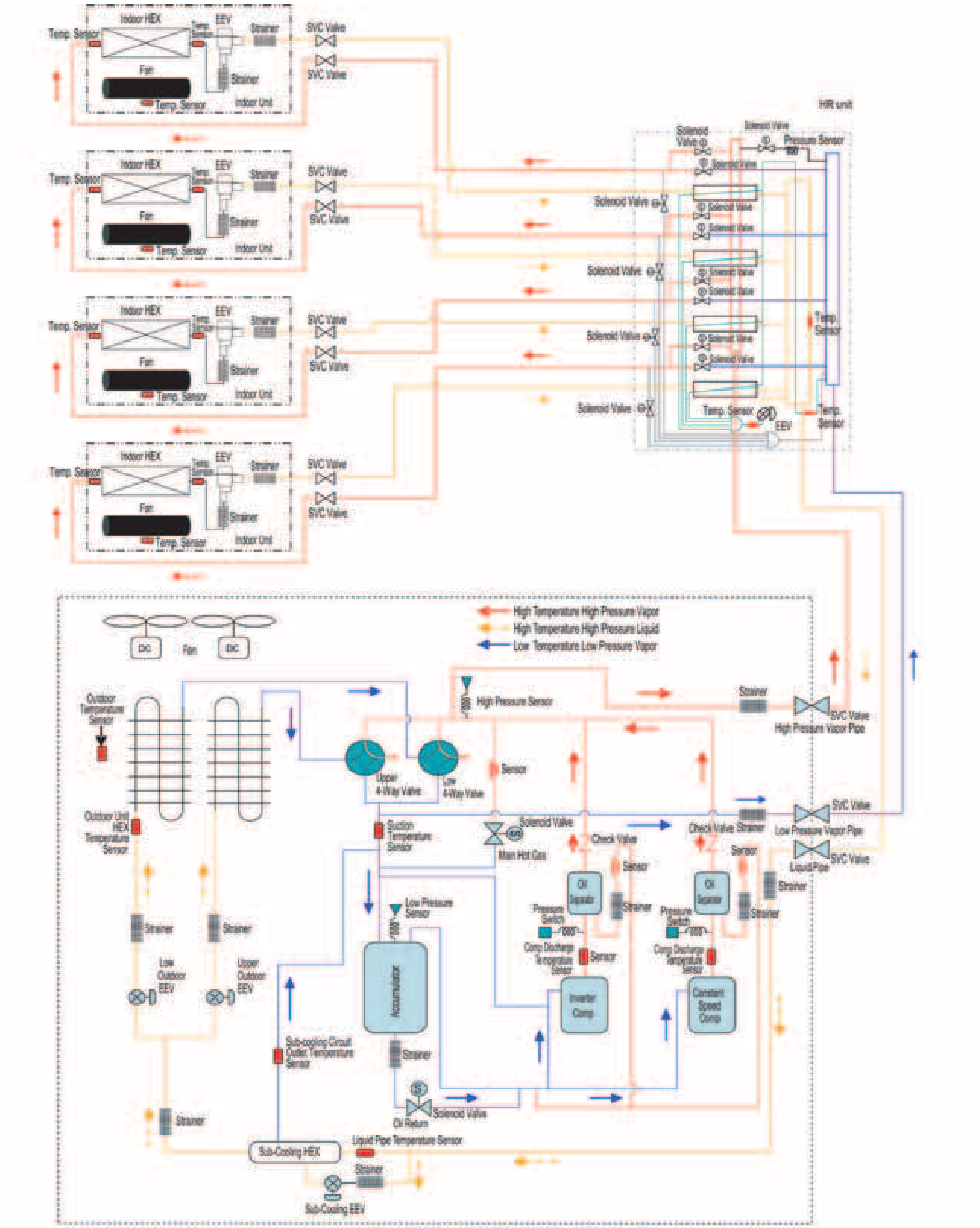
Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

Due to our policy of continuous product innovation, some specifications may change without notification.

HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3

Heating Mode



Remarks	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

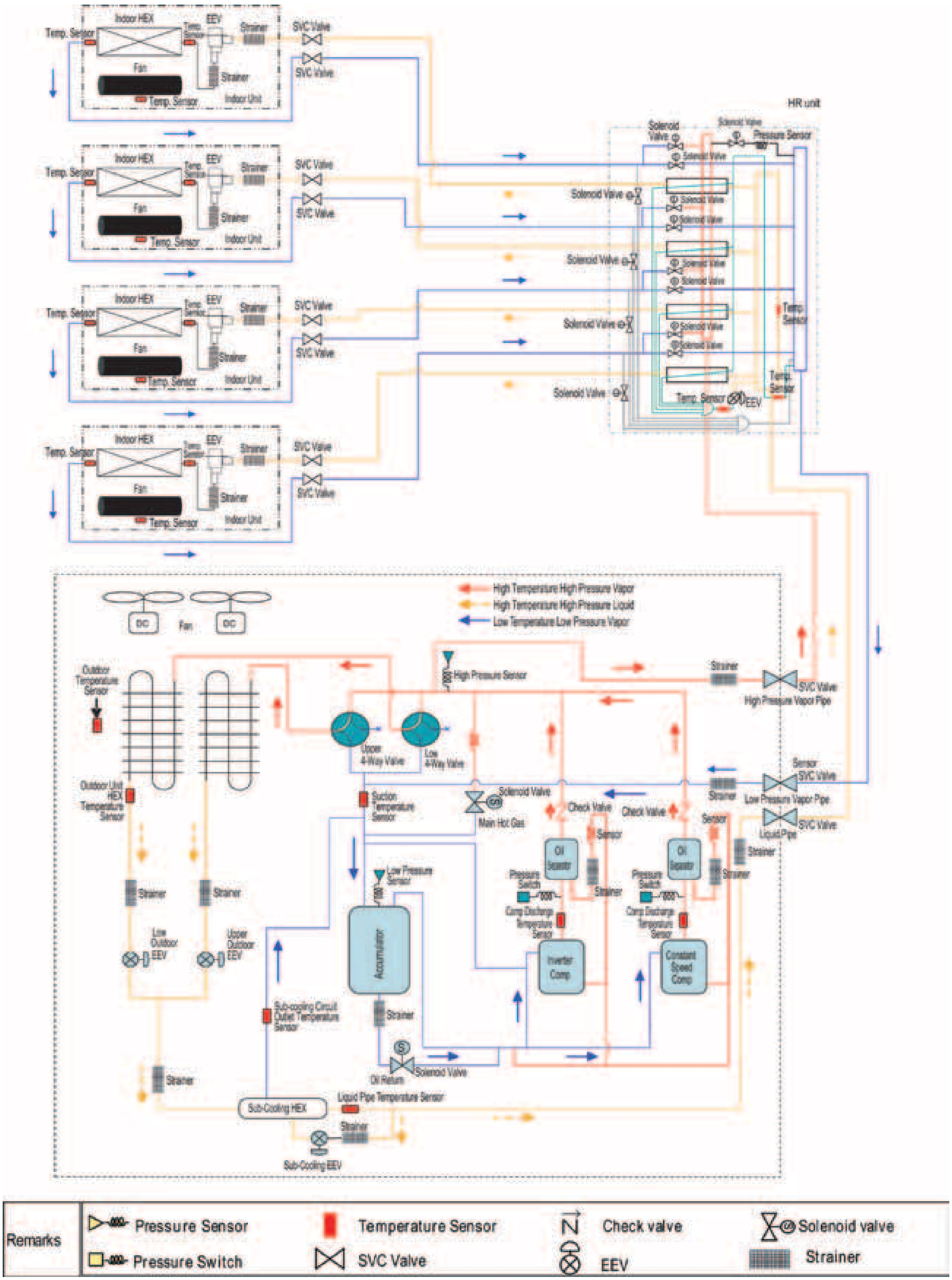
Product Data

HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

MULTI V III

Oil Return & Defrost Operation

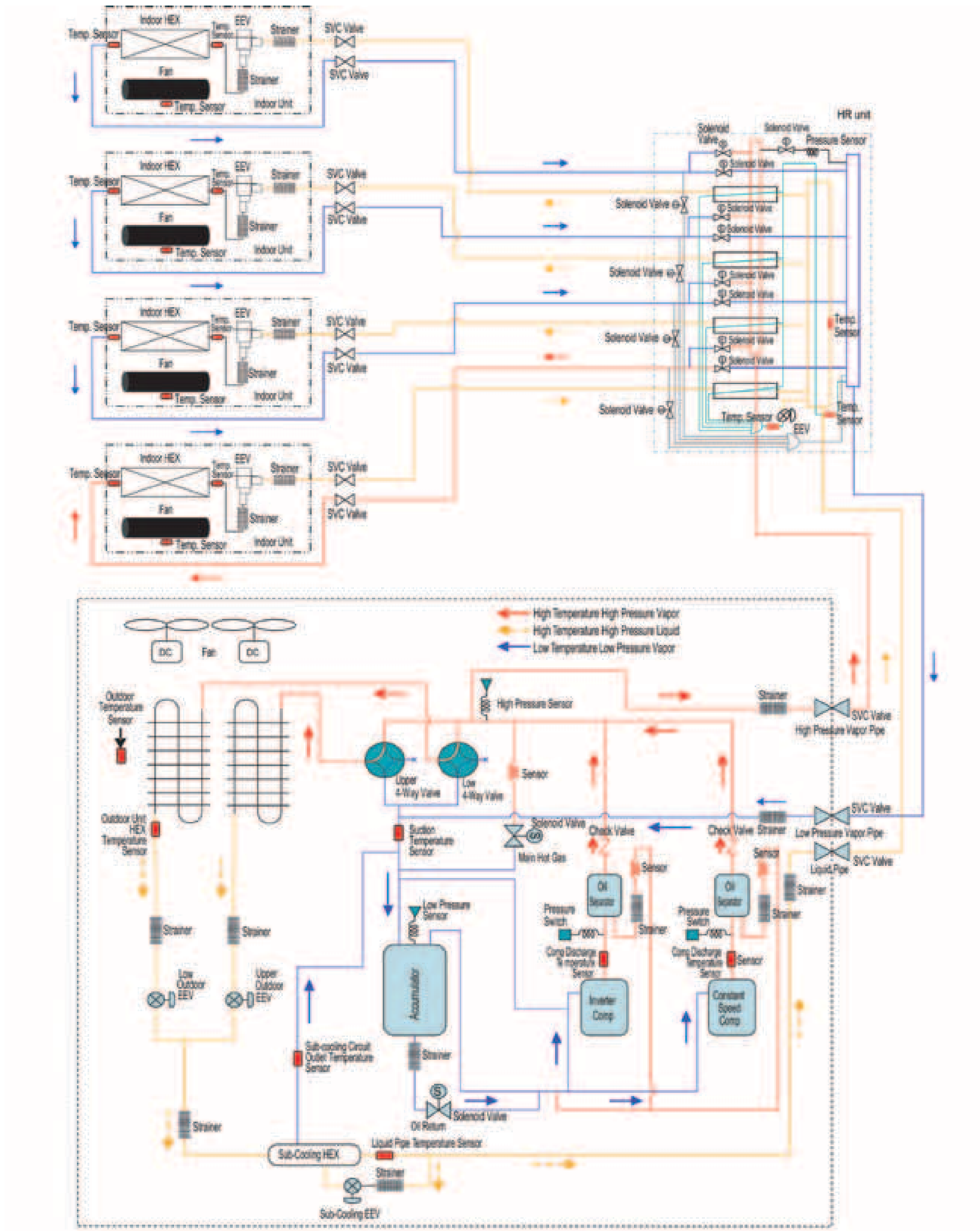
ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3



MULTI V III HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT

ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3

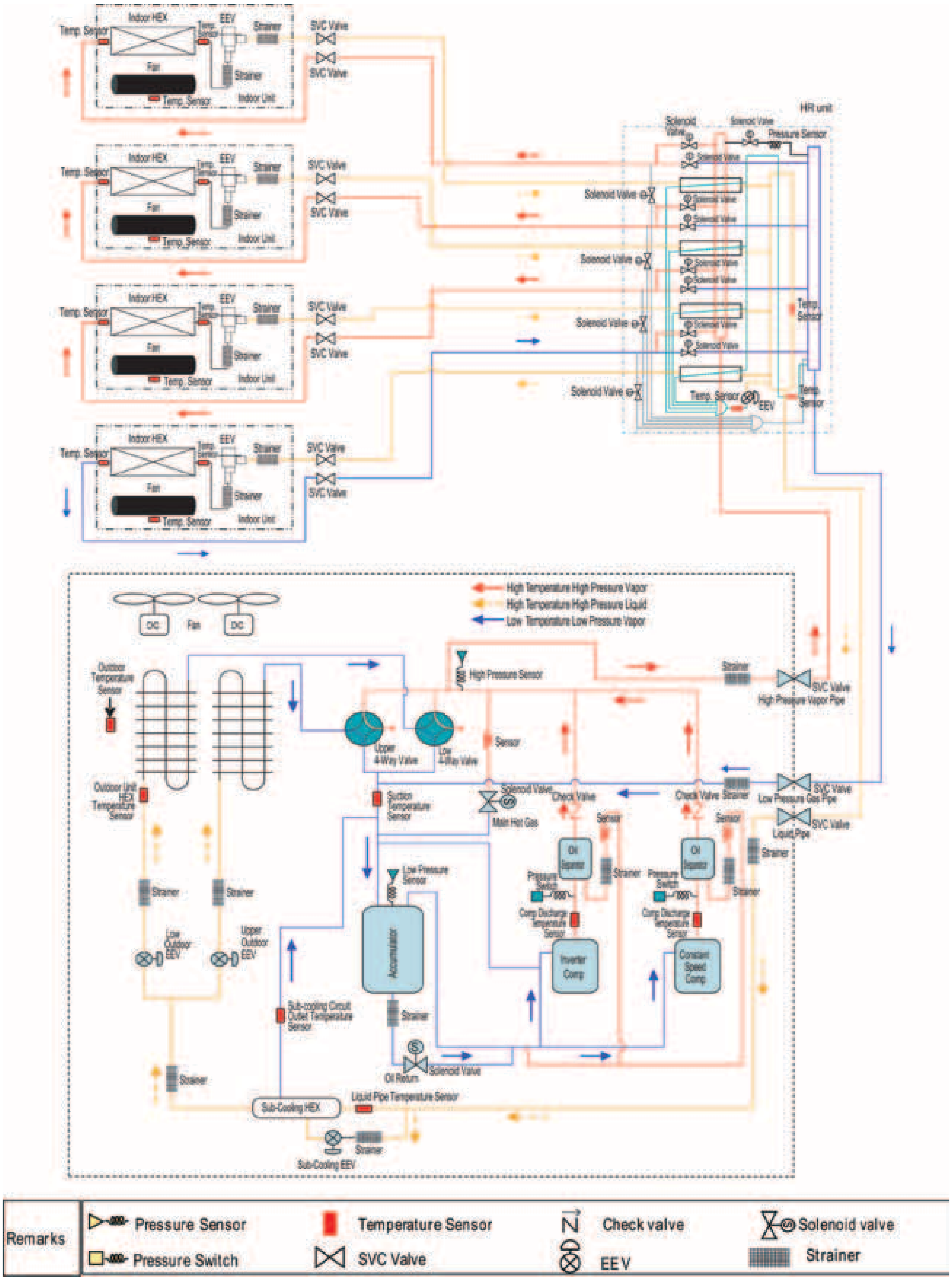
Cooling-based Simultaneous Operation



Remarks	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

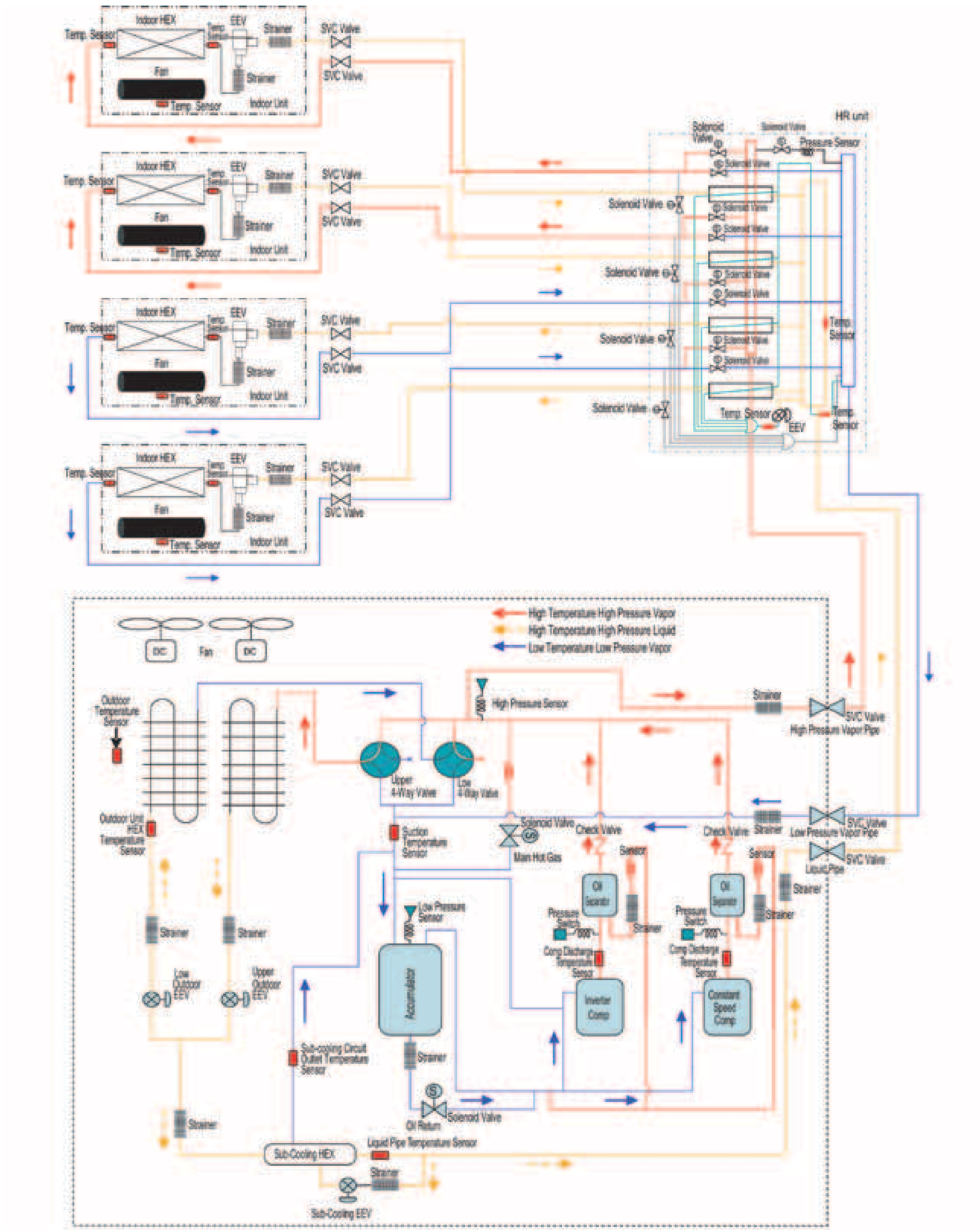
HEAT RECOVERY OUTDOOR UNIT REFRIG. CIRCUIT MULTI V III

Heating-based Simultaneous Operation ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3



ARUB096BT3 / ARUB096DT3, ARUB121BT3 / ARUB121DT3, ARUB144BT3 / ARUB144DT3

Balanced Simultaneous Operation

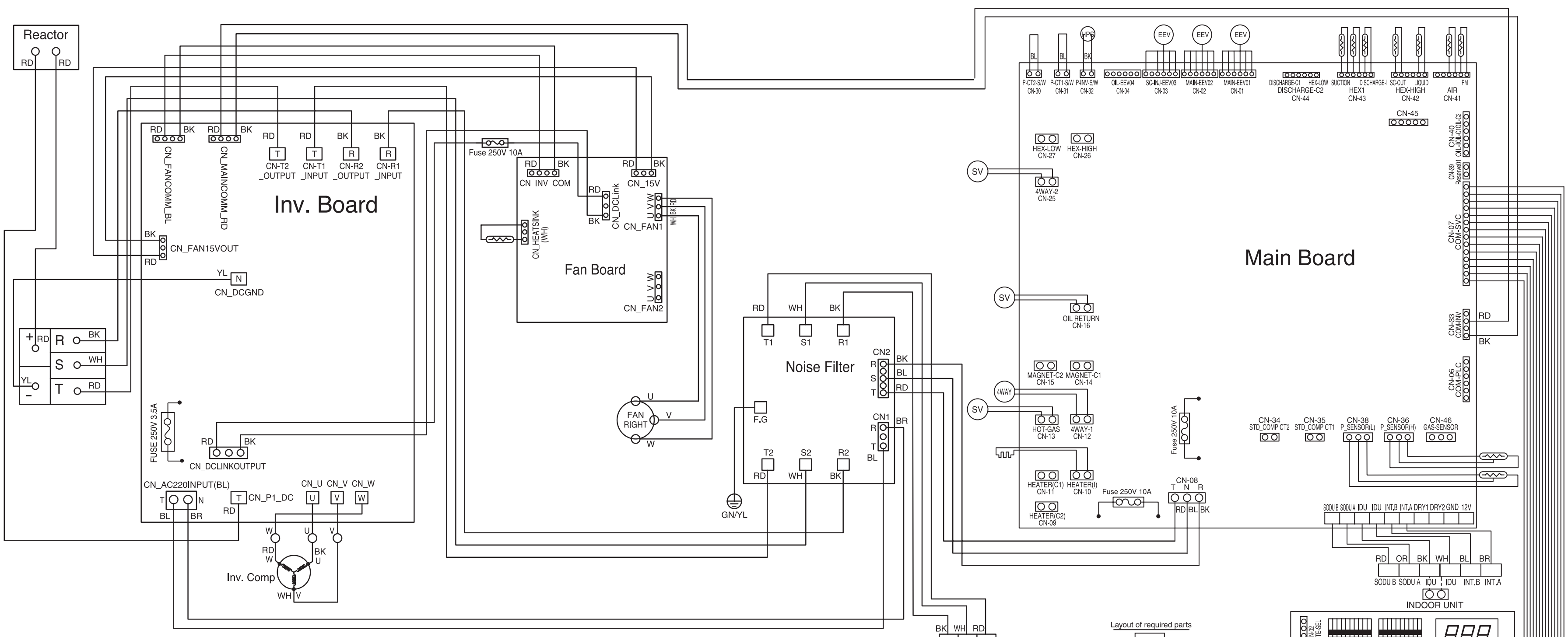


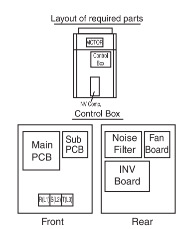
Remarks				
	Pressure Sensor	Temperature Sensor	Check valve	Solenoid valve
	Pressure Switch	SVC Valve	EEV	Strainer

HEAT RECOVERY OUTDOOR UNIT WIRING DIAGRAMS

MULTI V III

ARUB072BT3 208-230V





Main Board Note1

SYMBOL	DESCRIPTION
CN01	ELECTRONIC EXPANSION VALVE1(MAIN UPPER)
CN02	ELECTRONIC EXPANSION VALVE2(MAIN LOW)
CN03	ELECTRONIC EXPANSION VALVE(SUBCOOLING)
CN04	ELECTRONIC EXPANSION VALVE(OIL)
CN06	PLC THERMINAL
CN07	SUB PCB COMMUNICATION TERMINAL
CN08	AC POWER 220V
CN09	CONST. COMP. 2 CRANK HEATER
CN10	INV. COMP. CRANK HEATER
CN11	CONST. COMP. 1 CRANK HEATER
CN12	4WAY VALVE1(UPPER)
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONST. COMP.1 MAGNETIC SWITCH
CN15	CONST. COMP.2 MAGNETIC SWITCH
CN16	OIL RETURE VALVE
CN25	4WAY VALVE2(LOW)
CN26	HOT GAS BYPASS VALVE1(UPPER)
CN27	HOT GAS BYPASS VALVE2(LOW)
CN30	CONST. COMP.2 HIGH PRESSURE SWITCH
CN31	CONST. COMP.1 HIGH PRESSURE SWITCH
CN32	INV. COMP. HIGH PRESSURE SWITCH

Main Board Note2

SYMBOL	DESCRIPTION
CN33	INV. PCB COMMUNICATION TERMINAL
CN34	CONST. COMP. 2 CT SENSOR
CN35	CONST. COMP. 1 CT SENSOR
CN36	HIGH PRESSURE SENSOR
CN38	LOW PRESSURE SENSOR
CN40(OIL BALANCE_I)	INV. OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C1)	CONST. COMP. 1 OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C2)	CONST. COMP. 2 OIL BALANCE PIPE THERMISTOR
CN41(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN41(HEX_HIGH)	ODU HEX HIGH PIPE THERMISTOR
CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
CN42(AIR)	OUTDOOR AIR THERMISTOR
CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
CN43(HEX)	ODU HEX LOW PIPE THERMISTOR
CN43(DISCHARGE_I)	INV. COMP. DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C1)	CONST. COMP. 1 DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Inv. Board Note

SYMBOL	DESCRIPTION
CN_FANCOMM_BL	TRANSMISSION WITH FAN PCB
CN_MAINCOMM_RD	TRANSMISSION WITH MAIN PCB
CN_FAN15VOUT	DC 15V
CN_DCLINKOUTPUT	DC LINK 700V
CN_AC220 INPUT(BL)	AC POWER 220V
CN_U	TERMINAL FOR OUTPUT U
CN_V	TERMINAL FOR OUTPUT V
CN_W	TERMINAL FOR OUTPUT W
CN-T2_OUTPUT	T PHASE OUTPUT
CN-T1_INPUT	T PHASE INPUT
CN-R2_OUTPUT	R PHASE OUTPUT
CN-R1_INPUT	R PHASE INPUT

Notes)
1. This circuit diagram is applied only to the outdoor unit.
2. (R S T): Terminal Block, (O O): Connector, ⊕: Grounding.
3. When installation for field wiring, refer to the installation manual.

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERT
CN 15V	DC 15V INPUT
CN FAN	POWER SUPPLY FOR FAN
CN DC LINK	DC LINK 700V

Sub Board Note

SYMBOL	DESCRIPTION
CN-01	MAIN PCB COMMUNICATION TERMINAL
CN-02	WRITE SELECT
CN-03	FLASH-WRITE(MAIN)
CN-05	FLASH-WRITE(SVC)
CN-06	THERMINAL FOR LGMV

COLOR

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

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

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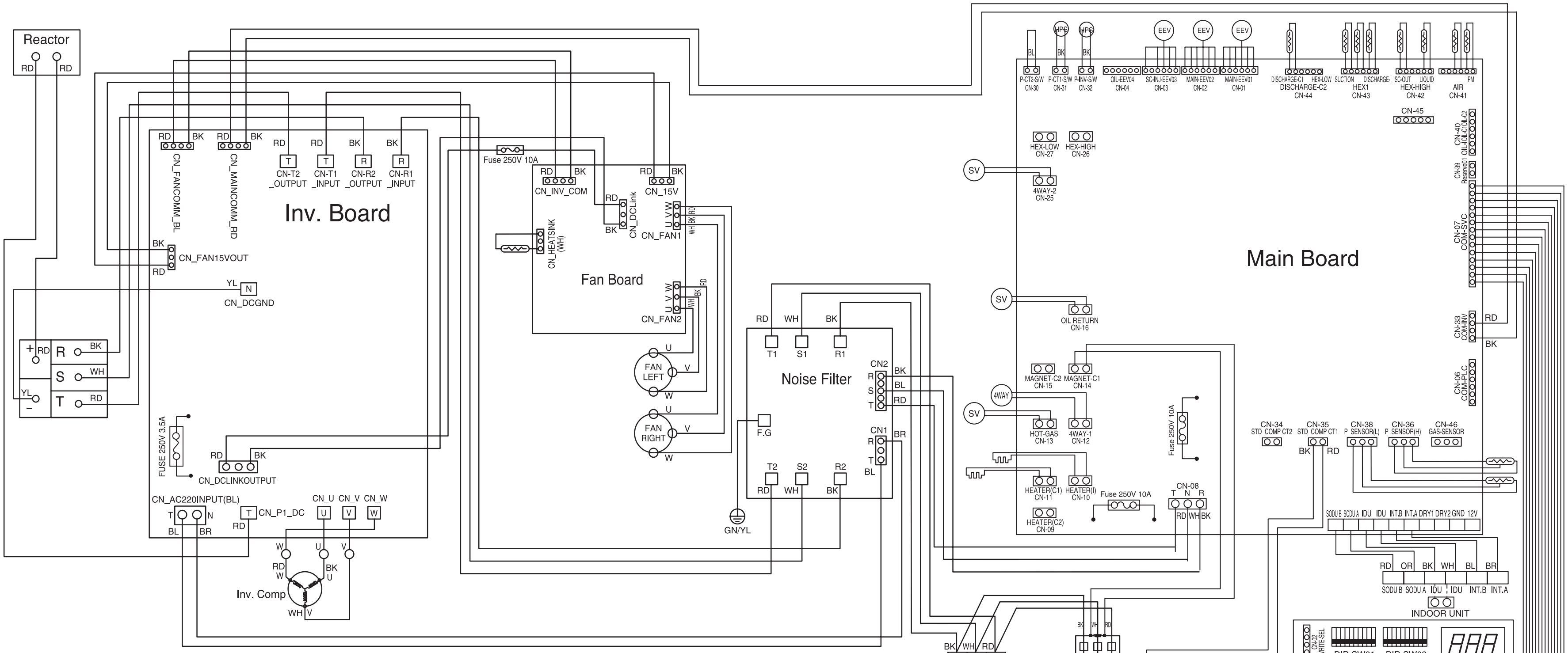
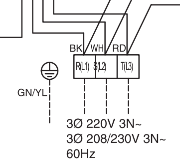
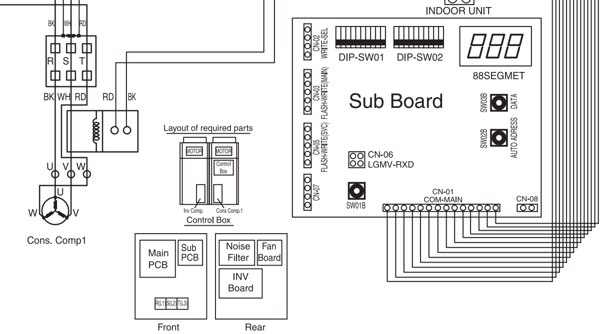
HEAT RECOVERY OUTDOOR UNIT WIRING DIAGRAMS

ARUB096BT3, ARUB121BT3, ARUB144BT3 208-230V







Main Board Note1

SYMBOL	DESCRIPTION
CN01	ELECTRONIC EXPANSION VALVE1(MAIN UPPER)
CN02	ELECTRONIC EXPANSION VALVE2(MAIN LOW)
CN03	ELECTRONIC EXPANSION VALVE(SUBCOOLING)
CN04	ELECTRONIC EXPANSION VALVE(OIL)
CN06	PLC THERMINAL
CN07	SUB PCB COMMUNICATION TERMINAL
CN08	AC POWER 220V
CN09	CONST. COMP. 2 CRANK HEATER
CN10	INV. COMP. CRANK HEATER
CN11	CONST. COMP. 1 CRANK HEATER
CN12	4WAY VALVE1(UPPER)
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONST. COMP.1 MAGNETIC SWITCH
CN15	CONST. COMP.2 MAGNETIC SWITCH
CN16	OIL RETURE VALVE
CN25	4WAY VALVE2(LOW)
CN26	HOT GAS BYPASS VALVE1(UPPER)
CN27	HOT GAS BYPASS VALVE2(LOW)
CN30	CONST. COMP.2 HIGH PRESSURE SWITCH
CN31	CONST. COMP.1 HIGH PRESSURE SWITCH
CN32	INV. COMP. HIGH PRESSURE SWITCH

Main Board Note2

SYMBOL	DESCRIPTION
CN33	INV. PCB COMMUNICATION TERMINAL
CN34	CONST. COMP. 2 CT SENSOR
CN35	CONST. COMP. 1 CT SENSOR
CN36	HIGH PRESSURE SENSOR
CN38	LOW PRESSURE SENSOR
CN40(OIL BALANCE_I)	INV. OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C1)	CONST. COMP. 1 OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C2)	CONST. COMP. 2 OIL BALANCE PIPE THERMISTOR
CN41(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN41(HEX_HIGH)	ODU HEX HIGH PIPE THERMISTOR
CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
CN42(AIR)	OUTDOOR AIR THERMISTOR
CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
CN43(HEX)	ODU HEX LOW PIPE THERMISTOR
CN43(DISCHARGE_I)	INV. COMP. DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C1)	CONST. COMP. 1 DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Inv. Board Note

SYMBOL	DESCRIPTION
CN_FANCOMM_BL	TRANSMISSION WITH FAN PCB
CN_MAINCOMM_RD	TRANSMISSION WITH MAIN PCB
CN_FAN15VOUT	DC 15V
CN_DCLINKOUTPUT	DC LINK 700V
CN_AC220 INPUT(BL)	AC POWER 220V
CN_U	TERMINAL FOR OUTPUT U
CN_V	TERMINAL FOR OUTPUT V
CN_W	TERMINAL FOR OUTPUT W
CN-T2_OUTPUT	T PHASE OUTPUT
CN-T1_INPUT	T PHASE INPUT
CN-R2_OUTPUT	R PHASE OUTPUT
CN-R1_INPUT	R PHASE INPUT

Notes)
1. This circuit diagram is applied only to the outdoor unit.
2. R S T : Terminal Block, O O : Connector, ⏚ : Grounding.
3. When installation for field wiring, refer to the installation manual.

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERT
CN 15V	DC 15V INPUT
CN FAN RIGHT	POWER SUPPLY FOR RIGHT FAN
CN FAN LEFT	POWER SUPPLY FOR LEFT FAN
CN DC LINK	DC LINK 700V

Sub Board Note

SYMBOL	DESCRIPTION
CN-01	MAIN PCB COMMUNICATION TERMINAL
CN-02	WRITE SELECT
CN-03	FLASH-WRITE(MAIN)
CN-05	FLASH-WRITE(SVC)
CN-06	THERMINAL FOR LGMV

COLOR

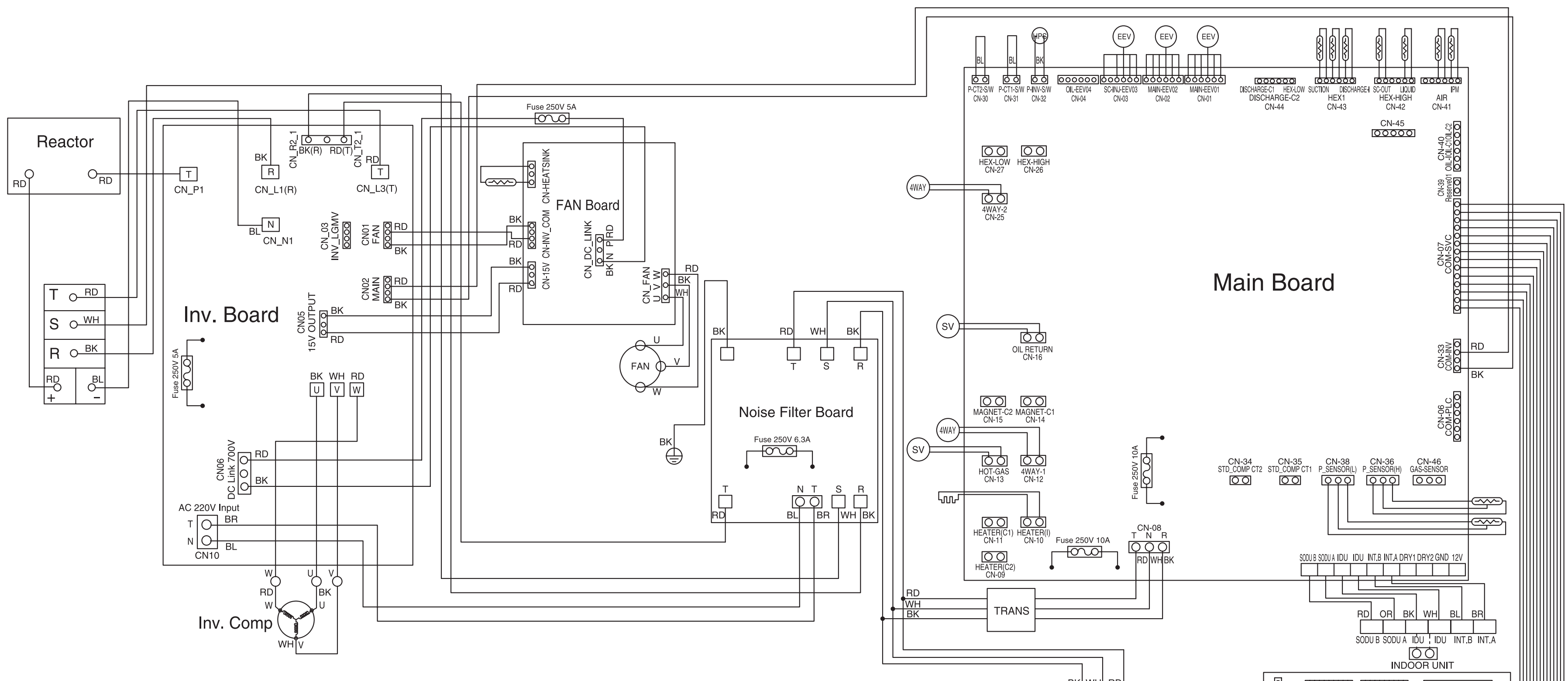
SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

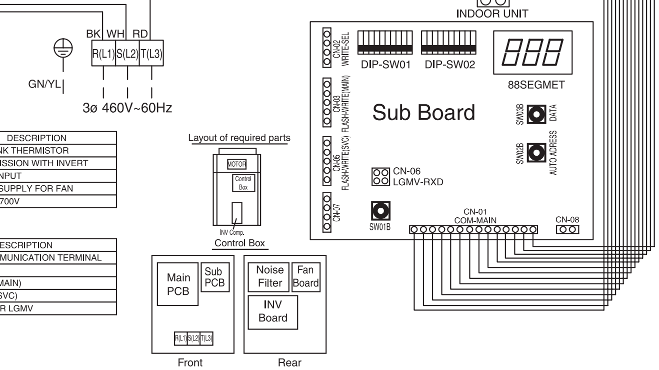
Note
1. - - - - - - - : Field Wiring
2. ———————— : Factory Wiring

HEAT RECOVERY OUTDOOR UNIT WIRING DIAGRAMS

MULTI V III

ARUB072DT3 460V





Main Board Note1

SYMBOL	DESCRIPTION
CN01	ELECTRONIC EXPANSION VALVE1(MAIN UPPER)
CN02	ELECTRONIC EXPANSION VALVE2(MAIN LOW)
CN03	ELECTRONIC EXPANSION VALVE(SUBCOOLING)
CN04	ELECTRONIC EXPANSION VALVE(OIL)
CN06	PLC THERMINAL
CN07	SUB PCB COMMUNICATION TERMINAL
CN08	AC POWER 220V
CN09	CONST. COMP. 2 CRANK HEATER
CN10	INV. COMP. CRANK HEATER
CN11	CONST. COMP. 1 CRANK HEATER
CN12	4WAY VALVE1(UPPER)
CN13	HOT GAS BYPASS VALVE(MAIN)
CN14	CONST. COMP.1 MAGNETIC SWITCH
CN15	CONST. COMP.2 MAGNETIC SWITCH
CN16	OIL RETURE VALVE
CN25	4WAY VALVE2(LOW)
CN26	HOT GAS BYPASS VALVE1(UPPER)
CN27	HOT GAS BYPASS VALVE2(LOW)
CN30	CONST. COMP.2 HIGH PRESSURE SWITCH
CN31	CONST. COMP.1 HIGH PRESSURE SWITCH
CN32	INV. COMP. HIGH PRESSURE SWITCH

Main Board Note2

SYMBOL	DESCRIPTION
CN33	INV. PCB COMMUNICATION TERMINAL
CN34	CONST. COMP. 2 CT SENSOR
CN35	CONST. COMP. 1 CT SENSOR
CN36	HIGH PRESSURE SENSOR
CN38	LOW PRESSURE SENSOR
CN40(OIL BALANCE_I)	INV. OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C1)	CONST. COMP. 1 OIL BALANCE PIPE THERMISTOR
CN40(OIL BALANCE_C2)	CONST. COMP. 2 OIL BALANCE PIPE THERMISTOR
CN41(SC_OUT)	SUBCOOLING OUTLET PIPE THERMISTOR
CN41(HEX_HIGH)	ODU HEX HIGH PIPE THERMISTOR
CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
CN42(AIR)	OUTDOOR AIR THERMISTOR
CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
CN43(HEX)	ODU HEX LOW PIPE THERMISTOR
CN43(DISCHARGE_I)	INV. COMP. DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C1)	CONST. COMP. 1 DISCHARGE PIPE THERMISTOR
CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Inv. Board Note

SYMBOL	DESCRIPTION
CN01	TRANSMISSION WITH FAN PCB
CN02	TRANSMISSION WITH MAIN PCB
CN03	THERMINAL FOR ON-BOARDING
CN05	DC 15V
CN06	DC LINK 700V
CN10	AC POWER 220V
CN14	THERMINAL FOR OUTPUT U.V.W
CN_L1(R)	R PHASE INPUT
CN_N1	S PHASE INPUT
CN_L3(T)	T PHASE INPUT

Fan Board Note

SYMBOL	DESCRIPTION
CN HEAT SINK	HEAT SINK THERMISTOR
CN INV_COM	TRANSMISSION WITH INVERT
CN 15V	DC 15V INPUT
CN FAN	POWER SUPPLY FOR FAN
CN DC LINK	DC LINK 700V

Sub Board Note

SYMBOL	DESCRIPTION
CN-01	MAIN PCB COMMUNICATION TERMINAL
CN-02	WRITE SELECT
CN-03	FLASH-WRITE(MAIN)
CN-05	FLASH-WRITE(SVC)
CN-06	THERMINAL FOR LGMV

Note

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

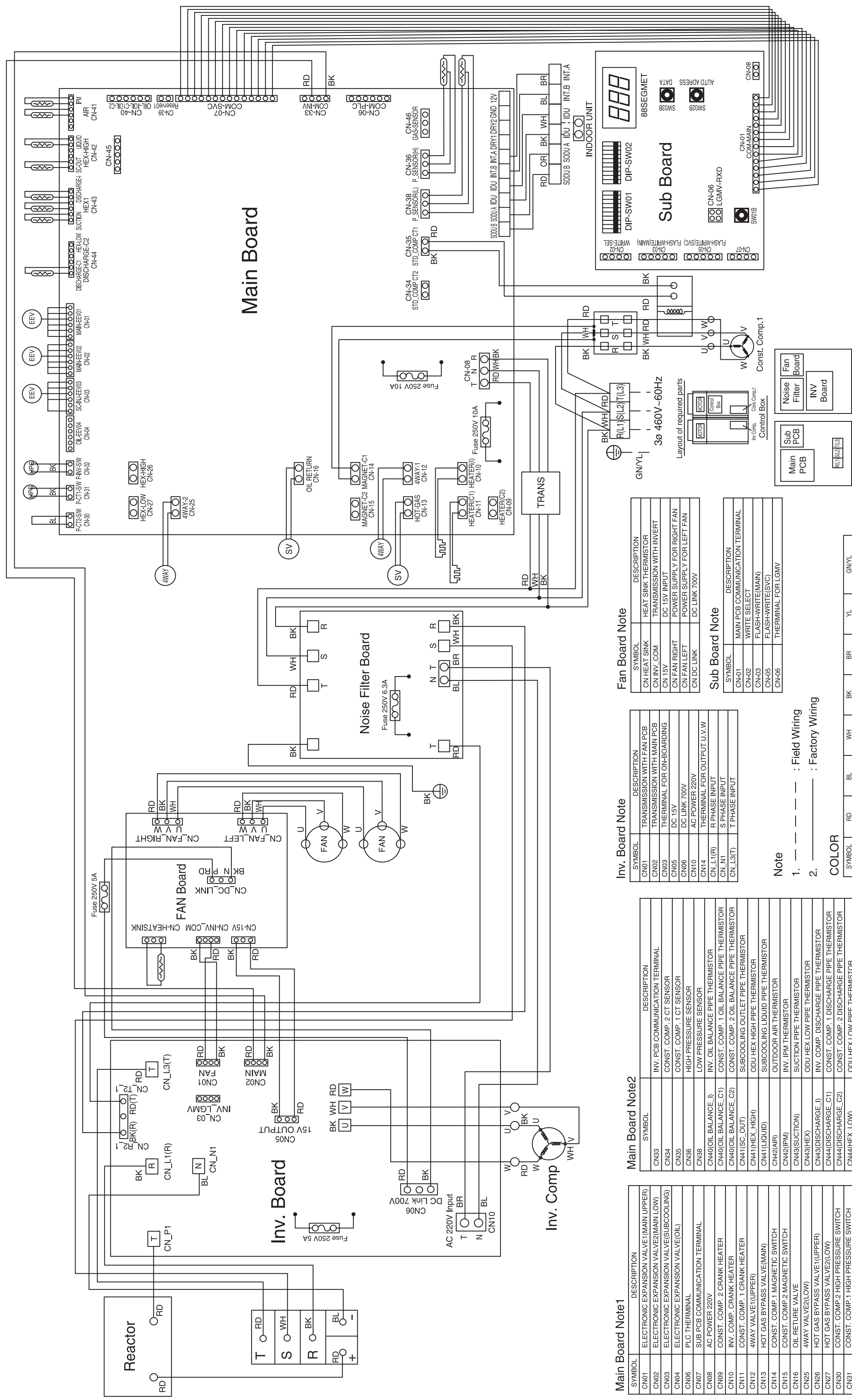
COLOR

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

LG Life's Good

HEAT RECOVERY OUTDOOR UNIT WIRING DIAGRAMS

ARUB096DT3, ARUB121DT3, ARUB144DT3 460V



Main Board Note1

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CN01	ELECTRONIC EXPANSION VALVE1(MAIN UPPER)
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CN41(LIQUID)	SUBCOOLING LIQUID PIPE THERMISTOR
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CN42(IPM)	INV. IPM THERMISTOR
CN43(SUCTION)	SUCTION PIPE THERMISTOR
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CN44(DISCHARGE_C2)	CONST. COMP. 2 DISCHARGE PIPE THERMISTOR
CN44(HEX_LOW)	ODU HEX LOW PIPE THERMISTOR
CN45	THERMINAL FOR CONTROL UNIT

Inv. Board Note

SYMBOL	DESCRIPTION
CN01	TRANSMISSION WITH FAN PCB
CN02	TRANSMISSION WITH MAIN PCB
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CN05	DC 15V
CN06	DC LINK 700V
CN10	AC POWER 220V
CN14	THERMINAL FOR OUTPUT U.V.W
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CN_N1	S PHASE INPUT
CN_L3(T)	T PHASE INPUT

Fan Board Note

SYMBOL	DESCRIPTION
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CN-06	THERMINAL FOR LGMV

Note

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

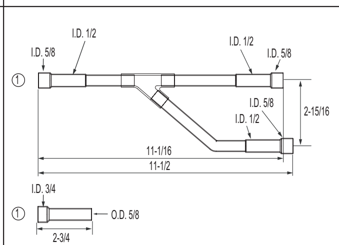
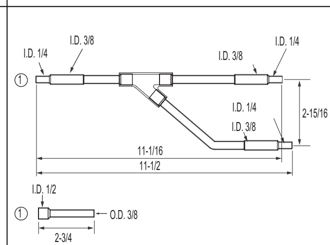
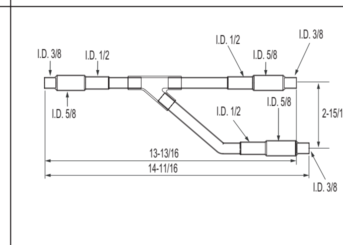
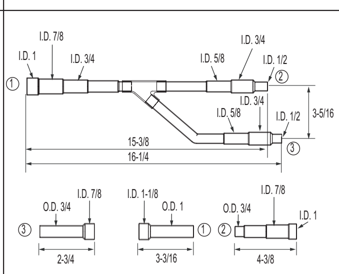
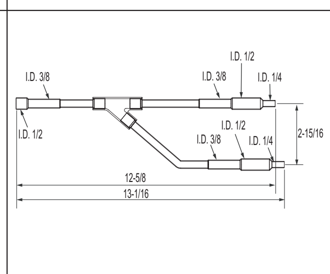
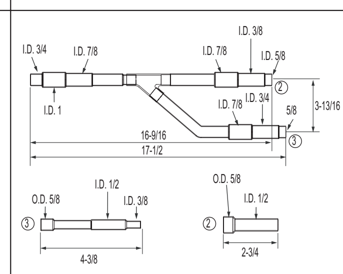
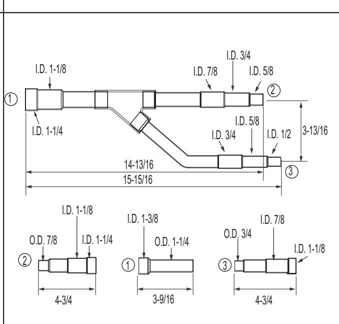
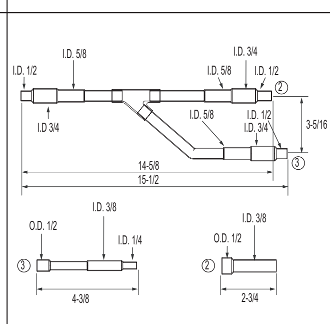
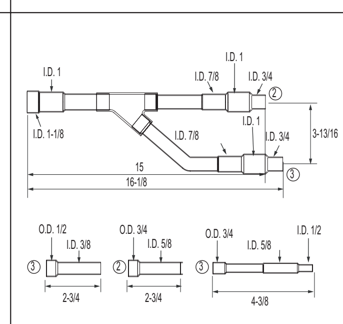
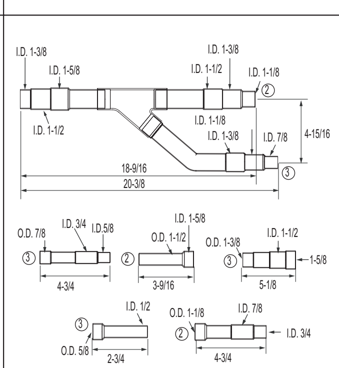
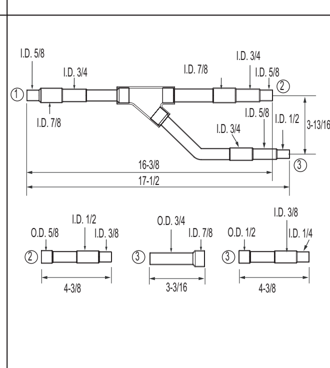
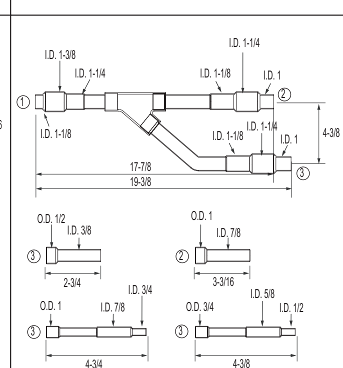
COLOR

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

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 Frames**		**Use to Combine Three Frames**
	ARCNB21		ARCNB21
			ARCNB31

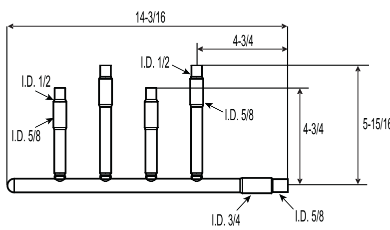
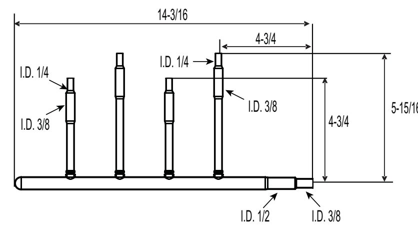
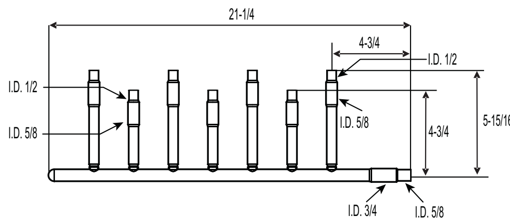
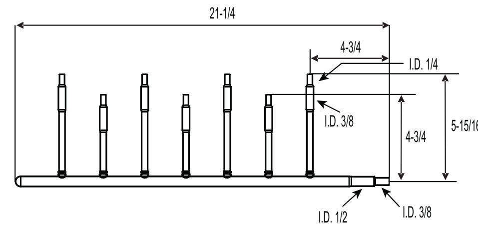
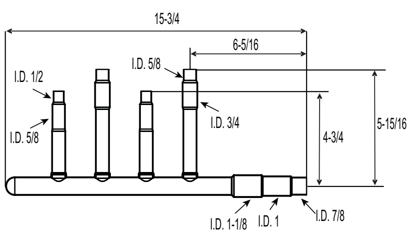
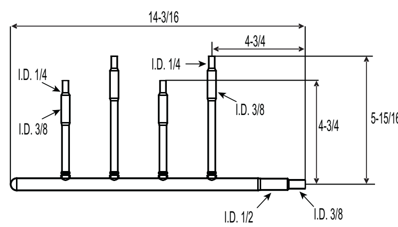
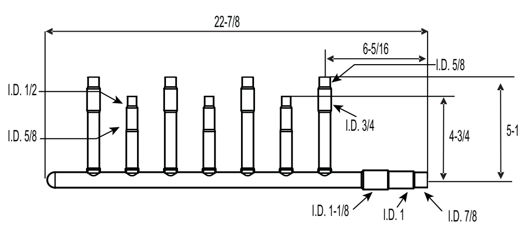
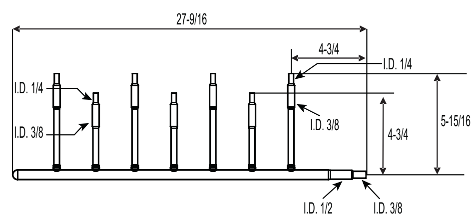
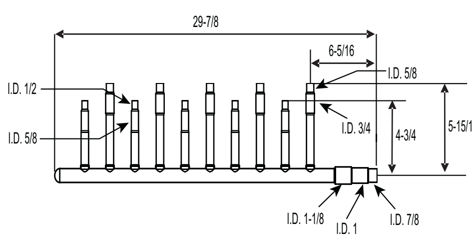
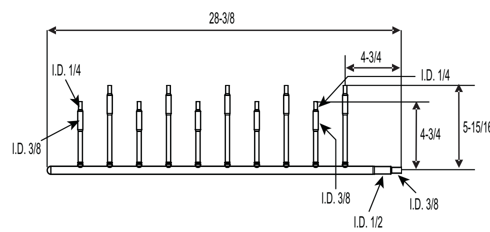
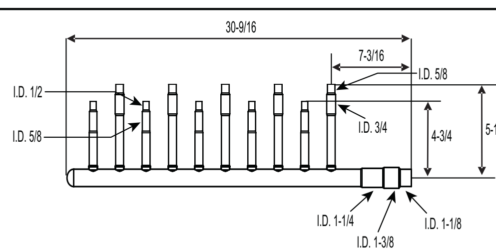
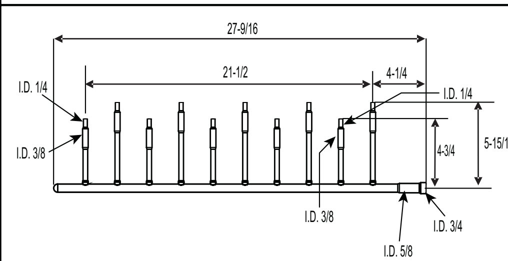
Y-branches (for indoor unit connection)

Unit: inch

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

Headers (for indoor unit connection)

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		

Due to our policy of continuous product innovation, some specifications may change without notification.

Heat Recovery Units

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

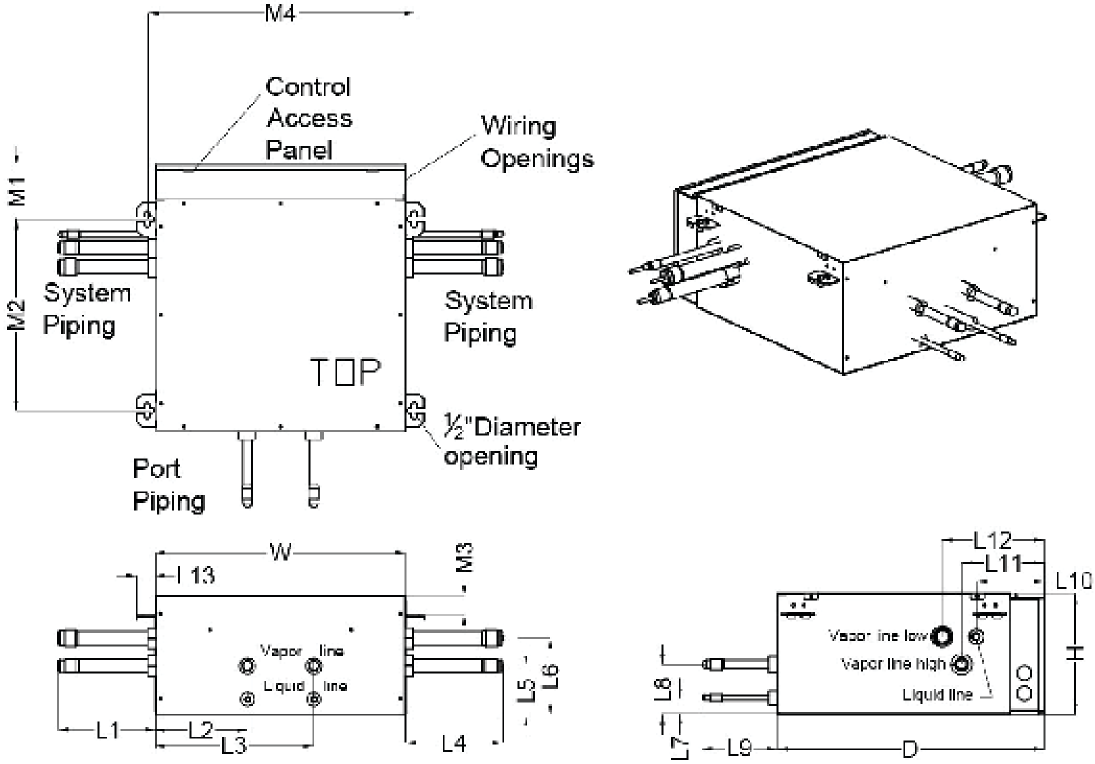
Heat Recovery Unit Specifications

Model			PRHR021A	PRHR031A	PRHR041A
Number of Ports			2	3	4
Max. Connectable No. of Indoor Units			16	24	32
Max. Connectable No. of Indoor Units on each port			8	8	8
Max. Port Capacity (each port)		Btu/h	54,000	54,000	54,000
Max. Unit Capacity (sum of ports)		Btu/h	192,000	192,000	192,000
Net Weight		lbs	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 Outdoor 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		

Heat Recovery Unit Electrical Data

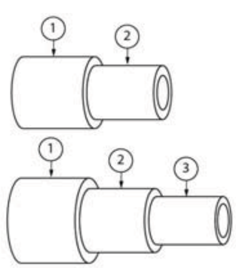
Unit Model No.	V / Hz / Ph	Input (kW)	
		Cooling	Heating
PRHR021A	208-230 / 60 / 1	0.014	0.014
PRHR031A	208-230 / 60 / 1	0.021	0.021
PRHR041A	208-230 / 60 / 1	0.029	0.029

PRHR021A Heat Recovery Unit



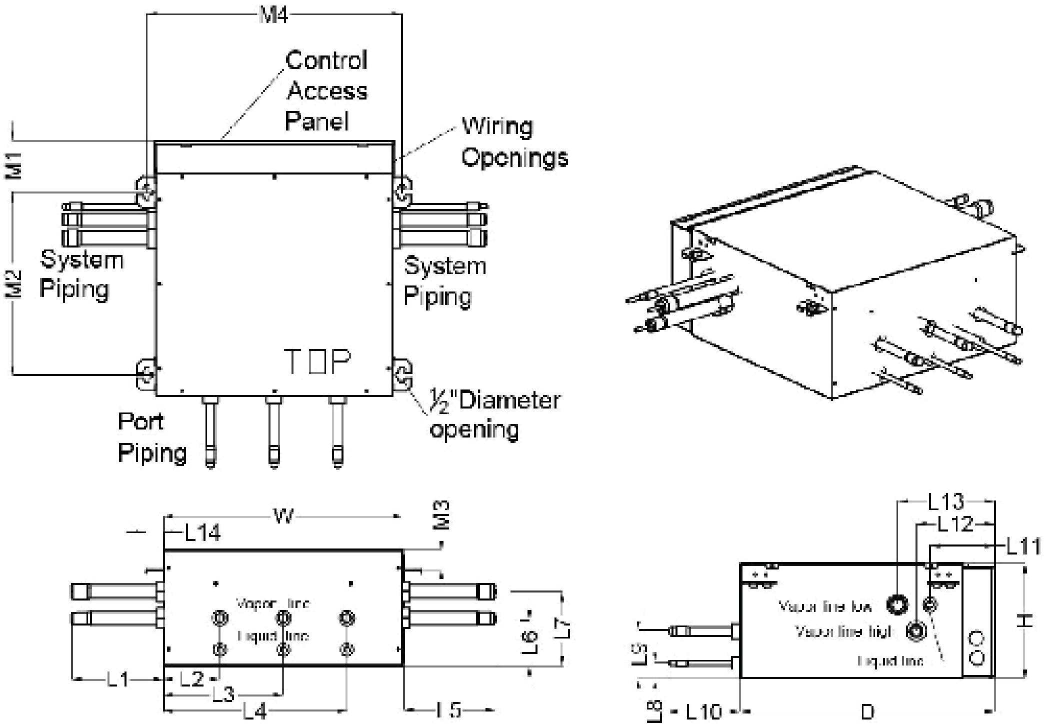
W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	6-5/8"
L3	11-3/8"
L4	6-7/8"
L5	3-1/2"
L6	5-1/2"
L7	1-3/16"
L8	3-9/16"
L9	5-7/16"
L10	4-3/4"
L11	5-3/4"
L12	7-1/4"
L13	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"

Product Data

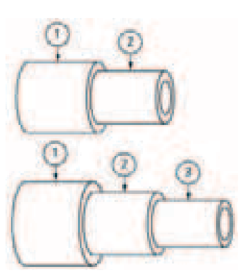


Reducer Dimensions (in)					
		1	2	3	Quantity
Indoor Unit	Liquid Line	3/8 OD	1/4 OD	-	2
	Vapor Line	5/8 OD	1/2 OD	-	2
HR Unit	Liquid Line	3/8 OD	1/4 OD	-	2
	Vapor Line Low	5/8 OD	1/2 OD	-	2
		7/8 OD	3/4 OD	5/8 OD	2
	Vapor Line High	1/2 OD	3/8 OD	-	2
		3/4 OD	5/8 OD	1/2 OD	2

PRHR031A Heat Recovery Unit



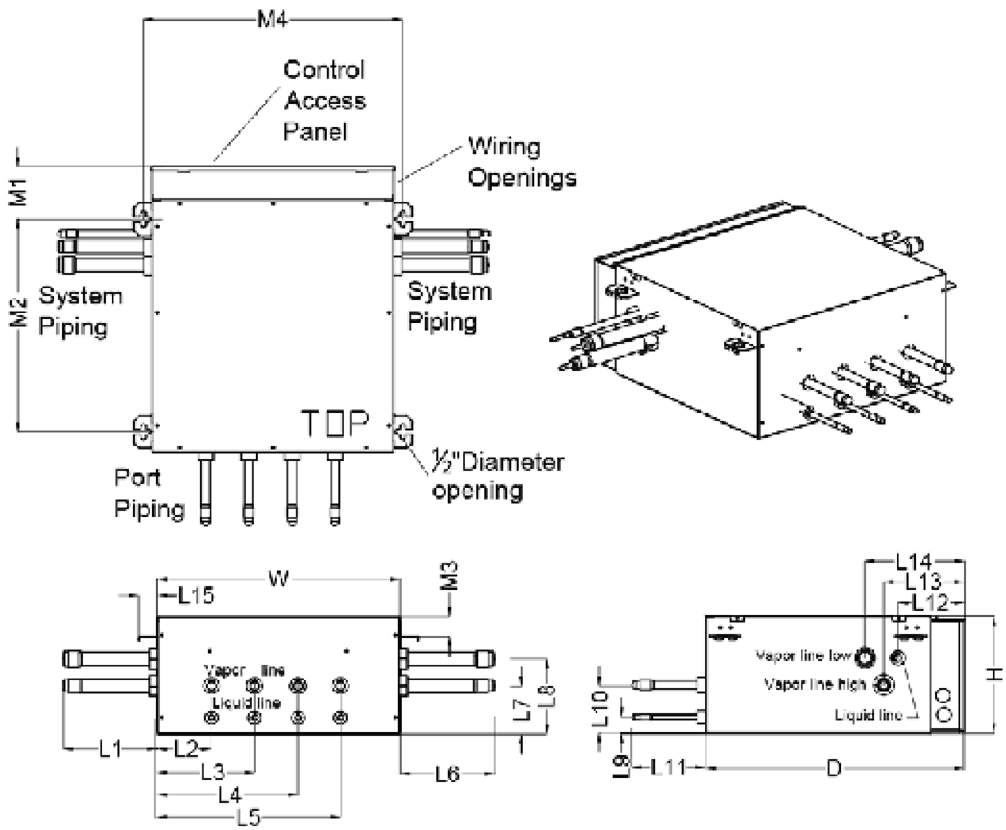
W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	9"
L4	13-3/4"
L5	6-7/8"
L6	3-1/2"
L7	5-1/2"
L8	1-3/16"
L9	3-9/16"
L10	5-7/16"
L11	4-3/4"
L12	5-3/4"
L13	7-1/4"
L14	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"



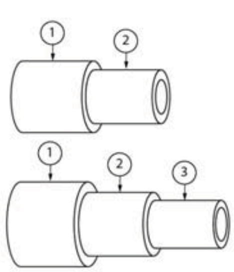
Reducer Dimensions (in)

		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

PRHR041A Heat Recovery Unit

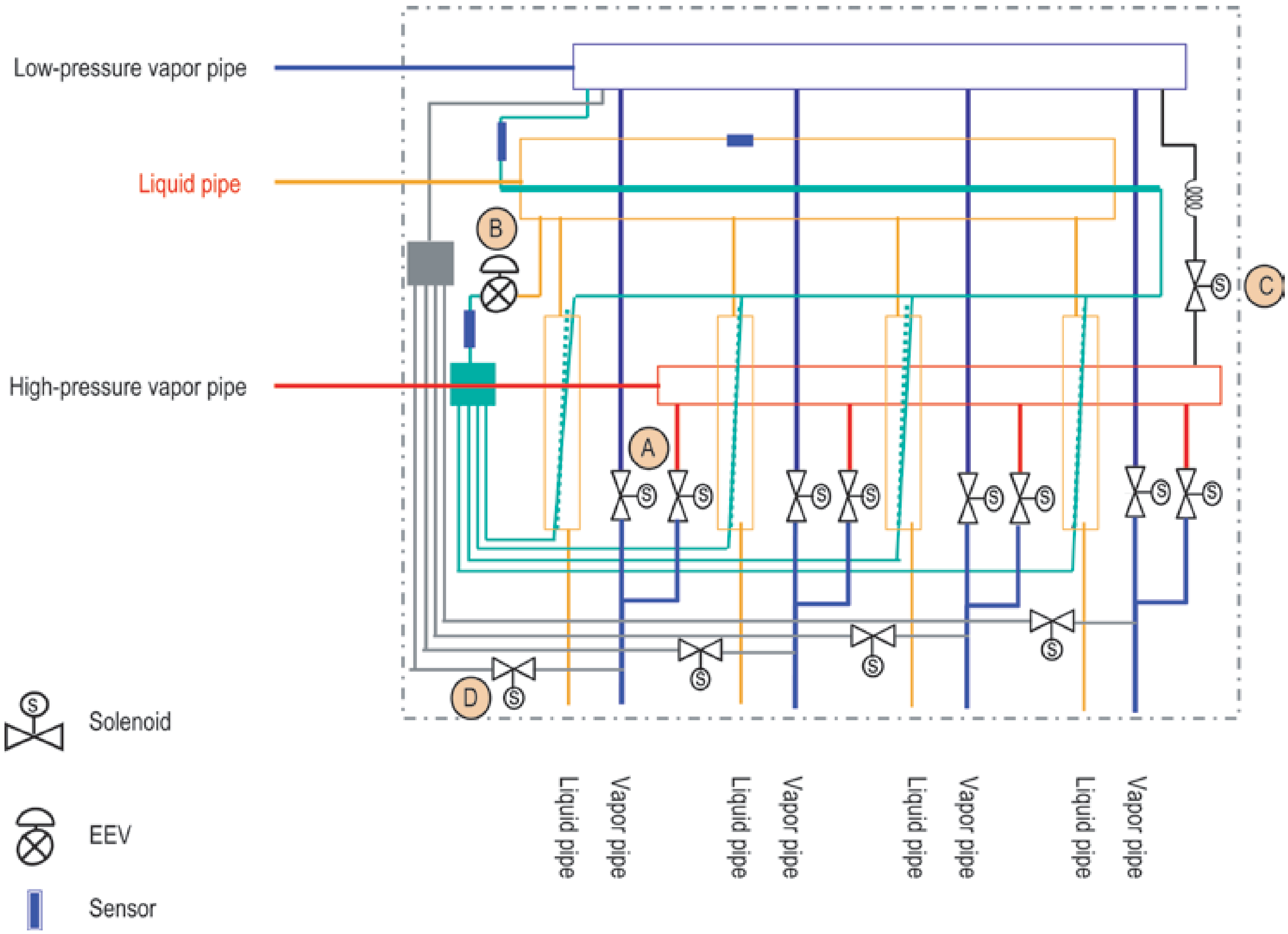


W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	7-1/2"
L4	10-1/2"
L5	13-3/4"
L6	6-7/8"
L7	3-1/2"
L8	5-1/2"
L9	1-3/16"
L10	3-9/16"
L11	5-7/16"
L12	4-3/4"
L13	5-3/4"
L14	7-1/4"
L15	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"



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

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



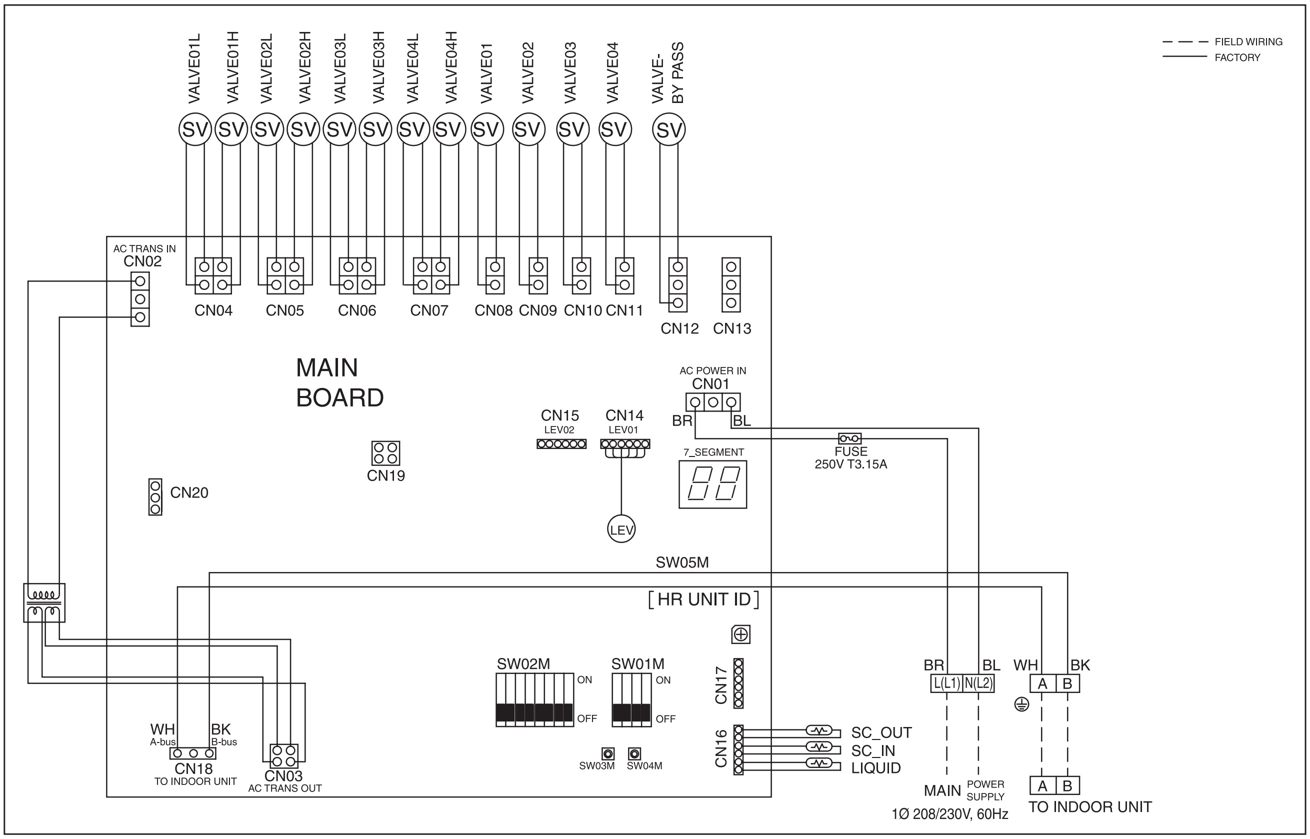
Ⓐ: Switch operation between cooling and heating.

Ⓑ: 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.

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

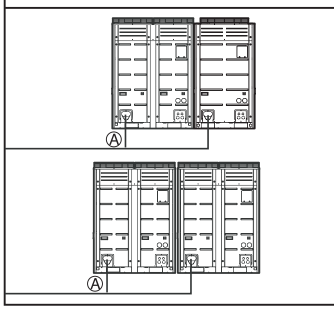
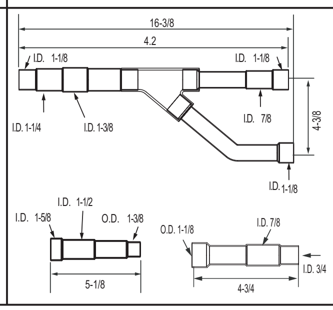
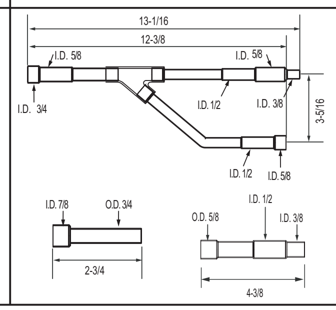
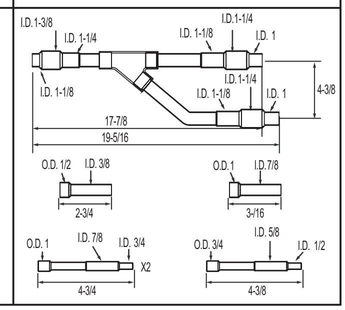


CN04	Solenoid Valve 01L/H (For Room 1)
CN05	Solenoid Valve 02L/H (For Room 2)
CN06	Solenoid Valve 03L/H (For Room 3)
CN07	Solenoid Valve 04L/H (For Room 4)
CN08	Solenoid Valve 01 (Bypass for Room 1)
CN09	Solenoid Valve 02 (Bypass for Room 2)
CN10	Solenoid Valve 03 (Bypass for Room 3)
CN11	Solenoid Valve 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

Multi-frame Connectors (for heat recovery outdoor unit connection)

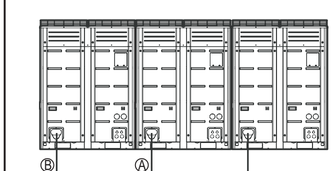
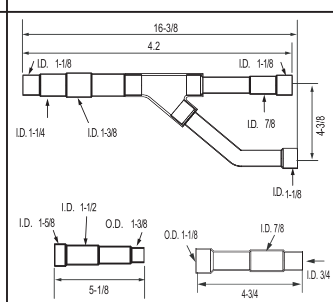
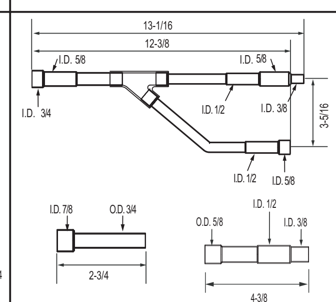
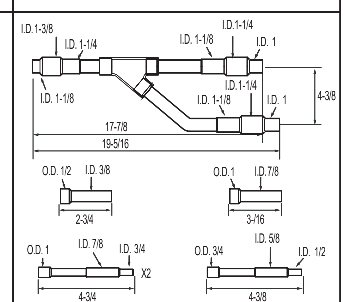
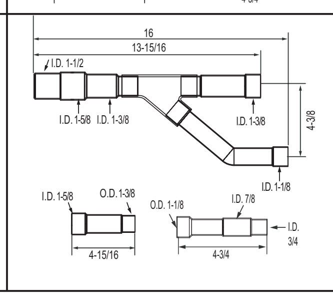
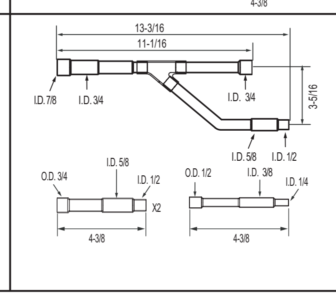
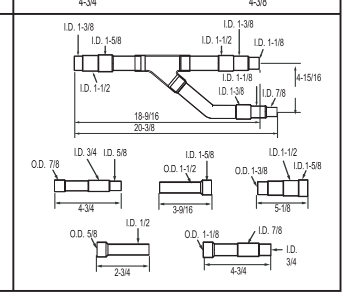
Two outdoor units

Unit: inch

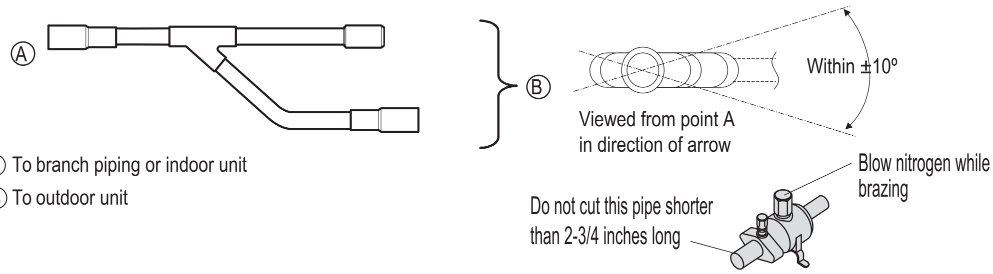
Combination specification	Multi-Frame Connector	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	Ⓐ ARCNB21			

Three outdoor units

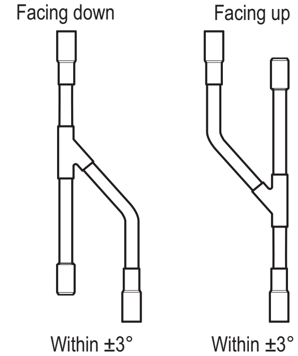
Unit: inch

Combination specification	Multi-Frame Connector	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	Ⓐ ARCNB21			
	Ⓑ ARCNB31			

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



Ⓐ To branch piping or indoor unit
Ⓑ To outdoor unit



Outdoor Unit Placement Considerations

Multi V III outdoor units are designed to operate properly in a wide range of environmental conditions, but correct placement of the outdoor unit is essential for maximizing unit performance. Consider the following factors:

Mounting Platform

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

Tie-Downs and Wind Restraints

The strength of Multi V III frames is adequate to be used with field-provided wind restraint tie-downs. The overall tie-down configuration must be approved by a local professional engineer. Always refer to local code when designing a wind restraint system.

Ambient Air Conditions

Do not place the unit in a corrosive environment. Avoid exposing the outdoor unit to steam, combustible gases, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, discharge from boiler stacks, and other sources of extreme temperature, gases, or substances that may degrade performance or cause damage to the unit. When installing multiple outdoor units, avoid placing the units where discharge air from the front of one outdoor unit is blown into the back side of an adjacent unit.

Dealing with Snow and Ice

In climates that experience snow buildup, place the unit on a raised platform to ensure proper outdoor unit coil airflow. The raised support platform must be high enough to allow the unit to remain above the anticipated snow accumulation level (consider snow drifts). Design the mounting base to prevent snow accumulation on the platform in front or back of the unit case. If necessary, use an inlet and discharge duct or a snow hood to prevent snow or ice from accumulating on the coil, fan blades, and fan guards. Best practice prevents snow from accumulating on top of the unit as well. When the system is commissioned, adjust the dip switch for “snow throw” operation if a snow hood is not used. In all cases, the outdoor unit supply and/or discharge duct work or hood must be designed to have a combined air pressure drop rating that does not exceed 0.32" WG.

⚠ *Note:*
- *When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost mode will not accumulate and freeze on sidewalks or driveways.*
- *Snow throw mode does not prevent ice from forming on the fan blade or discharge grille.*

Handling Outdoor Unit Condensate

While operating in heating mode, the surface temperature of the outdoor coil may drop below the dew point of the surrounding air. Moisture may condense on the coil fins and subsequently drain onto the surface of the surrounding area from the bottom of the unit case. If the designer chooses to control the flow of condensate from the outdoor unit, install a field-provided drain pan under the unit and pipe the condensate to a nearby drain. Mount the unit in the pan on rails or isolation pads. If the unit will be operating near or below freezing with a condensate drain pan installed, consider installing heat tape in the bottom of the outdoor unit drain pan and along the condensate drain line.

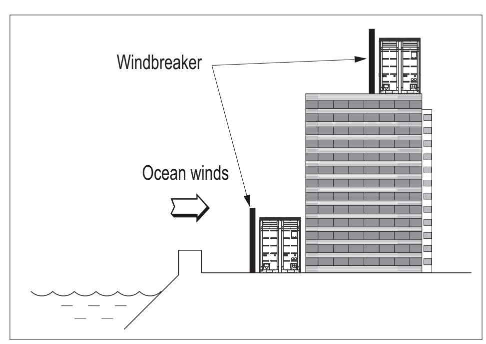
Oceanside Installation Precautions

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

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

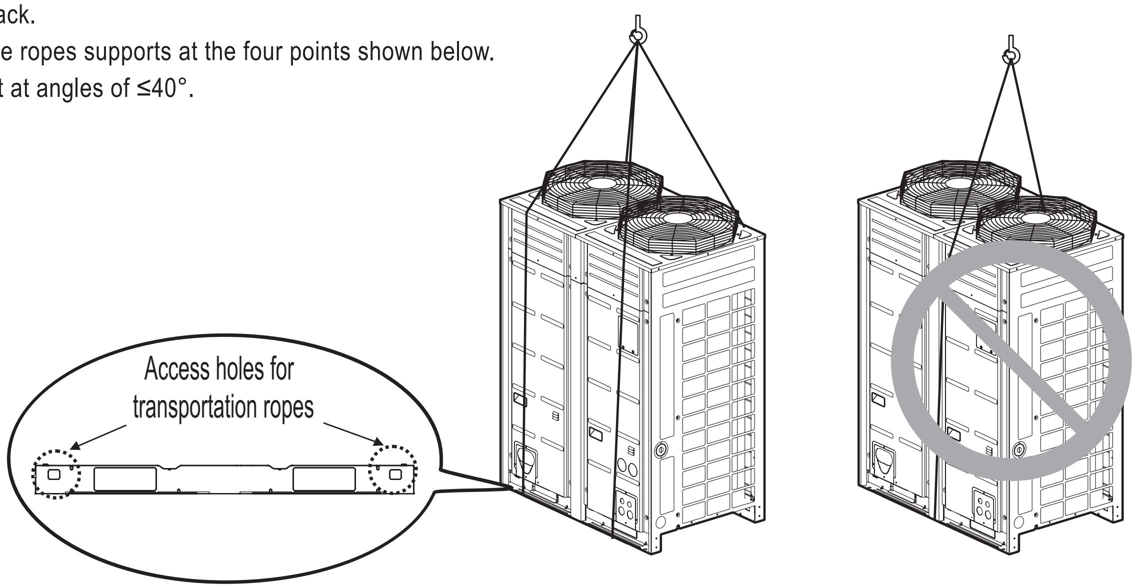
⚠ *Note:*
Ocean winds may cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.

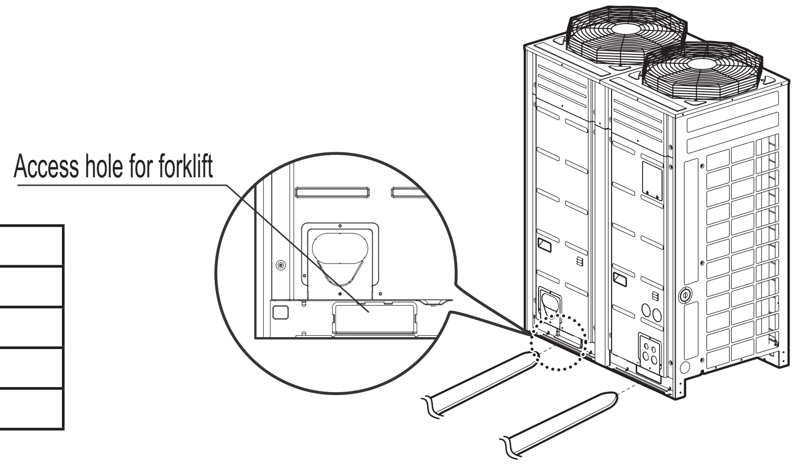
If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width should be more than 150% of the outdoor unit, and be installed at least 27-1/2 inches away from the outdoor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



Transporting / Lifting the Outdoor 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°.





Capacity (ton)	Weight (lbs.)
6	418
8	617
10	617
12	617

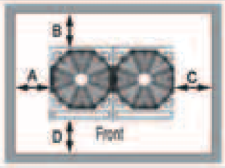
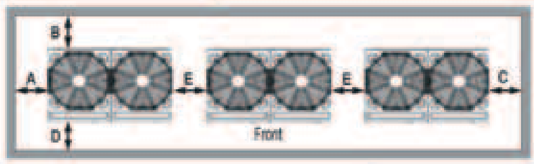
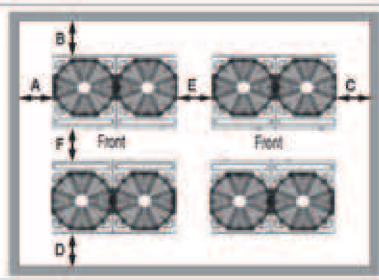
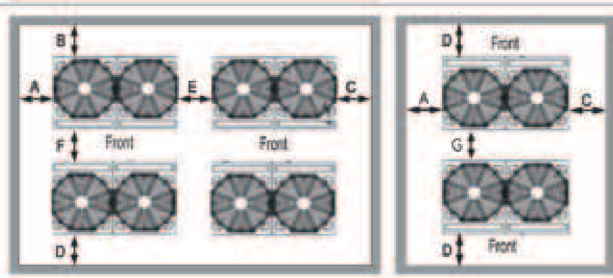
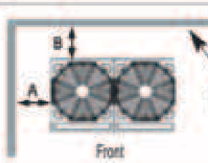
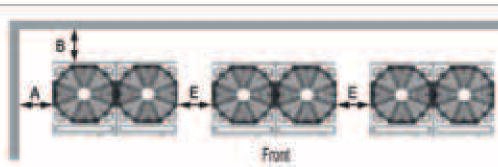
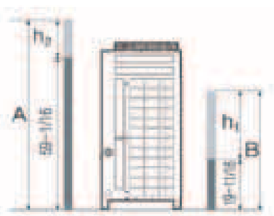
⚠WARNING

- *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.*

⚠CAUTION

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

Proper airflow through the outdoor unit coil is critical for correct unit operation. When installing the outdoor unit, consider service, inlet, and outlet, and minimum allowable space requirements as illustrated in the diagrams below.

Description	Installation Area	Example No. 1 7/16" ≤ Space A, C ≤ 1-7/8"	Example No. 2 Space A, C ≥ 1-7/8"
Unit(s) is (are) enclosed by four (4) walls		A≥ 7/16" B≥ 11-13/16" C≥ 7/16" D≥36"	A≥ 2" B≥ 3-15/16" C≥ 2" D≥ 36"
		A≥ 7/16" B≥ 11-13/16" C≥ 7/16" D≥ 36" E≥ 2-3/4"	A≥ 2" B≥ 3-15/16" C≥ 2" D≥ 36" E≥ 3-15/16"
		A≥ 7/16" B≥ 11-13/16" C≥ 7/16" D≥36" E≥ 2-3/4" F≥ 36"	A≥ 2" B≥ 3-15/16" C≥ 2" D≥ 36" E≥ 3-15/16" F≥ 36"
		A≥ 7/16" B≥ 11-13/16" C≥ 7/16" D≥ 36" E≥ 2-3/4" F≥ 36" G≥ 20"	A≥2" B≥13-15/16" C≥2" D≥36" E≥3-15/16" F≥36" G≥ 20"
Two (2) sides are walls	 No limitations on wall height.	A≥ 7/16" B≥ 11-13/16"	
	 No limitations on wall height.	A≥ 7/16" B≥ 11-13/16" E≥ 15-3/4"	
Wall height limitations (when the unit[s] is [are] surrounded by four [4] walls)	 • Wall height at the front of the unit must be ≤59-1/16 inches. • Wall height at the inlet side of the unit must be ≤19-11/16 inches. • There are no height limitations for the walls at the sides of the unit. • If the wall height at the front and inlet sides of the unit are higher than allowable limits, additional space must be included. - Additional space on the inlet side by 1/2 of h1. - Additional space on the front side by 1/2 of h2. - h2 = A (actual height) - 59-1/16 inches. - h1 = B (actual height) - 19-11/16 inches.		

INSTALLATION

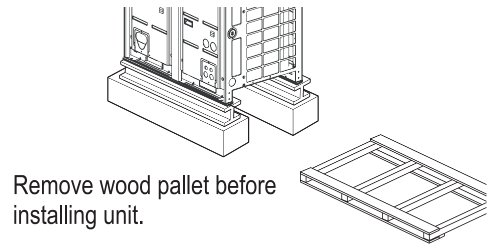
Installing Outdoor Unit Supports

⚠ WARNING

Remove the wood pallet from the bottom of the outdoor unit base pan before welding. The pallet may cause a fire hazard if not removed.

⚠ CAUTION

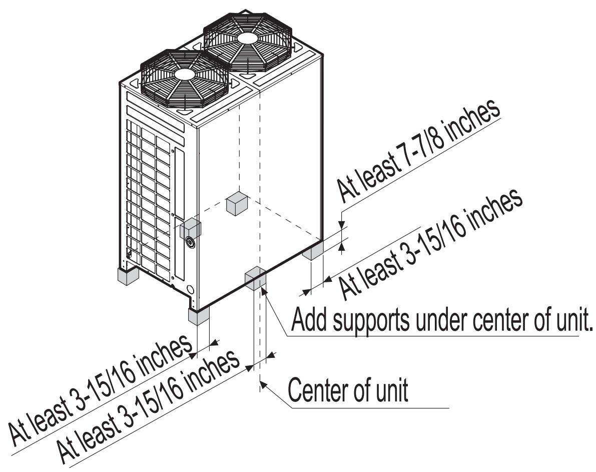
Remove the wood pallet from the bottom of the outdoor unit base pan before attaching the anchor bolt. If the pallet is not removed, the outdoor unit may may become unstable and heat exchanger may freeze, resulting in improper operation.

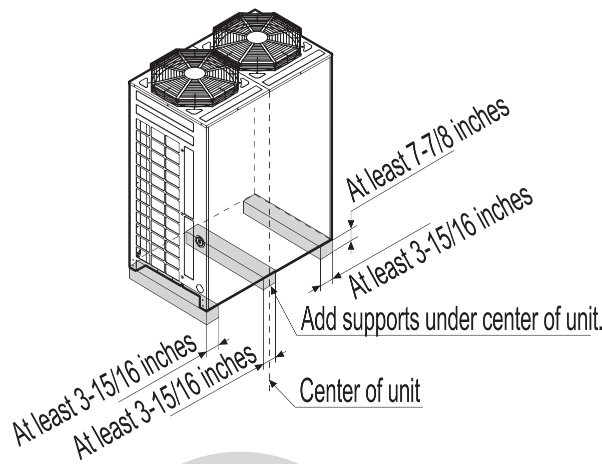


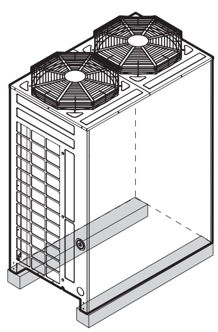
⚠ WARNING

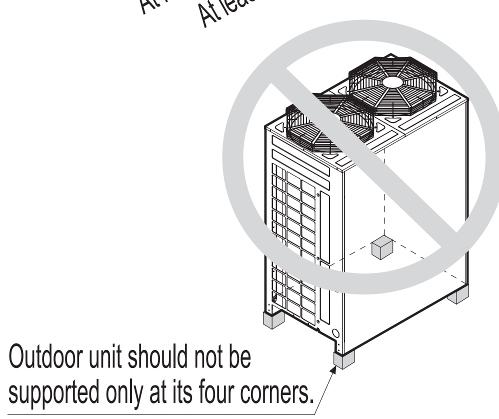
- *When building the support(s) for the outdoor unit, ensure that its surface has enough strength to support the weight of the product. If installation is not strong enough, the outdoor unit may fall and cause physical injury or death.*

- Outdoor unit supports must be ≥3-15/16 inches wide and ≥7-7/8 inches high.
- 3/8-inch or 5/16-inch anchor bolts must be inserted at least 2-15/16 inches deep into the supports.





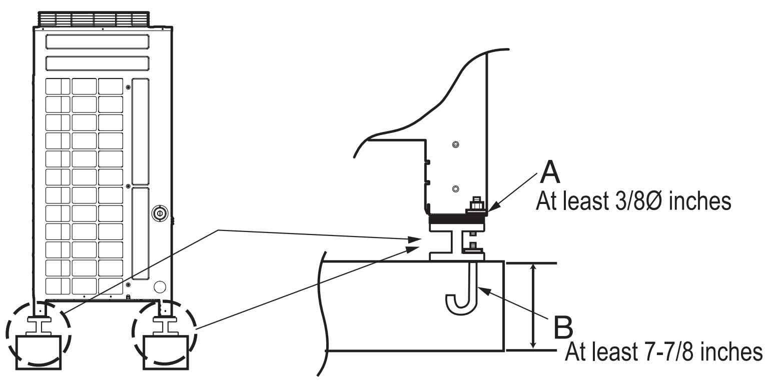


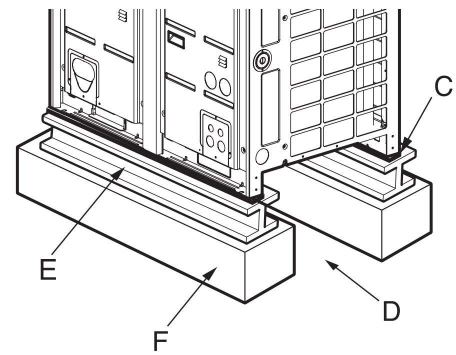


⚠ WARNING

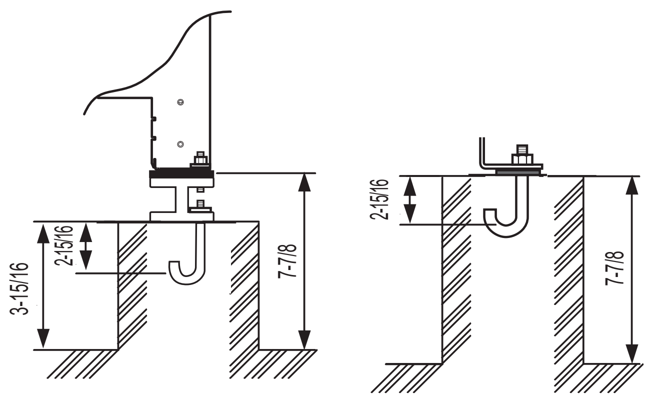
Secure the outdoor unit with bolts to stabilize it in the event of earthquakes or strong winds. Any deficiency in installation may cause the outdoor unit to fall, resulting in physical injury or death.

- The H-beam may be used as a base support.
- The installed outdoor unit may transfer noise and vibration to the floor or surrounding walls in the installation area. To reduce noise and vibration, install a ≥7-7/8 inch thick cushion pad under the outdoor unit.





A: Corners must be firmly attached, otherwise, the support will bend.
B: Use a 3/8 inch or 5/16 inch hexagon nut.
C: Anti-vibration material.
D: Include enough space for refrigerant piping and electrical wiring when installing through the bottom of the unit.
E: H-beam support.
F: Concrete support.

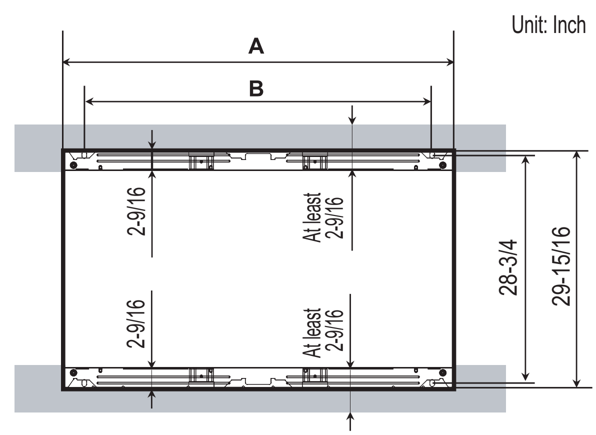


⚠ CAUTION

- *Ensure that any generated condensate can properly drain away from the outdoor unit. Do not install tubing or piping in the base pan for condensate drainage. If the condensate is not properly drained, the tubing or piping or pipe may freeze and liquid or ice may build in the outdoor unit.*
- *Ensure that enough space is available for piping and wiring.*
- *When installing inside a mechanical room, a drain pan is recommended to collect condensate.*

Location of the Anchor Bolts

Capacity (ton)	A (inches)	B (inches)
6	36-1/4	31-3/16
8	48-13/16	43-3/8
10		
12		

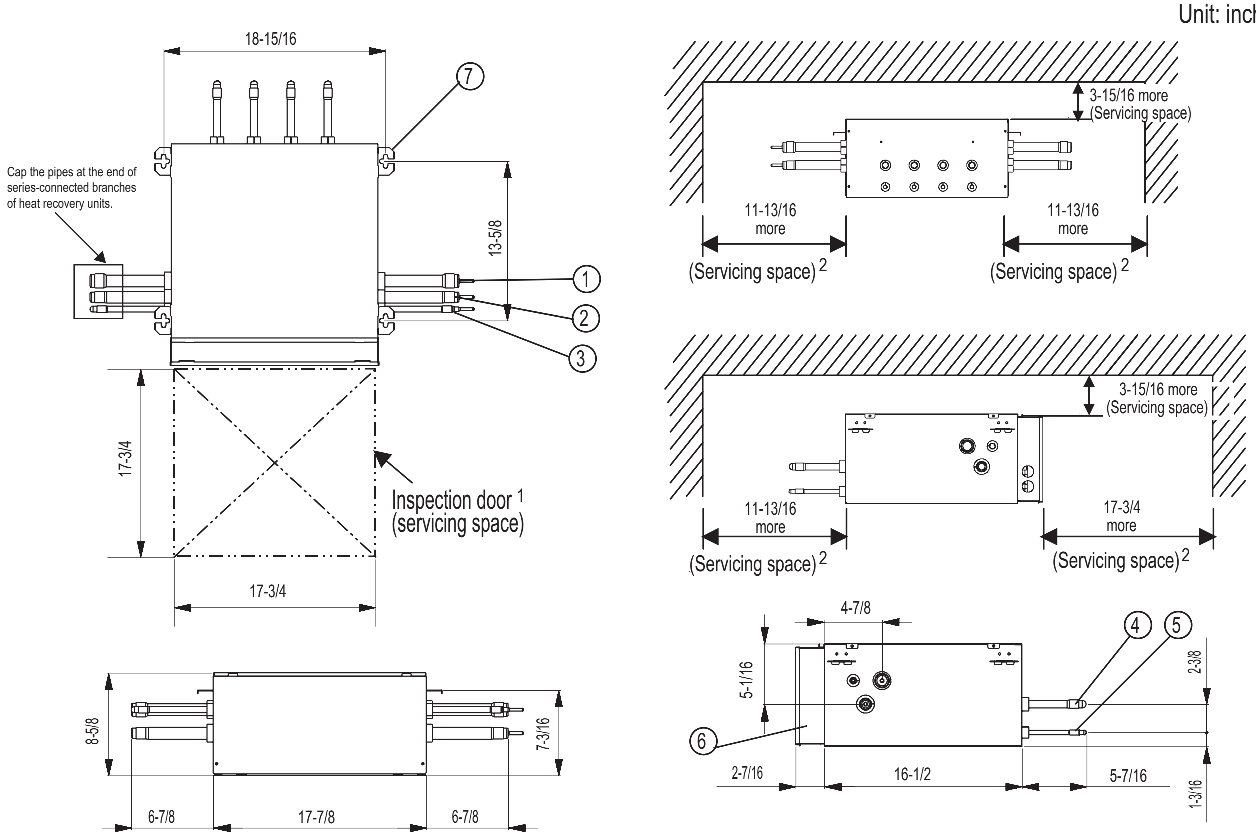


Note:
Heat recovery units are for use with ARUB Series Heat Recovery systems only.

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

- Install the heat recovery unit indoors.
- 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 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 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: inch



Unit: inch

No.	Part Name	Description	
		PRHR021A	PRHR031A / PRHR041A
1	Low pressure vapor pipe connection port	7/8Ø Brazed connection	1-1/8Ø Brazed connection
2	High pressure vapor pipe connection port	3/4Ø Brazed connection	7/8Ø Brazed connection
3	Liquid pipe connection port	3/8Ø Brazed connection	1/2Ø Brazed connection (PRHR031A) 5/8Ø Brazed connection (PRHR041A)
4	Indoor unit vapor pipe connection port	5/8Ø Brazed connection	5/8Ø Brazed connection
5	Indoor unit liquid pipe connection port	3/8Ø Brazed connection	3/8Ø Brazed connection
6	Control box	-	-
7	Metal hanger tab	3/8 or 5/16	3/8 or 5/16

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

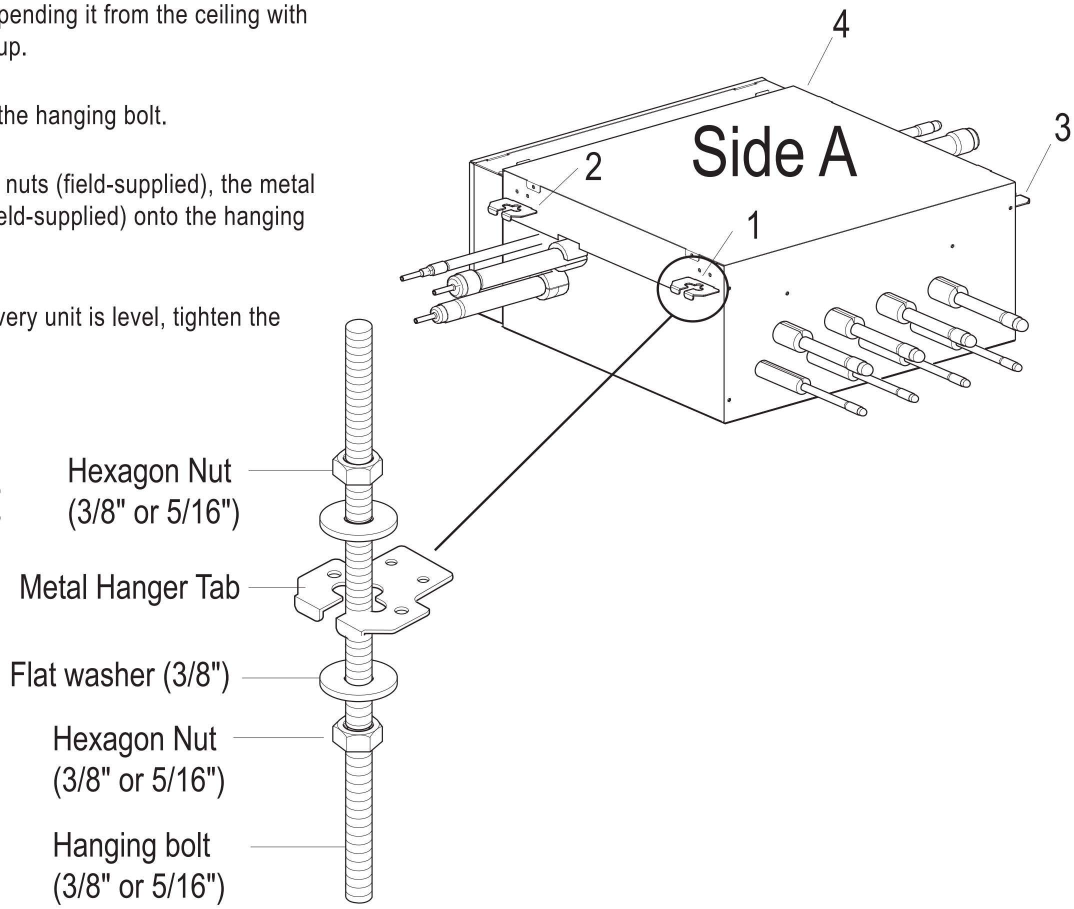
Install the heat recovery unit by suspending it from the ceiling with side A (see diagram) always facing up.

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 unit is level, tighten the hexagon nuts.

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



The proper design and installation of the refrigerant piping system is a critical element of the Multi V system. Multi V III Heat Pump requires two pipes between system components – a liquid line and a vapor line. Multi V III Heat Recovery requires three pipes between the outdoor 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 line that eliminates the possibility of refrigeration oil from collecting in the vapor lines.

Refrigerant Piping Quality Assurance

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

The piping system can be engineered manually using the procedure outlined in the "Manual Layout Procedure" on page 85, however, the preferred method is to design the system using LG's LATS Multi V software. **To ensure that the refrigerant piping design meets LG's quality standards, a LATS refrigerant piping design must be provided with every Multi V III order. Following the installation, if any changes or variations on the original LATS design are necessary, a new LATS file must be created and provided to LG prior to system commissioning to ensure the proper pipe size has not changed.**

Adjusting LATS Multi V Output for Altitude

When a system is installed at elevations significantly above sea level, the designer must also consider the impact air density has on the capacity of the indoor and outdoor units. An Altitude Correction Factor must be manually applied to the indoor and outdoor unit data provided in the LATS report. Refer to the "Equipment Selection Procedure" in the Multi V III Engineering Manual for more information.

Design Choices

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

CAD Mode

Using 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 software. Multi V air-source units, heat recovery units, and indoor units can be selected from drag and drop lists and placed on the floor plan drawing(s), and interconnecting pipes between system components will be drafted directly on the drawing set. LATS will size the refrigerant piping, certify the design, and provide a detailed materials report and system schematic. Use the export feature to create a CAD file (.dxf format) that can subsequently be imported into the building design drawings.

- 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).

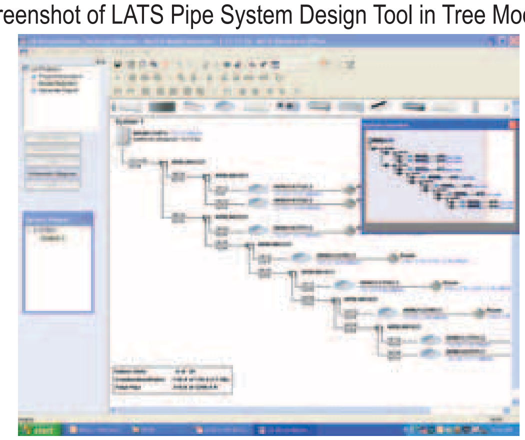
Tree Mode

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

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

In either case, LATS Multi V software 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 III outdoor units, air handlers, control devices, accessories, refrigerant pipe sizes segregated by building, by system, by pipe size, and by pipe segments.

Screenshot of LATS Pipe System Design Tool in Tree Mode



Creating a Balanced Piping System

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

⚠ Note:

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

⚠ 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 to Multi V III systems is one, taking into consideration of the minimum combination ratio.
- The maximum number of indoor units on Multi V III outdoor heat pump and heat recovery systems is:

ARUN072BT3-DT3 / ARUB072BT3-DT3 = 13
ARUN096BT3-DT3 / ARUB096BT3-DT3 = 16
ARUN121BT3-DT3 / ARUB121BT3-DT3 = 20
ARUN144BT3-DT3 / ARUB144BT3-DT3 = 23
ARUN168BT3-DT3 / ARUB168BT3-DT3 = 29
ARUN192BT3-DT3 / ARUB192BT3-DT3 = 32
ARUN216BT3-DT3 / ARUB216BT3-DT3 = 35
ARUN240BT3-DT3 / ARUB240BT3-DT3 = 39
ARUN264BT3-DT3 / ARUB264BT3-DT3 = 42
ARUN288BT3-DT3 / ARUB288BT3-DT3 = 45
ARUN312BT3-DT3 / ARUB312BT3-DT3 = 52
ARUN336BT3-DT3 / ARUB336BT3-DT3 = 55
ARUN360BT3-DT3 / ARUB360BT3-DT3 = 58
ARUN384BT3-DT3 / ARUB384BT3-DT3 = 61
ARUN408BT3-DT3 / ARUB408BT3-DT3 = 64
ARUN432BT3-DT3 / ARUB432BT3-DT3 = 64

Multi V III Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	**Longest total**	3,280 feet
	Longest distance from outdoor unit to indoor unit	656 feet (Actual) 738 feet (Equivalent)
	Distance between fittings and indoor units	≥20 inches
	Distance between fittings and Y-branches	≥20 inches
	Distance between two Y-branches	≥20 inches
	Distance between two series-piped heat recovery units (ARUB Series only)	≥20 inches
	Minimum distance between indoor unit to any Y-branch	3 feet from indoor unit to Y-branch
	Maximum distance between first Y-branch to farthest indoor unit	131 feet (295 feet for conditional applications)
Elevation (all elevation limitations are measured in actual feet)	**If outdoor unit is above or below indoor unit**	360 feet
	Between any two indoor units	49 feet
	Between indoor units connected to a heat recovery unit (ARUB Series only)	49 feet

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 units, if possible, 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 87 and "Using LG Header Kits" on page 88.

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 9-14 and 35-40, list the nominal cooling capacity next to each indoor unit on the drawing.

6. Starting at the indoor unit located farthest from the outdoor 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 94-104 to determine the pipe size of the liquid and vapor lines of all pipes.

8. Starting at the indoor unit located farthest from the outdoor unit, sum the capacity of liquid line pipe segments located between the indoor unit(s) and each Y-branch fitting, header fitting, and heat recovery unit. Record these values next to each Y-branch, header, and/or heat recovery unit on the drawing.

9. Refer to “Y-branch Kits” on pages 32 and 66, “Header Kits” on page 33 and 67, and heat recovery units on page 68 to determine the part number of each Y-branch, header, and/or heat recovery unit 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 86 to estimate the equivalent length of field-provided pipe and fittings for each segment. Equivalent lengths should be totaled with the upstream segment only.

11. Verify the equivalent pipe length complies with the limitations in “Multi V III Refrigerant Piping System Limitations” Table on page 84. If the limitations are exceeded, either reroute the pipe or change the location of the Y-branch fittings, header fittings, heat recovery units, and/or indoor unit locations so the design conforms with all limitations.

12. Verify the length of the design complies with the limitations set in “Multi V III Refrigerant Piping System Limitations” on page 84.

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.

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 2-1/8" (ASTM B 280, clean, dry and capped).
- Annealed temper ACR copper tubing is available in sizes 1/4" through 21-1/8" (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 "Equivalent Piping Length for Y-branches, Headers, and Other Piping Components" 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.

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

Component	Size (Inches)													
	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	2-1/8
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 ARUB Heat Recovery Units only)	8.2													

[1]Kit for ARUN Heat Pump systems contains two Y-branches: one for liquid and one for vapor; Kit for ARUB 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	0.00020
3/8	0.375	0.030	0.126	0.00054	0.032	0.134	0.00053
1/2	0.500	0.035	0.198	0.00101	0.032	0.182	0.00103
5/8	0.625	0.040	0.285	0.00162	0.035	0.251	0.00168
3/4	0.750	0.042	0.362	0.00242	0.042	0.362	0.00242
7/8	0.875	0.045	0.455	0.00336	0.045	0.455	0.00336
1-1/8	1.125	0.050	0.655	0.00573	0.050	0.655	0.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]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.

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:
No Substitutions
Only LG supplied Y-Branch and Header fittings can be used to join one pipe segment to two or more segments. Third-party or field fabricated Tee's, Y-fittings, Headers, or other branch fittings are not qualified for use with LG Multi V III systems. The only field-provided fittings allowed in a Multi V III piping system are 45° and 90° elbows.

LG supplied Y-branch kits consists of:
- Two (2) Y-branches (liquid line, vapor lines)
- Reducer fittings as applicable
- Molded clam-shell type insulation covers

LG Header kits consists of:
- Two (2) Headers (one liquid line, one vapor line)
- Reducer fittings as applicable
- Molded clam-shell type insulation covers

Using LG Y-branch Kits

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

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

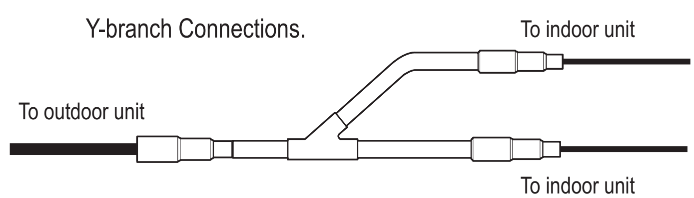
There is no limitation on the number of Y-branches that can be installed, but there is a limitation on the number of indoor units connected to a single outdoor unit.

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

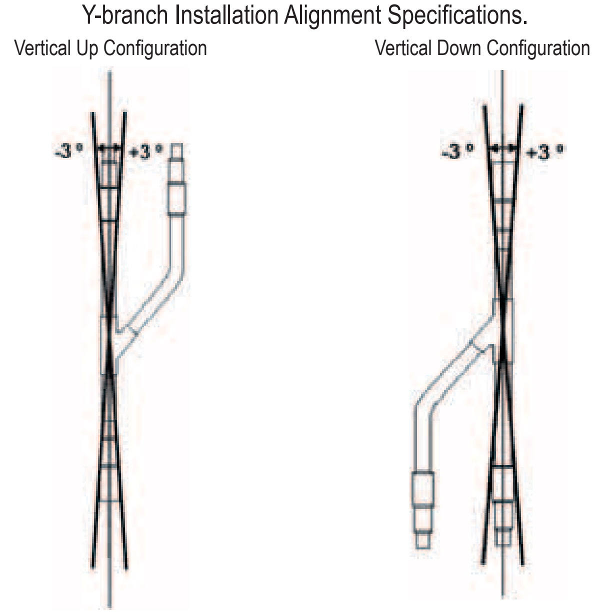
It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors should be provided for inspection access.

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

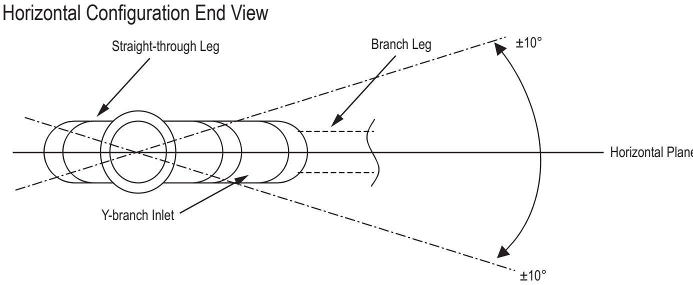
Y-branch Connections.



Y-branch Installation Alignment Specifications.



Horizontal Configuration End View

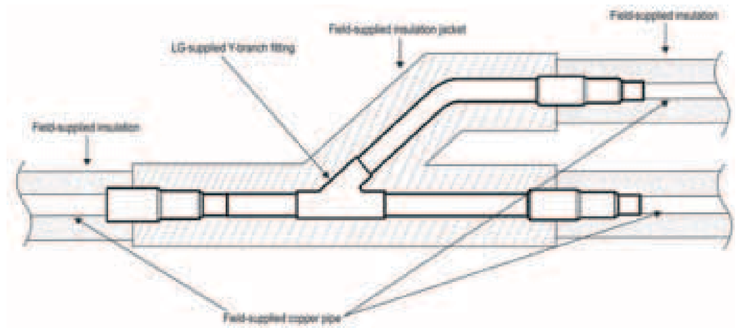


Y-branch Insulation

Each Y-branch kit comes with two 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(s).

1. Check the fit of the Y-branch 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 (3) 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

⚠ Note:

Install Correctly

Y-branches can be installed upstream between the Header and the outdoor unit, but a Y-branch cannot be installed between a header and an indoor unit.

To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between the header fitting and each connected indoor unit.

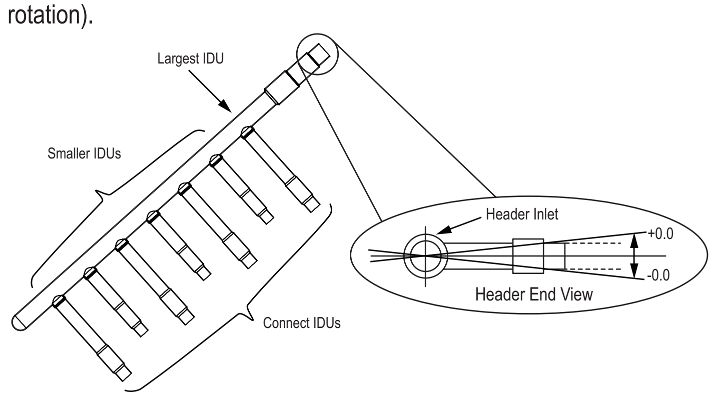
Header kits are intended for use where multiple indoor units are in the same vicinity, and it is more economical to “home-run” the run-out pipes back to a centralized location. If connecting multiple indoor units that are far apart, Y-branches may be more economical.

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

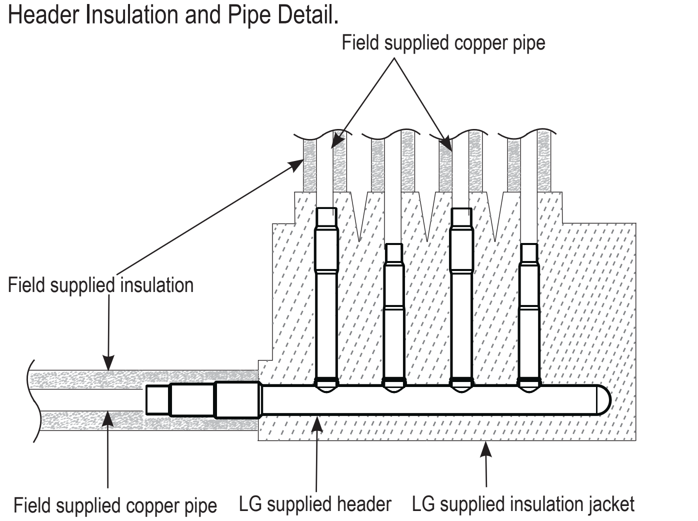
When connecting indoor units to a Header, always connect the unit with the largest nominal capacity to the port closest to the outdoor unit. Then install the next largest indoor unit to the next port working down to the smallest indoor unit. Do not skip ports.

All indoor units 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 outdoor unit and the Header fitting and connect the elevated indoor unit to the Y-branch.

Header Kit—horizontal rotation limit (must be installed level with no rotation).



Header Insulation and Pipe Detail.



Header Insulation

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

⚠ Note:

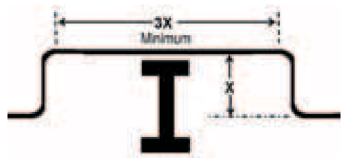
No Pipe Size Substitutions

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.

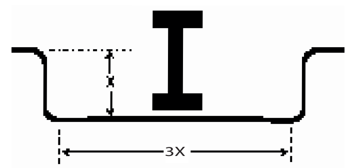
Obstacles

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

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 III system can vary as much as 280°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures.

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

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

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of Expansion Loop or U-bends (see pages 90-91). Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the Expansion Loop or U-bend should be. Linear pipe expansion can be calculated using the following formula:

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

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

See table on next page for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant tubing.

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

Linear Thermal Expansion of Copper Tubing in Inches.

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

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

Example:

A Multi V III 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

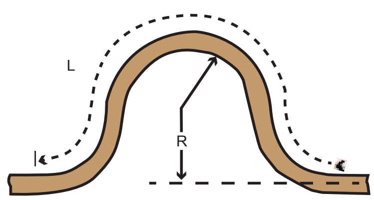
Transporting Hot Vapor: 260 ft. pipe at 120°F = 3.64 in.
Transporting Suction Vapor: 260 ft. pipe at 40°F = 1.04 in
Anticipated Change in Length: 3.64 in. – 1.04 in. = 2.60 in.

Liquid Line

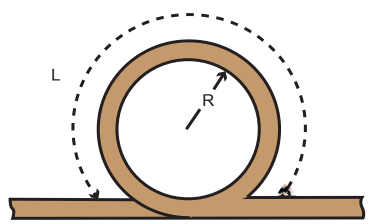
The liquid temperature remains the same temperature. Only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint height should be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an expansion loop is provided in 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. If you choose other types of expansion joints, design per ASTM B-88 Standards.

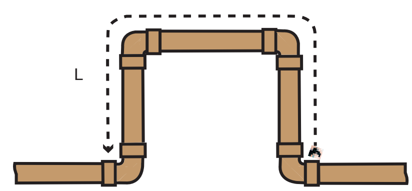
Coiled Expansion Loops and Offsets



Large Tubing U-Bend (>3/4 in.)



Loop



Small Tubing U-Bend (<3/4 in.)

Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

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

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

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 91.

In-line Refrigeration Components

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

Field-provided Isolation Ball Valves

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

If valves are not installed and a single indoor unit needs to be removed or repaired, the entire system must be shut down and evacuated. If isolation ball valves are installed, and an indoor unit needs to be repaired, the unaffected indoor units can remain operational with readdressing and the proper combination ratio. Reclamation of refrigerant, then, can be restricted to a single indoor unit.

Position valves with a minimum distance of three (3) to six (6) inches of pipe on either side of the valve, and placed between six (6) and twelve (12) inches from the first upstream heat recovery control unit, Y-branch, or header. If ball valves are installed away from the first upstream heat recovery unit, Y-branch, or header and closer to the indoor unit, oil may accumulate where it cannot be returned to the air-source unit and may cause a shortage of oil in the compressor.

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

Using Elbows

Field supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer and installer, however, should be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment in the LATS program. See page 86 for equivalent lengths.

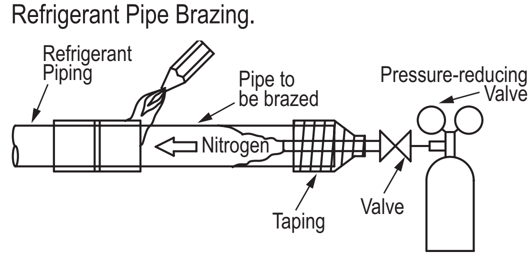
Installation of Refrigerant Piping / Brazing Practices

⚠ *Note:*

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

1. All joints are brazed in the field. Multi V III refrigeration system components contain very small capillary tubes, small orifices, electronic expansion valves, oil separators, and heat exchangers that can easily become blocked. Proper system operation depends on the installer using best practices and utmost care while assembling the piping system.
   - Store pipe stock in a dry place; keep stored pipe capped and clean.
   - Blow clean all pipe sections with dry nitrogen prior to 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 saw to cut pipe. De-bur and clean all cuts before assembly.
3. Brazing joints:
   - Use a dry nitrogen purge operating at a minimum pressure of three (3) psig and maintain a steady flow.
   - Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
   - Protect isolation valves, electronic expansion valves, and other heat-sensitive control components from excessive heat with a wet rag or heat barrier spray.

Refrigerant Pipe Brazing.



Pipe Supports

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

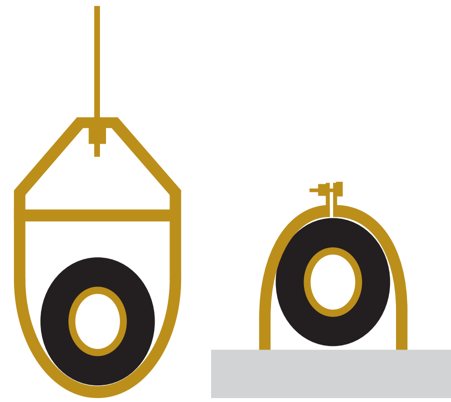
Pipe supports should never touch the pipe wall; supports shall be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports shall be installed outside (around) the primary pipe insulation jacket. Clevis hangers should be used with shields between the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

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

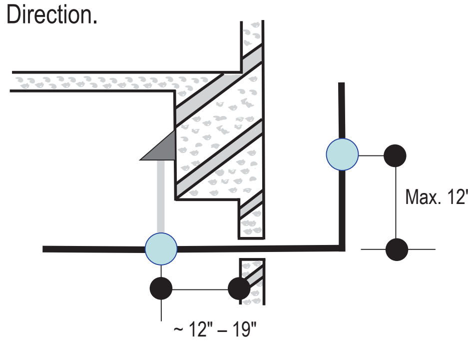
- Maximum of five (5) feet on center for straight segments of pipe up to 3/4 inches outside diameter size.
- Maximum of six (6) feet on center for pipe up to one (1) inch outside diameter size.
- Maximum of eight (8) feet on center for pipe up to two (2) inches outside diameter size.

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

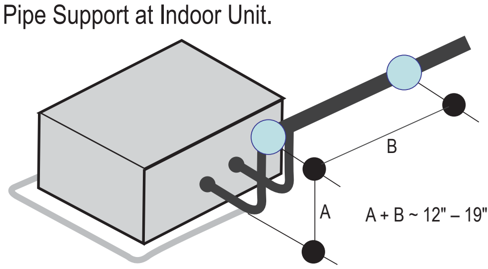
Pipe Hanger Details.



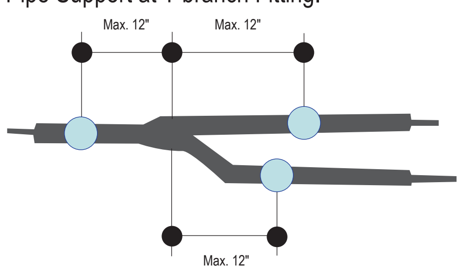
Typical Pipe Support Location—Change in Pipe Direction.



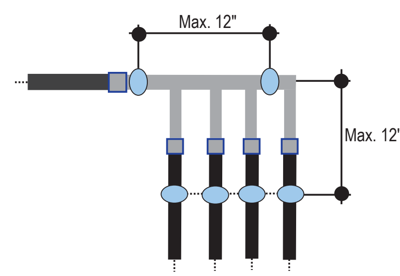
Pipe Support at Indoor Unit.



Pipe Support at Y-branch Fitting.



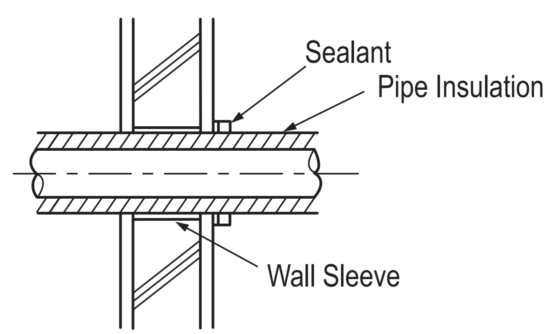
Pipe Support at Header Fitting.



Pipe Sleeves and Wall Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve. Underground refrigerant pipe shall be routed inside a protective sleeve to prevent insulation deterioration.

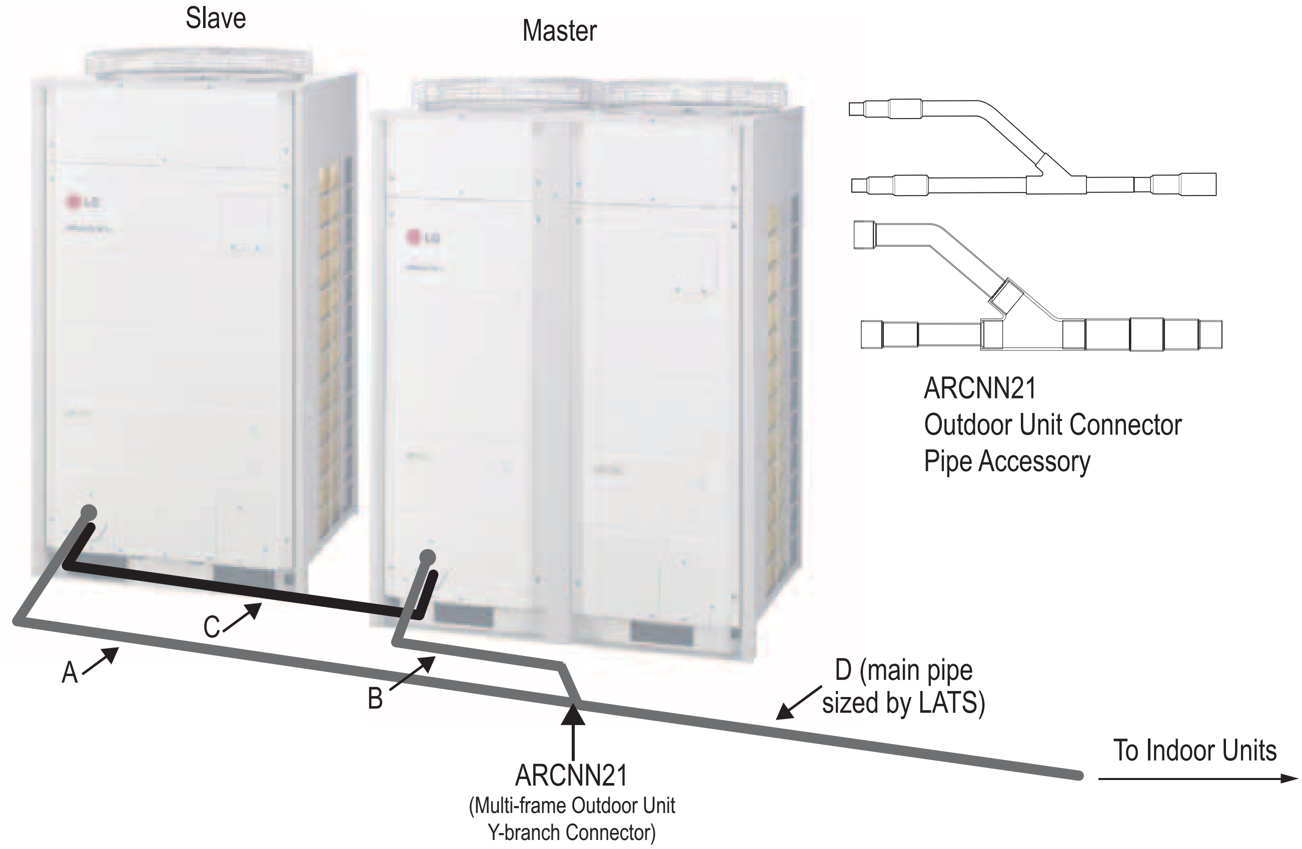
Typical Pipe Penetration.



REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Pump ARUN Series Units

Dual-Frame Heat Pump Outdoor Unit Connections



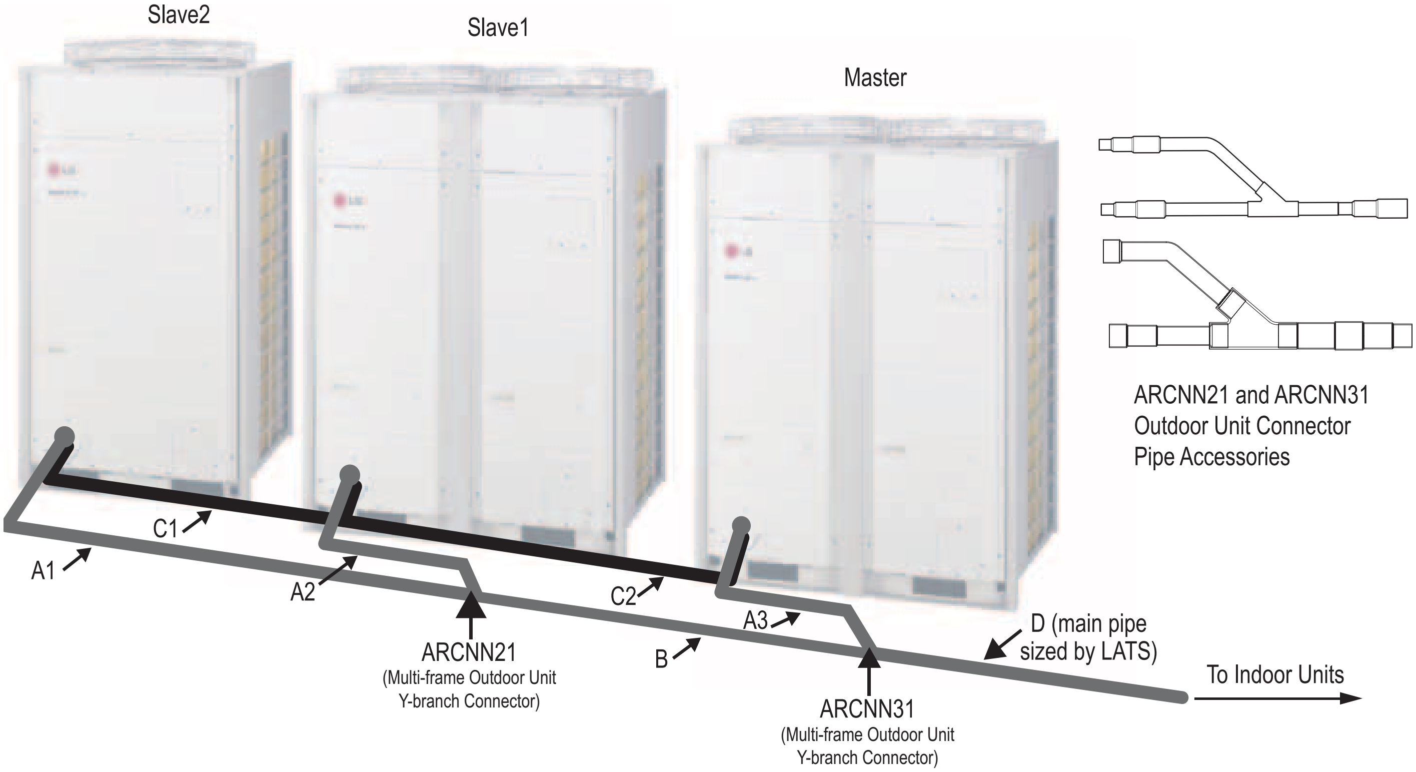
A and B diameters match outdoor unit connection diameters. Main pipe D diameters are sized by LATS. See the table below for C diameter.

Size (tons)	Model	Master	Slave	Common Pipe (C)
14	ARUN168BT3	ARUN096BT3	ARUN072BT3	3/4"
	ARUN168DT3	ARUN096DT3	ARUN072DT3	
16	ARUN192BT3	ARUN121BT3	ARUN072BT3	3/4"
	ARUN192DT3	ARUN121DT3	ARUN072DT3	
18	ARUN216BT3	ARUN144BT3	ARUN072BT3	3/4"
	ARUN216DT3	ARUN144DT3	ARUN072DT3	
20	ARUN240BT3	ARUN144BT3	ARUN096BT3	3/4"
	ARUN240DT3	ARUN144DT3	ARUN096DT3	
22	ARUN264BT3	ARUN144BT3	ARUN121BT3	3/4"
	ARUN264DT3	ARUN144DT3	ARUN121DT3	
24	ARUN288BT3	ARUN144BT3	ARUN144BT3	3/4"
	ARUN288DT3	ARUN144DT3	ARUN144DT3	

Not

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor units in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.*
- *Insulate all refrigerant system piping and piping connections as detailed on page 92 and pages 133-135.*

Triple-Frame Heat Pump Outdoor Unit Connections



A1, A2, and A3 diameters match the outdoor unit connection diameters. Main pipe D diameters are sized by LATS. See the table below for B, C1, and C2 diameters.

Size (tons)	Model	Master	Slave1	Slave2	B		Common Pipe (C1)	Common Pipe (C2)
					Liquid	Vapor		
26	ARUN312BT3	ARUN144BT3	ARUN096BT3	ARUN072BT3	1/2"	1-1/8"	3/4"	3/4"
	ARUN312DT3	ARUN144DT3	ARUN096DT3	ARUN072DT3				
28	ARUN336BT3	ARUN144BT3	ARUN121BT3	ARUN072BT3	5/8"	1-1/8"	3/4"	3/4"
	ARUN336DT3	ARUN144DT3	ARUN121DT3	ARUN072DT3				
30	ARUN360BT3	ARUN144BT3	ARUN144BT3	ARUN072BT3	5/8"	1-1/8"	3/4"	3/4"
	ARUN360DT3	ARUN144DT3	ARUN144DT3	ARUN072DT3				
32	ARUN384BT3	ARUN144BT3	ARUN144BT3	ARUN096BT3	5/8"	1-3/8"	3/4"	3/4"
	ARUN384DT3	ARUN144DT3	ARUN144DT3	ARUN096DT3				
34	ARUN408BT3	ARUN144BT3	ARUN144BT3	ARUN121BT3	5/8"	1-3/8"	3/4"	3/4"
	ARUN408DT3	ARUN144DT3	ARUN144DT3	ARUN121DT3				
36	ARUN432BT3	ARUN144BT3	ARUN144BT3	ARUN144BT3	3/4"	1-3/8"	3/4"	3/4"
	ARUN432DT3	ARUN144DT3	ARUN144DT3	ARUN144DT3				

Not

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor untis in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.*
- *Insulate all refrigerant system piping and piping connections as detailed on page 92 and pages 133-135.*

REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Pump ARUN Series Units

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

Y-branch Pipe Sizing for a Single Outdoor Unit System

Example: Five (5) indoor units connected

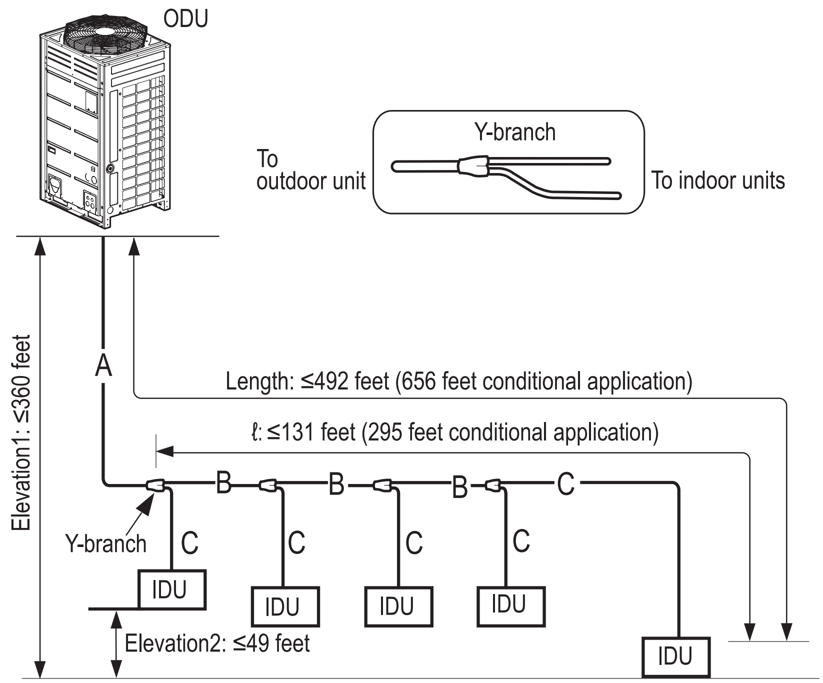
ODU: Outdoor Units.

IDU: Indoor Units.

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

B: Y-branch to Y-branch.

C: Y-branch to Indoor Unit.



Y-branch Pipe Sizing When Installing a Dual-Frame System

Example: Five (5) indoor units connected

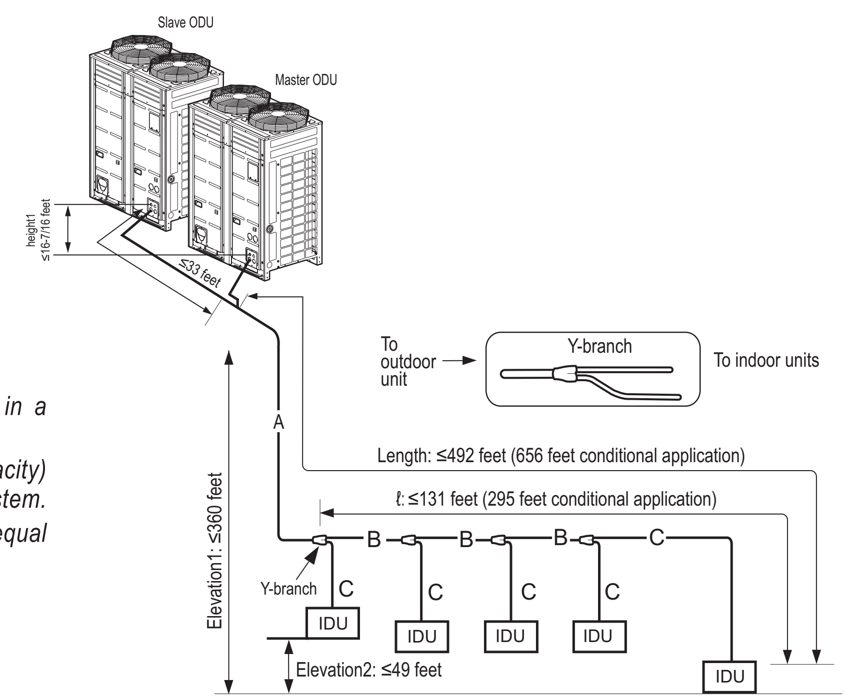
ODU: Outdoor Units.

IDU: Indoor Units.

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

B: Y-branch to Y-branch.

C: Y-branch to Indoor Unit.



⚠ **Not**

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor unit in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave outdoor unit capacity.*

⚠ ***Note:***

See pages 98-99 for refrigerant pipe diameter and pipe length tables.

Pipe Sizing for Heat Pump ARUN Series Units

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

Y-branch Pipe Sizing When Installing a Triple-Frame System

Example: Five (5) indoor units connected

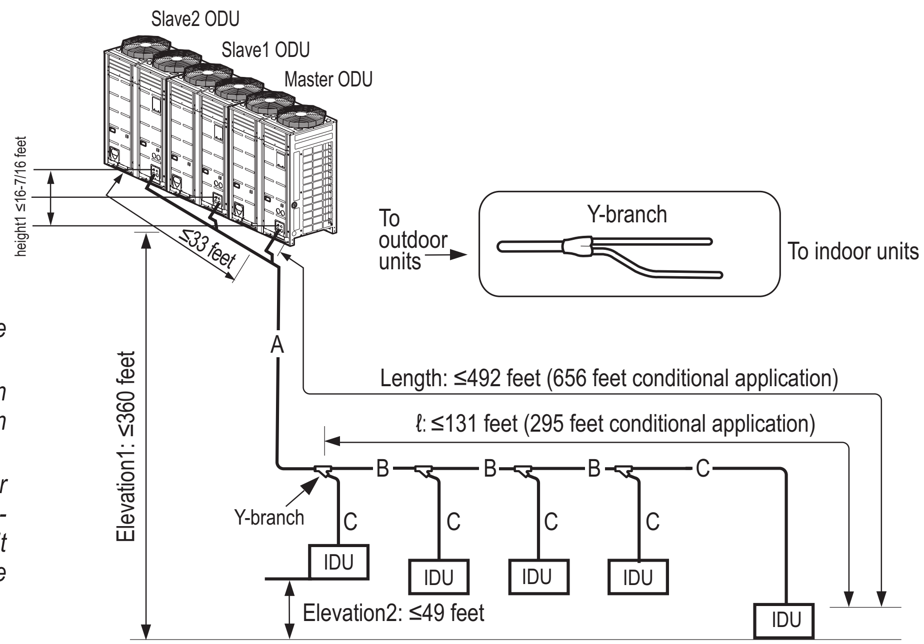
ODU: Outdoor Units.

IDU: Indoor Units.

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

B: Y-branch to Y-branch.

C: Y-branch to Indoor Unit.



⚠ **Not**

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

Header Pipe Sizing When Installing a Single Outdoor Unit System

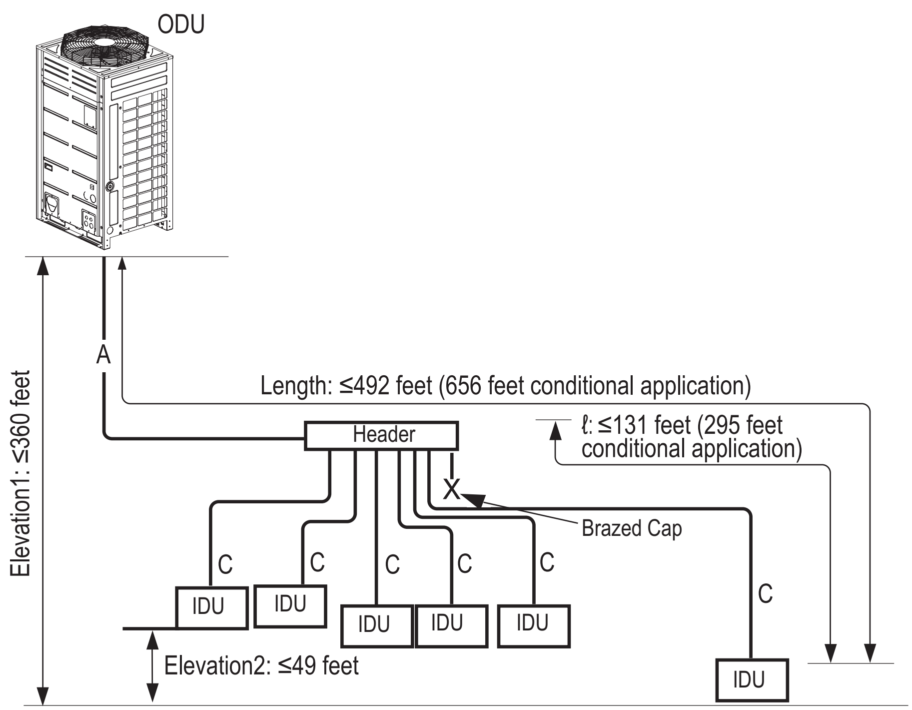
Example: Six (6) indoor units connected

ODU: Outdoor Units

IDU: Indoor Units

A: Main Pipe from Outdoor Unit to Header

C: Header to Indoor Unit



⚠ ***Note:***

See pages 98-99 for refrigerant pipe diameter and pipe length tables.

REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Pump ARUN Series Units

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

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

Example: Five (5) indoor units connected

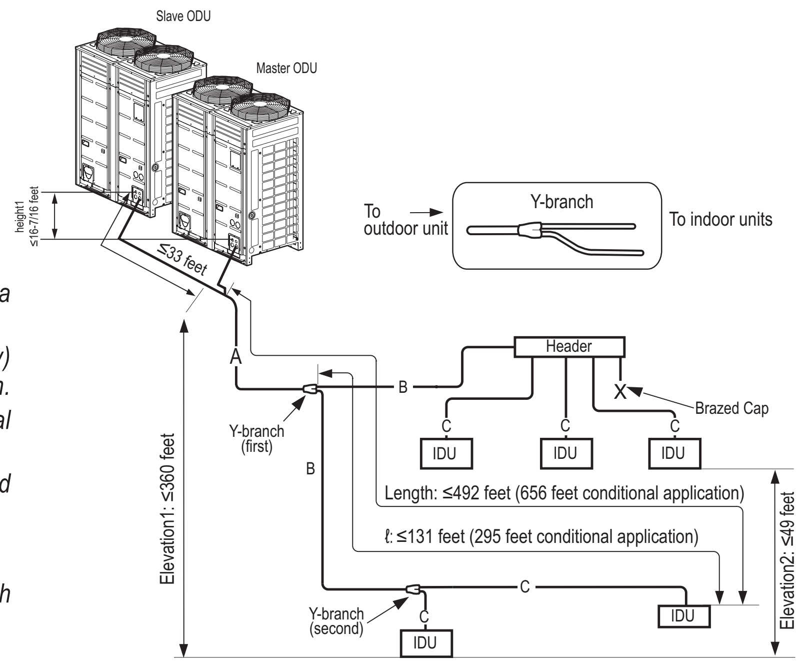
ODU: Outdoor Units.

IDU: Indoor Units.

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

B: Y-branch to Y-branch / Header.

C: Y-branch / Header to Indoor Unit.



Not

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor unit in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave outdoor unit capacity.*
- *Y-branches and other header branches cannot be installed downstream of the initial header branch.*

Note:

See pages 98-99 for refrigerant pipe diameter and pipe length tables.

Main Pipe (A) Diameter from Outdoor Unit to First Y-branch / Header Branch.

ODU Capacity (ton)	Pipe diameter when pipe length is <295 feet		Pipe diameter when pipe length is ≥295 feet		Pipe diameter when height differential (ODU ↔ IDU) is >164 feet	
	Liquid pipe (inches OD)	Vapor pipe (inches OD)	Liquid pipe (inches OD)	Vapor pipe (inches OD)	Liquid pipe (inches OD	Vapor pipe (inches OD)
6	3/8Ø	3/4Ø	1/2Ø	7/8Ø	1/2Ø	3/4Ø
8	3/8Ø	7/8Ø	1/2Ø	1Ø	1/2Ø	7/8Ø
10	1/2Ø	1-1/8Ø	5/8Ø	1-1/8Ø	5/8Ø	1-1/8Ø
12	1/2Ø	1-1/8Ø	5/8Ø	1-1/8Ø	5/8Ø	1-1/8Ø
14	5/8Ø	1-1/8Ø	3/4Ø	1-1/4Ø	3/4Ø	1-1/8Ø
16	5/8Ø	1-1/8Ø	3/4Ø	1-1/4Ø	3/4Ø	1-1/8Ø
18	5/8Ø	1-1/8Ø	3/4Ø	1-1/4Ø	3/4Ø	1-1/8Ø
20	5/8Ø	1-3/8Ø	3/4Ø	1-3/8Ø	3/4Ø	1-3/8Ø
22	3/4Ø	1-3/8Ø	7/8Ø	1-1/2Ø	7/8Ø	1-3/8Ø
24	3/4Ø	1-3/8Ø	7/8Ø	1-1/2Ø	7/8Ø	1-3/8Ø
26	3/4Ø	1-3/8Ø	7/8Ø	1-1/2Ø	7/8Ø	1-3/8Ø
28	3/4Ø	1-3/8Ø	7/8Ø	1-1/2Ø	7/8Ø	1-3/8Ø
30	3/4Ø	1-5/8Ø	7/8Ø	1-5/8Ø	7/8Ø	1-5/8Ø
32	3/4Ø	1-5/8Ø	7/8Ø	1-5/8Ø	7/8Ø	1-5/8Ø
34	3/4Ø	1-5/8Ø	7/8Ø	1-5/8Ø	7/8Ø	1-5/8Ø
36	3/4Ø	1-5/8Ø	7/8Ø	1-5/8Ø	7/8Ø	1-5/8Ø

Refrigerant Pipe Diameter (B) from Y-branch to Y-branch / Header.

Downstream Total Capacity of IDUs (Btu/h)[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4Ø	1/2Ø
≤54,600	3/8Ø	5/8Ø
≤76,400	3/8Ø	3/4Ø
≤114,700	3/8Ø	7/8Ø
≤172,000	1/2Ø	1-1/8Ø
≤229,400	5/8Ø	1-1/8Ø
≤248,500	5/8Ø	1-3/8Ø
≤344,000	3/4Ø	1-3/8Ø
≤592,500	3/4Ø	1-5/8Ø
≤630,700	7/8Ø	1-3/4Ø
≤764,400	7/8Ø	2Ø

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

Indoor Unit Connecting Pipe from Branch (C).

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

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

Note:

If the next higher pipe diameter size is not available, then sizing up is not possible.

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

Pipe Capabilities.

Length	Total pipe length	Longest actual pipe length	Equivalent pipe length[1]
	A + ΣB + ΣC ≤ 3,280 feet	≤492 feet (656 feet conditional application)	≤574 feet (738 feet conditional application)
ℓ	Longest pipe length after first branch		
	≤131 feet (295 feet conditional application)		
Elevation1	Elevation differential (Outdoor Unit ↔ Indoor Unit)		
	Height ≤360 feet		
Elevation2	Elevation differential (Indoor Unit ↔ Indoor Unit)		
	height ≤49 feet		
height1	Elevation differential (Outdoor Unit ↔ Outdoor Unit)		
	16.4 feet		
Distance between Outdoor Unit to Outdoor Unit			≤33 feet (Max. 43 feet for Outdoor Unit ≥12 tons)
Distance between fittings and Indoor Unit			≥20 inches
Distance between fittings and Y-branches / Headers			≥20 inches
Distance between two Y-branches / Headers			≥20 inches

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

Note:

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

Conditional Application

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

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

- Pipe segment diameters between the first Y-branch and the second Y-branch should be sized up by one following the information in the table at right. This applies to both liquid and vapor pipes. If the next size up is not available, or if the piping segment diameters are the same as main pipe A diameters, sizing up is not possible.
- While calculating the entire refrigerant pipe length, pipe lengths for ΣB should be multiplied by two: A+(ΣBx2)+ΣC ≤3,281 feet.
- Length of pipe C from each indoor unit to the closest Y-branch or header ≤ 131 feet.
- [Length of pipe from outdoor unit to farthest indoor unit (A+B+C)] - [Length of pipe from outdoor unit to closest indoor unit (A+B+C)] ≤131 feet.

Pipe Diameters for Standard and Conditional Applications.

Pipe Diameters	
Std. Applications (in. OD)	**Cond. Application (in. OD)**
1/4Ø	3/8Ø
3/8Ø	1/2Ø
1/2Ø	5/8Ø
5/8Ø	3/4Ø
3/4Ø	7/8Ø
7/8Ø	1Ø
1-1/8Ø	1-1/4Ø
1-3/8Ø	1-1/2Ø
1-5/8Ø	1-3/4Ø

If the pipe (B) diameters after the first branch are bigger than the main pipe (A) diameters, pipe (B) should changed to match main pipe (A) sizes. Example: When an indoor unit combination ratio of 120% is connected to a 22-ton outdoor unit:

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

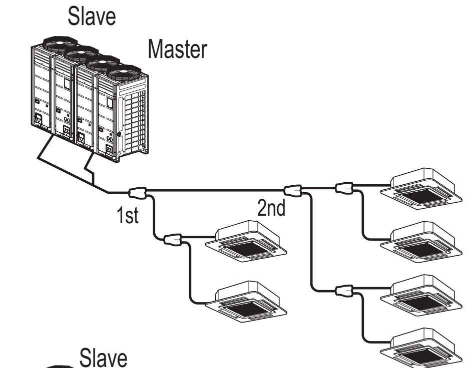
Instead of using the total indoor unit capacity to choose main pipe (A) diameters, use outdoor unit capacity to choose downstream main pipe (A) diameters. Do not permit connection pipes B from branch to branch to exceed main pipe (A) diameters as indicated by outdoor unit capacity. Example: When an indoor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

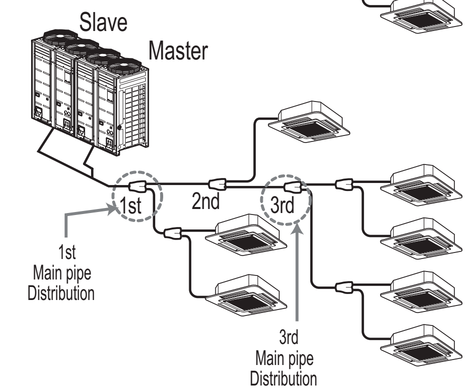
1. Main pipe (A) diameters on a 20-ton outdoor unit: 1-1/8Ø inches (vapor) and 5/8Ø inches (liquid).
2. Pipe diameters between first and second branches, however, are: 1-3/8Ø (vapor) and 3/4Ø (liquid) (connected downstream indoor unit capacity is 20 tons).
3. If main pipe (A) diameters of a 20 ton outdoor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

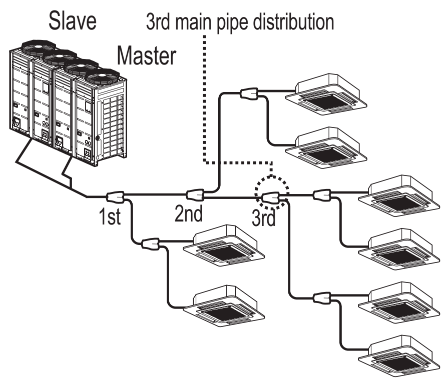
REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Pump ARUN Series Units

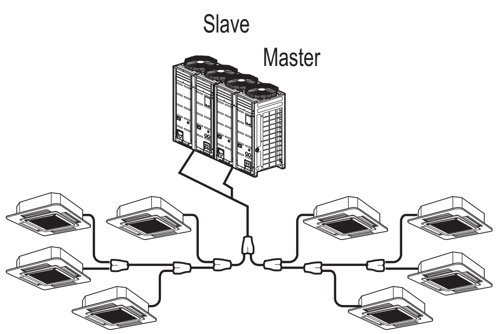
Line Distribution

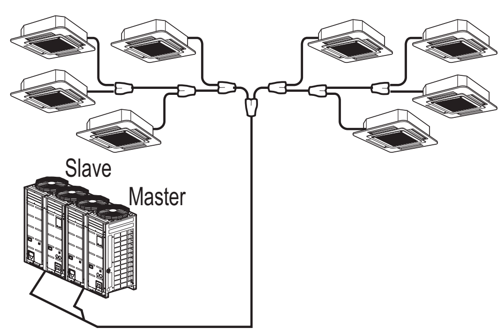




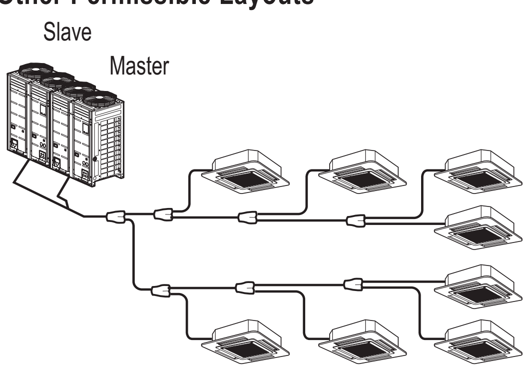


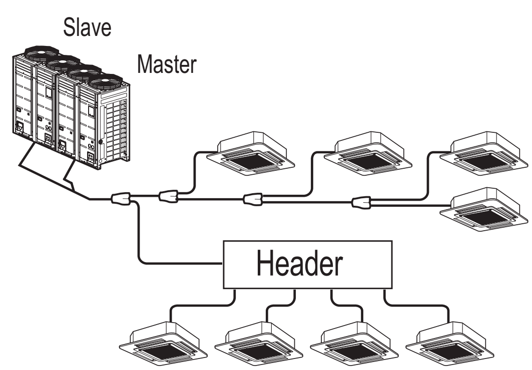
Vertical Distribution



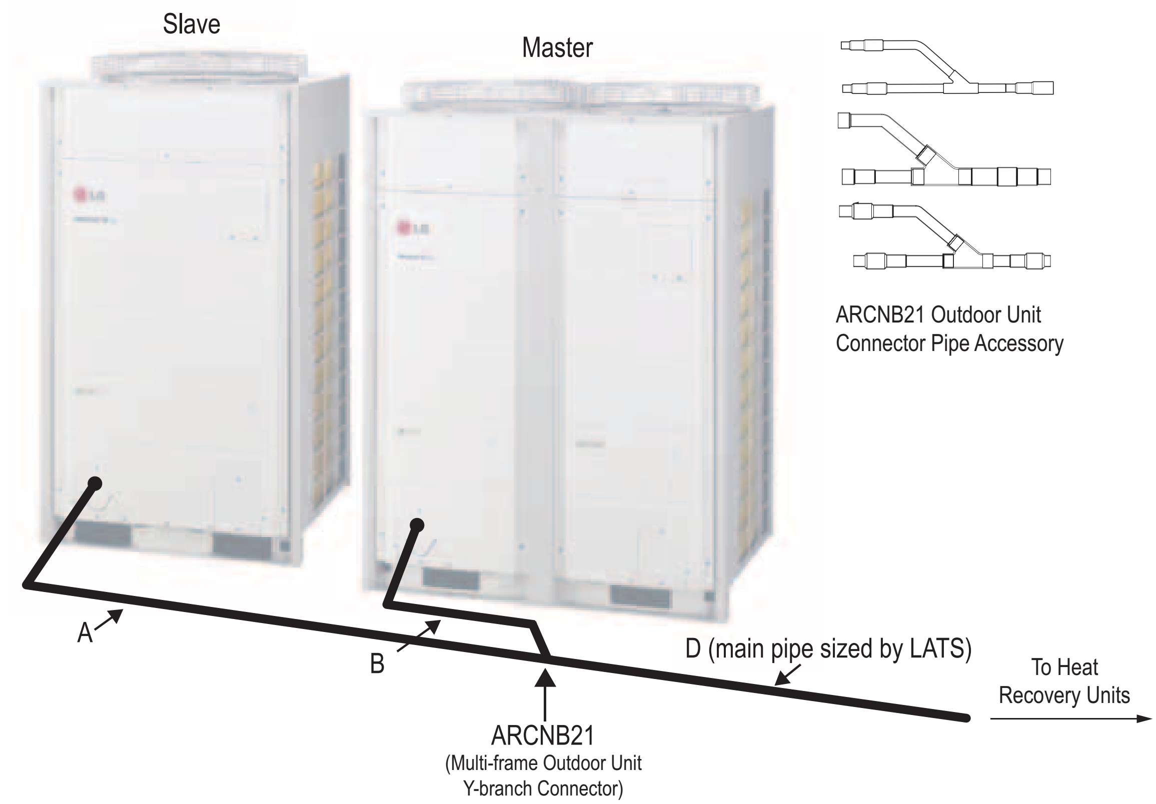


Other Permissible Layouts





Dual-Frame Heat Recovery Outdoor Unit Connections



ARCNB21 Outdoor Unit Connector Pipe Accessory

Diameters for A and B match the outdoor unit connection diameters. Main pipe D diameters are sized by LATS.

Size (tons)	Model	Master	Slave
14	ARUB168BT3	ARUB096BT3	ARUB072BT3
	ARUB168DT3	ARUB096DT3	ARUB072DT3
16	ARUB192BT3	ARUB121BT3	ARUB072BT3
	ARUB192DT3	ARUB121DT3	ARUB072DT3
18	ARUB216BT3	ARUB144BT3	ARUB072BT3
	ARUB216DT3	ARUB144DT3	ARUB072DT3
20	ARUB240BT3	ARUB144BT3	ARUB096BT3
	ARUB240DT3	ARUB144DT3	ARUB096DT3
22	ARUB264BT3	ARUB144BT3	ARUB121BT3
	ARUB264DT3	ARUB144DT3	ARUB121DT3
24	ARUB288BT3	ARUB144BT3	ARUB144BT3
	ARUB288DT3	ARUB144DT3	ARUB144DT3

Note

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor unit in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.*
- *Insulate all refrigerant system piping and piping connections as detailed on page 92 and pages 133-135.*

REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Recovery ARUB Series Units

Triple-Frame Heat Recovery Outdoor Unit Connections

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

Size (tons)	Model	Master	Slave1	Slave2	B		
					Liquid	Low Pressure Vapor	High Pressure Vapor
26	ARUB312BT3	ARUB144BT3	ARUB096BT3	ARUB072BT3	1/2"	1-1/8"	7/8"
	ARUB312DT3	ARUB144DT3	ARUB096DT3	ARUB072DT3			
28	ARUB336BT3	ARUB144BT3	ARUB121BT3	ARUB072BT3	5/8"	1-1/8"	7/8"
	ARUB336DT3	ARUB144DT3	ARUB121DT3	ARUB072DT3			
30	ARUB360BT3	ARUB144BT3	ARUB144BT3	ARUB072BT3	5/8"	1-1/8"	7/8"
	ARUB360DT3	ARUB144DT3	ARUB144DT3	ARUB072DT3			
32	ARUB384BT3	ARUB144BT3	ARUB144BT3	ARUB096BT3	5/8"	1-3/8"	1-1/8"
	ARUB384DT3	ARUB144DT3	ARUB144DT3	ARUB096DT3			
34	ARUB408BT3	ARUB144BT3	ARUB144BT3	ARUB121BT3	5/8"	1-3/8"	1-1/8"
	ARUB408DT3	ARUB144DT3	ARUB144DT3	ARUB121DT3			
36	ARUB432BT3	ARUB144BT3	ARUB144BT3	ARUB144BT3	3/4"	1-3/8"	1-1/8"
	ARUB432DT3	ARUB144DT3	ARUB144DT3	ARUB144DT3			

Note

- *Larger-capacity outdoor units must be the master in a multi-frame system.*
- *Single-compressor outdoor units (72,000 Btu/h capacity) cannot be the master outdoor unit in a multi-frame system.*
- *Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.*
- *Insulate all refrigerant system piping and piping connections as detailed on page 92 and pages 133-135.*

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

Pipe Sizing When Installing Heat Recovery Units

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

ODU: Outdoor Units.

HRU: Heat Recovery Units.

IDU: Indoor units.

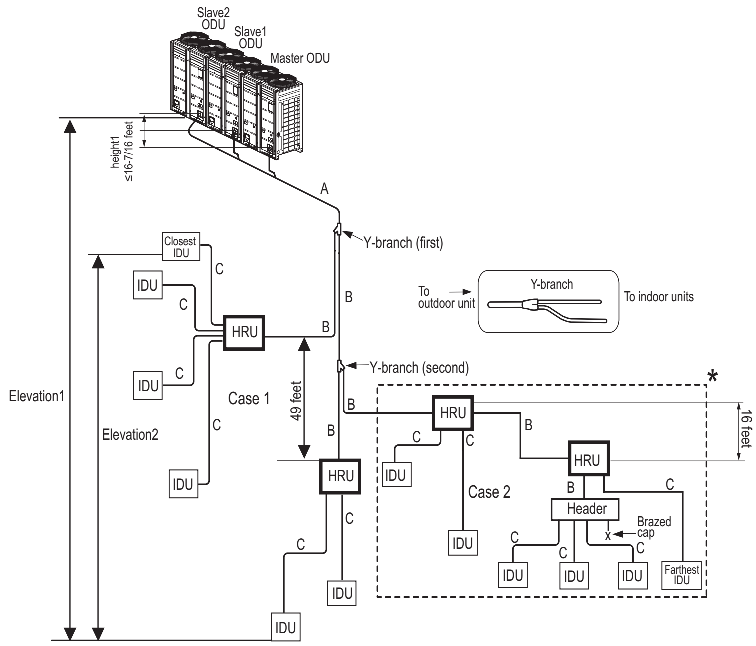
A: Main Pipe from Outdoor Unit to First Y-branch.

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

C: Heat Recovery Unit / Header to Indoor Unit.

⚠ Note:

- *Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the outdoor unit.*
- *Install the header branches or heat recovery units so that the pipe distances between the connected indoor units are minimized. Large differences in pipe distances can cause indoor unit performances to fluctuate.*
- *Y-branches and other headers branches cannot be installed downstream of the initial header branch.*
- *Indoor units must be installed at a position lower than the header.*
- *Total capacity of indoor units in series connection of heat recovery units ≤192,400 Btu/h.*
- *If large capacity indoor units (>12,000 Btu/h with piping sizes >5/8Ø / 3/8Ø) are installed, the valve group setting should be used (Refer to the PCB of the heat recovery unit for the valve group control setting.)*
- *Always reference the LATS Multi V software report.*



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

⚠ Not

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

Main Pipe (A) Diameter from Outdoor Unit to First Y-branch.

ODU Capacity (ton)	Standard Pipe Diameter			Pipe diameter when pipe length is ≥295 feet or when height differential (ODU ↔IDU) is >164 feet		
	Liquid Pipe (inches OD)	Low Pressure Vapor Pipe (inches OD)	High Pressure Vapor Pipe (inches OD)	Liquid Pipe (inches OD)	Low Pressure Vapor Pipe (inches OD)	High Pressure Vapor Pipe (inches OD)
6	3/8Ø	3/4Ø	5/8Ø	1/2Ø	3/4Ø	5/8Ø
8	3/8Ø	7/8Ø	3/4Ø	1/2Ø	7/8Ø	3/4Ø
10	1/2Ø	1-1/8Ø	3/4Ø	5/8Ø	1-1/8Ø	3/4Ø
12	1/2Ø	1-1/8Ø	7/8Ø	5/8Ø	1-1/8Ø	7/8Ø
14	5/8Ø	1-1/8Ø	7/8Ø	3/4Ø	1-1/8Ø	7/8Ø
16	5/8Ø	1-1/8Ø	7/8Ø	3/4Ø	1-1/8Ø	7/8Ø
18	5/8Ø	1-3/8Ø	1-1/8Ø	3/4Ø	1-3/8Ø	1-1/8Ø
20	5/8Ø	1-3/8Ø	1-1/8Ø	3/4Ø	1-3/8Ø	1-1/8Ø
22	3/4Ø	1-3/8Ø	1-1/8Ø	7/8Ø	1-3/8Ø	1-1/8Ø
24	3/4Ø	1-3/8Ø	1-1/8Ø	7/8Ø	1-3/8Ø	1-1/8Ø
26	3/4Ø	1-3/8Ø	1-1/8Ø	7/8Ø	1-3/8Ø	1-1/8Ø
28	3/4Ø	1-3/8Ø	1-1/8Ø	7/8Ø	1-3/8Ø	1-1/8Ø
30	3/4Ø	1-5/8Ø	1-1/8Ø	7/8Ø	1-5/8Ø	1-1/8Ø
32	3/4Ø	1-5/8Ø	1-3/8Ø	7/8Ø	1-5/8Ø	1-3/8Ø
34	3/4Ø	1-5/8Ø	1-3/8Ø	7/8Ø	1-5/8Ø	1-3/8Ø
36	3/4Ø	1-5/8Ø	1-3/8Ø	7/8Ø	1-5/8Ø	1-3/8Ø

REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Recovery ARUB Series Units

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

Refrigerant Pipe (B) Diameter between Y-branches and Y-branches / Heat Recovery Units / Headers.

Downstream IDU total capacity (Btu/h)	Liquid pipe (inches OD)	Vapor pipe (inches OD)	
		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
<114,700	3/8Ø	7/8Ø	3/4Ø
<172,000	1/2Ø	1-1/8Ø	7/8Ø
<229,400	5/8Ø	1-1/8Ø	7/8Ø
<248.500	5/8Ø	1-3/8Ø	1-1/8Ø
<344,000	3/4Ø	1-3/8Ø	1-1/8Ø
<592,500	3/4Ø	1-5/8Ø	1-3/8Ø
<630,700	7/8Ø	1-3/4Ø	1-5/8Ø
<764,400	7/8Ø	2-1/8Ø	1-3/4Ø

Indoor Unit Connecting Pipe from Branch (C).

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

[1]19,600-24,200 Btu 4-way 3 feet x 3 feet Cassette and 15,400-24,200 High Static Ducted indoor units have 3/8Ø (liquid) and 5/8Ø (vapor).

Pipe Capabilities.

Length	Total pipe length	Longest actual pipe length	Equivalent pipe length[1]
	A + ΣB + ΣC ≤ 3,280 feet	≤492 feet (656 feet conditional application)	≤574 feet (738 feet conditional application)
ℓ	Longest pipe length after first branch		
	≤131 feet (295 feet conditional application)		
Elevation1	Elevation differential (Outdoor Unit ↔ Indoor Unit)		
	Height ≤360 feet		
Elevation2	Elevation differential (Indoor Unit ↔ Indoor Unit)		
	height ≤49 feet		
height1	Elevation differential (Outdoor Unit ↔ Outdoor Unit)		
	≤16.4 feet		
Distance between Outdoor Unit to Outdoor Unit			≤33 feet (Max. 43 feet for Outdoor Unit ≥12 tons)
Distance between fittings and IDU			≥20 inches
Distance between fittings and Y-branches / Headers			≥20 inches
Distance between two Y-branches / Headers			≥20 inches
Distance between two Heat Recovery Unit if installed with a Y-branch			≤49 feet
Height differential between two series-piped Heat Recovery Units			≤16 feet

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

Conditional Application

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

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

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

Pipe Diameters for Standard and Conditional Applications.

Pipe Diameters	
Std. Application (in. OD)	Cond. Application (in. OD)
1/4Ø	3/8Ø
3/8Ø	1/2Ø
1/2Ø	5/8Ø
5/8Ø	3/4Ø
3/4Ø	7/8Ø
7/8Ø	1Ø
1-1/8Ø	1-1/4Ø
1-3/8Ø	1-1/2Ø
1-5/8Ø	1-3/4Ø

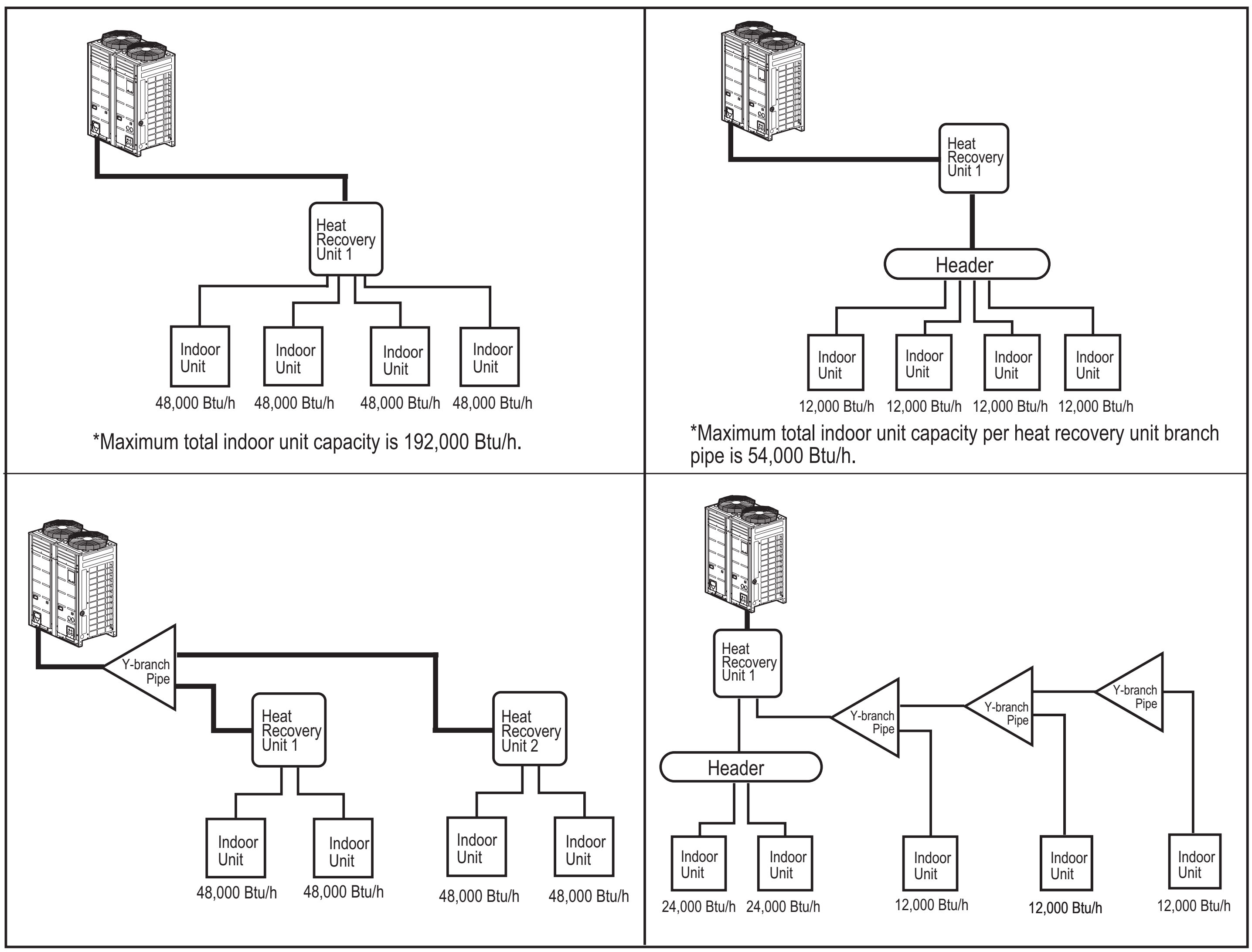
Other Examples of Y branch, Header and HRU Connections

Pipe installation from outdoor units to heat recovery units

: Three (3) pipes (Low-pressure vapor pipe, High-pressure vapor pipe, Liquid pipe)

Pipe installation from heat recovery units to indoor units

: Two (2) pipes (Vapor pipe, Liquid pipe)



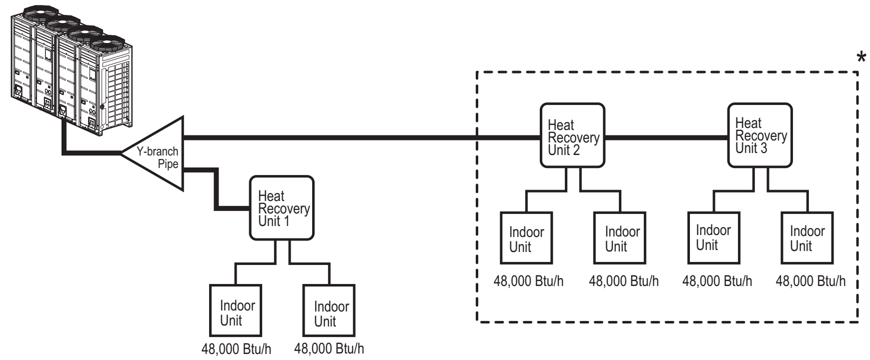
*Maximum total indoor unit capacity is 192,000 Btu/h.

*Maximum total indoor unit capacity per heat recovery unit branch pipe is 54,000 Btu/h.

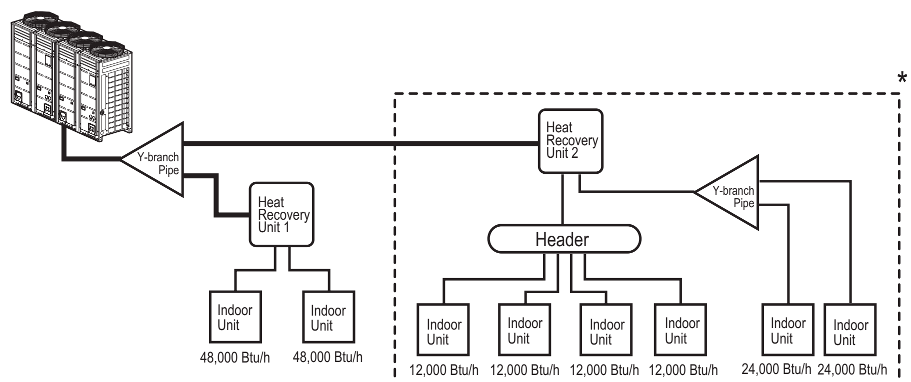
REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Recovery ARUB Series Units

Other Examples of Y branch, Header and HRU Connections

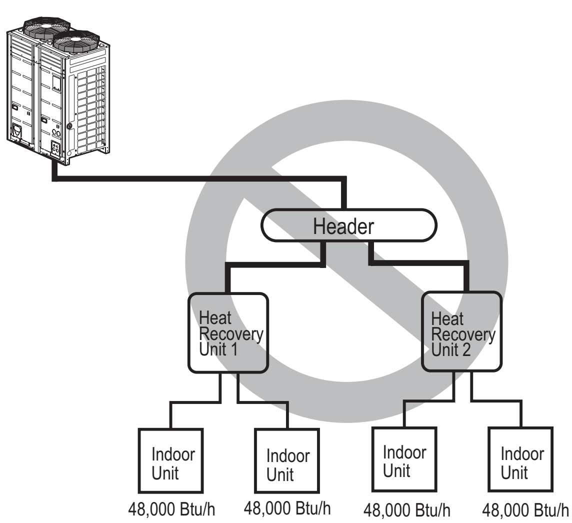


*Serial connection of Heat Recovery Units: Total capacity of indoor units ≤192,000 Btu/h.

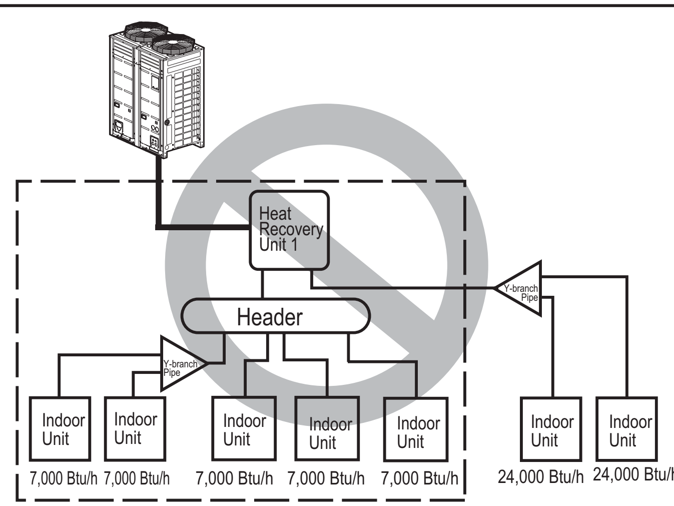


*Maximum indoor units per Header branch is eight (8).

Examples of Improper Connections



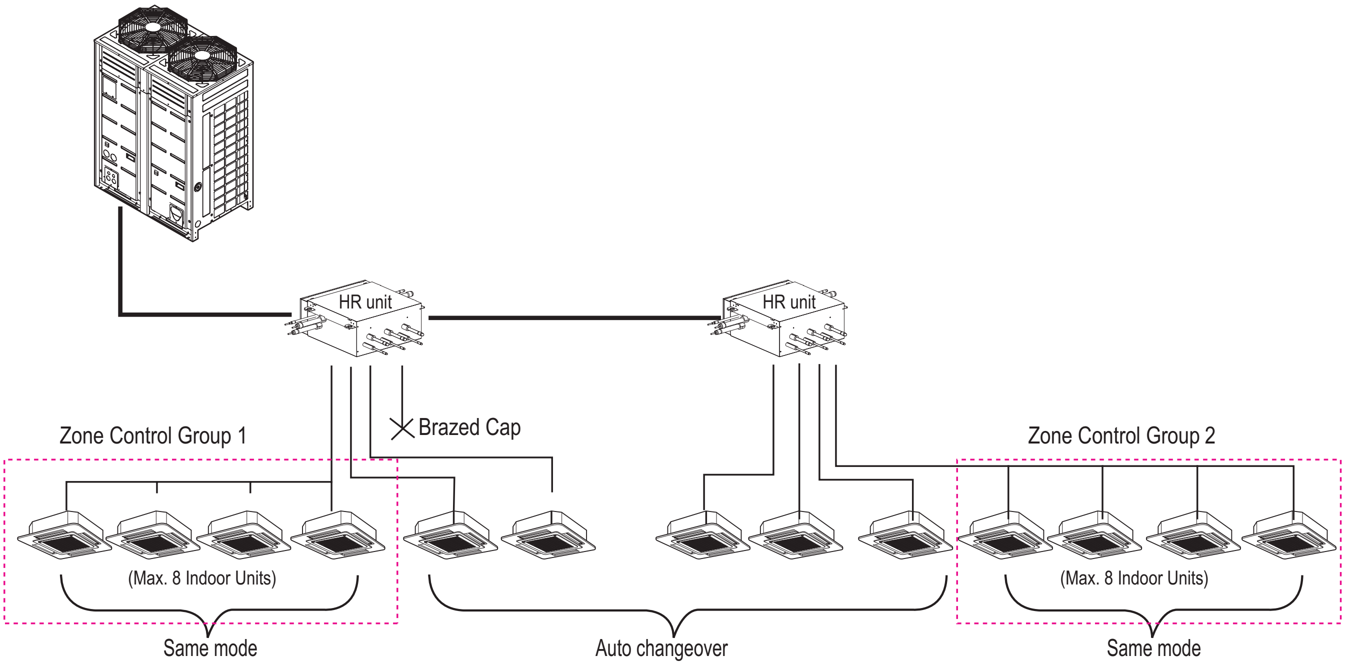
*Improper installation: Header branch pipe → heat recovery unit.



*Improper installation: Heat recovery unit → Header branch pipe → Y-branch and Header branch pipe.

Zone Control with Heat Recovery ARUB Series Systems

Some indoor units can be connected to one port of heat recovery unit.



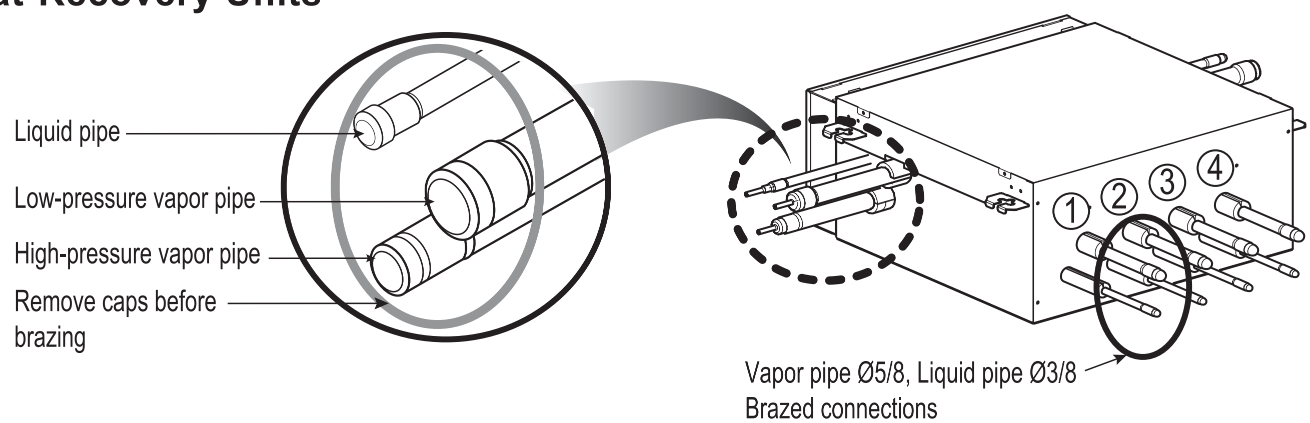
- One heat recovery unit branch pipe can support a maximum of 54,000 Btu/h total indoor unit cooling capacity.
- PRHR041A heat recovery unit can support a maximum of 192,000 Btu/h total capacity and up to 32 connected indoor units (maximum indoor units per heat recovery unit branch pipe is 8).
- Zone control groups cannot operate in “Auto changeover” or “Mode override” functions.
- In the zone control group, if some indoor units are operating in cooling or heating mode, the other indoor units cannot changeover to / operate in the opposite mode.

Pipe Sizing for Heat Recovery ARUB Series Units

Note:

1. *Series connection of heat recovery units: Total capacity of indoor units ≤192,000 Btu/h.*
2. *Refer to the heat recovery unit PCB for valve group control setting.*
3. *Maximum capacity of each port is 54,000 Btu/h and eight (8) indoor units.*

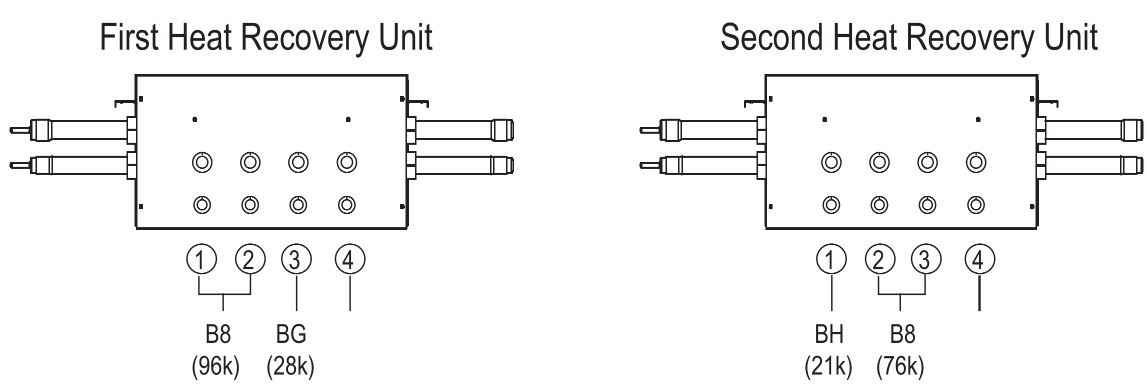
Heat-Recovery Units



Heat Recovery Unit	PRHR021A	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

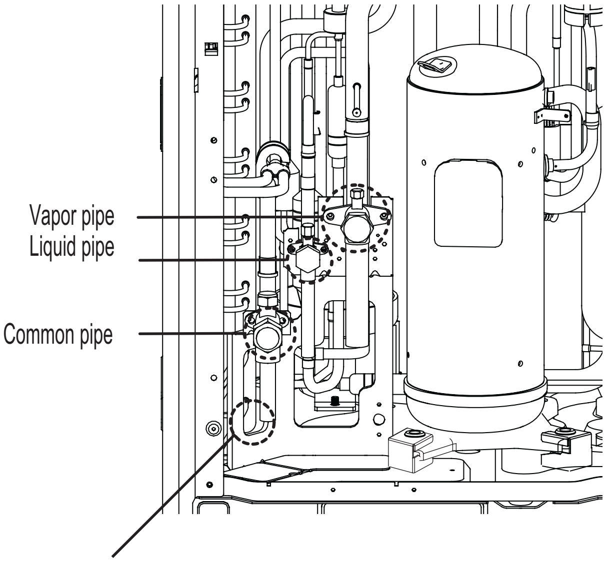
Combining Heat Recovery Ports for Large Indoor Units (ARNU76GB8-, ARNU96GB8-)

It is necessary to combine two ports on a heat recovery unit when installing a large indoor unit (B5/B8 frame). Two neighboring heat recovery ports are combined using a reverse Y-branch that is then connected to the one large indoor unit.

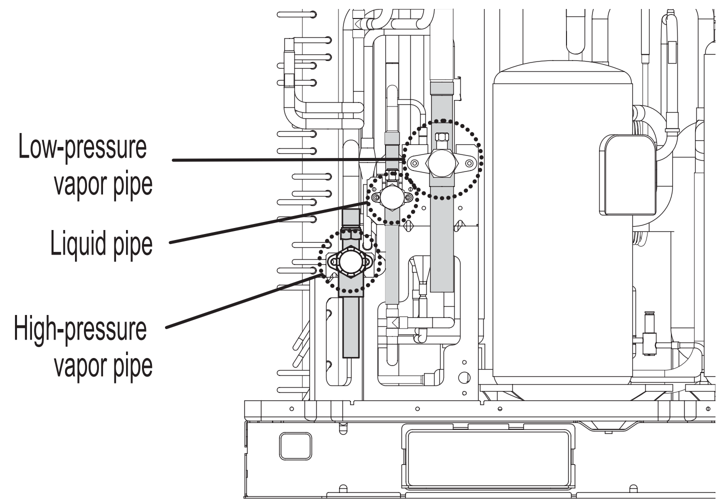


- Connect the end of the pipe to the branch pipes.
- Outdoor unit refrigerant pipes are divided at the end to connect to each indoor unit.
- Use flare connections for the indoor units, and weld the connections for the outdoor pipes and branch pipes.
- Use a hexagon wrench to open and close the valve.

ARUN Heat Pump Outdoor Unit Valves.

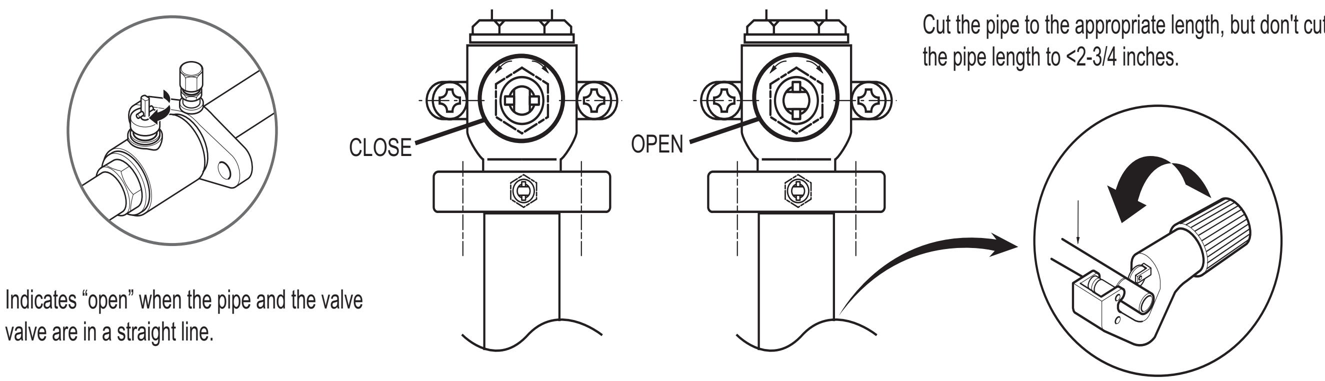


ARUB Heat Recovery Outdoor Unit Valves.



Not

When installing a single-frame system, make sure that the copper cap is brazed to the common pipe.



WARNING

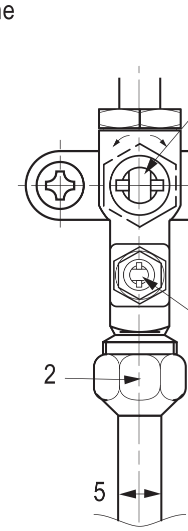
Always take extreme care to prevent refrigerant gas (R410A) from leaking during use, around fire or flame, and during brazing. If the refrigerant gas comes in contact with a flame from any source, it may break down and generate a poisonous gas. Never braze in a room that is not ventilated. After refrigerant 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.

REFRIGERANT PIPING INSTALLATION

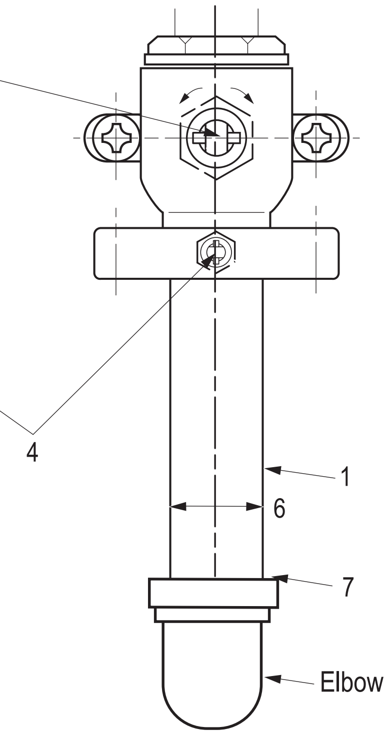
Pipe Connection and Factory-supplied Shut-off Valve Operation

Factory-supplied Shut-off Valves for ARUN 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).



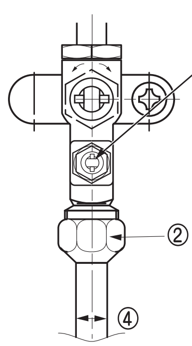
Ball Valve
(Liquid Pipe)



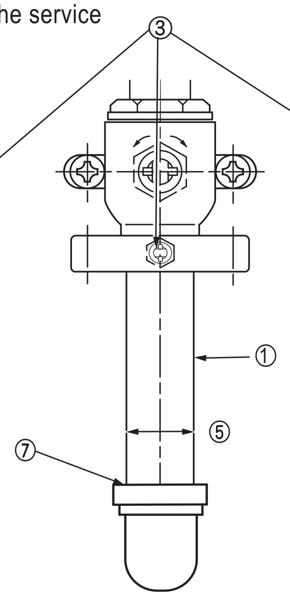
Ball Valve

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

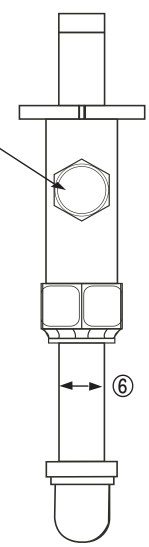
1. Piping joint (auxiliary component): Braze with a nitrogen purge through the service valve port. (Releasing pressure: ≤2.9 psi.)
2. Flare nut: Loosen or tighten the flare nut by using a torque wrench with a backup wrench. Coat the flare connection with oil.
3. Service ports: Evacuate and charge the 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).



Ball Valve
(Liquid pipe)



Ball Valve
(Low-pressure Vapor pipe)



Flare Valve
(High-pressure Vapor pipe)

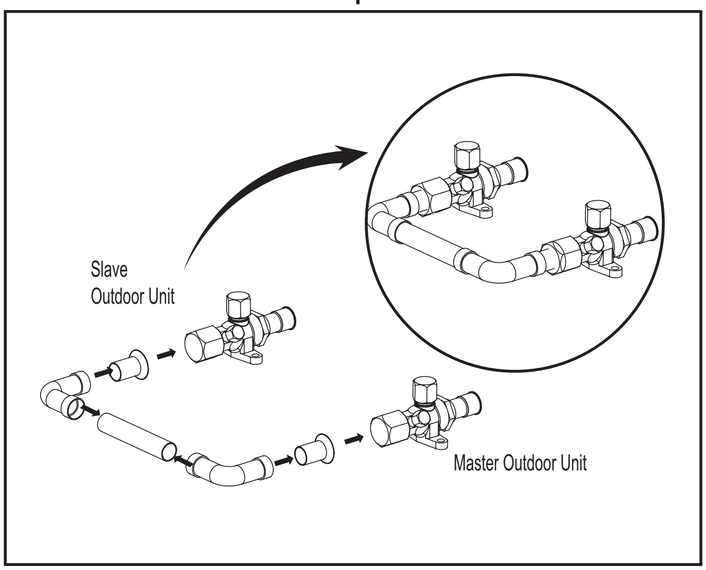
⚠ *Note:*

- *Remove the front panel before connecting the pipes.*
- *Check the pipes (liquid pipe and vapor pipes) before connecting.*
- *After installing the pipe, fill any open spaces around the piping, and block any access holes in the front and side panels. Animals may enter the interior of the unit through the open access holes and damage the wiring.*

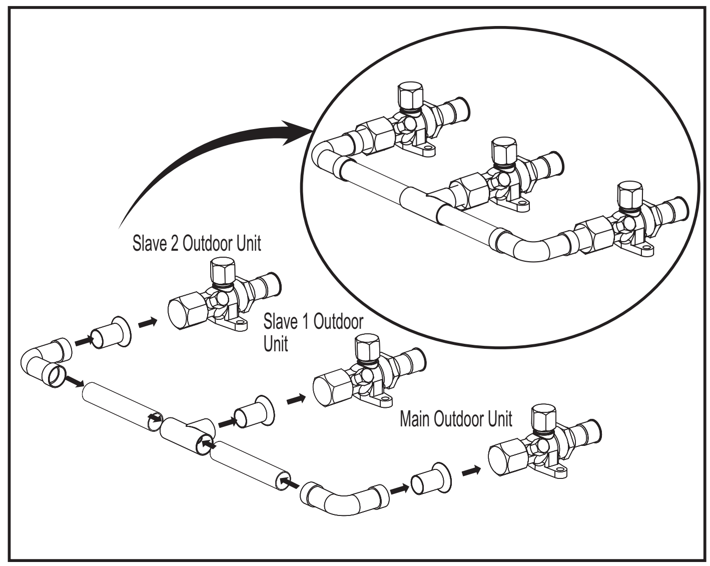
High-/Low-pressure Common Pipes

1. Use provided elbows to connect the master and slave outdoor 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 foreign particles are 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.

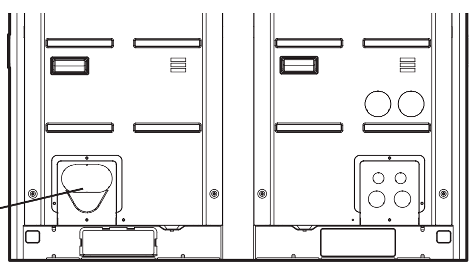
For Two Heat Pump Outdoor Units



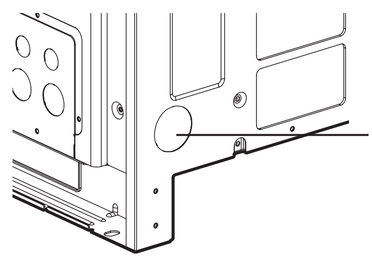
For Three Heat Pump Outdoor Units



Front and Side Piping Installation Options



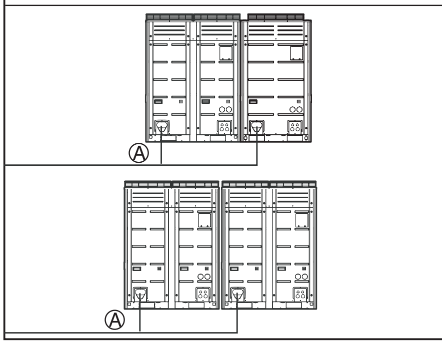
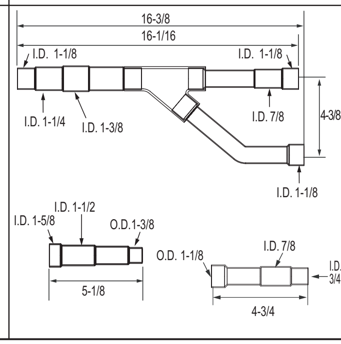
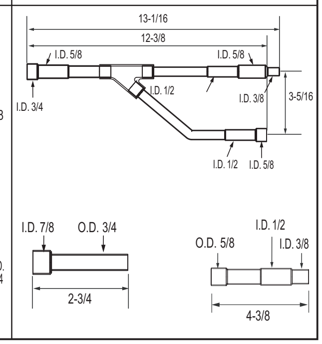
Front Side Piping Installation



Side Piping Installation (Limited to high/ low pressure common pipes)

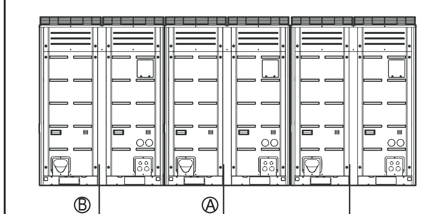
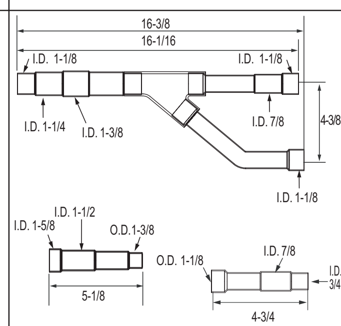
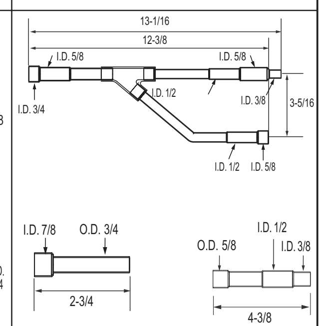
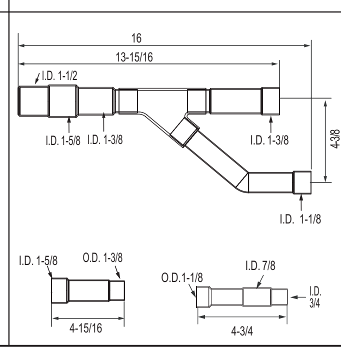
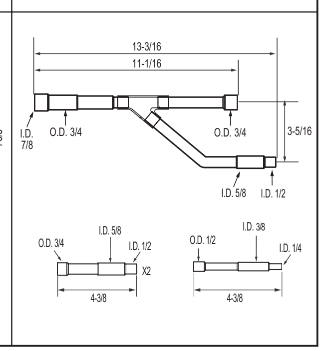
For Dual-Frame Heat Pump Systems

Unit: inch

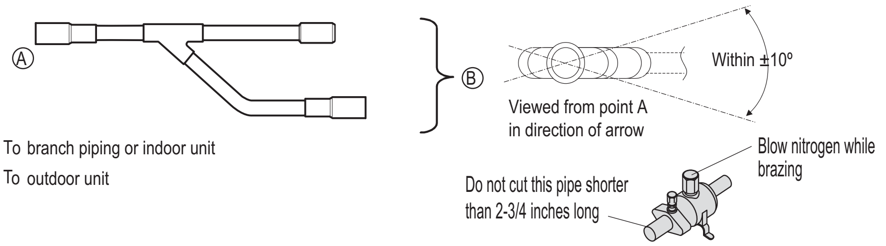
Combination	Multi-Frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		

For Triple-Frame Heat Pump Systems

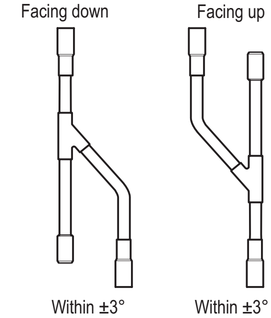
Unit: inch

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

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



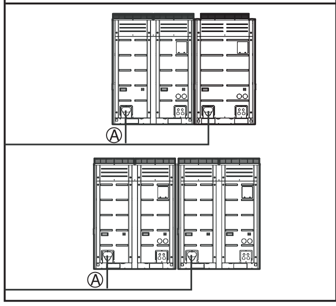
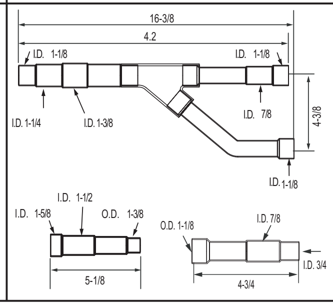
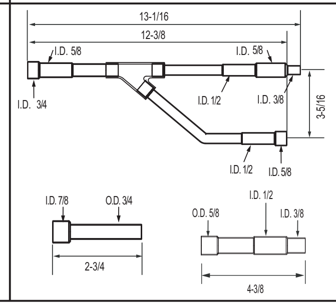
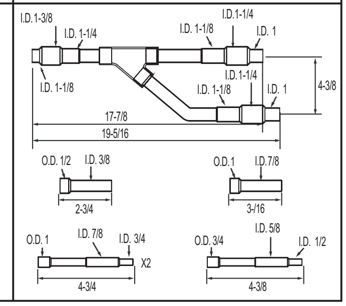
Ⓐ To branch piping or indoor unit
Ⓑ To outdoor unit



⚠ *Note:*
Use caution when installing the branch pipe vertically between the outdoor units. Improper installation can cause uneven refrigerant distribution between the outdoor units, and may lead to compressor burn and reduced system capacity.

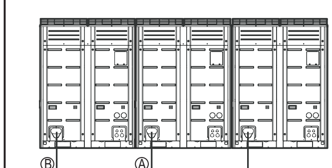
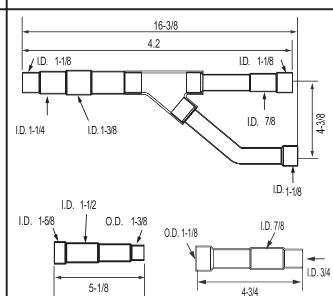
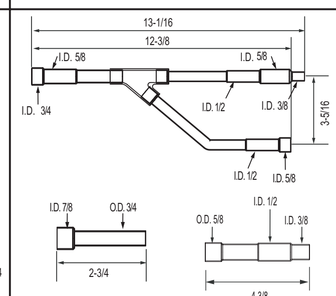
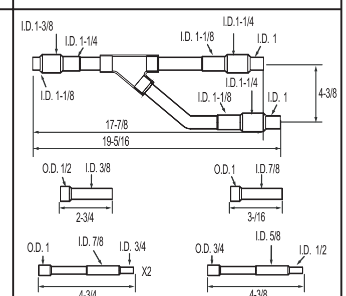
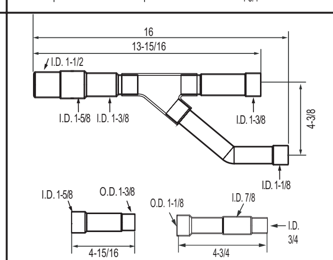
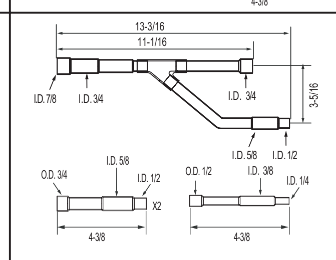
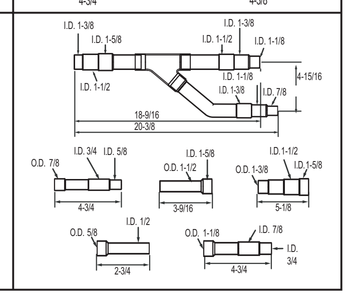
For Dual-Frame Heat Recovery Systems

Unit: inch

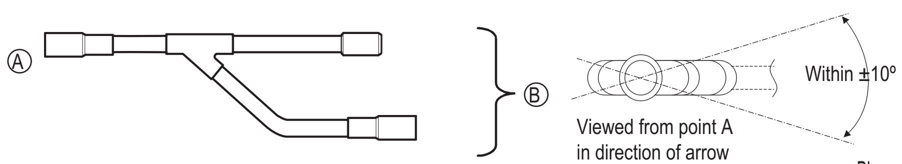
Combination specification	Multi-Frame Connector	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	Ⓐ ARCNB21			

For Triple-Frame Heat Recovery Systems

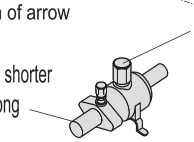
Unit: inch

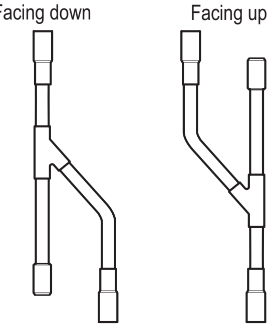
Combination specification	Multi-Frame Connector	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	Ⓐ ARCNB21			
	Ⓑ ARCNB31			

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



Ⓐ To branch piping or indoor unit
Ⓑ To outdoor unit





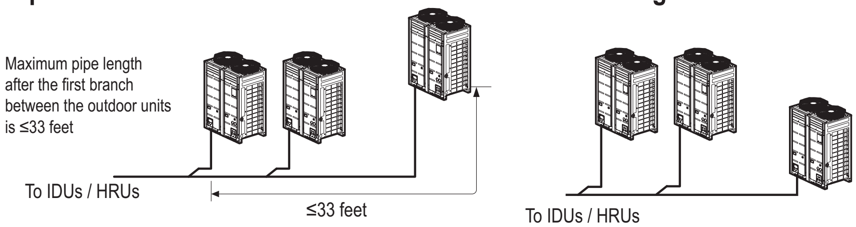
⚠ Note:

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

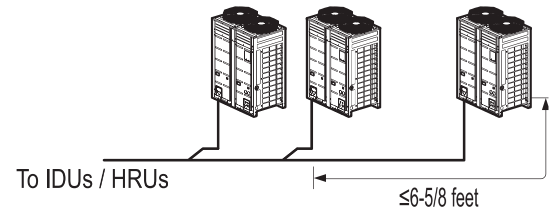
Refrigerant Piping for Separated Outdoor Units

Double and triple frame outdoor units should be installed with all components next to each other. In conditions when the double and triple frame units need to be separated, see the rules demonstrated in the diagrams below.

Pipe connection between outdoor units—standard length.



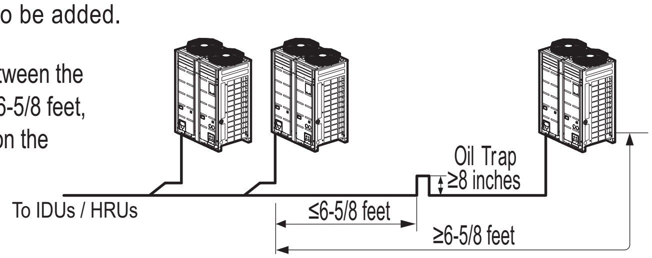
Pipe connection between outdoor units when length is ≤6-/58 feet.



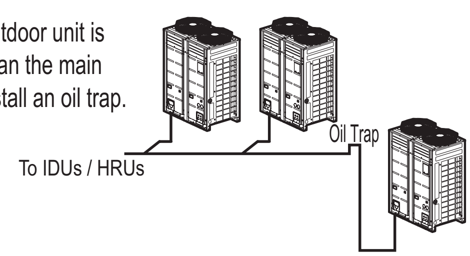
Oil Trap installation between outdoor units when length is ≥6-5/8 feet.

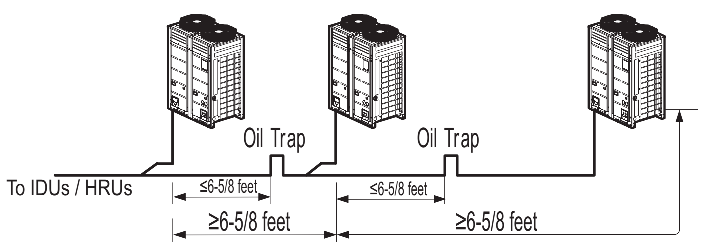
- Oil could accumulate in an outdoor unit after operation has stopped if there is an elevation differential between the outdoor units, or if the pipe distance between the outdoor units is >6-5/8 feet. Install an oil trap if any of these phenomena occur. Just one oil trap is necessary, however, and only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

- If the distance between the outdoor units is >6-5/8 feet, install an oil trap on the vapor pipes.



- If the outdoor unit is lower than the main pipe, install an oil trap.

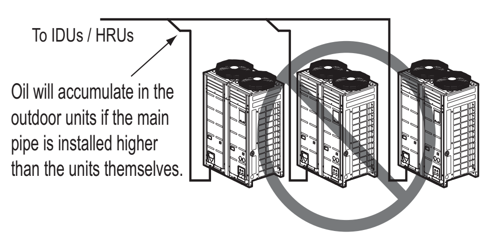


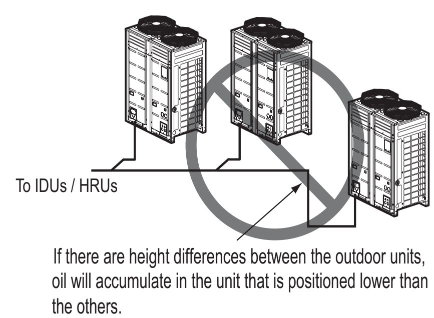


Note:

Examples of improper installation.

- *If the main pipe is installed higher than the outdoor unit, oil can accumulate in the outdoor unit when it it is not operating.*
- *If there is an elevation differential between the outdoor unit pipes, oil can accumulate in the lower-positioned outdoor unit until operation has stopped.*

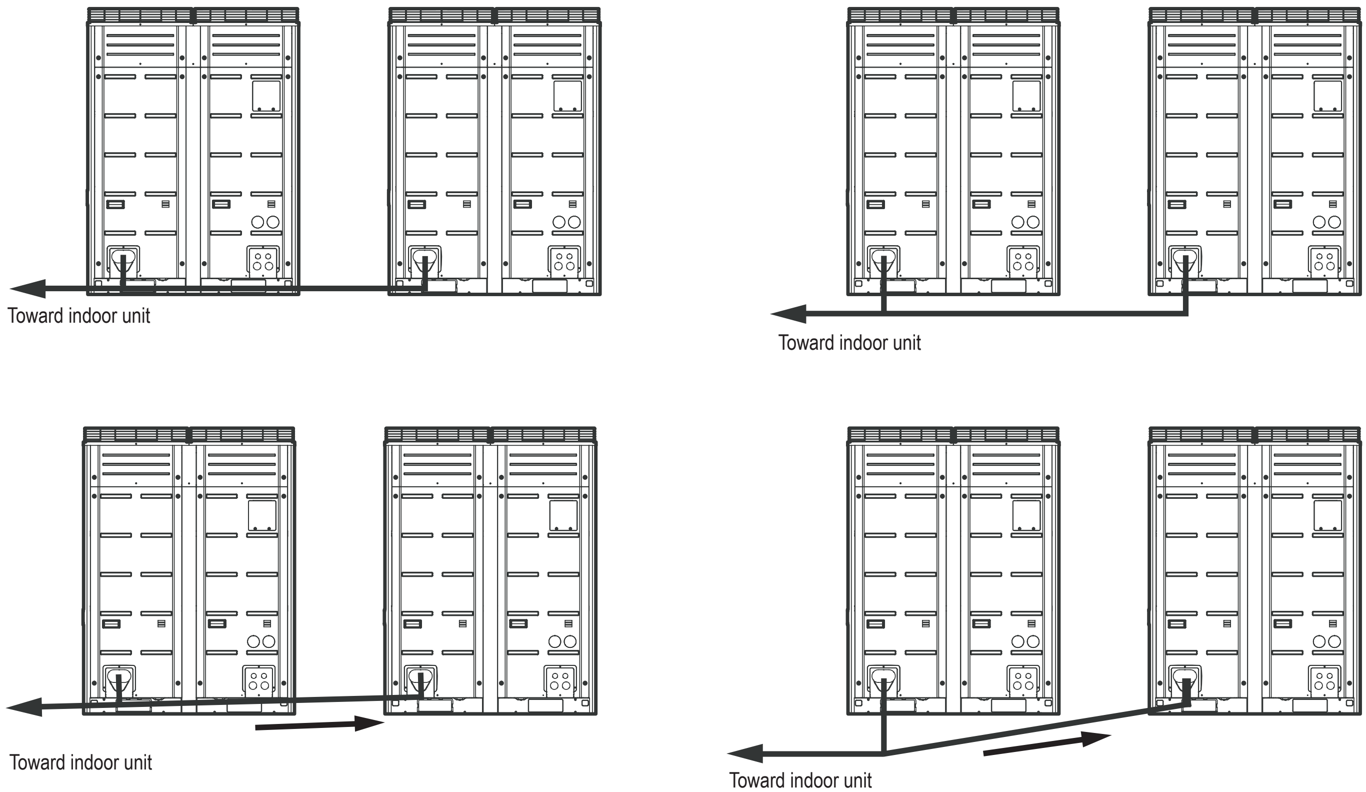




Pipe Slope

Horizontal pipe slope cannot exceed 10° up or down, otherwise refrigerant will flow back towards the slave outdoor unit and the system may not operate properly.

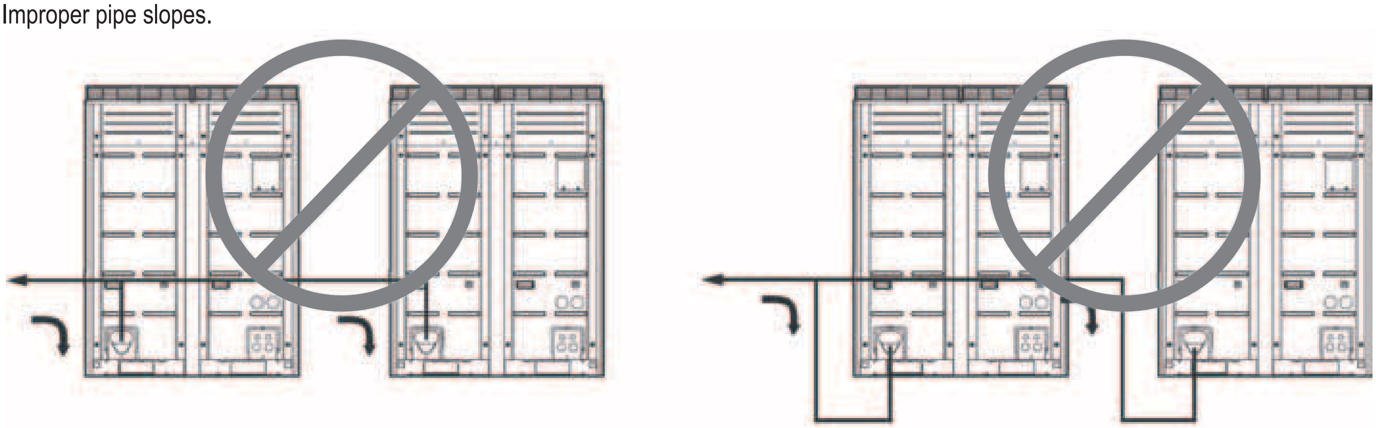
Allowable pipe slopes.



⚠ *Note:*

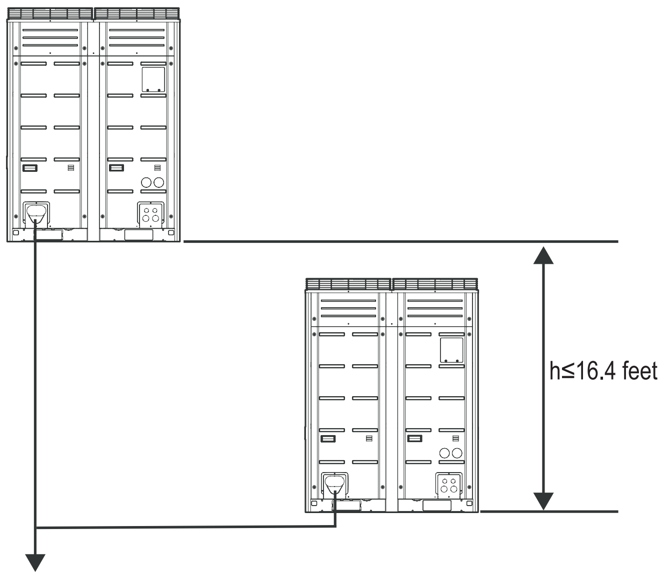
Do not install the outdoor units in such a way that oil could accumulate in the slave unit(s); if oil accumulates in the slave unit(s) the units may not operate properly.

Improper pipe slopes.

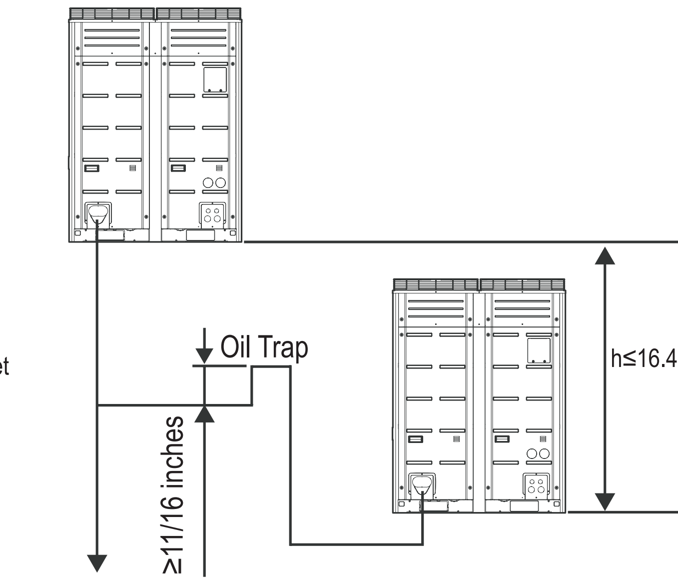


Height Differential for Separated Outdoor Units

Maximum allowable height differential (h) between two outdoor units is 16.4 feet.

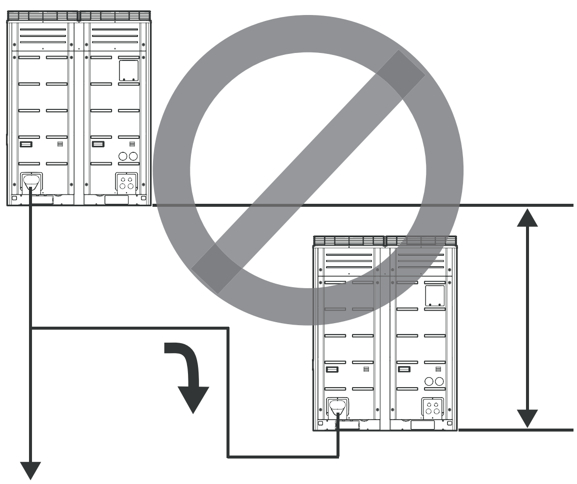


To indoor units



To indoor units

Example of improper height differential.

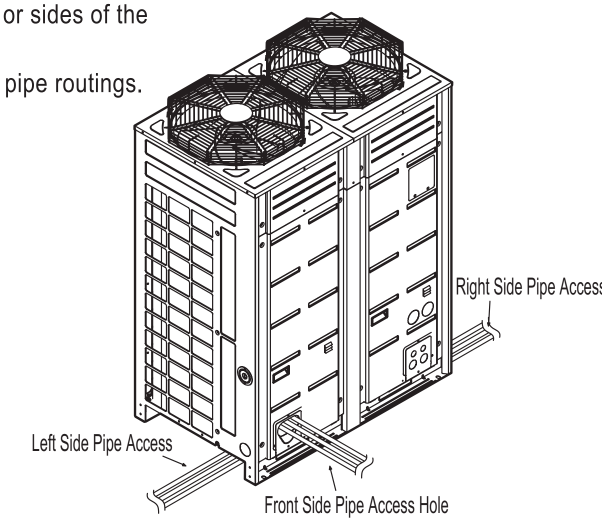


To indoor units

REFRIGERANT PIPING INSTALLATION

Pipe Connections Between Outdoor Units and Indoor Units

- Refrigerant piping can be positioned through the access holes on the front or sides of the outdoor unit, depending on installation needs.
- Access holes at the bottom of the unit can be used for left / right or bottom pipe routings.
- Use nitrogen at 2.8 psi of flow during welding.



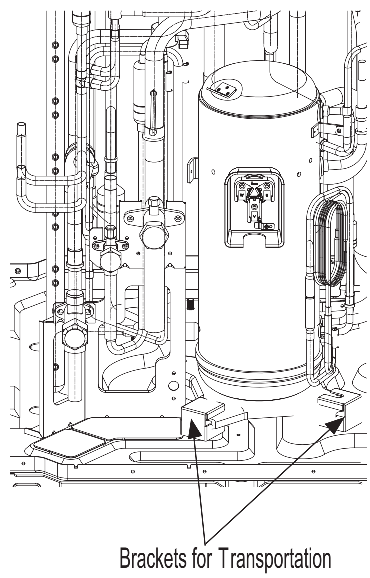
⚠ Note:
If nitrogen was not used while brazing, oxidized materials may form inside the pipe which may affect the operation of the valves and condensers.

⚠ Note:
Avoid Pipe Damage
- *When routing field-provided piping inside the outdoor unit frame, avoid causing vibration that will damage the components.*
- *Correctly route the piping so it does not make contact with the compressor casing, terminal cover, or mounting bolts. Allow room for field installation.*
- *Properly insulate the liquid and vapor lines separately up to the point of connection inside the confines of the unit frame.*

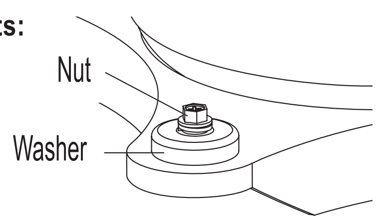
Attaching the Compressor

Brackets are installed on the inverter compressor base to protect the unit during transportation.

⚠ Note:
The brackets must be remove or abnormal noise or vibration will occur during unit operation.



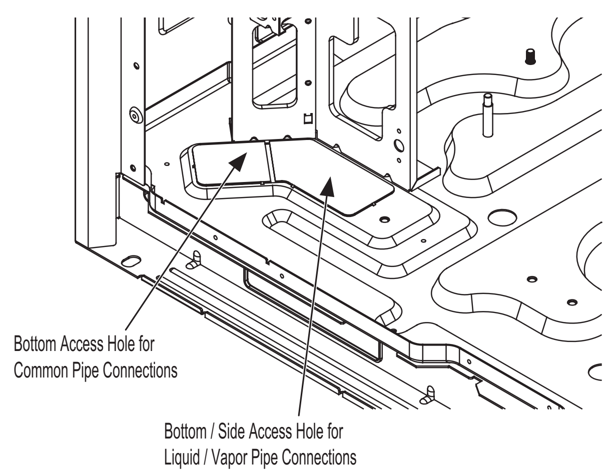
To remove compressor brackets:
1. Open the front panel.
2. Remove the brackets.
3. Attach the compressor to the outdoor unit frame with a nut and washer as shown.



Outdoor Unit Access Holes

Use the access holes in the outdoor unit frame base for left / right side or bottom refrigerant pipe installation.

⚠ Note:
- *Do not damage the piping or the outdoor unit frame base when opening the access holes.*
- *Remove any burrs that were created when opening the access holes.*
- *Add a protective sleeve around the access hole to prevent the wires from being damaged during installation.*



Outdoor Unit Refrigerant Piping Access Holes

ARUN Series Heat Pump Unit Connections

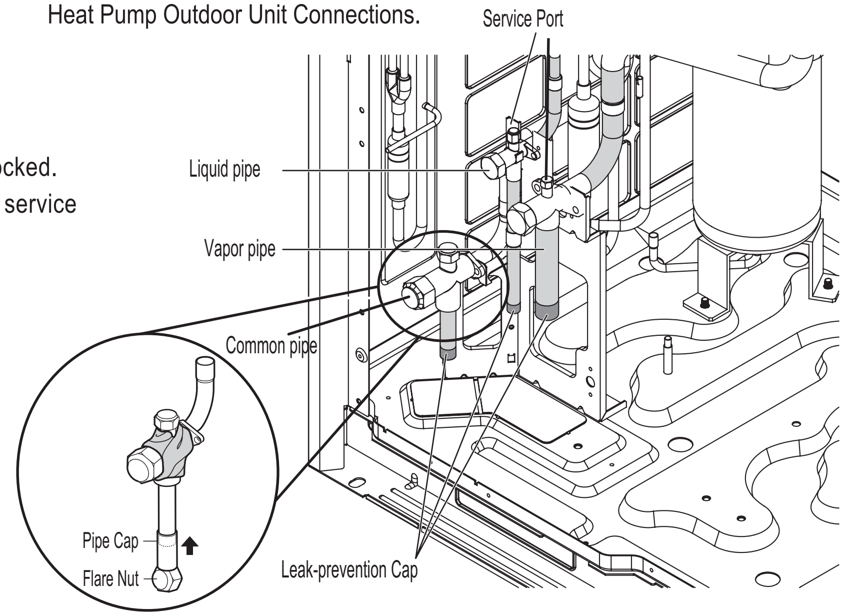
⚠ Note:
The leak-prevention cap attached to the outdoor unit service valves must be removed before pipe installation.

1. Remove the leak-prevention cap.
2. Check if the liquid, vapor, and common pipes are fully locked.
3. Vacuum out any remaining refrigerant or air through the service port.

Pipe Connection for a Single-unit System

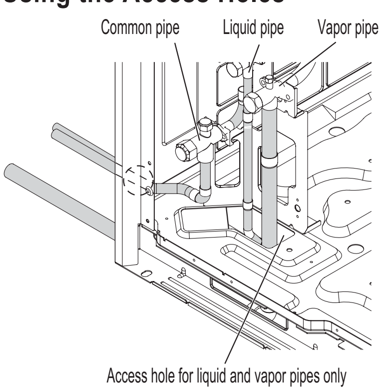
1. Remove the rubber cap from the common pipe.
2. Wrap the service valve of the common pipe with a wet towel. If the the service valve is not protected, the inside of the valve may be damaged during welding.
3. Insert the provided pipe cap into the common pipe.
4. Place the flare nut under the pipe cap as shown at right to tighten the pipe cap.
5. Braze the pipe cap.

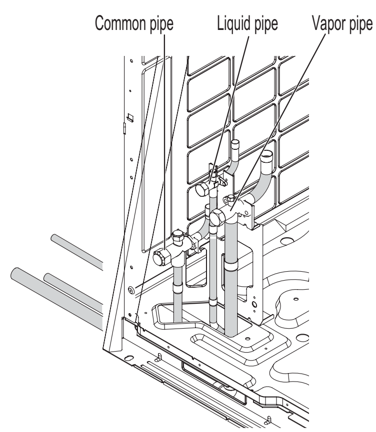
Heat Pump Outdoor Unit Connections.



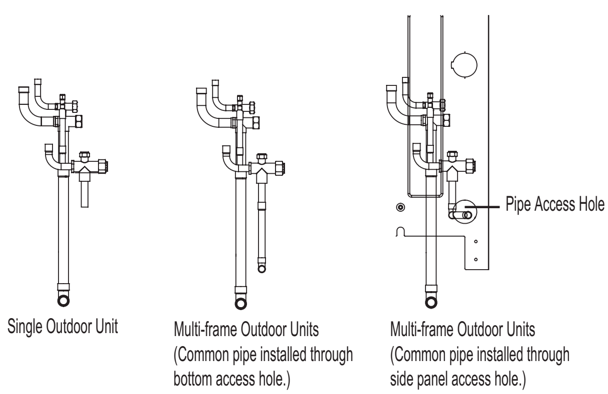
⚠ Note:
If the pipe cap is not properly installed, the outdoor unit may leak refrigerant and the system will not operate properly.

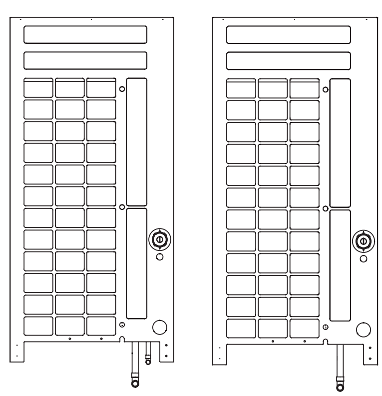
Using the Access Holes





Pipe and Outdoor Unit Side Panel Views

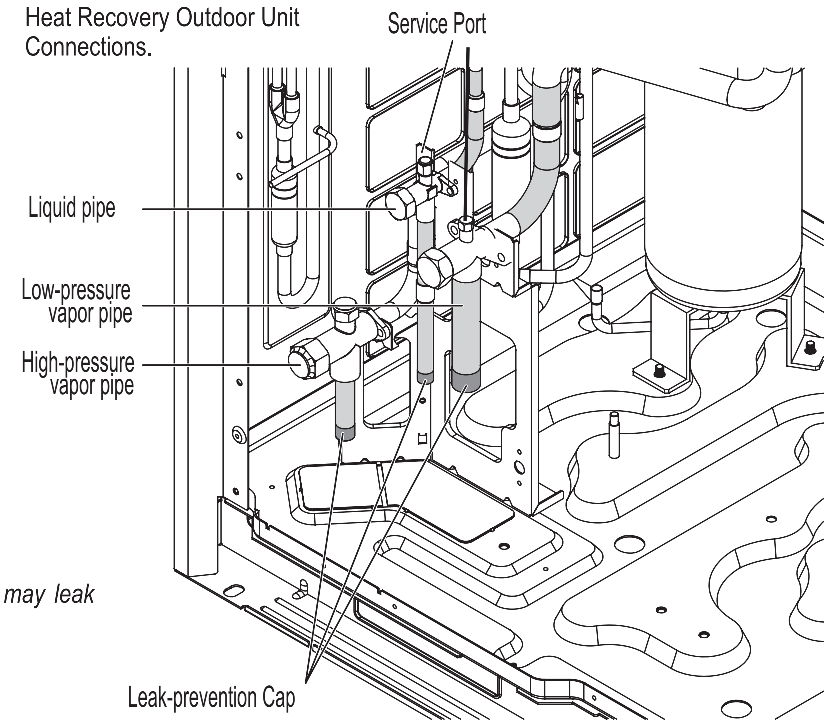




ARUB Series Heat Recovery Unit Connections

⚠ Note:
The leak-prevention cap attached to the outdoor unit service valves must be removed before pipe installation.

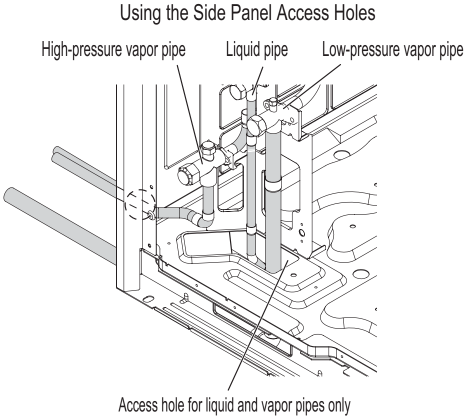
1. Remove the leak-prevention cap.
2. Check if the liquid, low pressur vapor, and high pressure vapor pipes are locked.
3. Vacuum out any remaining refrigerant or air through the service port.



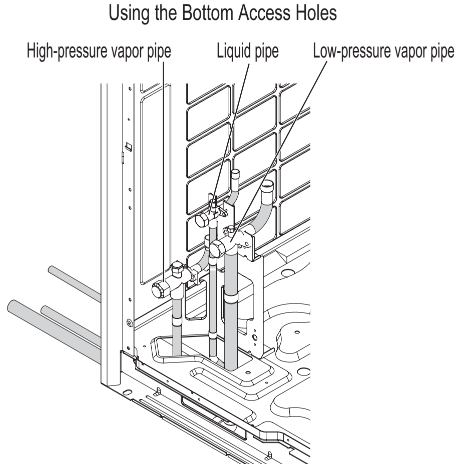
⚠ Note:
If the pipe cap is not properly installed, the outdoor unit may leak refrigerant and the system will not operate properly.

Using the Access Holes

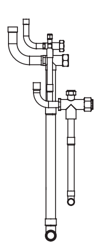
Using the Side Panel Access Holes



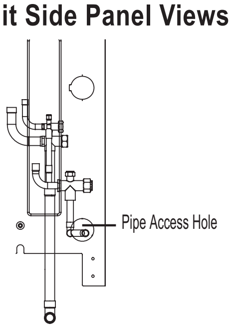
Using the Bottom Access Holes



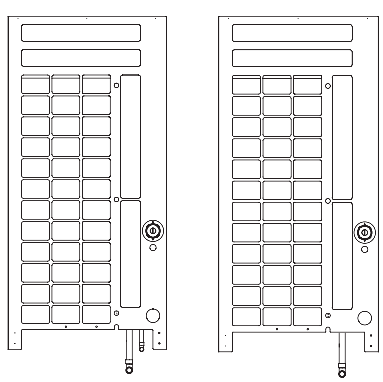
Pipe and Outdoor Unit Side Panel Views



Single / Multi-frame Outdoor Units (High-pressure vapor pipe installed through bottom access hole.)



Single / Multi-frame Outdoor Units (High-pressure vapor pipe installed through side panel access hole.)



REFRIGERANT PIPING INSTALLATION

Connecting and Preparing the Refrigerant Piping

⚠ *Note:*

Use the following specifications for refrigerant piping.

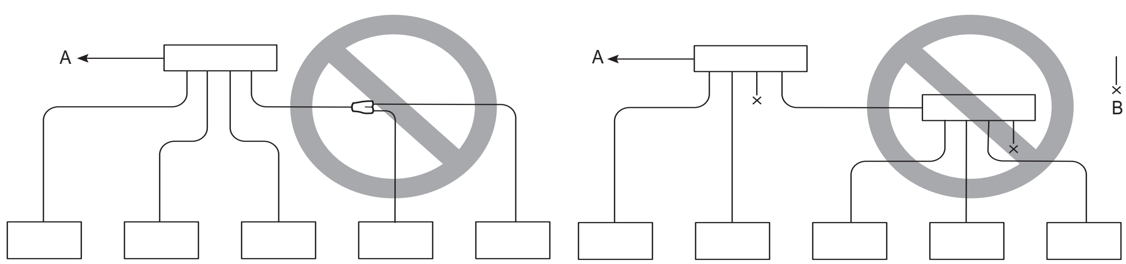
- *Material: Seamless phosphorous deoxidized copper pipe, ACR Type.*
- *Wall thickness: Must comply with local and national regulations for a design pressure of 550 psi. See wall thickness recommendations below.*

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	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.05

- *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 ARUN Series Heat Pump	Y-branches ARUB Series Heat Recovery	Headers		
		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.*



A: To outdoor unit

B: Brazed cap

- *In ARUB Series heat recovery systems, the refrigerant pipe diameter from the heat recovery unit to the indoor unit is determined by indoor unit capacity. Heat recovery unit ports are designed with brazed 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 outdoor 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 outdoor 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.*

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 outdoor 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:

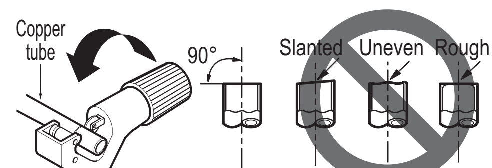
Always tighten with the regulated torque using a torque wrench and a backup wrench.

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

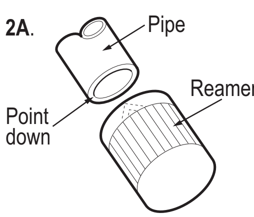
Preparing the Refrigerant Piping

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

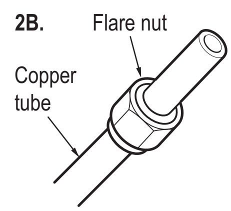
1. Cut the pipes and cable.
   - Use the accessory piping kit or field-suppled pipes.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

1.


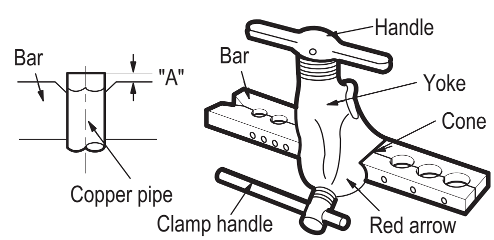
2A. Remove the burrs
- Completely remove all burrs from the cut cross-section of pipe.
- When removing the burrs, point the end of the copper pipe down to avoid adding foreign materials in the pipe.

2A.


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

2B.


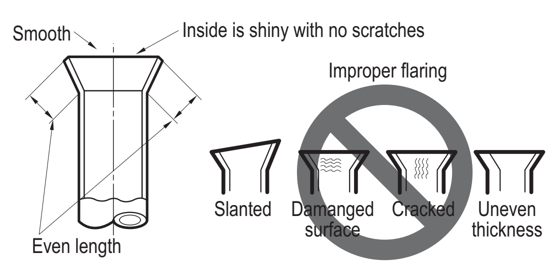
3. Flared connections
   - Use tool to finish flared connections as shown.
   - Firmly hold the copper tube in a clamp, bar, or die, as indicated (see dimensions below).

3.


Indoor unit (Btu/h)[1]	Pipe		"A"	
	Vapor (in.)	Liquid (in.)	Vapor (in.)	Liquid (in.)
≤19,100	1/2	1/4	0.02 ~ 0.03	0 ~ 0.02
<54,600	5/8	3/8	0.03 ~ 0.04	0.02 ~ 0.03
≤76,400	3/4	3/8	0.04 ~ 0.05	0.02 ~ 0.03
≤95,900	7/8	3/8	0.04 ~ 0.05	0.02 ~ 0.03

*[1]For ARNU093TN*2, ARNU123TN*2, ARNU153TN*2, ARNU183TM*2, ARNU243TM*2, ARNU153BG*2, ARNU183BG*2, ARNU243BG*2 indoor units: Liquid pipe = 3/8 in. (0.02 ~ 0.03 in.), Vapor pipe = 5/8 in. (0.03 ~ 0.04 in.).*

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.

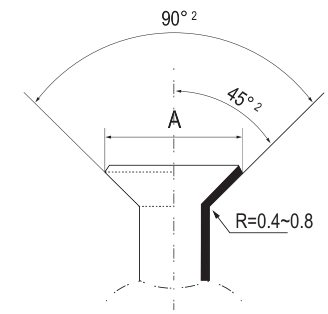
4.


Shape of the Flare and Tightening Torque of the Flare Nut

⚠ 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.



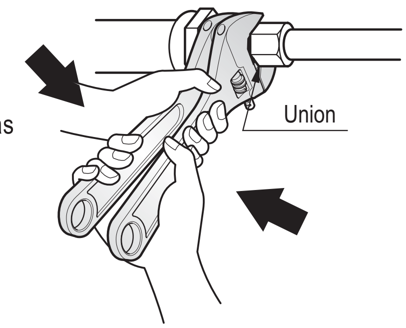
Tightening Torque for Flare Nuts.

Pipe size (inches)	Tightening torque (ft.-lbs.)	Width of the flare (A [inches])
3/8Ø	24.2 - 29.5	1/2
1/2Ø	36.5 - 44.5	5/8
5/8Ø	45.6 - 55.6	3/4

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.

Tightening the Flare Nuts.



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="5">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></tr>
<tr><td>1/4Ø</td><td rowspan="2">4.0 - 4.9</td><td rowspan="5">Hexagon wrench, 4mm</td><td rowspan="2">10.0 - 12.2</td><td rowspan="7">8.5 - 10.3</td><td>10.3 ~ 12.5</td></tr>
<tr><td>3/8Ø</td><td>24.3 ~ 28.8</td></tr>
<tr><td>1/2Ø</td><td>6.0 - 7.3</td><td>13.3 - 16.2</td><td>36.9 ~ 44.3</td></tr>
<tr><td>5/8Ø</td><td>10.0 - 12.2</td><td rowspan="2">17.0 - 19.9</td><td>45.7 ~ 55.3</td></tr>
<tr><td>3/4Ø</td><td rowspan="3">19.9 - 24.3</td><td>68.6 ~ 87.8</td></tr>
<tr><td>7/8Ø</td><td rowspan="2">Hexagon wrench, 8mm</td><td rowspan="2">26.6 - 32.5</td><td rowspan="2">–</td></tr>
<tr><td>1-1/8Ø</td></tr>
</table>

REFRIGERANT PIPING INSTALLATION

Leak Test for Heat Pump ARUN Series Systems

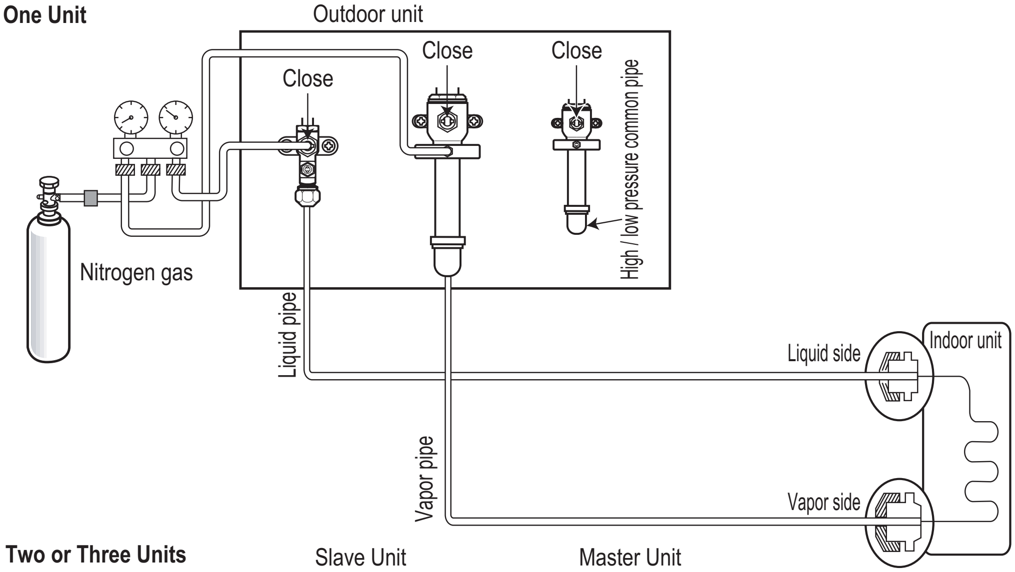
⚠ Note:

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

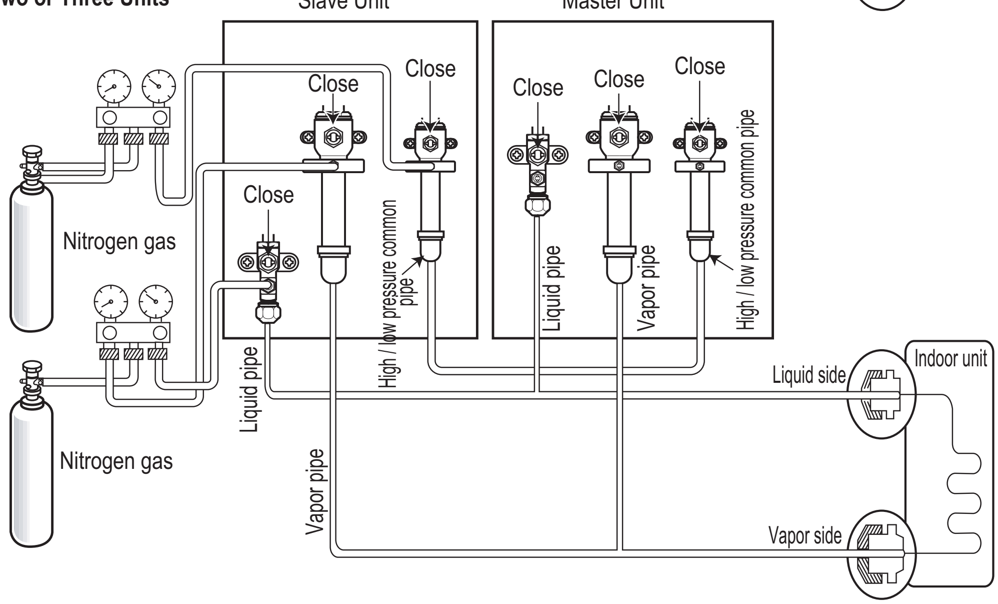
Test for leaks by running pressurized nitrogen gas to 550 psig through the refrigerant system (see diagram below). The test must be performed with the service valves closed, and the low-pressure vapor pipe and liquid pipe must be pressurized simultaneously.

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.

One Unit



Two or Three Units



⚠ 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.

Leak Test for Heat Recovery ARUB Series Systems

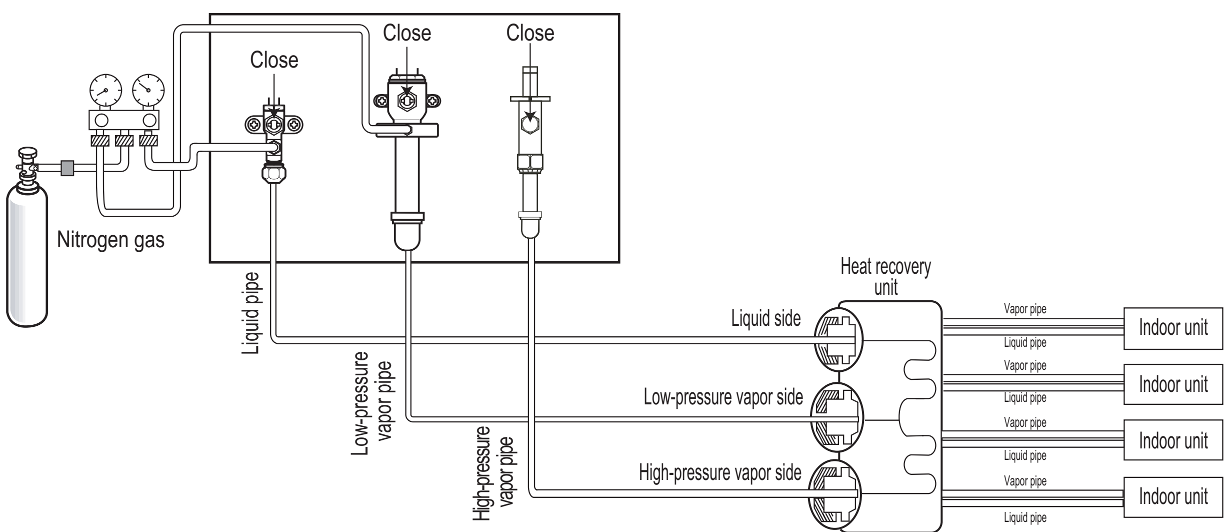
⚠ Note:

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

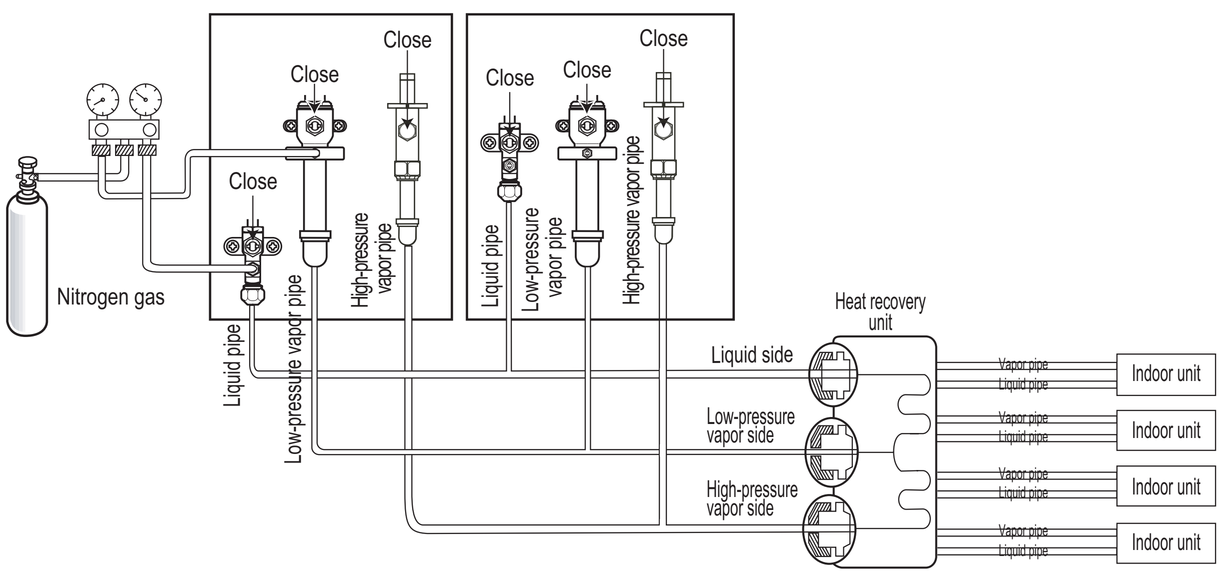
Test for leaks by running pressurized nitrogen gas to 550 psig through the refrigerant system (see diagram below). The test must be performed with the service valves closed, and the low-pressure vapor pipe and liquid pipe must be pressurized simultaneously.

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.

One Unit



Two or Three Units



⚠ 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.

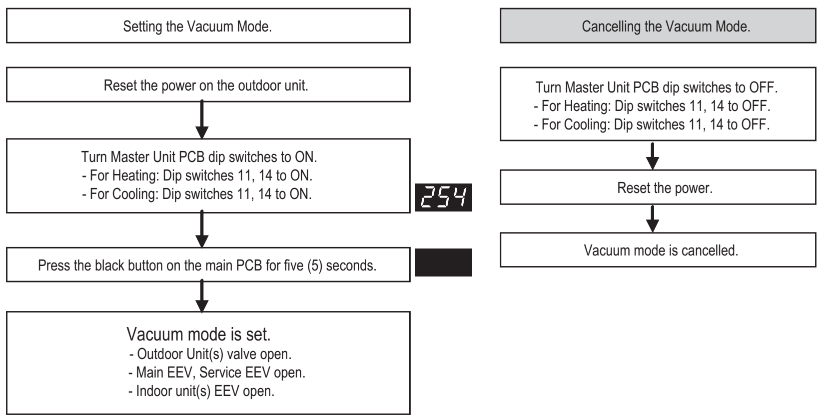
⚠CAUTION

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.

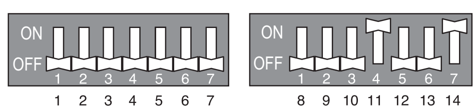
Mode is used to create vacuum in the system after the compressor is replaced, an outdoor unit part is replaced, or an indoor unit is replaced or added.

⚠ ***Note:***
Outdoor unit functions stops during vacuum mode operation—the compressors cannot operate.

Vacuum Mode for ARUN Heat Pump Systems

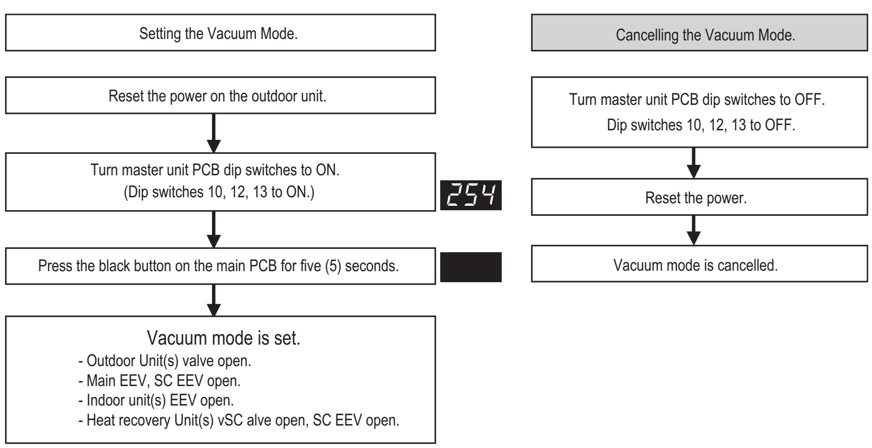


Dip Switch Settings

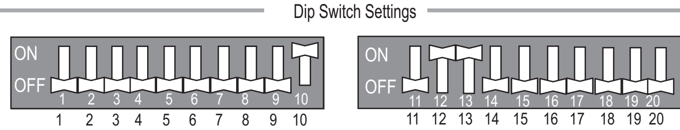


⚠ ***Note:***
Main PCB must be reset before the DIP switch settings are changed.

Vacuum Mode for ARUB Heat Recovery Systems



Dip Switch Settings



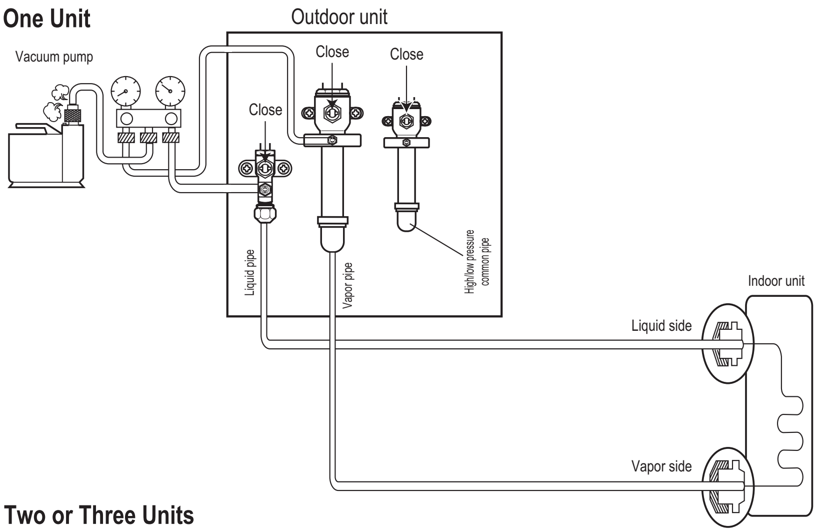
⚠ ***Note:***
Main PCB must be reset before the dip switch settings are changed.

Vacuum for Heat Pump ARUN Series Systems

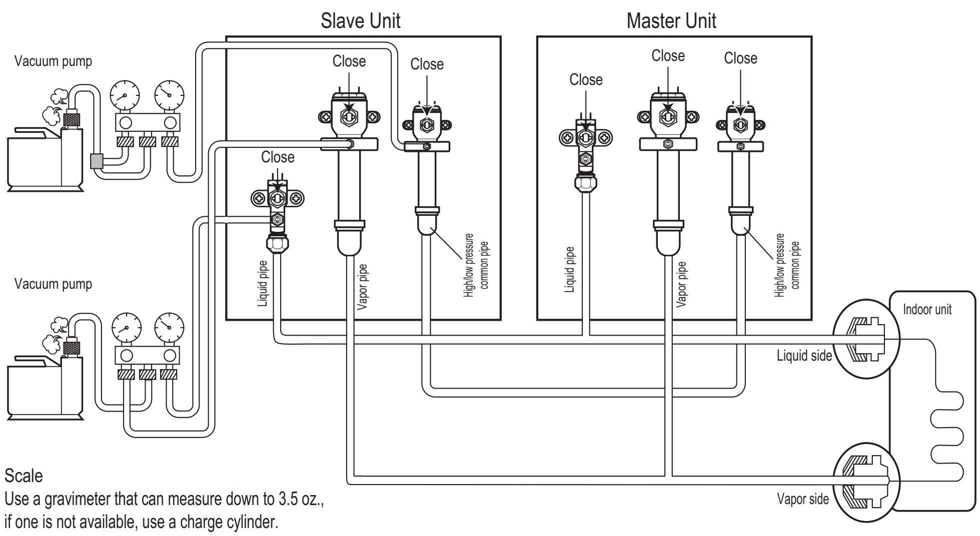
Vacuum the refrigerant piping system by connecting the vacuum pump to the service ports for the liquid pipes and the vapor pipes on the outdoor unit. Use a vacuum pump with a gauge that can evacuate to 500 microns, and vacuum with the service port valve closed. Never air purge with refrigerant.

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.

⚠ *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.

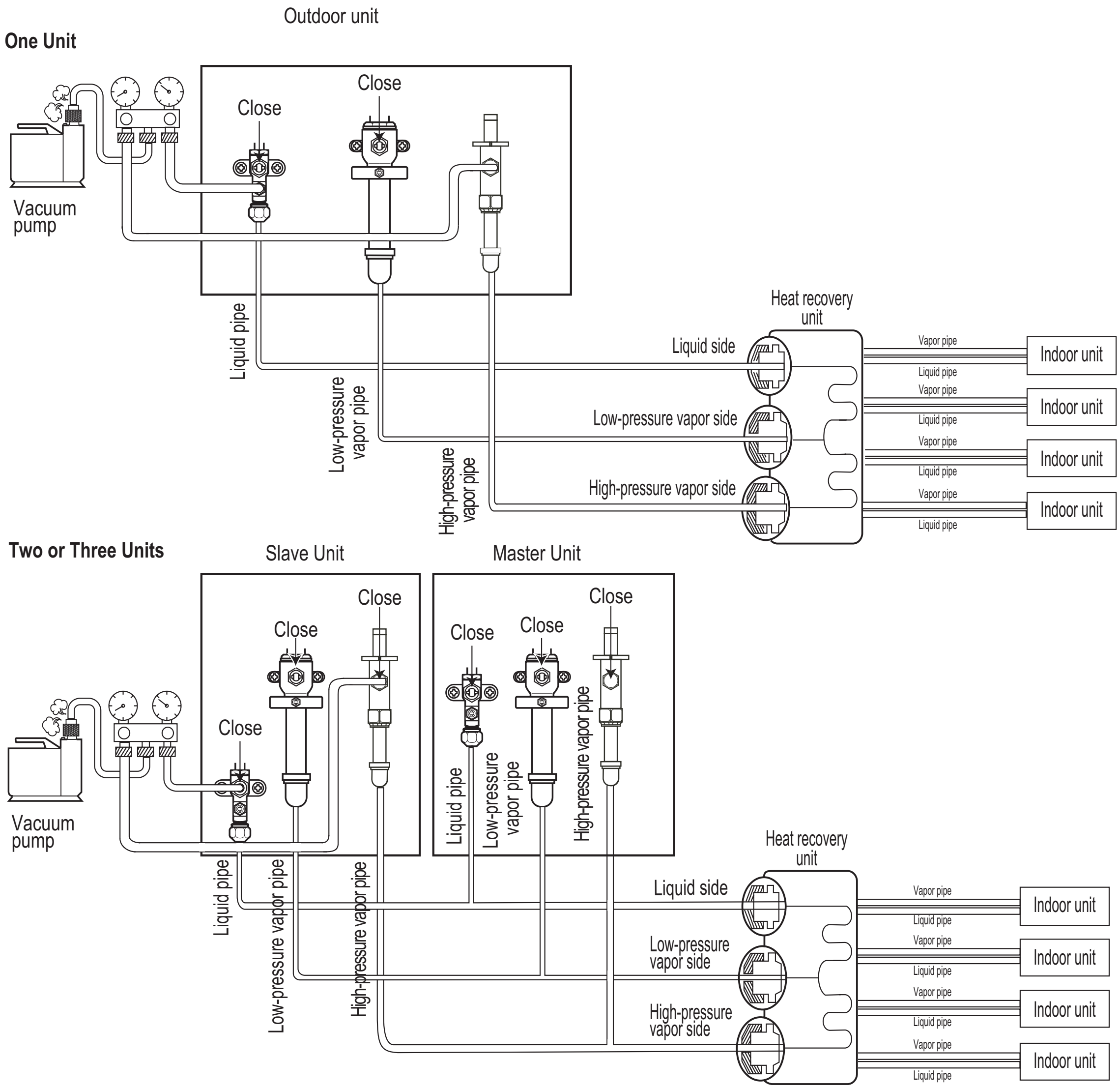
⚠CAUTION

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.

Vacuum for Heat Recovery ARUB 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 outdoor 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 outdoor 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.

System Refrigerant Charge Calculator (lbs.).

System Tag or ID________________________________

Job Name____________________________________

Project Manager_______________________________

Date_______________________________________

Line #	Description	Chassis I.D.	Size	Quantity	CF (Ref.)[1]	Total (lbs.)
1	Linear feet of 1/4" liquid line tubing[2]	—	—		0.015	
2	Linear feet of 3/8" liquid line tubing[2]	—	—		0.041	
3	Linear feet of 1/2" liquid line tubing[2]	—	—		0.079	
4	Linear feet of 5/8" liquid line tubing[2]	—	—		0.116	
5	Linear feet of 3/4" liquid line tubing[2]	—	—		0.179	
6	Linear feet of 7/8" liquid line tubing[2]	—	—		0.238	
7	Linear feet of 1" liquid line tubing[2]	—	—		0.323	
8	Wall Mounted + Art Cool Mirror	SE	7k to 15k		0.53	
9	Wall Mounted + Art Cool Mirror	S8, S5	18k to 24k		0.62	
10	1-Way Cassette	TJ	7k to 12k		0.44	
11	2-Way Cassette	TL	18k to 24k		0.35	
12	4-Way 2' x 2' Cassette	TR	5k to 7k		0.40	
13	4-Way 2' x 2' Cassette	TR	9k to 12k		0.55	
14	4-Way 2' x 2' Cassette	TQ	15k to 18k		0.71	
15	4-Way 3' x 3' Cassette	TN	9k to 15k		1.06	
16	4-Way 3' x 3' Cassette	TM	18k to 24k		1.41	
17	4-Way 3' x 3' Cassette	TP	24k to 28k		1.06	
18	4-Way 3' x 3' Cassette	TN	36k		1.41	
19	4-Way 3' x 3' Cassette	TM	42k to 48k		1.41	
20	High Static Ducted	BH	7k to 24k		0.57	
21	High Static Ducted	BG	15k to 42k		0.97	
22	High Static Ducted	BR	48k, 54k		1.37	
23	High Static Ducted	B8	76k to 95k		2.20	
24	Low Static Ducted, Low Static Ducted Bottom Return	B1, B3	7k to 15k		0.37	
25	Low Static Ducted, Low Static Ducted Bottom Return	B2, B4	18k to 24k		0.82	
26	Vertical / Horizontal Air Handling Unit	NJ	12k to 24k		1.04	
27	Vertical / Horizontal Air Handling Unit	NJ	30k		1.04	
28	Vertical / Horizontal Air Handling Unit	NJ	36k		1.57	
29	Vertical / Horizontal Air Handling Unit	NK	42k to 54k		2.00	
30	Ceiling Suspended	VJ	18k to 24k		0.77	
31	Convertible Surface Mount—Ceiling/Wall	VE	9k to 12k		0.22	
32	Floor Standing	CE (U)	7k to 15k		0.37	
33	Floor Standing	CF (U)	18k to 24k		0.82	
34	PRHR021A, PRHR031A, PRHR041A	—	—		1.1	
35	Additional Refrigerant Charge Required					
36a-d	Outdoor Unit Factory Refrigerant Charge (To obtain factory refrigerant charge for each frame, see Multi V III Engineering Manual.)	36a ARU*072**3	72k		12.1	
		36b ARU*096**3	96k		20.7	
		36c ARU*121**3	121k		20.7	
		36d ARU*144**3	144k		20.7	
37	Total Factory Refrigerant Charge (sum of refrigerant charge for all outdoor units in the system)					
38	Total System Charge: Sum of Additional Refrigerant Charge Required and Total Factory Refrigerant Charge					

[1]CF (Ref.) = Correction Factor for Refrigerant Charge.

[2]For refrigerant charge purposes, consider only the liquid line; ignore the vapor line(s).

Total Heat Pump Outdoor Unit (208-230V / 460V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARUN072	—	—	—	12.1	—	—	12.1
8.0	ARUN096	—	—	—	20.7	—	—	20.7
10.0	ARUN121	—	—	—	20.7	—	—	20.7
12.0	ARUN144	—	—	—	20.7	—	—	20.7
14.0	ARUN168	ARUN072	ARUN096	—	12.1	20.7	—	32.8
16.0	ARUN192	ARUN072	ARUN121	—	12.1	20.7	—	32.8
18.0	ARUN216	ARUN072	ARUN144	—	12.1	20.7	—	32.8
20.0	ARUN240	ARUN096	ARUN144	—	20.7	20.7	—	41.4
22.0	ARUN264	ARUN121	ARUN144	—	20.7	20.7	—	41.4
24.0	ARUN288	ARUN144	ARUN144	—	20.7	20.7	—	41.4
26.0	ARUN312	ARUN072	ARUN096	ARUN144	12.1	20.7	20.7	53.5
28.0	ARUN336	ARUN072	ARUN121	ARUN144	12.1	20.7	20.7	53.5
30.0	ARUN360	ARUN072	ARUN144	ARUN144	12.1	20.7	20.7	53.5
32.0	ARUN384	ARUN096	ARUN144	ARUN144	20.7	20.7	20.7	62.1
34.0	ARUN408	ARUN121	ARUN144	ARUN144	20.7	20.7	20.7	62.1
36.0	ARUN432	ARUN144	ARUN144	ARUN144	20.7	20.7	20.7	62.1

Total Heat Recovery Outdoor Unit (208-230V / 460V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARUB072	—	—	—	12.1	—	—	12.1
8.0	ARUB096	—	—	—	20.7	—	—	20.7
10.0	ARUB121	—	—	—	20.7	—	—	20.7
12.0	ARUB144	—	—	—	20.7	—	—	20.7
14.0	ARUB168	ARUB072	ARUB096	—	12.1	20.7	—	32.8
16.0	ARUB192	ARUB072	ARUB121	—	12.1	20.7	—	32.8
18.0	ARUB216	ARUB072	ARUB144	—	12.1	20.7	—	32.8
20.0	ARUB240	ARUB096	ARUB144	—	20.7	20.7	—	41.4
22.0	ARUB264	ARUB121	ARUB144	—	20.7	20.7	—	41.4
24.0	ARUB288	ARUB144	ARUB144	—	20.7	20.7	—	41.4
26.0	ARUB312	ARUB072	ARUB096	ARUB144	12.1	20.7	20.7	53.5
28.0	ARUB336	ARUB072	ARUB121	ARUB144	12.1	20.7	20.7	53.5
30.0	ARUB360	ARUB072	ARUB144	ARUB144	12.1	20.7	20.7	53.5
32.0	ARUB384	ARUB096	ARUB144	ARUB144	20.7	20.7	20.7	62.1
34.0	ARUB408	ARUB121	ARUB144	ARUB144	20.7	20.7	20.7	62.1
36.0	ARUB432	ARUB144	ARUB144	ARUB144	20.7	20.7	20.7	62.1

Note:

Fill in the f-gas label on the outdoor 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).*

ASHRAE Standards 15 and 34—Designing for Refrigerant Safety with Multi V

Standards 15-2004 and 34-2007 were developed to educate the design community on the safe use of refrigerants in commercial buildings and to address the classification of refrigerants. All Multi V systems use R410A refrigerant, which ASHRAE Standard 15-2004 and ASHRAE Standard 34-2007 classify in Safety Group “A1.”[1] These are the same ratings given to refrigerants R22, R134A, and R407C.

The displacement of oxygen in an occupied space could lead to occupant asphyxiation in the event of a catastrophic release of the entire system’s refrigerant charge. The standard allows a Refrigerant Concentration Limit (RCL) of 0.026 lbs./ft.^{3} for R410A in most applications (refer to Standard for exceptions). The RCL rating indicates the allowable concentration (by weight) of refrigerant per cubic foot of room volume to avoid escape-impairing effects, such as oxygen deprivation, flammability, and cardiac sensitization.

⚠WARNING

This designation does not indicate that R410A is non-toxic. With high enough concentration levels, all refrigerants can be hazardous.

The standards are written to cover worst case scenarios and assume that the complete system charge is released into a confined space over a short period. If a refrigerant leak occurs, the actual concentration level in the confined space is dependent on the quantity of refrigerant in the equipment and the volume of air available for dispersion and dilution.

The total estimated charge of the refrigeration system is calculated by either LG’s LATS Multi V refrigerant piping design software (see “Computer-assisted Refrigerant Pipe Design” on page 83), or manually by following the procedure titled “Manual Layout Procedure” on page 85. To apply the standard, the designer must first determine the occupied space with the smallest cubic volume served by the system.

Calculate the volume of air in each occupied space using the following guidelines to determine the dimensions of each space:

Nonconnected Spaces Defined as: “Where a refrigerating system or a part thereof is located in one or more enclosed occupied spaces that do not connect through permanent openings or HVAC ducts. Where different stories and floor levels connect through an open atrium or mezzanine arrangement, the volume used is determined by multiplying the floor area of the lowest space by 8-1/4 feet.”[1]

Ventilated Spaces Defined as: “Where a refrigerating system or a part thereof is located within an air handler, an air distribution duct system, or an occupied space served by a mechanical ventilation system, the entire air distribution system shall be analyzed to determine the smallest volume area.”[1]

Closure Closures (i.e., motorized dampers) in the air distribution system shall be considered. If one or more spaces of a ducted system can be closed off from the source of the refrigerant leak, the volume(s) shall not be used in the calculation.[1]

Closure exceptions include smoke and fire dampers or combinations thereof that shut in an emergency and are not associated with a refrigerant leak, and dampers where airflow is never reduced below 10% of its maximum with the fan running.

Plenums The volume of the supply and return ducts and plenums shall be included when calculating the refrigerant quantity limit in the system.”[1]

Supply/Return Ducts The volume of the supply and return ducts and plenums shall be included when calculating the refrigerant quantity limit in the system.”[1]

[1]*American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) Standard 34-2007. Atlanta, GA. ASHRAE, Inc.*

Follow these steps to calculate the potential refrigerant concentration level:

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space.
3. Divide the refrigerant charge of the Multi V system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.025 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants may have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34-2007 and local codes for detailed information.[1]

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{System refrigerant charge (lbs.)}}{\text{Volume of smallest occupied space (ft}^3\text{)}}$$

To determine the volume of an occupied space, the designer must determine which ones are connected, not connected, or ventilated. Refer to Standard 34-2007 for help.

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

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

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

- Install transfer ducts between rooms.
- Undercut doors.
- Include ventilation grilles in doors.
- Include the area above the ceiling as part of the return or supply air path.

[1]*American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) Standard 34-2007. Atlanta, GA. ASHRAE, Inc.*

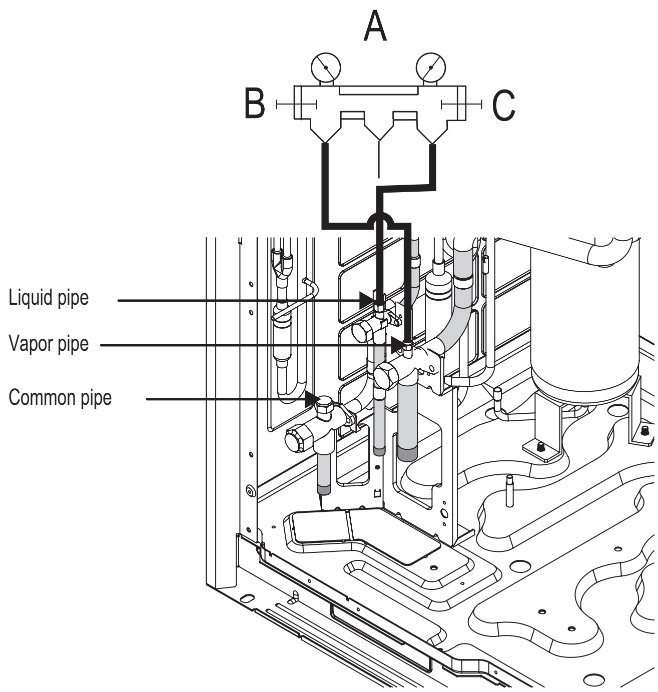
REFRIGERANT PIPING INSTALLATION

Charging the Refrigerant

⚠ *Note:*

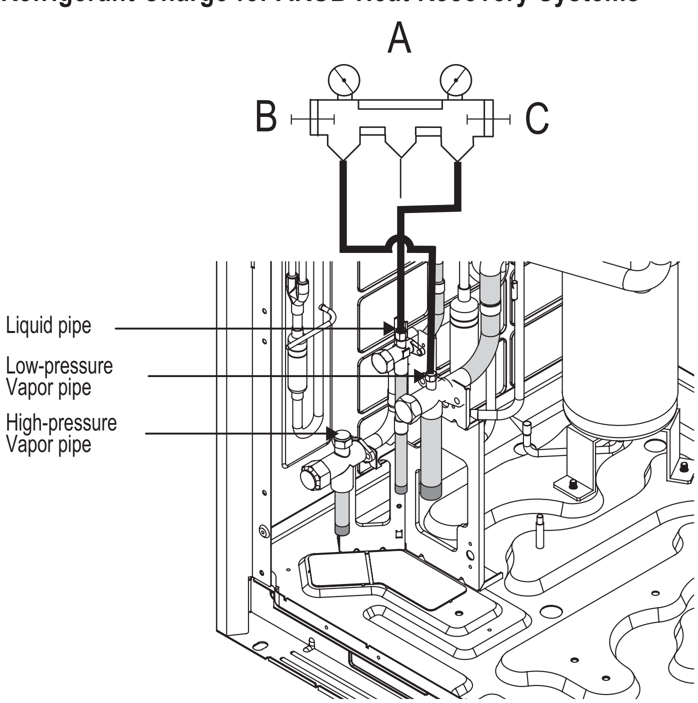
- *Pipes to be vacuumed: gas pipe, liquid pipe, common pipe.*
- *Add exact amount of refrigerant determined by the pipe diameter length and total indoor unit capacity (see the LATS Multi V report). If the refrigerant charge is not exact, the system may not operate properly.*
- *If the additional refrigerant charge is more than ±10%, it may cause condenser burnout or improper indoor unit performance.*

Refrigerant Charge for ARUN Heat Pump Systems



A: Manifold Gauge
B: Low-pressure side Handle
C: High-pressure side Handle

Refrigerant Charge for ARUB Heat Recovery Systems

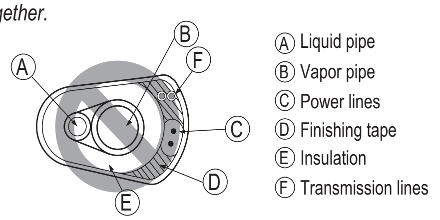
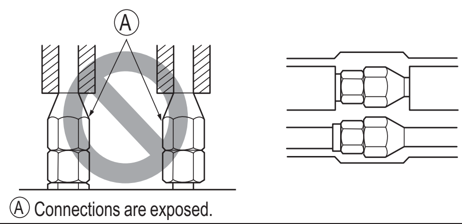
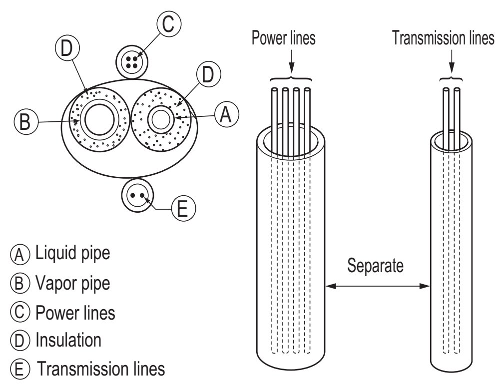
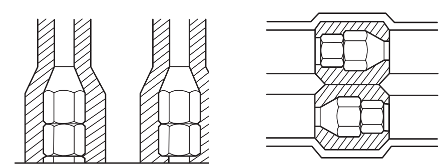


A: Manifold Gauge
B: Low-pressure Side Handle
C: High-pressure Side Handle

Refrigerant Piping System Insulation

To prevent heat loss/heat gain through the refrigerant piping, all refrigerant piping including liquid lines, high-pressure vapor lines, and low-pressure vapor lines must be insulated separately. Insulation must be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions and local codes. All refrigerant piping including Y-branch and Header connections, field-provided isolation ball valves, service valves, and elbows must be completely insulated using closed-cell pipe insulation. All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. Insulation passing through pipe hangers, inside conduit, and/or sleeves must not be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to direct sunlight and deterioration-proceuding elements must be properly protected with PVC, aluminum vapor barrier jacket, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover.

The design engineer should perform calculations to determine if the factory-supplied insulation jackets have sufficient thickness to meet local codes and to avoid sweating at jobsite conditions. Technical data on factory-supplied insulation can be found in the Cut Sheet pages in the Multi V III Engineering Manual. Add additional insulation if necessary. Check the fit of the insulation jacket provided with the LG Y-branch and Header kits after all pipes are brazed to fittings. Mark all pipes at the point where the insulation jacket ends. Remove the jacket. Install field-supplied insulation on the pipe segments first, and then install the LG provided insulation plugs on the ends of all unused Header ports. Apply the clam-shell insulation on jackets to Y-branch and Header fittings last. Peel the adhesive glue protector slip from the insulation jacket and install the clam-shell jacket over the fitting.

<table>
<tr>
<td>Bad insulation work</td>
<td>⚠ Note:
Do not insulate the vapor or low pressure pipe and liquid or high pressure pipe together.
</td>
<td>⚠ Note:
Fully insulate the connections.
</td>
</tr>
<tr>
<td>Good insulation work</td>
<td></td>
<td></td>
</tr>
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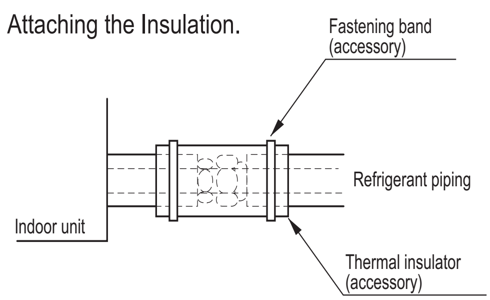
⚠ ***Note:***

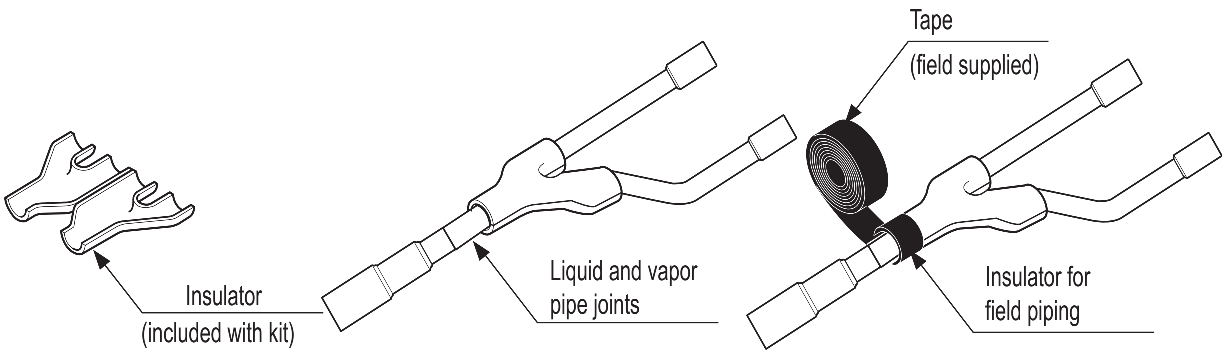
Use insulation material that has high heat-resistance properties (more than 248°F).

Attaching the Insulation.



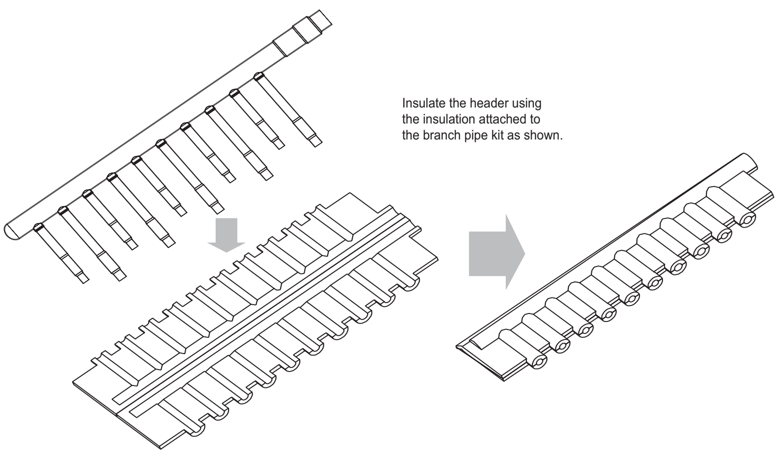
Insulating the Y-branches (Heat Pump ARUN Series and Heat Recovery ARUB Series)

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

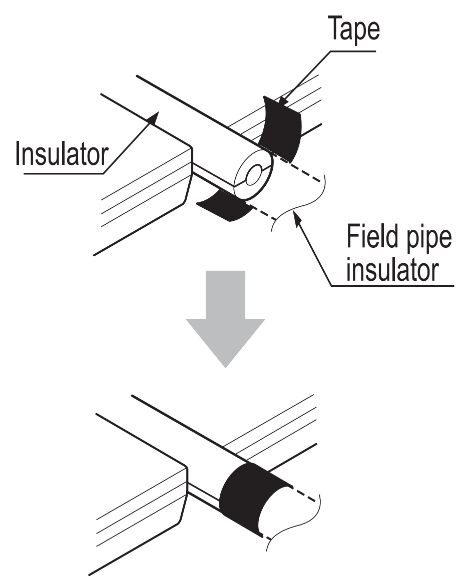


Insulating the Headers

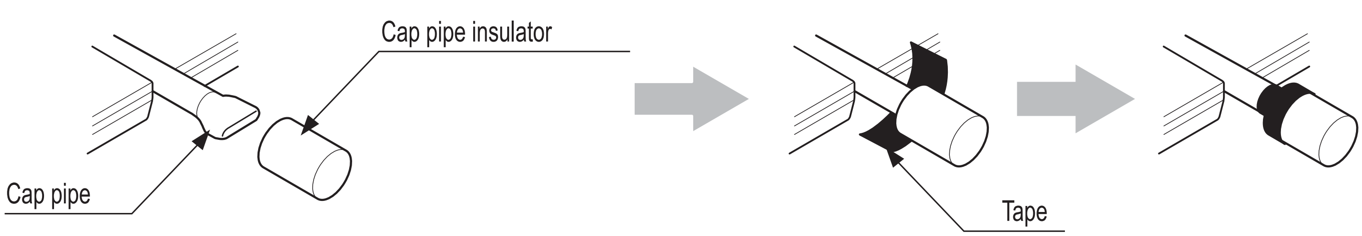
Insulate the header using the insulator included in each kit.



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



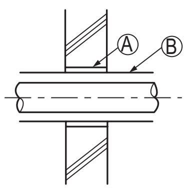
Cap pipes should be insulated using the insulator included in each kit, and then taped as shown.



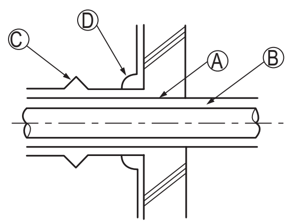
Pipe Sleeves at Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve. Underground refrigerant pipe shall be routed inside a protective sleeve to prevent insulation deterioration.

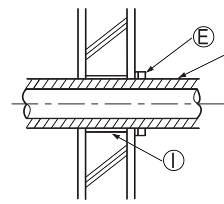
Inside wall (concealed)



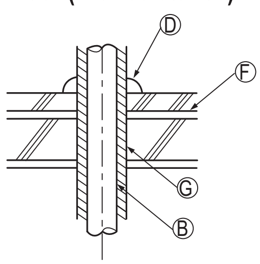
Outside wall



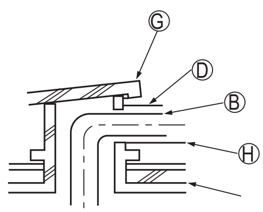
Outside wall (exposed)



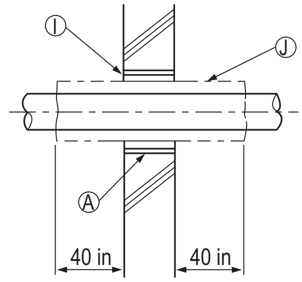
Floor (fire-resistance)



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.)

Note:

All floor and wall penetrations should be properly sized and large enough to accomodate pipe diameter plus insulation thickness.

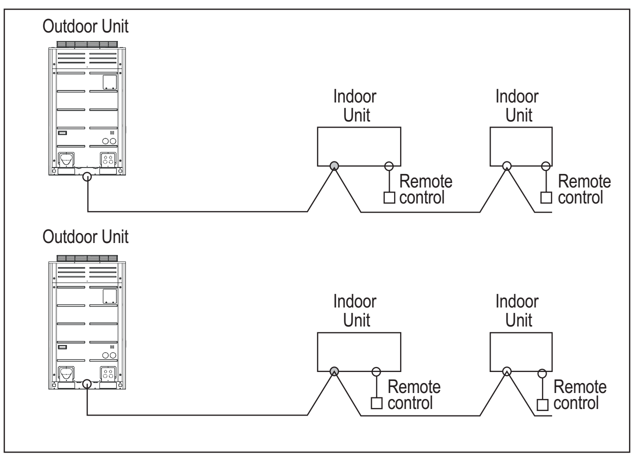
⚠ WARNING

- *Have qualified electricians 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 outdoor 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.*

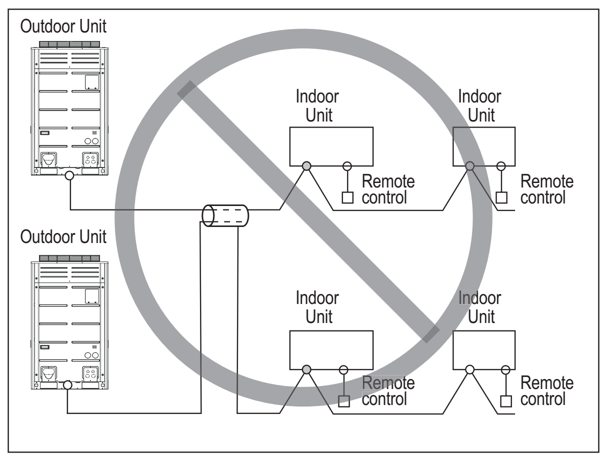
- Follow local, state, and federal ordinances for technical standards related to electrical equipment and wiring regulations.
- Locate the outdoor unit transmission wiring away from the power supply circuit so that it is not affected by electric interference. (Do not run it through the same conduit.
- Provide a designated ground wire to the outdoor unit.
- Include some allowance in the wiring for the electrical box of the indoor and outdoor 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 two-core shielded 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 improper system operation. (Indicated as ⃠ in the diagram below.)
- Only the transmission line specified should be connected to the outdoor unit terminal block.

Heat Pump ARUN Series System Electrical Wiring Recommendations

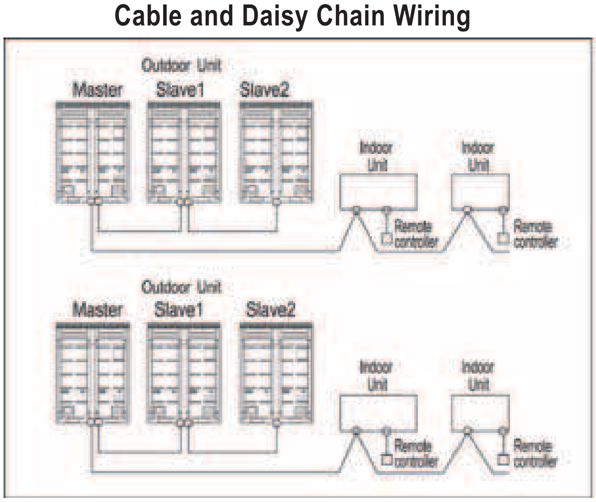
Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring



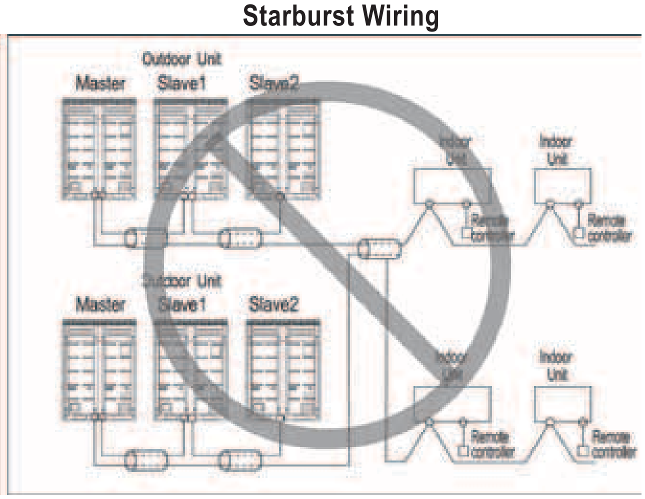
Not recommended - Multiple-core Cable and Starburst Wiring



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

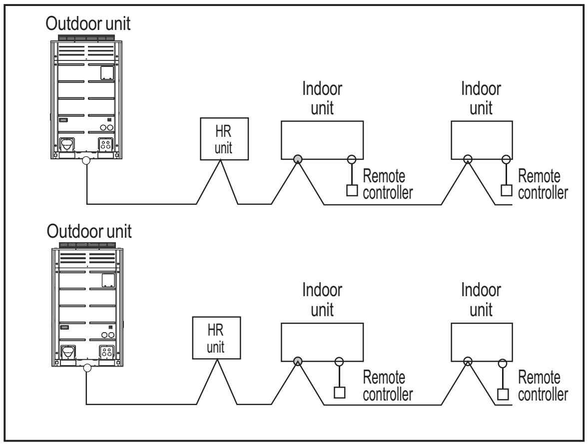


Not recommended - Multiple-core Cable and Starburst Wiring

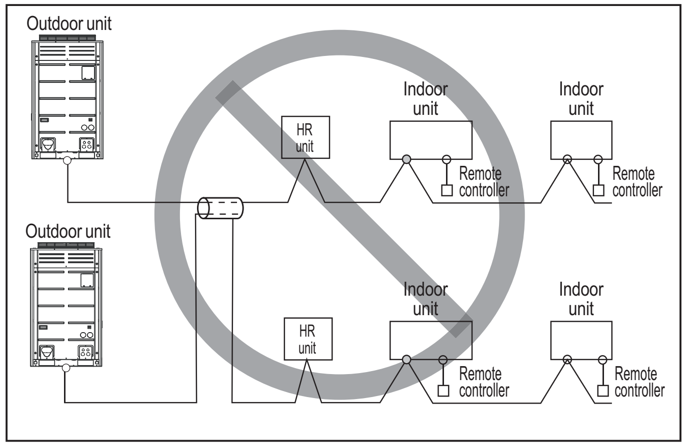


Heat Recovery ARUB Series System Electrical Wiring Recommendations

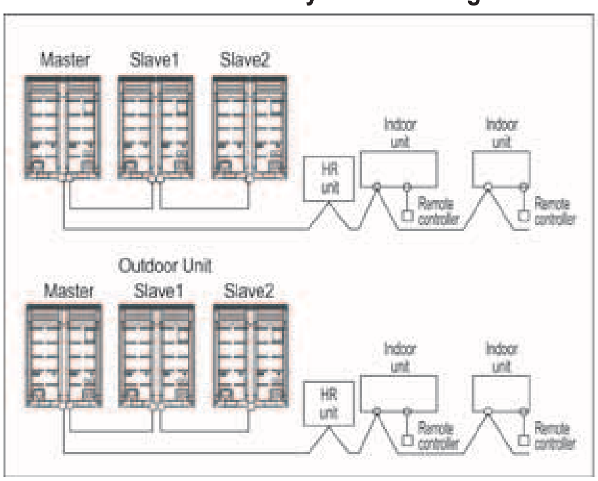
Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring



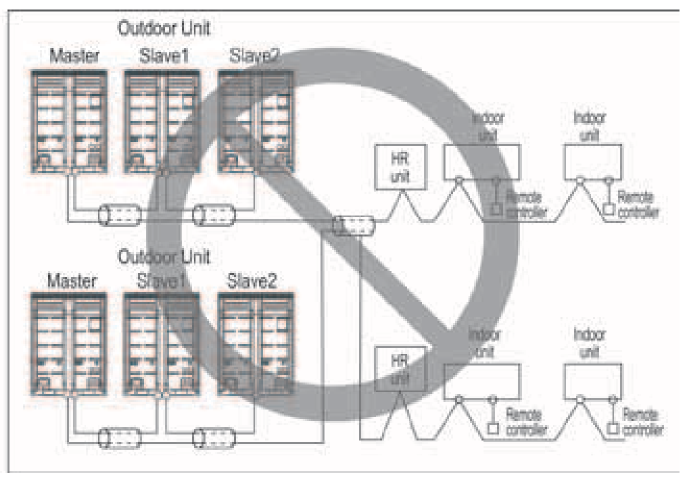
Not recommended - Multiple-core Cable and Starburst Wiring



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



Not recommended - Multiple-core Cable and Starburst Wiring

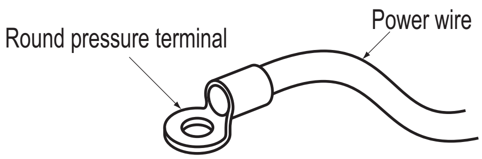


⚠ *Note:*

- *Use two-core shielded, stranded cables for the transmission wiring. Never install the transmission (control) wiring with the power cables.*
- *The conductive shielded layer of cable should be grounded to the outdoor unit frame only, and connected to the indoor units by using wire nuts.*
- *Never use multiple-core cables.*
- *These outdoor 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

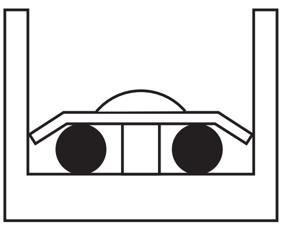
Use round ring terminals for connections to the power terminal block.



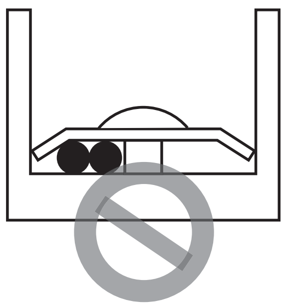
If round ring terminals are not available, then:

- Do not connect wiring of different thicknesses to the power terminal block. (Slack in the power wiring may generate heat.)
- Follow instructions below.

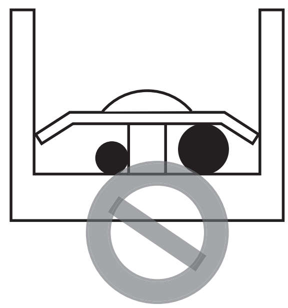
Connect same thickness wiring to both sides.



Do not connect two wires on one side.



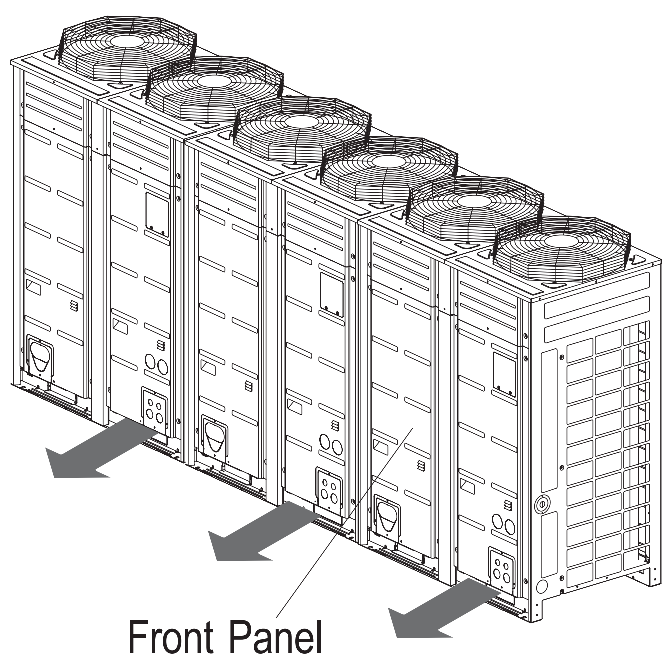
Do not connect wiring of different thicknesses.



⚠ *Note:*
If 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 outdoor units through the terminal block.
- Connect the transmission wire between the outdoor unit and indoor unit (and heat-recovery units [ARUB Series only)] through the terminal block.
- When connecting the transmission wire from the outdoor 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 outdoor unit.

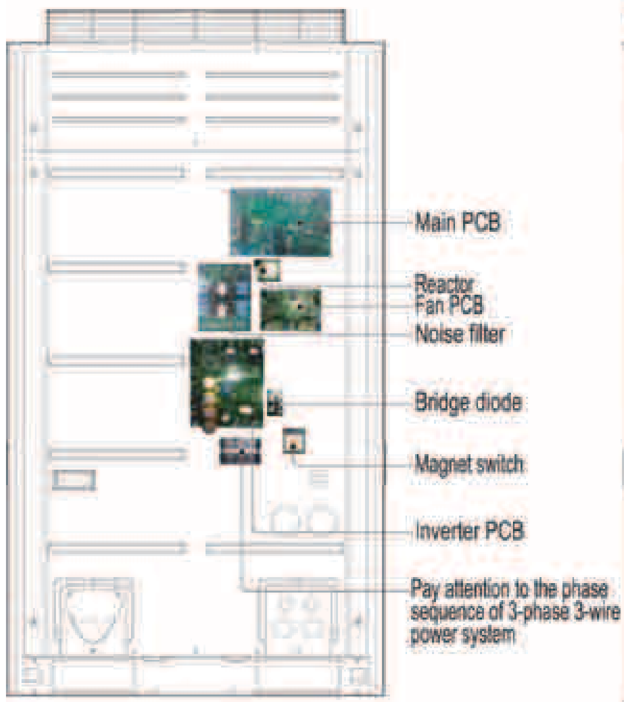


⚠ *Note:*
The temperature sensor for outdoor air should not be exposed to direct sunlight.

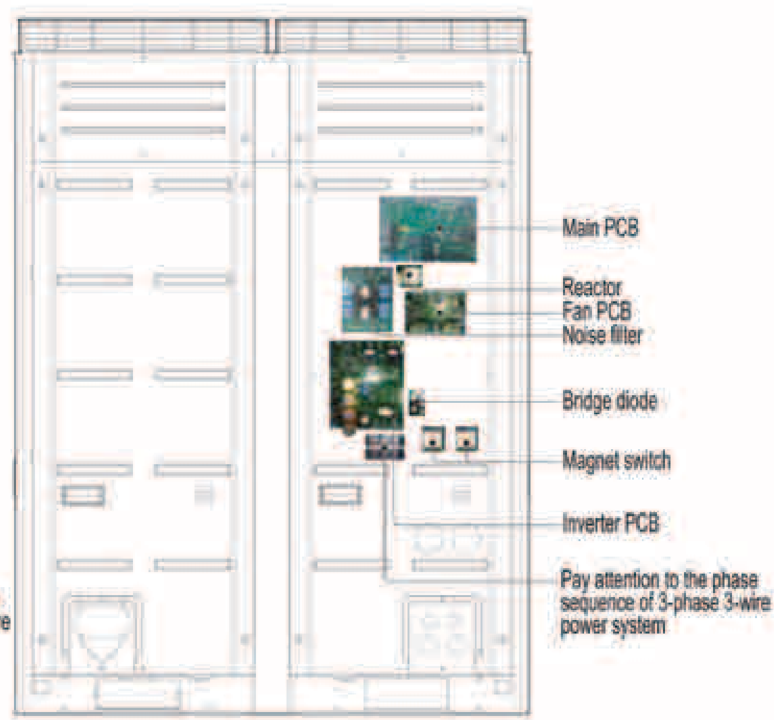
Electrical Wiring Specifications

208-230V ARUN Series Heat Pump Outdoor Units

Small-Frame Outdoor Units

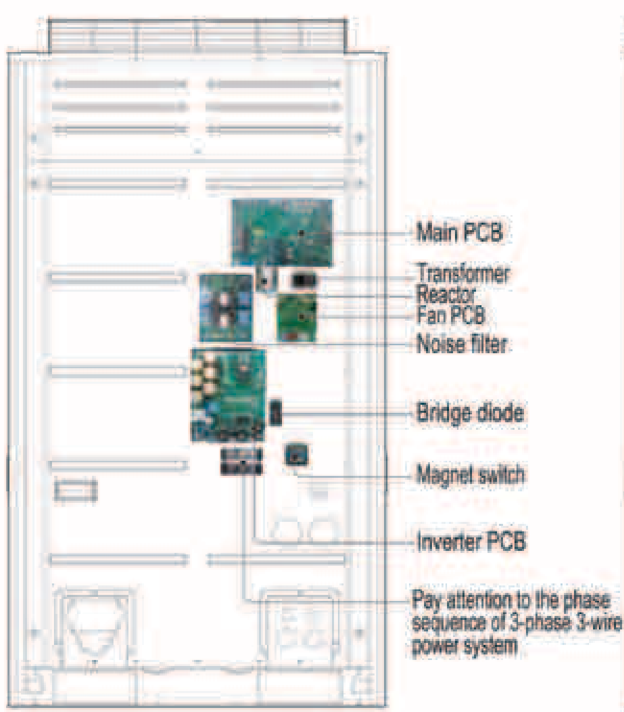


Large-Frame Outdoor Units

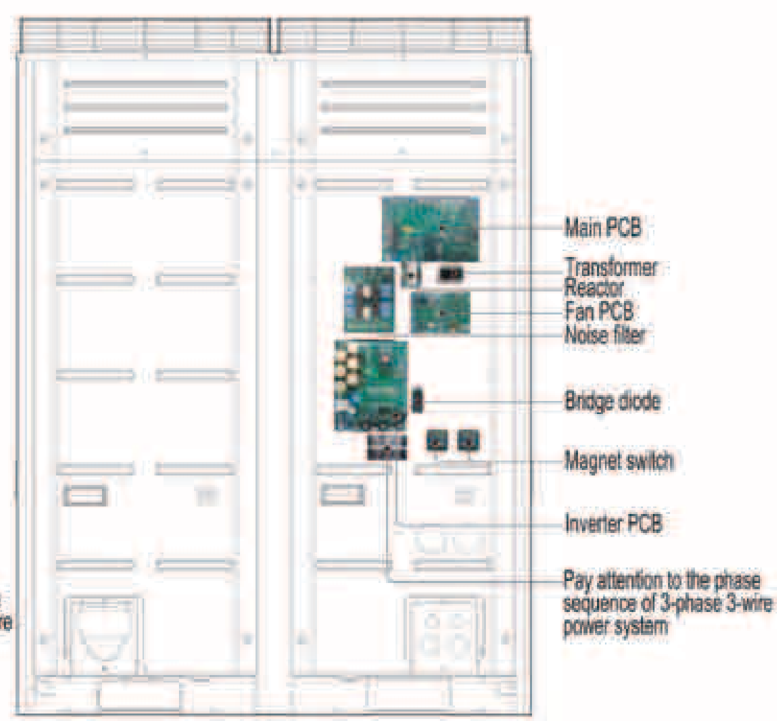


460V ARUN Series Heat Pump Outdoor Units

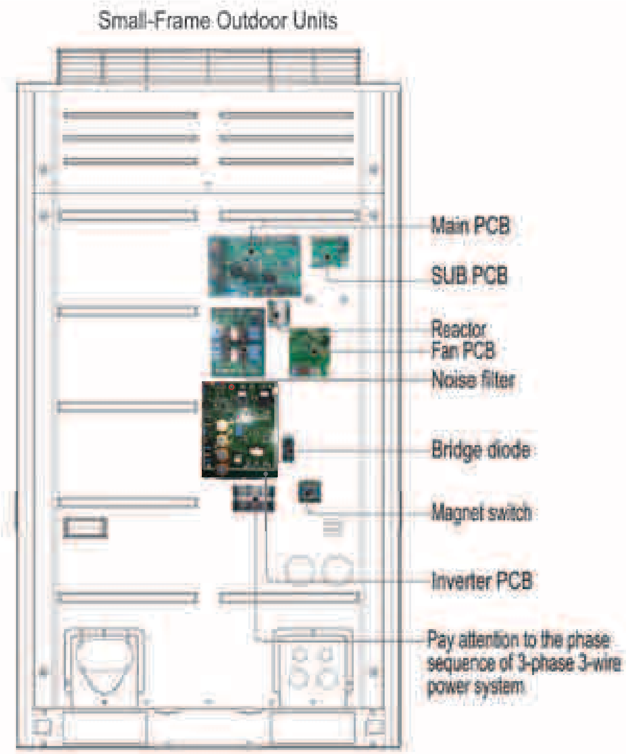
Small-Frame Outdoor Units

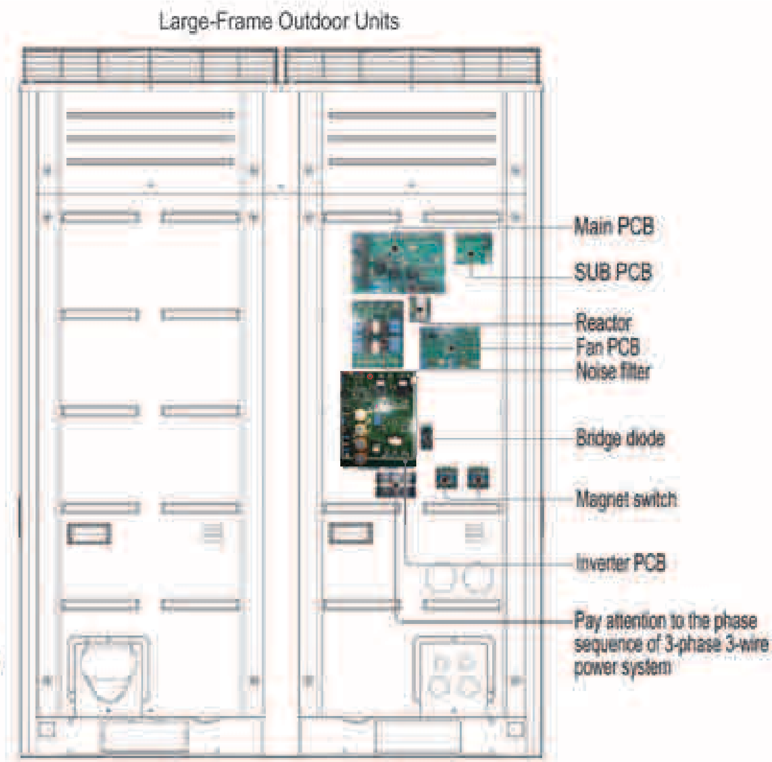


Large-Frame Outdoor Units

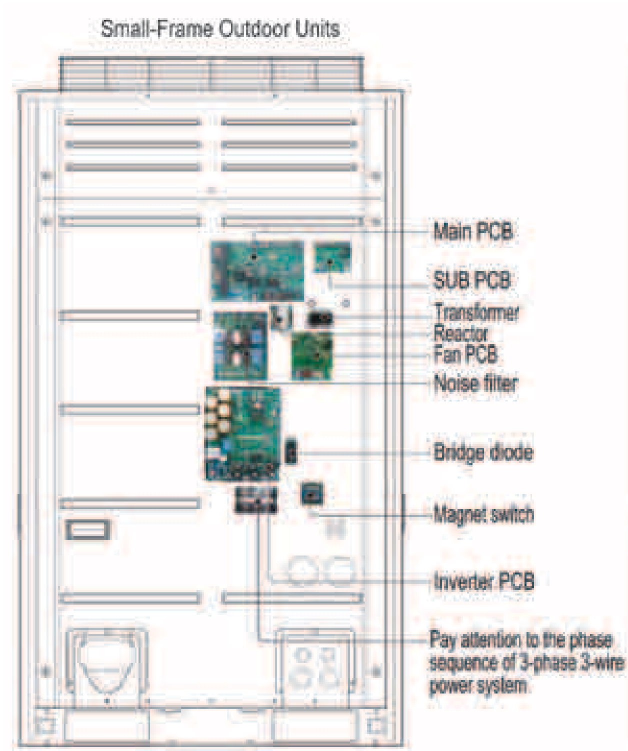


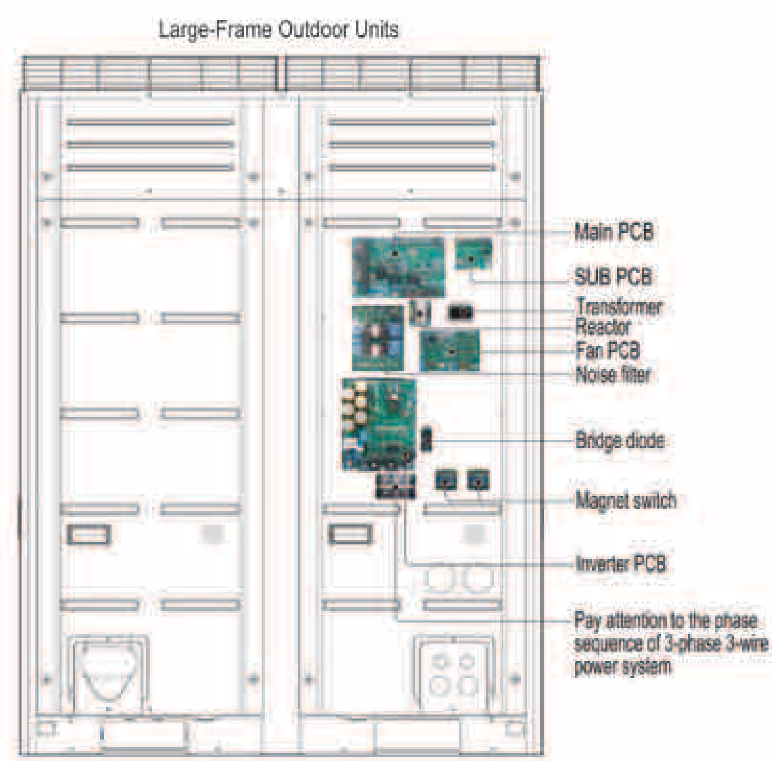
208-230V ARUB Series Heat Recovery Outdoor Units





460V ARUB Series Heat Recovery Outdoor Units





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 line length: 3,281 feet.

2. Remote Control Cable
   - Type: Three-core cable (shielded wire).

3. Central Control Cable
   - For AC EZ Controller: Four-core cable (shielded wire).
   - For ACP and AC Smart Controllers: Two-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
	Exceeds 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.

Main Power Supply Wiring and Equipment Capacity

1. Use separate power supplies for the outdoor units and the indoor units.
2. Consider ambient conditions (temperature, direct sunlight, rain water, etc.) when installing wiring and performing the connections.
3. 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.

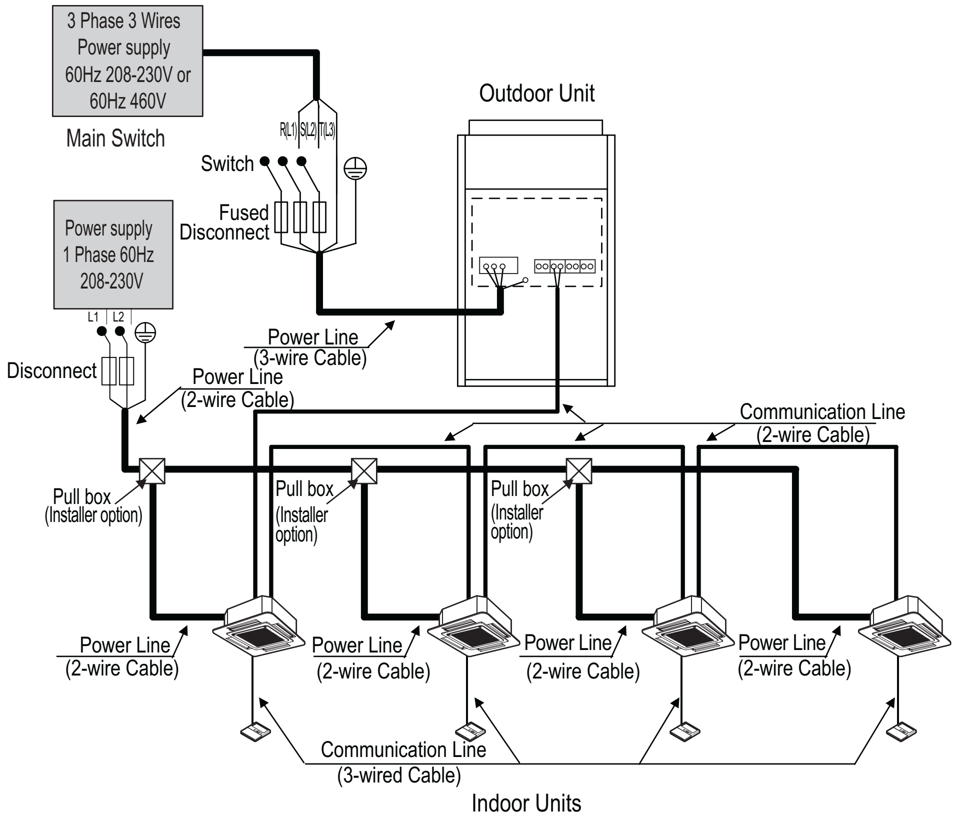
Note:

- *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.*

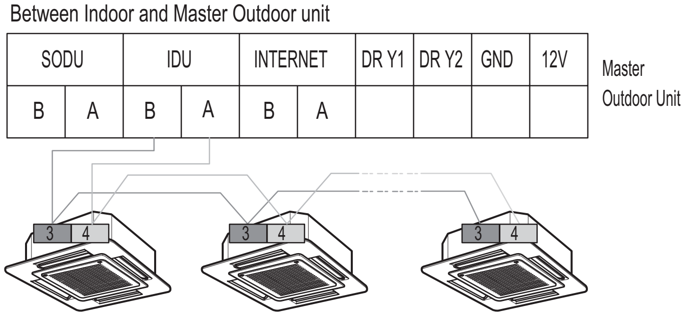
208-230V and 460V Single-Frame Heat Pump Systems



⚠WARNING

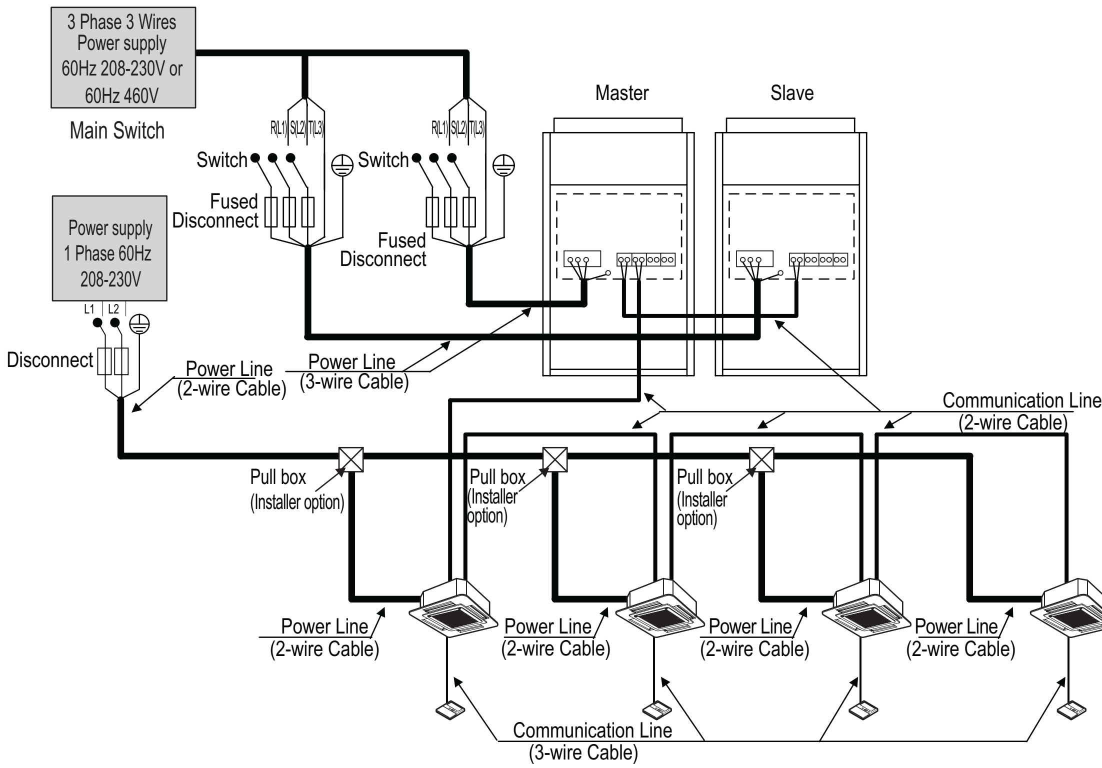
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*

Heat Pump
Between Indoor and Master Outdoor unit



The GND terminal at the main PCB is a '-' terminal for day contact, not a ground line.

208-230V and 460V Dual-Frame Heat Pump Systems

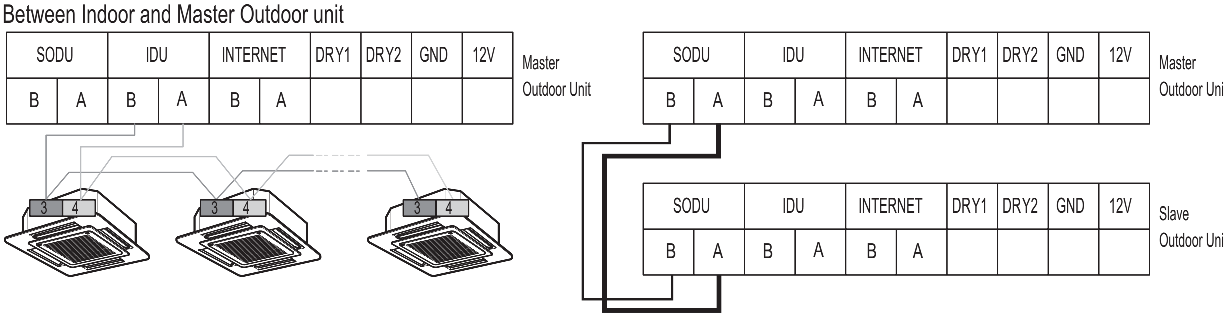


⚠WARNING

- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*

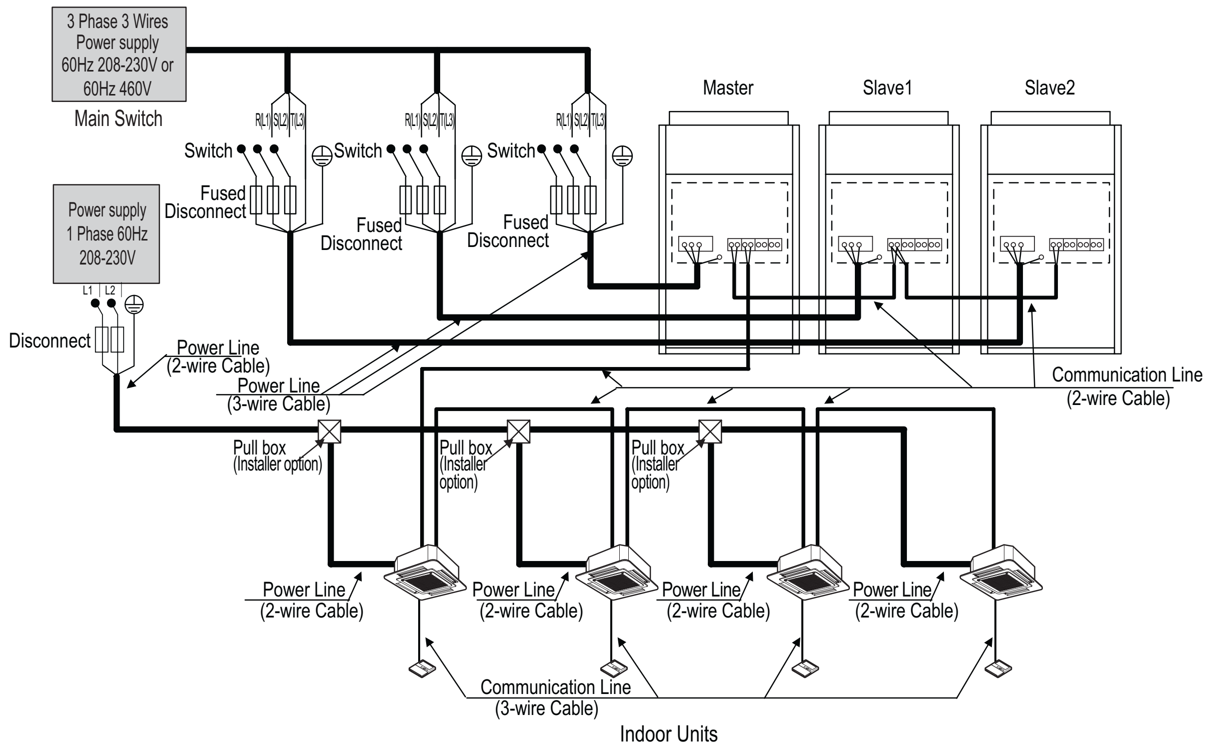
Heat Pump

Between Indoor and Master Outdoor unit



The GND terminal at the main PCB is a negative terminal for dry contact, not a ground.

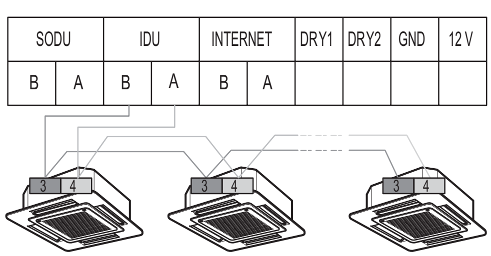
208-230V and 460V Triple-Frame Heat Pump Systems



⚠ WARNING

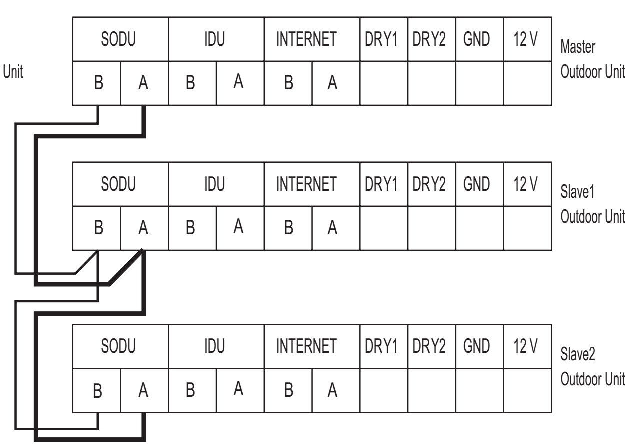
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*

Heat Pump
Between Indoor and Master Outdoor unit



The GND terminal at the main PCB is a negative terminal for dry contact, not a ground.

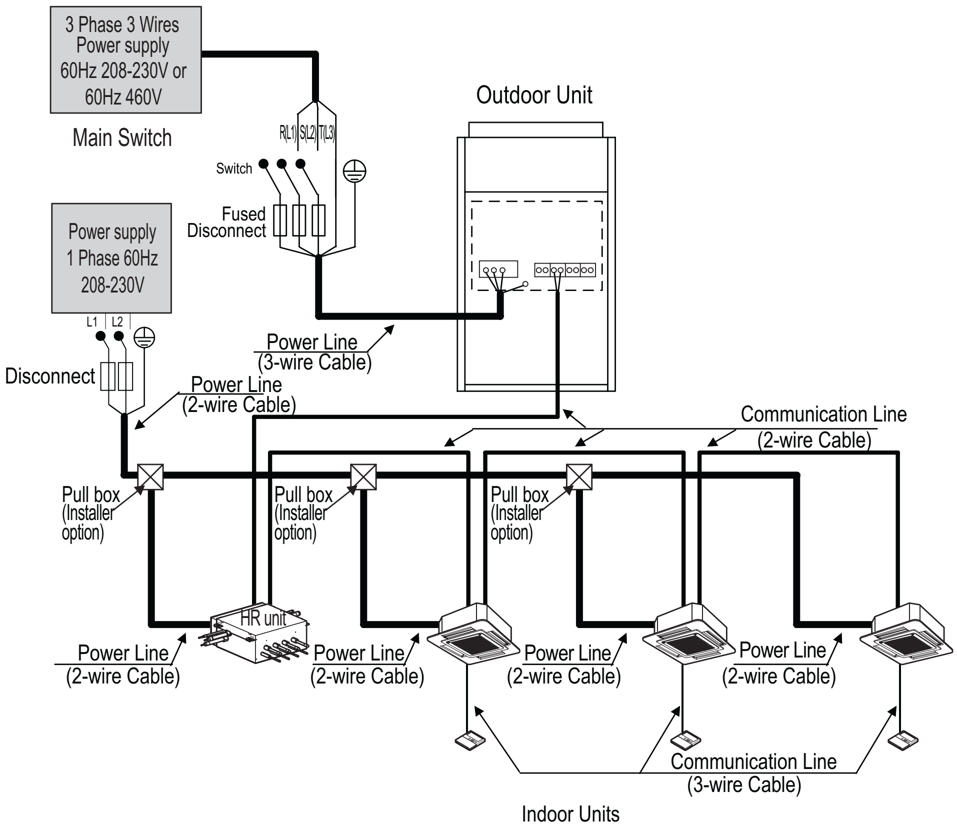
- Make sure that terminal number of master and slave outdoor units match. (A-A,B-B)



ELECTRICAL SYSTEM INSTALLATION

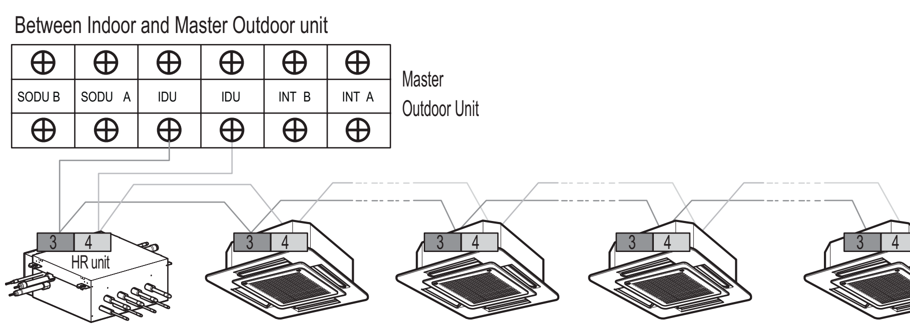
Electrical and Communication Cable Connections

208-230V and 460V Single-Frame Heat Recovery Systems



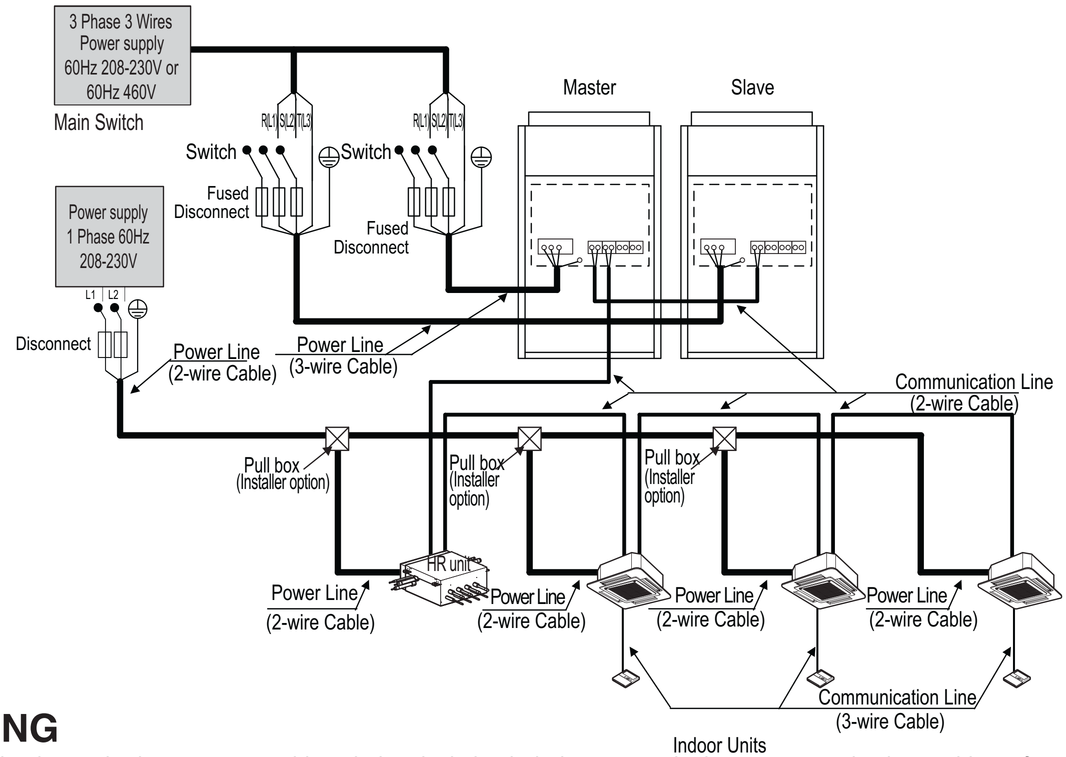
⚠WARNING

- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*



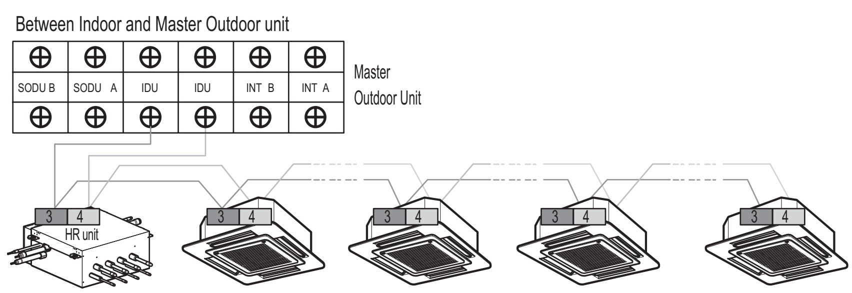
The GND terminal at the main PCB is a negative terminal for dry contact, not a ground.

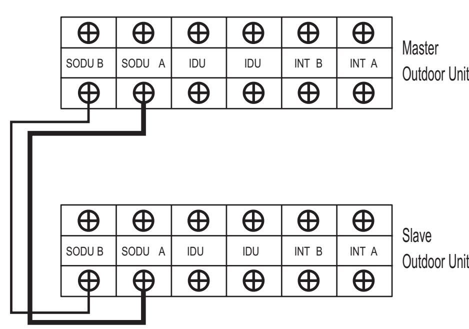
208-230V and 460V Dual-Frame Heat Recovery Systems



⚠WARNING

- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*

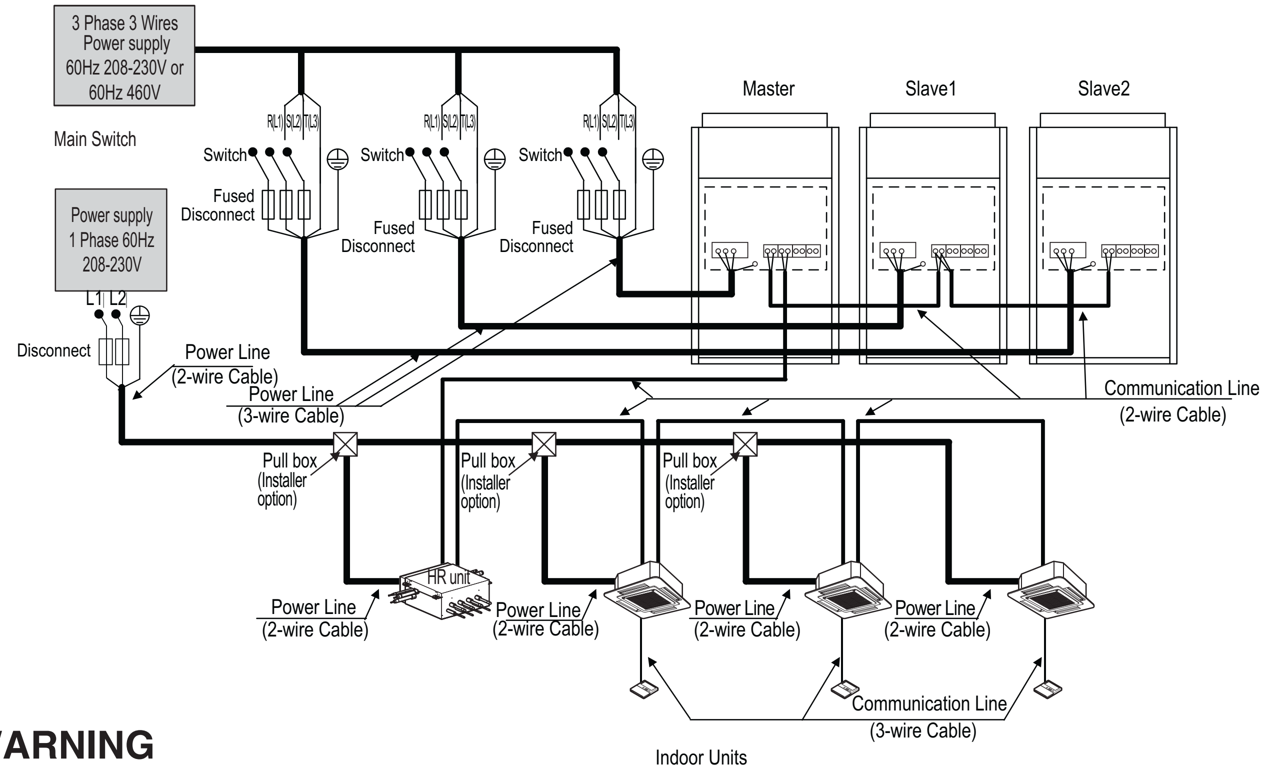




The GND terminal at the main PCB is a negative terminal for dry contact, not a ground.

• Make sure that terminal number of master and slave outdoor units match. (A-A,B-B)

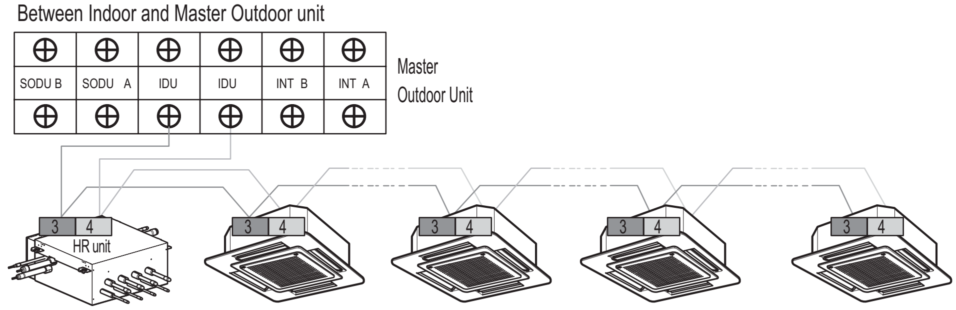
208-230V and 460V Triple-Frame Heat Recovery Systems

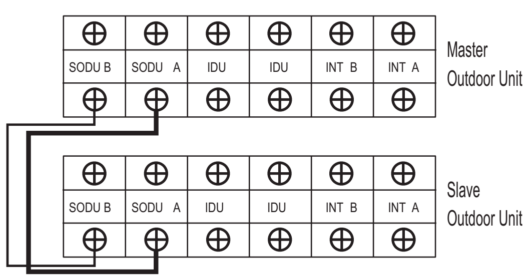


⚠ WARNING

- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. Ground the communication control cable at the outdoor unit only.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If the system operates in reversed phase, it may break the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. Operating the system in reverse phase may break the compressor and other unit components.*

Between Indoor and Master Outdoor unit



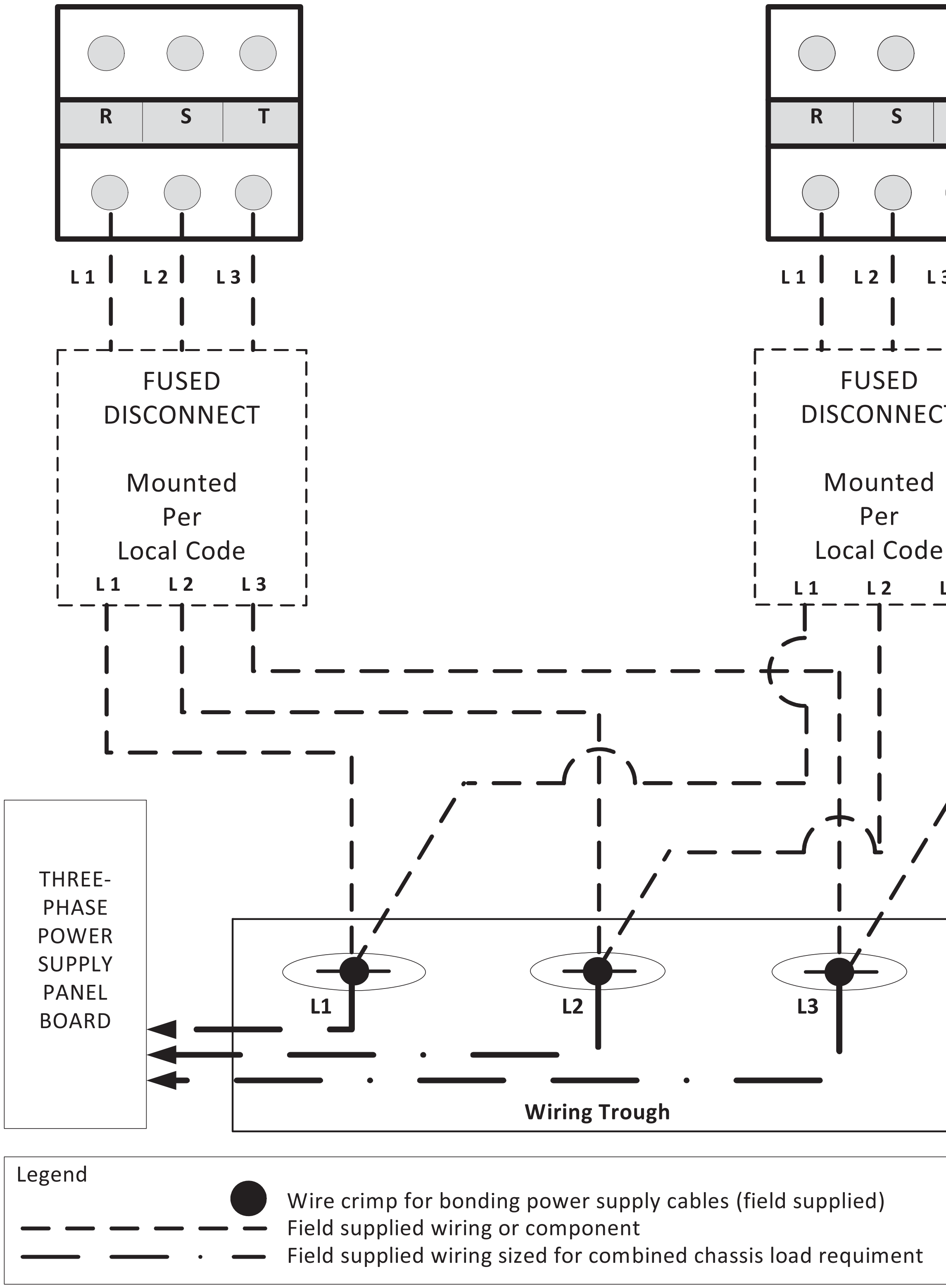


The GND terminal at the main PCB is a negative terminal for dry contact, not a ground line.

- Make sure that terminal number of master and slave outdoor units match. (A-A,B-B)

Dual-Frame Configuration

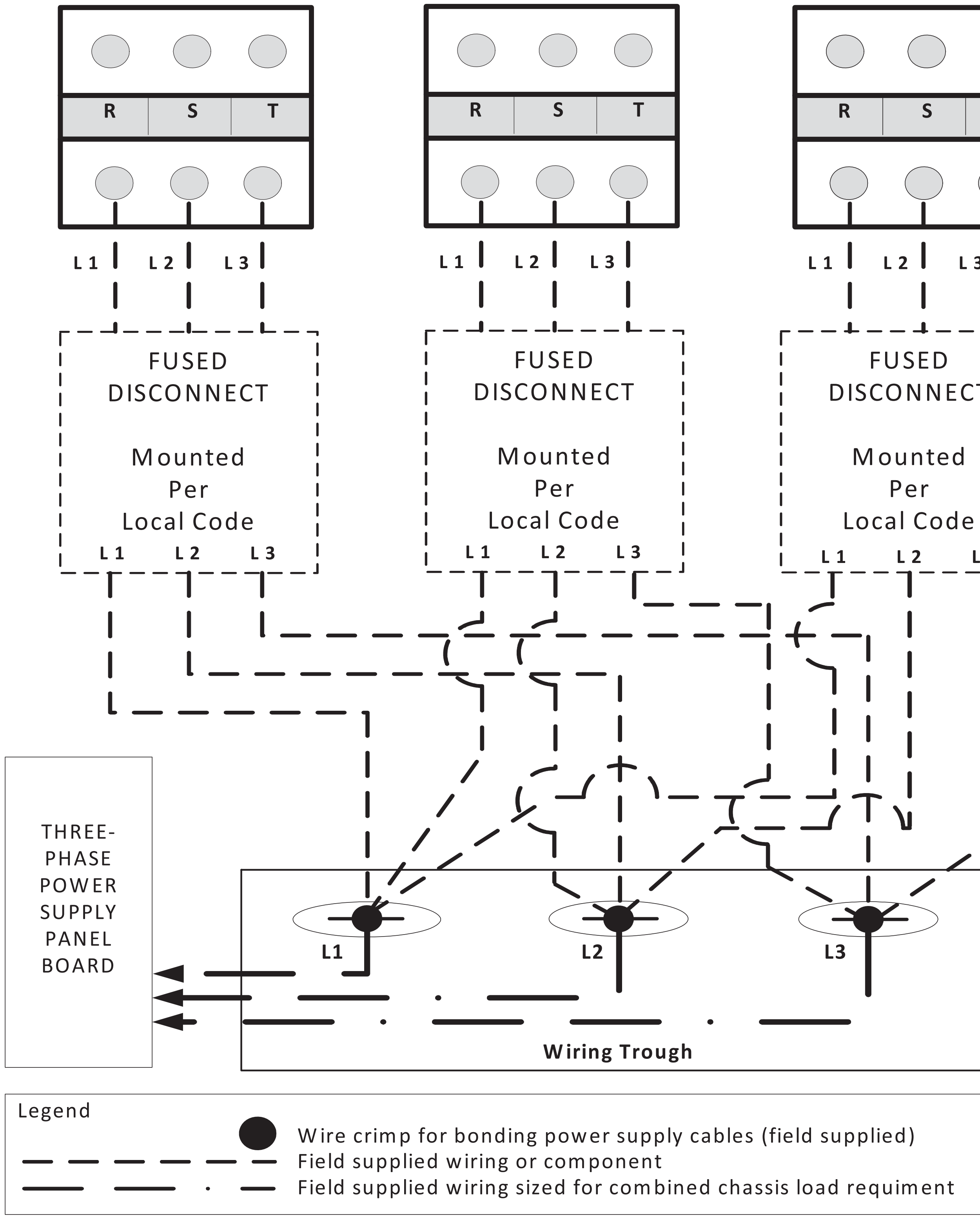
⚠ Note:
All wiring field must be engineered per local code.



Electrical and Communication Cable Connections

Triple-Frame Configuration

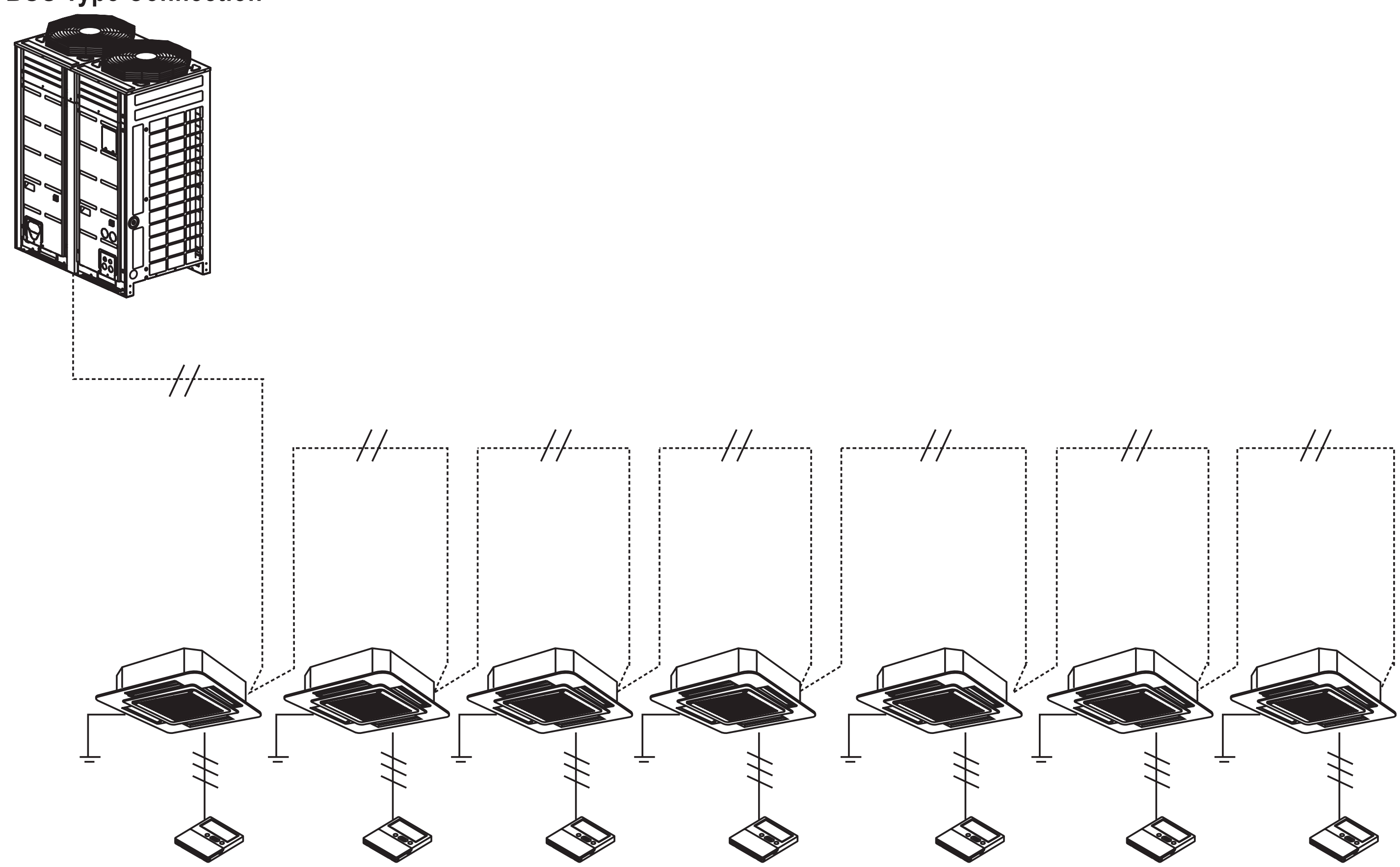
⚠ *Note:*
All wiring field must be engineered per local code.



Daisy Chain (BUS) Type

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

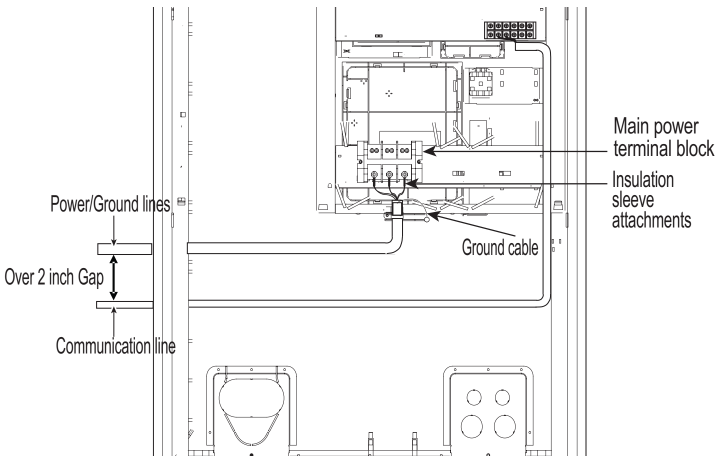
BUS Type Connection



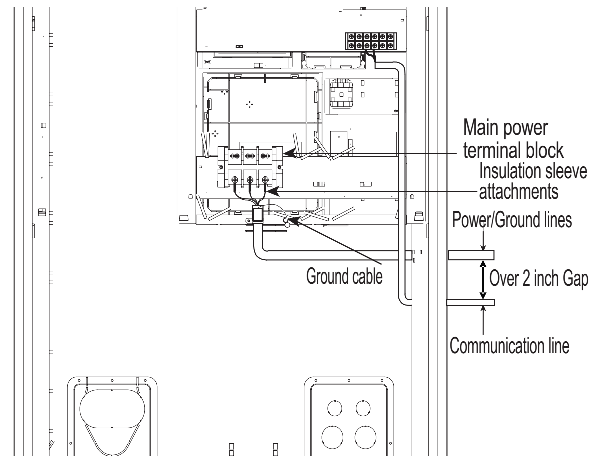
Note:
Improper system operation can occur if the communication cable is installed in a star type configuration.

Small-Frame Connections

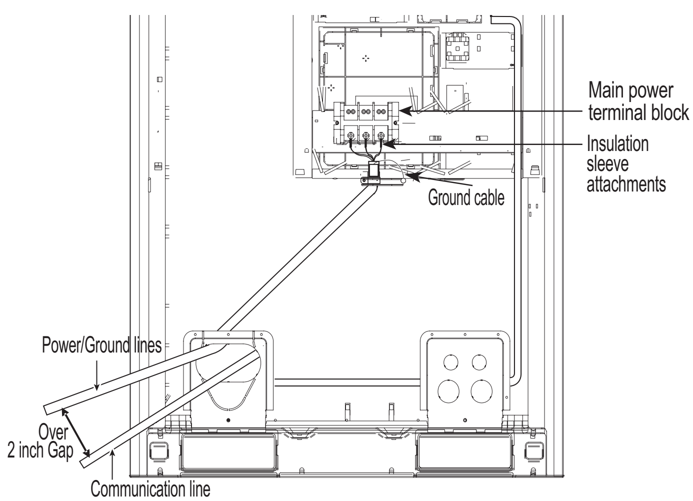
Left Side



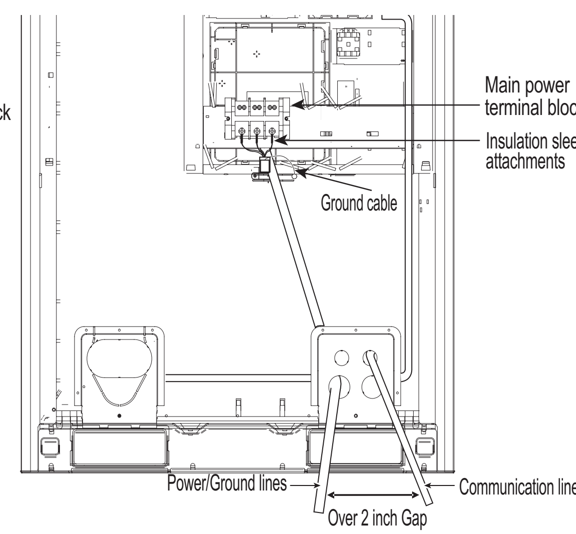
Right Side



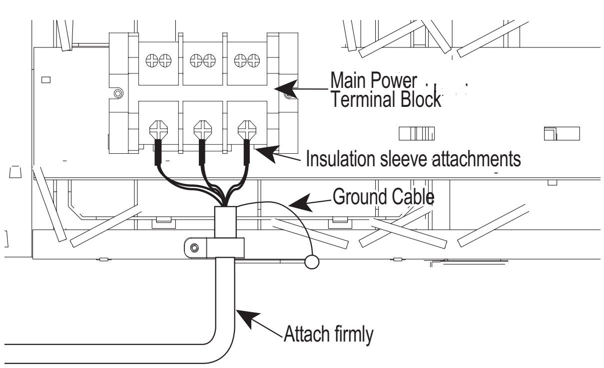
Front Side 1



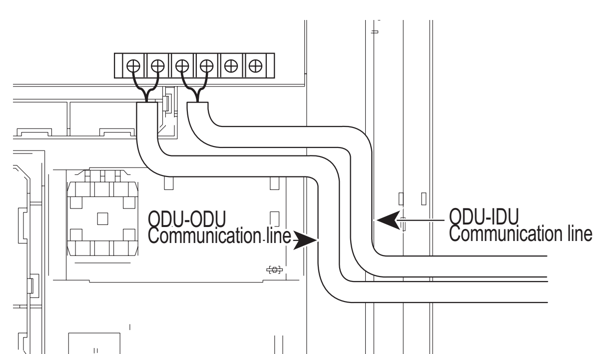
Front Side 2



Main Power Connection

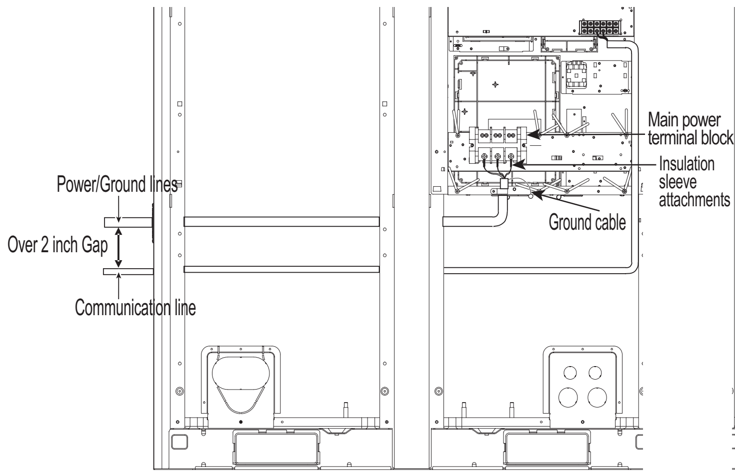


Main PCB Connection

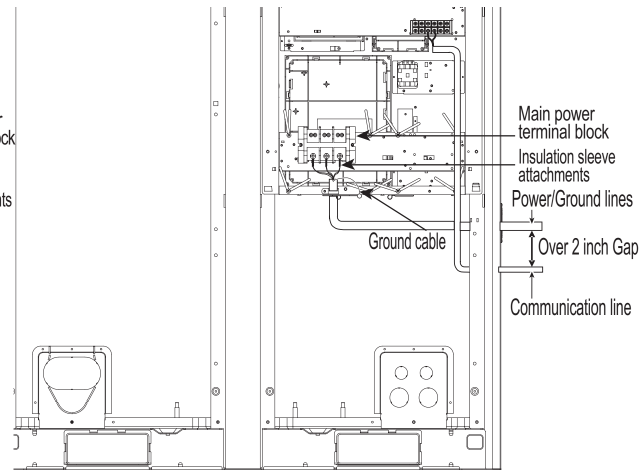


Large-Frame Connections

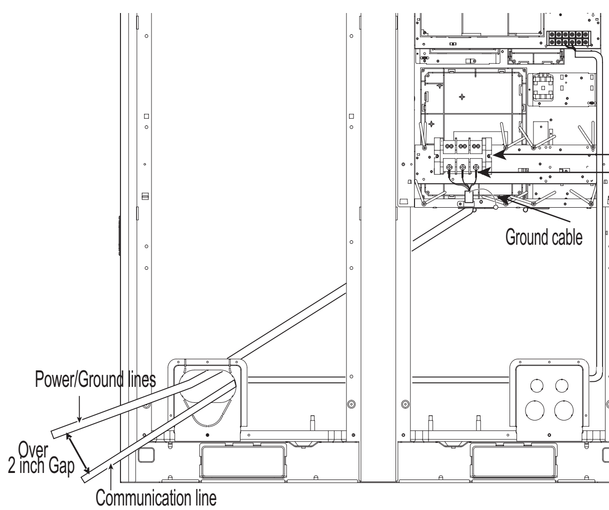
Left Side



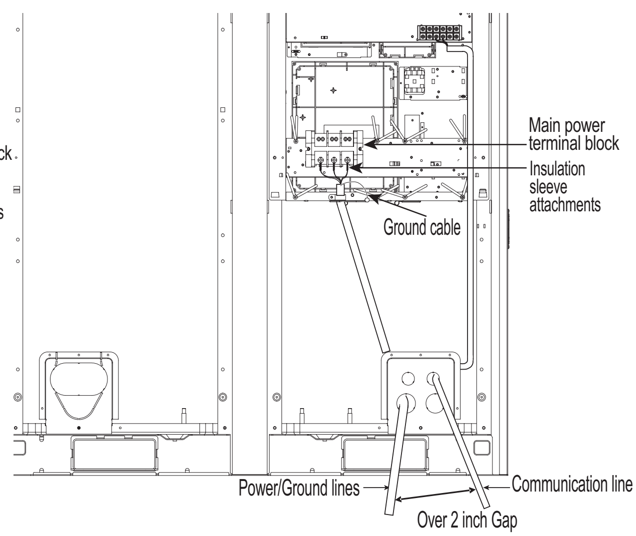
Right Side



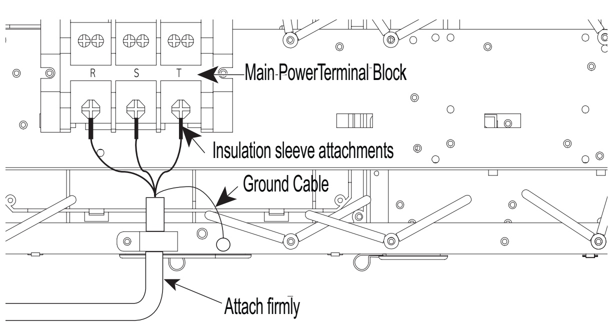
Front Side 1



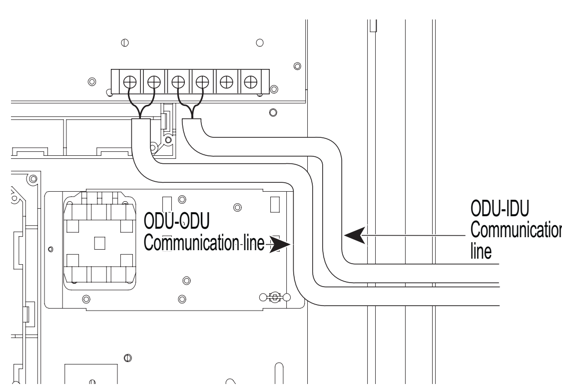
Front Side 2



Main Power Connection



Main PCB Connection



Heat Pump ARUN Series Dip Switch Settings

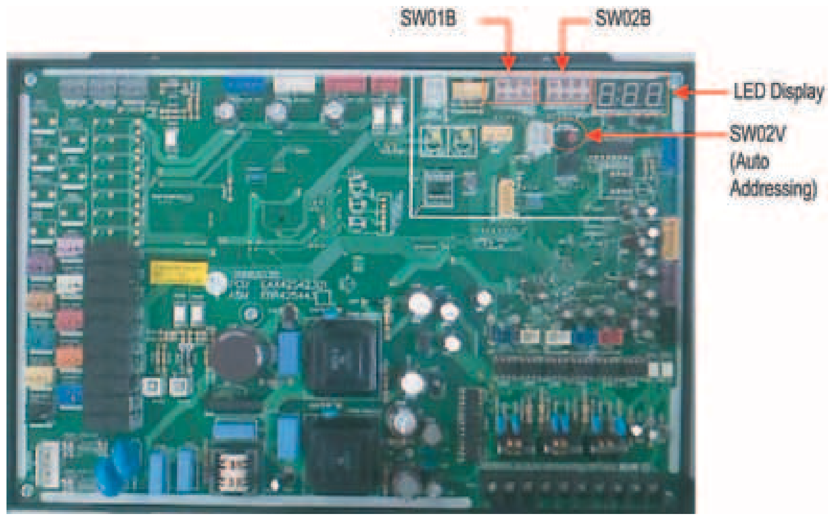
1. Location of Dip Switches on Main PCB.

2. Dip Switch Settings

- Dip switches should only be changed when the power to the outdoor units is OFF. Power reset is required every time the dip switch settings are changed.
- Set the dip switch, turn outdoor unit power ON, and check the Master unit Main PCB LED display to verify that the settings were entered correctly.

3. Check the Master Outdoor Unit Setting

- The setting value(s) appear sequentially on the LED within five (5) seconds after power is turned ON.



Sequence	Code	Description
1	12~15 (See table below)	Master unit model code
2		Slave1 unit model code
3		Slave2 unit model code
4		Slave3 unit model code
5	8~42HP (6~12 tons)	Total capacity in horsepower (master unit + slave unit[s])
6	2	Heat pump model
7	25	Normal mode display (If the dip switch is not set correctly, this number is not displayed.)
8	140	208 / 230V Heat pump model type
	160	460V Heat pump model type

Heat Pump Model Codes

Model Code	Capacity (Tons)	Unit	Refrigerant
12	6	Master and Slave	R410A
13	8		
14	10		
15	12		

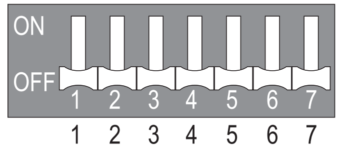
Note:
If the applicable dip switch is not set correctly, the unit may not operate properly.

ELECTRICAL SYSTEM INSTALLATION

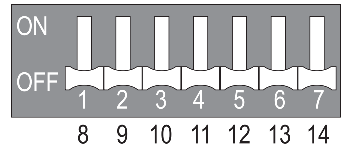
Heat Pump ARUN Series Dip Switch Settings

- Dip switch settings are applied only after the power is reset or the reset button is pressed.
- If the dip switch is changed when power is ON, the change will not be applied.

SW01B



SW02B



	Dip Switch	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Function	*Heating Capacity Up*	●													
	Indoor Unit Fan RPM Control		●												
	Auto Charge	●	●					●						X	X
	Refrigerant Check	●	●					●						X	●
	Integrated Test Operation (Cooling)	●	●					X						●	X
	Integrated Test Operation (Heating)	●	●					X						●	●
	Inverter Backup			●											
	Unit Backup				●										
	Adjusting EEV on Non-operating Indoor Unit	X	X			●	X	X							
	Adjusting Indoor Unit Target Subcool/Overheat	X	X			X	●	X							
	Adjusting EEV on Operating Indoor Unit	X	●			●	X	X							
	Dry Contact					●	●	X							
	Snow Removal								●	X					
	Forced Defrost								X	●					
	Snow Removal + Forced Defrost								●	●					
	Forced Overall Defrost							●							●
	Static Pressure Mode	X	X										X	●	X
	Night Low Sound Operation (Cooling Only)												●	X	●
	Night Low Sound Operation (Cooling / Heating)												●	●	●
	Pump Down										●				X
	Pump Out										●				●
	Forced Oil Return Operation	X	X					●							X
	Vacuum Mode											●	X	X	●
	Selector Fan / All OFF	X	X									●	●		X
	Outdoor Unit Address Setting												●	X	X
Outdoor Unit Setting	*Master Unit*					X	X	X							
	Slave 1 Unit					●	X	●							
	Slave 2 Unit					X	●	●							

⚠ *Note:*

1. *"X" indicates that the dip switch must be set to OFF. If not, the function may not work properly.*
2. *If the applicable dip switch is not set correctly, the unit may not operate properly.*
3. *Before executing the test function(s), check if the indoor units are operating. Only execute the test function(s) after all indoor units are off.*
4. *Auto test function does not work if only one indoor unit is connected to the system.*
5. *Cooling Only function does not work on ARUN Series Heat Pumps.*

ELECTRICAL SYSTEM INSTALLATION

Heat Recovery ARUB Series Dip Switch Settings

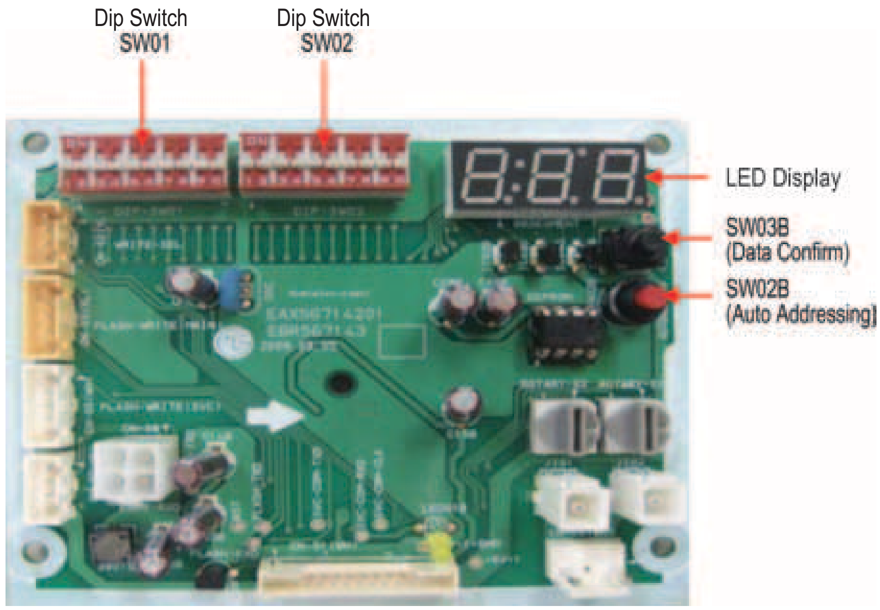
1. Location of Dip Switches on SUB PCB.

2. Dip Switch Settings

- Dip switches should only be changed when the power to the outdoor units is OFF. Power reset is required every time the dip switch settings are changed.
- Set the dip switch, turn outdoor unit power ON, and check the Master unit SUB PCB LED display to verify that the settings were entered correctly.

3. Check the Master Outdoor Unit Setting

- The setting value(s) appear sequentially on the LED within five (5) seconds after power is turned ON.



Sequence	Code	Description
1	190-193 (See table below)	Master unit model code
2		Slave1 unit model code
3		Slave2 unit model code
4	8~42HP (~12 tons)	Total capacity in horsepower (master unit + slave unit[s])
5	-	Cooling Only
6	2	Heat pump / heat recovery model
7	25	Normal mode display (If the dip switch is not set correctly, this number is not displayed.)
8	170	208 / 230V Heat recovery model type
9	190	460V Heat recovery model type

Heat Recovery Model Codes

Model Code	Capacity (Tons)	Unit	Refrigerant
190	6	Master and Slave	R410A
191	8		
192	10		
193	12		

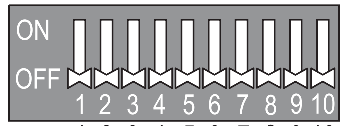
⚠ ***Note:***
If the applicable dip switch is not set correctly, the unit may not operate properly.

ELECTRICAL SYSTEM INSTALLATION

Heat Recovery ARUB Series Dip Switch Settings

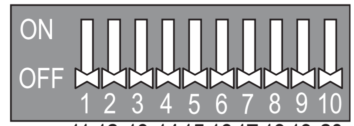
- Dip switch settings are applied only after the power is reset or the reset button is pressed.
- If the dip switch is changed when power is ON, the change will not be applied.

SW01B



1 2 3 4 5 6 7 8 9 10

SW02B



11 12 13 14 15 16 17 18 19 20

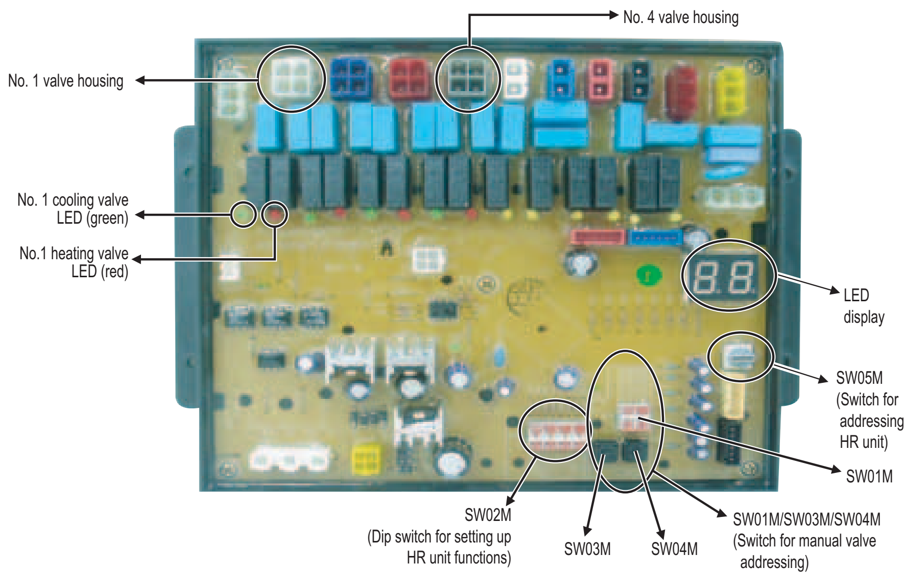
	Dip Switch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Function	*Inverter Backup*	●																			
	Const. 1 backup		●																		
	Unit Backup	●	●	●																	
	Night Low Sound Operation (Cooling / Heating)				●																
	Night Low Sound Operation (Cooling Only)					●															
	Snow Removal						●				X										
	Forced Defrost							●			X										
	Snow Removal + Forced Defrost						●	●			X										
	Adjusting EEV on Non-operating Indoor Unit												●	X							X
	Adjusting Indoor Unit Target Subcool/Overheat												X	●							X
	Adjusting EEV on Operating Indoor Unit												●	●							X
	Real-time Sensor Monitoring															●					X
	Overall Defrost Only																●				
	Static Pressure Mode																		●	X	X
	Pump Out										●		●	X							
	Pump Down										●		X	●							
	Vacuum Mode										●		●	●							
	Forced Oil Return Operation										●				X	●	X				
	4-way valve manual operation-upper, low OFF										X		X	X				X	X	X	●
	4-way valve manual operation-upper ON, low OFF										X		●	X				X	X	X	●
	4-way valve manual operation-upper OFF, low ON										X		X	●				X	X	X	●
	4-way valve manual operation-upper, low ON										X		●	●				X	X	X	●
	Auto pipe detection mode 1																	●			X
	Auto pipe detection mode 2														●			●			X
	Indoor unit pipe display										●				●	X	●				
	No. Indoor units connected to a branch of HR Unit										●				●	●	●				
	Auto Charge																	●	●	X	●
	Refrigerant Check																	X	X	●	●
	Integrated Test Operation (Heating)																	X	●	●	●
	Integrated Test Operation (Cooling)																	●	X	●	●
	Heating Capacity Up										●				●						
	Indoor Unit Fan RPM Control										●				●	●					
	Outdoor Unit Address Setting										●				X	●	●				
Outdoor Unit Setting	*Master Unit*								X	X											
	Slave 1 Unit								●	X											
	Slave 2 Unit								X	●											

⚠ *Note:*

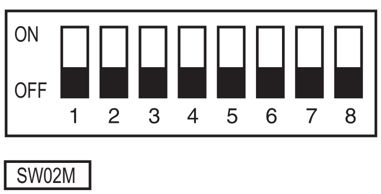
1. *"X" indicates that the dip switch must be set to OFF. If not, the function may not work properly.*
2. *If the applicable dip switch is not set correctly, the unit may not operate properly.*
3. *Before executing the test function(s), check if the indoor units are operating. Only execute the test function(s) after all indoor units are off.*
4. *Auto test function does not work if only one indoor unit is connected to the system.*

Setting up the Heat Recovery Unit (For Heat Recovery ARUB Series Only)

Heat Recovery Unit PCB Dip Switches.



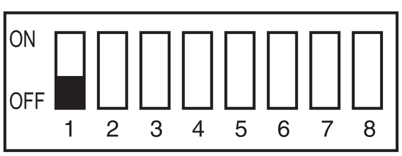
1. Main function of SW02M.



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")	Zone setting ("ON")
No. 8	Used only in factory production (preset to "OFF")	

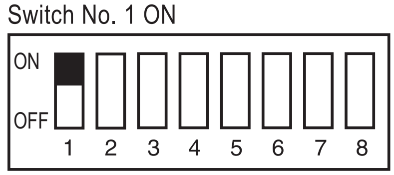
2. Selecting the heat recovery unit valve addressing method (pipe detection) (Auto / Manual).

Switch No. 1 OFF



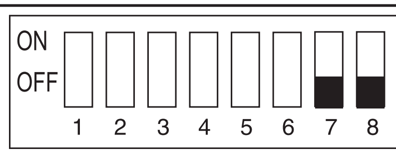
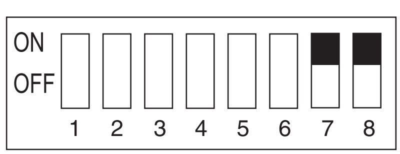
Auto

Switch No. 1 ON

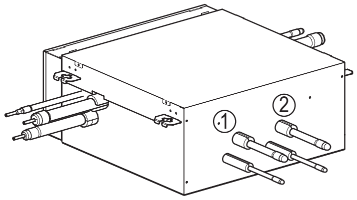
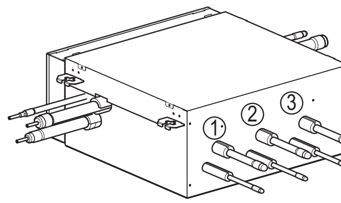
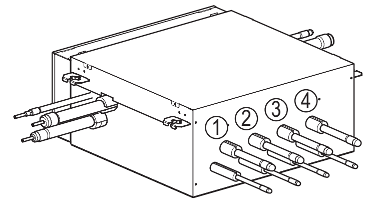
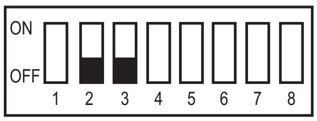
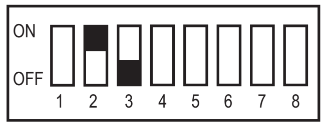
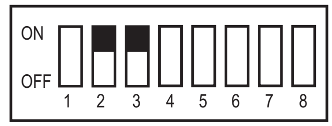
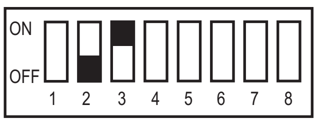
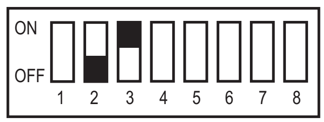
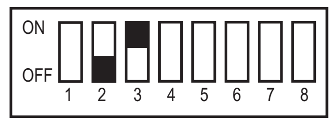
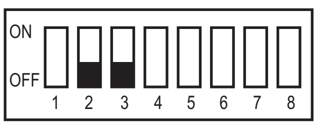
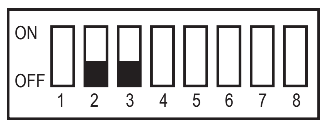
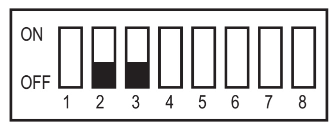
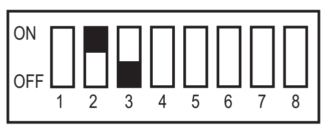
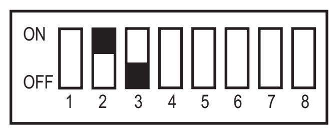
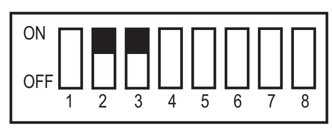


Manual

3. Zone control setting.

	Dip Switch Settings	
Normal Control		 SW01M
Zone Control		 SW01M Turn the dip switch of the zoned branch to on. Ex: Branches 1 and 2 are set to zone control.

4. 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			

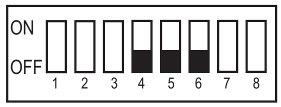
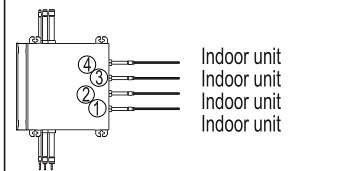
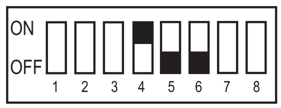
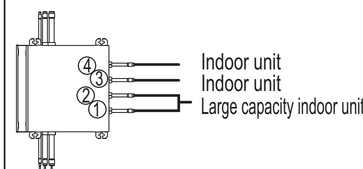
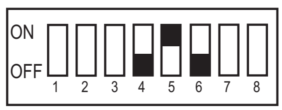
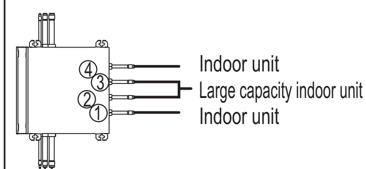
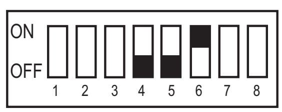
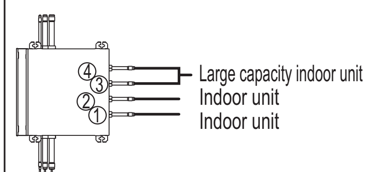
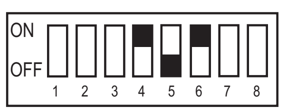
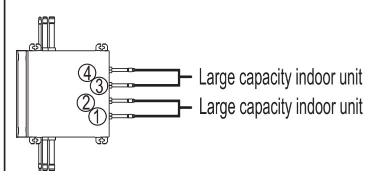
⚠ ***Note:***

Each heat recovery unit 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 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 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 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 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.*

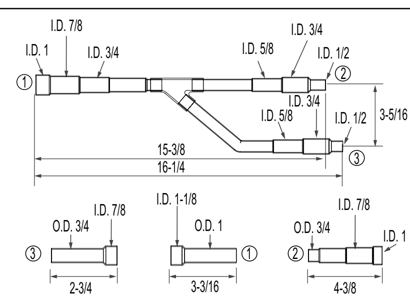
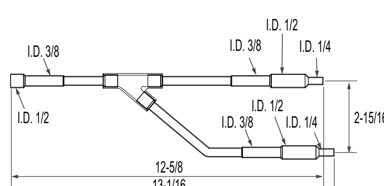
Heat Recovery Unit Dip Switch Settings (For Heat Recovery ARUB Series Only)

5. Setting the valve group.

	Dip Switch Setting	Example
No Valve Group Control		
No. 1, 2 Valve Control		
No. 2, 3 Valve Control		
No. 3, 4 Valve Control		
No. 1, 2 Valve Control No. 3, 4 Valve Control		

⚠ ***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

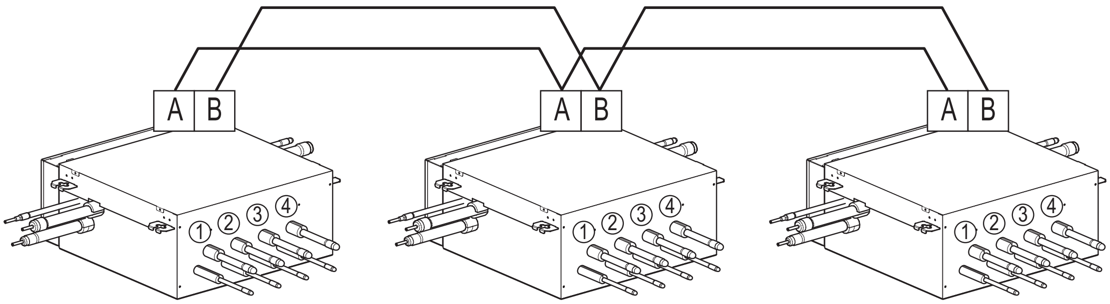
Models	Vapor pipe	Liquid pipe
ARBLN03321		

Heat Recovery Unit Dip Switch Settings (For Heat Recovery ARUB Series Only)

6. SW05M Function (Rotary switch for addressing heat recovery units).

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

Example: Installing three heat recovery units.

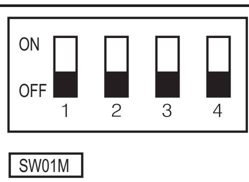
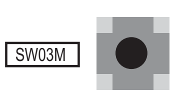
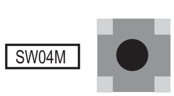


7. SW01M / SW03M / SW04M dip switch and tact switch for manual heat recovery unit valve addressing.

Use to manually address the heat recovery unit valve.

Normal Setting.

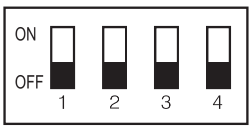
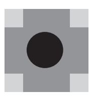
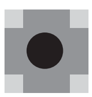
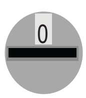
1. Set the address of the heat recovery valve to the central control address of the connected indoor unit.
   - SW01M: Selects the valve to address.
   - SW03M: Increases the ten (10) digit of the valve address.
   - SW04M: Increases the valve address by one (1).
2. Prerequisite for manual valve addressing: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

	Dip Switch No.	Setup
	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	Increases the ten (10) digit of the valve address
	SW04M	Increases the valve address by one (1)

Heat Recovery Unit Dip Switch Settings (For Heat Recovery ARUB Series Only)

Zone Setting.

1. Set the address of the heat recovery valve to the central control address of the connected indoor unit.
   - SW01M: Selects the valve to address.
   - SW03M: Increases the ten (10) digit of the valve address.
   - SW04M: Increases the valve address by one (1).
   - SW05M: Rotary switch.
2. Prerequisite for manual valve addressing: The central control address of each indoor unit must be preset at its wired remote controller.

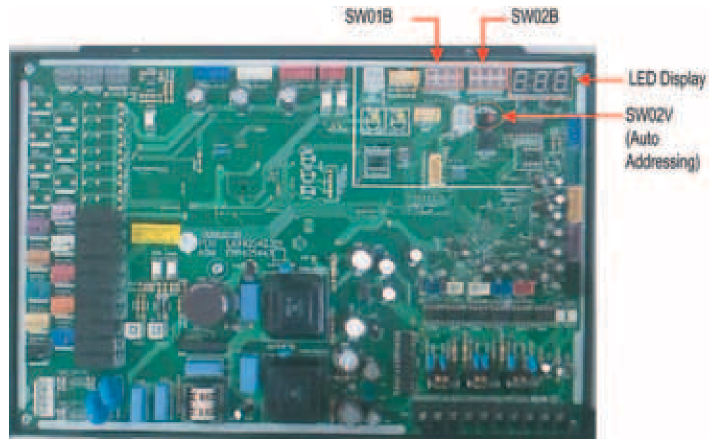
	Dip Switch No.	Setup
 SW01M	No. 1	Manual addressing valve No. 1
	No. 2	Manual addressing valve No. 2
	No. 3	Manual addressing valve No. 3
	No. 4	Manual addressing valve No. 4
SW03M 	SW03M	Increases the ten (10) digit of the valve address
SW04M 	SW04M	Increases the valve address by one (1)
SW05M 	SW05M	Manual addressing zoned indoor units

Auto Addressing—ARUN Series Heat Pump Systems Only

Addresses of all indoor units can be set by using the auto addressing procedure.

1. Supply power to the master and slave outdoor units and indoor units. Wait three (3) minutes.
2. Press the red button on the outdoor units for five (5) seconds.
3. The number “88” displays on the LED of the master outdoor unit PCB.
4. Wait two (2) to seven (7) minutes, depending on the number of connected indoor units.
5. LED displays for thirty (30) seconds the number of indoor units that have successfully completed the auto addressing procedure.
6. The address of each indoor unit is also shown on the wired remote control display (CH00, CH01, CH02...CH06 indicates address number of each connected indoor unit).

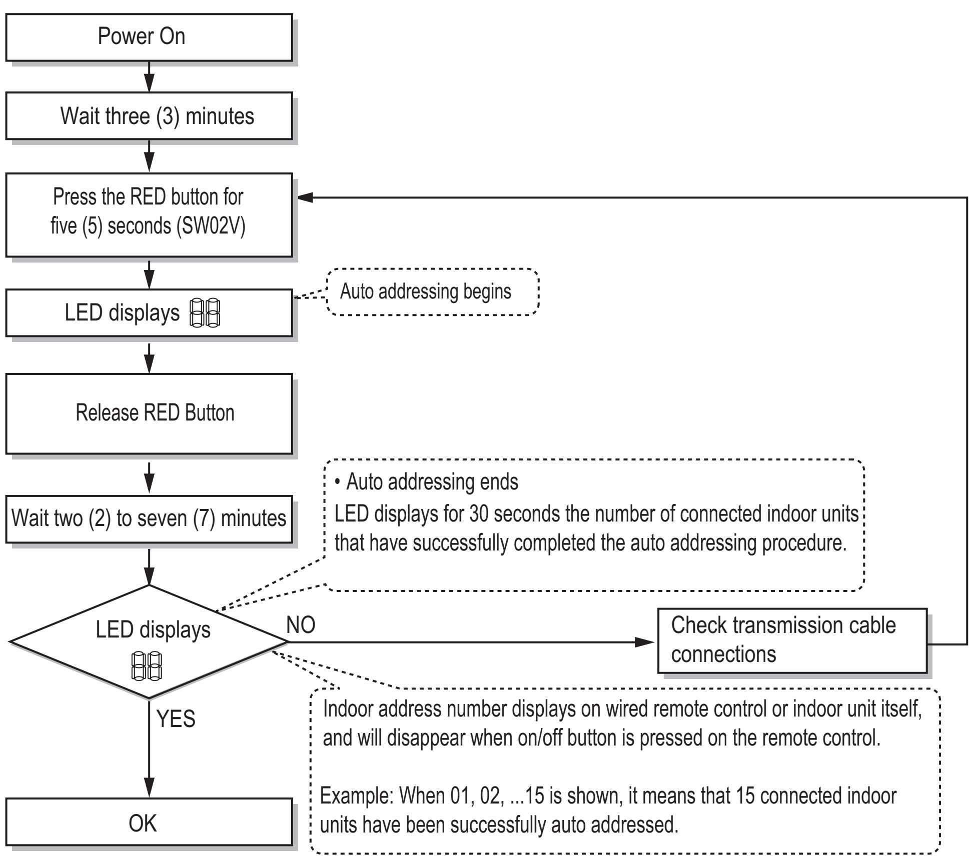
Master Outdoor Unit Main PCB.



⚠ *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 outdoor units and indoor units; if power is not supplied, an operation error will occur.*
- *Auto addressing is only possible on the main PCB of the outdoor unit (master unit if dual / triple frame system).*
- *When power is turned onto the outdoor units and indoor units, wait three (3) minutes to improve communication to the indoor units before auto addressing can be performed.*

Auto Indoor Unit Addressing Procedure.

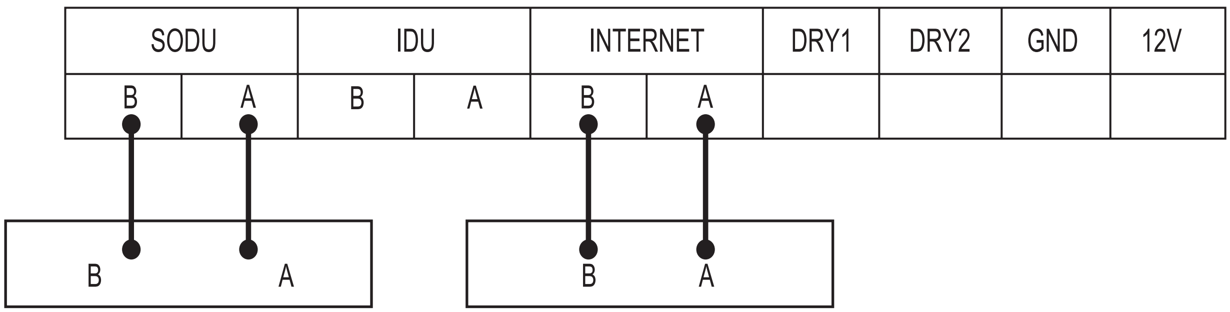


Precommissioning

Group Number Setting for Indoor Units—ARUN Series Heat Pump Systems Only

1. Verify that the power to the entire system (outdoor units, indoor units) is off. If not, turn off.
2. Connect the transmission lines to the INTERNET terminal on the outdoor 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 one simple central controller, set the group ID from "0" to "F."

Terminal block of the main PCB on the Outdoor Unit



Example: 1 F Group Number Setting.
• Number indicates group number.
• Letter indicates indoor unit number.

Group Control 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)

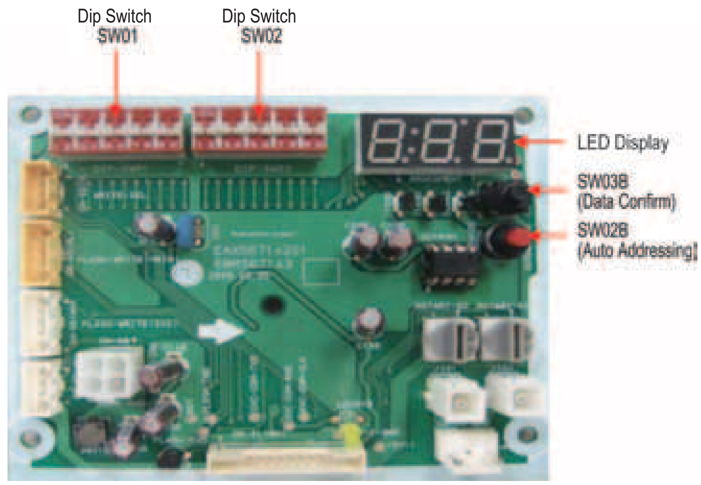
1. Auto addressing the indoor units.
2. Auto pipe detection.
3. Manual pipe detection (Execute if auto pipe detection fails).

1. Auto addressing the indoor units.

Addresses of all indoor units can be set by using the auto addressing procedure.

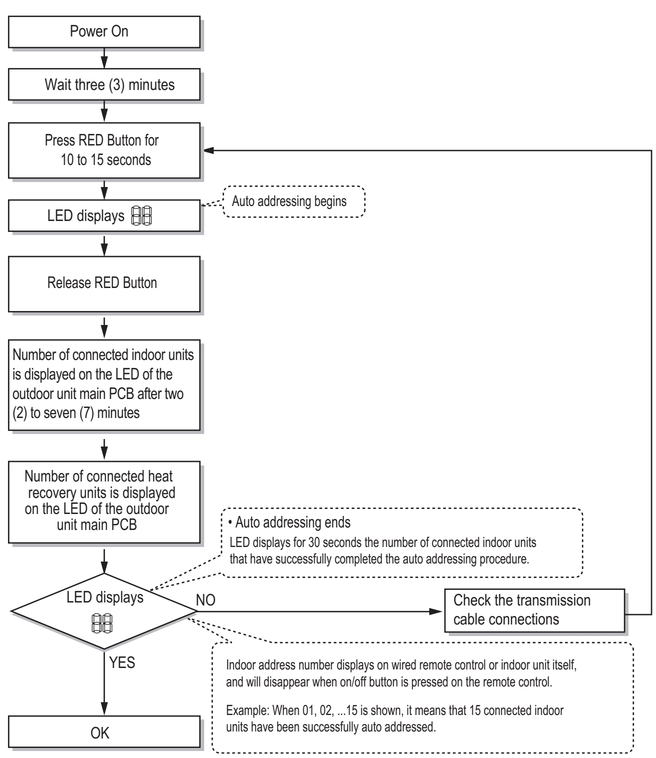
1. Supply power to the master and slave outdoor units and indoor units. Wait three (3) minutes.
2. Press the red button on the outdoor units for ten (10) to fifteen (15) seconds.
3. Number “88” displays on the LED of the master outdoor unit PCB.
4. Wait two (2) to seven (7) minutes, depending on the number of connected indoor units.
5. LED displays for thirty (30) seconds which indoor units have successfully completed the auto addressing procedure.
6. The address of each indoor unit is also shown on the wired remote control display (CH00, CH01, CH02...CH06 indicates address number of each connected indoor unit).

Master Outdoor Unit Sub PCB.



Note:
- *If the indoor unit PCB needs to be replaced, the auto addressing procedure needs to be performed again. (At that time, please check about using independent power module to any indoor unit.)*
- *Always execute the auto addressing procedure with the power supplied to the outdoor units and indoor units; if power is not supplied, an operation error will occur.*
- *Auto addressing is only possible on the main PCB of the outdoor unit (master unit if dual / triple frame system).*
- *When power is turned onto the outdoor units and indoor units, wait three (3) minutes to improve communication to the indoor units before auto addressing can be performed.*

Auto Addressing Procedure.



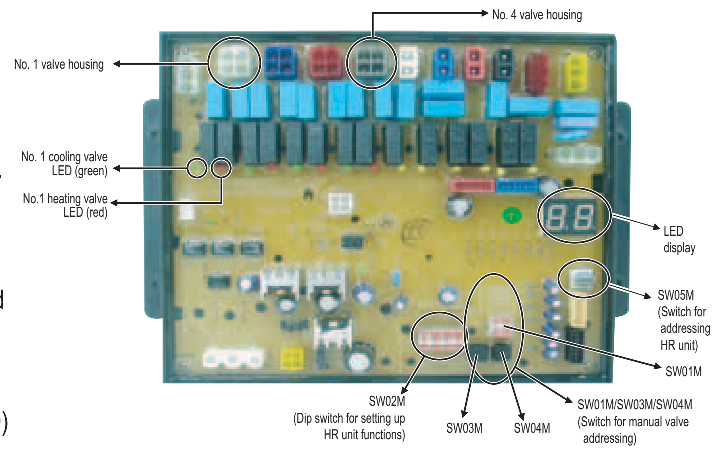
Auto Addressing—ARUB Series Heat Recovery Systems Only

2. Auto pipe detection.

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

1. Verify that No. 1 of SW02M on the heat recovery unit PCB is off.
2. Confirm that the settings on Nos. 2 and 3 of SW02M correspond to the number of connected indoor units.
3. Reset the power to the heat recovery unit PCB.
4. Set dip switches SW01 and SW02 on the outdoor unit PCB.
   - If the outdoor temperature is below 59°F, set No. 17 to on.
   - If the outdoor temperature is above 59°F, set Nos. 14 and 17 to on.
5. Reset the power to the outdoor unit.
6. Wait three (3) minutes.
7. Press SW03M on the outdoor unit main PCB for five (5) seconds.
8. The number of connected connected heat recovery units is displayed on the LED. Example: If installing four heat recovery units, the LED will read "04."
9. The code "88" will display on the LED of the outdoor unit main PCB.
10. The auto pipe dectection procedure will operate from five (5) to thirty (30) minutes, depending on the number of connected indoor units and the outdoor temperature.
11. When auto pipe detection is complete, the number of connectedf indoor units will display on the LED of the outdoor unit PCB for about one (1) minute.
12. The number of connected indoor units to each heat recovery unit is displayed on the heat recovery unit itself.

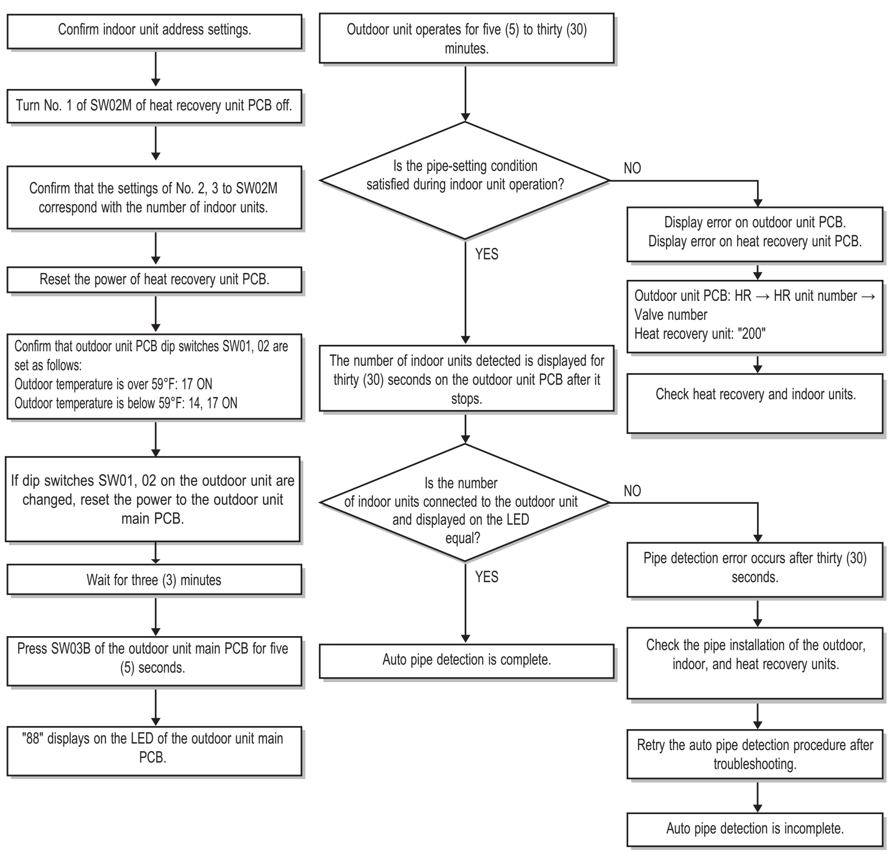
Heat Recovery Unit PCB.



⚠ *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 Procedure.



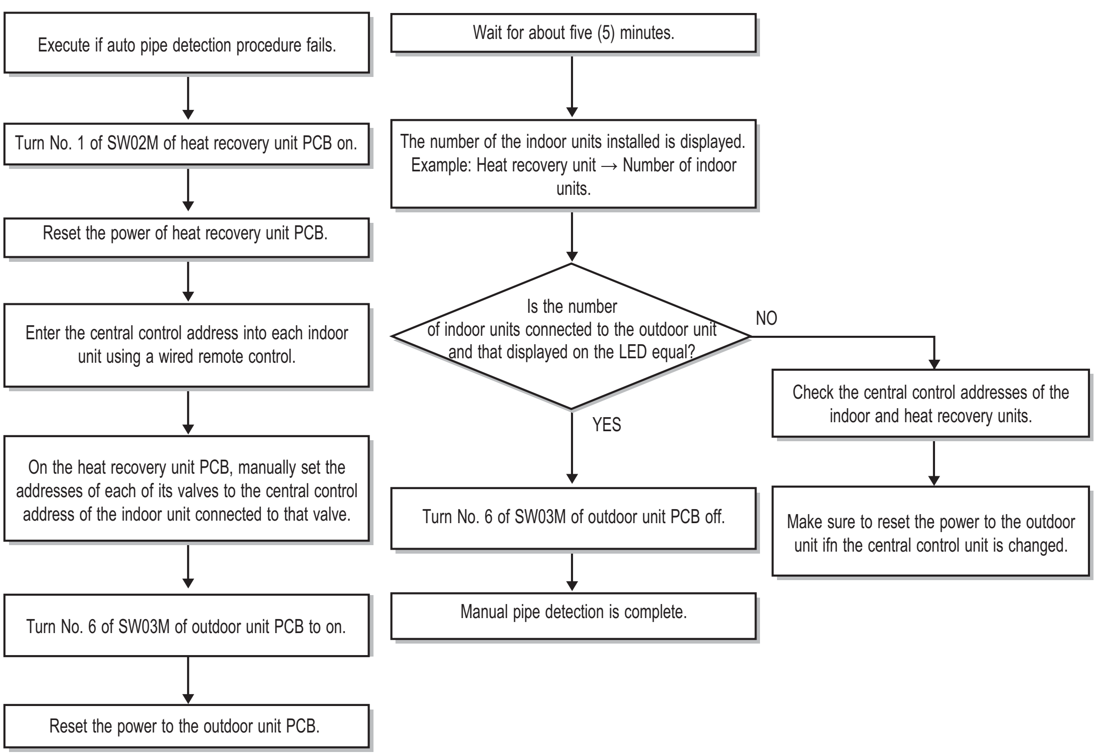
Note:
An audible indication may occur when operation mode changes from heating to cooling; this audible indication does not occur during normal operation.

Note:
1. *The auto addressing and auto pipe detection procedures must be performed again whenever the indoor and heat recovery unit PCBs are replaced.*
2. *Error No. 200 will display if the number of auto addressed indoor units is different than the actual number of connected indoor units.*
3. *If auto pipe detection fails, reset the outdoor unit(s) and peform the procedure again.*
4. *If auto pipe detection fails a second time, perform the manual pipe detection procedure. (If auto pipe detection is successfully completed, manual pipe detection is not required.)*
5. *To store the pipe detection procedure results automatically, do not turn off the main outdoor unit PCB for five (5) minutes after the procedure has been completed.*

3. Manual pipe detection.

1. Enter the central control address to each indoor unit using its wired remote controller.
2. Switch on No. 1 of SW02M of the heat recovery unit.
3. Reset the power to the heat recovery unit PCB.
4. On the heat recovery 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 of the outdoor unit PCB.
6. Reset the power to the outdoor unit PCB.
7. The number of connected indoor units will display after about five (5) minutes. (Heat recovery unit → number of connected indoor units.
8. Switch off No. 6 of SW03M on the outdoor unit PCB.
9. Reset the power to the outdoor unit and heat recovery unit PCBs.
10. Manual pipe detection procedure is complete.

Manual Pipe Detection Procedure.



PRECOMMISSIONING

Manual Addressing—ARUB Series Heat Recovery Systems Only

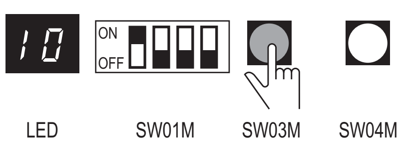
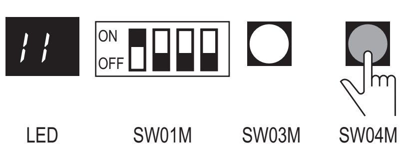
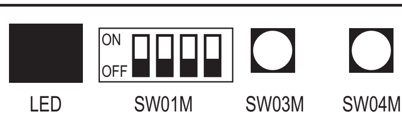
⚠ *Note:*

1. *If a central controller is not installed, leave the address data alone until installer sets the central control address as desired.*
2. *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 unit pipe address following the central control address of the indoor unit.)*
3. *Central controller addresses must be set manually at each individual controller.*
4. *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.)*
5. *Change the manual pipe settings through the heat recovery unit PCB.*
6. *An error indicates that the manual pipe detection procedure was not completed properly.*
7. *To store the pipe detection procedure results automatically, do not turn off the main outdoor unit PCB for five (5) minutes after the procedure has finished.*

Manual Pipe Detection Example (Non-zone Setting).

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

Prerequisite for manual pipe detection: The central control address of each indoor unit must be preset differently using its wired remote control.

No.	Display / Setup	Description
1	 LED, SW01M (ON/OFF), SW03M, SW04M	Operation: None Display: None
2	 00 LED, SW01M (ON/OFF), SW03M, SW04M	Operation: Turn dip switch No. 1 on to address valve No. 1. Display: Existing value saved in EEPROM is displayed on LED.
3	 10 LED, SW01M (ON/OFF), SW03M, SW04M	• Operation: Set the “10” digit of the Group High data number of the wired remote control connected to the corresponding indoor unit to the valve No. 1 by pressing left tack switch. • Display: Digit increases with the number of times the tack switch is pressed, shown on left LED.
4	 11 LED, SW01M (ON/OFF), SW03M, SW04M	• Operation: Set the “1” digit of the Group Low data number of the wired remote control connected to the corresponding indoor unit to the valve No. 1 by pressing right tack switch. • Display: Digit increases with the number of times the tach switch is pressed; shown on right LED.
5	 LED, SW01M (ON/OFF), SW03M, SW04M	• Operation: Turn dip switch No. 1 off to save the address of valve No. 1 • Display: “11” displayed on LED disappears

⚠ *Note:*

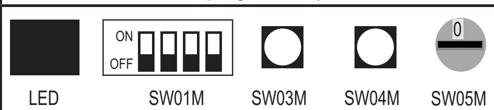
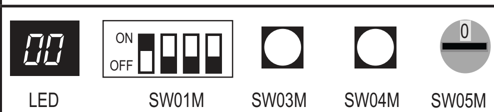
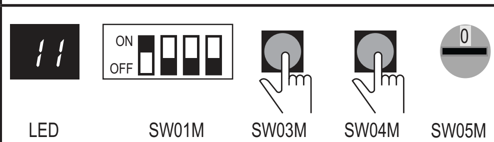
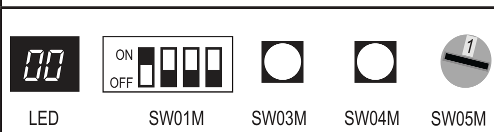
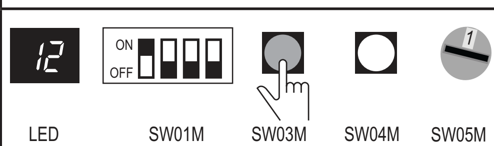
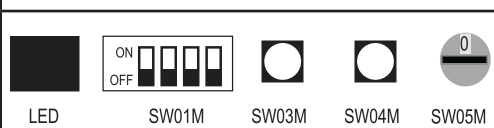
- *The procedure described above must be performed for all heat recovery unit valves.*
- *Valves that do not have connected indoor units should be addressed with a number that has not been used. (Valves will not work if the address numbers are the same.)*

Manual Pipe Detection Example (Zone Setting).

Zone control: When two (2) or more indoor units are connected to one valve of the heat recovery unit. For this application, set the controls with multiple indoor connections by using the rotary switch; i.e., only the rotary switch changes from same valve set condition and set indoor units connection.

1. Set the dip switch on the corresponding valves and the rotary switch to “0”.
2. Set the number by using the tact switch.
3. If additional indoor units are connected to one heat recovery unit valve, increase the rotary switch setting by one (1) and set the number by using the tact switch.
4. To verify the number of the corresponding valve, turn the dip switch to on and set the number on the rotary switch.
5. One heat recovery unit valve can support up to eight (8) indoor units per port (rotary switch settings 0~7). An error will display if more than eight (8) indoor units per heat recovery valve are set with the rotary switch.
6. Return the rotary switch to its original settings (heat recovery unit number settings) after all pipe settings are complete.
7. *Manual pipe detection is only required if auto-pipe detection fails. Each indoor unit should be given an address. If some indoor units off a single port of a heat recovery unit are not addressed, the heat recovery unit will only recognize these indoor units as an “FF” address, which is the address of a group of indoor units.*

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

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 “10” digit of the Group High data number of the wired remote control connected to the corresponding indoor unit to the valve No. 1 by pressing left tack switch. • Display: Digit increases with the number of times the tack switch is pressed, shown on left LED.
4		• Operation: Set SW05M to “1”. • Display: Former set value is shown on LED.
5		• Operation: Set SW03M, SW04M, and SW05M to “1”. • Display: Set value is shown on LED.
6		• Operation: Turn dip switch No.1 to off to save the address of valve No. 1. • Display : LED is blank.
7		• Operation : Addressing the return valve of the heat recovery unit. • Display: LED is blank.

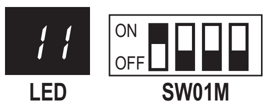
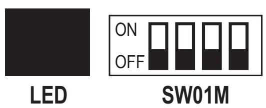
⚠ *Note:*

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

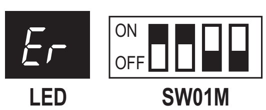
Manual Addressing—ARUB Series Heat Recovery Systems Only

Checking the Pipe Detection Procedure Result at the Heat Recovery Unit.

Example: An indoor unit with a central control address of “11” is connected to heat recovery unit valve No. 1.

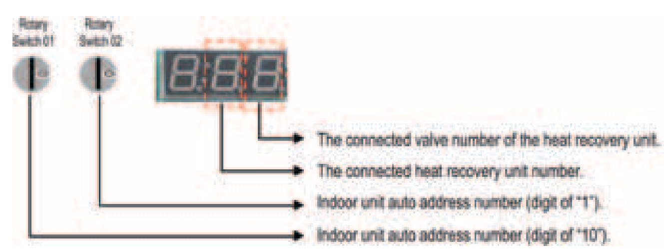
No.	Display / Setup	Description
1		• Operation: Turn dip switch No. 1 to ON. • Display: “11” displays on LED.
2		• Operation: Turn dip switch No. 1 to OFF. • Display: LED is blank.

Identifying the Manual Valve Address

No.	Display / Setup	Description
1		• Operation: More than two (2) dip switches are on. • Display: LED displays “Er.”

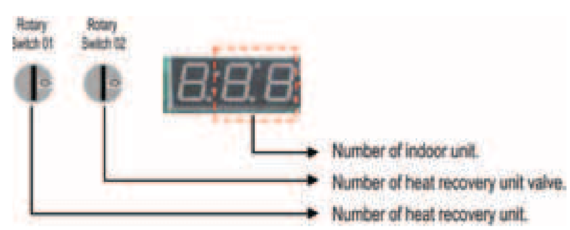
Checking the Pipe Detection Procedure Result at the Outdoor Unit.

1. Wait for five (5) minutes after the pipe detection procedure is complete.
2. Turn dip switches Nos. 10, 14, and 16 of the master outdoor unit SUB PCB to on.
3. Check the LED display and the settings on rotary switches 01 and 02.



Setting the Master Indoor Unit for Zone Setting Applications.

1. Turn dip switches 5, 6, and 10 at the master outdoor unit to off.
2. Set the left rotary switch to the heat recovery unit number. (Rotary switch No. "0" → Heat recovery unit No. "1".)
3. Set the right rotary switch to the indoor unit number. (Rotary switch No. "0" → Heat recovery unit branch No. "1".)
4. The master indoor unit number to that heat recovery unit displays on the LED. (Default display is "00".)
5. Press the black button; the indoor unit number will increase every one (1) second.
6. To set the master indoor unit, press the red button for 1.5 seconds after it stops blinking.



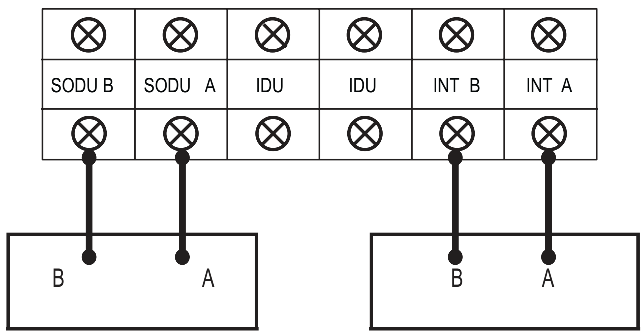
Note:

- *After the power is turned on, wait for eighty (80) seconds before setting the master indoor unit.*
- *Any zone and master indoor unit settings will not be stored in the EEPROM after system is auto addressed.*
- *If central control is present, then setting the master indoor unit for zoning applications is not possible.*

Setting Indoor Unit Group Numbers.

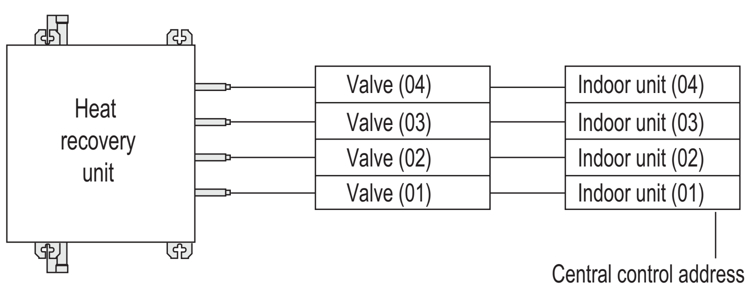
1. Verify that the power to the entire system (outdoor units, heat recovery units, indoor units) is off. If not, turn off.
2. Connect the transmission lines to the INTERNET terminal on the outdoor unit PCB, matching polarity with polarity (A → A, B → B).
3. Turn the power to the entire system on.
4. 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 one simple central controller, set the group ID from "0" to "F."

Terminal Block of the Main PCB on the Outdoor Unit



Group Control 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)

Note:
If manual addressing, the heat recovery unit valve address and the central control address of its corresponding indoor unit should be set using the same number.



System Test Run Checks

1	Check for refrigerant leaks and loose power or transmission wiring.
2	Using a 500V megger meter, verify that there is ≥2 MΩ between the power supply terminal block and ground terminal. Do not operate the system if <2 MΩ is measured. **CAUTION** *Do not perform the megaohm check over the terminal control board; it will destroy it.* *Immediately after outdoor unit install or if the system has been shut off for an extended period, insulation resistance between the power supply terminal board and the ground terminal may decrease due to refrigerant accumulating in the compressor(s).* To increase insulation resistance and help evaporate any accumulated refrigerant, turn on the main power supply and energize the crankcase heater for ≥six (6) hours.
3	• Verify that the low/high pressure common pipe, the liquid pipe, and the vapor pipe valves are fully opened. • Tighten caps.
4	• Check for auto addressing errors. • Verify that indoor units, remote controllers, or outdoor unit LEDs are not displaying any error codes.

Test Run Step Functions

Step 0: Verify command signals. Select function to be executed during the test run.

Step 1: Examine the outdoor unit and indoor unit sensors to make sure they are operating normally.

Step 2: Perform an integrated test run procedure to verify that the system and all system components are operating normally.

Step 3: Check sensors while system operates in real-time.

Piping Connections

- Inspect liquid and vapor piping connections.
- Verify that the liquid and gas pipes are not connected to each other.

Note:

Main power to the outdoor units.

- *Ensure main power is supplied to the outdoor unit during prime operating seasons (cooling / heating seasons).*
- *Power the outdoor unit ≥six (6) hours to preheat the crankcase heater before performing the test run. If the crankcase heater is not preheated and the outdoor temperature is <50°F, the compressor may burn out during operation.*

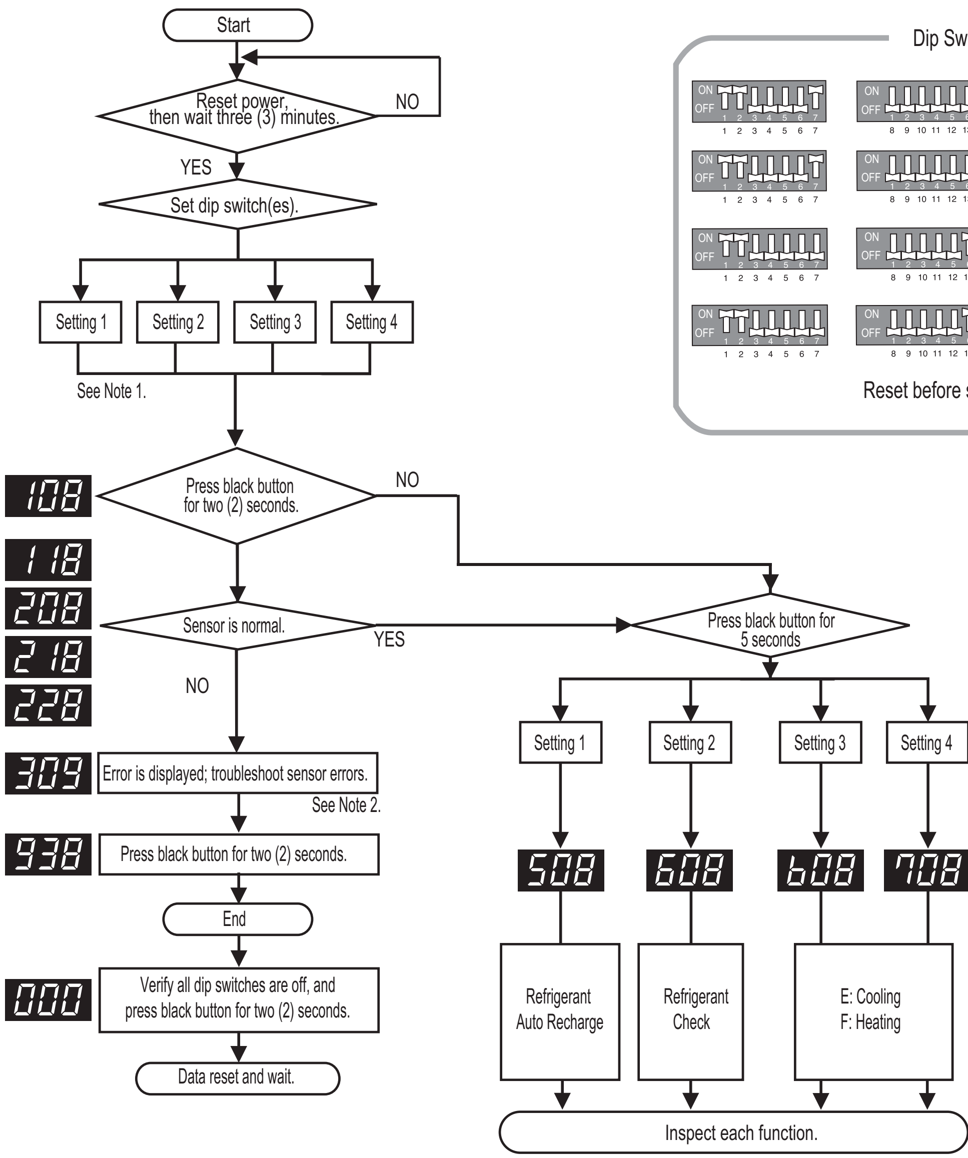
Solving Test Run Errors

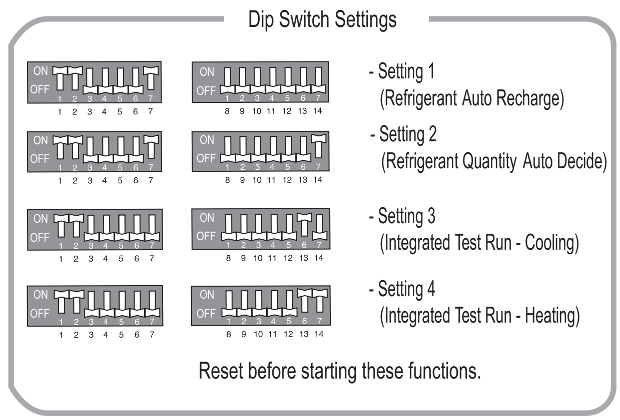
Main Component	Problem	Cause	Solution
Compressor	Not operating	Motor insulation is broken.	Check resistance between terminals and frames.
		Strainer is clogged.	Clean or change strainer.
		Oil is leaking.	Check oil amount after opening oil port.
	Stops during operation	Motor insulation failure.	Check resistance between terminals and frame.
	Abnormal sound during operation	R (L1) - S (L2) - T (L3) are improperly connected.	Check R (L1) - S (L2) - T (L3) compressor connections.
Outdoor Fan	High pressure error during cooling operation.	Motor has failed. Ventilation around outdoor heat exchanger is poor.	Turn off outdoor units, then check outdoor fan operation. Remove any obstacles around the outdoor units.
Outdoor EEV	Heating operation failure; frequent defrost mode operation.	Bad connector contact.	Check the connections.
	No operating sound after power is turned on.	Coil has failed.	Check the resistance between the terminals.
	Heating operation failure; outdoor unit heat exchanger is frozen.	EEV is clogged.	Service is necessary.
	Low pressure or discharge temperature error.		

When a system error occurs, the error code is displayed on the indoor unit or remote control display. For detailed information please refer to the Troubleshooting section on pages 209-308.

Sensor Check Function for ARUN Series Heat Pump Systems

Sensor check function determines if the indoor and outdoor units are correctly reading the current temperature(s). There are three (3) indoor and ten (10) outdoor temperature sensors.[1] Two (2) outdoor unit pressure sensors are used along with Refrigerant Auto Recharge and Refrigerant Check functions to determine sensor error.[2]





Number of temperature sensors differs according to frame size.

	Small-Frame Units (One Compressor)	Large-Frame Units (Two Compressors)
Number of Sensors	6	7

Note 1: Each step is displayed on the Main PCB LED.

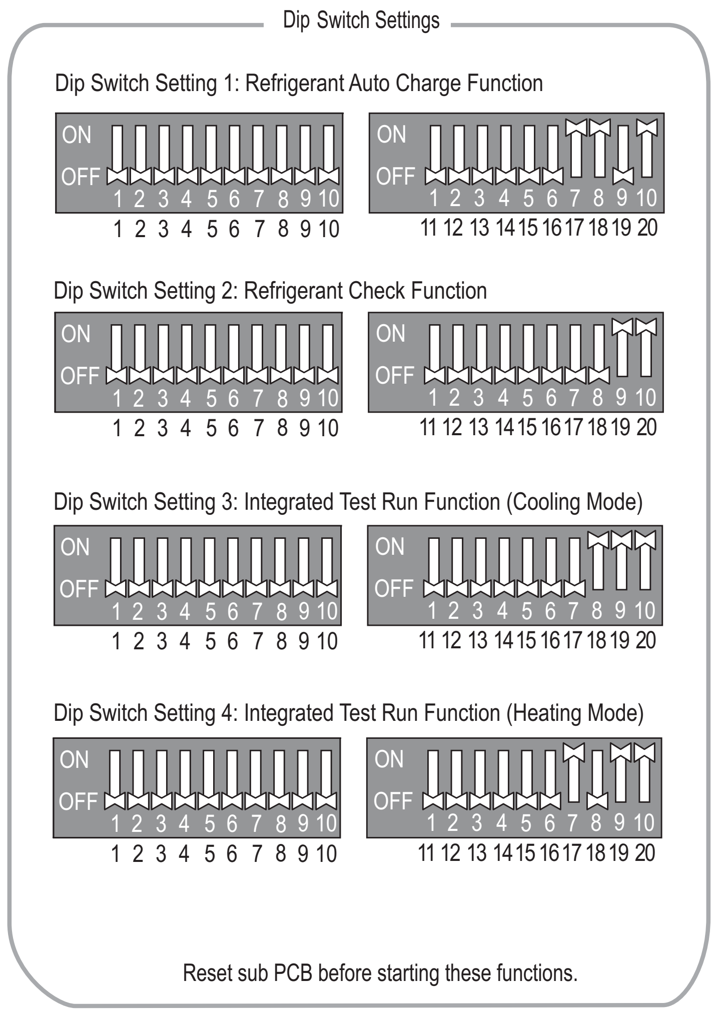
Note 2: Refer to the sensor error descriptions.

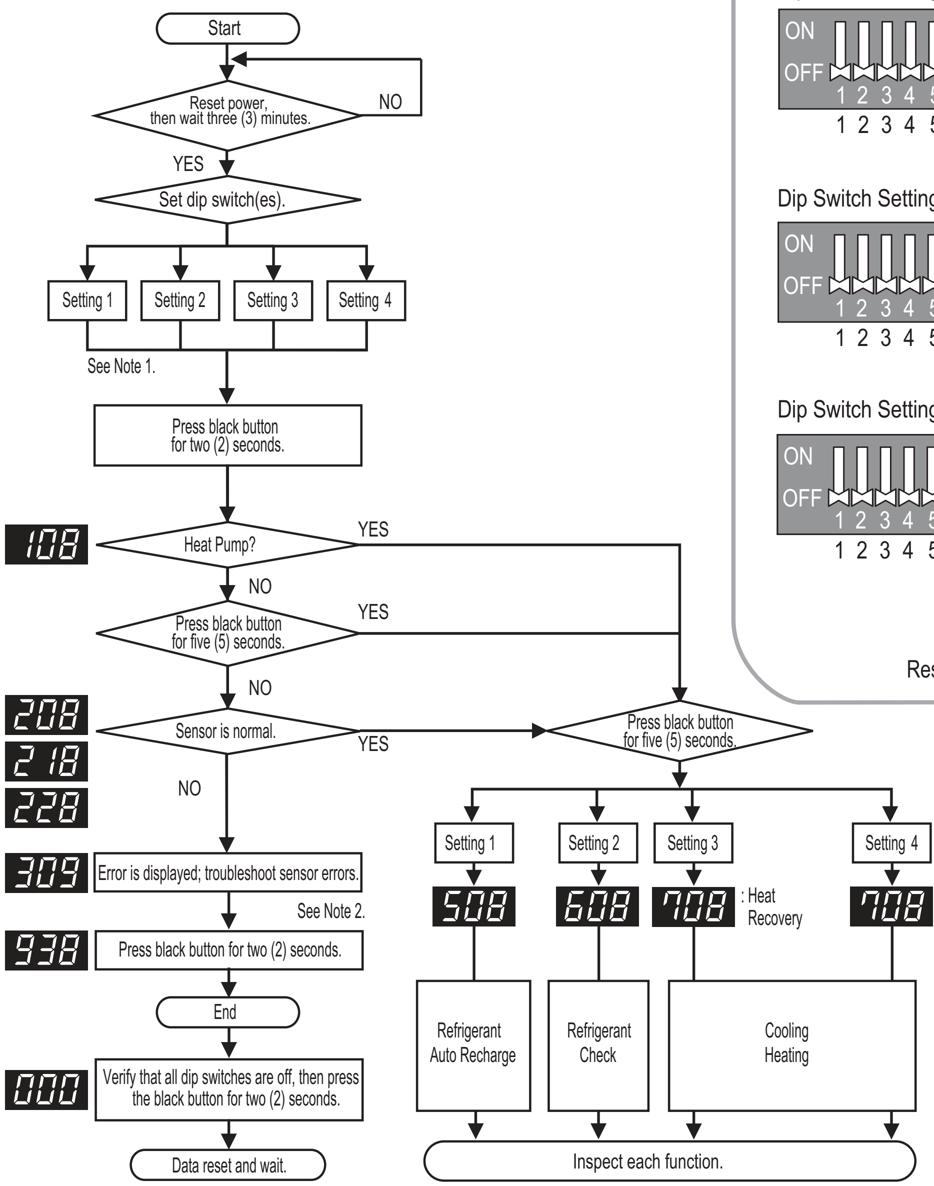
⚠ *Note:*

1. *Confirm if the auto addressing procedure was executed; verify the number of connected indoor units.*
2. *Sensors may exhibit abnormal readings if the installed location is not appropriate or because of temperature conditions. If errors occur, check and troubleshoot each sensor.*

Sensor Check Function for ARUB Series Heat Recovery Systems

Sensor check function determines if the indoor and outdoor unit sensors are correctly reading the current temperature(s). There are three (3) indoor and ten (10) outdoor temperature sensors.[1] Two (2) outdoor unit pressure sensors are used along with Refrigerant Auto Charge and Refrigerant Check functions to determine sensor error.[2]





Number of temperature sensors differs according to frame size.

	Small-Frame Units (One Compressor)	Large-Frame Units (Two Compressors)
Number of Sensors	6	7

Note 1: Each step is displayed on the Main PCB LED.

Note 2: Refer to the sensor error descriptions.

Note:

1. Confirm if the auto addressing procedure was executed; verify the number of connected indoor units.

2. Sensors may exhibit abnormal readings if the installed location is not appropriate or because of temperature conditions. If errors occur, check and troubleshoot each sensor.

Sensor Check Function for ARUB Series Heat Recovery Systems

Sensor Check Function Error Codes

If error occurs during sensor check procedure, main PCB LED sequentially displays the following error codes.

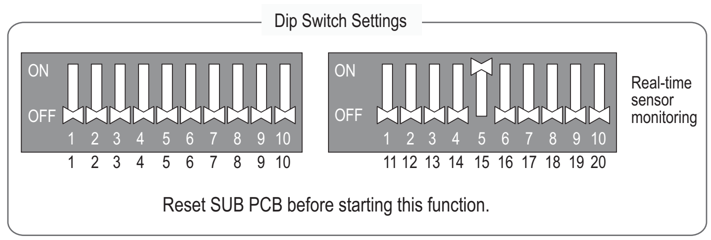
Indoor sensor error: 319

↓

Outdoor sensor error: 309

↓

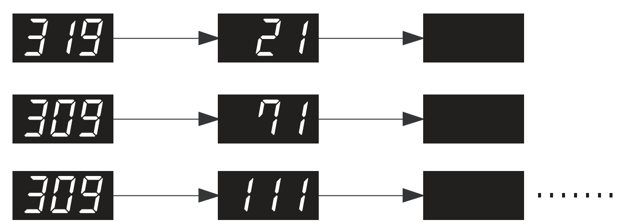
Display error content.



Example: Indoor unit No. 2 pipe inlet temperature sensor error.

Example: Master outdoor unit liquid pipe temperature sensor error.

Example: Indoor unit No. 2 pipe inlet temperature sensor error, master outdoor unit suction temperature sensor, and slave 3 outdoor unit high-pressure sensor error.



⚠ Note:

- *Up to five (5) errors will be continuously and repeatedly displayed. If five errors occur, perform sensor check function after errors are solved.*
- *The indoor unit in which error occurs will operate in air circulation mode.*

Displaying Outdoor Unit Errors

- First and second number represent error code.
- Last number represents the outdoor unit number.

  1 = Master.

  2 = Slave 1.

  3 = Slave 2.

Indoor unit number follows auto addressing number (see the LGMV data).

Outdoor Unit Sensor Error Codes.

No.	Sensor Type
1	Outdoor Air Temperature
2	Heat Exchanger Temperature
5	Liquid Pipe Temperature
6	SC pipe out
7	Suction Temperature
8	Inverter Compressor Discharge Temperature
9	Constant Compressor 1 Discharge Temperature
10	Constant Compressor 2 Discharge Temperature
11	High Pressure
12	Low Pressure
14	IPM temperature

Displaying Indoor Unit Errors

- First and second numbers represent the indoor unit number.
- Last number represents the specific sensor.

  1 = Pipe inlet temperature sensor.

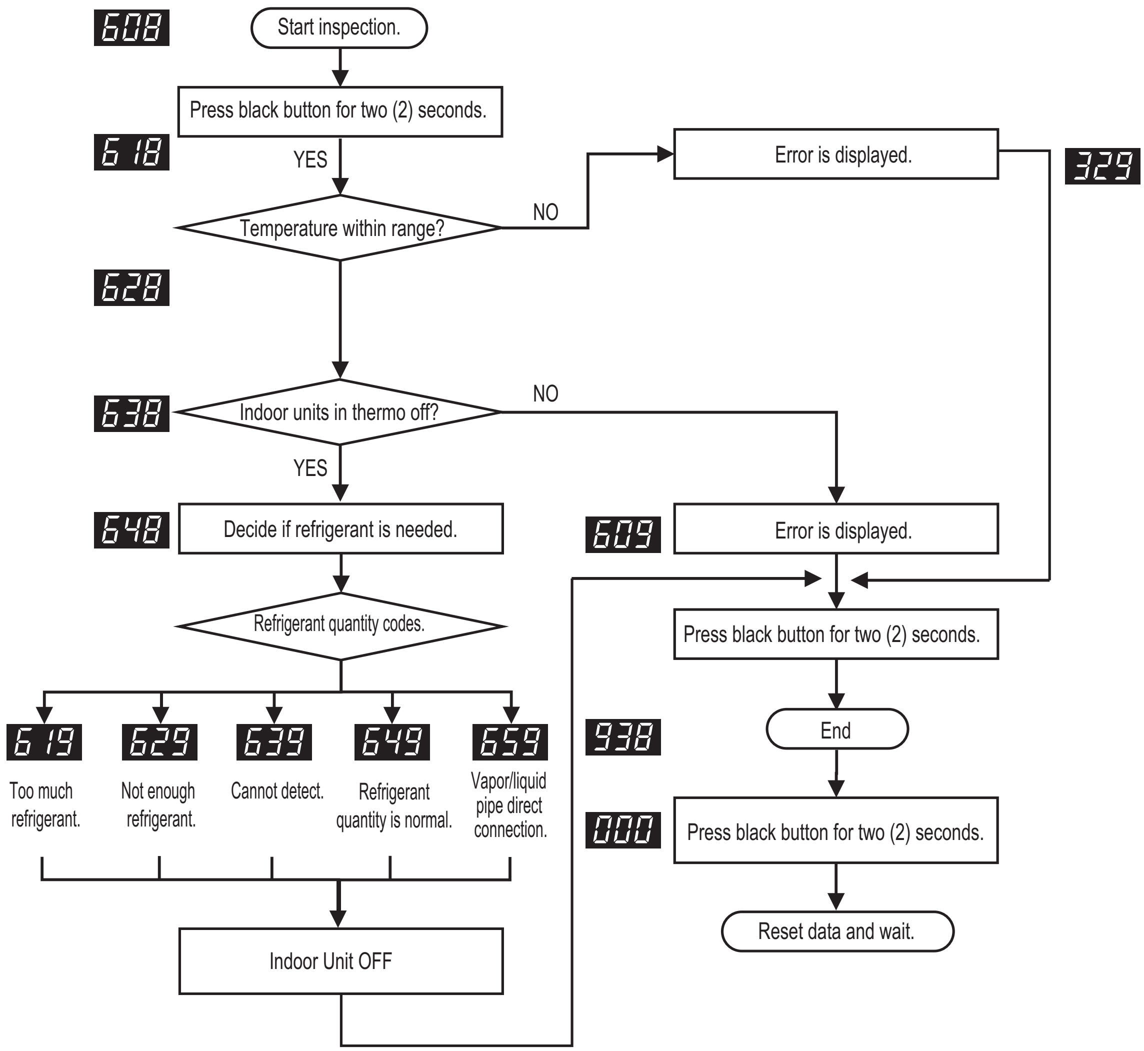
  2 = Pipe outlet temperature sensor.

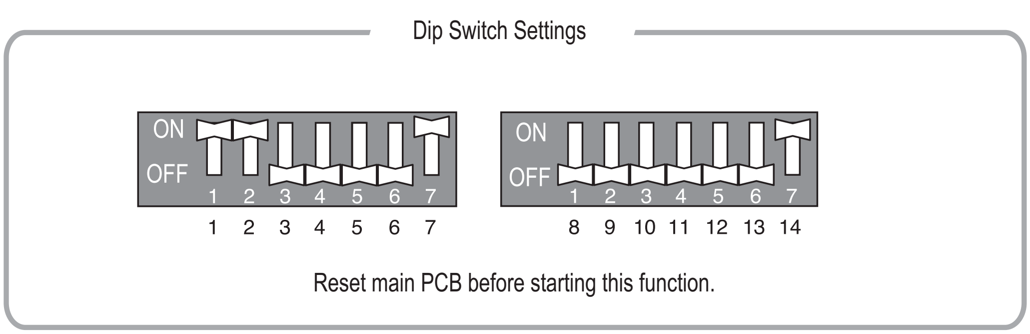
  3 = Air temperature sensor.

Indoor Unit Sensor Error Codes.

No.	Classification
1	Pipe Inlet Temperature
2	Pipe Outlet Temperature
3	Indoor Air Temperature

Refrigerant check function identifies refrigerant leaks and if the system is overcharged.





Note 1: If air temperature is beyond the permissible Refrigerant Check function temperature range, the system may not perform the Refrigerant Check procedure.
Note 2: If the cycle isn't stable, then Refrigerant Check function may not operate.

Refrigerant Check Function for ARUN Series Heat Pump Systems, continued.

⚠ *Note:*

Permissible Refrigerant Check Function Temperature Ranges.

(Error occurs if temperature is beyond the ranges listed below.)

- *For Indoor Units: 68°F ~ 90°F.*
- *For Outdoor Units: 32°F ~ 109°F.*

These temperature ranges are specifically for accurate refrigerant charge and are irrelevant of unit operation temperature ranges.

⚠ *Note:*

- *Set the wired remote controller so that the temperature is sensed at the indoor unit.*
- *Check that the indoor units are not thermo off.*

Refrigerant Check Function Error Codes.

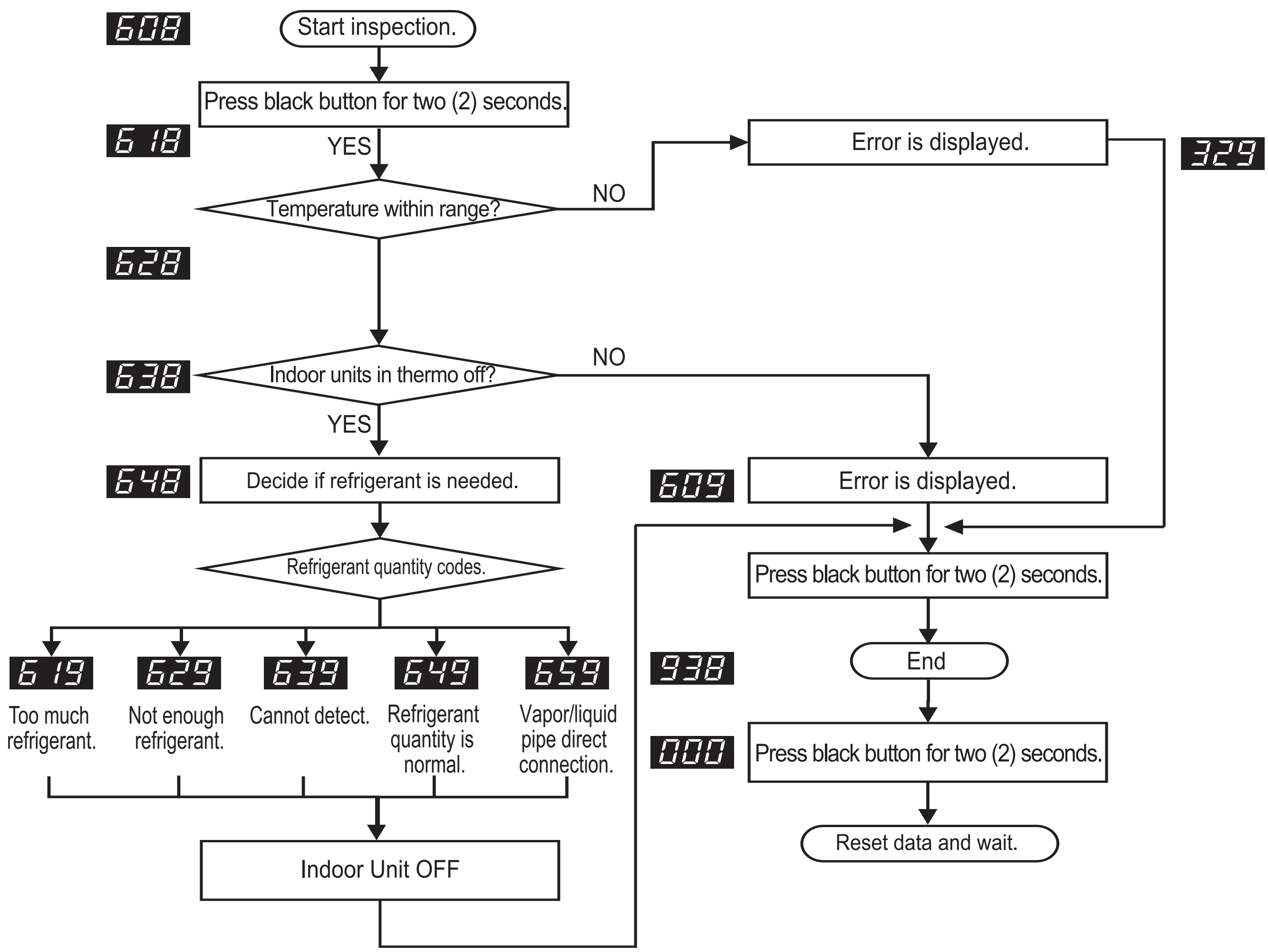
Error No.	Description	Cause
329	Temperature range error.	Ambient temperatures for indoor or outdoor unit(s)are beyond permissible Refrigerant Auto Check function temperature range(s); system will not execute function and will turn off.
609	System unstable error.	System does not stabilize after 45 minutes of operation.

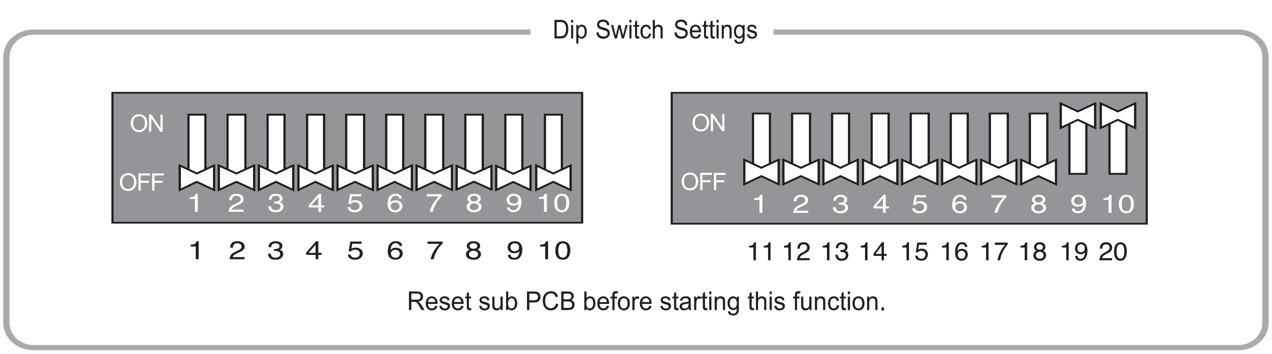
Solving Refrigerant Check Function Errors.

Error No.	Description	Solution
619	Excess refrigerant error.	Remove 20% of the total calculated refrigerant and recharge.
629	Shortage of refrigerant error.	Charge refrigerant.
639	Cannot determine.	Check for problems besides refrigerant quantity errors.

Refrigerant Check Function for ARUB Series Heat Recovery Systems

Refrigerant check function identifies refrigerant leaks and if the system is overcharged.





Note 1: If air temperature is beyond the permissible Refrigerant Check function temperature range, the system may not perform the Refrigerant Check procedure.
Note 2: If the cycle isn't stable, then Refrigerant Check function may not operate.

⚠ *Note:*
To check for normal operating conditions, refer to the test run report.

Refrigerant Check Function for ARUB Series Heat Recovery Systems, continued.

Note:

Permissible Refrigerant Check Function Temperature Ranges.

(Error occurs if temperature is beyond the ranges listed below.)

- *For Indoor Units: 68°F ~ 90°F.*
- *For Outdoor Units: 32°F ~ 109°F.*

These temperature ranges are specifically for accurate refrigerant charge and are irrelevant of unit operation temperature ranges.

Note:

- *Set the wired remote controller so that the temperature is sensed at the indoor unit.*
- *Check that the indoor units are not thermo off.*

Refrigerant Check Function Error Codes.

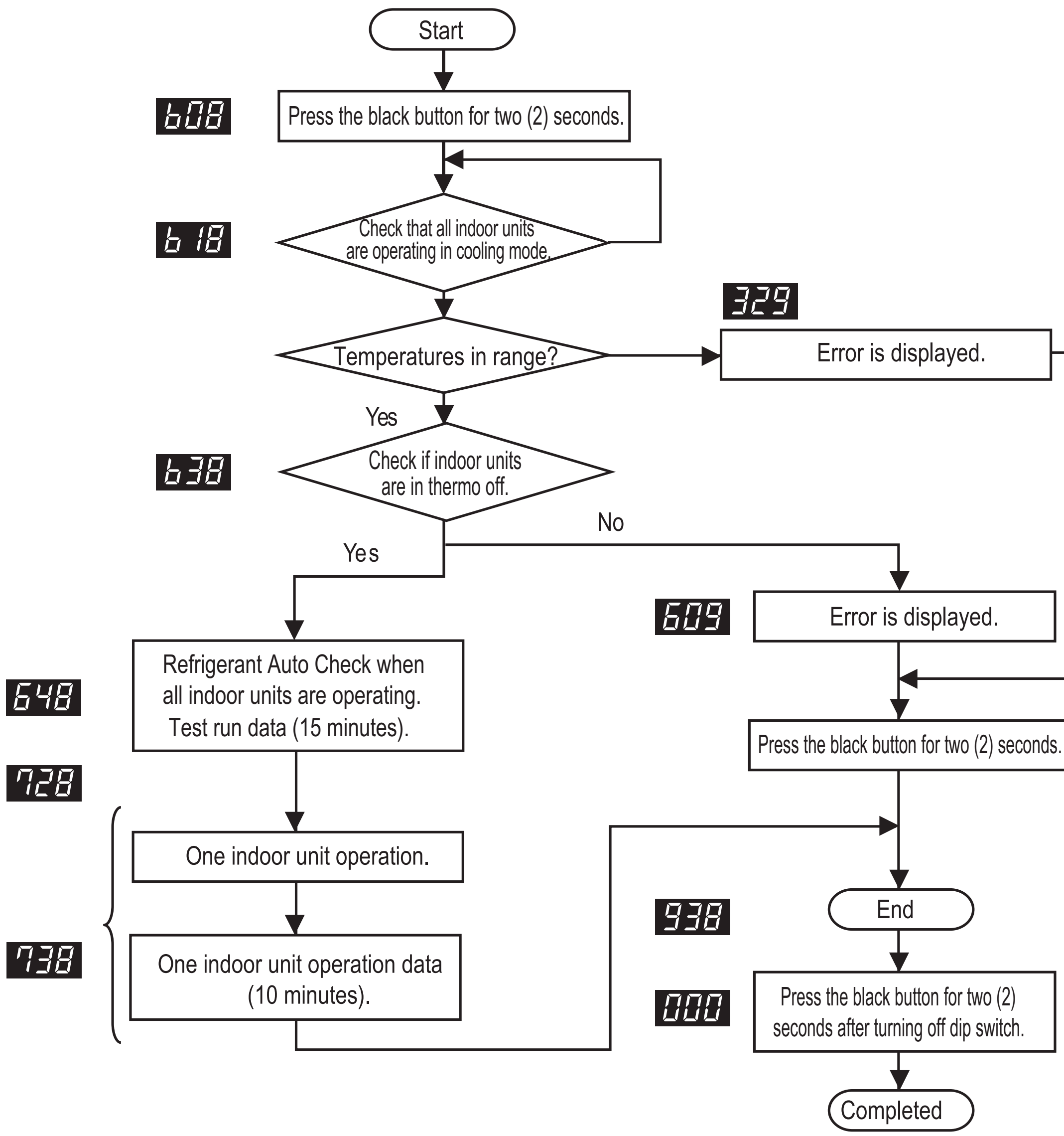
Error No.	Description	Cause
329	Temperature range error	Ambient temperatures for indoor or outdoor unit(s)are beyond permissible Refrigerant Auto Check function temperature range(s); system will not execute function and will turn off.
609	System unstable error.	System does not stablize after 45 minutes of operation.

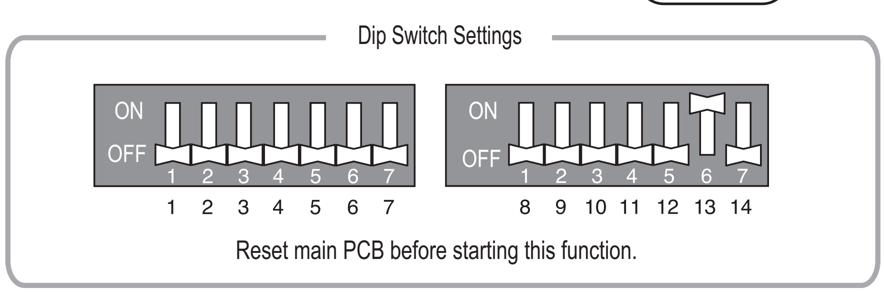
Solving Refrigerant Check Function Errors.

Error No.	Description	Solution
619	Excess refrigerant error.	Remove 20% of the total calculated refrigerant and recharge.
629	Shortage of refrigerant error.	Charge refrigerant.
639	Cannot determine.	Check for problems besides refrigerant quantity errors.

Integrated Test Run Function (Cooling Mode) for ARUN Series Heat Pump Systems

Integrated test run function checks for system and system component operation during cooling mode. This also includes Refrigerant Auto Check Function, and recorded data can be checked by LG Monitoring View (LGMV) Diagnostic Software.

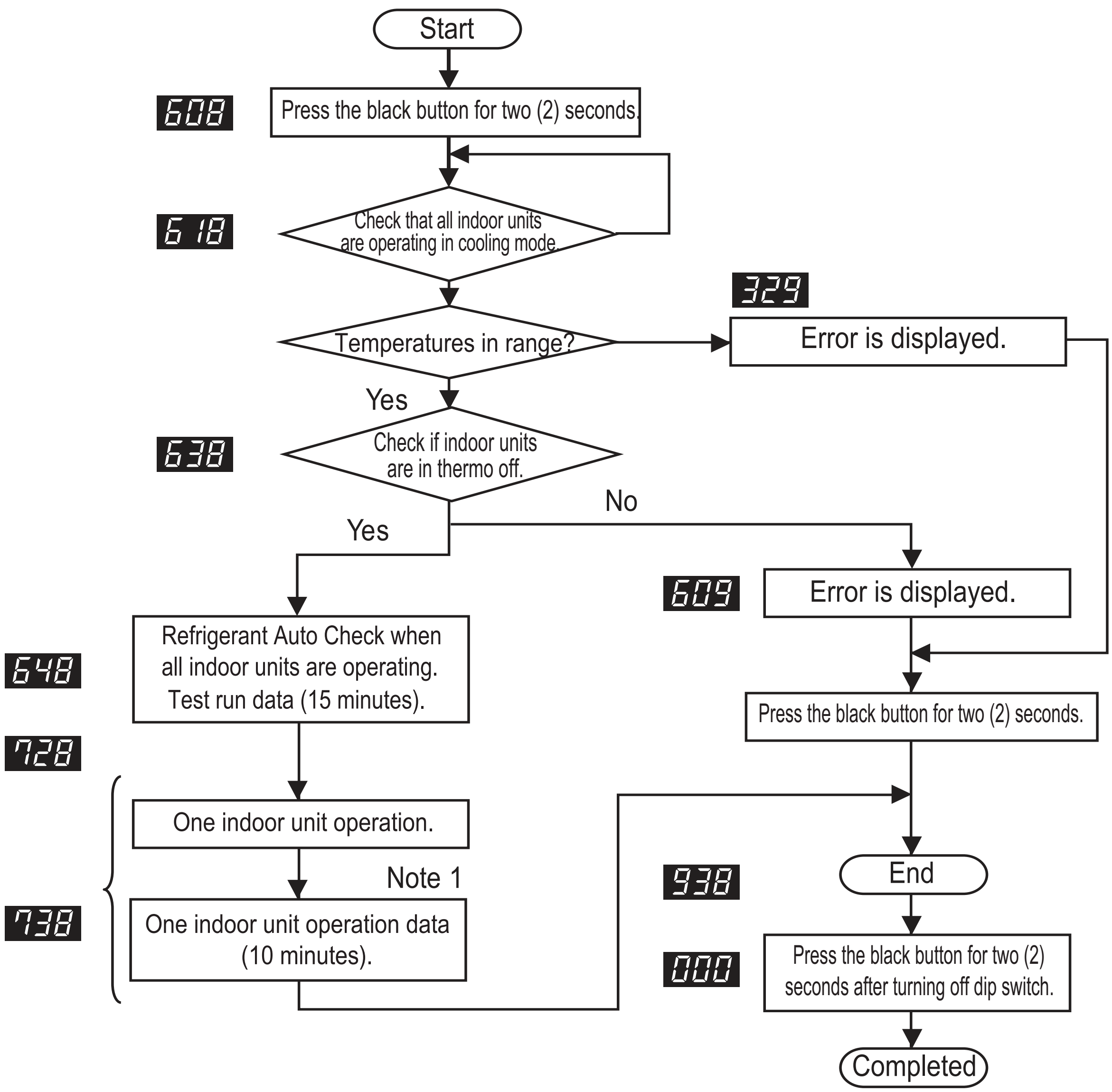


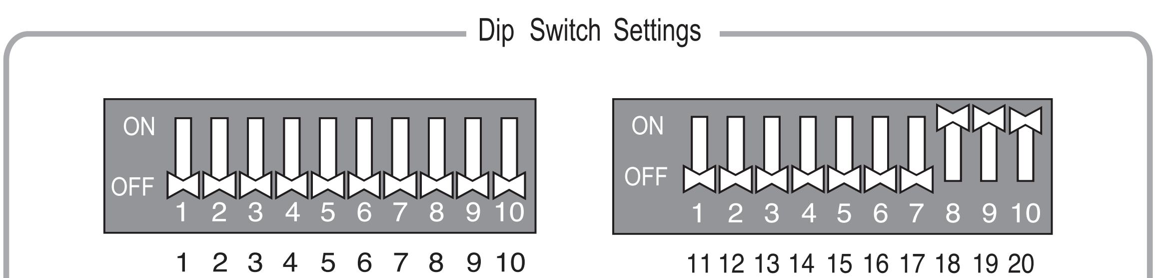


⚠ Note:
To check for normal operating conditions, refer to the test run report.

Integrated Test Run Function (Cooling Mode) for ARUB Series Heat Recovery Systems

Integrated test run function checks for system and system component operation during cooling mode. This also includes Refrigerant Auto Check Function, and recorded data can be checked by LG Monitoring View (LGMV) Diagnostic Software.



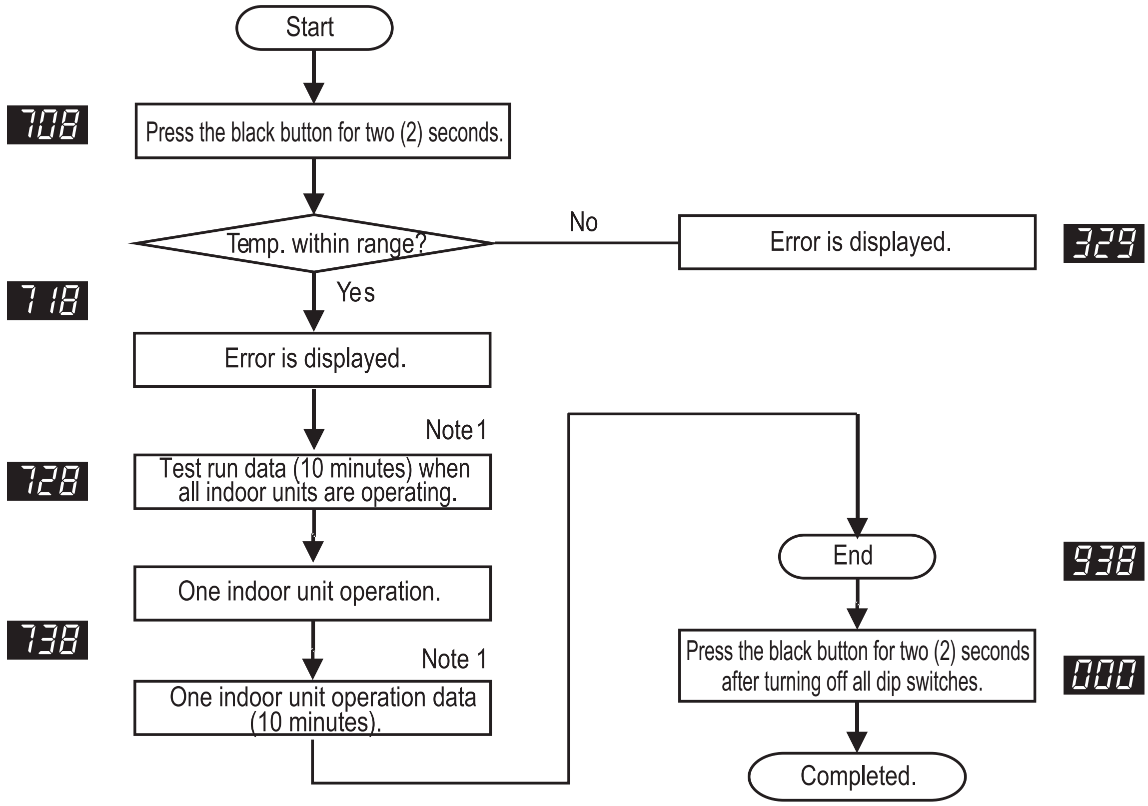


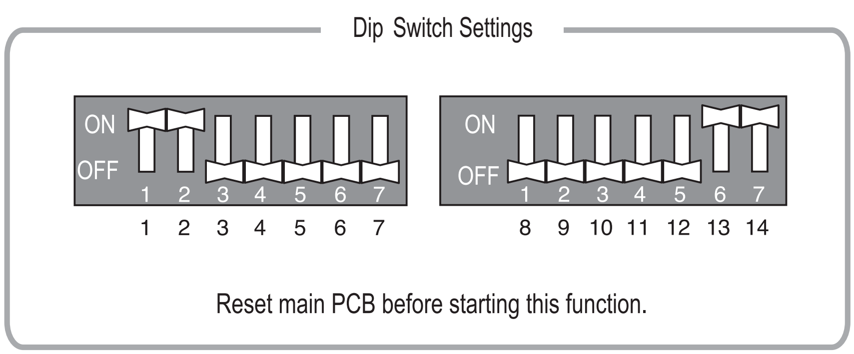
Reset sub PCB before starting this function.

⚠ ***Note:***
To check for normal operating conditions, refer to the test run report.

Integrated Test Run Function (Heating Mode) for ARUN Series Heat Pump Systems

Integrated test run function checks for system and system component operation during heating mode. This also includes Refrigerant Auto Check Function, and recorded data can be checked by LG Monitoring View (LGMV) Diagnostic Software.

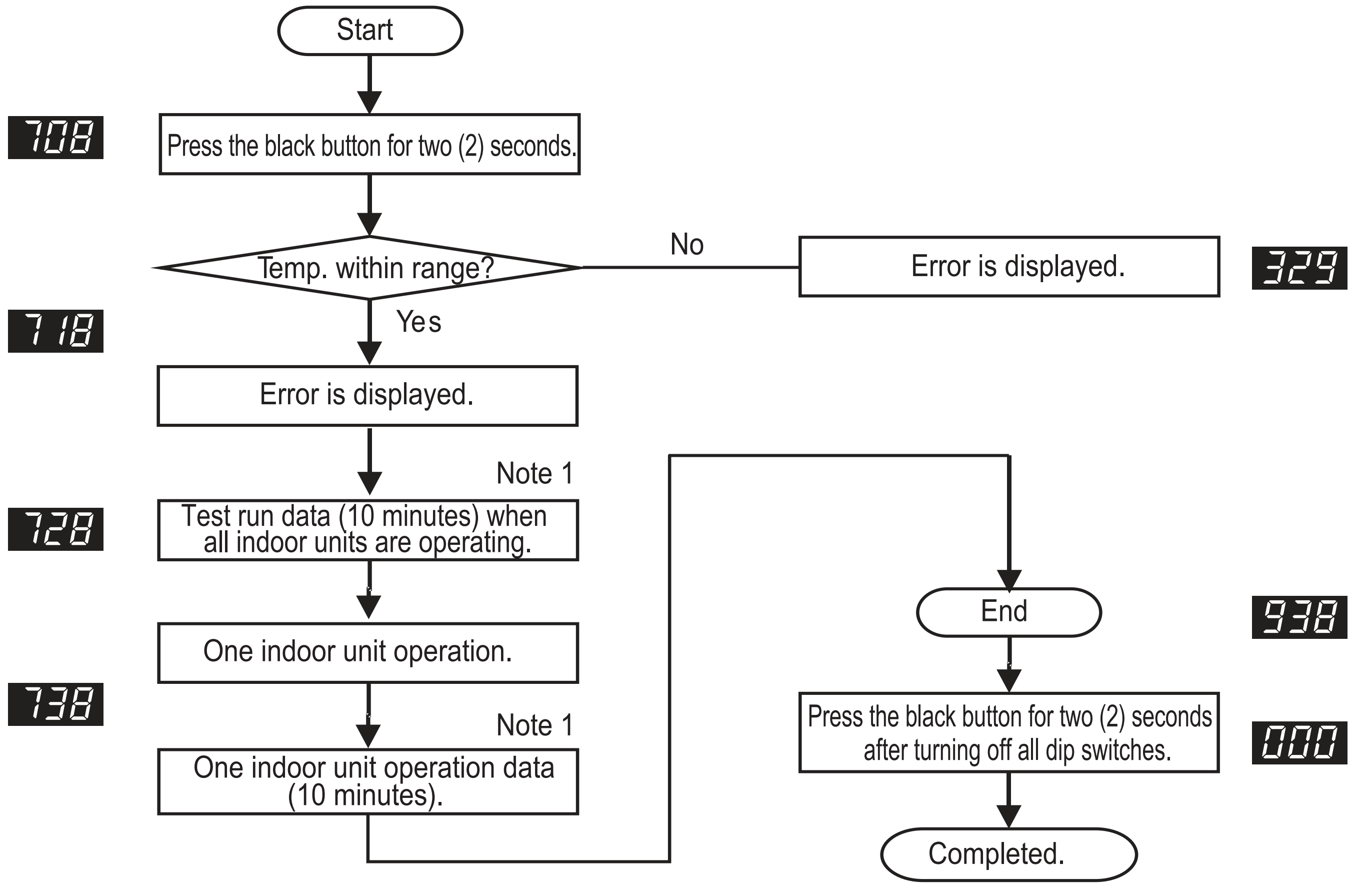


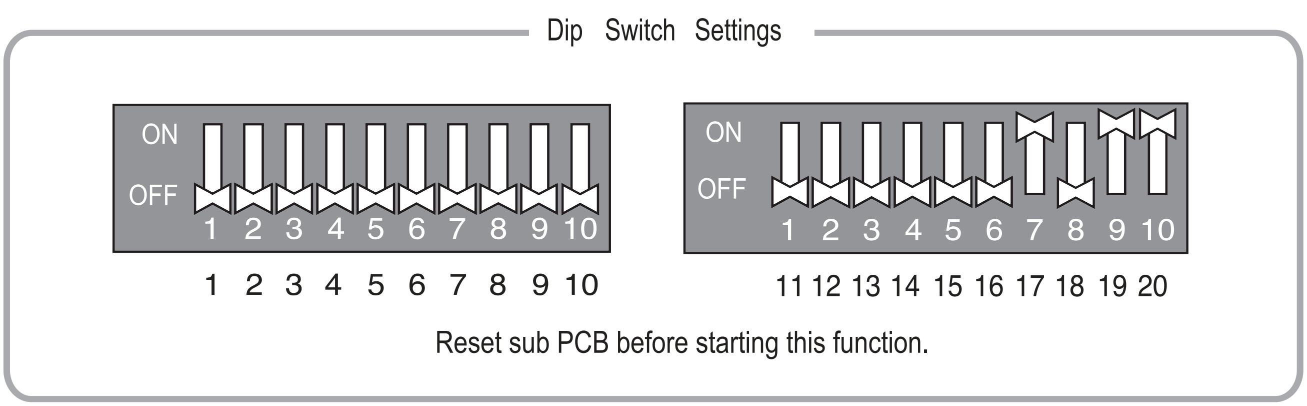


⚠ Note:
To check for normal operating conditions, refer to the test run report.

Integrated Test Run Function (Heating Mode) for ARUB Series Heat Recovery Systems

Integrated test run function checks for system and system component operation during heating mode. This also includes Refrigerant Auto Check Function, and recorded data can be checked by LG Monitoring View (LGMV) Diagnostic Software.





Note:
To check for normal operating conditions, refer to the test run report.

Night Silent permits the outdoor unit fan to operate at a lower RPM to reduce sound while in cooling mode.

Maximum Fan RPM Setting Procedure.

Set the dip switches.

↓

Reset the power.

↓

Set the maximum fan RPM.

↓

Setting complete.

RPM / Time Settings.

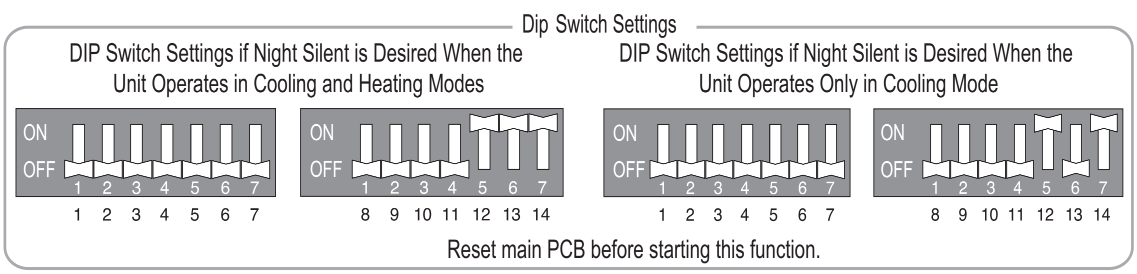
Capacity (HP)		Capacity 8	Capacity 10~14	Judgment Time (Hr.)	Operation Time (Hr.)
Step		Fan Maximum RPM			
1				8	9
2	1	790	900	6.5	10.5
3				5	12
4				8	9
5	2	680	800	6.5	10.5
6				5	12
7				8	9
8	3	620	780	6.5	10.5
9				5	12

Maximum Fan RPM Steps.

Step	Black Button	Red Button
1	1 time	1 time
2	2 time	1 time
3	3 time	1 time
4	4 time	1 time
5	5 time	1 time
6	6 time	1 time
7	7 time	1 time
8	8 time	1 time
9	9 time	1 time

Sound Levels per Step.

Capacity (ton)	6	8~12
Step	Maximum RPM Sound (dB)	
Standard	58	62
1	55	59
2	52	56
3	49	53



⚠ *Note:*

- *Set the Night Silent function during initial installation.*
- *If the Night Silent function is not used, set the dip switch to off and reset the power.*
- *Cooling capacity may be reduced if the RPM on the outdoor unit fan changes.*

PRECOMMISSIONING

Night Silent Operation for ARUB Series Heat Recovery Systems

Night Silent permits the outdoor unit fan to operate at a lower RPM to reduce sound while in cooling mode.

Maximum Fan RPM Setting Procedure.

Set the dip switches.
↓
Reset the power.
↓
Set the maximum fan RPM.
↓
Setting complete.

RPM / Time Settings.

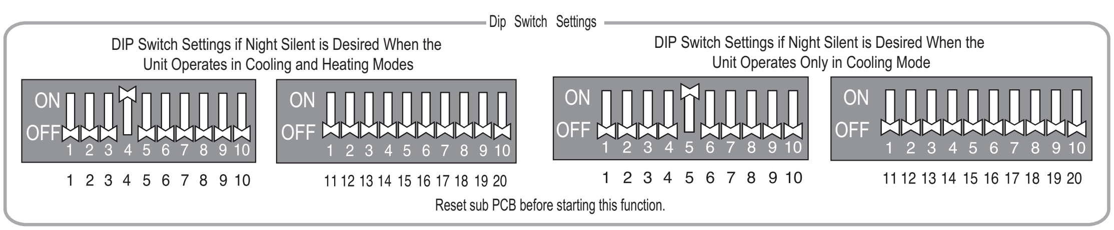
Capacity (HP)		Capacity		Judgment Time (Hr.)	Operation Time (Hr.)
		8	10~14		
Step		Fan Maximum RPM			
1	1	790	900	8	9
2				6.5	10.5
3				5	12
4	2	680	800	8	9
5				6.5	10.5
6				5	12
7	3	620	780	8	9
8				6.5	10.5
9				5	12

Maximum Fan RPM Steps.

Step	Black Button	Red Button
1	1 time	1 time
2	2 time	1 time
3	3 time	1 time
4	4 time	1 time
5	5 time	1 time
6	6 time	1 time
7	7 time	1 time
8	8 time	1 time
9	9 time	1 time

Sound Levels per Step.

Capacity (ton)	6	8~12
Step	Maximum RPM Sound (dB)	
Standard	58	62
1	55	59
2	52	56
3	49	53



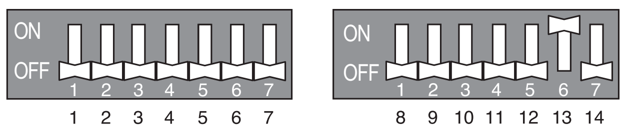
⚠ *Note:*

- *Set the Night Silent function during initial installation.*
- *If the Night Silent function is not used, set the dip switch to off and reset the power.*
- *Cooling capacity may be reduced if the RPM on the outdoor unit fan changes.*

Static pressure compensation mode changes the outdoor unit air flow rate when a duct has been installed on its fan discharge.

Setting the Static Pressure Compensation Mode	Cancelling the Static Pressure Compensation Mode
Set the dip switch to on.	Set the dip switch to off.
↓	↓
Reset power.	Reset power.
↓	↓
Static pressure compensation mode is set.	Static pressure compensation mode is cancelled.

Dip Switch Settings



Reset main PCB before starting this function.

Setting the Static Pressure Compensation Mode on the Outdoor Unit.

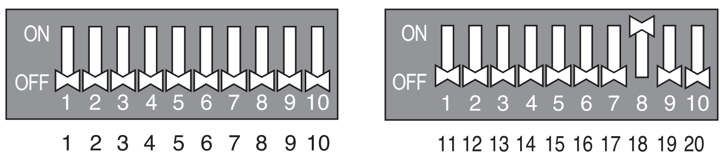
- Standard External Static Pressure: 0.16" WG.
- High External Static Pressure: 0.32" WG (set dip switch no. 13 to on (see diagram above).

Static Pressure Compensation Mode for ARUB Series Heat Recovery Systems

Static pressure compensation mode changes the outdoor unit air flow rate when a duct has been installed on its fan discharge.

Setting the Static Pressure Compensation Mode	Cancelling the Static Pressure Compensation Mode
Set the dip switch to on.	Set the dip switch to off.
↓	↓
Reset power.	Reset power.
↓	↓
Static pressure compensation mode is set.	Static pressure compensation mode is cancelled.

Dip Switch Settings



Reset sub PCB before starting this function.

Setting the Static Pressure Compensation Mode on the Outdoor Unit.
- Standard External Static Pressure: 0.16" WG.
- High External Static Pressure: 0.32" WG (set dip switch no. 18 to on (see diagram above).

Normal Operation

Actuator	Cooling Operation	Heating Operation	Stop State
Compressor	Fuzzy logic	Fuzzy logic	Stop
Fan	Fuzzy logic	Fuzzy logic	Stop
Main EEV	Fully open	Fuzzy logic	Minimum pulse
Subcooling EEV	Fuzzy logic	• Normal: minimum pulse • High discharge temperature control	Minimum pulse
Indoor Unit EEV	Superheat fuzzy logic	Subcooling fuzzy logic	Minimum pulse

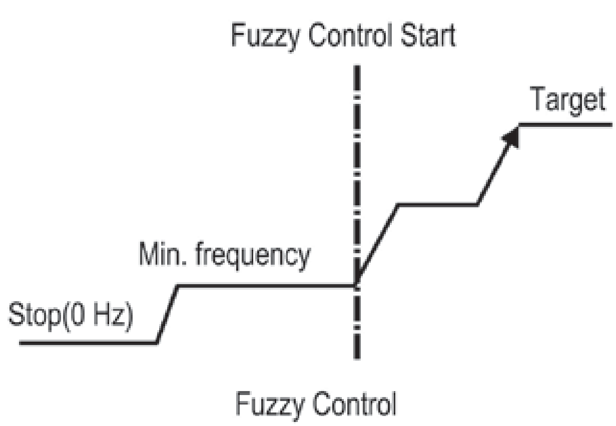
Compressor Control

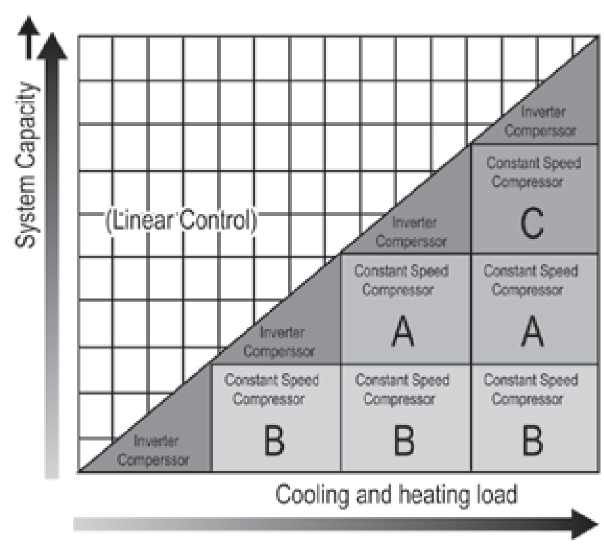
Fuzzy control: Maintains constant evaporating temperature (Te) in cooling mode, and constant condensing temperature (Tc) in heating mode to ensure stable system performance.

Te: 36°F ~ 41°F
Tc: 117°F ~ 124°F

1. Cooling mode: Te can be set during the initial dip switch setting procedure. (Normal mode, capacity up mode, and energy save mode.)
2. Heating mode: Tc can be set during initial dip switch setting procedure. (Normal mode, capacity up mode, and energy save mode.)

Note:
Te and Tc can be set simultaneously through the dip switches.





Inverter linear control as cooling and heating load increases

Master and Slave Outdoor Unit EEV Control

1. Main EEV Control.

Main EEV Control uses fuzzy logic to keep the superheat temperature at the evaporator outlet stable (about 37°F) during heating mode.
• Superheat temperature = T-suction - T-evaporation.
• T-suction = Temperature at the suction pipe sensor (°F).
• T-evaporation = Evaporation temperature equivalent to low pressure (°F).

2. Subcooling EEV Control.

Subcooling EEV Control uses fuzzy logic to keep the subcooling temperature at the subcooler outlet stable (about 58°F) during cooling mode.
• Subcooling temperature = T-condensation - T-liquid.
• T-liquid = Temperature at the subcooler outlet (°F).
• T-condensation = Condensation temperature equivalent to high pressure (°F).

3. High Discharge Temperature Control.

Used to control high discharge temperature. When main EEV opens a certain amount (R410A: 800 pulses) and discharge temperature is ≥194°F for ARUN Series Heat Pump systems in heating mode, and ≥185°F for ARUB Series Heat Recovery systems in heating mode, subcooling EEV may control the "subcooling out temperature-evaporating temperature" to be some given difference.

Oil Return Control in Cooling Mode

Oil return control operation recovers oil amount in compressor by collecting oil accumulated in refrigerant piping systems. Each component within the oil return control operation functions as shown in the tables below.

Outdoor Unit.

Component	Start	Operation	Stop
Inverter Compressor	30 Hz	Set Value	30 Hz
Constant Speed Compressor	OFF	ON	OFF
Fan	Normal control	Normal control	Normal control
Main EEV	2,000 pulse (ARUN Series Heat Pump Systems)	2,000 pulse (ARUN Series Heat Pump Systems)	2,000 pulse (ARUN Series Heat Pump Systems)
	2,500 pulse (ARUB Series Heat Recovery Systems)	2,500 pulse (ARUB Series Heat Recovery Systems)	2,500 pulse (ARUB Series Heat Recovery Systems)
Subcooling EEV	Normal control	Min. pulse	85 pulse (ARUN Series Heat Pump Systems) 100 pulse (ARUB Series Heat Recovery Systems)
Four-way Valve	OFF	OFF	OFF
Hot-gas Bypass Valve	Normal control	Normal control	Normal control

Indoor Unit.

Component	Start	Operation	Stop
Fan	Normal control	OFF	Normal control
Thermo On Unit EEV	Normal control	Normal control (ARUN Series Heat Pump Systems)) 1,200 pulse (ARUB Series Heat Recovery Systems)	Normal control
Thermo Off Unit EEV	40 pulse	400 pulse (ARUN Series Heat Pump Systems) 40 pulse (ARUB Series Heat Recovery Systems)	40 pulse
Oil Return Signal	OFF	ON	OFF

Note:
- *Oil return control function operates every eight (8) hours.*
- *Each step in the oil return control function operates for three (3) minutes.*
- *Oil return control stops if compressor protection control starts.*

Oil Return Control in Heating Mode

Outdoor Unit.

Component	Start	Operation	Stop
Inverter Compressor	50 Hz (ARUN Series Heat Pump Systems) 30 Hz (ARUB Series Heat Recovery Systems)	Set Value	50 Hz (ARUN Series Heat Pump Systems) 30 Hz (ARUB Series Heat Recovery Systems)
Constant Speed Compressor	OFF	ON	OFF
Fan	Normal control	Normal control	Normal control
Main EEV	2,000 pulse (ARUN Series Heat Pump Systems) 2,500 pulse (ARUB Series Heat Recovery Systems)		
Subcooling EEV	Normal control	Min. pulse	100 pulse
Four-way Valve	ON	OFF	ON
Hot-gas Bypass Valve	Normal control	Normal control	Normal control

Indoor Unit.

Component	Start	Operation	Stop
Fan	Normal control	OFF	Normal control
Thermo On Unit EEV	Normal control	400-800 pulse	Normal control
Thermo Off Unit EEV	80-130 pulse	400-800 pulse	80-130 pulse

⚠ ***Note:***
- *Start condition is the same as cooling mode.*
- *Each step in the oil return control function operates for three (3) minutes.*
- *Oil return control stops if compressor protection control starts.*

Defrost Operation

Defrost operation eliminates ice that has accumulated on the heat exchanger, recovering its performance. Each component within the defrost operation functions as shown in the tables below.

Defrost Operation stops when the following conditions are met:
1. All heat exchanger pipe temperatures are above the set temperature for 30 seconds.
2. Defrost operation runs for more than 30% of the total heating operation time.
3. If compressor protection control begins because the compressor exhibits a high discharge temperature, etc.

Outdoor Unit.

Component	Start	Operation	Stop
Inverter Compressor	30 Hz	Set Value	30 Hz
Constant Speed Compressor	OFF	ON	OFF
Fan	Stop	High pressure control	Normal control
Main EEV	Normal control	2,000 pulse (ARUN Series Heat Pump Systems) 2,500 pulse (ARUB Series Heat Recovery Systems)	Normal control
Subcooling EEV	Normal control	Min. pulse	Normal control
Four-way Valve	ON → OFF	OFF	ON
Hot Gas Bypass Valve	Normal control	Normal control	Normal control

Indoor Unit.

Component	Start	Operation	Stop
Fan	OFF	OFF	OFF
Thermo On Unit EEV	Normal control	400-800 pulse	Normal control

Optional System Functions

Cooling Mode Stop Operation

Outdoor Unit.

Component	Operation	Note
Inverter Compressor	OFF	N/A
Constant Speed Compressor	OFF	N/A
Fan	Stop	N/A
Main EEV	50 pulse	Stop (Min. pulse) (ARUN Series Heat Pump Systems) N/A (ARUB Series Heat Recovery Systems)
Subcooling EEV	35 pulse	Stop (Min. pulse)
Four-way Valve	OFF	N/A
Hot Gas Bypass Valve	OFF	OFF after 15 minutes

Heating Mode Stop Operation

Outdoor Unit.

Component	Operation	Note
Inverter Compressor	OFF	N/A
Constant Speed Compressor	OFF	N/A
Fan	Stop	N/A
Main EEV	50 pulse	N/A
Subcooling EEV	35 pulse	Stop (Min. pulse)
Four-way Valve	ON	OFF when air temperature is more than 86°F
Hot Gas Bypass Valve	OFF (ARUN Series Heat Pump Systems) ON (ARUB Series Heat Recovery Systems)	OFF after 15 minutes

Oil Equalizing Control (ARUN Series Heat Pump Unit Systems only)

Oil equalizing control function prevents an unbalance of oil between the inverter compressor and constant speed compressor.

Compressor discharge temperature - Compressor oil temperature ≥ Standard oil temperature.

Compressor oil temperature: Compressor oil balance temperature.

Pressure Protection Control on Cooling Mode

High Pressure Control.

Pressure Range	Compressor	Fan
P_d ≥581 psi	Stop	Stop
P_d >552 psi	-5 Hz / four (4) seconds	+100 RPM / four (4) seconds
P_d ≥529 psi	Frequency holding[1]	Normal control
P_d <529 psi	Normal control	

[1]Frequency holding: frequency (or RPM) is not increasing (can decrease).

Low Pressure Control.

Pressure Range	Compressor	Fan
P_s ≤22 psi, one (1) minute after operation	Stop	Stop
P_s ≤50 psi, one (1) minute before operation	-5 Hz / four (4) seconds	-100 RPM / four (4) seconds
P_s ≤58 psi	Normal control	Frequency holding[1]

[1]Frequency holding: frequency (or RPM) is not increasing (can decrease).

Pressure Protection Control on Heating Mode

High Pressure Control.

Pressure Range	Compressor	Fan
P_d ≥581 psi	Stop	Stop
P_d >495 psi	-5 Hz / four (4) seconds	-50 RPM / four (4) seconds
P_d ≥481 psi	Normal control	Frequency holding[1]
P_d <481 psi	Normal control	P_d <476 psi / control

[1]Frequency holding: frequency (or RPM) is not increasing (can decrease).

Low Pressure Control for ARUN Series Heat Pump Systems.

Pressure Range	Compressor	Fan
Ps ≤22 psi, one (1) minute after operation	Stop	Stop
Ps <22 psi, one (1) minute before operation	Inverter Compressor at Minimum Freq. + Standard Compressor Off	+100 RPM / ten (10) seconds
Ps <24 psi, one (1) minute before operation	Inverter Compressor -15 Hz / ten (10) seconds	-
Ps >28 psi	Inverter Compressor frequency change limit, <5 Hz	-
Ps >29 psi	Normal control	

Low Pressure Control for ARUB Series Heat Recovery Systems.

Pressure Range	Compressor	Fan
P_s ≤22 psi, one (1) minute after operation	Stop	Stop
P_s ≤22 psi, one (1) minute before operation	-5 Hz / four (4) seconds	+100 RPM / four (4) seconds
P_s ≤24 psi	Normal control	Normal control

[1]Frequency holding: frequency (or RPM) is not increasing (can decrease).

Discharge Temperature Control

Outdoor Unit Control.

Temperature range	Compressor	Sub-cooling EEV	Indoor Unit EEV
Tdis >230°F	Off	SC, SH decrease control	SH decrease control
Tdis >212°F	-5 Hz / ten (10) seconds	SC, SH decrease control	SH decrease control
Tdis >226°F	Normal control	SC, SH decrease control	SH decrease control

SC = Sub Cooling, SH = Super Heating.

Inverter Protection Control

Inverter Protection Control for ARUN Series Heat Pump Systems.

	Normal Operation	Frequency Down	System Stop
AC Input Current[1]	≤33A	≥33A	≥35A
Compressor Current	≤34A	≥34A	≥40A

[1]AC Input Current = Inverter Compressor Input Current - Constant Current (the current that passes through noise filter).

Inverter Protection Control for ARUB Series Heat Recovery Systems.

	Normal Operation	Frequency Down	System Stop
AC Input Current[1]	≤20A	≥20A	≥22A
Compressor Current	≤24A	≥24A	≥30A

[1]AC Input Current = Inverter Compressor Input Current - Constant Current (the current that passes through noise filter).

Phase Detection

If the unit has a reversed phase, or the electrical wires have not been installed properly, (Power line: R[L1] S[L2], T[L3]), it isn't a defect or operate for protection of product function and constant speed compressor.

Reversed Phase	R(L1), T(L3), S(L2)	Single	M	-	-
			541	-	-
		Series	M	S1	S1
			541	542	542
			M+S1 (at the same time)	M+S2 (at the same time)	M+S3 (at the same time) (ARUB Series Heat Recovery Systems only)
			542	543	543
			M+S1+S2 (at the same time)	-	-
			543	-	-
Missed Phase	R(L1), T(L3)	Single	M	-	-
			501	-	-
		Series	M	S1	S2
			501	502	503
			M+S1 (at the same time)	M+S2 (at the same time)	M+S3 (at the same time)
			502	503	503
			M+S1+S2 (at the same time)	-	-
			503	-	-
	S (L2)	Single	M	-	-
			231	-	-
		Series	M	S1	S2
			231	232	233
			M+S1(at the same time)	M+S2(at the same time)	M+S3 (at the same time) (ARUB Series Heat Recovery Systems only)
			232	233	233
			M+S1+S2 (at the same time)	-	-
			233	-	-

Pressure Switch Control

- Main has a pressure sensing switch in series between compressor and power relay.
- The pressure switch is normally on, and has a small electric current from 220V AC.

⚠ WARNING

Do not touch the pressure switch connecting terminal, or short two wires directly.

Sequence of Operations — Heat Recovery Unit

Normal Operation

Actuator	Power On	Cooling Operation	Heating Operation	Stop State
High-pressure Vapor Valve	Close	Close	Open	Keep
Low-pressure Vapor Valve	Open after 30 seconds	Open	Close	Keep
Liquid Valve	Close	Open	Close	Close

Start Control (Heating Mode Only)

If the system is operating in heating mode, all high-pressure vapor valves are opened.

Valve Control

Mode Change Time Calculation.

Previous Mode	Change Mode	Mode Change Time
Stop or Ventilation	Cooling or Heating	120 seconds
Cooling Mode	Heating	180 seconds
Heating Mode	Cooling	120 seconds
Cooling Mode or Heating Mode	Stop or Ventilation	During Heating Mode: 60 seconds During Cooling Mode: 0 seconds

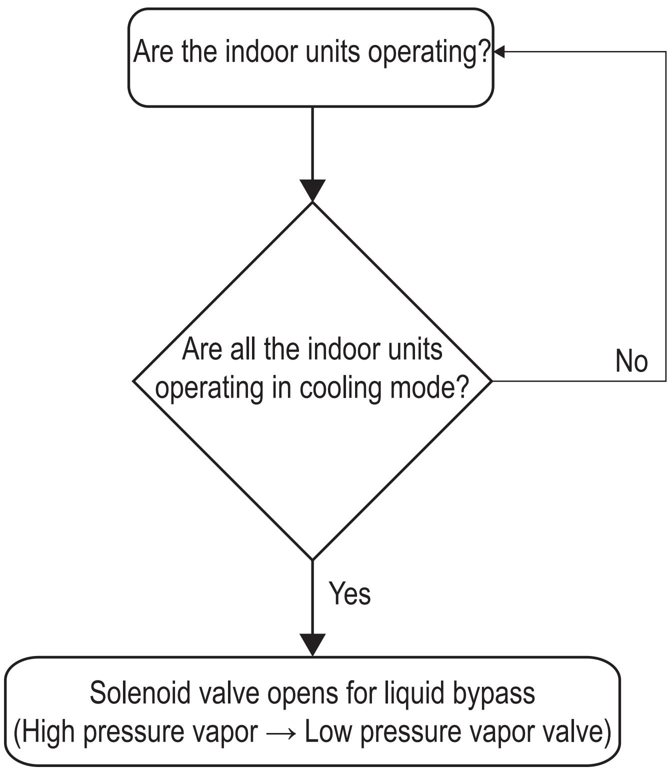
Valve Control by Mode Change Time.

Operating Mode	Mode Change Time	High-pressure Vapor Valve	Low-pressure Vapor Valve	Balancing Valve
Cooling Mode	120 ≤ Time	Keep	Keep	Close
	0 < Time < 120	Close	Close	Open
	Time = 0	Close	Open	Close
Heating Mode	180 ≤ Time	Keep	Keep	Close
	0 < Time < 180	Close	Close	Close
	Time = 0	Open	Close	Close
Stop or Ventilation	0 < Time 5	Cooling Mode: Close	Keep	Close
	Time = 0	Heating Mode: Low-pressure Vapor Valve → Close	Keep	Close

Oil Return / Defrost Control

Component	Start	Operation	Stop
Inverter Compressor	Stop	60 Hz	40 Hz
High-pressure Vapor Valve	Keep	Close	Open or Close
Low-pressure Vapor Valve	Keep	Open	Open or Close
Balancing Valve	Open for 30 seconds	Close	Close

Liquid Bypass Control



Subcooling EEV Control

Subcooling EEV control function uses fuzzy logic to maintain subcooling temperatures at the subcooler outlet during simultaneous cooling and heating operation.

- Target: 77°F.
- Subcooler Temperature = T outlet of subcooler – T inlet of subcooler.

PRECOMMISSIONING

Initial Setup — ARUN Series Heat Pump Systems

There are four (4) initial setup steps before the system operates. All dip switches must be set before initial setup.

⚠ *Note:*
All dip switches must be set before initial setup operation.

Step 1: Factory Set Value Display.
Factory settings are shown on the PCB LED display for twenty-four (24) seconds.

Power ON.

Master outdoor unit model code is displayed for three (3) seconds. 15

Slave1 outdoor unit model code is displayed for three (3) seconds. 15

Slave2 outdoor unit model code is displayed for three (3) seconds. 15

Total capacity (including slave outdoor units) is displayed for two (2) seconds. 42

Heat pump: Two (2) is default display.
Cooling only: No display. 2

Factory setting (twenty-five [25] is normal). 25

Outdoor unit model type (140 for 208-230V units; 160 for 460V units). 160

Step 2: Communication Check.
- If all outdoor unit model codes are shown on the LED, including all slave outdoor units, then communication is functioning normally.
- If LED displays “104,” check communication wires between all the outdoor units, and check the dip switch settings.

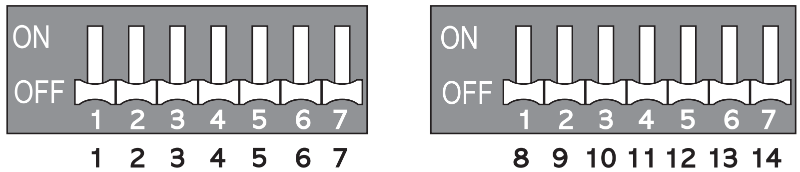
Step 3: PCB Error Check.
- Error check for the master and slave outdoor units will begin after forty (40) seconds.
- All outdoor unit errors, including slave outdoor units, are displayed on the LED. If error is displayed, check the wiring on the corresponding components:
  1. If communication between main PCB and inverter PCB isn't functioning properly, “52” will be displayed on the LED.
  2. If communication between main PCB and fan PCB isn't functioning properly, “105” will be displayed on the LED.

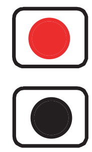
Initial Setup, continued.

Step 4 : Indoor Unit Auto Addressing

- Auto addressing is initiated when the address (red) button on the main PCB is pressed down for six (6) seconds.
- During auto addressing, the main PCB LED displays "88."
- After auto addressing, the number of indoor units is displayed on the LED for thirty (30) seconds. The address of each indoor unit is also displayed on each wired remote controller.

Push address (red) button for six (6) seconds.

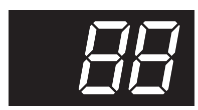




Six (6) seconds

Auto addressing begins.

Auto addressing procedure takes about fifteen (15) minutes to complete.



The number of indoor units is displayed for thirty (30) seconds.

A total of thirty-five (35) indoor units have been found.

Auto address process is finished.
Every indoor unit displays its address on its wired remote controller, and LED display on the main PCB is off.

Initial Setup — ARUB Series Heat Recovery Systems

There are four (4) initial setup steps before the system operates. All dip switches must be set before initial setup.

⚠ Note:
All dip switches must be set before initial setup operation.

Step 1: Factory Set Value Display.
Factory settings are shown on the PCB LED display for twenty-four (24) seconds.

Power ON.

Master outdoor unit model code is displayed for three (3) seconds.	196
Slave1 outdoor unit model code is displayed for three (3) seconds.	196
Slave2 outdoor unit model code is displayed for three (3) seconds.	196
Total capacity (including slave outdoor units) is displayed for two (2) seconds.	60
Heat Recovery Units: Two (2) is displayed.	2
Factory setting (twenty-five [25] is normal).	25
Outdoor unit model type (170 for 208-230V units, 190 for 460 units).	190

Step 2: Communication Check.
- If all outdoor unit model codes are shown on the LED, including all slave outdoor units, then communication is functioning normally.
- If LED displays “104,” check communication wires between all the outdoor units, and check the dip switch settings.

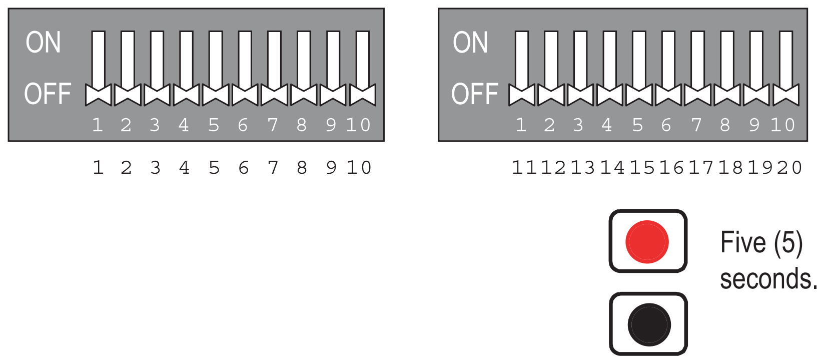
Step 3: PCB Error Check.
- Error check for the master and slave outdoor units will begin after forty (40) seconds.
- All outdoor unit errors, including slave outdoor units, are displayed on the LED. If error is displayed, check the wiring on the corresponding components:
  1. If communication between main PCB and inverter PCB isn't functioning properly, “52” will be displayed on the LED.
  2. If communication between main PCB and fan PCB isn't functioning properly, “105” will be displayed on the LED.

Initial Setup, continued.

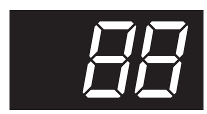
Step 4: Indoor Unit and Heat Recovery Unit Auto Addressing

- Auto addressing is initiated when the address (red) button on the main PCB is pressed down for five (5) seconds.
- During auto addressing, the main PCB LED displays "88."
- After auto addressing, the number of indoor units and heat recovery units is displayed on the LED for thirty (30) seconds. The address of each indoor unit is also displayed on each wired remote controller.

Push address (red) button for five (5) seconds.



Auto addressing begins.



Auto addressing procedure takes about fifteen (15) minutes to complete.

The number of indoor units is displayed for thirty (30) seconds.

A total of thirty-five (35) indoor units have been found.

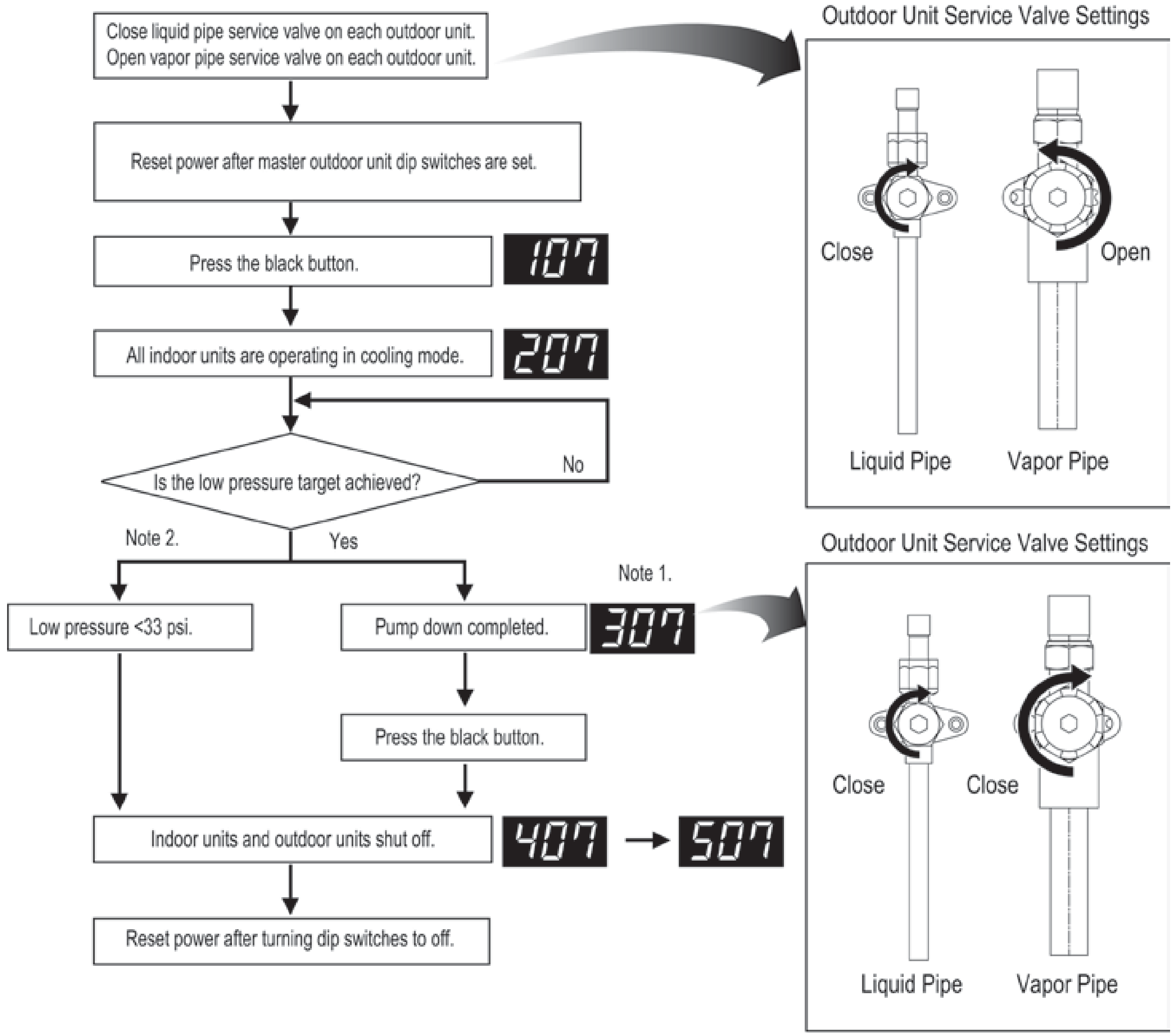
The number of heat recovery units is displayed for ten (10) seconds.

A total of four (4) heat recovery units have been found.

Auto address process is finished.
Every indoor unit displays its address on its wired remote controller, and LED display on the main PCB is off.

Pump Down — ARUN Series Heat Pump Systems

Pump down function gathers the refrigerant present in the system. Use this function to store system refrigerant if there is a leak or if an indoor unit needs replaced.



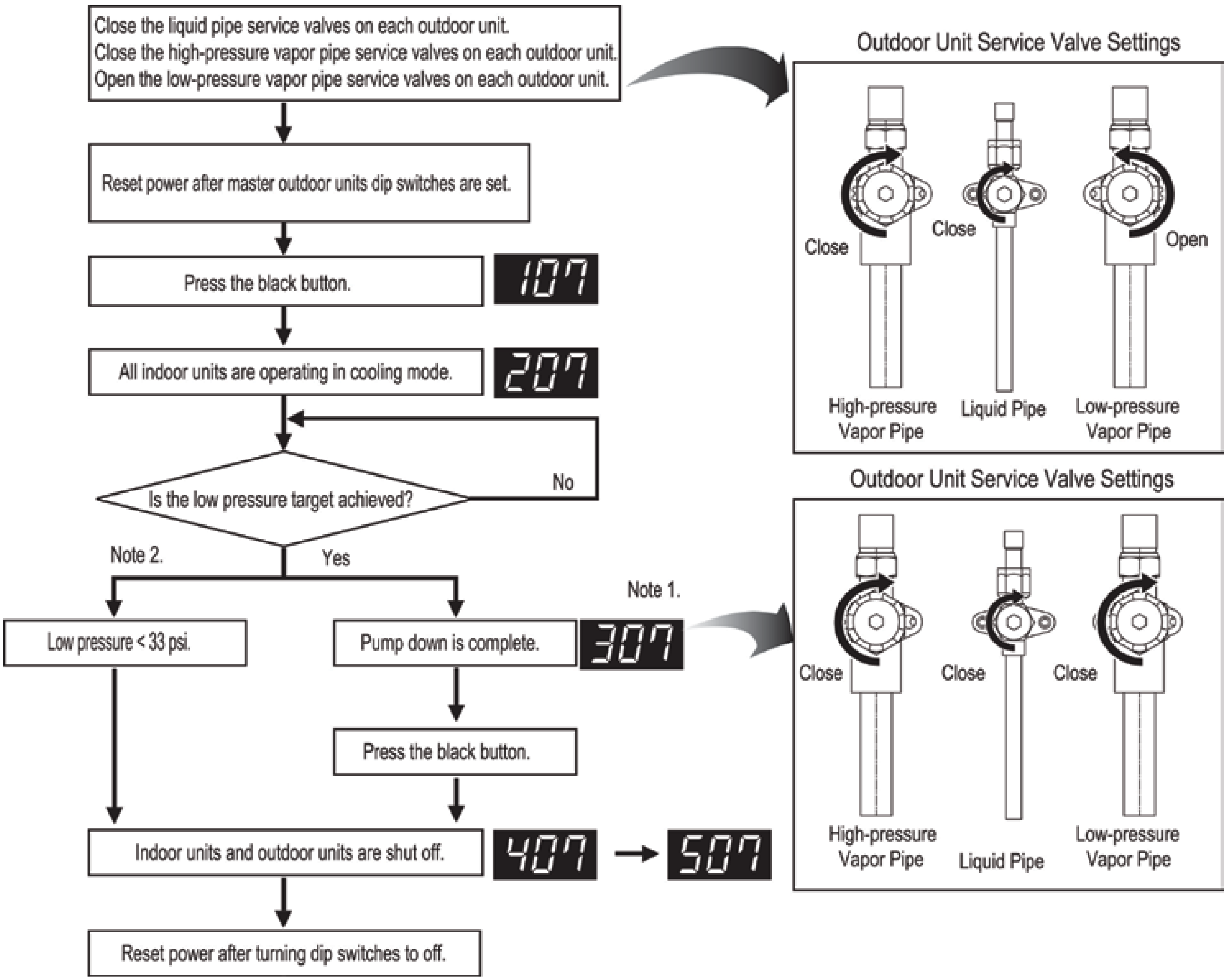
Note 1: If “307”appears on the LED, immediately close the vapor pipe service valves on all outdoor units.

Note 2: If low pressure falls below 33 psi, the system automatically shuts off. Close the vapor pipe service valves immediately.

⚠ *Note:*

- *Use the pump down function within the guaranteed temperature range: Indoor Units = 68° to 90°F; Outdoor Units = 41° to 104°F.*
- *Ensure that the indoor units do not operate in thermo off mode during pump down.*
- *If low pressure does not decrease, maximum operation time of pump down is thirty (30) minutes. To stop pump down, press the black and red buttons (indoor units and outdoor units will shut off) 407 → 507.*

Pump down function gathers the refrigerant present in the system. Use this function to store system refrigerant if there is a leak or if an indoor unit needs replaced.



Note 1: If “307”appears on the LED, immediately close the low-pressure vapor pipe service valves on all outdoor units.

Note 2: If low pressure falls below 33 psi, the system automatically shuts off. Close the low-pressure vapor pipe service valves immediately.

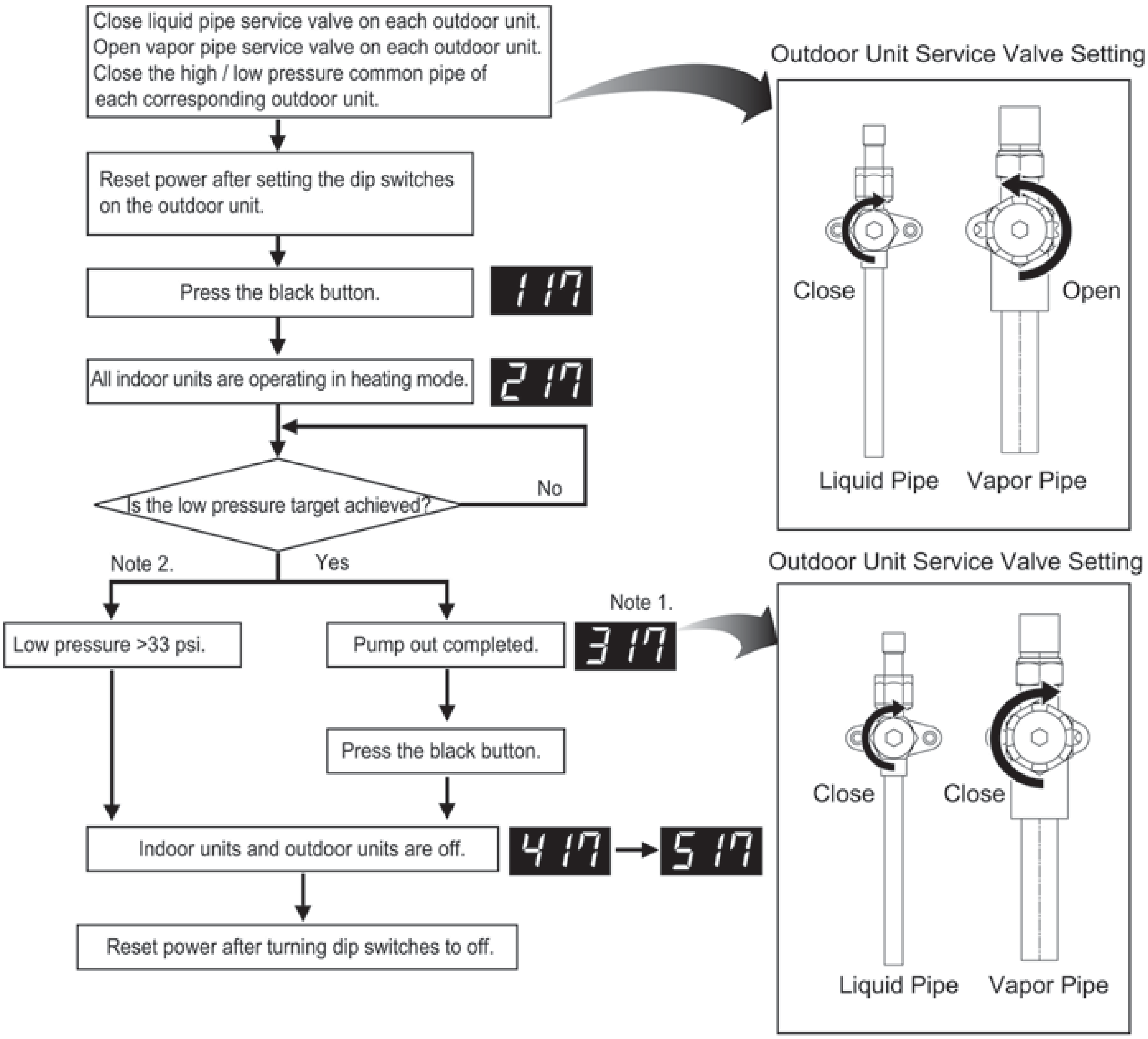
⚠ Note:

- *Use the pump down function within the guaranteed temperature range: Indoor Units = 68° to 90°F; Outdoor Units = 41° to 104°F.*
- *Ensure that the indoor units do not operate in thermo off mode during pump down.*
- *If low pressure does not decrease, maximum operation time of pump down is thirty (30) minutes. To stop pump down, press the black and red buttons (indoor units and outdoor units will shut off) 407 → 507.*

PRECOMMISSIONING

Pump Out — ARUN Series Heat Pump Systems

Pump out function gathers the refrigerant from indoor units or other outdoor units. Use this function if the compressor fails, if an outdoor unit part is defective, or if there is a leak.



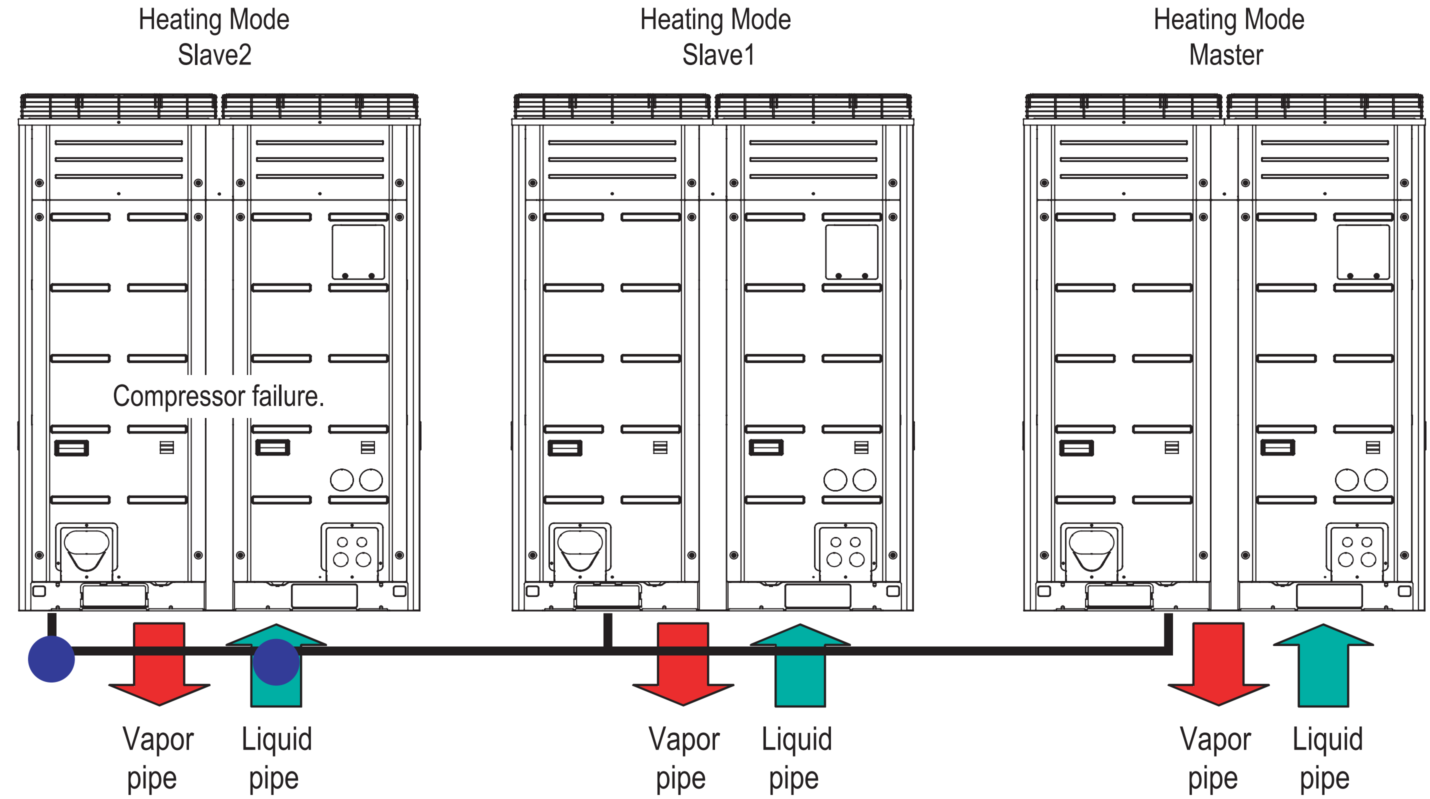
Note 1: If “317”appears on the LED, immediately close the vapor pipe service valves on all outdoor units.

Note 2: If low pressure falls below 33 psi, the system automatically shuts off. Close the vapor pipe service valves immediately.

Note:

- *Use the pump out function within the guaranteed temperature range: Indoor Units = 50° to 86°F; Outdoor Units = 41° to 104°F.*
- *Ensure that the indoor units do not operate in thermo off mode during pump out (just in case low pressure does not decrease).*
- *Pump out function takes two (2) to five (5) minutes after compressor begins operating. To stop pump out, press the black and red buttons (indoor units and outdoor units will shut off) 417 → 517.*

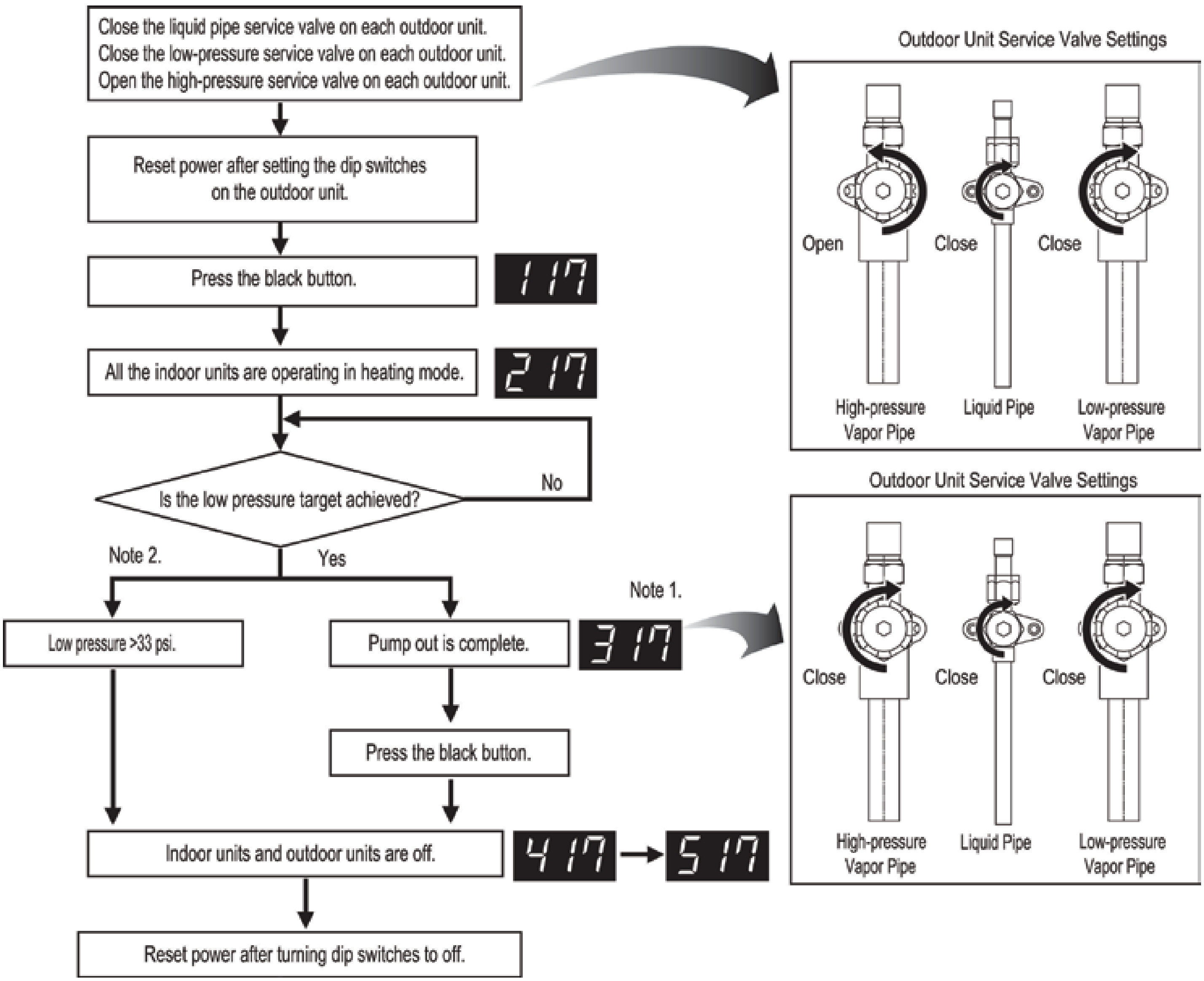
Example of Pump Out Function: Slave2 Outdoor Unit has an inverter compressor failure.



1. Close liquid pipe and common pipe service valves of the slave2 outdoor unit.
2. Operate pump out function.
3. Close vapor pipe service valve of slave2 outdoor unit after pump out function is complete.
4. End pump out function.
5. Close common pipe service valves of no.1, 2.
6. Open common pipe service valves of corresponding outdoor unit, and remove refrigerant.
7. Replace compressor and perform vacuum.
8. Add refrigerant using auto charge function.

Pump Out — ARUB Series Heat Recovery Systems

Pump out function gathers the refrigerant from indoor units or other outdoor units. Use this function if the compressor fails, if an outdoor unit part is defective, or if there is a leak.



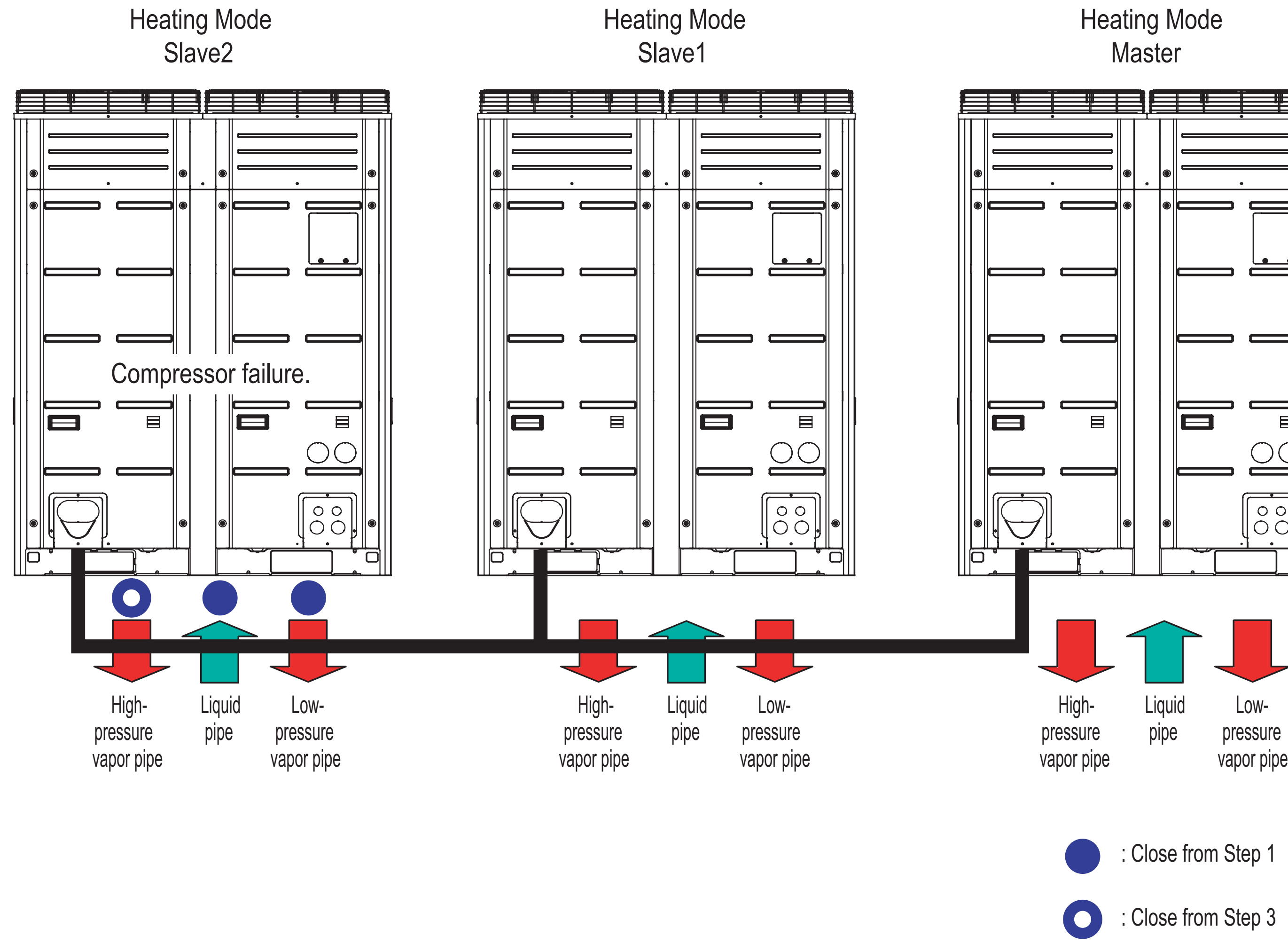
Note 1: If "317"appears on the LED, immediately close the low-pressure vapor pipe service valves on all outdoor units.

Note 2: If low pressure falls below 33 psi, the system automatically shuts off. Close the low-pressure vapor pipe service valves immediately.

⚠ *Note:*

- *Use the pump down function within the guaranteed temperature range: Indoor Units = 50° to 86°F; Outdoor Units = 41° to 104°F.*
- *Ensure that the indoor units do not operate in thermo off mode during pump out (just in case low pressure does not decrease).*
- *Pump out function takes two (2) to five (5) minutes after compressor begins operating. To stop pump out, press the black and red buttons (indoor units and outdoor units will shut off) 417 → 517.*

Example of Pump Out Function: Slave2 Outdoor Unit has an inverter compressor failure.



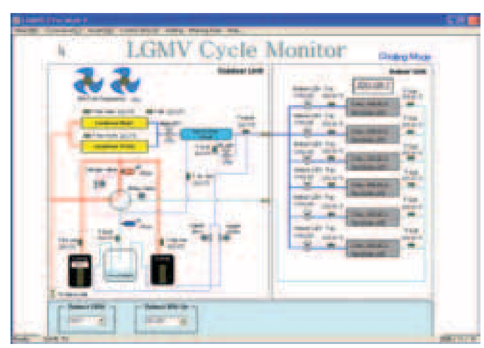
1. Close liquid pipe and low-pressure vapor pipe service valves of the slave2 outdoor unit.
2. Operate pump out function.
3. Close high-pressure vapor pipe service valve of slave2 outdoor unit after pump out function is complete.
4. End pump out function.
5. Open the high-pressure vapor pipe service valve on the corresponding outdoor unit, and eliminate refrigerant in the suction port.
6. Replace compressor and perform vacuum.
7. Add refrigerant using auto charge function.

LG Monitoring View (LGMV) Diagnostic Software and Cable

(PRCTSL1 and PRCTFE1)

LGMV software allows the service technician or commissioning agent to connect a computer USB port to the outdoor unit 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 outdoor fan speed
- Target outdoor unit fan speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Constant speed compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- 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 outdoor units
- Site name
- Total number of connected indoor units
- Communication indicator lights
- Indoor unit capacity
- Indoor unit operating mode
- Indoor unit fan speed
- Indoor unit EEV position
- Indoor unit room temperature
- Indoor unit inlet pipe temperature
- Indoor unit outlet pipe temperature
- Indoor unit error code



MV Cycleview.

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

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - Indoor units
   - Liquid injection valves
   - Temperature and pressure sensors
   - Four-way reversing valve
   - Outdoor fans showing status and speeds
2. Graph: Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar enables user to go back in time and view data.
3. Control IDU: Enables user to turn on all indoor unit's default setpoints of 86°F in heat mode or 64°F in cool mode.
4. Setting: Converts metric values to imperial values.
5. Making Data: Recording of real time data to a separate file created to be stored on the user's computer.
6. Loading Data: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.
7. Electrical Data: The lower half of main screen is changed to show the following:
   - Inverter compressor
     - Amps
     - Volts
     - Power Hz
     - Inverter control board fan Hz
   - Constant compressor
     - Current transducer value
     - Phase

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

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

In lieu of connecting to the outdoor unit, user has the option to connect to the indoor unit with the use of a USB to RS-485 connector kit. When connected through indoor unit, 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.

MV Real-time Data Screen..

MV Control Indoor Units Screen.

Recommended Minimum PC Configuration:

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

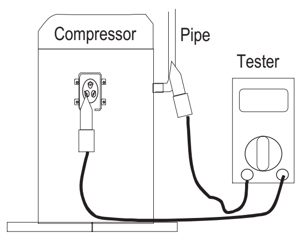
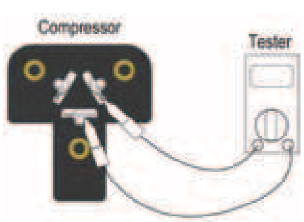
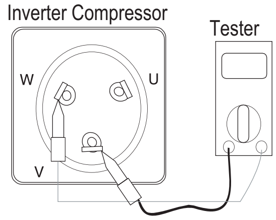
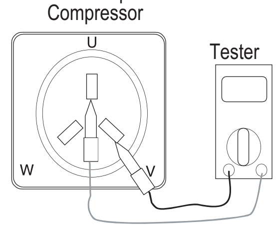
Main component	Problem	Cause	Solution
Compressor	Not operating.	Motor insulation damaged	Check resistance between terminals and unit frames.
		Strainer is clogged	Clean / change the strainer.
		Oil leakage	Check amount of oil.
	Stopped during operation.	Motor insulation failed	Check resistance between terminals and unit frames.
	Abnormal noise during operation.	R (L1) - S (L2) - T (L3) connection error	Check compressor R (L1) - S (L2) - T (L3)connection.
Outdoor Unit Fan	High pressure error when unit operates in cooling mode.	Motor failure, bad ventilation around outdoor unit heat exchanger	Check the fan operation to confirm proper motor functioning. Switch OFF the outdoor unit and remove obstacles, if any, around the HEX. Check connector.
Outdoor Unit EEV	Heating failure, frequent defrost.	Bad connector contact	Check resistance between terminals.
	No operation sound after switching on the power supply	Coil failure	Check resistance between terminals.
	Heating operation failed; outdoor 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 the remote control.
- If CH05/53/11 error occurs, check if auto-addressing is complete and communication wiring is properly installed.

SERVICE TROUBLESHOOTING

Troubleshooting Compressor Errors

If there is a compressor error, or if any error related to the electrical system has occurred, check the items below and follow the corresponding procedure listed.

<table>
<tr><th>Step No.</th><th>Check</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 operation starts?</td><td>The compressor stops and same error appears.</td><td>IPM may have failed.</td></tr>
<tr><td>Method to Measure Insulation Resistance.
</td><td>Inverter output voltage is stable.</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: 77°F.
<table>
<tr><th></th><th colspan="2">Inverter Compressor</th><th colspan="2">Constant speed Compressor</th></tr>
<tr><td></td><td>208/230V</td><td>460V</td><td>208/230V</td><td>460V</td></tr>
<tr><td>U-V</td><td>0.179Ω</td><td>0.438Ω</td><td>0.78Ω</td><td>2.19Ω</td></tr>
<tr><td>U-W</td><td>0.178Ω</td><td>0.433Ω</td><td>0.78Ω</td><td>2.13Ω</td></tr>
<tr><td>W-U</td><td>0.178Ω</td><td>0.435Ω</td><td>0.79Ω</td><td>2.26Ω</td></tr>
</table></td></tr>
<tr><td>Method to Measure Coil Resistance.
For 208-230V Units.

For 460V Units.
Inverter Compressor

Constant Speed Compressor
</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 the voltage and inverter power circuit current, 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).*

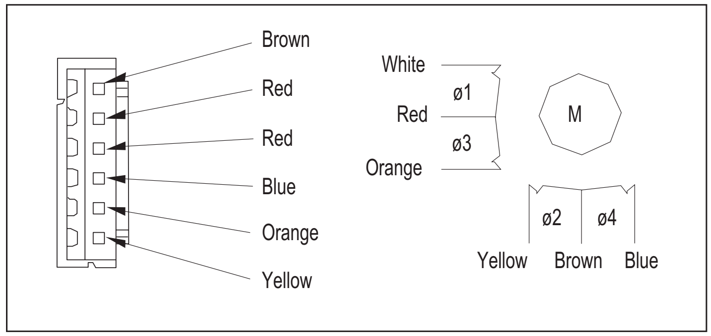
If there is a fan error, check the items below and follow the corresponding procedure listed.

Check	Problem	Solution
1. Fan motor is not operating. (Does fan motor fail again when operation starting?) 2. Fan motor vibration is excessive.	Power supply is not correct.	Fix the connection at the front or back of the breaker.
		Power supply voltage is beyond permissible specifications—modify.
	Wiring is wrong.	• Check wiring connections. • Check connector contacts. • Check that all components are firmly secured (tighten screws). • Check polarity connection. • Check ground wiring and for short circuits.
	Motor has failed.	Measure the winding resistance of the motor coils. **For 208-230V Units:** • LG Motor: 2.85 Ω ± 5% (@77°F). **For 460V Units:** • LG Motor: 8.6 Ω ± 7% (@77°F). • Panasonic Motor: 8.8 Ω ± 5% (@77°F).
	Fuse is defective (460V units).	Replace the fuse (Fuse 800V, 30A).
	Circuit board is defective.	Replace the circuit board following the steps below if errors occur again after power is reset. (Carefully check both connector and ground wires when replacing the circuit board.) • Replace only the fan control boards. If operation begins, it means that the fan control board is defective. • Replace both the fan control board and the main board. If operation begins, it means that the main board is defective. • If problems continue to occur after the steps above have been followed, it means that both boards are defective.

Troubleshooting Electronic Expansion Valve Errors

Pulse Signal Output Value and Valve Operation.

Output (ø) No.	Output State			
	1	2	3	4
ø1	ON	ON	OFF	OFF
ø2	ON	ON	ON	ON
ø3	OFF	OFF	OFF	ON
ø4	OFF	OFF	OFF	OFF

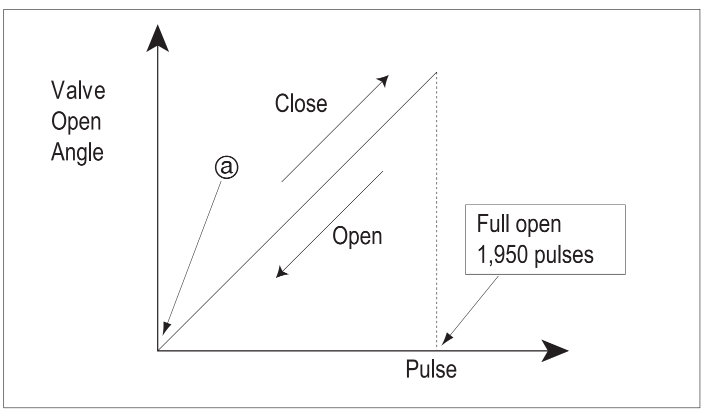


Output Pulse Sequence

- Valve close sequence: 4 → 3 → 2 → 1 → 4.
- Valve open sequence: 1 → 2 → 3 → 4.

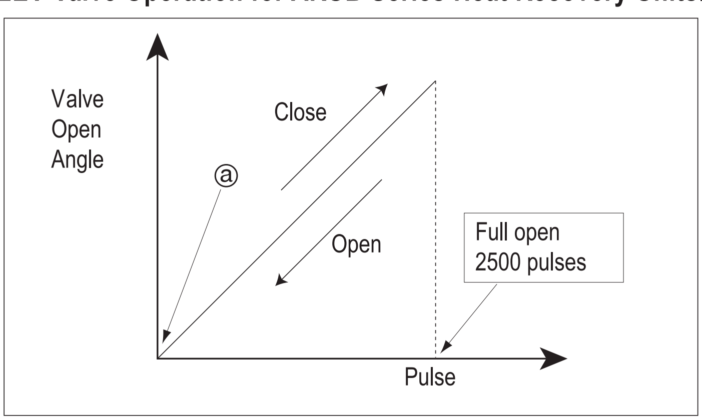
1. If the EEV open angle does not change, output phase will be off.
2. If the output phase is different or continuously on, the motor will start vibrating.

EEV Valve Operation for ARUN Series Heat Pump Units.



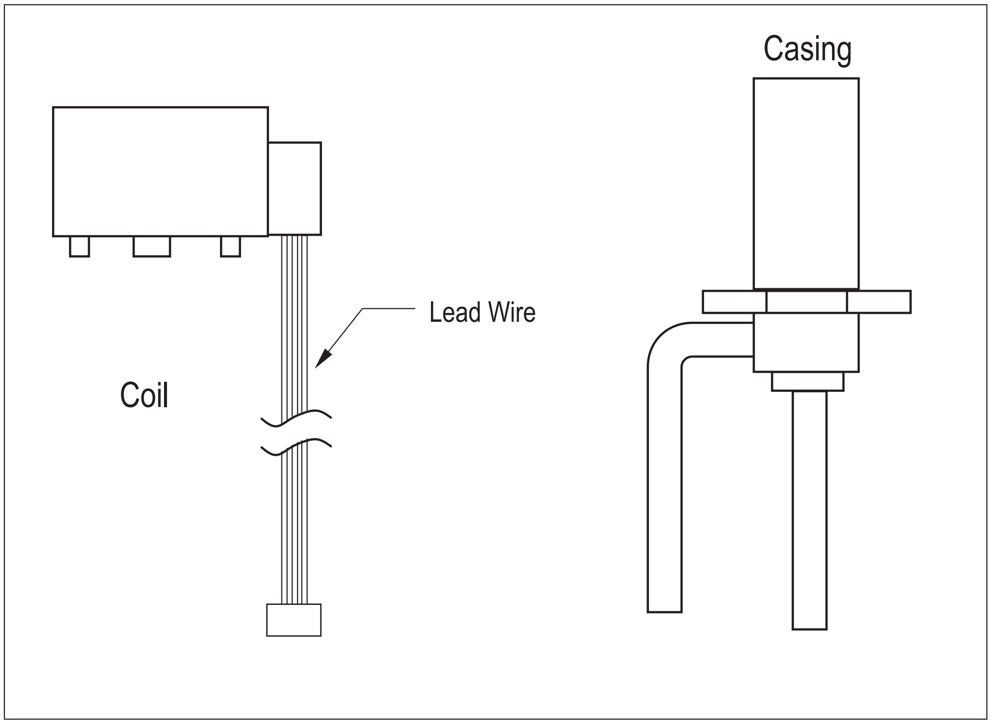
- At power on, open angle signal is 1,400 pulses output, and valve position is set to “a” (see left). When the valve operates properly, noise and vibration will not occur. If the valve is closed, noise will be heard.
- EEV noise can be heard by touching its surface with a screwdriver and listening.
- Noise is reduced when liquid refrigerant is in the EEV.

EEV Valve Operation for ARUB Series Heat Recovery Units.

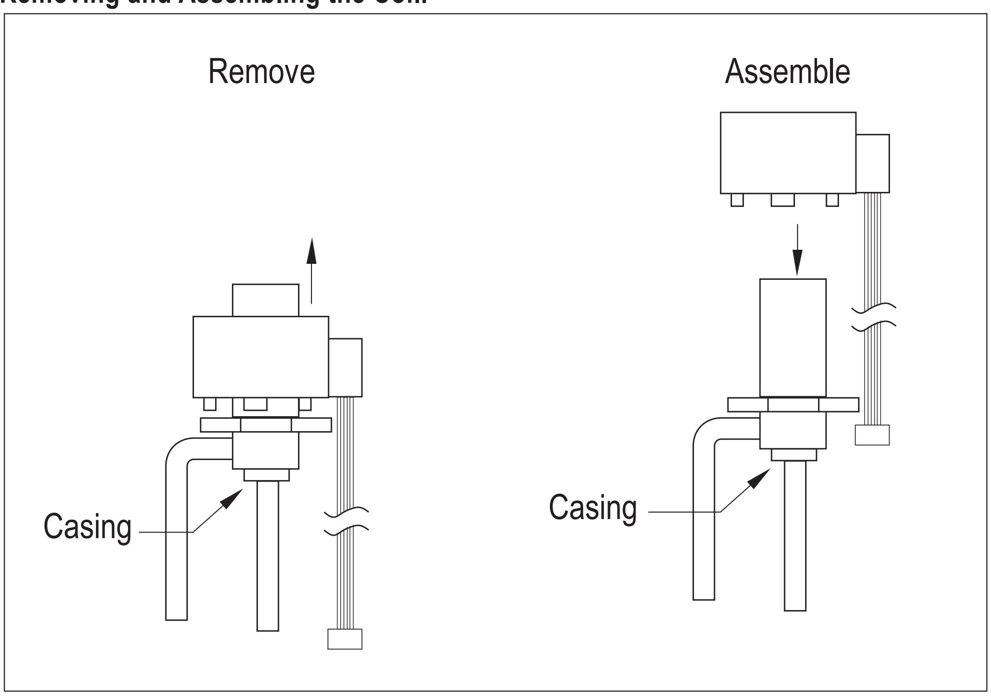


- At power on, open angle signal is 1,400 pulses output, and valve position is set to "a" (see left). When the valve operates properly, noise and vibration will not occur. If the valve is closed, noise will be heard.
- EEV noise can be heard by touching its surface with a screwdriver and listening.
- Noise is reduced when liquid refrigerant is in the EEV.

EEV Coil and Casing (Outdoor Unit).



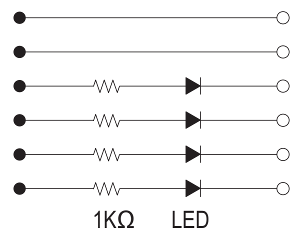
Removing and Assembling the Coil.



- Tighly grip the casing and pull the coil up.
- During assembly, or when the coil is removed, take care not to bend the casing pipe.

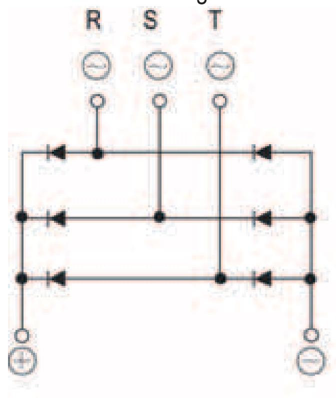
SERVICE TROUBLESHOOTING

Troubleshooting Electronic Expansion Valve Errors

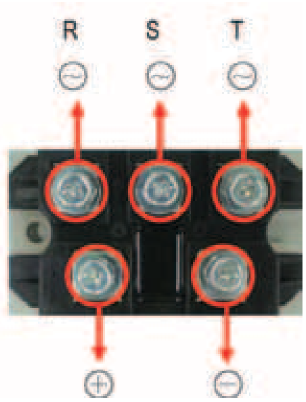
Component	Problem	Check	Solution
Indoor Unit	Microcomputer circuit failure.	• Disconnect the EEV connector from the control board and connect LED to test.  • With main power on, watch for 17 seconds if pulse signal outputs from EEV. If LEDs do not turn on, or are on continuously, then the circuit is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

208-230V Heat Pump and Heat Recovery Outdoor Units.

Internal Circuit Diagram

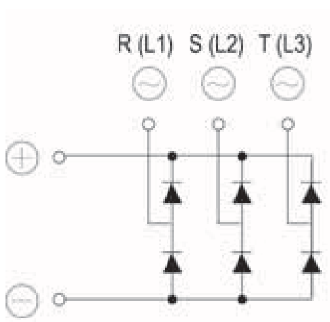


Phase Bridge Diode

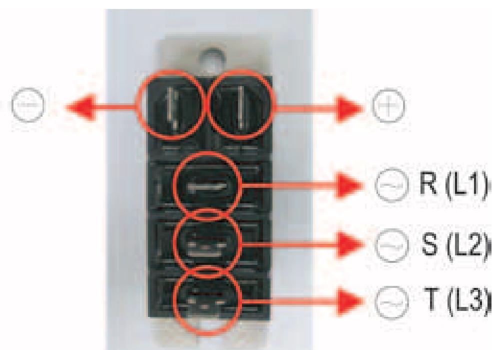


460V Heat Pump and Heat Recovery Outdoor Units.

Internal Circuit Diagram



Phase Bridge Diode



1. Wait until inverter PCB DC voltage has discharged after the main power is turned off.
2. Disconnect all connections to the three-phase bridge diode.
3. Set the 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 the multitester to resistance mode and measure again. 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.

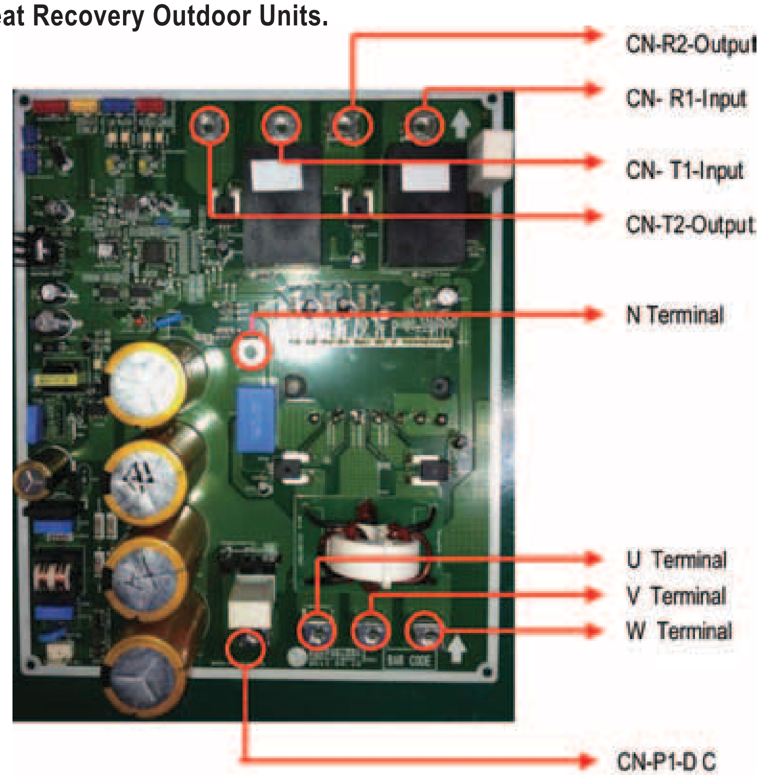
Diode terminal / Tester terminal	+ Terminal: Black (-)	- Terminal: Red (+)
R (~) : Red (+)	0.4V ~ 0.7V	-
S (~) : Red (+)	0.4V ~ 0.7V	-
T (~) : Red (+)	0.4V ~ 0.7V	-
R (~) : Black (-)	-	0.4V ~ 0.7V
S (~) : Black (-)	-	0.4V ~ 0.7V
T (~) : Black (-)	-	0.4V ~ 0.7V

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.

208-230V Heat Pump and Heat Recovery Outdoor Units.

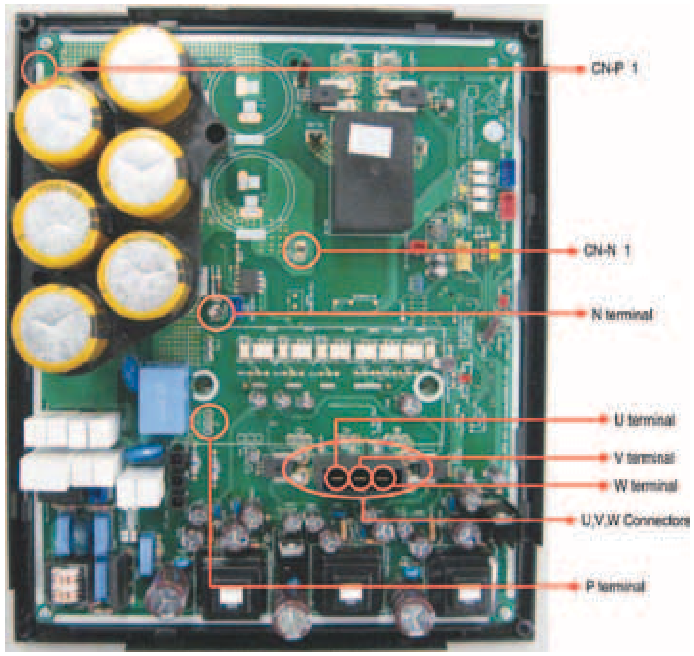


1. After main power is shut off, wait a few minutes until inverter PCB DC voltage is discharged.
2. Disconnect the CN-P1 and CN-N1 connectors and U, V, W COMP connectors on the inverter PCB.
3. Set the multitester to diode mode.
4. Measured value should be between 0.4~0.7V as seen in the table below.
5. If the measured value is different from what is listed in the table below, set the multitester to resistance mode and measure. If the value is too small (0Ω) or too large (hundreds MΩ), the PCB is damaged and needs to be replaced.

	P1 Terminal: Black (-)	**N Terminal: Black (-)**
U Terminal : Red (+)	0.4V ~ 0.7V	Open
V Terminal : Red (+)	0.4V ~ 0.7V	Open
W Terminal : Red (+)	0.4V ~ 0.7V	Open
	P Terminal: Red (+)	**N Terminal: Red (+)**
U Terminal : Black (-) Open 0.4V ~ 0.7V	Open	0.4V ~ 0.7V
V Terminal : Black (-) Open 0.4V ~ 0.7V	Open	0.4V ~ 0.7V
W Terminal : Black (-) Open 0.4V ~ 0.7V	Open	0.4V ~ 0.7V

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

460V Heat Pump and Heat Recovery Outdoor Units.



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 COMP connectors 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.

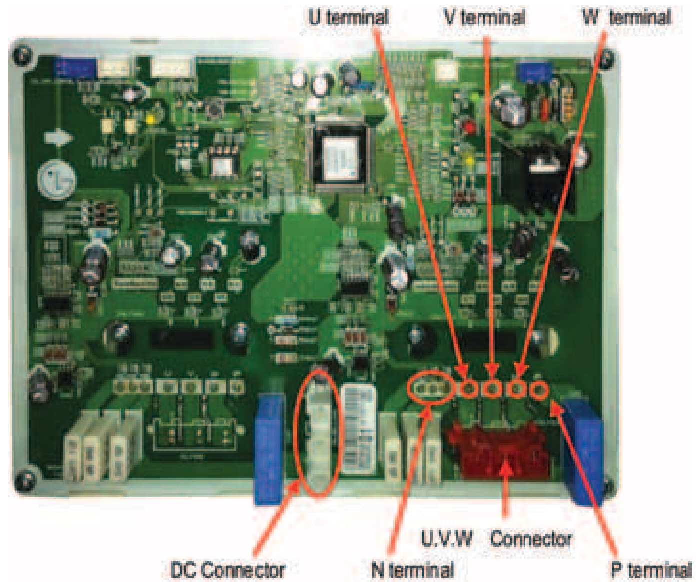
	P Terminal: Black (-)	N Terminal: Red (-)
U terminal : Red (+)	28KΩ ± 10%	Open
V terminal : Red (+)	28KΩ ± 10%	Open
W terminal : Red (+)	28KΩ ± 10%	Open
	P Terminal: Red (+)	N Terminal: Red (+)
U terminal : Black (-)	Open	28KΩ ± 10%
V terminal : Black (-)	Open	28KΩ ± 10%
W terminal : Black (-)	Open	28KΩ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

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

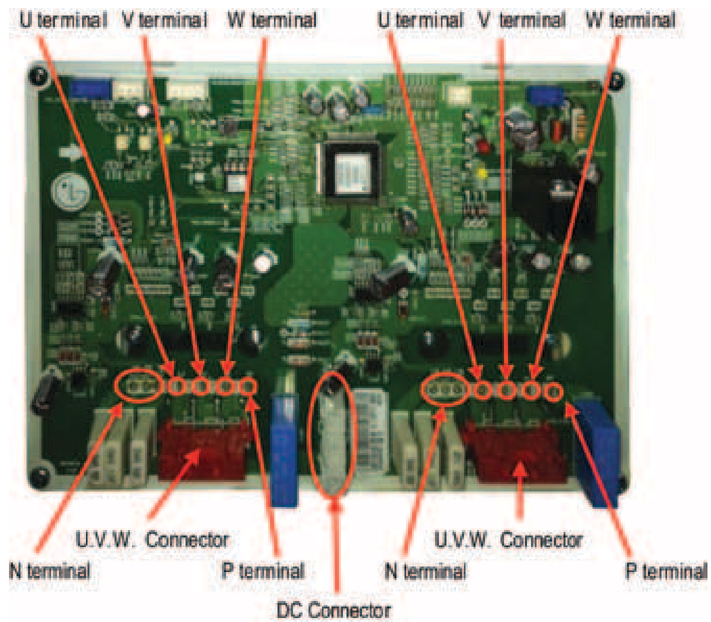
SERVICE TROUBLESHOOTING

Troubleshooting Fan IPM Errors

208-230V Small-Frame (6-ton) Heat Pump and Heat Recovery Outdoor Unit Fan PCB.



208-230V Large-Frame (8, 10, 12-ton) Heat Pump and Heat Recovery Outdoor Unit Fan PCB.

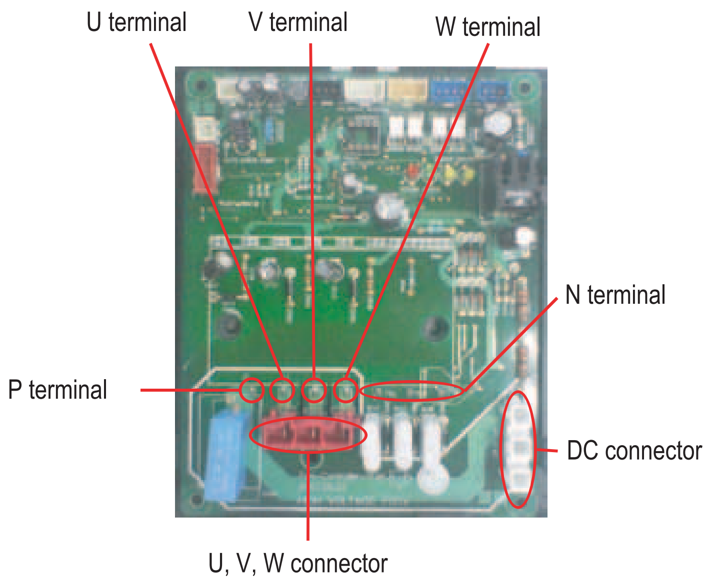


1. After main power is shut off, wait a few minutes until inverter PCB DC voltage is discharged.
2. Disconnect the DC connector, and U, V, W fan motor connectors to the fan PCB.
3. Set the multitester to diode mode.
4. Measured value should be between 0.4~0.7V as seen in the table below.
5. If the measured value is different from what is listed in the table below, set the multitester to resistance mode and measure. If the value is too small (0Ω) or too large (hundreds MΩ), the PCB is damaged and needs to be replaced.

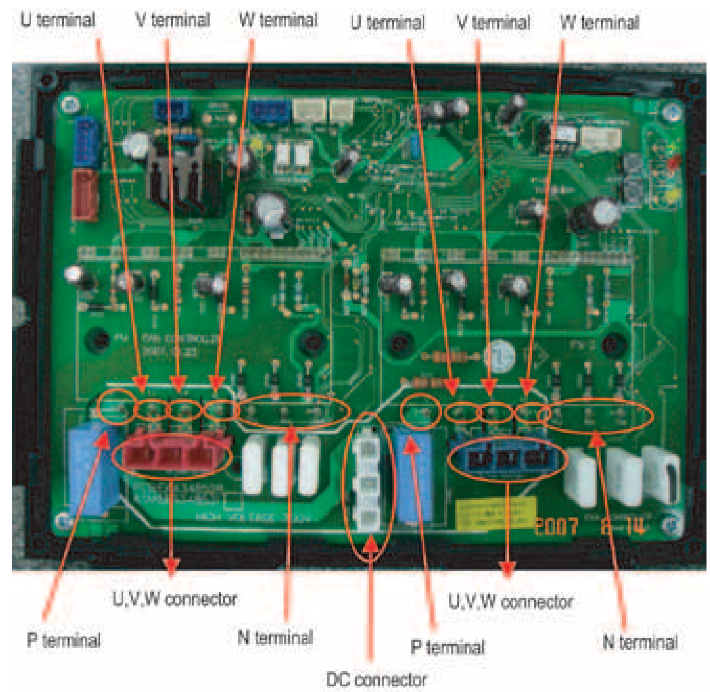
	P Terminal: Black (-)	**N Terminal: Black (-)**
U terminal : Red (+)	0.4V ~ 0.7V	Open
V terminal : Red (+)	0.4V ~ 0.7V	Open
W terminal : Red (+)	0.4V ~ 0.7V	Open
	P Terminal: Red (+)	**N Terminal: Red (+)**
U terminal : Black (-)	Open	0.4V ~ 0.7V
V terminal : Black (-)	Open	0.4V ~ 0.7V
W terminal : Black (-)	Open	0.4V ~ 0.7V

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

460V Small-Frame (6-ton) Heat Pump and Heat Recovery Outdoor Unit Fan PCB.



460V Large-Frame (8, 10, 12-ton) Heat Pump and Heat Recovery Outdoor Unit Fan PCB.



1. After main power is shut off, wait a few minutes until inverter PCB DC voltage is discharged.
2. Disconnect the DC connector, and U, V, W fan motor connectors to the fan PCB.
3. Set the multitester to resistance mode and measure.
4. If the value between the P and N terminals of the IPM is too small (0Ω) or too large (tens KΩ), the IPM is damaged and the PCB needs to be replaced.
5. If the value is open (hundreds KΩ), measure resistance mode, and the value should be within 35KΩ ±10% as shown in the table below.
6. If the measured value is different from what is listed in the table below, the PCB is damaged and needs to be replaced.

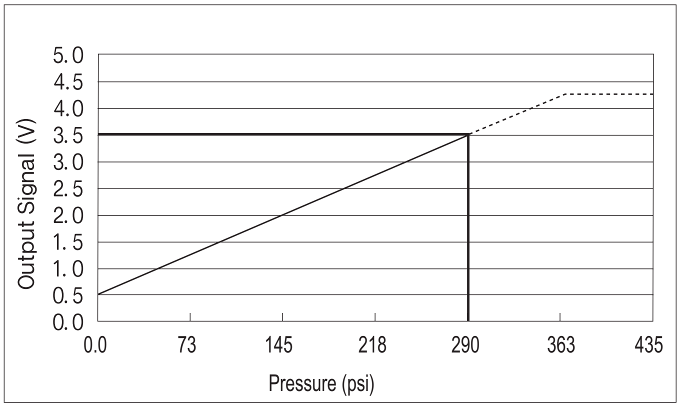
	P Terminal: Black (-)	**N Terminal: Red (-)**
U terminal : Red (+)	35KΩ ± 10%	Open
V terminal : Red (+)	35KΩ ± 10%	Open
W terminal : Red (+)	35KΩ ± 10%	Open
	P Terminal: Red (+)	**N Terminal: Red (+)**
U terminal : Black (-)	Open	35KΩ ± 10%
V terminal : Black (-)	Open	35KΩ ± 10%
W terminal : Black (-)	Open	35KΩ ± 10%

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

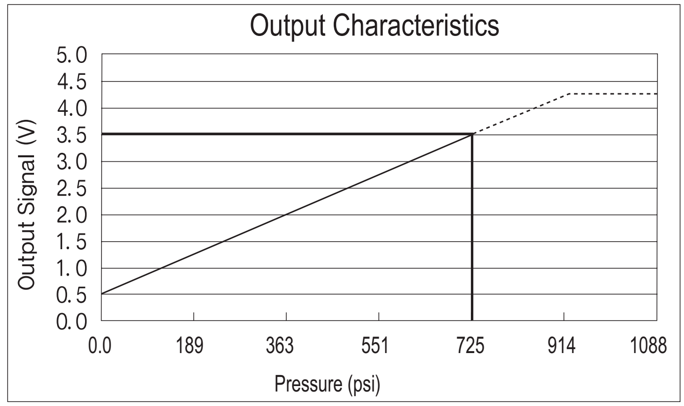
Troubleshooting the High / Low Pressure Sensors.

Connect the manifold gauge to the outdoor unit service valve, and compare the high pressure sensor output to the low pressure sensor output. Compare the pressure sensor output to the manifold gauge pressure outlet using the charts below.

Low Pressure Sensor

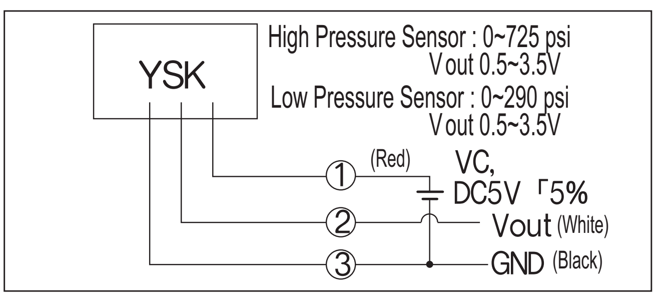


High Pressure Sensor



1. If the manifold gauge reads 0 to 14 psi, then there is a decrease in pressure due to a refrigerant leak.
2. Find the refrigerant leak and fix it.
3. If the difference between the high and low pressure outputs is ≤14 psi, the pressure sensor is operating normally.
4. If the difference between the high and low pressure outputs is ≥14 psi, the pressure sensor is not functioning properly and needs to be replaced.

Schematic of a Pressure Sensor Circuit.



If DC 5V voltage is carried on the red and black wires, voltage would be made between the white and black wire. See the charts above for the equivalent pressure output.

Troubleshooting the Outdoor Fan.

1. The inverter motor controls the speed of the outdoor unit fan.
2. The high / low pressure sensors control the outdoor unit fan when the compressor is running.
3. Even if the compressor is on, the outdoor unit fan may not function due to low capacity operation or if the outdoor temperature is low. This is normal, and the outdoor unit fan will begin to operate after the system reaches setpoint.

Compare solenoid valve operation to the control board output.

Troubleshooting the Hot Gas Bypass Solenoid Valve.

1. When the compressor begins operating, hot-gas bypass solenoid valve functions for one (1) minute. Check for operation noise or pipe vibration on the solenoid valve.
2. To decrease the difference between system high pressure and system low pressure after the compressor stops, wait for five (5) seconds, then turn the hot-gas bypass solenoid valve on.
3. Turn the hot-gas bypass solenoid valve on if the compressor suction pipe temperature is lower than the permissible operating temperature range.
4. Hot-gas bypass solenoid valve may remain on, depending on cycle conditions. This is normal operation and does not indicate system malfunction.
5. A change in operation can be verified by the inlet and outlet temperature sensors of the hot-gas bypass valve, and by the sound of refrigerant.
6. Insulation resistance between the valve and the coil should be ≥100mΩ when measured with a DC 500V megatester.

Troubleshooting the Oil Solenoid Valve.

1. The oil solenoid valve, located at the bottom of the accumulator, helps provide oil to the compressor after the compressor begins to operate.
2. When the compressor starts operation, oil solenoid valve will function for two (2) minutes. Check for operation noise or pipe vibration on the solenoid valve.
3. The oil solenoid valve will also turn on immediately after the compressor stops operating.
4. The oil solenoid valve can repeatedly turn on and off, depending on cycle conditions. This is normal operation and does not indicate system malfunction.
5. Insulation resistance between the valve and the coil should be ≥100mΩ. Measure insulation resistance with a DC 500V megatester.

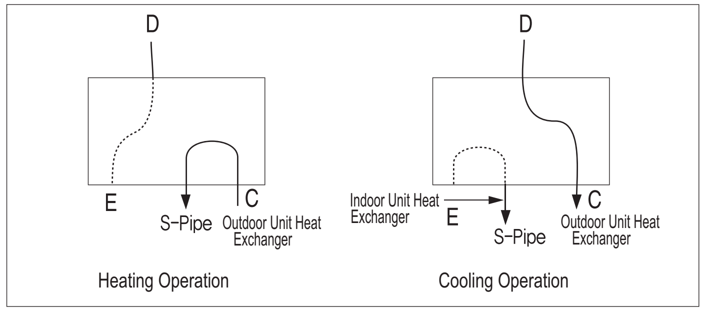
SERVICE TROUBLESHOOTING

Troubleshooting Four-Way Valve, Temperature Sensor, and Voltage Distribution Errors

Troubleshooting the Four-Way Valve

1. Ensure that the four-way valve is off before the outdoor and indoor units are powered on.
2. Four-way valve position during cooling, defrost, and oil recovery operation: OFF
3. Four-way valve position during heating operation: ON
4. Four-way valve changes position during restart for three (3) minutes when system switches from cooling operation to heating operation.
5. To verify if the four-way valve is operating in cooling or heating mode, touch the pipe of the low pressure service valve.
6. Insulation resistance between the valve and the coil should be ≥100mΩ when measured with a DC 500V megatester.

Refrigerant Flowchart of Four-Way Valve.



Troubleshooting the Temperature Sensor

TH1 = Outdoor Temperature Sensor.

TH2 = Suction Pipe (S-pipe) Temperature Sensor.

TH2 = Outdoor Heat Exchanger (center of condenser) Temperature Sensor.

TH3 = Discharge Pipe (D-pipe) Temperature Sensor.

1. Check temperature sensor installation and contacts.
2. Check if the temperature sensor connector contact is normal.
3. Measure the temperature sensor resistance.

Temperature Sensor Resistance.

Temperature Sensor	TH1	TH2	TH3
Resistance	10KΩ ± 1% @ 77°F	5KΩ ± 1%@77°F	200KΩ ± 1% @ 77°F
	1.07KΩ ± 3.3% @ 185°F	0.535KΩ ± 3.3% @185°F	28KΩ ± 7.7% @ 185°F

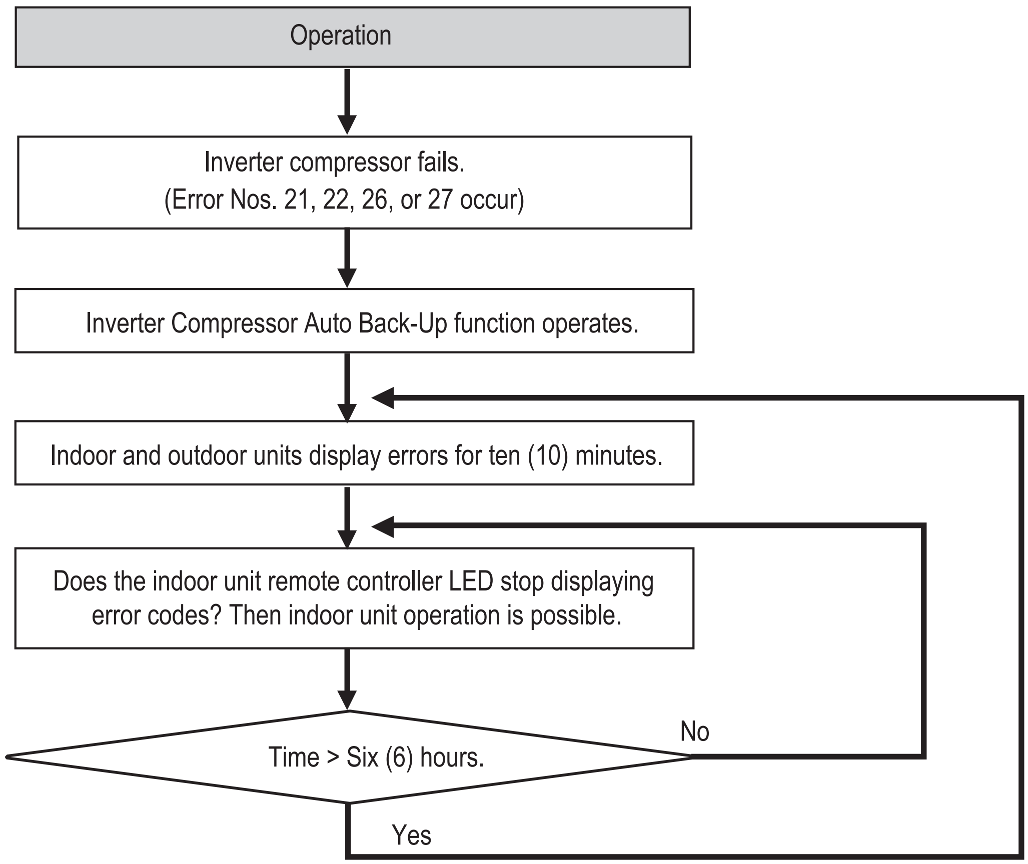
Checking the Electrolytic Capacitor and Resistor for Voltage Distribution.

1. Disconnect the terminal of the voltage distribution resistor from each DC link electrolytic capacitor.
2. Set the multimeter to resistance mode, and connect the probe to the + / - capacitor terminal. If the measured resistance value has continuously increased without shorting (value is 0), then the resistor is operating normally.
3. Set the multimeter to resistance mode again to confirm that the resistance value of the resistor is around 270 kOhm.
4. Check and replace any broken components.

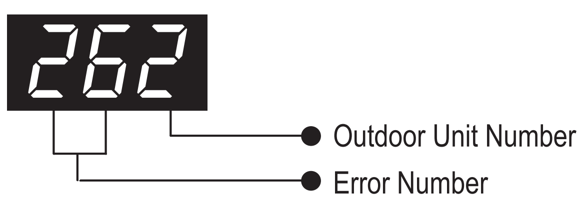
SERVICE TROUBLESHOOTING

Inverter Compressor Auto Back-Up Function

Auto back-up function allows the system to operate if an inverter compressor fails by backing up the compressor. Service can be asked by displaying error to the customer every six (6) hours.



Example: Slave1 Outdoor Unit Inverter Compressor failed to start—error occurred.

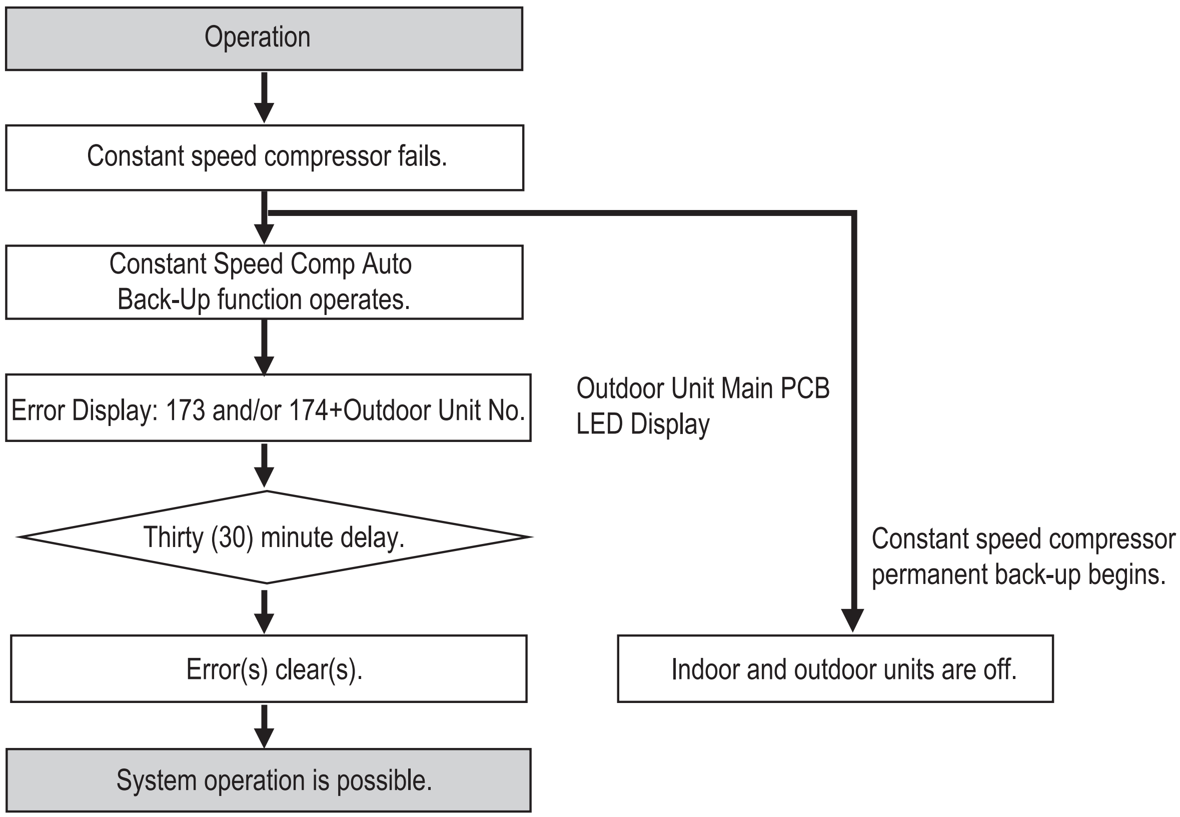


⚠ *Note:*

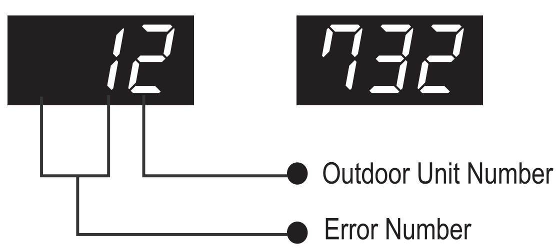
- *Request service immediately if compressor errors occur.*
- *Auto Back-Up is set up only to one (1) inverter compressor.*
- *When the Inverter Compressor Auto Back-Up function begins, error(s) will display for ten (10) minutes every six (6) hours.*
- *Error(s) will continuously display on the corresponding outdoor unit.*

Constant Speed Compressor Auto Back-Up Function

Auto back-up function allows the system to operate by backing up the compressor if a constant speed compressor fails.



Example: Slave1 Outdoor Unit Constant Speed Compressor Failure (Error No. 173)



⚠ Note:
Request service immediately if compressor errors occur.

Black box function saves the data from the system operation that immediately occured before the error is noted by the outdoor unit main PCB, thus making error analysis possible.

Black Box Procedure

Indoor units, outdoor units stop operating.

↓

Press the black button for five (5) seconds.

↓

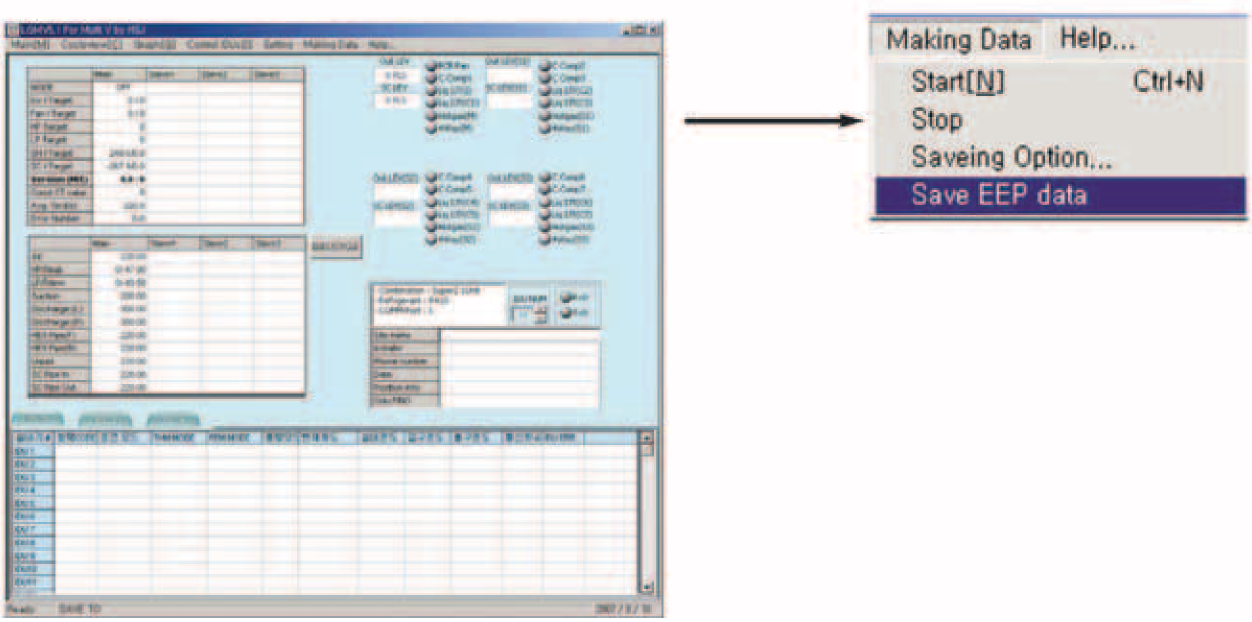
EEPROM ➡ Main MICOM data save

Yellow LED (LED01C) is off when data is loading. After completion, LED starts blinking. Data load takes about twenty (20) seconds.

↓

EEPROM data is saved to PC by using the "Save EEP data" function in LGMV software.

Black Box process : Data is generated ➡ EEP data is stored ➡ Select PC to store the data ➡ Files are saved



⚠ ***Note:***

For use with LGMV version 6.2 only.

SERVICE TROUBLESHOOTING

Error / Fault Code Tables

- Indicates different types of unit failures, assists in self-diagnosis, and tracks the frequency of occurrence.
- Error codes are shown on the LED display of indoor units, wired remote controllers, and the outdoor 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 or wired remote controller has not received signal from indoor unit.
	0	4	-	Indoor unit drain pump error.	Drain pump is malfunctioning.
	0	5	-	Communication error between outdoor unit and indoor unit.	Indoor unit PCB has not received signal from outdoor unit.
	0	6	-	Indoor unit outlet pipe temperature sensor error.	Indoor unit outlet pipe temperature sensor has disconnected or short circuited.
	0	9	-	Indoor unit EEPROM error.	Serial number on EEPROM of indoor unit is 0 or FFFFFF.
	1	0	-	Fan motor operation error.	Fan motor terminal has disconnected, indoor fan motor lock has failed.
	1	7	-	FAU inlet air temperature sensor error.	Air temperature sensor of indoor unit has disconnected or short circuited.
Outdoor Unit	2	1	1	Master outdoor unit inverter compressor IPM error.	Master outdoor unit inverter compressor drive IPM error.
	2	1	2	Slave1 outdoor unit inverter compressor IPM error.	Slave1 outdoor unit inverter compressor drive IPM error.
	2	1	3	Slave2 outdoor unit inverter compressor IPM error.	Slave2 outdoor unit inverter compressor drive IPM error.
	2	2	1	Overcurrent of master outdoor unit inverter board input (RMS).	Overcurrent of master outdoor unit inverter board input (RMS).
	2	2	2	Overcurrent of slave1 outdoor unit inverter board input (RMS).	Overcurrent of slave1 outdoor unit inverter board input (RMS).
	2	2	3	Overcurrent of slave2 outdoor unit inverter board input (RMS).	Overcurrent of slave2 outdoor unit inverter board input (RMS).
	2	3	1	Low voltage to the master outdoor unit inverter compressor DC link.	DC voltage is not charged after outdoor unit operating relay is turned on.
	2	3	2	Low voltage to the slave1 outdoor unit inverter compressor DC link.	DC voltage is not charged after slave1 outdoor unit operating relay is turned on.
	2	3	3	Low voltage to the slave2 outdoor unit inverter compressor DC link.	DC voltage is not charged after slave2 outdoor unit operating relay is turned on.
	2	4	1	Master outdoor unit high pressure switch error.	System has been turned off by the master outdoor unit high pressure switch.
	2	4	2	Slave1 outdoor unit high pressure switch error.	System has been turned off by the slave1 outdoor unit high pressure switch.
	2	4	3	Slave2 outdoor unit high pressure switch error.	System has been turned off by the slave2 outdoor unit high pressure switch.

To troubleshoot each error, see pages 235-308.

	Error Code			Description	Details
Outdoor Unit	2	5	1	Input voltage to the master outdoor unit is too high or too low.	Master outdoor unit has an input voltage of ≤140V or ≥300V (for 208-230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	5	2	Input voltage to the slave1 outdoor unit is too high or too low.	Slave1 outdoor unit has an input voltage of ≤140V or ≥300V (for 208-230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	5	3	Input voltage to the slave2 outdoor unit is too high or too low.	Slave2 outdoor unit has an input voltage of ≤140V or ≥300V (for 208-230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	6	1	Master outdoor unit inverter compressor start error.	Initial operation failure due to master outdoor unit inverter compressor error.
	2	6	2	Slave1 outdoor unit inverter compressor start error.	Initial operation failure due to slave1 outdoor unit inverter compressor error.
	2	6	3	Slave2 outdoor unit inverter compressor start error.	Initial operation failure due to slave2 outdoor unit inverter compressor error.
	2	8	1	Master outdoor unit inverter DC link high voltage error.	System shut off because of an overcurrent in the master outdoor unit DC link voltage.
	2	8	2	Slave1 outdoor unit inverter DC link high voltage error.	System shut off because of an overcurrent in the slave1 outdoor unit DC link voltage.
	2	8	3	Slave2 outdoor unit inverter DC link high voltage error.	System shut off because of an overcurrent in the slave2 outdoor unit DC link voltage.
	2	9	1	Master outdoor unit inverter compressor overcurrent error.	Master outdoor unit inverter compressor has a fault or a drive fault.
	2	9	2	Slave1 outdoor unit inverter compressor overcurrent error.	Slave1 outdoor unit inverter compressor has a fault or a drive fault.
	2	9	3	Slave2 outdoor unit inverter compressor overcurrent error.	Slave2 outdoor unit inverter compressor has a fault or a drive fault.
	3	0	1	Excessive increase in the discharge temperature at the master outdoor unit constant-speed2 compressor.	System shut off because of a high discharge temperature at the master outdoor unit constant-speed2 compressor.
	3	0	2	Excessive increase in the discharge temperature at the slave1 outdoor unit constant-speed2 compressor.	System shut off because of a high discharge temperature at the slave1 outdoor unit constant-speed2 compressor.
	3	0	3	Excessive increase in the discharge temperature at the slave2 outdoor unit constant-speed2 compressor.	System shut off because of a high discharge temperature at the slave2 outdoor unit constant-speed2 compressor.
	3	2	1	Excessive increase in the discharge temperature at the master outdoor unit inverter compressor.	System shut off because of a high discharge temperature at the master outdoor unit inverter compressor.
	3	2	2	Excessive increase in the discharge temperature at the slave1 outdoor unit inverter compressor.	System shut off because of a high discharge temperature at the slave1 outdoor unit inverter compressor.
	3	2	3	Excessive increase in the discharge temperature at the slave2 outdoor unit inverter compressor.	System shut off because of a high discharge temperature at the slave2 outdoor unit inverter compressor.
	3	3	1	Excessive increase in the discharge temperature at the master outdoor unit number 1 constant-speed compressor.	System shut off because of a high discharge temperature at the master outdoor unit constant-speed compressor.
	3	3	2	Excessive increase in the discharge temperature at the slave1 outdoor unit number 1 constant-speed compressor.	System shut off because of a high discharge temperature at the slave1 outdoor unit constant-speed compressor.
	3	3	3	Excessive increase in the discharge temperature at the slave2 outdoor unit number 1 constant-speed compressor.	System shut off because of a high discharge temperature at the slave2 outdoor unit constant-speed compressor.
	3	4	1	Excessive increase in master outdoor unit high pressure.	System shut off because of an excessive increase in high pressure at the master outdoor unit.
	3	4	2	Excessive increase in slave1 outdoor unit high pressure.	System shut off because of an excessive increase in high pressure at the slave1 outdoor unit.
	3	4	3	Excessive increase in slave2 outdoor unit high pressure.	System shut off because of an excessive increase in high pressure at the slave2 outdoor unit.

To troubleshoot each error, see pages 235-308.

	Error Code			Description	Details
Outdoor Units	3	5	1	Excessive decrease in master outdoor unit low pressure.	System shut off because of an excessive decrease in low pressure at the master outdoor unit.
	3	5	2	Excessive decrease in slave1 outdoor unit low pressure.	System shut off because of an excessive decrease in low pressure at the slave1 outdoor unit.
	3	5	3	Excessive decrease in slave2 outdoor unit low pressure.	System shut off because of an excessive decrease in low pressure at the slave2 outdoor unit.
	3	6	1	Master outdoor unit fell below low condenser ratio limit.	Master outdoor unit remained below the low condenser ratio limit for three (3) minutes.
	3	6	2	Slave1 outdoor unit fell below low condenser ratio limit.	Slave1 outdoor unit remained below the low condenser ratio limit for three (3) minutes.
	3	6	3	Slave2 outdoor unit fell below low condenser ratio limit.	Slave2 outdoor unit remained below the low condenser ratio limit for three (3) minutes.
	4	0	1	Master outdoor unit inverter compressor CT sensor error.	Disconnection or short circuit of master outdoor unit inverter compressor current detection (CT) sensor.
	4	0	2	Slave1 outdoor unit inverter compressor CT sensor error.	Disconnection or short circuit of slave1 outdoor unit inverter compressor current detection (CT) sensor.
	4	0	3	Slave2 outdoor unit inverter compressor CT sensor error.	Disconnection or short circuit of slave2 outdoor unit inverter compressor current detection (CT) sensor.
	4	1	1	Master outdoor unit inverter compressor discharge temperature sensor error.	Disconnection or short circuit of master outdoor unit inverter compressor discharge temperature sensor.
	4	1	2	Slave1 outdoor unit inverter compressor discharge temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit inverter compressor discharge temperature sensor.
	4	1	3	Slave2 outdoor unit inverter compressor discharge temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit inverter compressor discharge temperature sensor.
	4	2	1	Master outdoor unit low pressure sensor error.	Disconnection or short circuit of master outdoor unit low pressure sensor.
	4	2	2	Slave1 outdoor unit low pressure sensor error.	Disconnection or short circuit of slave1 outdoor unit low pressure sensor.
	4	2	3	Slave2 outdoor unit low pressure sensor error.	Disconnection or short circuit of slave2 outdoor unit low pressure sensor.
	4	3	1	Master outdoor unit high pressure sensor error.	Disconnection or short circuit of master outdoor unit high pressure sensor.
	4	3	2	Slave1 outdoor unit high pressure sensor error.	Disconnection or short circuit of slave1 outdoor unit high pressure sensor.
	4	3	3	Slave2 outdoor unit high pressure sensor error.	Disconnection or short circuit of slave2 outdoor unit high pressure sensor.
	4	4	1	Master outdoor unit air temperature sensor error.	Disconnection or short circuit of master outdoor unit air temperature sensor.
	4	4	2	Slave1 outdoor unit air temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit air temperature sensor.
	4	4	3	Slave2 outdoor unit air temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit air temperature sensor.
	4	5	1	Master outdoor unit front-side heat exchanger temperature sensor error.	Disconnection or short circuit of master outdoor unit heat exchanger temperature sensor on the front.
	4	5	2	Slave1 outdoor unit front-side heat exchanger temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit heat exchanger temperature sensor on the front.
	4	5	3	Slave2 outdoor unit front-side heat exchanger temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit heat exchanger temperature sensor on the front.
	4	6	1	Master outdoor unit compressor suction temperature sensor error.	Disconnection or short circuit of master outdoor unit suction temperature sensor.
	4	6	2	Slave1 outdoor unit compressor suction temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit suction temperature sensor.
	4	6	3	Slave2 outdoor unit compressor suction temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit suction temperature sensor.

To troubleshoot each error, see pages 235-308.

	Error Code			Description	Details
Outdoor Unit	4	7	1	Master outdoor unit constant-speed compressor discharge temperature sensor error.	Disconnection or short circuit of master outdoor unit constant-speed compressor discharge temperature sensor.
	4	7	2	Slave1 outdoor unit constant-speed compressor discharge temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit constant-speed compressor discharge temperature sensor.
	4	7	3	Slave2 outdoor unit constant-speed compressor discharge temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit constant-speed compressor discharge temperature sensor.
	4	9	1	Master outdoor unit IPM temperature sensor error.	Disconnection or short circuit of master outdoor unit IPM temperature sensor.
	4	9	2	Slave1 outdoor unit IPM temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit IPM temperature sensor.
	4	9	3	Slave2 outdoor unit IPM temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit IPM temperature sensor.
	5	0	1	Master outdoor unit three-phase power is not connected.	One or more of R(L1), S(L2), T(L3) input power line connections is / are missing for the master outdoor unit.
	5	0	2	Slave1 outdoor unit three-phase power is not connected.	One or more of R(L1), S(L2), T(L3) input power line connections is / are missing for the slave1 outdoor unit.
	5	0	3	Slave2 outdoor unit three-phase power is not connected.	One or more of R(L1), S(L2), T(L3) input power line connections is / are missing for the slave2 outdoor unit.
	5	1	1	Total indoor unit capacity exceeds allowable outdoor unit capacity.	Value of total indoor unit capacity exceeds allowable outdoor unit capacity specifications.
	5	1	2	Total indoor unit capacity exceeds allowable heat recovery unit branch capacity. (ARUB Heat Recovery Systems only.)	Value of total indoor unit capacity exceeds allowable heat recovery unit branch capacity specifications. (ARUB Heat Recovery Systems only.)
	5	2	1	Communication error between master outdoor unit inverter PCB and main PCB.	Master outdoor unit main controller is not receiving signal from inverter controller.
	5	2	2	Communication error between slave1 outdoor unit inverter PCB and main PCB.	Slave1 outdoor unit main controller is not receiving signal from inverter controller.
	5	2	3	Communication error between slave2 outdoor unit inverter PCB and main PCB.	Slave2 outdoor unit main controller is not receiving signal from inverter controller.
	5	3	1	Communication error between outdoor unit main PCB and indoor unit.	Main PCB on the outdoor unit is not receiving signal from the indoor unit.
	5	4	1	Master outdoor unit power error.	Master outdoor unit three-phase power R(L1), S(L2), T(L3) is not connected properly (reverse phase / phase is missing).
	5	4	2	Slave1 outdoor unit power error.	Slave1 outdoor unit three-phase power R(L1), S(L2), T(L3) is not connected properly (reverse phase / phase is missing).
	5	4	3	Slave2 outdoor unit power error.	Slave2 outdoor unit three-phase power R(L1), S(L2), T(L3) is not connected properly (reverse phase / phase is missing).
	5	7	1	Master outdoor unit controller and inverter controller communication error.	Master outdoor unit controller is not receiving signal from inverter controller (common after on-boarding).
	5	7	2	Slave1 outdoor unit inverter controller communication error.	Slave1 outdoor unit controller is not receiving signal from inverter controller (common after on-boarding).
	5	7	3	Slave2 outdoor unit inverter controller communication error.	Slave2 outdoor unit controller is not receiving signal from inverter controller (common after on-boarding).
	5	9	1	Outdoor unit series installation error.	A smaller outdoor unit is set as the master outdoor unit.
	6	0	1	Master outdoor unit inverter PCB EEPROM error.	Access errors of the master outdoor unit inverter PCB.
	6	0	2	Slave1 outdoor unit inverter PCB EEPROM error.	Access errors of the slave1 outdoor unit inverter PCB.
	6	0	3	Slave2 outdoor unit inverter PCB EEPROM error.	Access errors of the slave2 outdoor unit inverter PCB.
	6	7	1	Master outdoor unit fan has locked up.	Master outdoor unit air flow is restricted.
	6	7	2	Slave1 outdoor unit fan has locked up.	Slave1 outdoor unit air flow is restricted.
	6	7	3	Slave2 outdoor unit fan has locked up	Slave2 outdoor unit air flow is restricted.

To troubleshoot each error, see pages 235-308.

Error Code		Description	Details
Outdoor Unit	6 9 1	Master outdoor unit constant-speed compressor CT sensor error.	Disconnection or short circuit of master outdoor unit constant-speed compressor CT sensor.
	6 9 2	Slave1 outdoor unit constant-speed compressor CT sensor error.	Disconnection or short circuit of slave1 outdoor unit constant-speed compressor CT sensor.
	6 9 3	Slave2 outdoor unit constant-speed compressor CT sensor error.	Disconnection or short circuit of slave2 outdoor unit constant-speed compressor CT sensor.
	7 3 1	Master outdoor PFC instant overcurrent (peak) error.	Instant overcurrent (peak) of master outdoor unit PFC.
	7 3 2	Slave1 outdoor PFC instant overcurrent (peak) error.	Instant overcurrent (peak) of slave1 outdoor unit PFC.
	7 3 3	Slave2 outdoor PFC instant overcurrent (peak) error.	Instant overcurrent (peak) of slave2 outdoor unit PFC.
	7 5 1	Master outdoor unit fan CT sensor error.	Disconnection or short circuit of master outdoor unit fan current detection (CT) sensor.
	7 5 2	Slave1 outdoor unit fan CT sensor error.	Disconnection or short circuit of slave1 outdoor unit fan current detection (CT) sensor.
	7 5 3	Slave2 outdoor unit fan CT sensor error.	Disconnection or short circuit of slave2 outdoor unit fan current detection (CT) sensor.
	7 6 1	Master outdoor unit fan DC link high voltage error.	Master outdoor unit fan DC link high voltage error.
	7 6 2	Slave1 outdoor unit fan DC link high voltage error.	Slave1 outdoor unit fan DC link high voltage error.
	7 6 3	Slave2 outdoor unit fan DC link high voltage error.	Slave2 outdoor unit fan DC link high voltage error.
	7 7 1	Master outdoor unit fan overcurrent error.	Master outdoor unit fan current is >10A (for 208-230V units) or 5A (for 460V units).
	7 7 2	Slave1 outdoor unit fan overcurrent error.	Slave1 outdoor unit fan current is >10A (for 208-230V units) or 5A (for 460V units).
	7 7 3	Slave2 outdoor unit fan overcurrent error.	Slave2 outdoor unit fan current is >10A (for 208-230V units) or 5A (for 460V units).
	7 9 1	Master outdoor unit fan operation failure error.	Master outdoor unit fan is experiencing first position sensor failure.
	7 9 2	Slave1 outdoor unit fan operation failure error.	Slave1 outdoor unit fan is experiencing first position sensor failure.
	7 9 3	Slave2 outdoor unit fan operation failure error.	Slave2 outdoor unit fan is experiencing first position sensor failure.
	8 6 1	Master outdoor unit main PCB EEPROM error.	• Communication error between master outdoor unit main MICOM and EEPROM. • EEPROM is missing.
	8 6 2	Slave1 outdoor unit main PCB EEPROM error.	• Communication error between slave1 outdoor unit main MICOM and EEPROM. • EEPROM is missing.
	8 6 3	Slave2 outdoor unit main PCB EEPROM error.	• Communication error between slave2 outdoor unit main MICOM and EEPROM. • EEPROM is missing.
	8 7 1	Master outdoor unit fan PCB EEPROM error.	• Communication error between master outdoor unit fan MICOM and EEPROM. • EEPROM is missing.
	8 7 2	Slave1 outdoor unit fan PCB EEPROM error.	• Communication error between slave1 outdoor unit fan MICOM and EEPROM. • EEPROM is missing.
	8 7 3	Slave2 outdoor unit fan PCB EEPROM error.	• Communication error between slave2 outdoor unit fan MICOM and EEPROM. • EEPROM is missing.
	1 0 4 1	Communication error between master outdoor unit and other outdoor units.	Master outdoor unit main PCB is not receiving signals from slave outdoor units.
	1 0 4 2	Communication error between slave1 outdoor unit and other outdoor units.	Slave1 outdoor unit main PCB is not receiving signals from other outdoor units.
	1 0 4 3	Communication error between slave2 outdoor unit and other outdoor units.	Slave2 outdoor unit main PCB is not receiving signals from other outdoor units.
	1 0 5 1	Master outdoor unit fan PCB communication error.	Master outdoor unit main PCB is not receiving a signal from the fan.
	1 0 5 2	Slave1 outdoor unit fan PCB communication error.	Slave1 outdoor unit main PCB is not receiving a signal from the fan.
	1 0 5 3	Slave2 outdoor unit fan PCB communication error.	Slave2 outdoor unit main PCB is not receiving a signal from the fan.

To troubleshoot each error, see pages 235-308.

Error Code					Description	Details
Outdoor Unit	1	0	6	1	Master outdoor unit fan IPM error.	Instant overcurrent (peak) of master outdoor unit fan IPM.
	1	0	6	2	Slave1 outdoor unit fan IPM error.	Instant overcurrent (peak) of slave1 outdoor unit fan IPM.
	1	0	6	3	Slave2 outdoor unit fan IPM error.	Instant overcurrent (peak) of slave2 outdoor unit fan IPM.
	1	0	7	1	Master outdoor unit fan DC link low voltage error.	Master outdoor unit fan DC link voltage is <140V (for 208-230V units) or <380V (for 460V units).
	1	0	7	2	Slave1 outdoor unit fan DC link low voltage error.	Slave1 outdoor unit fan DC link voltage is <140V (for 208-230V units) or <380V (for 460V units).
	1	0	7	3	Slave2 outdoor unit fan DC link low voltage error.	Slave2 outdoor unit fan DC link voltage is <140V (for 208-230V units) or <380V (for 460V units).
	1	1	3	1	Master outdoor unit liquid pipe temperature sensor error.	Disconnection or short circuit of master outdoor unit liquid pipe temperature sensor.
	1	1	3	2	Slave1 outdoor unit liquid pipe temperature sensor error.	Disconnection or short circuit of outdoor unit liquid pipe temperature sensor.
	1	1	3	3	Slave2 outdoor unit liquid pipe temperature sensor error.	Disconnection or short circuit of outdoor unit liquid pipe temperature sensor.
	1	1	5	1	Master outdoor unit subcooling outlet temperature sensor error.	Disconnection or short circuit of master outdoor unit subcooling outlet temperature sensor.
	1	1	5	2	Slave1 outdoor unit subcooling outlet temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit subcooling outlet temperature sensor.
	1	1	5	3	Slave2 outdoor unit subcooling outlet temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit subcooling outlet temperature sensor.
	1	5	1	1	Master outdoor unit operation mode conversion error.	Pressure imbalance between outdoor units.
	1	5	1	2	Slave1 outdoor unit operation mode conversion error.	
	1	5	1	3	Slave2 outdoor unit operation mode conversion error.	
	1	5	3	1	Master outdoor unit upper heat exchanger temperature sensor error.	Disconnection or short circuit of master outdoor unit upper heat exchanger temperature sensor.
	1	5	3	2	Slave1 outdoor unit upper heat exchanger temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit upper heat exchanger temperature sensor.
	1	5	3	3	Slave2 outdoor unit upper heat exchanger temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit upper heat exchanger temperature sensor.
	1	5	4	1	Master outdoor unit lower heat exchanger temperature sensor error.	Disconnection or short circuit of master outdoor unit lower heat exchanger temperature sensor.
	1	5	4	2	Slave1 outdoor unit lower heat exchanger temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit lower heat exchanger temperature sensor.
	1	5	4	3	Slave2 outdoor unit lower heat exchanger temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit lower heat exchanger temperature sensor.
	1	7	3	1	Master outdoor unit constant-speed compressor error.	Master outdoor unit constant-speed compressor has locked up, the comp dielectric has broken down, or the check valve has leaked.
	1	7	3	2	Slave1 outdoor unit constant-speed compressor error.	Slave1 outdoor unit constant-speed compressor has locked up, the comp dielectric has broken down, or the check valve has leaked.
	1	7	3	3	Slave2 outdoor unit constant-speed compressor error.	Slave2 outdoor unit constant-speed compressor has locked up, the comp dielectric has broken down, or the check valve has leaked.
	1	7	4	1	Master outdoor unit rated speed 2 condenser error.	Master outdoor unit rated speed 2 condenser has burned up, locked up, or was subjected to overcurrent.
	1	7	4	2	Slave1 outdoor unit rated speed 2 condenser error.	Slave1 outdoor unit rated speed 2 condenser has burned up, locked up, or was subjected to overcurrent.
	1	7	4	3	Slave2 outdoor unit rated speed 2 condenser error.	Slave2 outdoor unit rated speed 2 condenser has burned up, locked up, or was subjected to overcurrent.
	1	8	2	1	Communication error between master outdoor unit MICOM and main PCB or sub PCB.	Communication error between master outdoor unit main and sub MICOMs.
	1	8	2	2	Communication error between slave1 outdoor unit MICOM and main PCB or sub PCB.	Communication error between slave1 outdoor unit main and sub MICOMs.
	1	8	2	3	Communication error between slave2 outdoor unit MICOM and main PCB or sub PCB.	Communication error between slave2 outdoor unit main and sub MICOMs.

To troubleshoot each error, see pages 235-308.

Error / Fault Code Tables

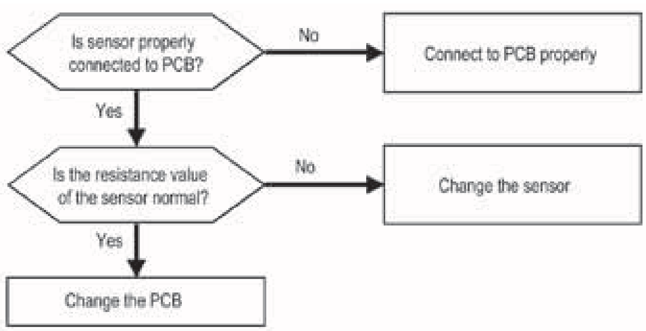
	Error Code				Description	Details
Outdoor Unit	1	8	4	1	Master outdoor unit inverter compressor oil balance pipe temperature sensor error.	Disconnection or short circuit of master outdoor unit inverter compressor oil balance pipe temperature sensor.
	1	8	4	2	Slave1 outdoor unit inverter compressor oil balance pipe temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit inverter compressor oil balance pipe temperature sensor.
	1	8	4	3	Slave2 outdoor unit inverter compressor oil balance pipe temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit inverter compressor oil balance pipe temperature sensor.
	1	8	5	1	Master outdoor unit constant-speed compressor1 oil balance pipe temperature sensor error.	Disconnection or short circuit of master outdoor unit constant-speed compressor1 oil balance pipe temperature sensor.
	1	8	5	2	Slave1 outdoor unit constant-speed compressor1 oil balance pipe temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit constant-speed compressor1 oil balance pipe temperature sensor.
	1	8	5	3	Slave2 outdoor unit constant-speed compressor1 oil balance pipe temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit constant-speed compressor1 oil balance pipe temperature sensor.
	1	9	3	1	Excessive increase in master outdoor unit fan PCB heat sink temperature.	Master outdoor unit fan inverter PCB temperature is >203°F.
	1	9	3	2	Excessive increase in slave1 outdoor unit fan PCB heat sink temperature.	Slave1 outdoor unit fan inverter PCB temperature is >203°F.
	1	9	3	3	Excessive increase in slave2 outdoor unit fan PCB heat sink temperature.	Slave2 outdoor unit fan inverter PCB temperature is >203°F.
	1	9	4	1	Master outdoor unit fan PCB heat sink temperature sensor error.	Disconnection or short circuit of master outdoor unit fan PCB heat sink temperature sensor.
	1	9	4	2	Slave1 outdoor unit fan PCB heat sink temperature sensor error.	Disconnection or short circuit of slave1 outdoor unit fan PCB heat sink temperature sensor.
	1	9	4	3	Slave2 outdoor unit fan PCB heat sink temperature sensor error.	Disconnection or short circuit of slave2 outdoor unit fan PCB heat sink temperature sensor.
Heat Recovery Unit	2	0	0	1	Valve addressing error.	Automatic valve addressing procedure failed.
	2	0	1	C + No. of HR Unit	Heat recovery unit liquid sensor error. (C = Heat recovery unit + Heat recovery unit number).	Disconnection or short circuit of heat recovery unit liquid pipe sensor.
	2	0	2	C + No. of HR Unit	Heat recovery unit subcooling pipe inlet sensor error. (C = Heat recovery unit + Heat recovery unit number).	Disconnection or short circuit of heat recovery unit subcooling pipe inlet sensor.
	2	0	3	C + No. of HR Unit	Heat recovery unit subcooling pipe outlet sensor error. (C = Heat recovery unit + Heat recovery unit number).	Disconnection or short circuit of heat recovery unit subcooling pipe outlet sensor.
	2	0	4	C + No. of HR Unit	Communication error between outdoor unit and heat recovery unit. (C = Heat recovery unit + Heat recovery unit number)	Outdoor unit does not receive signal from heat recovery unit.

To troubleshoot each error, see pages 235-308.

SERVICE TROUBLESHOOTING

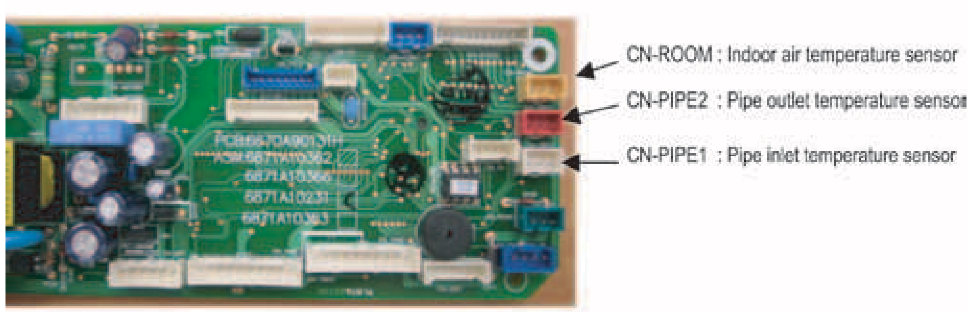
Error Nos. 01, 01 (FAU), 02, 06, and 17 (FAU)

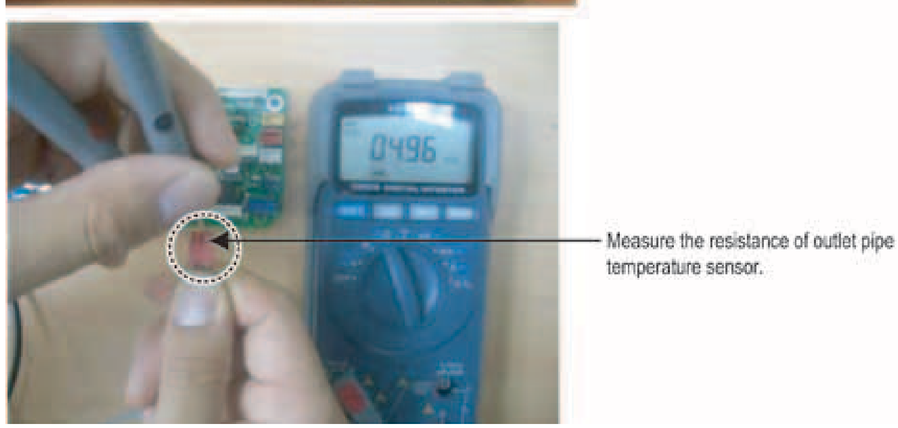
Error No.	Description	Details	Causes
01	Indoor unit air temperature sensor error.	Indoor unit sensor has disconnected or short circuited.	1. Problem with the sensor. 2. Connections on indoor unit PCB are wrong. 3. Indoor unit PCB has failed.
01 (FAU)	Fresh air intake unit outlet air sensor error.		
02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



⚠ *Note:*

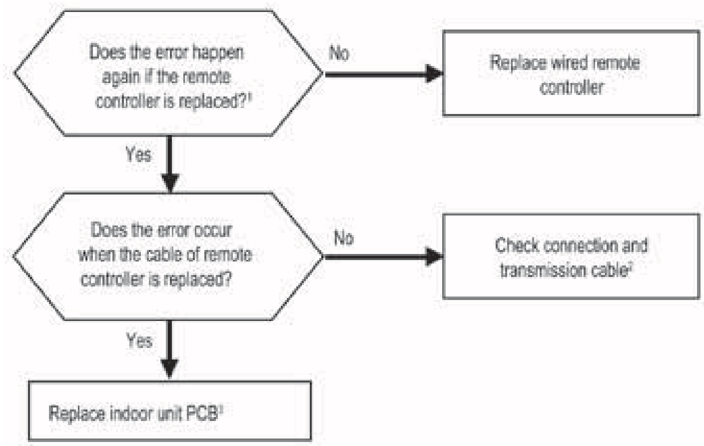
- *If the value is >100kΩ (open) or <100Ω (short), there is an error.*
- *Resistance value may be changing according to sensor temperature, it displays according to current temperature criteria (±5% margin) → Normal.*
- *Air temperature sensor: 50°F = 20.7kΩ : 76°F = 10kΩ : 122°F = 3.4kΩ.*
- *Pipe temperature sensor: 50°F = 10kΩ : 76°F = 5kΩ : 122°F = 1.8kΩ.*



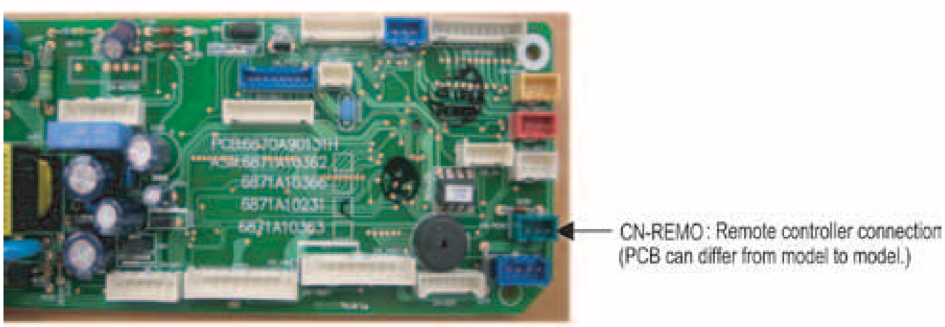


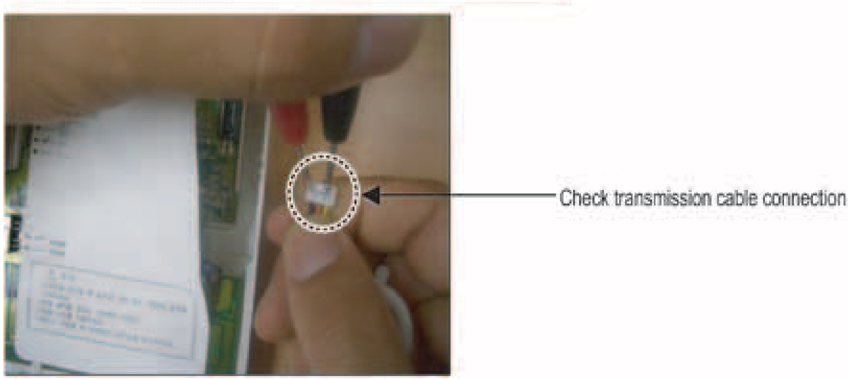
Error No. 03

Error No.	Description	Details	Causes
03	Communication error between wired remote controller and indoor unit.	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.

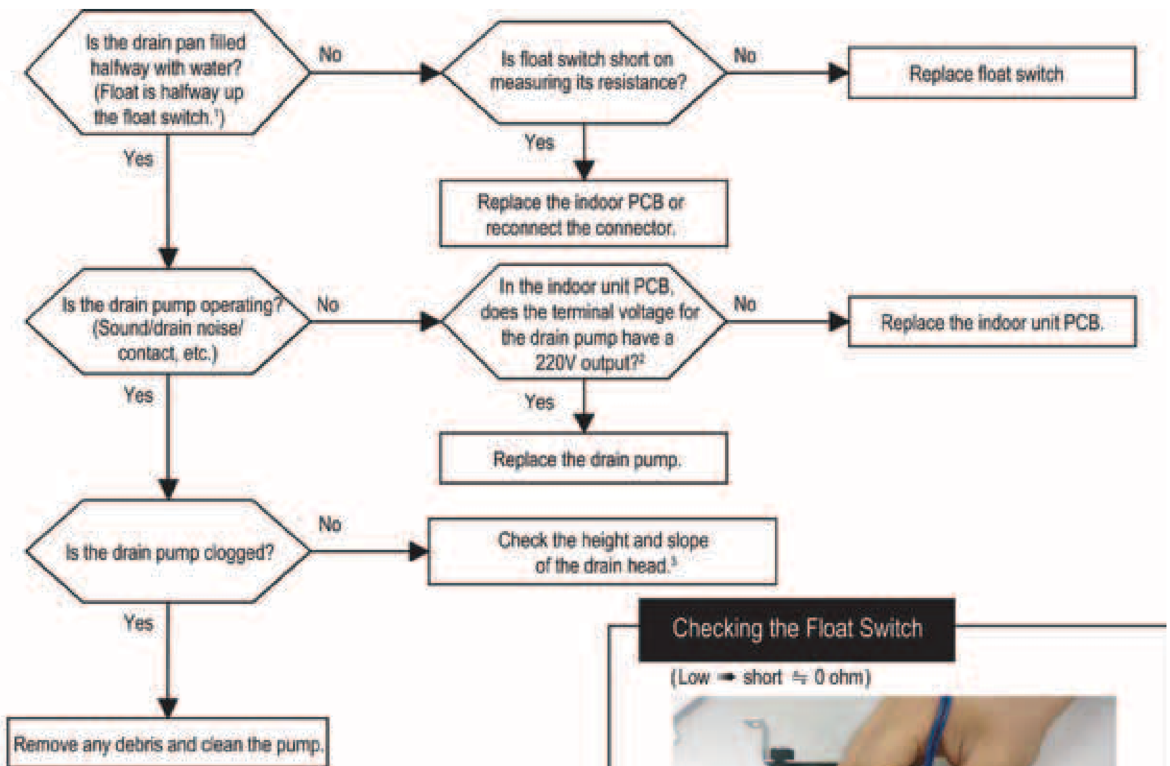


[1]If there isn't a remote controller to replace, use a remote controller from another indoor unit.
[2]Check the cable because the connection may be in error or wrong. Also, check distances between the communication and main electrical cables. Ensure that the cables are at safe distances so they are 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.)

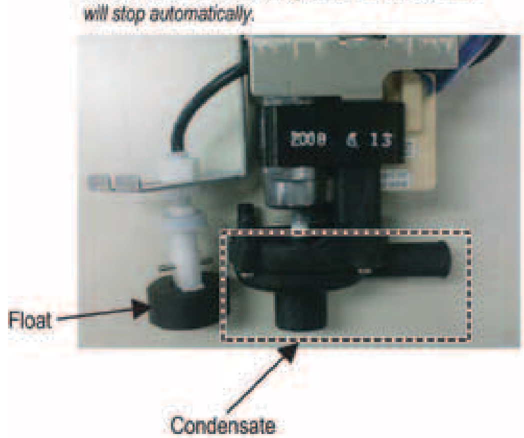


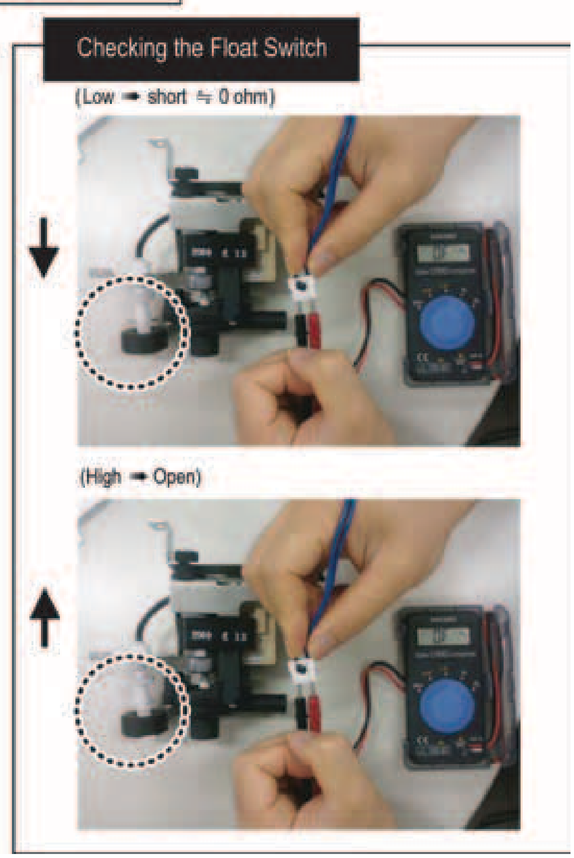


Error No.	Description	Details	Causes
04	Indoor unit drain pump error.	Float switch is open because of rising condensate levels; drain pump may not be operating, or drain pump may be clogged.	1. Drain pump / float switch error. 2. Improper drain pipe location, clogged drain pipe. 3. Indoor unit PCB error.



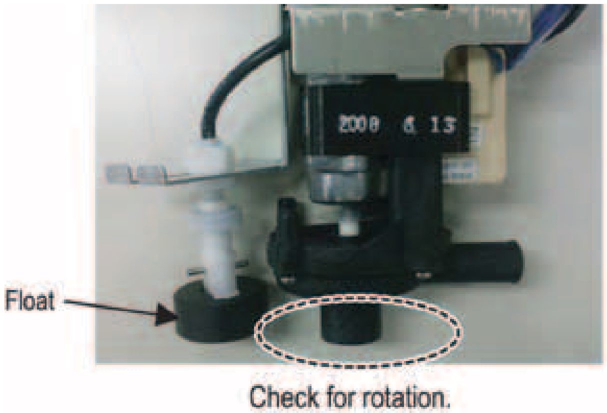
[1]If the float rises higher than halfway up the float switch, then the circuit will open and the indoor unit will stop automatically.

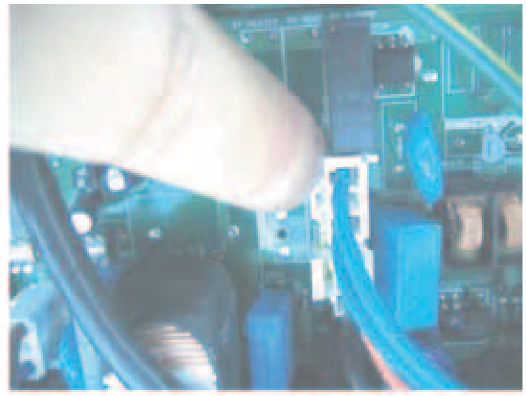




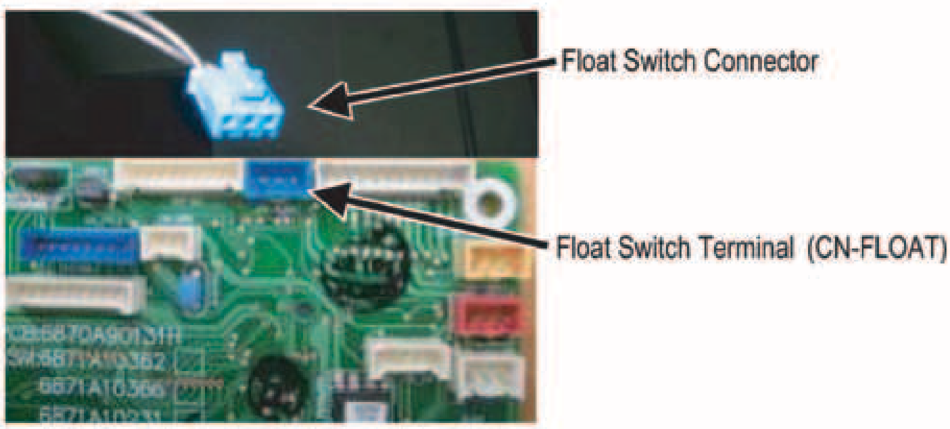
Service Troubleshooting

Error No. 04, continued.

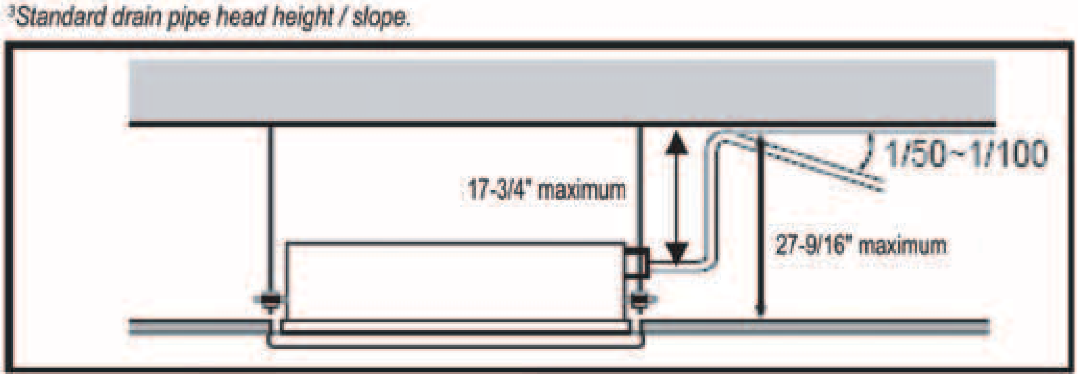




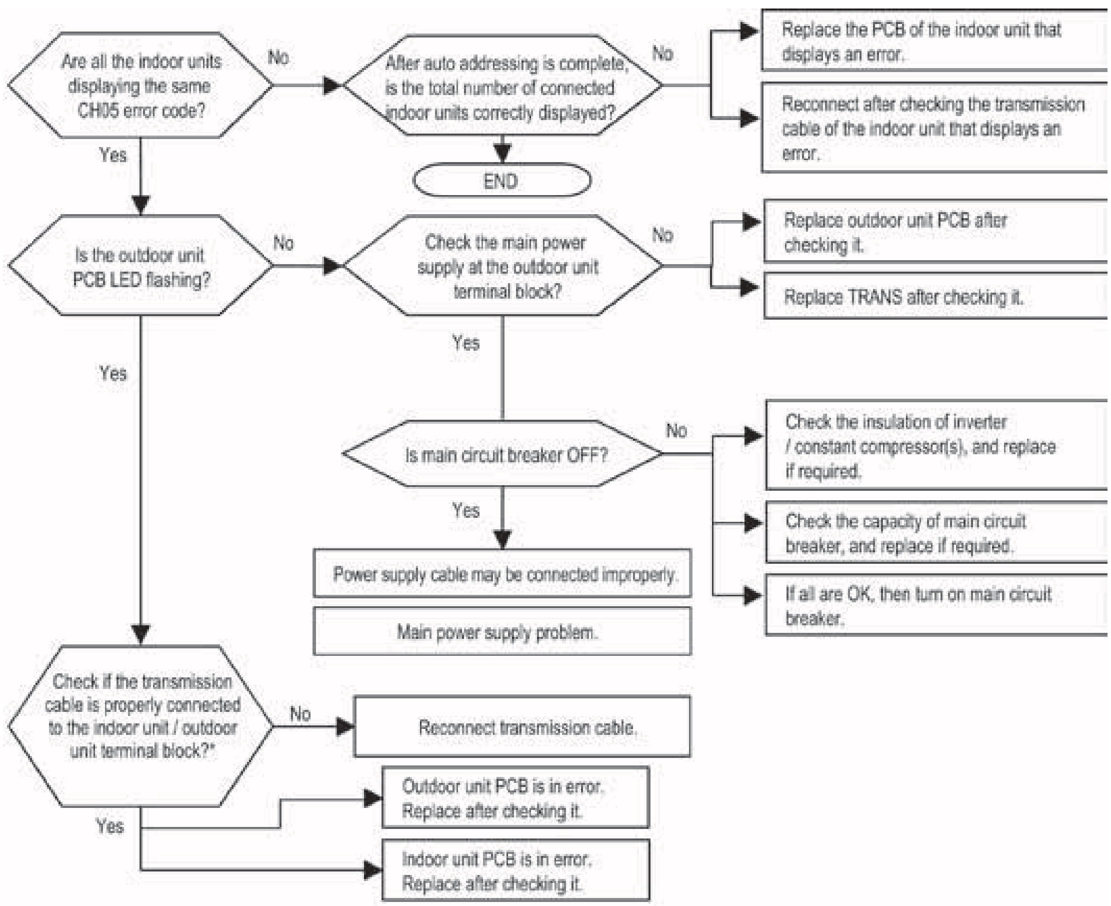
[2]Indoor PCB drain pump connector labeled as CN-DPUMP. Check 220V input.



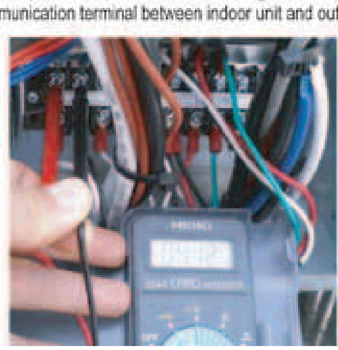
[3]Standard drain pipe head height / slope.



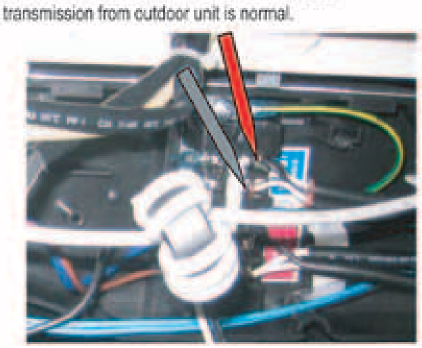
Error No.	Description	Details	Causes
05	Communication error between outdoor unit and indoor unit.	Indoor unit PCB has not received a signal from the outdoor unit.	1. Auto addressing has not been performed properly. 2. Communication cable is not connected. 3. Communication cable is short circuiting. 4. Indoor unit communication circuit error. 5. Outdoor unit communication circuit error. 6. Not enough physical distance between power and communication 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 outdoor unit.



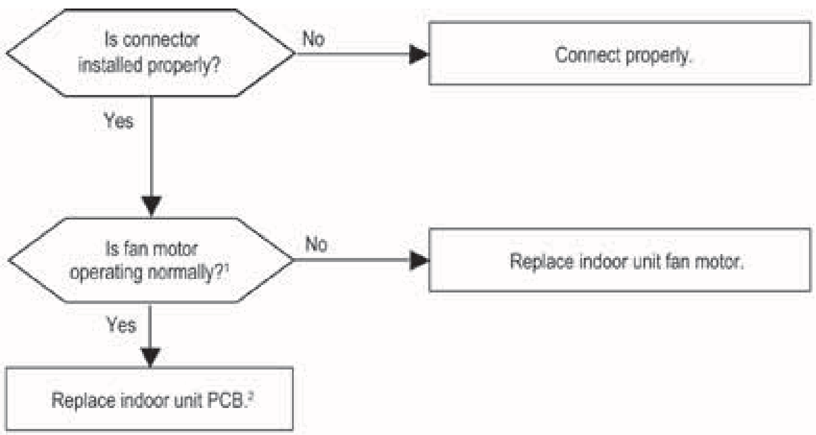
If the DC voltage between transmission terminal A, B of indoor unit fluctuates within -9V ~ +9V, then transmission from outdoor unit is normal.



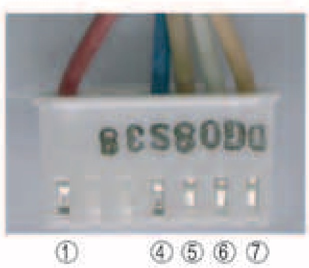
SERVICE TROUBLESHOOTING

Error No. 10

Error No.	Description	Details	Causes
10	Indoor unit BLDC fan motor 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.



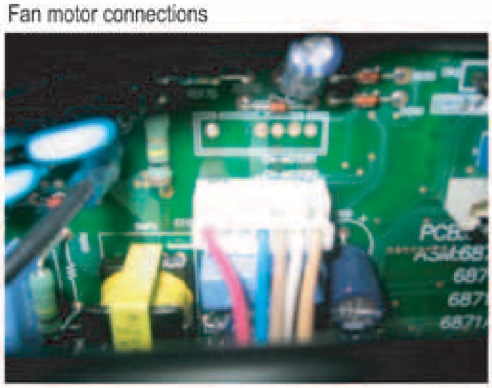
[1]*See below for indoor fan motor sensor connections.*



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

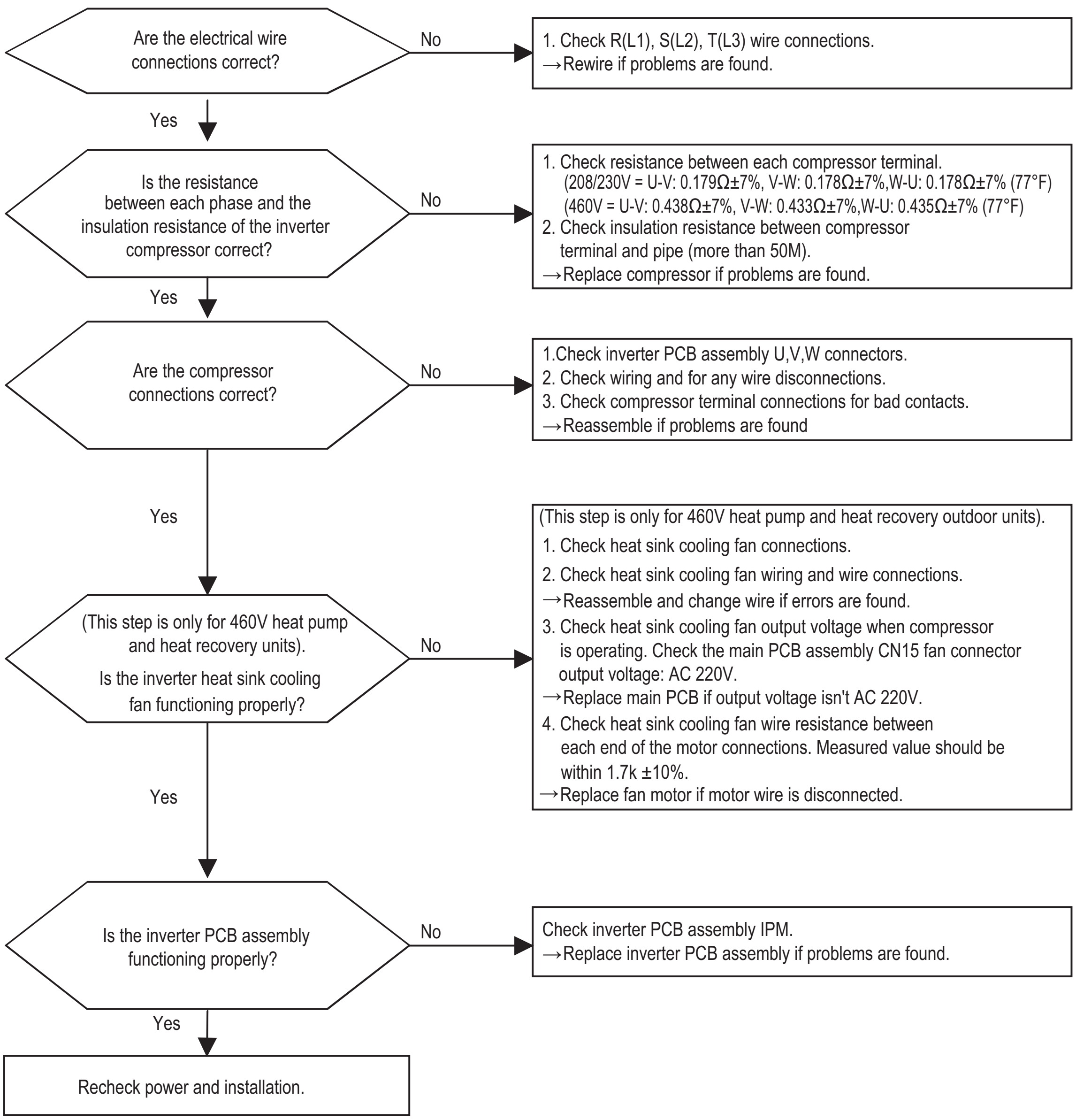
Fan motor connections



[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.*

Error No. 21

Error No.	Description	Details	Causes
21 Master: 211 Slave 1: 212 Slave 2: 213	Inverter compressor IPM error.	• IPM has overheated, or has been subjected to overcurrent or undercurrent conditions. • IPM self-protection circuit has been activated.	1. IPM has overheated due to damage to or disconnection of the heat sink fan, or the heat sink has been disassembled. 2. Overcurrent conditions have been detected at the inverter compressor (U,V,W). 3. Compressor motor or insulation has been damaged. 4. Inverter compressor terminal has been disconnected or loosened. 5. Inverter PCB assembly has been damaged. 6. Low input current to the outdoor unit.



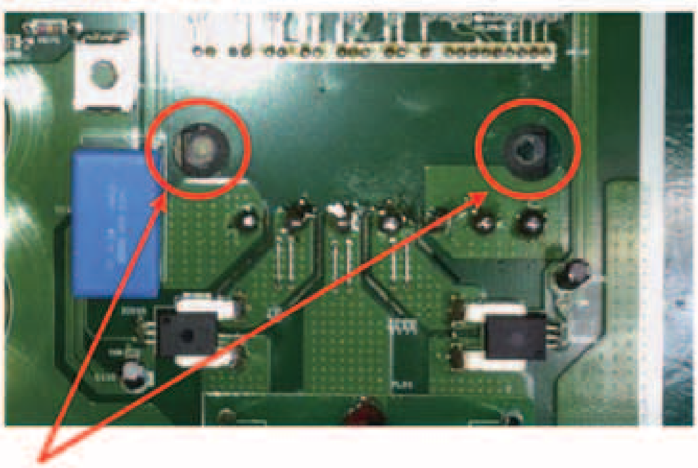
Error No. 21, continued.

208-230V Heat Pump and Heat Recovery Outdoor Units.

Measure resistance between each compressor terminal.

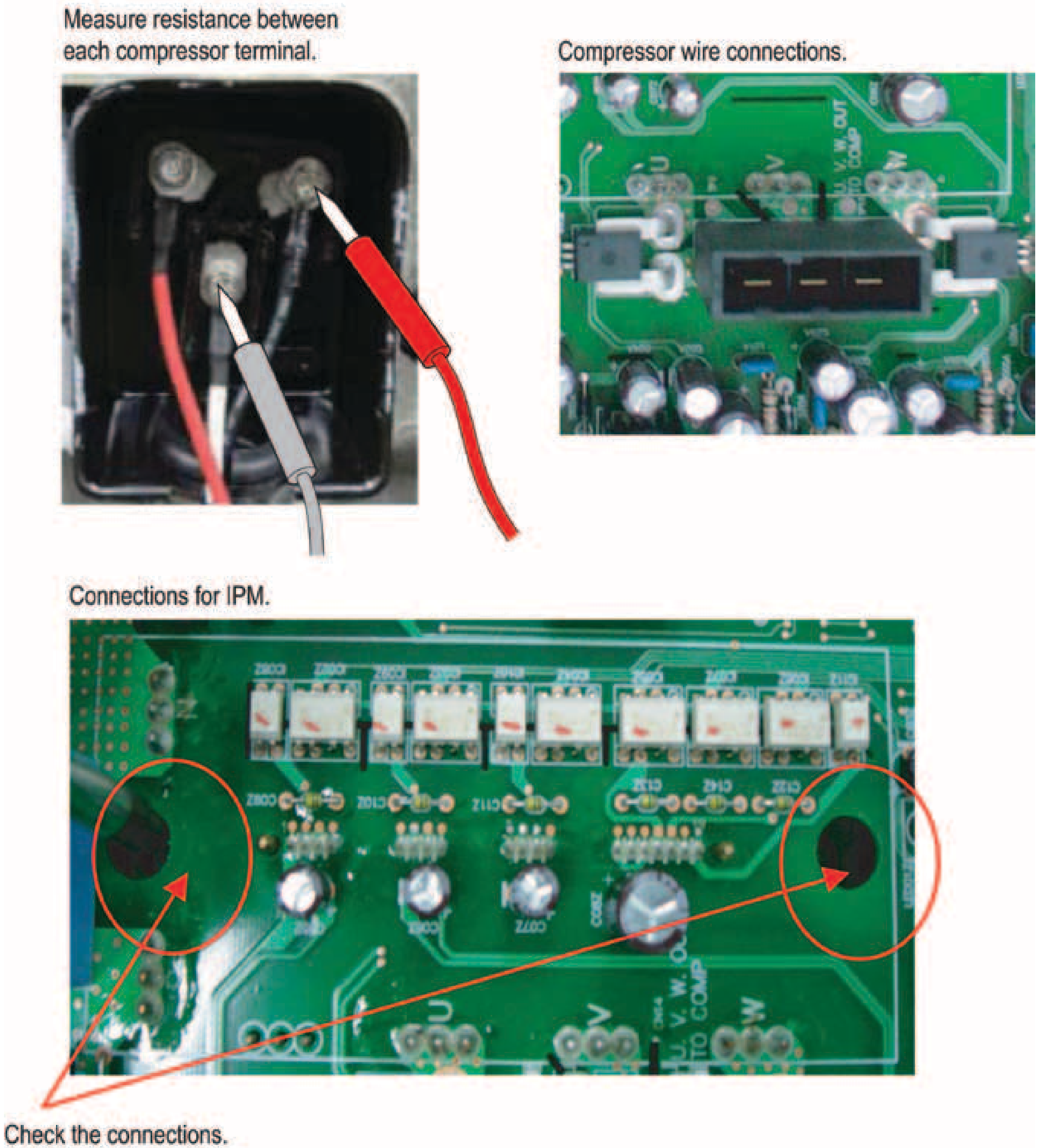
Compressor wire connections.

Connections for IPM.



Checking the connections.

460V Heat Pump and Heat Recovery Outdoor Units.



Error No. 22

Error No.	Description	Details	Causes
22 Master: 221 Slave 1: 222 Slave 2: 223	Overcurrent of outdoor unit inverter board input (RMS).	The three-phase input power current for the inverter PCB assembly is >40A (for 208-230V units) or >22A (for 460V units).	1. Overload: Pipe has been clogged, EEV is defective, there has been an overcharge in amount of refrigerant. 2. Compressor motor or insulation has been damaged. 3. Input voltage is low. 4. Improper connections in the power wiring. 5. Inverter PCB assembly has been damaged (input current sensor).

Is the installation correct?

No →
1. Check pipes for clogs and damage.
2. Check if the indoor unit or outdoor unit is blocked.
3. Check if the EEV connector assembly is correct and operating properly.
4. Check refrigerant pressure

→Adjust or reassemble if problems are found.

Yes ↓

Is the resistance between each phase and the insulation resistance of the inverter compressor correct?

No →
1. Check resistance between each compressor terminal.
(208/230V = U-V: 0.179 ± 7%, V-W: 0.178 ± 7%, W-U: 0.178 ± 7%, 77°F)
(460V = U-V: 0.438 ± 7%, V-W: 0.433 ± 7%, W-U: 0.435 ± 7%, 77°F)
2. Check insulation resistance between compressor terminal and pipe (more than 50M).

→Replace compressor if problems are found.

Yes ↓

Are the compressor wire connections correct?

No →
1. Check inverter PCB assembly U,V,W connections.
2. Check wires and wire connections.
3. Check compressor terminal connections for bad contacts.

→Rewire if problems are found.

Yes ↓

Is the inverter PCB assembly power connections correct?

No → Check for improper connection or for disconnection between inverter PCB assembly and bridge diode.
→Rewire if problems are found.

Yes ↓

Is the input voltage normal?

No → Check if R~S/S~T/T~R phase voltage is 220V ± 10% or 460V ± 10%.
→Check connections and wiring if power is not correct.

Yes ↓

Is the inverter PCB assembly correct?

No → Check for inverter PCB assembly IPM problems.
→Replace inverter PCB assembly.

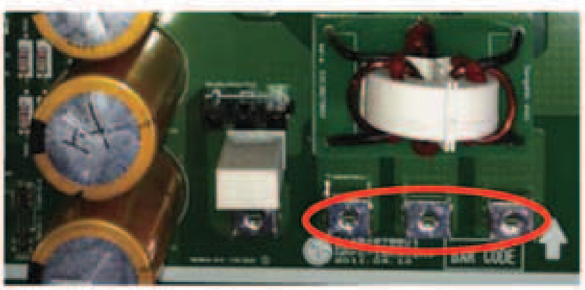
Yes ↓

Recheck power and installation.

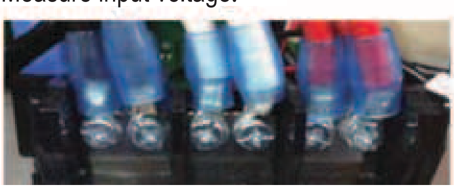
208-230V Heat Pump and Heat Recovery Outdoor Units.

Measure resistance between each compressor terminal.

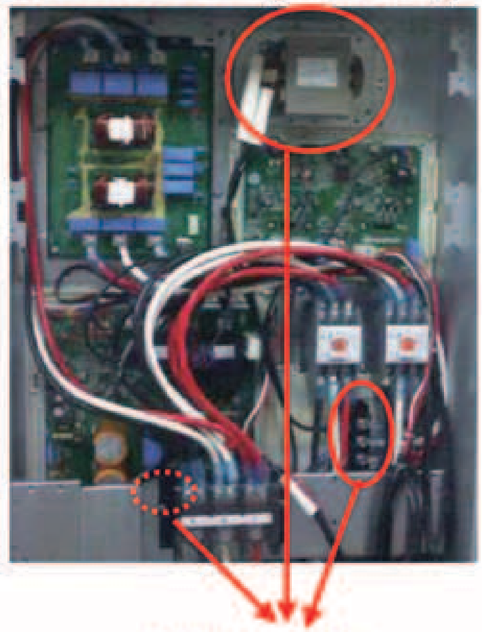
Compressor wire connections.



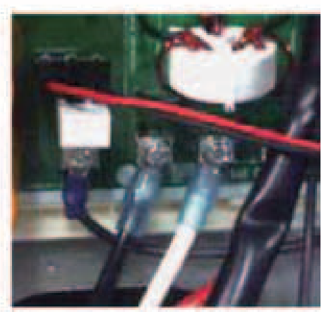
Measure input voltage.



Inverter PCB and bridge diode wiring.



Check connections.

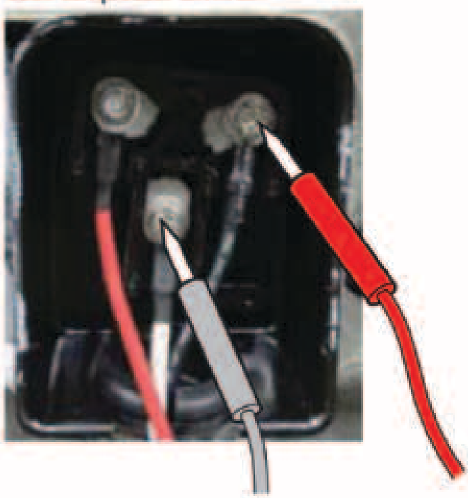


SERVICE TROUBLESHOOTING

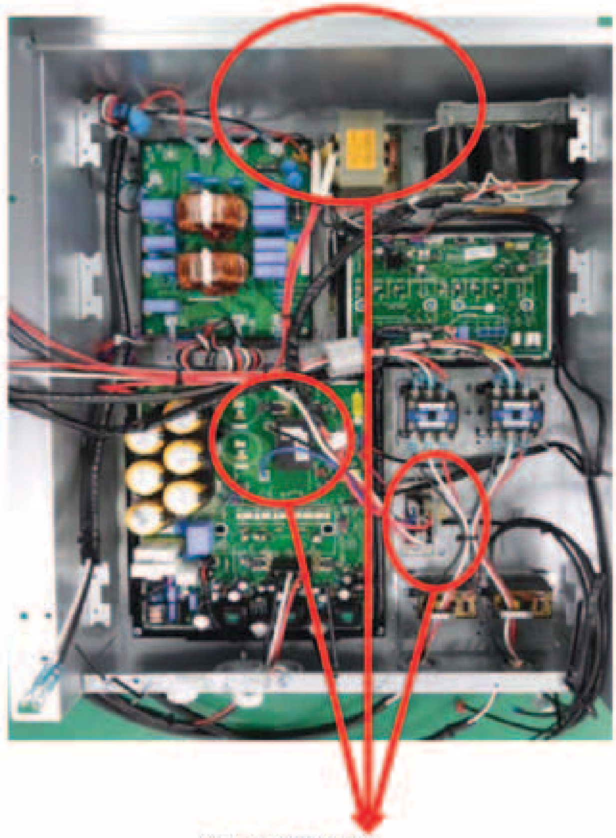
Error No. 22, continued.

460V Heat Pump and Heat Recovery Outdoor Units.2

Measure resistance between each compressor terminal.

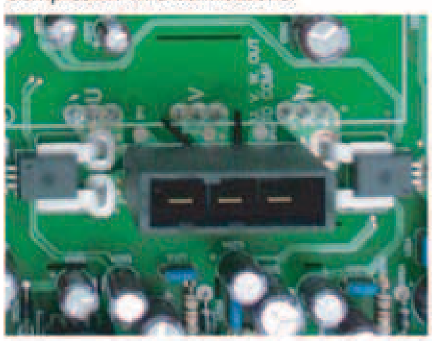


Inverter PCB and bridge diode wiring.

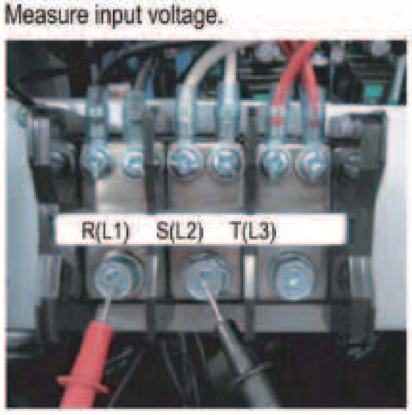


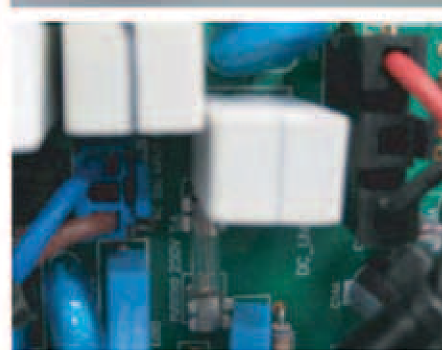
Check connections.

Compressor wire connections.



Measure input voltage.





Error No.	Description	Details	Causes
23 Master: 231 Slave 1: 232 Slave 2: 233	Low voltage to the 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.

- Are the power wire connections correct?
  - No → 1. Check R(L1)/S(L2)/T(L3) wiring connections. →Rewire if problems are found.
  - Yes ↓
- Is the input voltage normal?
  - No → Check if R~S/S~T/T~R phase voltage is 220V ±10%, or 460V±10%. →Check if power and wiring connections are correct.
  - Yes ↓
- Is the bridge diode connection normal?
  - No → 1.Check bridge diode connections. 2.Check wiring and if the wires have been disconnected. →Rewire if problems are found.
  - Yes ↓
- Is the inverter PCB assembly power connection correct?
  - No → Check for misconnections and / or disconnections between inverter PCB assembly and bridge diode. →Rewire if problems are found.
  - Yes ↓
- Is the inverter PCB assembly normal?
  - No → Check if inverter PCB assembly IPM is correct. →Replace inverter PCB assembly if problems are found.
  - Yes ↓
- Recheck power and installation.

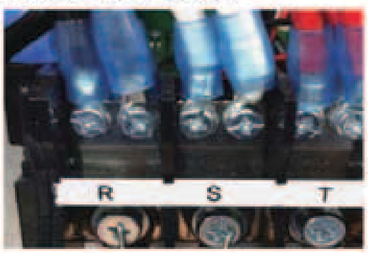
SERVICE TROUBLESHOOTING

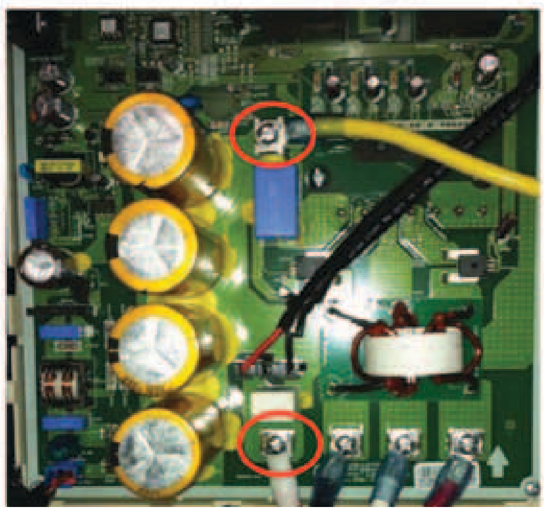
Error No. 23, continued.

208-230V Heat Pump and Heat Recovery Outdoor Units.

Inverter PCB and bridge diode wiring.

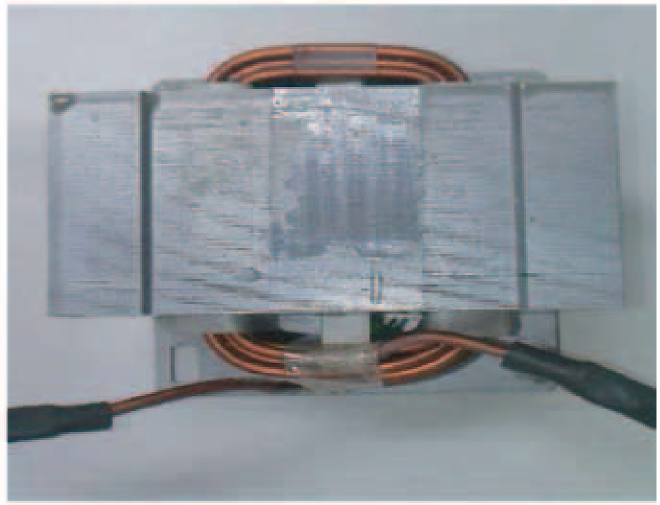
Measure input voltage.





460V Heat Pump and Heat Recovery Outdoor Units.

Inverter PCB and bridge diode wiring.

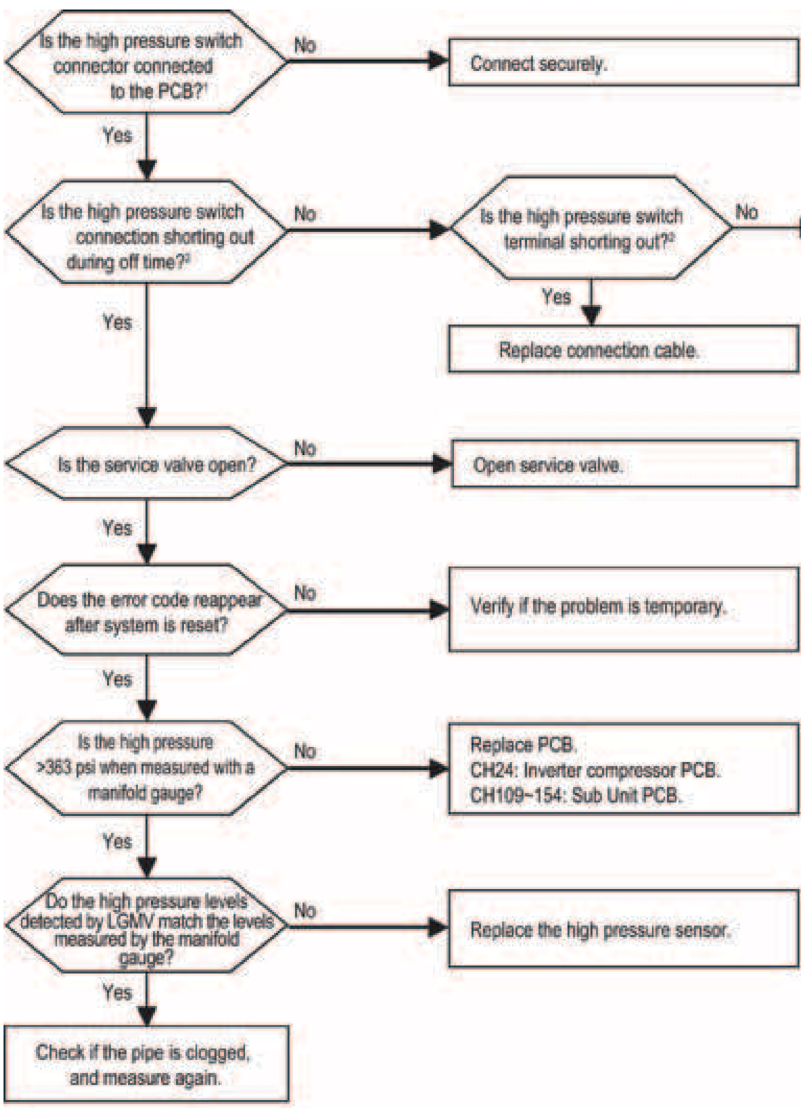


Measure input voltage.

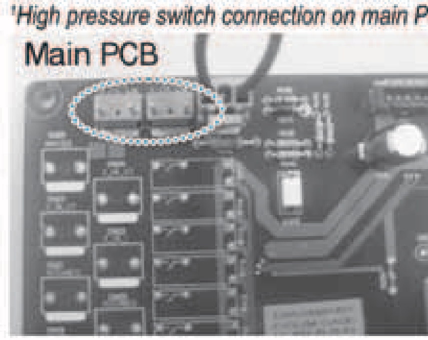
SERVICE TROUBLESHOOTING

Error No. 24

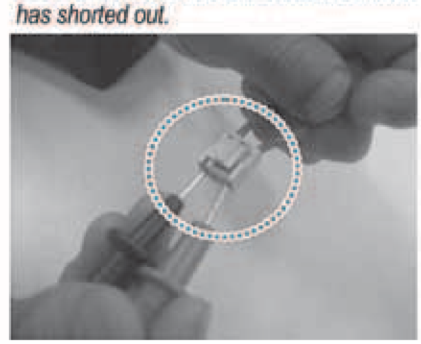
Error No.	Description	Details	Causes
24 Master: 241 Slave 1: 242 Slave 2: 243	Outdoor unit high pressure switch error.	Compressor has been turned off by an outdoor unit high pressure switch. Excessive increase in outdoor unit compressor discharge pressure.	1. High pressure switch is defective. 2. Indoor unit fan or outdoor unit fan is / are defective. 3. Compressor check valve is clogged. 4. Pipe has been damaged. 5. Overcharge of refrigerant. 6. Defective LEV at the indoor or outdoor unit. 7. Outdoor unit is blocked during cooling mode; indoor unit filter is clogged during heating mode. 8. Service valve is clogged. 9. Outdoor unit PCB is defective.



[1]High pressure switch connection on main PCB.



[2]Check if the high pressure switch connection has shorted out.



Error No.	Description	Details	Causes
25 Master: 251 Slave 1: 252 Slave 2: 253	Input voltage to the outdoor unit is too high or too low.	Outdoor unit has an input voltage of ≤140V or ≥300V (for 208-230V units), or an input voltage of ≤270V or ≥487V (for 460V units).	1. Input voltage abnormal (R[L1] - S[L2] - T[L3]). 2. Outdoor unit inverter PCB assembly is damaged (input voltage sensor component).

Are the power wire connections correct?

- No → 1. Check R(L1) / S(L2) / T(L3) wiring connections. →Rewire if problems are found.
- Yes ↓

Is the input voltage normal?

- No → Check if R~S / S~T / T~R phase voltage is 220V ± 10% or 460V ± 10%. →Check if power and wiring connections are correct.
- Yes ↓

Is the inverter PCB assembly power connection correct?

- No → Check for misconnections and / disconnections between the inverter PCB assembly and the bridge diode. →Rewire if problems are found.
- Yes ↓

Is the inverter PCB LED displaying an error code?

- No → Replace inverter PCB assembly.
- Yes ↓

Recheck power and installation.

Error No. 26

Error No.	Description	Details	Causes
26 Master: 261 Slave 1: 262 Slave 2: 263	Outdoor unit inverter compressor start error.	Initial operation failure due to outdoor unit inverter compressor error.	1. Overload error: Pipe is clogged, outdoor unit is blocked, EEV is blocked, or there is an overcharge in refrigerant. 2. Compressor insulation and / or motor has been damaged. 3. Compressor wiring error. 4. Outdoor unit inverter PCB has been damaged (CT).

Is the installation correction.

- No →
  1. Check pipes for clogs or damage.
  2. Check if the indoor and / or outdoor unit is / are blocked.
  3. Check if the EEV connection assembly is correct and is operating normally.
  4. Check the refrigerant pressure.

  → Fix or re-install if problems are found.
- Yes ↓

Are there any power wire connections correct?

- No → Check the R(L1) / S(L2) / T (L3) wiring connections.
  → Rewire if problems are found.
- Yes ↓

Is the resistance between each phase and the insulation resistance of the inverter compressor correct?

- No →
  1. Check resistance between each compressor terminal.
     (208-230V = U-V: 0.179Ω ± 7%, V-W: 0.178Ω ± 7%, W-U: 0.178Ω ± 7%, 77°F)
     (460V = U-V: 0.438Ω ± 7%, V-W: 0.433Ω ± 7%, W-U: 0.435Ω ± 7%, 77°F)
  2. Check insulation resistance between compressor terminal and pipe. (more than 50M).

  → Replace compressor if problems are found.
- Yes ↓

Are the compressor wire connections correct?

- No →
  1. Check inverter PCB assembly U,V,W connections.
  2. Check wires and for wire disconnections.
  3. Check compressor terminal connections for bad contacts.

  → Reassemble if problems are found.
- Yes ↓

Is the inverter PCB assembly correct?

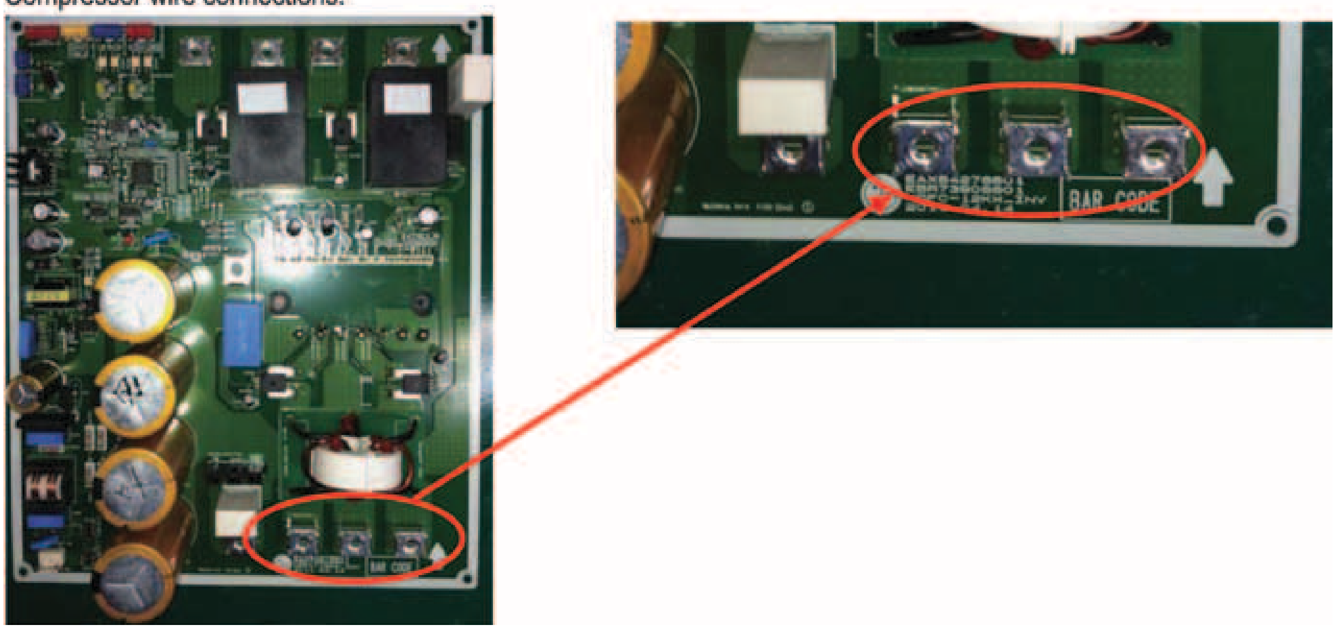
- No → Check inverter PCB assembly IPM.
  → Replace inverter PCB assembly.
- Yes ↓

Recheck power and installation.

208-230V Heat Pump and Heat Recovery Outdoor Units.

Measure resistance between each compressor terminal.

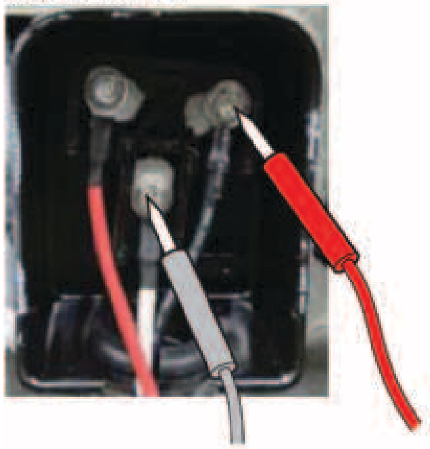
Compressor wire connections.



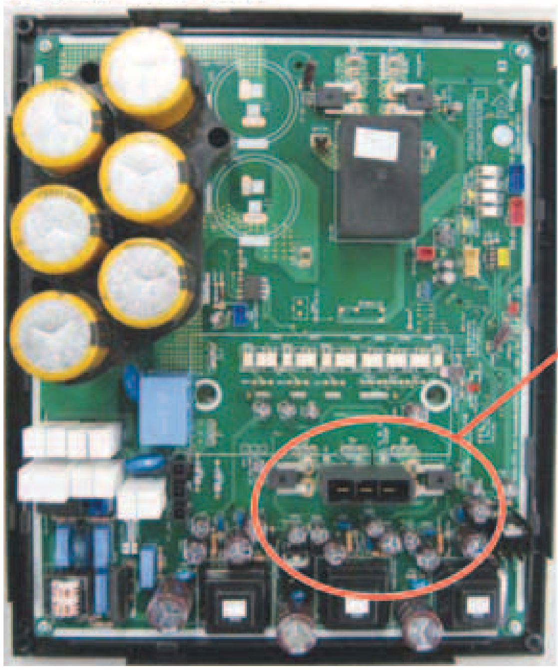
Error No. 26, continued.

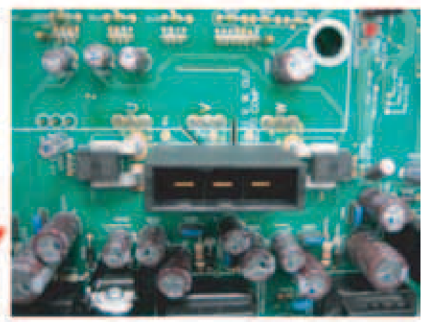
460V Heat Pump and Heat Recovery Outdoor Units.

Measure resistance between each compressor terminal.



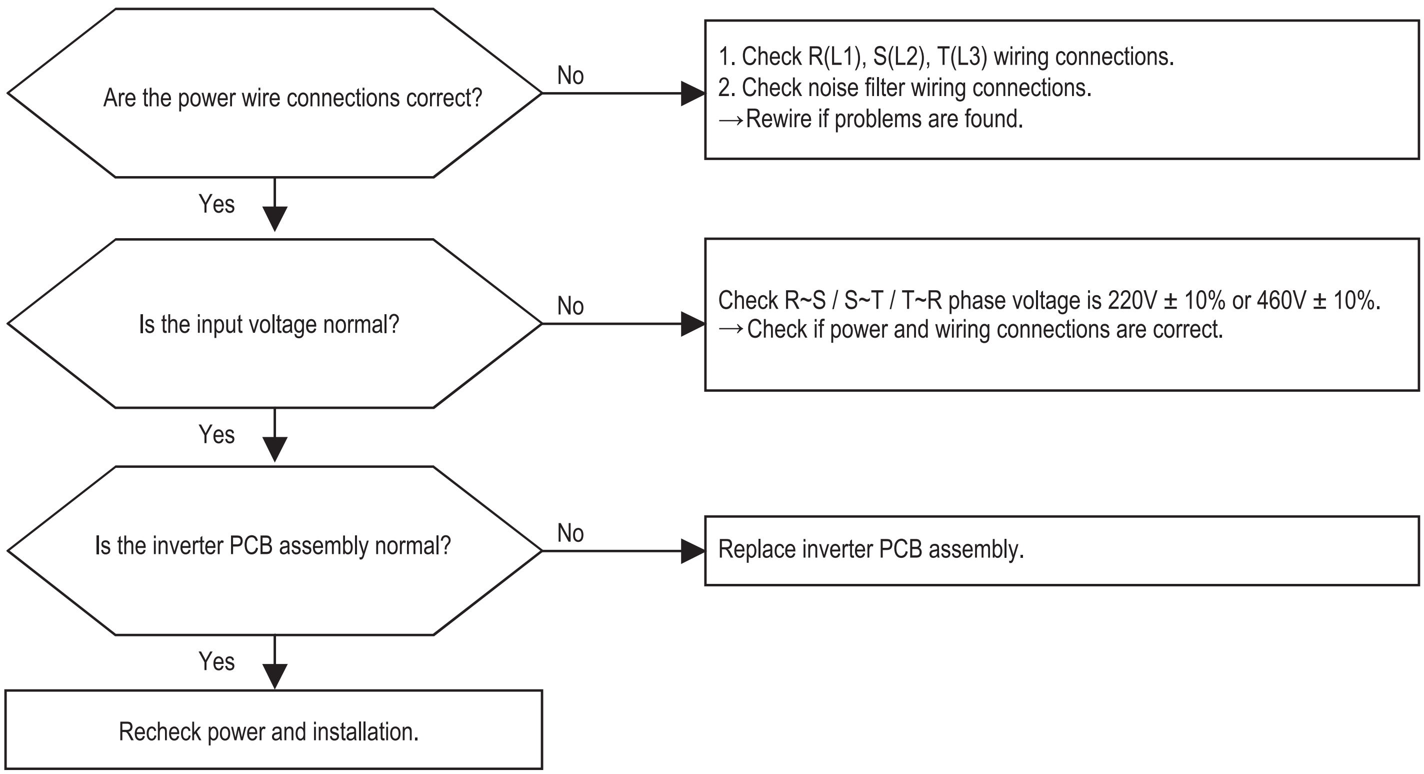
Compressor wire connections.





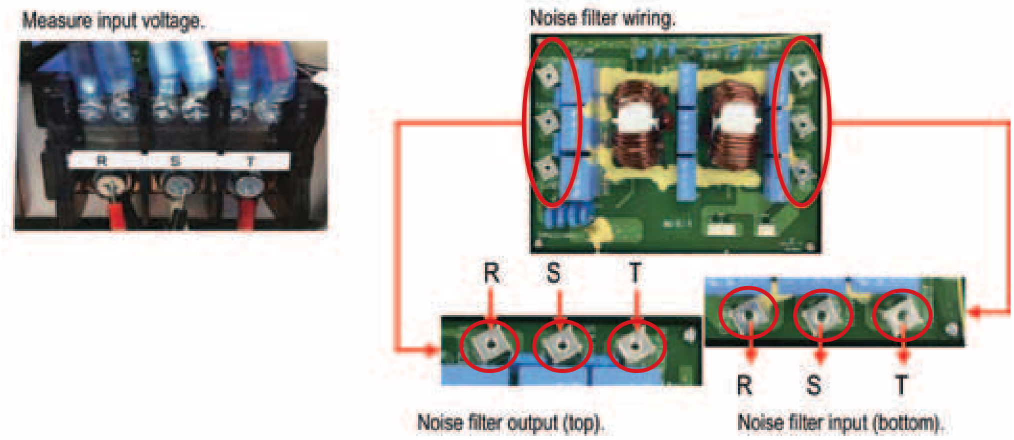
Error No. 28

Error No.	Description	Details	Causes
28 Master: 281 Slave 1: 282 Slave 2: 283	Outdoor unit inverter DC link high voltage error.	System shut off because of an overcurrent in the outdoor unit inverter PCB DC link voltage >420V (for 208-230V units) >780V (for 460V).	1. Input voltage is not correct R(L1), S(L2), T(L3). 2. Outdoor unit inverter PCB has been damaged (DC link voltage sensor component).

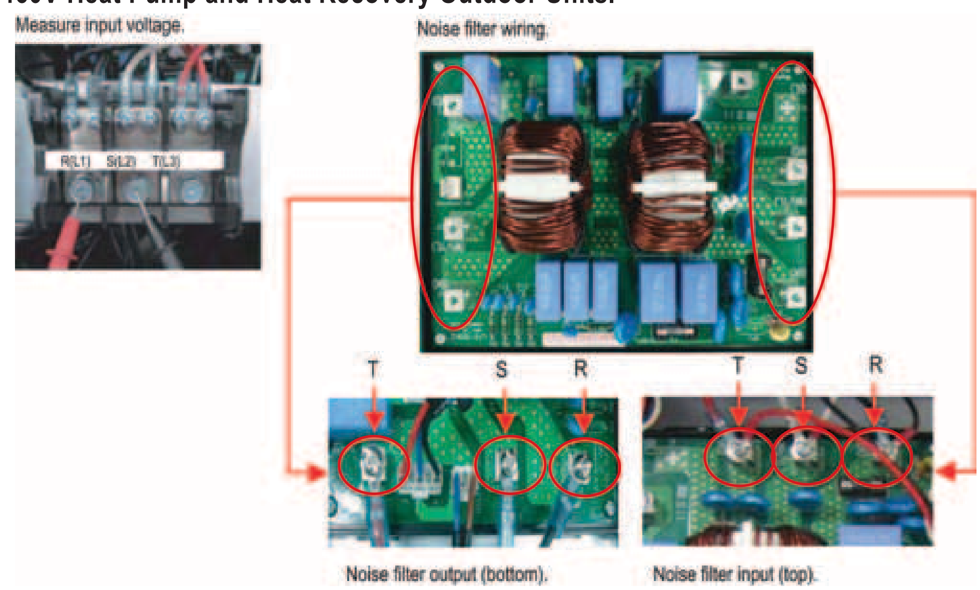


Error No. 28, continued.

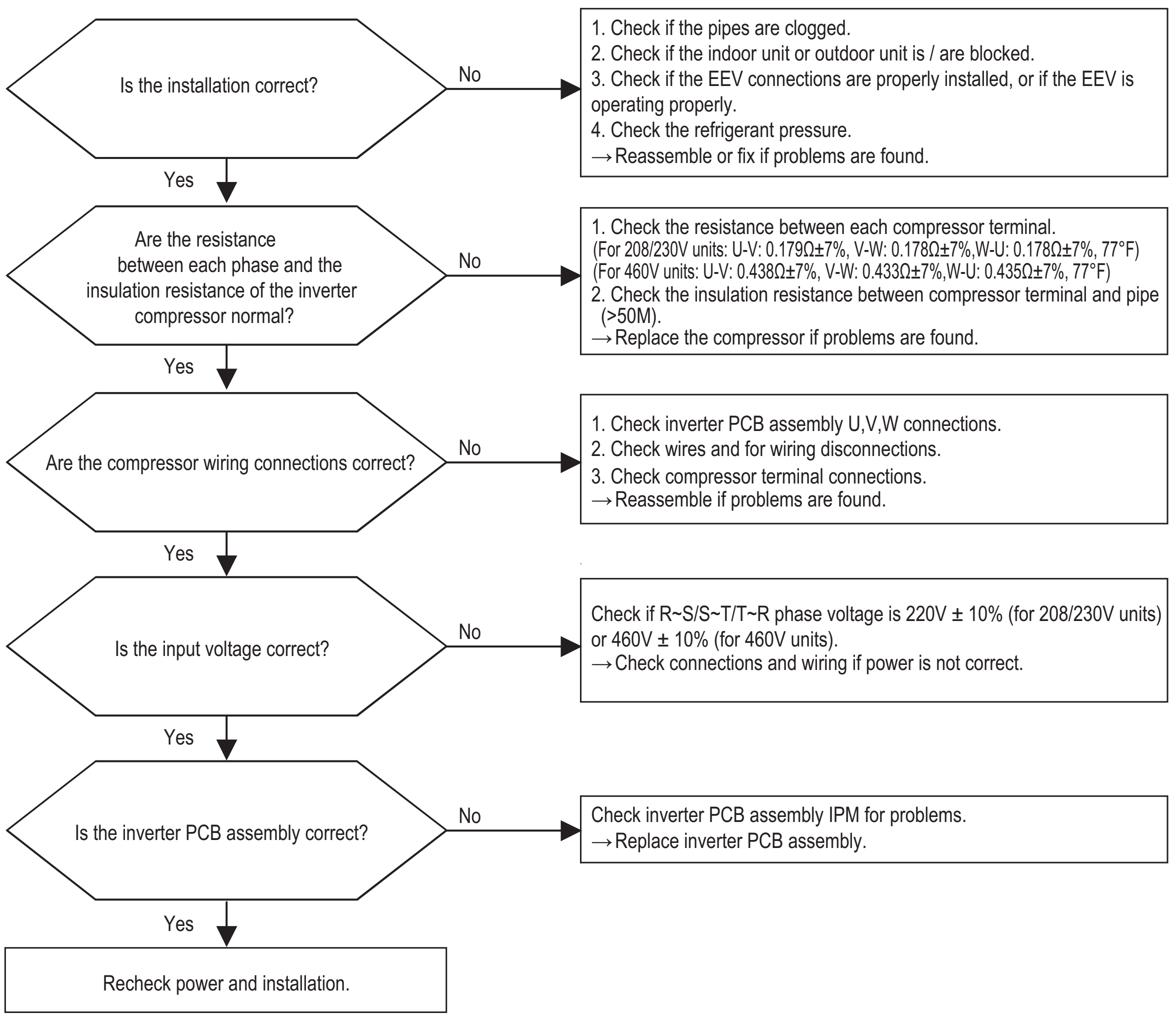
208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.

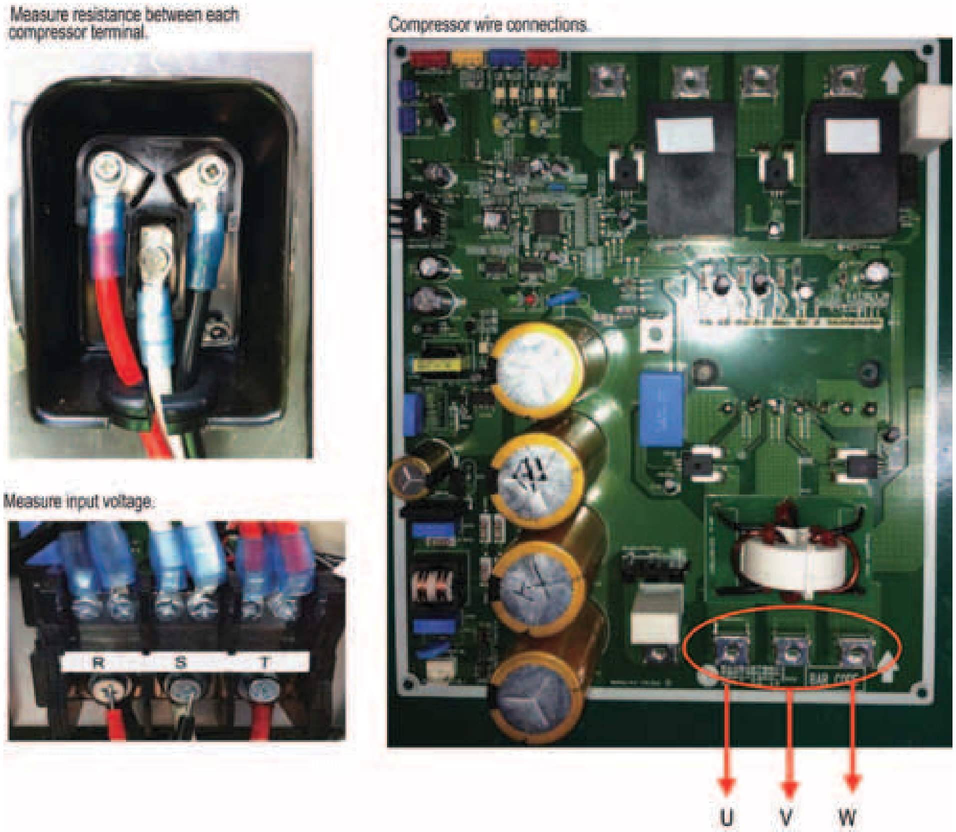


Error No.	Description	Details	Causes
29 Master: 291 Slave 1: 292 Slave 2: 293	Inverter compressor overcurrent error.	Inverter compressor input current is >40A (for 208-230V units) or >30A (for 460V units).	1. Overload operation (pipe is clogged or blocked, EEV is defective, refrigerant is overcharged). 2. Compressor insulation and / or motor is / are damaged. 3. Input voltage is low. 4. Outdoor unit inverter PCB assembly is damaged.

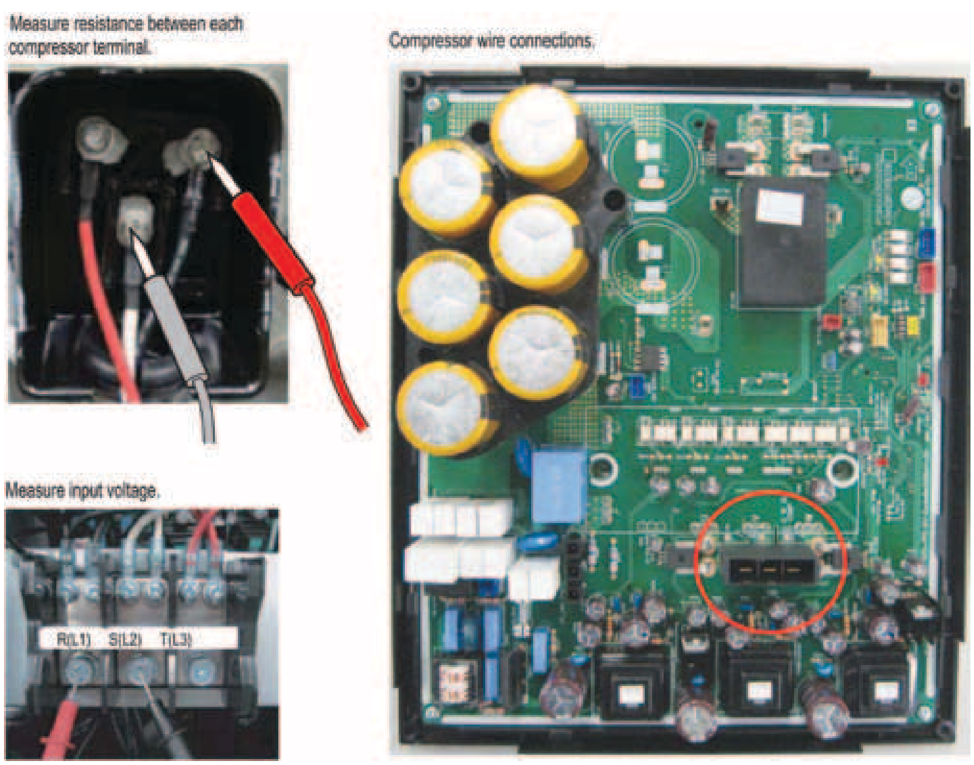


Error No. 29, continued.

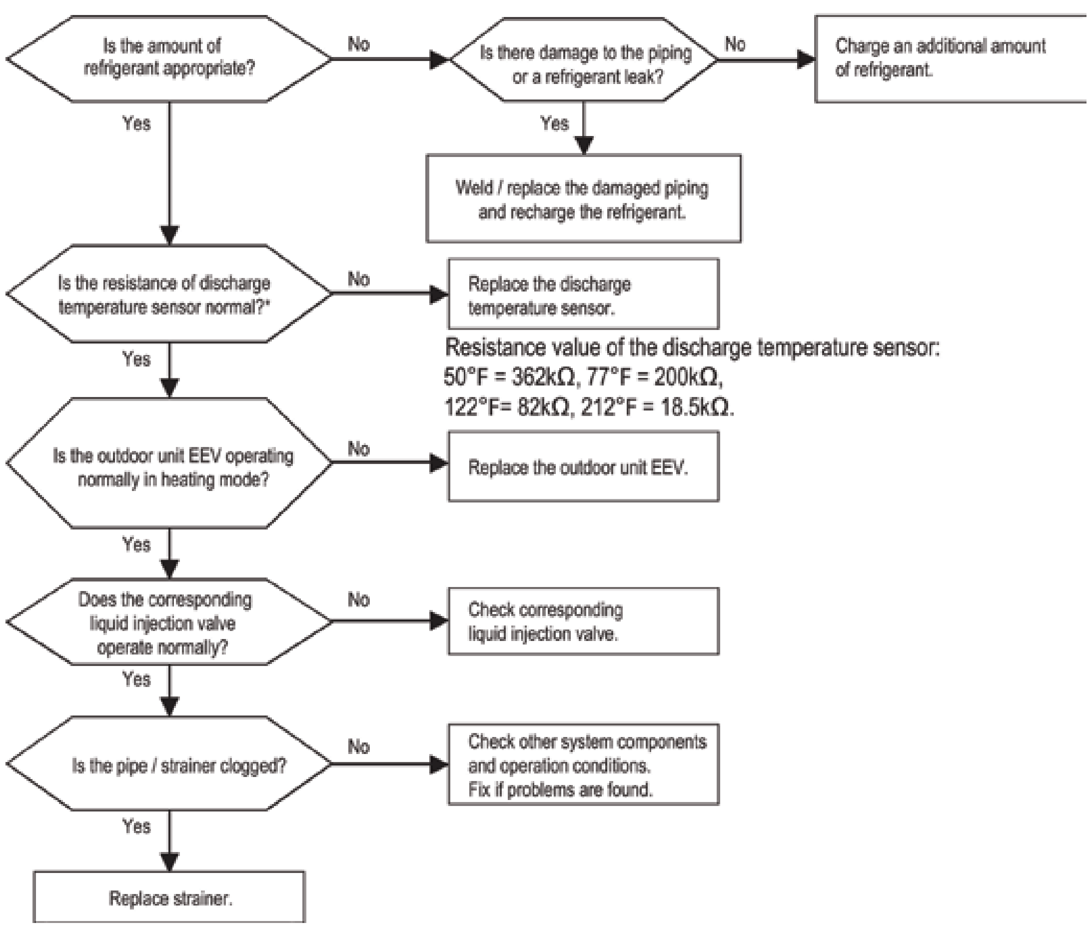
208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.



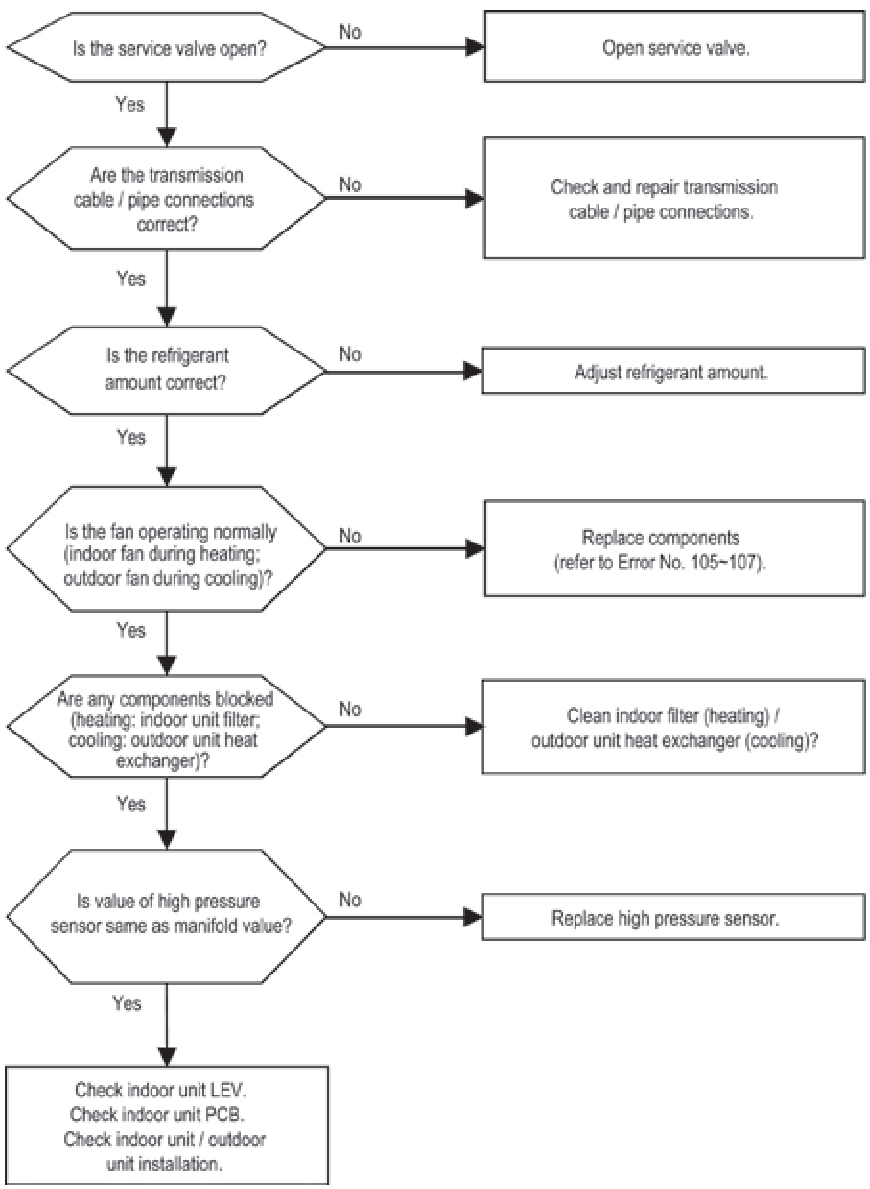
Error No.	Description	Details	Causes
30 Master: 301 Slave 1: 302 Slave 2: 303	Excessive increase in the discharge temperature at the outdoor unit constant-speed2 compressor	System / compressor shut off because of a high discharge temperature at the outdoor unit constant-speed2 compressor. Outdoor unit constant-speed2 compressor sensor shorted out.	1. Defective constant-speed2 compressor discharge temperature sensor. 2. Refrigerant is leaking or refrigerant is undercharged. 3. EEV has an error.
32 Master: 321 Slave 1: 322 Slave 2: 323	Excessive increase in the discharge temperature at the outdoor unit inverter compressor.	System / compressor shut off because of a high discharge temperature at the outdoor unit inverter compressor.	1. Defective inverter compressor discharge temperature sensor. 2. Refrigerant is leaking or refrigerant is undercharged. 3. EEV has an error. 4. Defective liquid injection valve.
33 Master: 331 Slave 1: 332 Slave 2: 333	Excessive increase in the discharge temperature at the outdoor unit constant-speed compressor	System / compressor shut off because of a high discharge temperature at the outdoor unit constant-speed compressor.	1. Defective constant-speed compressor discharge temperature sensor. 2. Refrigerant is leaking or refrigerant is undercharged. 3. EEV has an error. 4. Defective liquid injection valve.



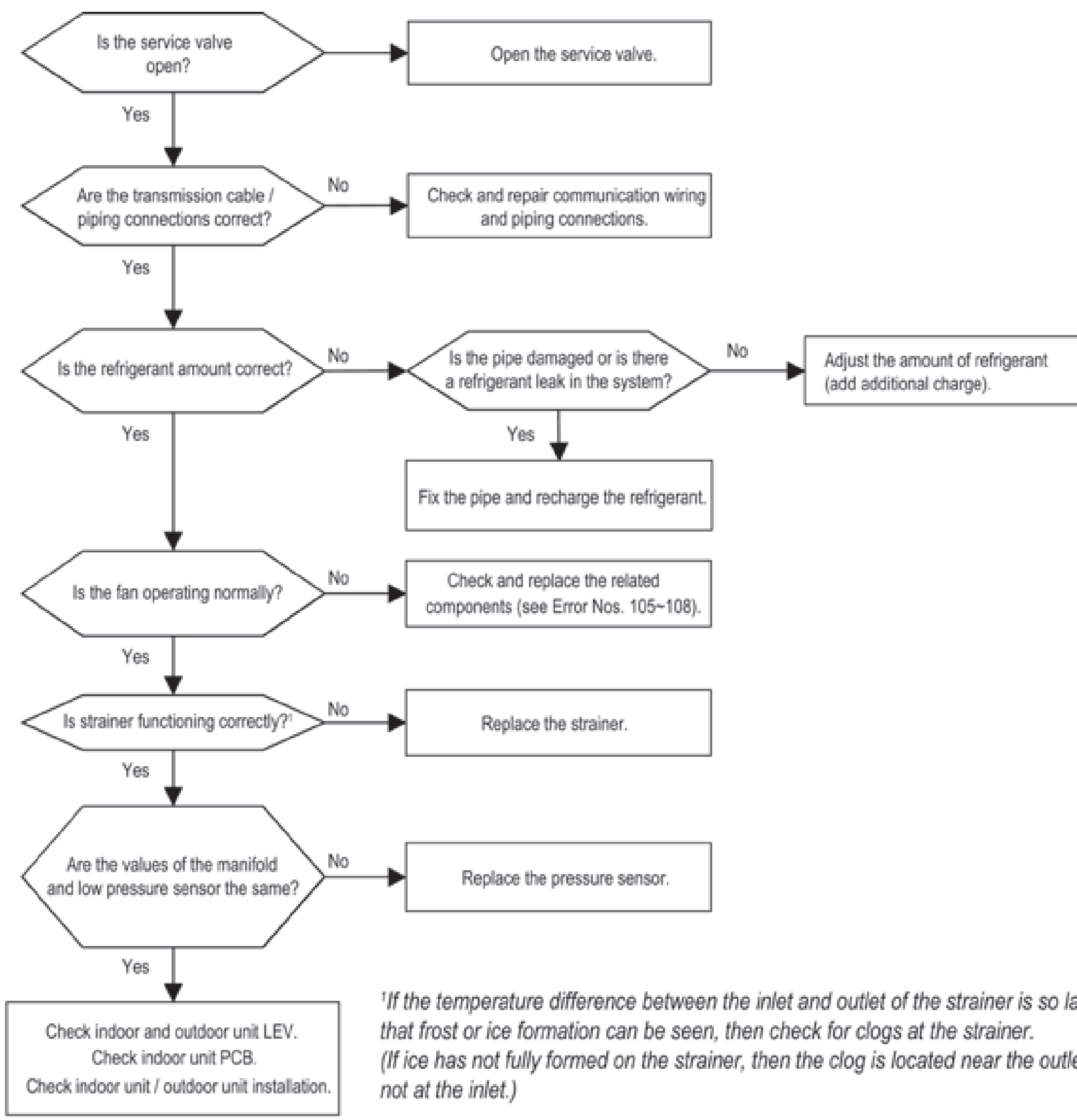
Service Troubleshooting

Error No. 34

Error No.	Description	Details	Causes
34 Master: 341 Slave 1: 342 Slave 2: 343	Excessive increase in outdoor unit high pressure.	System shut off because of an excessive increase in high pressure at the outdoor unit that occurs three consecutive times.	1. High pressure sensor is defective. 2. Indoor unit or outdoor unit fan is defective. 3. Refrigerant is overcharged. 4. Refrigerant pipe is damaged. 5. Defective indoor and / or outdoor unit EEV. 6. Outdoor unit is blocked during cooling, or indoor unit filter is blocked during heating. 7. Service valve is clogged. 8. Outdoor unit PCB is defective. 9. Indoor unit pipe temperature sensor is defective.



Error No.	Description	Details	Causes
35 Master: 351 Slave 1: 352 Slave 2: 353	Excessive decrease in compressor discharge low pressure.	System shut off because of an excessive decrease in low pressure at the outdoor unit that occurs three consecutive times.	1. Low pressure sensor is defective. 2. Indoor unit or outdoor 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 outdoor unit EEV. 6. Outdoor unit is blocked during cooling, or indoor unit filter is blocked during heating. 7. Service valve is clogged. 8. Outdoor 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.)

SERVICE TROUBLESHOOTING

Error No. 40

Error No.	Description	Details	Causes
40 Master: 401 Slave 1: 402 Slave 2: 403	Outdoor unit inverter compressor CT sensor error.	Disconnection or short circuit of outdoor unit inverter compressor current detection (CT) sensor. MICOM input voltage is not within 2.5V ±0.3V at initial power up.	1. Input voltage is not correct (R-S-T). 2. Outdoor unit inverter PCB is damaged (CT sensor component).

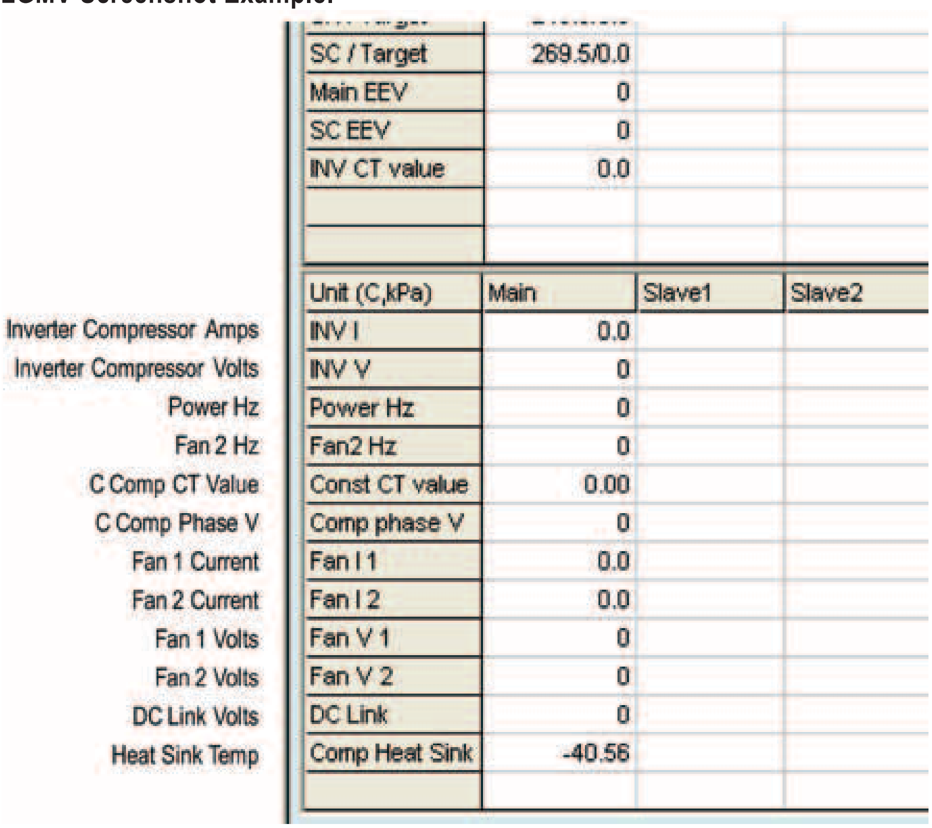
Are the power wire connections correct?
- No → 1. Check R/S/T/N wiring connections. 2. Check noise filter wiring connections. →Rewire if problems are found.
- Yes ↓

Is the input voltage correct?
- No → Check if R~S/S~T/T~R phase voltage is 220V ± 10% (for 208/230V units) or R~S/S~T/T~R phase voltage is 460V ± 10% (for 460V units). →Check if power and wiring connections are correct.
- Yes ↓

Is the inverter PCB assembly correct?
- No → Replace the inverter PCB assembly.
- Yes ↓

Recheck power and installation.

LGMV Screenshot Example.



	SC / Target	269.5/0.0		
	Main EEV	0		
	SC EEV	0		
	INV CT value	0.0		
	Unit (C,kPa)	Main	Slave1	Slave2
Inverter Compressor Amps	INV I	0.0		
Inverter Compressor Volts	INV V	0		
Power Hz	Power Hz	0		
Fan 2 Hz	Fan2 Hz	0		
C Comp CT Value	Const CT value	0.00		
C Comp Phase V	Comp phase V	0		
Fan 1 Current	Fan I 1	0.0		
Fan 2 Current	Fan I 2	0.0		
Fan 1 Volts	Fan V 1	0		
Fan 2 Volts	Fan V 2	0		
DC Link Volts	DC Link	0		
Heat Sink Temp	Comp Heat Sink	-40.56		

Error No. 40, continued.

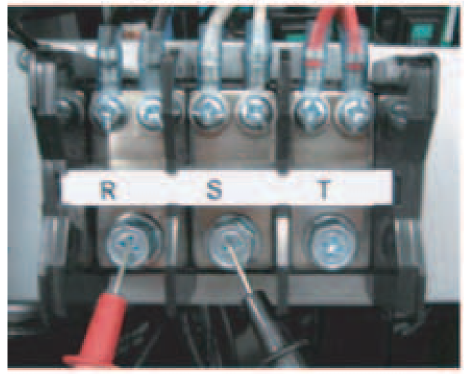
208-230V Heat Pump and Heat Recovery Outdoor Units.

Measure input voltage.

Inverter PCB assembly.

460V Heat Pump and Heat Recovery Outdoor Units.

Measure input voltage.

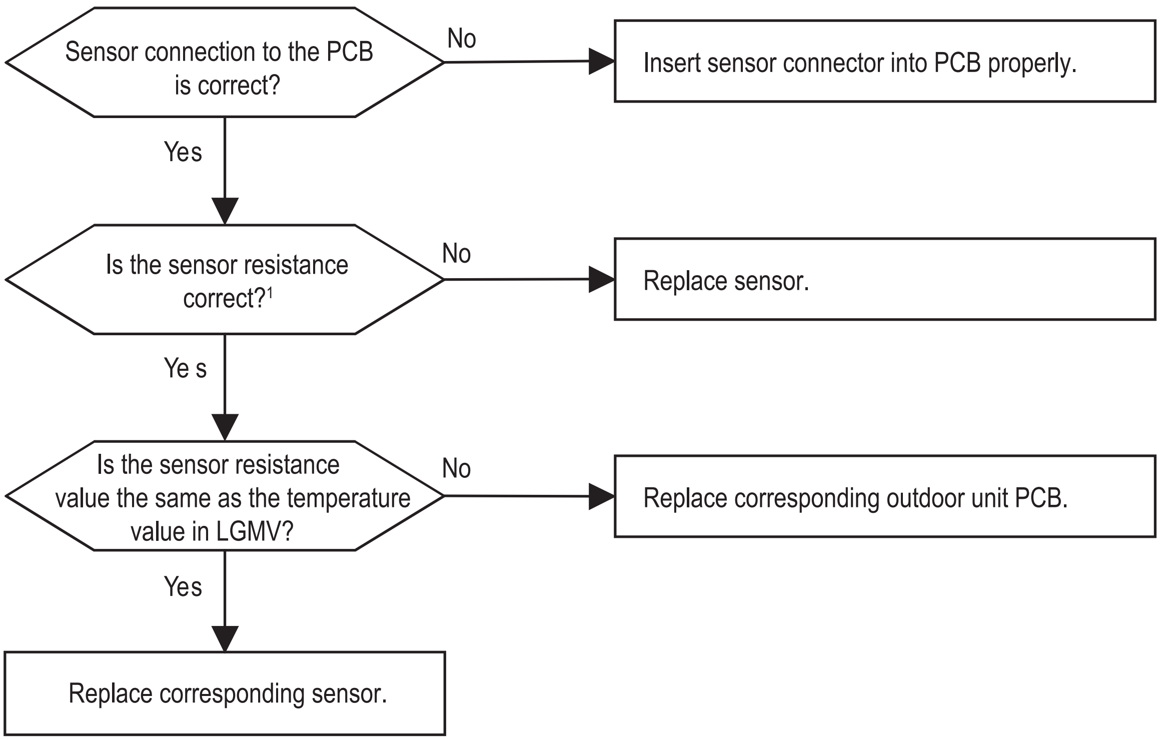


Inverter PCB assembly.

SERVICE TROUBLESHOOTING

Error Nos. 41 and 47

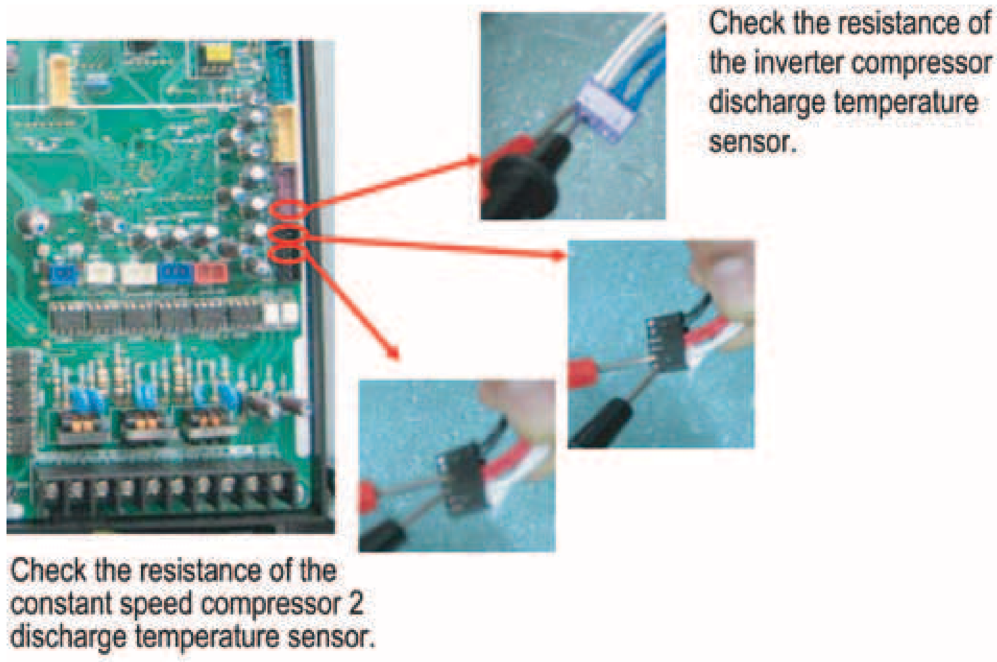
Error No.	Description	Details	Causes
41 (Inverter Compressor) Master: 411 Slave 1: 412 Slave 2: 413	Compressor discharge pipe temperature sensor error.	Disconnection or short circuit of outdoor unit compressor discharge temperature sensor.	1. Compressor discharge pipe temperature sensor is not connected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



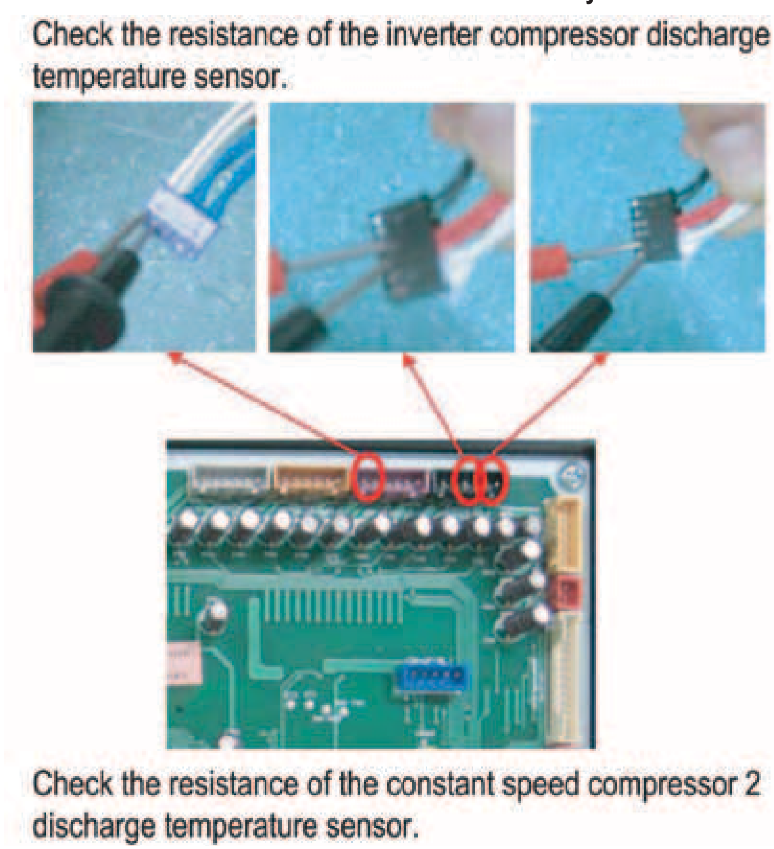
[1]*Error is generated if the resistance is >5M (open) or <2kΩ (short).*

Standard values of sensor resistance occur at different temperatures (5% variation):
50ºF = 362kΩ, 77ºF = 200kΩ, 122ºF = 82kΩ, 212ºF = 18.5kΩ.

208-230V and 460V ARUN Series Heat Pump Outdoor Units.



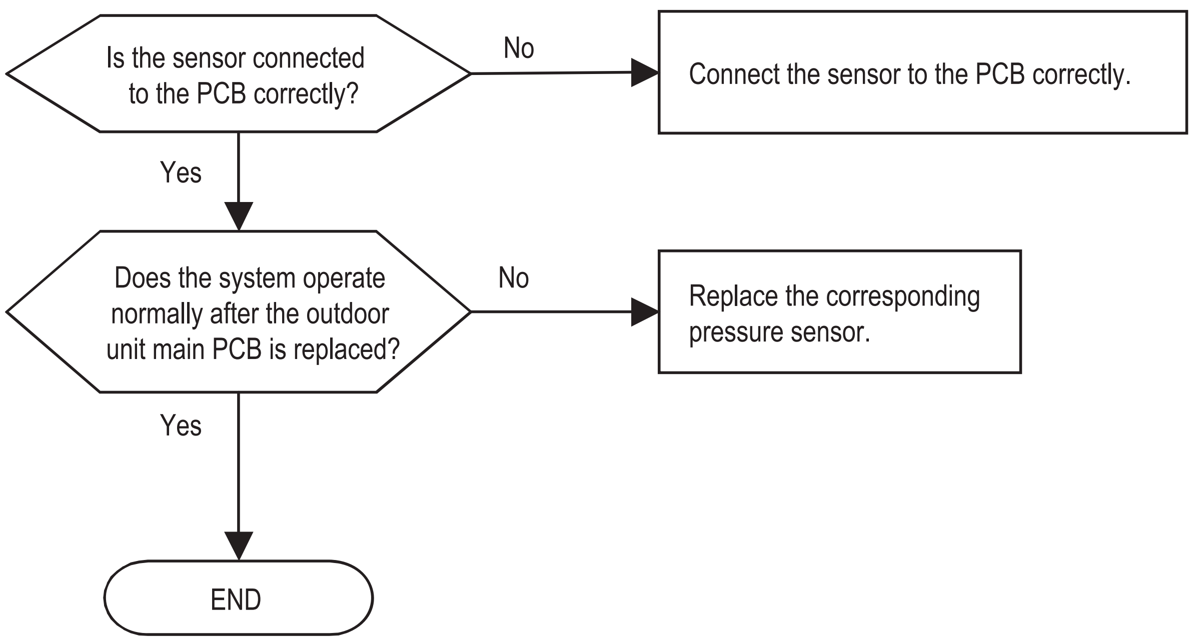
208-230V and 460V ARUB Series Heat Recovery Outdoor Units.



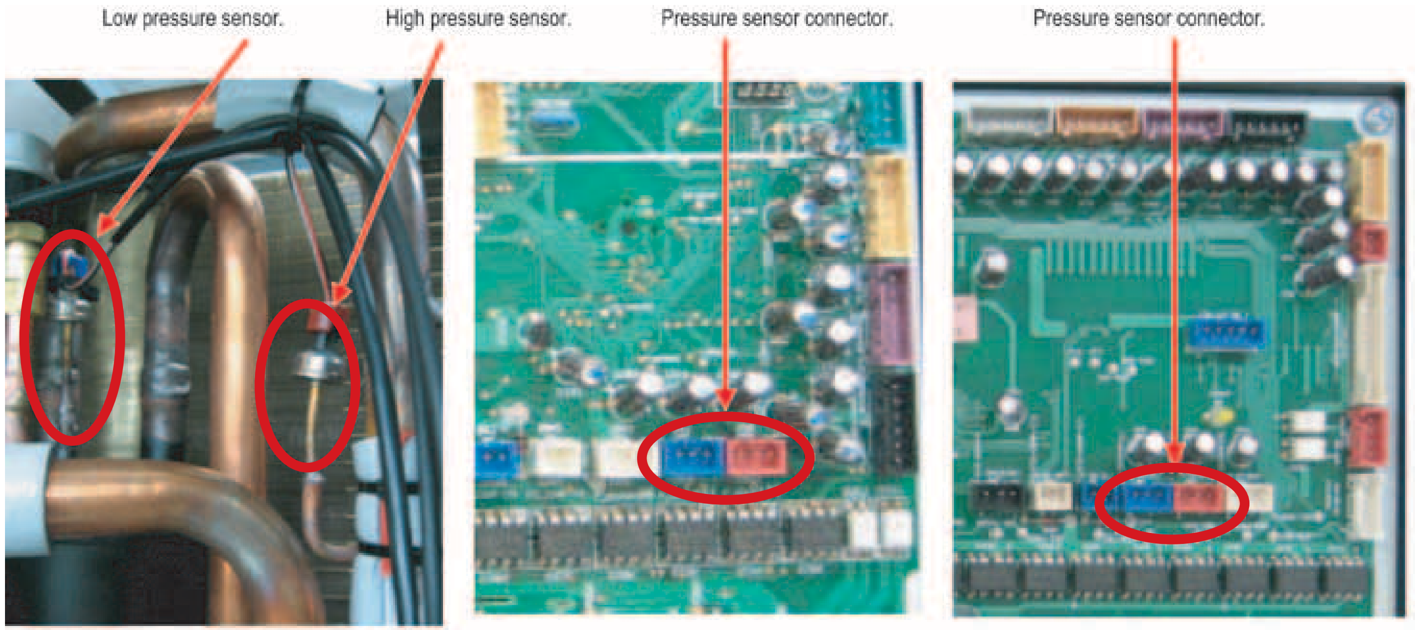
SERVICE TROUBLESHOOTING

Error Nos. 42 and 43

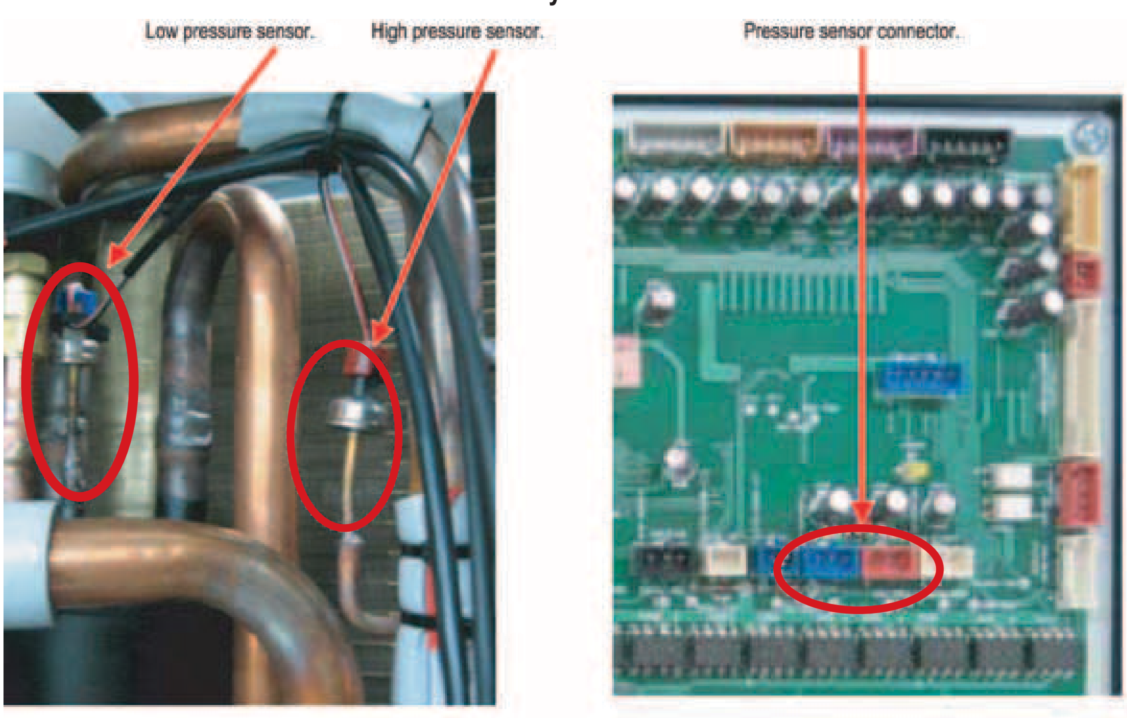
Error No.	Description	Details	Causes
42 Master: 421 Slave 1: 422 Slave 2: 423	Low pressure sensor error.	Disconnection or short circuit of outdoor unit low pressure sensor.	1. Bad low pressure sensor connection. 2. Low pressure sensor connector is defective or has malfunctioned (disconnected or short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



208-230V and 460V ARUN Series Heat Pump Outdoor Units.



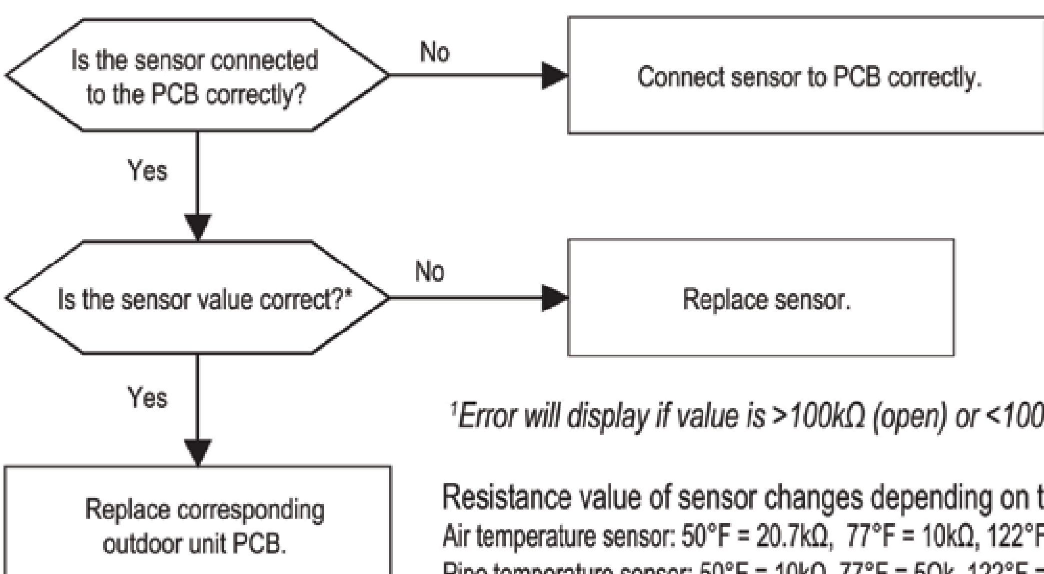
208-230V and 460V ARUB Series Heat Recovery Outdoor Units.



SERVICE TROUBLESHOOTING

Error Nos. 44, 45, 46, 49, 153, and 154

Error No.	Description	Details	Causes
44 Master: 441 Slave 1: 442 Slave 2: 443	Outdoor unit air temperature sensor error.	Disconnection or short circuit of outdoor unit compressor discharge temperature sensor.	1. Outdoor unit air temperature sensor is not connected properly. 2. Outdoor unit air temperature sensor is defective (disconnected or short circuited). 3. Outdoor unit PCB is defective.
45 Master: 451 Slave 1: 452 Slave 2: 453	Outdoor unit front-side heat exchanger temperature sensor error.	Disconnection or short circuit of outdoor unit heat exchanger temperature sensor on the front (A, B).	
46 Master: 471 Slave 1: 472 Slave 2: 473	Outdoor unit compressor suction tempera-ture sensor error.	Disconnection or short circuit of outdoor unit compressor suction temperature sensor.	
49 Master: 491 Slave 1: 492 Slave 2: 493	Outdoor unit IPM temperature sensor error.	Disconnection or short circuit of outdoor unit IPM temperature sensor.	
153 Master 11: 531 Slave 1 12: 532 Slave 2 13: 533	Outdoor unit upper heat exchanger temperature sensor error.	Disconnection or short circuit of outdoor unit upper heat exchanger temperature sensor.	1. Temperature sensor is not connected properly. 2. Temperature sensor is defective (disconnected or short circuited). 3. Outdoor unit main PCB is defective.
154 Master 11: 541 Slave 1 12: 542 Slave 2 13: 543	Outdoor unit lower heat exchanger temperature sensor error.	Disconnection or short circuit of outdoor unit lower heat exchanger temperature sensor.	



[1]Error will display if value is >100kΩ (open) or <100Ω (short).

Resistance value of sensor changes depending on the temperature:
Air temperature sensor: 50°F = 20.7kΩ, 77°F = 10kΩ, 122°F = 3.4kΩ.
Pipe temperature sensor: 50°F = 10kΩ, 77°F = 5Ωk, 122°F = 1.8kΩ.

Error No.	Description	Details	Causes
50 Master: 501 Slave 1: 502 Slave 2: 503	Outdoor unit three-phase power is missing.	One or more of R(L1), S(L2), T(L3) input power line connections is / are missing for the outdoor unit.	1. Input voltage is not correct R(L1), S(L2), T(L3). 2. Power line connections may not be correct. 3. Main PCB may be damaged. 4. Inverter PCB input current sensor error.

Are the power wire connections correct?

No →
1. Check R(L1), S(L2), T(L3) wiring connections.
→Rewire if problems are found.

Yes ↓

Is the resistance between each phase and the inverter compressor insulation resistance normal?

No →
1. Check the resistance between each compressor terminal (208/230V = 0.172~0.173Ω ± 7%, 460 = 0.34~0.35Ω ± 7%).
2. Check insulation resistance between compressor terminal and pipe (>50M).
→Replace compressor if problems are found.

Yes ↓

Is the compressor wire connections correct?

No →
1.Check inverter PCB assembly U,V,W connections.
2. Check wiring and for wire disconnections.
3. Check compressor terminal connections for bad contacts.
→Reassemble if problems are found.

Yes ↓

Is the inverter PCB assembly correct?

No →
Check if inverter PCB assembly IPM is normal.
→Replace inverter PCB assembly if problems are found.

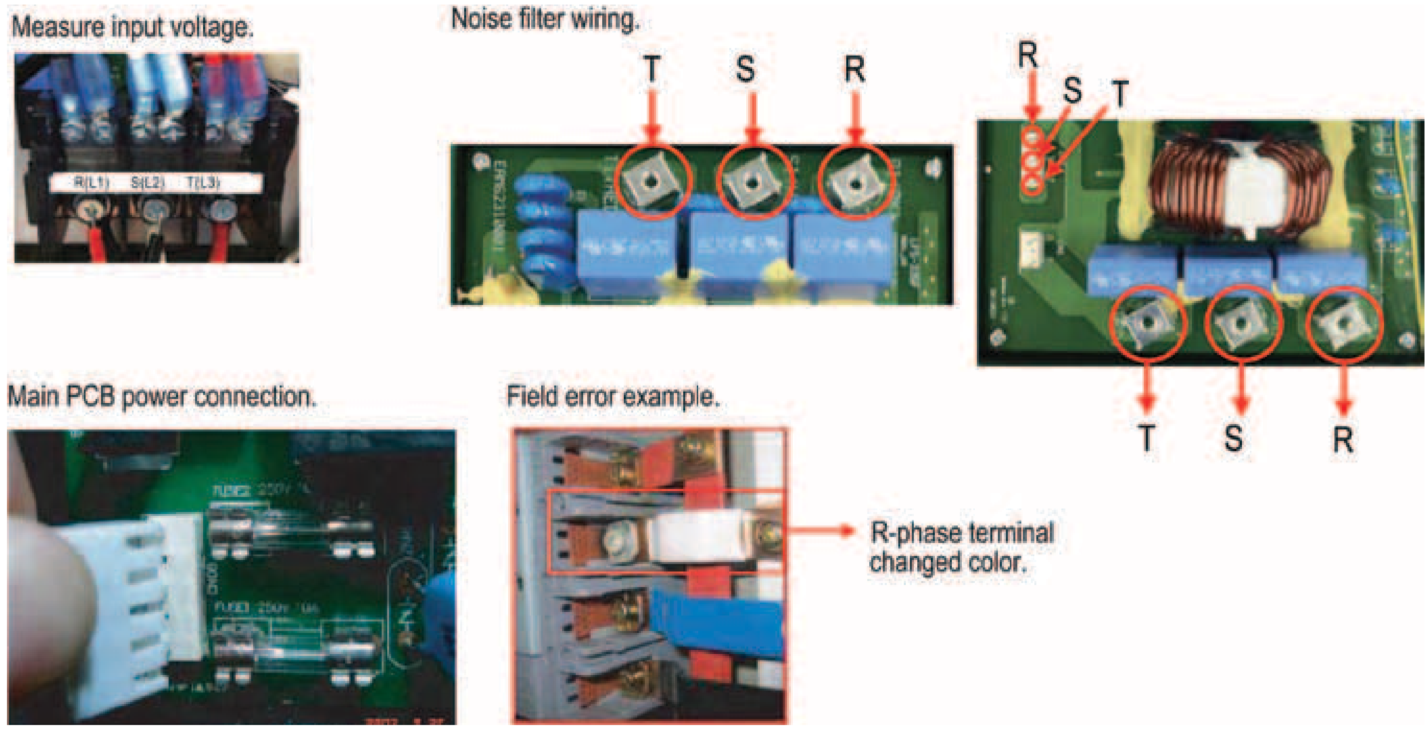
Yes ↓

Recheck power and installation.

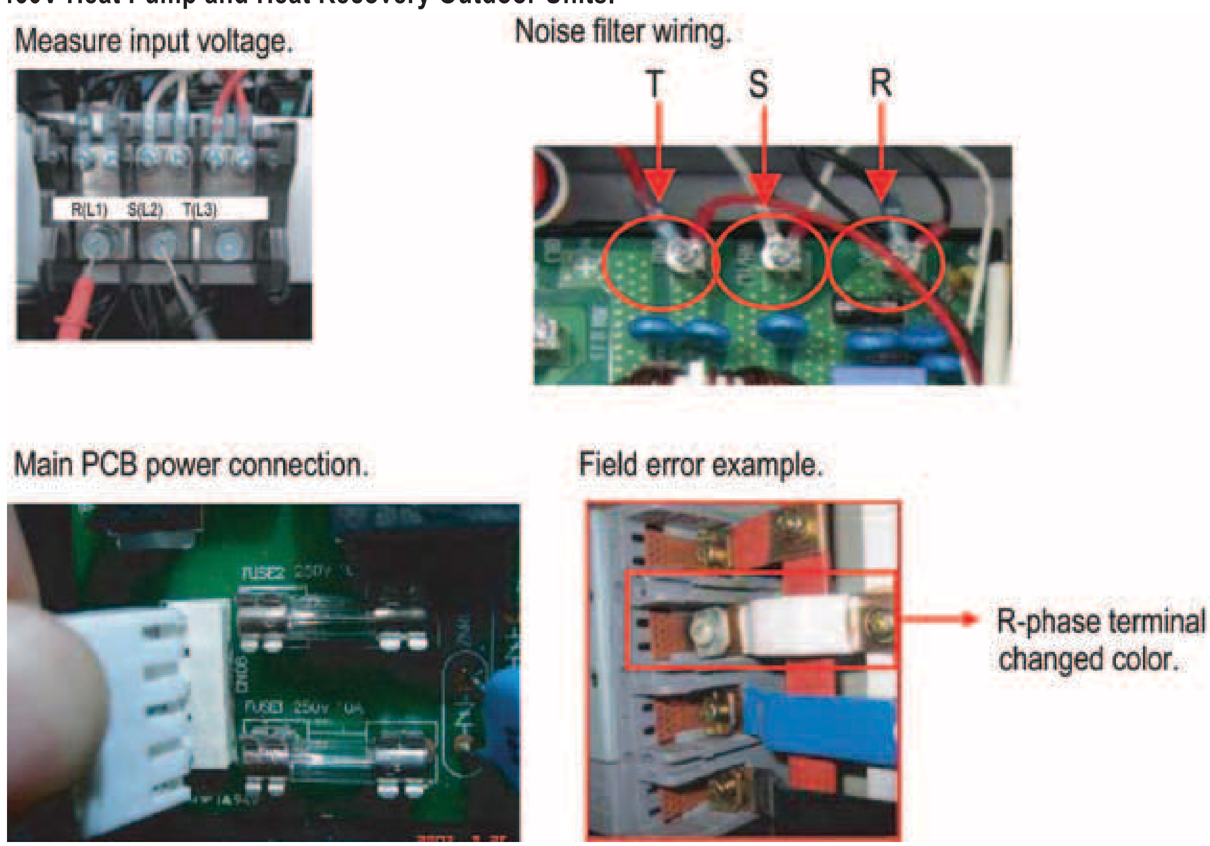
SERVICE TROUBLESHOOTING

Error No. 50, continued.

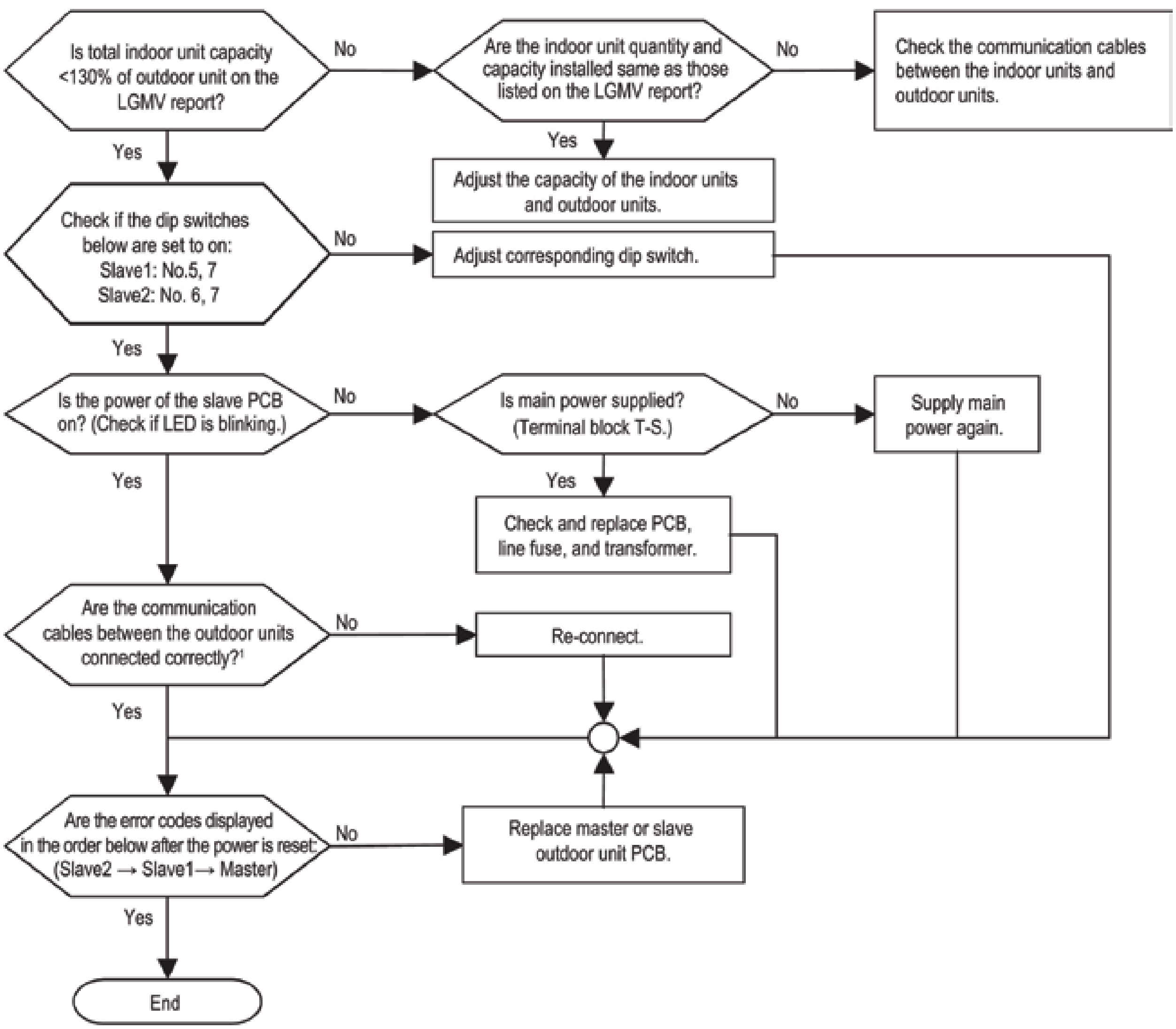
208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.



Error No.	Description	Details	Causes
51 Master: 511	Total indoor unit capacity exceeds allowable outdoor unit capacity.	Value of total indoor unit capacity exceeds allowable outdoor unit capacity specifications.	1. Total indoor unit capacity is more than 130% outdoor unit rated capacity. 2. Wrong transmission cable / piping connections. 3. Control error of slave outdoor unit dip switches. 4. Defective slave unit PCB power supply. 5. Outdoor unit PCB is defective.

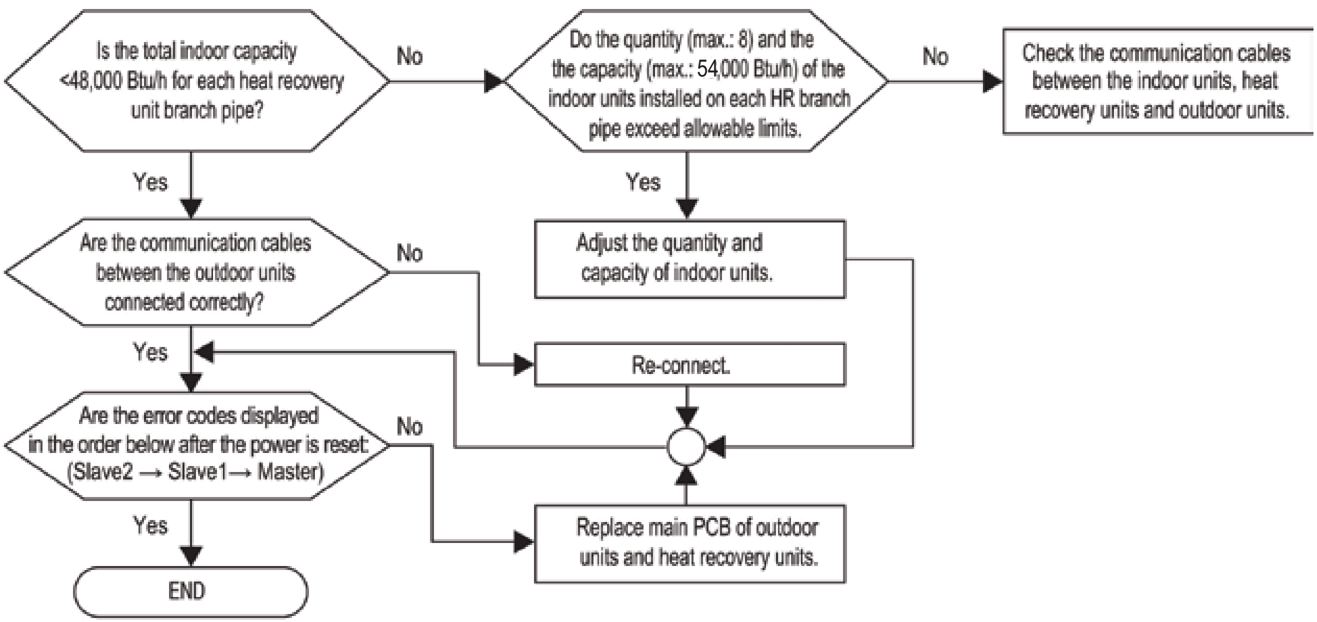


[1]To check the communication cables between the outdoor units, follow the order below: PCB connectors → terminal block → communication cables.

SERVICE TROUBLESHOOTING

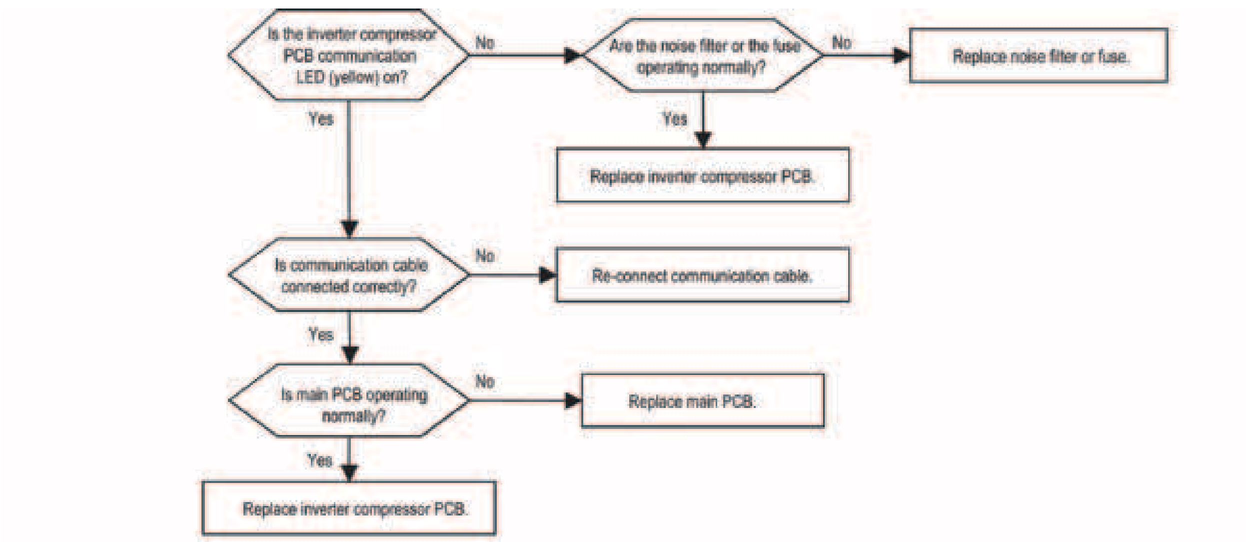
Error No. 51(2) (For ARUB Heat Recovery Systems only)

Error No.	Description	Details	Causes
51 Master: 512	Total indoor unit capacity exceeds allowable heat recovery unit branch capacity.	Value of total indoor unit capacity exceeds allowable heat recovery unit branch capacity specifications. Total indoor unit capacity is >54,000 Btu/h for each heat recovery unit branch pipe.	1. Total indoor unit capacity is more than 54,000 Btu/h per each heat recovery unit branch pipe. 2. Total indoor units connected to each heat recovery unit branch pipe is >eight (8). 3. Wrong transmission cable / piping connections. 4. Outdoor unit and heat recovery unit PCB is defective.



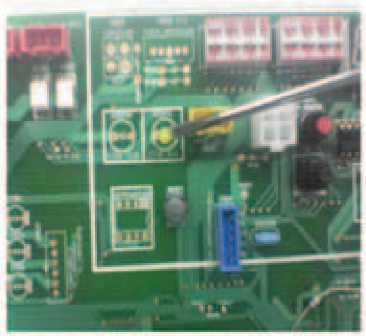
[1]To check the communication cables between the outdoor units, follow the order below: PCB connectors → terminal block → communication cables.

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

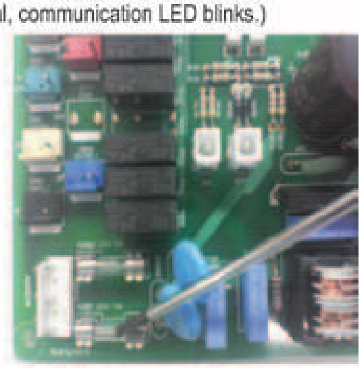


Checking the ARUN Heat Pump Outdoor Unit main and inverter compressor PCBs. (If normal, communication LED blinks.)

Inverter compressor PCB communication connection and LED.



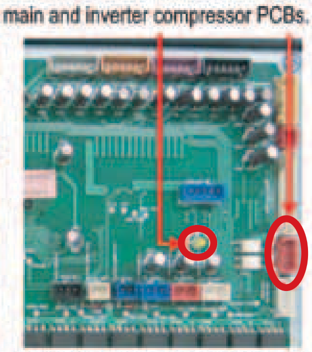
Main PCB communication connection and LED.



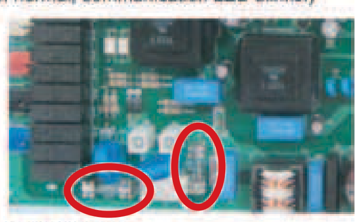
Main PCB fuse.

Checking the ARUB Heat Recovery Outdoor Unit main and inverter compressor PCBs. (If normal, communication LED blinks.)

Inverter compressor PCB communication connection and LED.



Main PCB communication connection and LED.

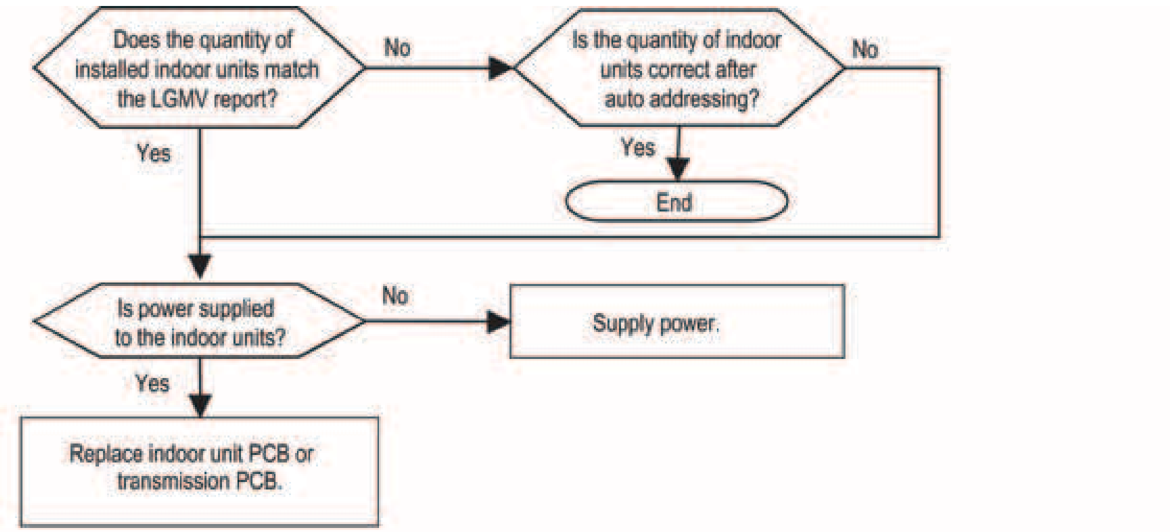


Main PCB Fuse.

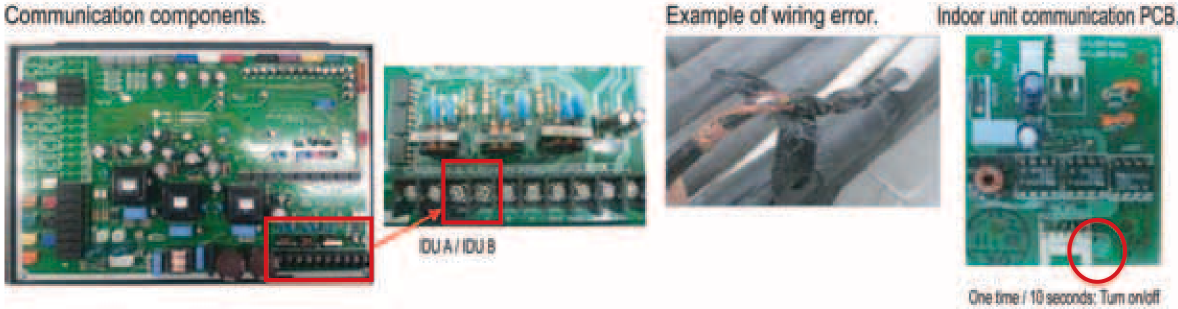
SERVICE TROUBLESHOOTING

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. Communication cables are not connected. 2. Communications cables are disconnected or have short circuted. 3. Outdoor unit main PCB / indoor unit PCB is defective or damaged. 4. Communication wire connection error.



Communication components. Example of wiring error. Indoor unit communication PCB.



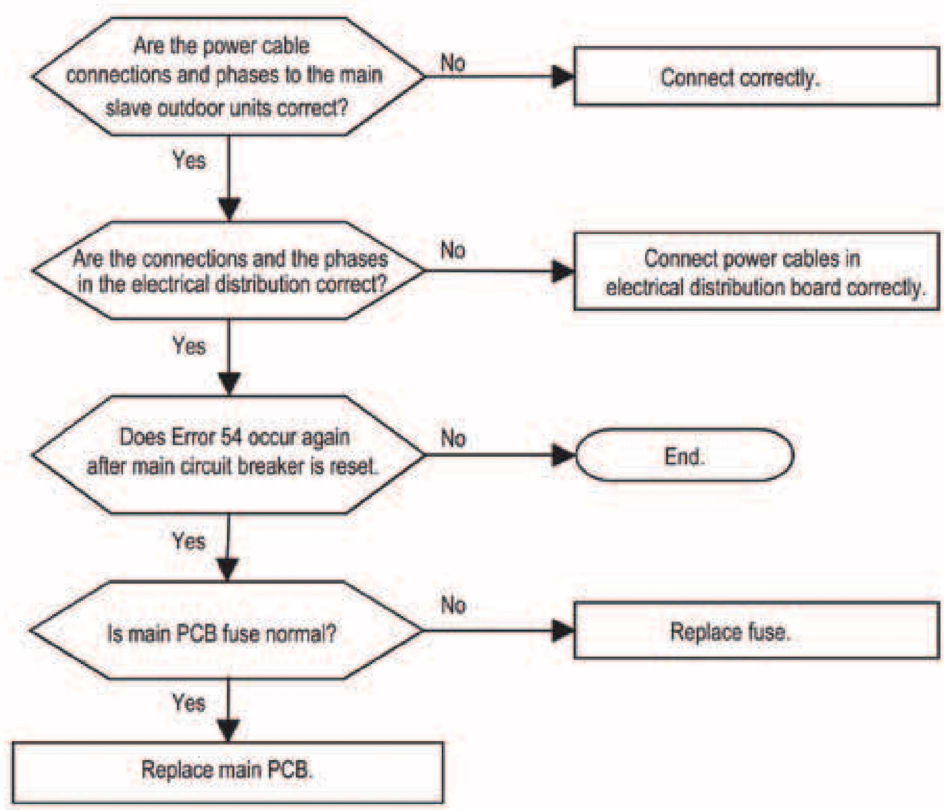
In addition to the information presented here, see also troubleshooting procedure for Error No. 05.

- If the quantity of installed indoor units matches the LGMV data, there may still be a few indoor units that have not been communicated 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:

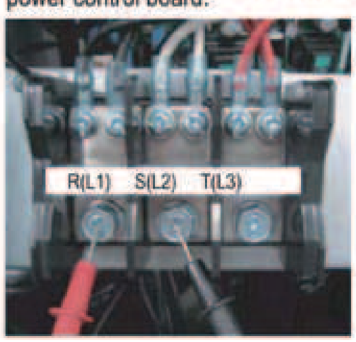
1. Wrong transmission or power cable connection.
2. Power / PCB / transmission cable dysfunction.
3. Duplicate numbers for indoor units.

- If the 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.

Error No.	Description	Details	Causes
54 Master: 541 Slave 1: 542 Slave 2: 543	Outdoor unit power error.	Outdoor unit three-phase power R(L1), S(L2), T(L3) is not connected properly (reverse phase / phase is missing).	1. Main PCB is defective. 2. No power supplied to R(L1), S(L2), T(L3) cables. 3. Wiring connection error to R(L1), S(L2), T(L3) cables. 4. Main PCB fuse has failed.



Check cable connections and phase order R(L1) - S(L2) - T(L3), in the outdoor unit power control board.

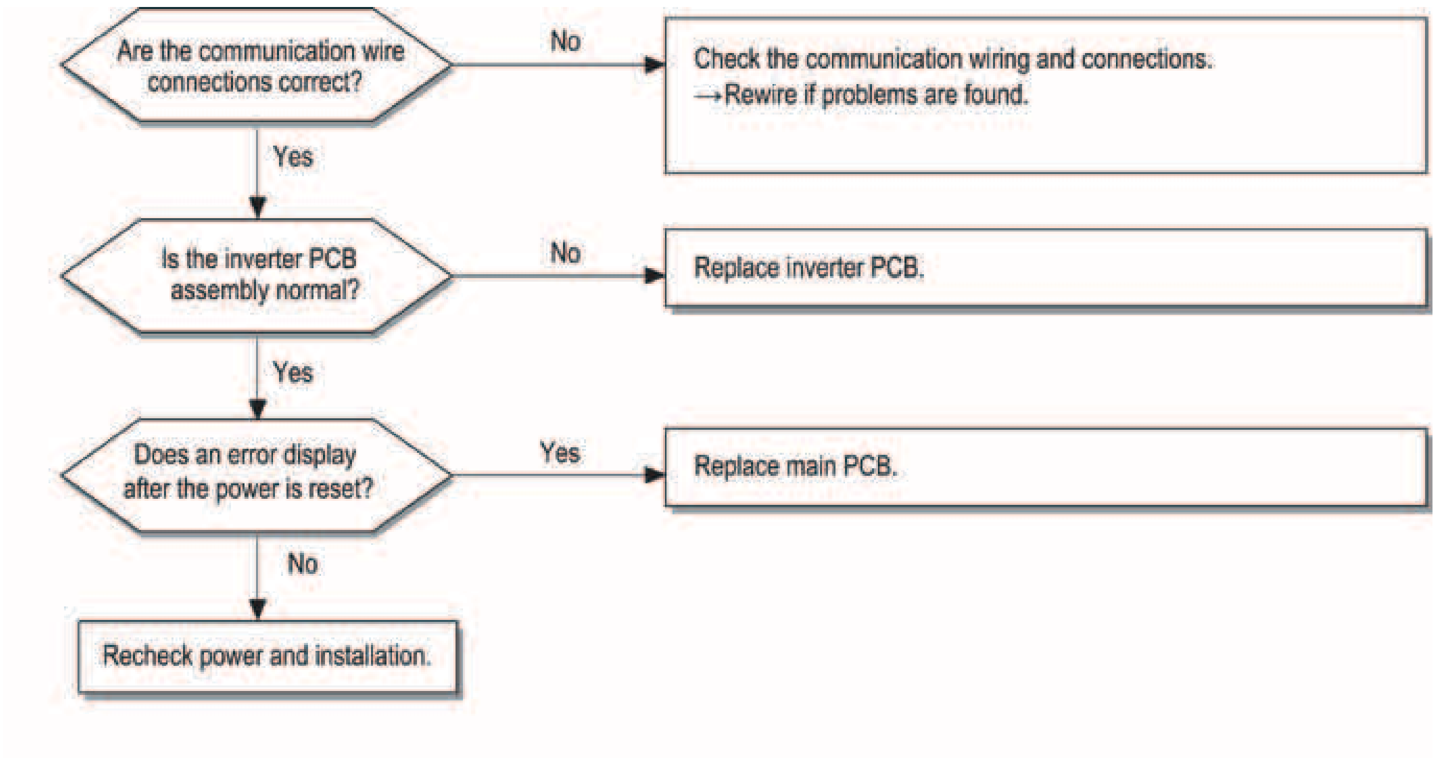


Check cable connections, phase order, and power supply to the electrical distribution board.

SERVICE TROUBLESHOOTING

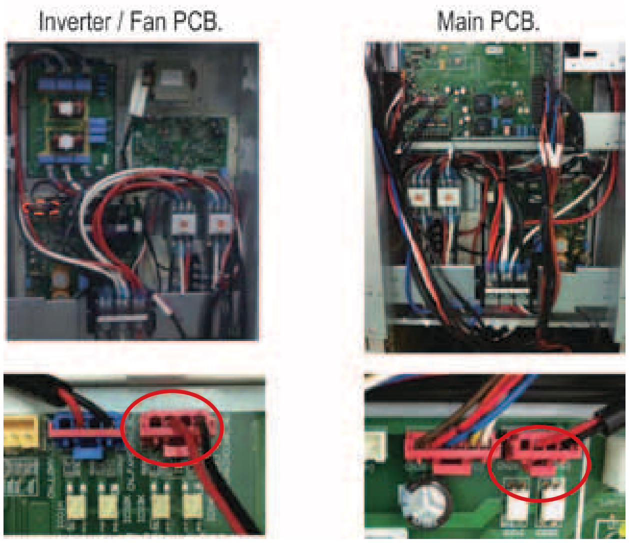
Error No. 57

Error No.	Description	Details	Causes
57 Master: 571 Slave 1: 572 Slave 2: 573	Outdoor unit controller and inverter controller communication error.	Outdoor unit controller is not receiving signal from inverter controller. Communication error between main PCB and inverter PCB.	1. Bad connection between inverter and main PCBs. 2. Communication wire noise problems. 3. Outdoor unit main PCB has been damaged. 4. Outdoor unit inverter PCB has been damaged.

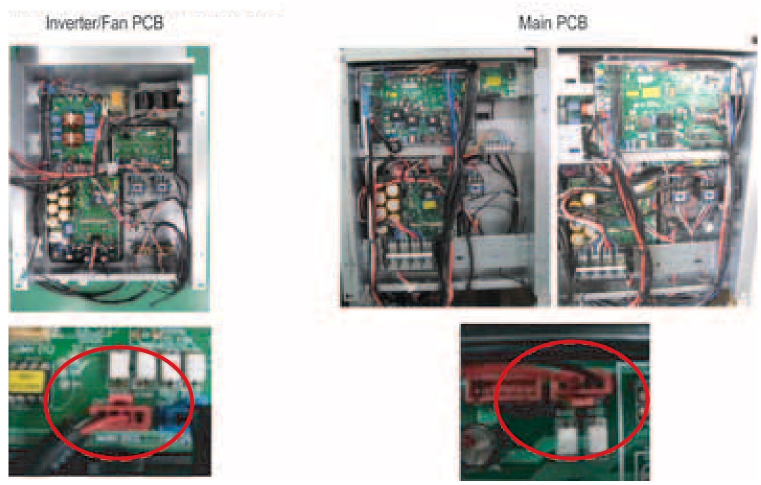


Error No. 57, continued.

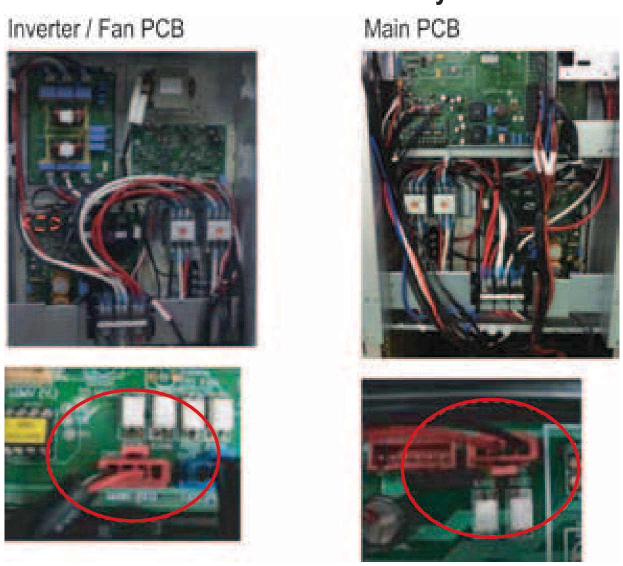
208-230V ARUN Series Heat Pump Outdoor Units.



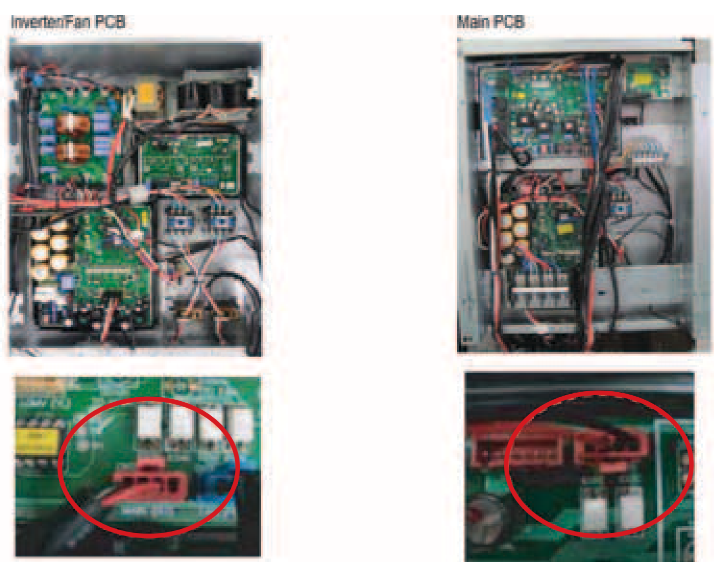
460V ARUN Series Heat Pump Outdoor Units.



208-230V ARUB Series Heat Recovery Outdoor Units.



460V ARUB Series Heat Recovery Outdoor Units.



Error No. 59(1)

Error No.	Description	Details	Causes
591	Outdoor unit series installation error.	A smaller outdoor unit is set as the master outdoor unit.	Dip switch setting error.

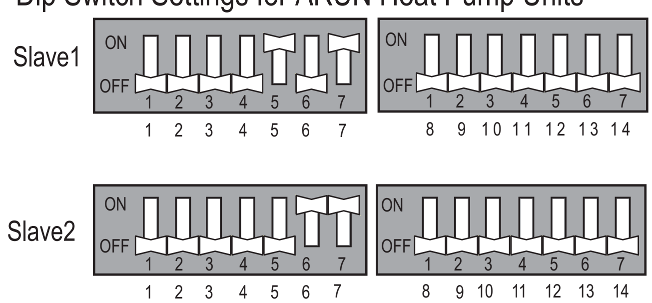
Is the dip switch setting correct?
- No → Set the largest capacity outdoor unit as the master.
- Yes ↓

Are the settings Master → Slave1 → Slave2
- No → Set as Master → Slave1 → Slave2.
- Yes ↓

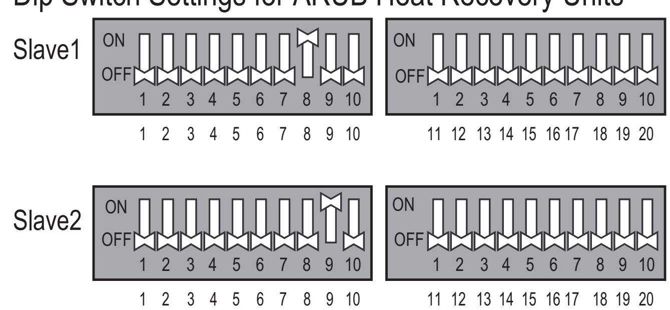
Is there an error when the power is reset?
- No → Replace main PCB.
- Yes ↓

Recheck installation.

Dip Switch Settings for ARUN Heat Pump Units



Dip Switch Settings for ARUB Heat Recovery Units



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. Outdoor inverter PCB assembly is damaged.

Is EEPROM installed correctly?

No → Check EEPROM connection and “Check Sum.” → Replace if problems are found.

Yes ↓

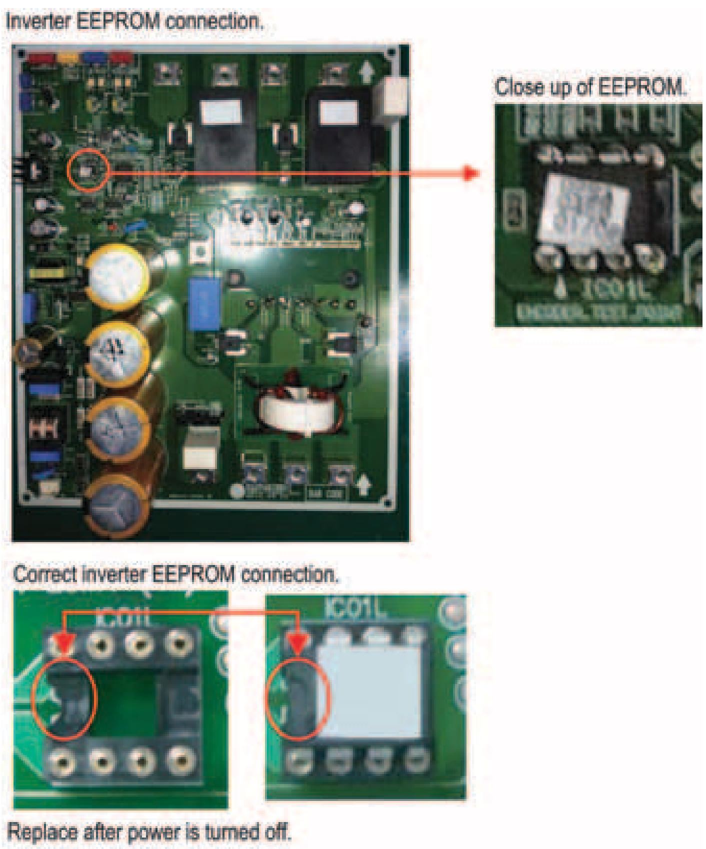
Is inverter PCB assembly correct?

No → Replace inverter PCB assembly.

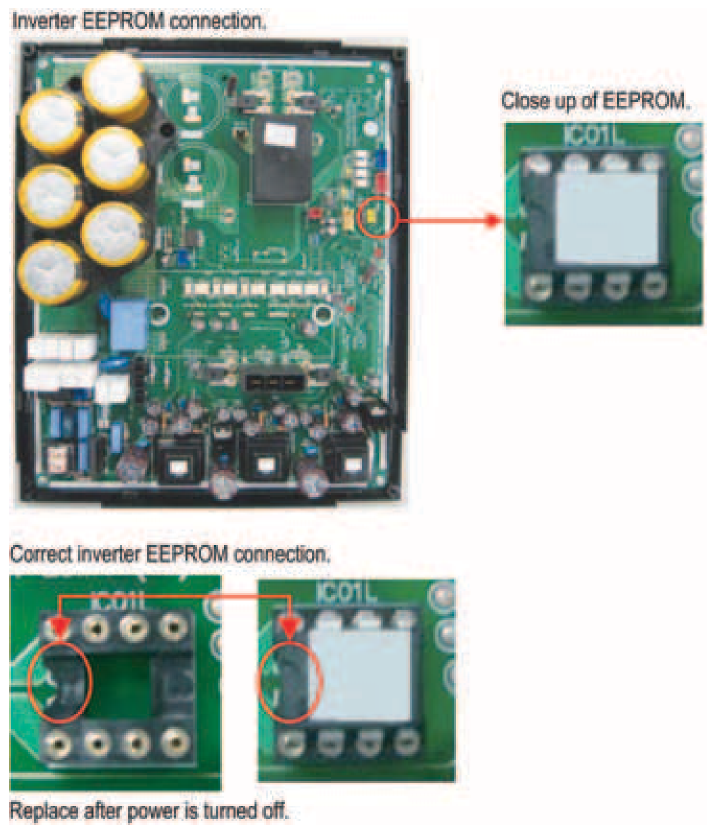
Yes ↓

Recheck power and installation.

208-230V Heat Pump and Heat Recovery Outdoor Units.

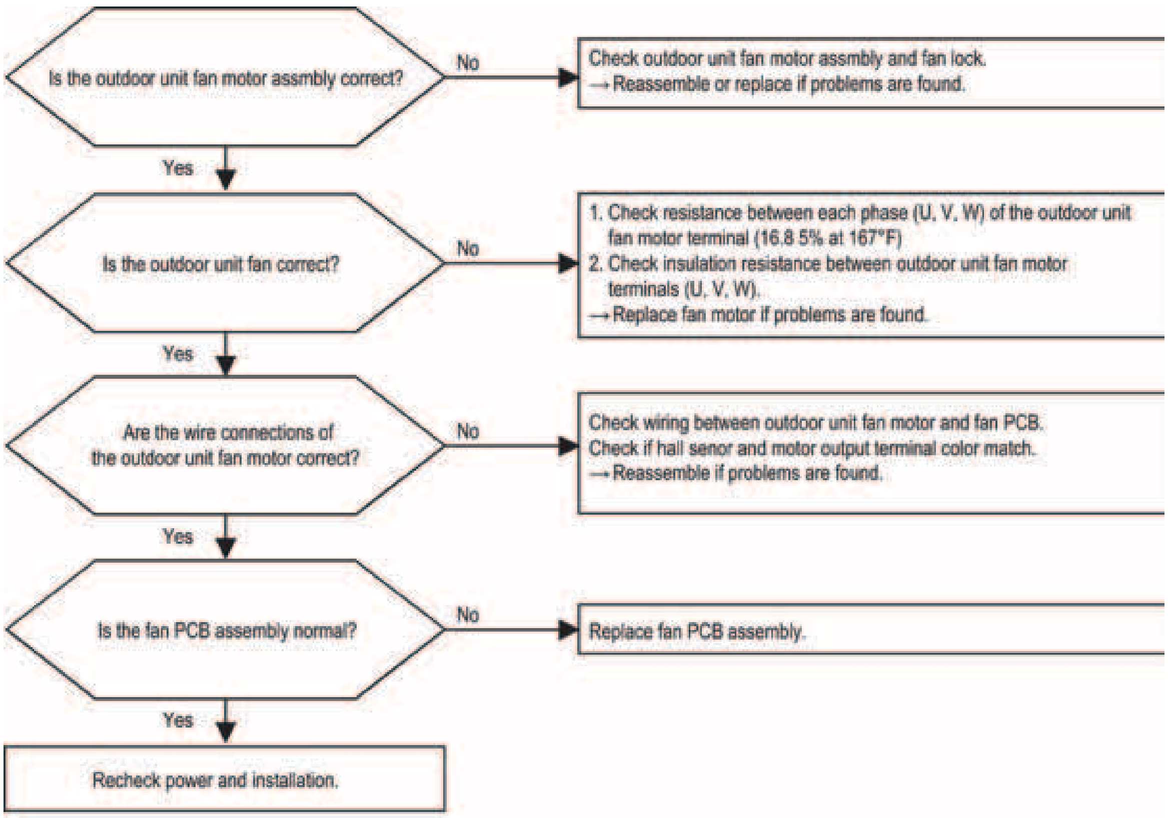


460V Heat Pump and Heat Recovery Outdoor Units.

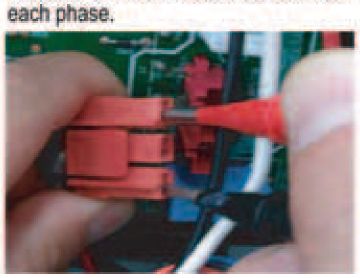


Error No. 67

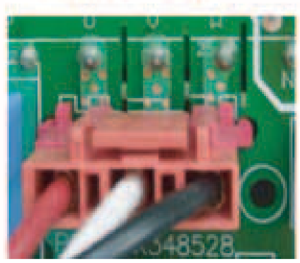
Error No.	Description	Details	Causes
67 Master: 671 Slave 1: 672 Slave 2: 673	Outdoor unit fan has locked up.	Fan operates at ≤10 RPMs for five (5) seconds when outdoor unit fan starts, or for ≤40 RPMs after fan starts.	1. Fan motor is defective; assembly is incorrect. 2. Fan motor is incorrectly connected (hall sensor; U, V, W output). 3. Rotation reverses after target RPM is reached. 4. Fan PBC assembly is defective. 5. Fan is blocked by snow.



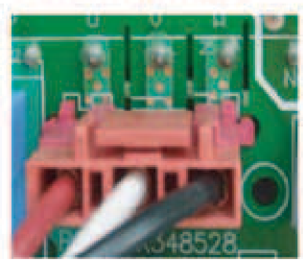
Measure fan motor resistance between each phase.



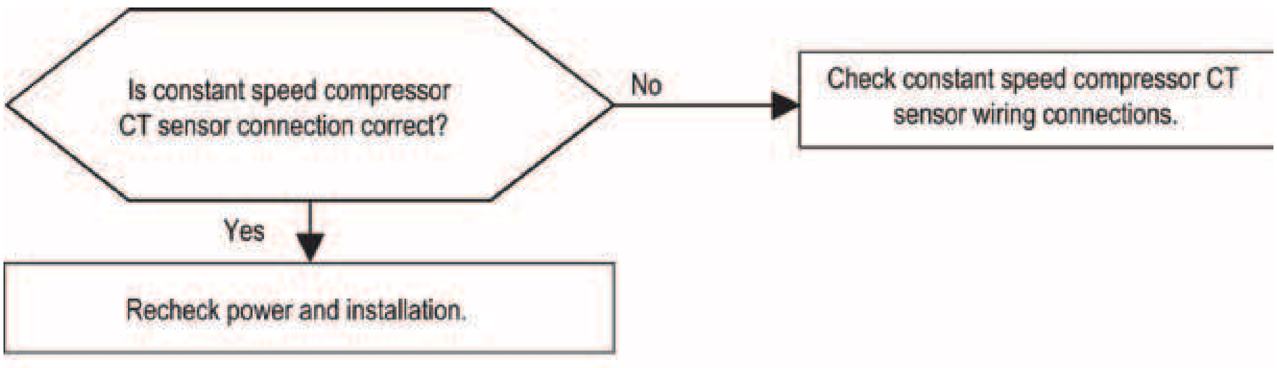
Hall sensor connection.

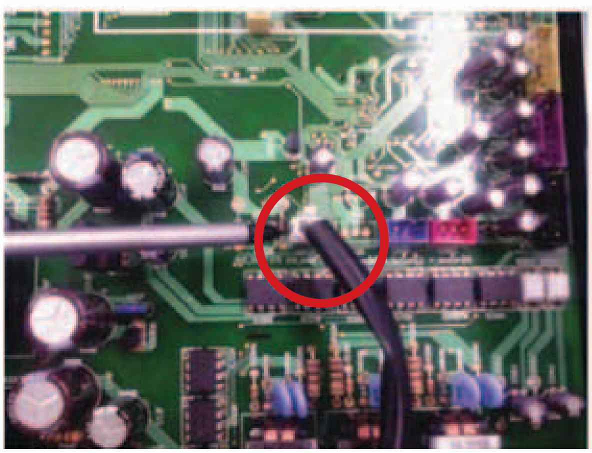


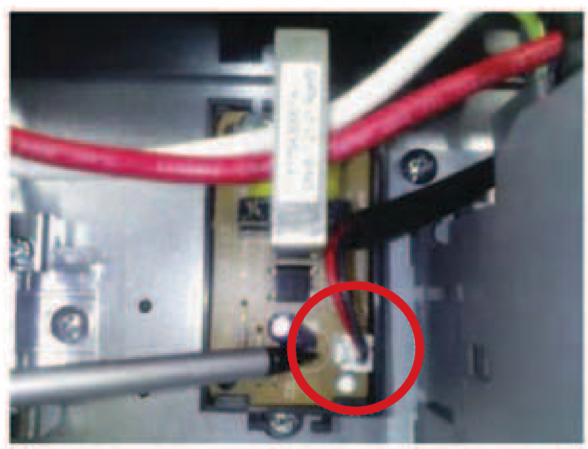
Fan motor wire connection.



Error No.	Description	Details	Causes
69 Master: 691 Slave 1: 692 Slave 2: 693	Outdoor unit constant-speed compressor CT sensor error.	Outdoor unit constant-speed compressor CT sensor error.	Disconnection or short circuit of outdoor unit constant-speed compressor1 CT sensor.

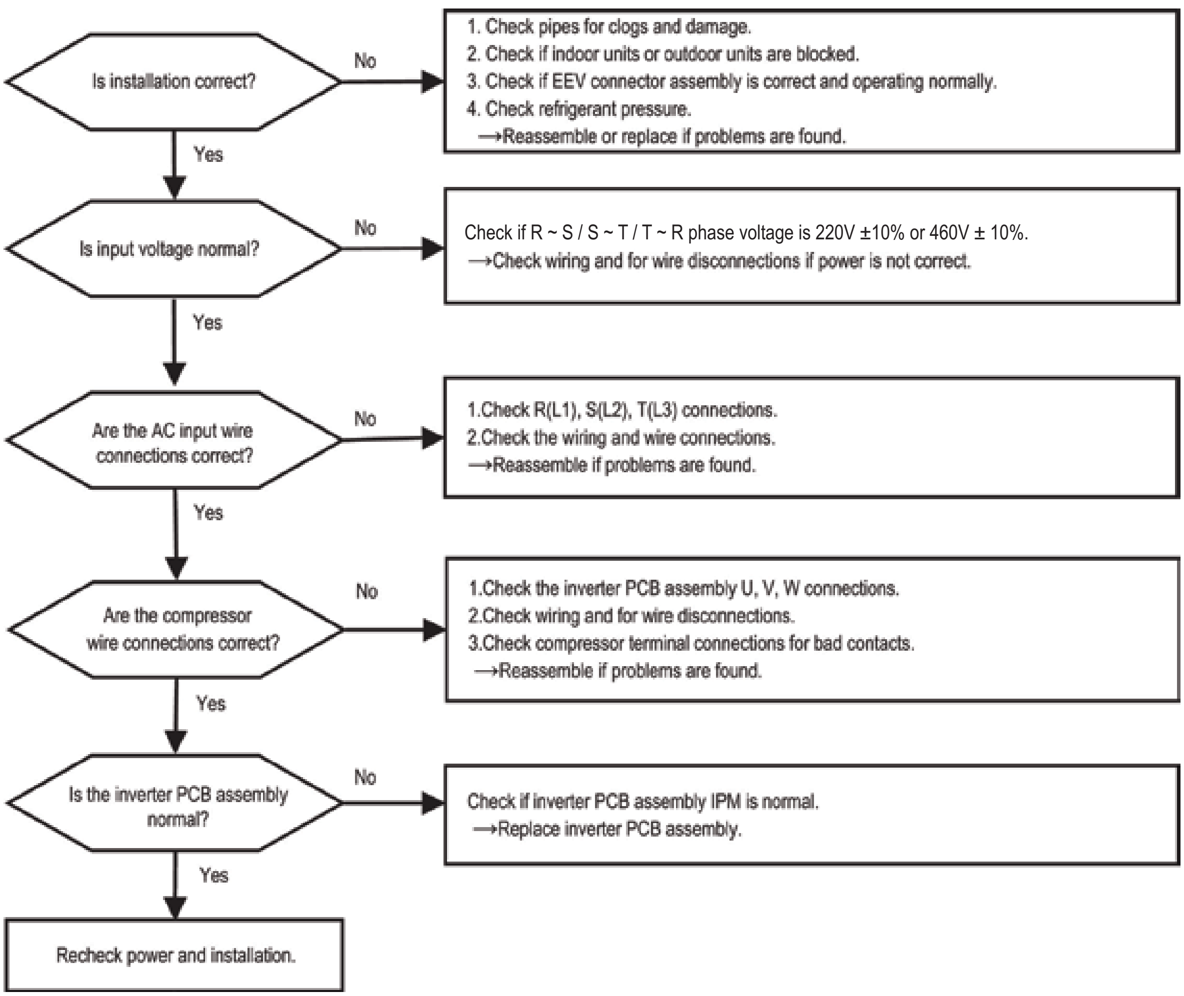




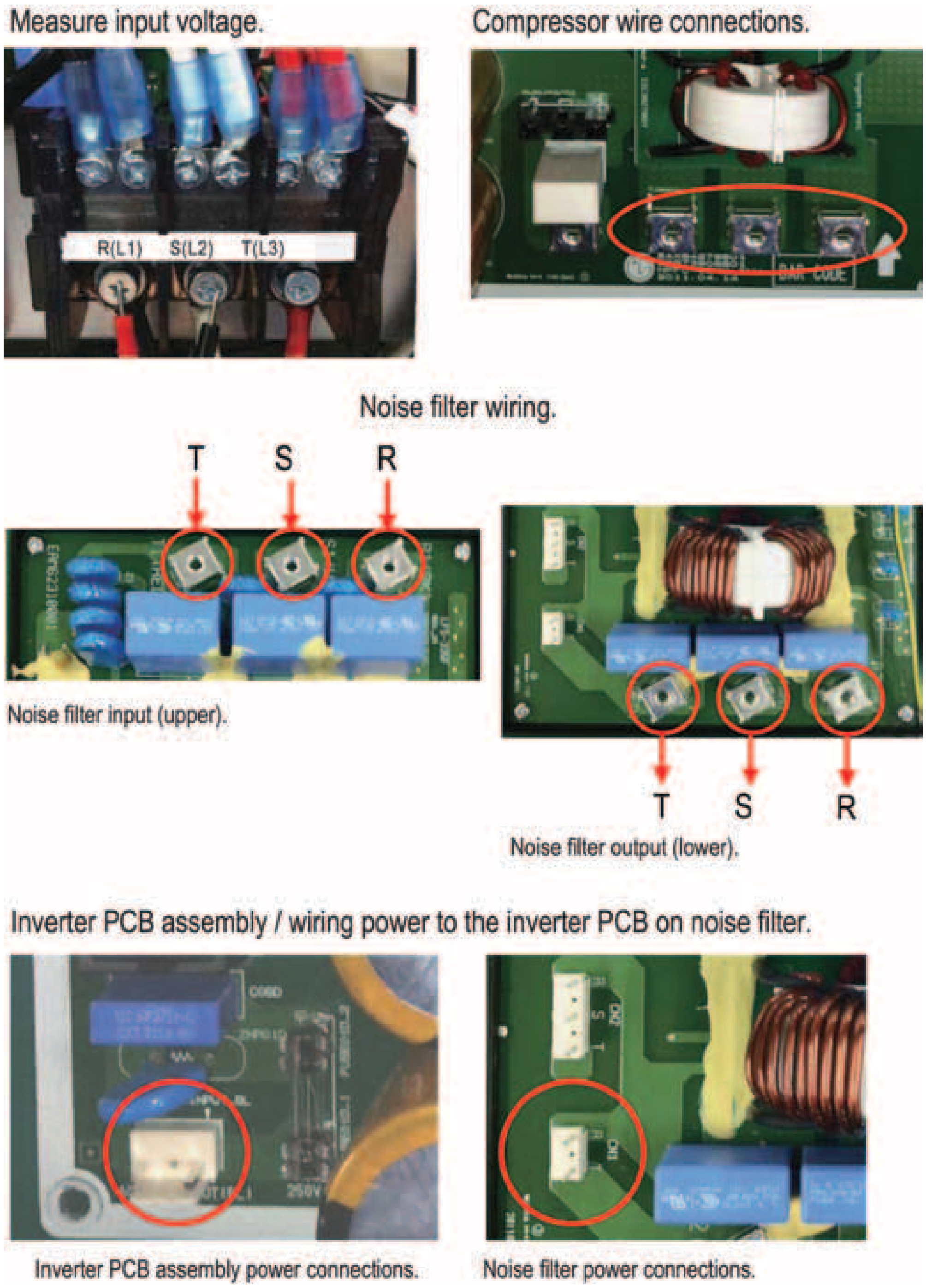


Error No. 73

Error No.	Description	Details	Causes
73 Master: 731 Slave 1: 732 Slave 2: 733	Outdoor PFC instant overcurrent (peak) error.	AC input instant overcurrent error (software error). Inverter PCB input 3-phase power current is over 50A (peak) for 2 minutes.	1. Overload operation: pipe is clogged, outdoor unit or indoor unit is blocked, EEV is defective, refrigerant is overcharged. 2. Compressor insulation and / or motor has been damaged. 3. Input voltage is not correct R(L1), S(L2), T(L3). 4. Power line assembly is not correct. 5. Inverter PCB assembly has been damaged (input current sensor component).

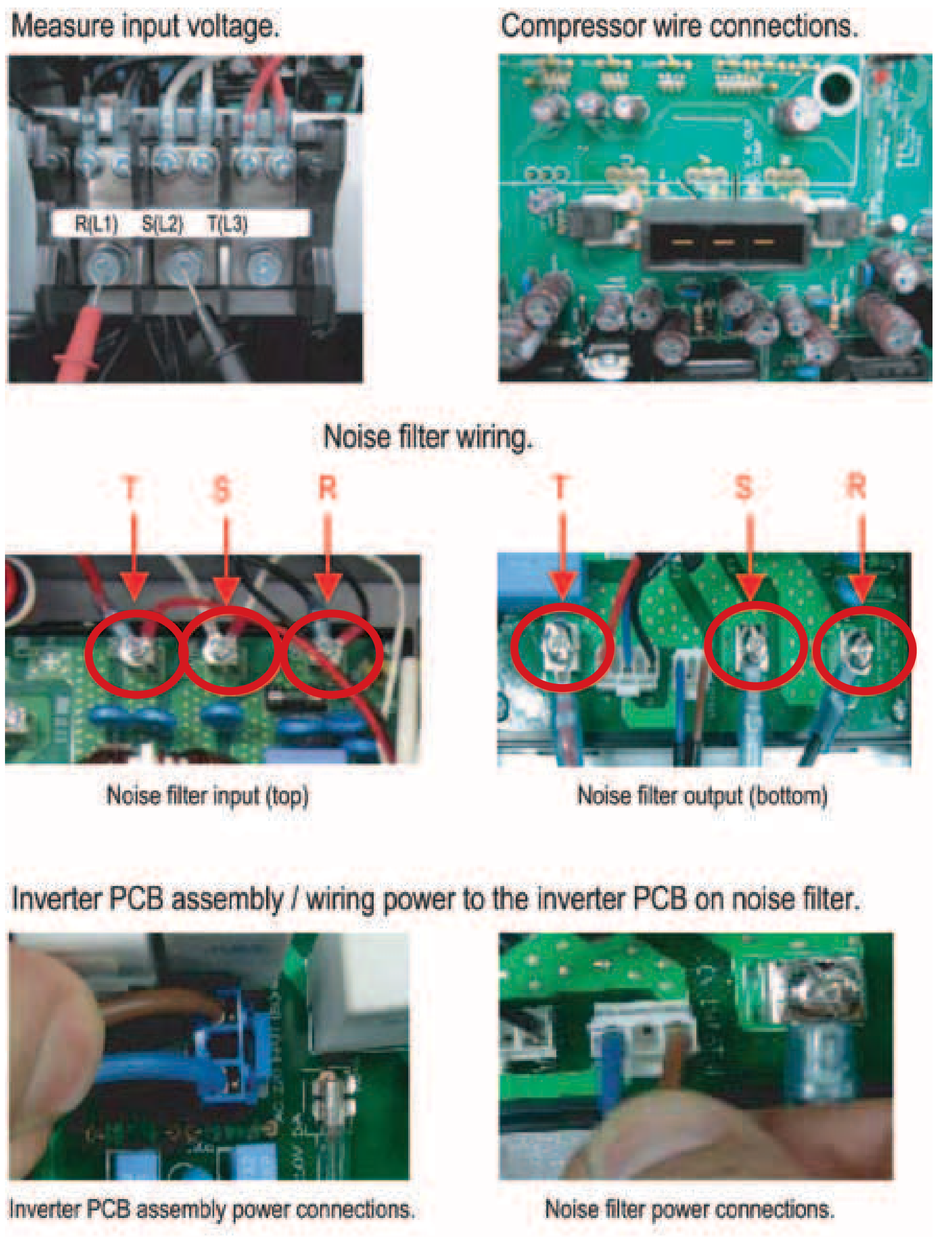


208-230V Heat Pump and Heat Recovery Outdoor Units.



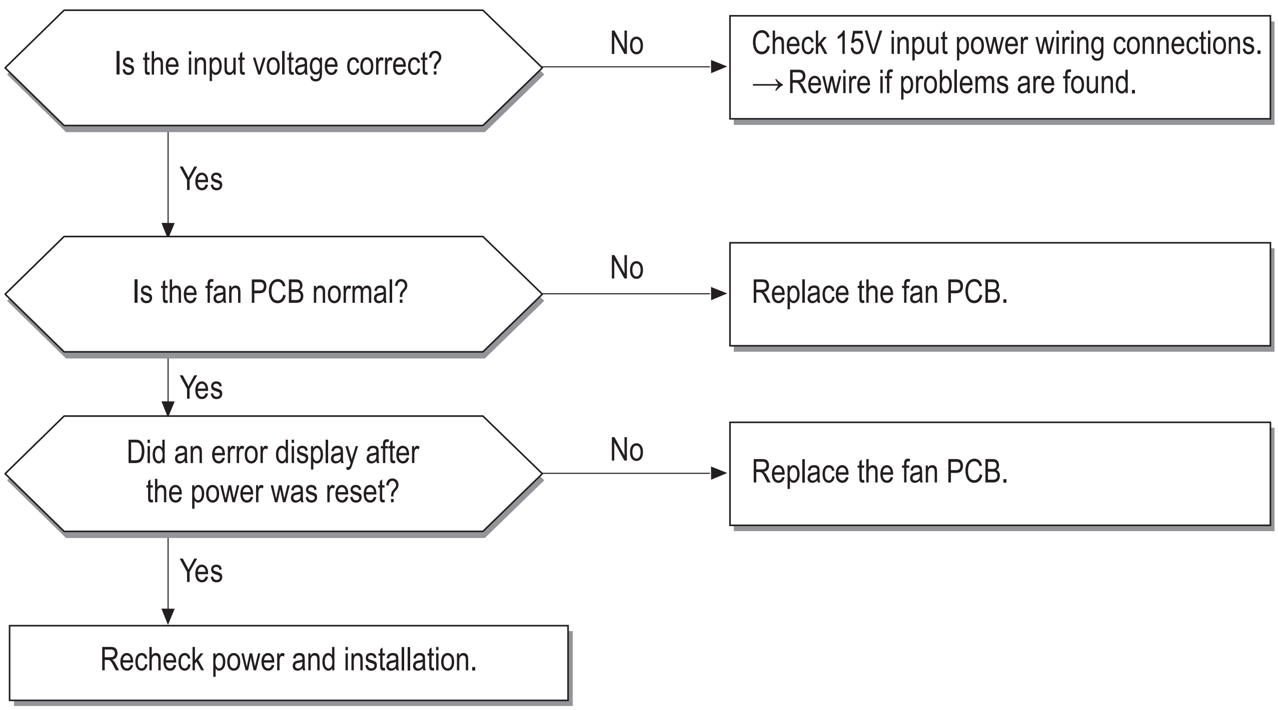
Error No. 73, continued.

460V Heat Pump and Heat Recovery Outdoor Units.



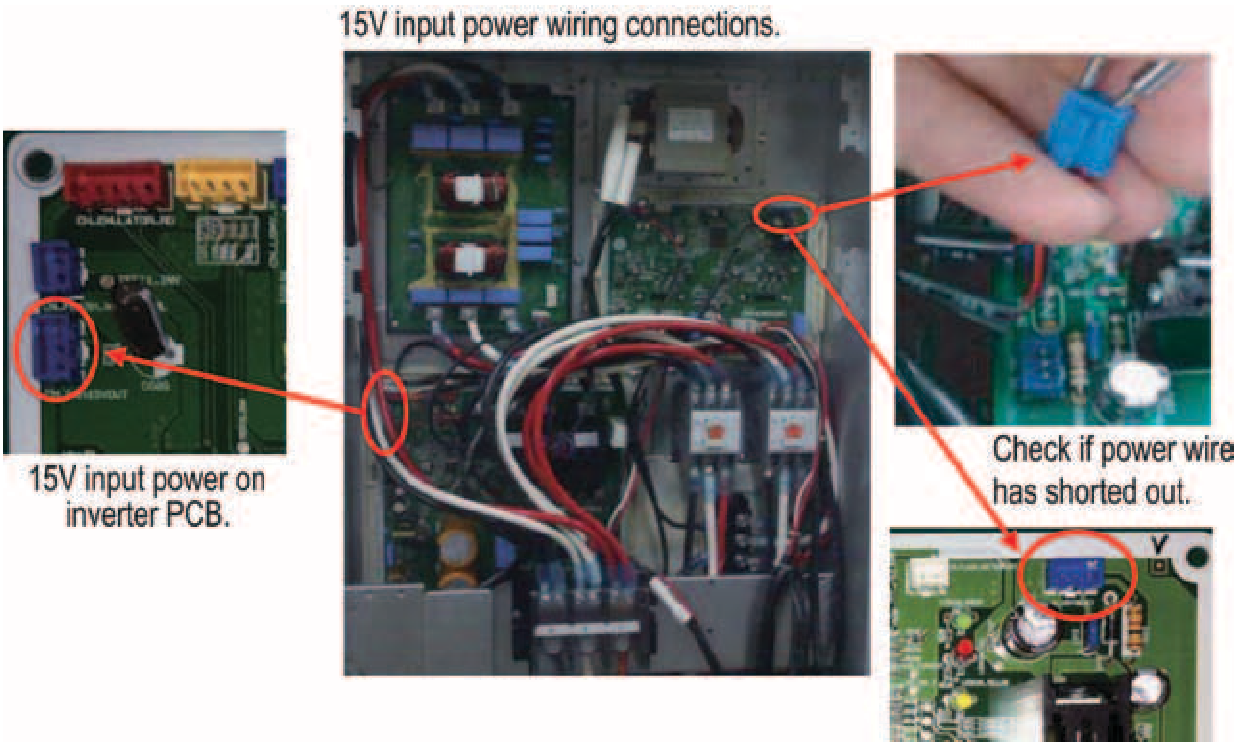
Error No. 75

Error No.	Description	Details	Causes
75 Master: 751 Slave 1: 752 Slave 2: 753	Outdoor unit fan CT sensor error.	Disconnection or short circuit of outdoor unit fan current detection (CT) sensor. MICOM component senses the fan motor phase current is not 2.5V.	1. Input voltage is not correct (not 15V). 2. Defective fan PCB assembly. 3. Disconnection or short circuit of power wire. 4. Defective inverter PCB assembly.

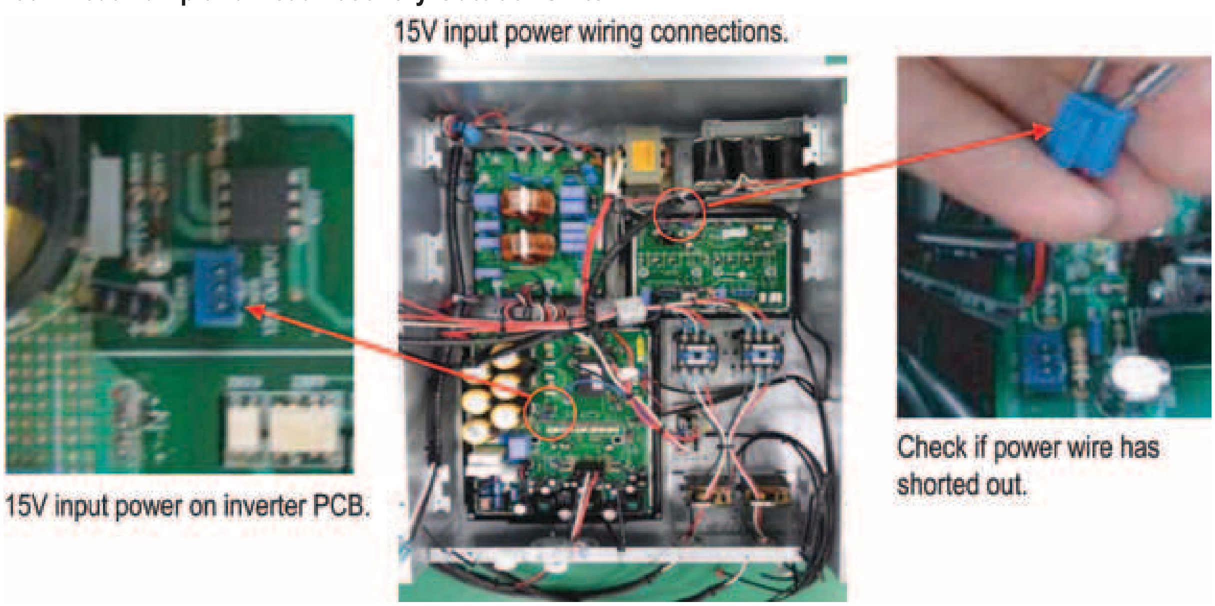


Error No. 75, continued.

208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.



Error No.	Description	Details	Causes
76 Master: 761 Slave 1: 762 Slave 2: 763	Outdoor unit fan DC link high voltage error.	Fan PCB DC link voltage is >420V (for 208-230V units) or >780V (for 460V units).	1. Input power is not correct. 2. Defective fan PCB assembly. 3. Power wire connection error.

Are the power wire connections correct?
- No → 1. Check R(L1), S(L2), T(L3) wiring connections.
  2. Check the noise filter wiring connections.
  →Rewire if problems are found.
- Yes ↓

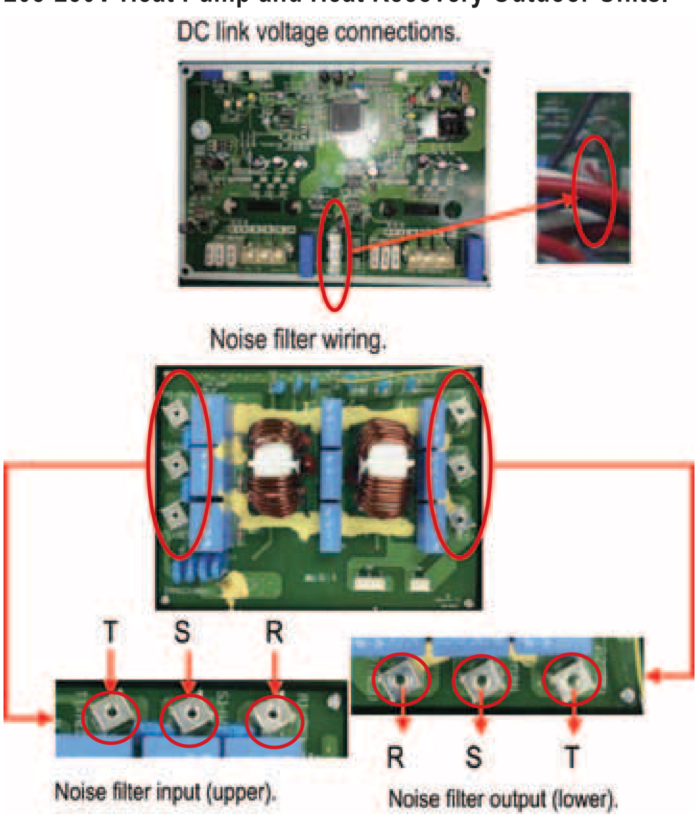
Is the input voltage correct?
- No → Check if voltage between R-S/S-T/T-R is 220V ± 10% (for 208/230V units) or 460V ± 10% (for 460V units).
  →Rewire if problems are found.
- Yes ↓

Is the DC link power correct?
- No → Check the DC link wiring connections.
  →Rewire if problems are found.
- Yes ↓

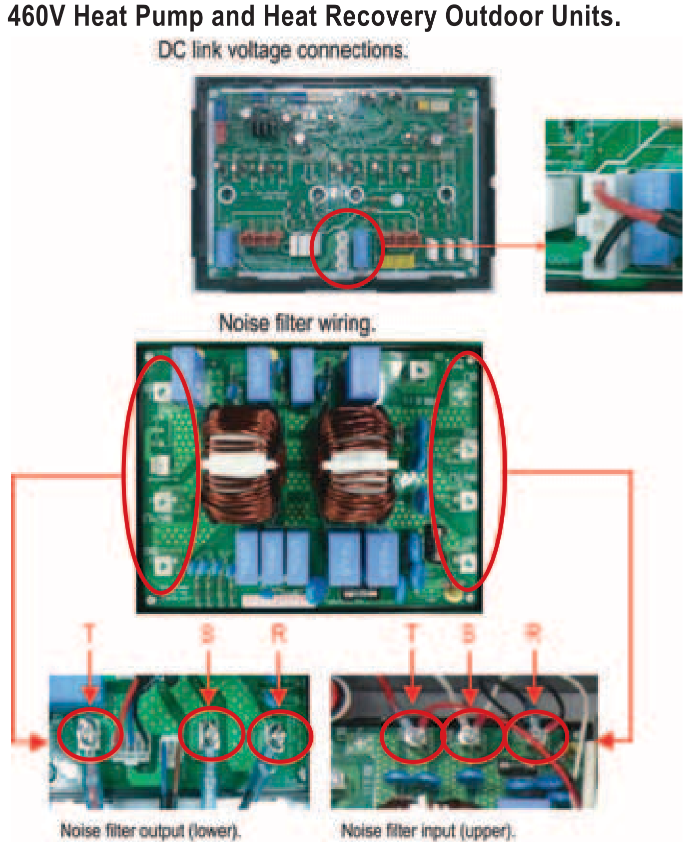
Is the fan PCB normal?
- No → Replace the fan PCB.
- Yes ↓

Recheck power and installation.

208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.



Error No. 77

Error No.	Description	Details	Causes
77 Master: 771 Slave 1: 772 Slave 2: 773	Fan overcurrent error.	Output current is >10A for 40 milliseconds (208-230V units) or >5A for 40 milliseconds (460V units).	1. Overload operation. 2. Fan motor is defective. 3. Fan PCB assembly is defective. 4. Fan motor connection is defective. 5. Condenser has iced up or is blocked.

Is the installation correct?
- No → Check the outdoor unit fan motor assembly for correct installation and / or if it is locking up. →Rewire if problems are found.
- Yes ↓

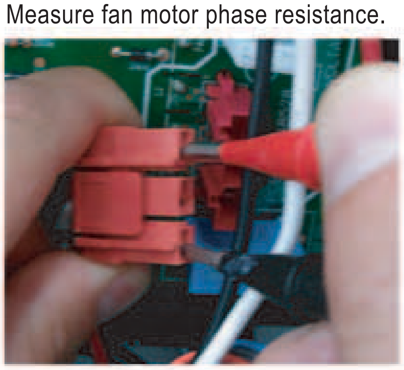
Are the insulation resistance and the resistance between each phase of the motor output terminal normal?
- No → Check resistance between each motor output terminal: LG motor=2.85Ω ± 5% (77°F) (208-230V units); LG motor=8.6Ω ± 7% (77°F) and Panasonic=8.8Ω ± 5% (77°F) (460V units). Check insulation resistance between outdoor unit fan motor terminals (U, V, W) and pipes (>100M). →Replace fan motor if problems are found.
- Yes ↓

Are the motor wire connections correct?
- No → Check if the motor output terminal (U, V, W) connections are connected to the right PCB terminals. Check wiring; check for any disconnections. →Reassemble or replace if problems are found.
- Yes ↓

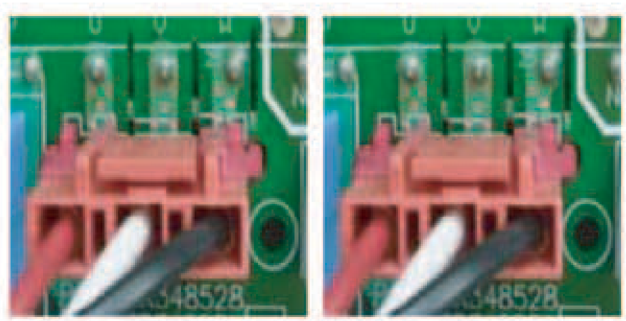
Is the fan PCB assembly correct?
- No → Check if fan PCB assembly IPM is normal. →Replace if problems are found.
- Yes ↓

Recheck power and installation.

Measure fan motor phase resistance.



Fan motor wire connections.



Error No.	Description	Details	Causes
79 Master: 791 Slave 1: 792 Slave 2: 793	Fan operation failure error.	Fan operation failure error.	1. Fan motor is defective. 2. Fan motor assembly installation is not correct. 3. Fan motor connector is not installed correctly (hall sensor, U, V, W output). 4. Fan PCB is defective.

Is fan motor assembly correct?
- No → Check the outdoor unit fan motor assembly for correct installation and / or if it is locking up. →Rewire if problems are found.
- Yes ↓

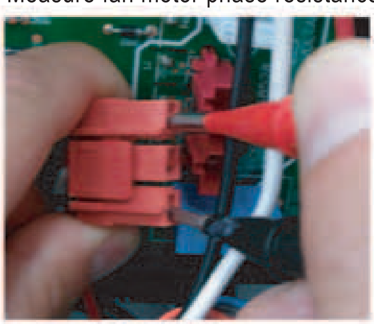
Are the insulation resistance and the resistance between each phase of the motor output terminal normal?
- No → Check resistance between each motor output terminal: LG motor=2.85Ω ± 5% (77°F) (208-230V units); LG motor=8.6Ω ± 7% (77°F) and Panasonic=8.8Ω ± 5% (77°F) (460V units). Check insulation resistance between outdoor unit fan motor terminals (U, V, W) and pipes (>100M). →Replace fan motor if problems are found.
- Yes ↓

Are the fan motor connections correct?
- No → Check if the motor output terminal (U, V, W) connections are connected to the right PCB terminals. Check wiring; check for any disconnections. →Reassemble or replace if problems are found.
- Yes ↓

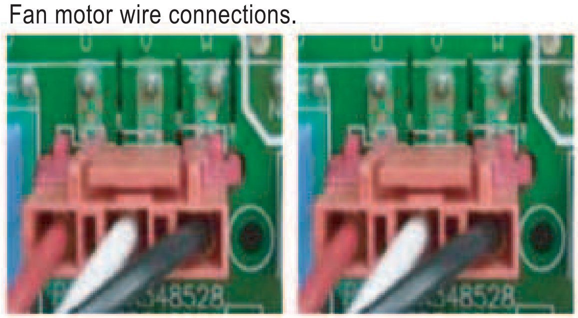
Is the fan PCB assembly correct?
- No → Check if fan PCB assembly IPM is normal. →Replace if problems are found.
- Yes ↓

Recheck power and installation.

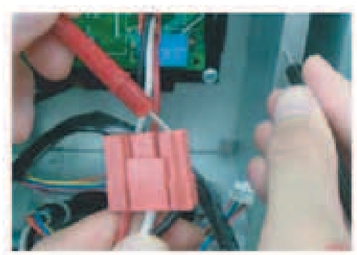
Measure fan motor phase resistance.



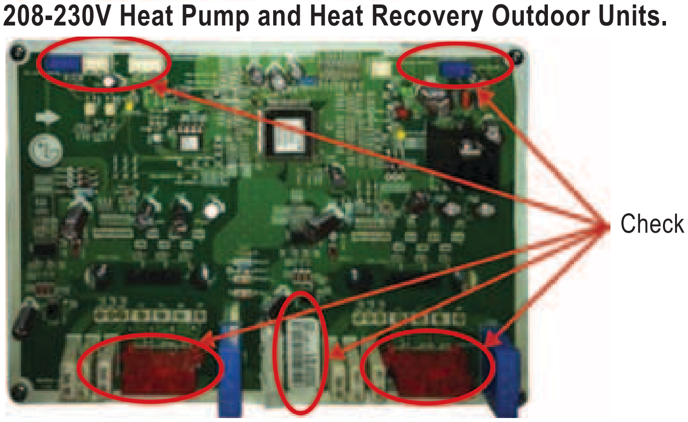
Fan motor wire connections.



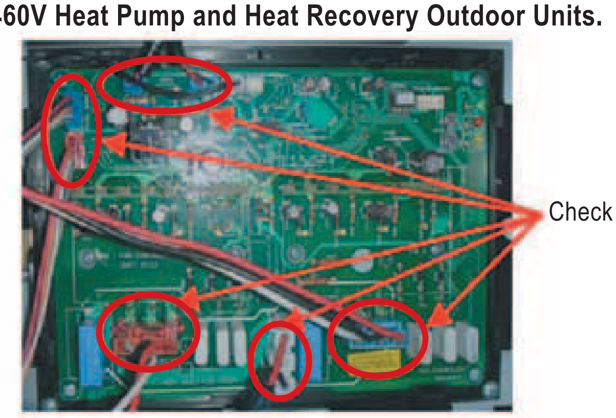
Measure insulation resistance between fan terminal and frame.



208-230V Heat Pump and Heat Recovery Outdoor Units.



460V Heat Pump and Heat Recovery Outdoor Units.



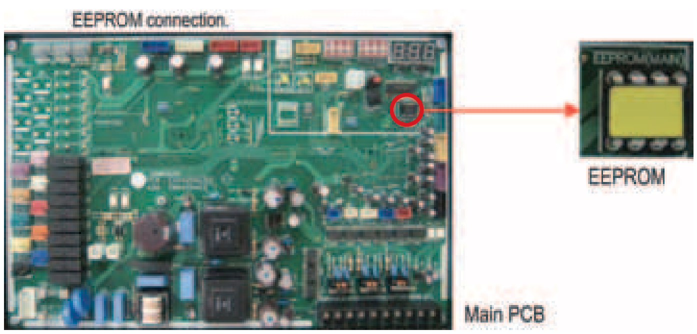
SERVICE TROUBLESHOOTING

Error No. 86

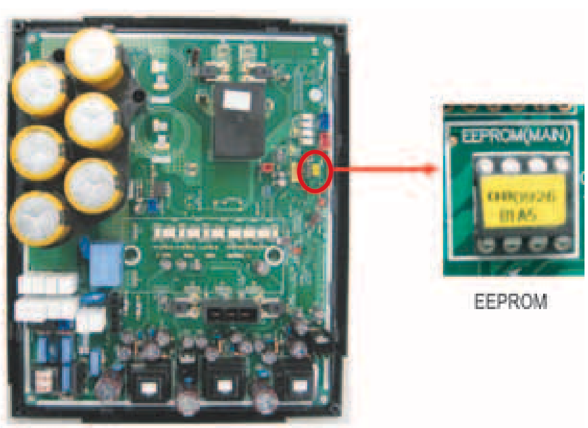
Error No.	Description	Details	Causes
86 Master: 861 Slave 1: 862 Slave 2: 863	Outdoor unit main PCB EEPROM error.	EEPROM access error.	1. No EEPROM. 2. EEPROM is not connected properly.

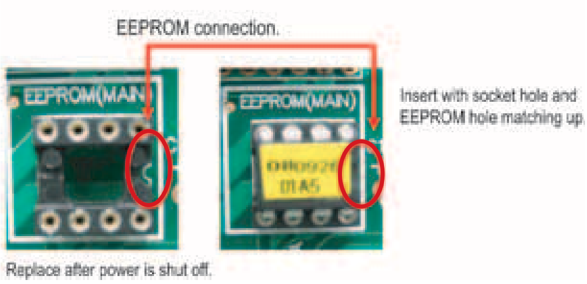
Is the EEPROM assembly connection correct?
- No → Reset after checking EEPROM connection.
- Yes → Is the EEPROM 24C16?
  - No → Replace EEPROM with 24C16.
  - Yes → Recheck power and installation.

208-230V ARUN Series Heat Pump Outdoor Units.

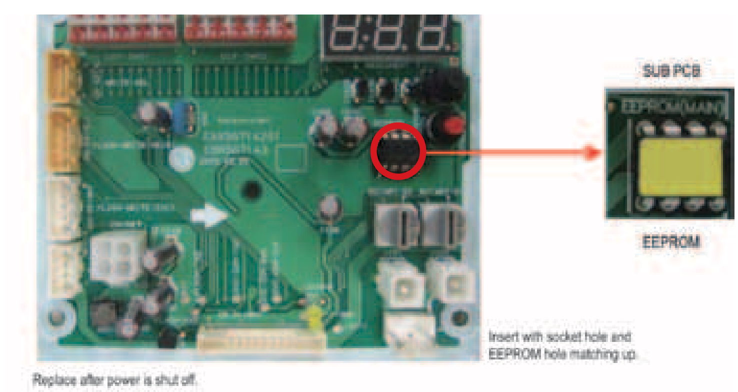


460V ARUN Series Heat Pump Outdoor Units.





208-230V and 460V ARUB Series Heat Recovery Outdoor Units.



SERVICE TROUBLESHOOTING

Error No. 87

Error No.	Description	Details	Causes
87 Master: 871 Slave 1: 872 Slave 2: 873	Outdoor unit fan PCB EEPROM error.	• Error is found after powering the system and when verifying the EEPROM "Check Sum." • Communication error between outdoor unit fan MICOM and EEPROM. • EEPROM is missing.	1. EEPROM is not inserted correctly or has a bad connection. 2. Different EEPROM version. 3. Outdoor unit fan PCB assembly was damaged after system was powered up.

Is the EEPROM connected properly?

No → Check EEPROM connection and "Check Sum." → Replace EEPROM if problems are found.

Yes ↓

Is the fan PCB assembly normal?

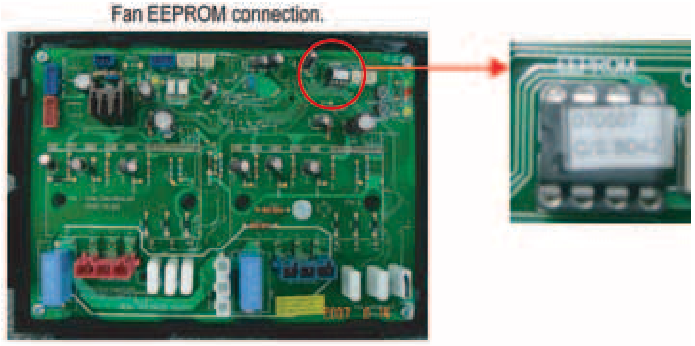
No → Replace the fan PCB assembly.

Yes ↓

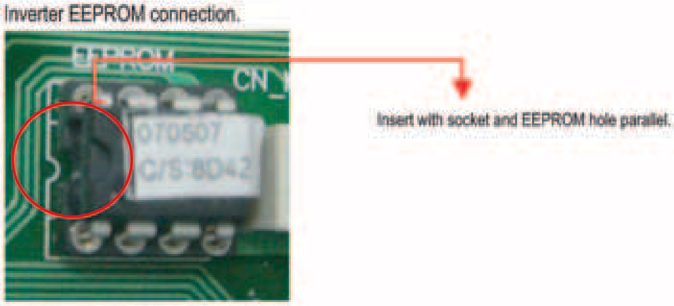
Recheck power and installation.

208-230V and 460V ARUN Series Heat Pump Outdoor Units.

Fan EEPROM connection.



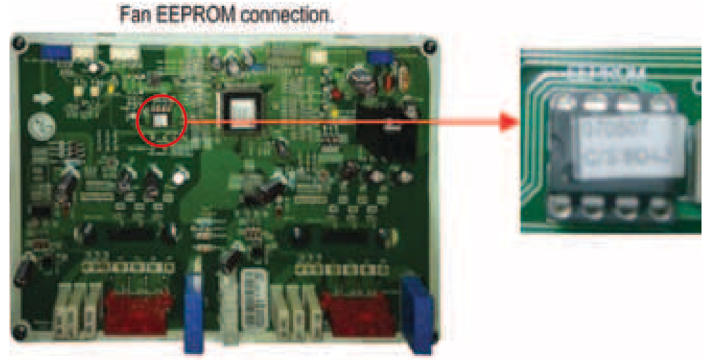
Inverter EEPROM connection.



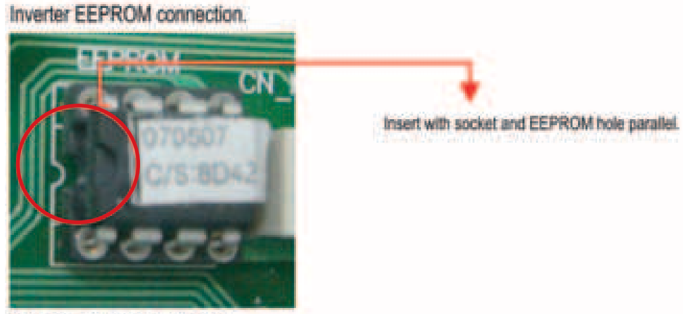
Replace after power is turned off.

208-230V and 460V ARUB Series Heat Recovery Outdoor Units.

Fan EEPROM connection.



Inverter EEPROM connection.

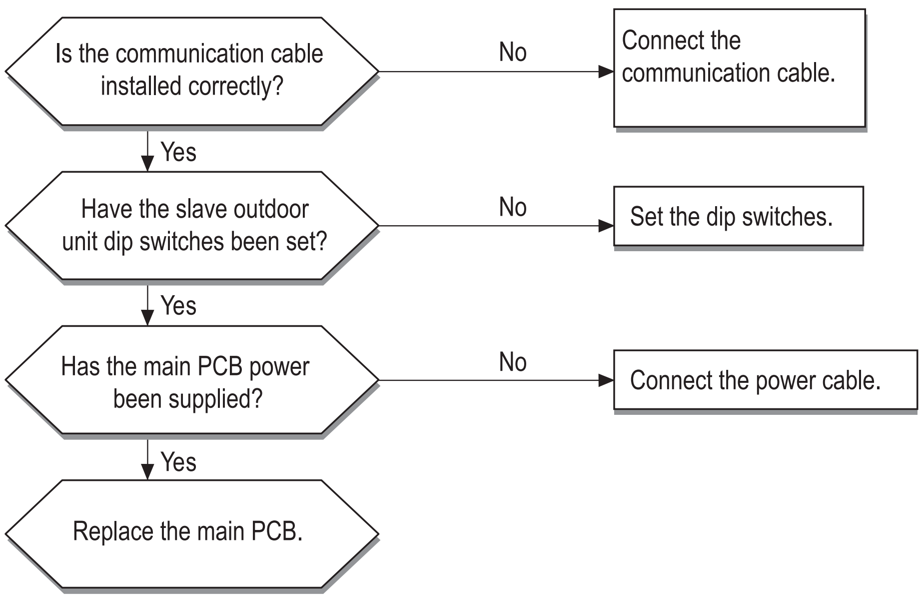


Replace after power is turned off.

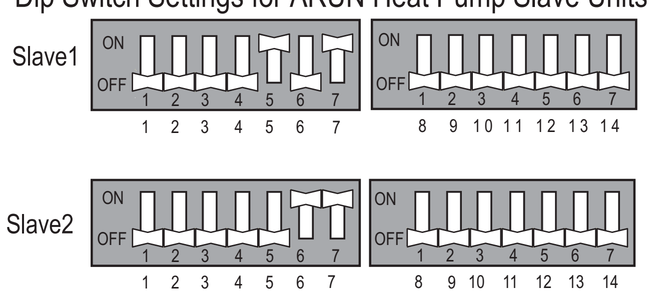
SERVICE TROUBLESHOOTING

Error No. 104

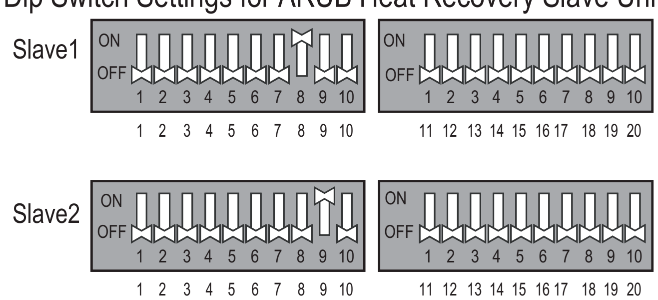
Error No.	Description	Details	Causes
104 Master: 11 → 041 Slave 1: 12 → 042 Slave 2: 13 → 043	Communication error between outdoor units.	Master unit displays outdoor unit number that has not been transmitted; slave unit displays its own error number.	1. Power cable/transmission cable connections have disconnected or short circuited. 2. PCBs of each outdoor unit are defective.



Dip Switch Settings for ARUN Heat Pump Slave Units

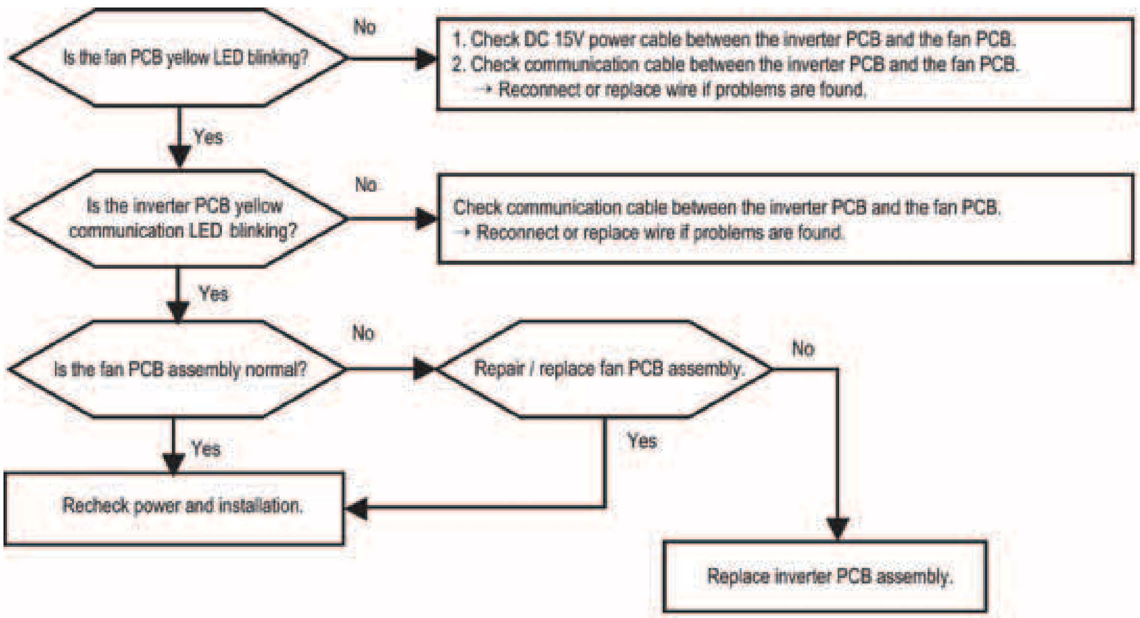


Dip Switch Settings for ARUB Heat Recovery Slave Units

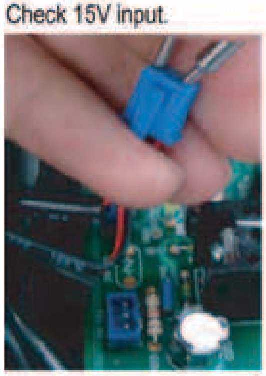


Error No. 105

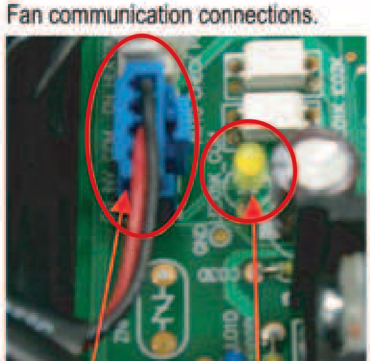
Error No.	Description	Details	Causes
105 Master: 11 → 051 Slave 1: 12 → 052 Slave 2: 13 → 053	Communication error between fan PCB and inverter PCB.	• Fan PCB controller did not receive signal from inverter PCB controller. • Master unit displays outdoor unit number that has not been transmitted; slave unit displays its own error number.	1. Connection between the inverter PCB and the fan PCB is not correct. 2. Power has not been supplied to the fan PCB. 3. Outdoor unit inverter PCB and / or fan PCB is / are defective.



Check 15V input.

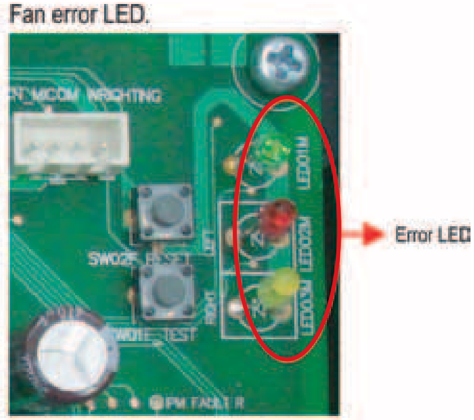


Fan communication connections.



Communication connection. Communication LED.

Fan error LED.

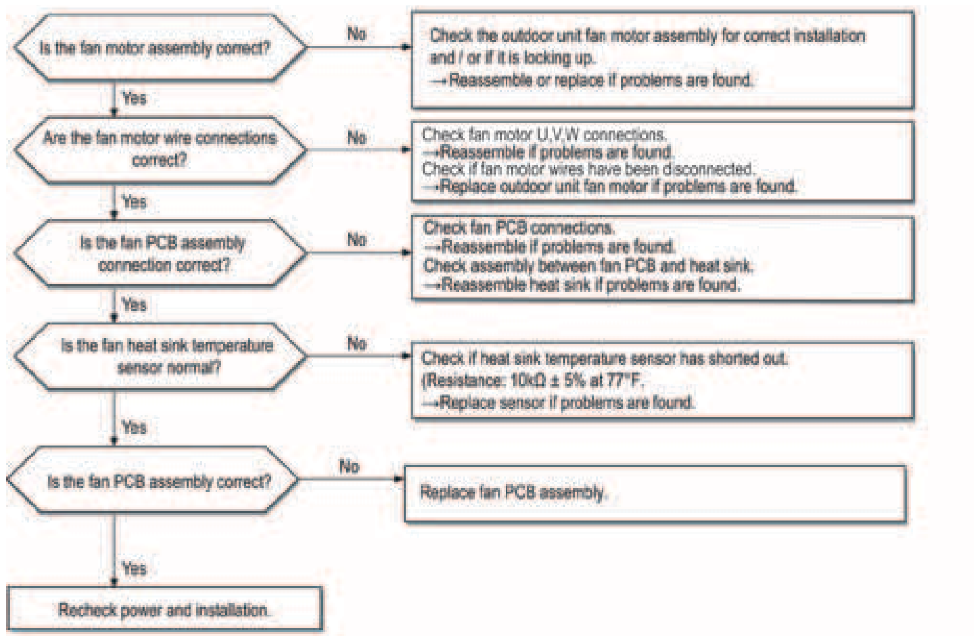


Check if the fan PCB assembly error LED is blinking. (Check for Error 108.)

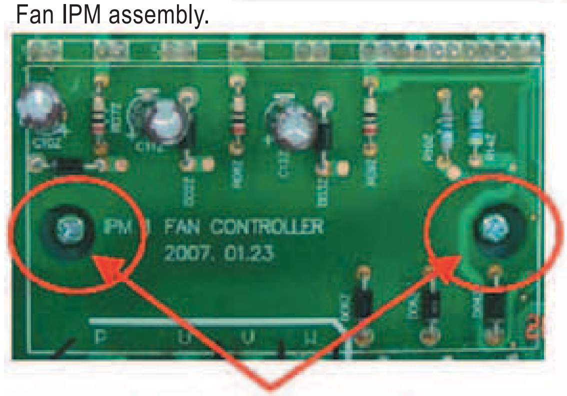
SERVICE TROUBLESHOOTING

Error No. 106

Error No.	Description	Details	Causes
106 Master: 11 → 061 Slave 1: 12 → 062 Slave 2: 13 → 063	Outdoor unit fan PCB IPM error.	IPM protection circuit has been activated due to overcurrent / overheating conditions.	1. Overload operation: pipes are clogged, EEV is defective, refrigerant has been overcharged. 2. Outdoor unit fan motor assembly is not correct: coils are disconnected, shorted out, insulation has been damaged. 3. Fan PCB heat sink assembly is not correct. 4. Fan PCB assembly is defective.

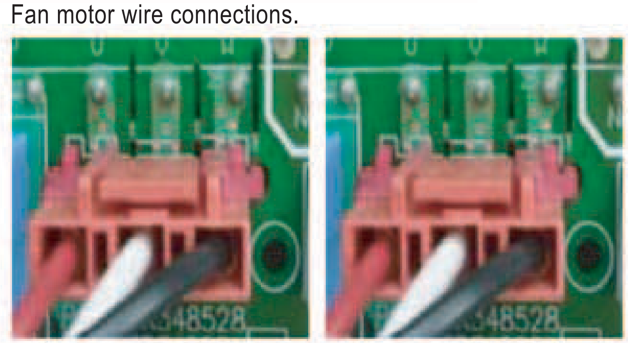


Fan IPM assembly.

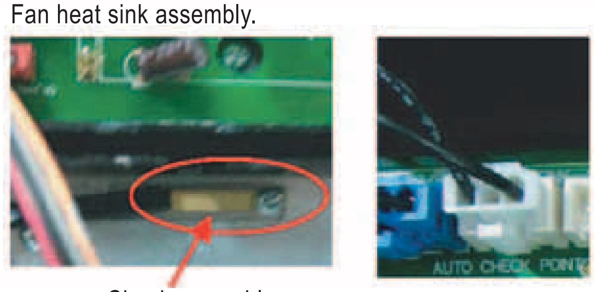


Check assembly.

Fan motor wire connections.



Fan heat sink assembly.



Check assembly.

Error No.	Description	Details	Causes
107 Master: 11 → 071 Slave 1: 12 → 072 Slave 2: 13 → 073	Fan PCB DC link low voltage error.	Supplied fan PCB DC link voltage is <140V (for 208-230V units) or <380V (for 460V units).	1. Wiring between the inverter PCB and the fan PCB is wrong. 2. Fan PCB assembly is defective. 3. Reactor terminal contact is defective. 4. DC link terminal wiring or connection is defective. 5. Bridge diode is defective.

Is the wiring between the fan motor and the PCB correct?

- No → 1. Check the DC link wire connections. 2. Check the DC link. → Replace wire if problems are found.
- Yes ↓

Is the DC link voltage normal?

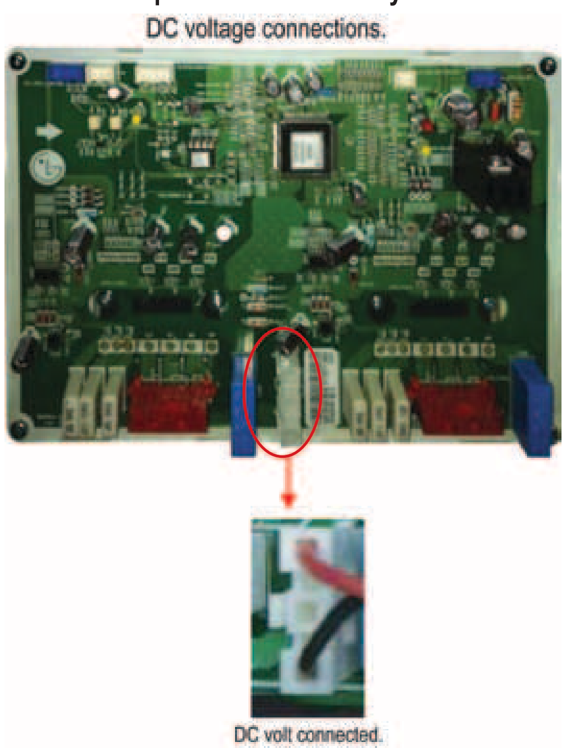
- No → Measure the DC link voltage. → Check inverter PCB if voltage is <140V (for 208/230V units) or <380V (for 460V).
- Yes ↓

Is the fan PCB assembly normal?

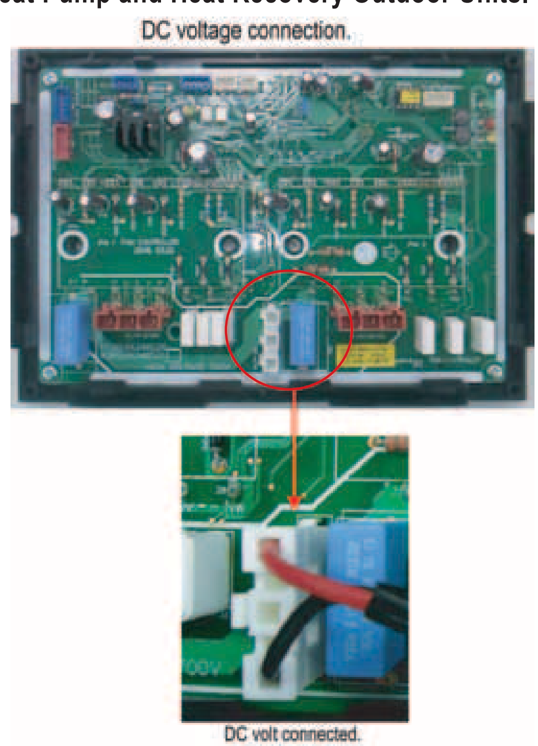
- No → Replace the fan PCB assembly.
- Yes ↓

Recheck power and installation.

208-230V Heat Pump and Heat Recovery Outdoor Units.



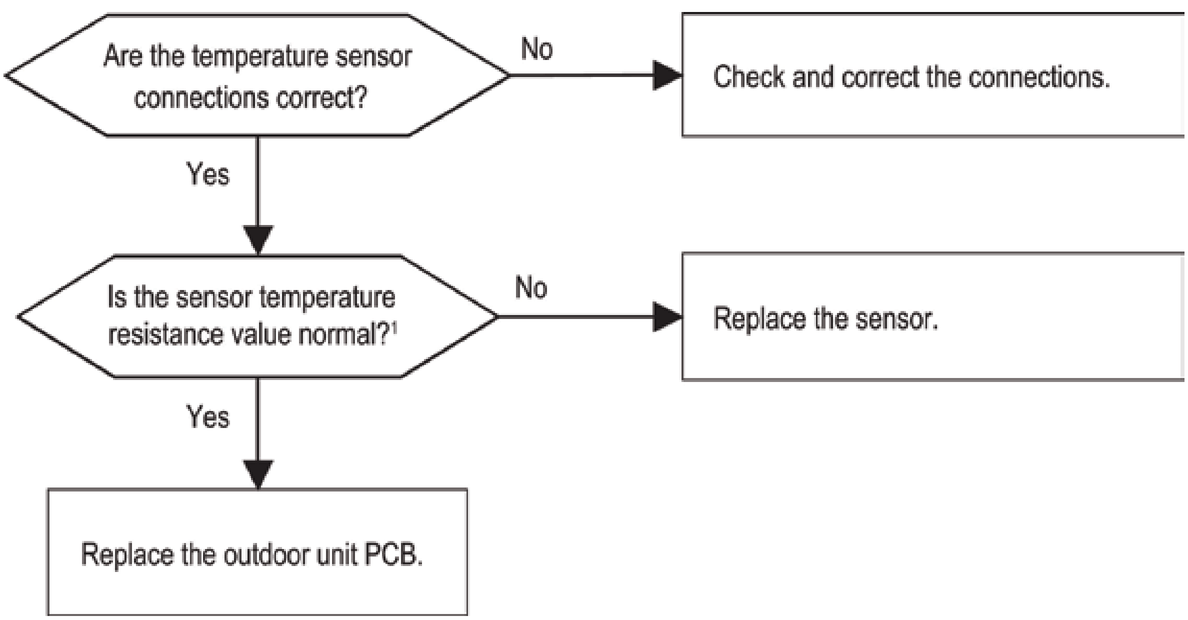
460V Heat Pump and Heat Recovery Outdoor Units.



SERVICE TROUBLESHOOTING

Error Nos. 113 and 115

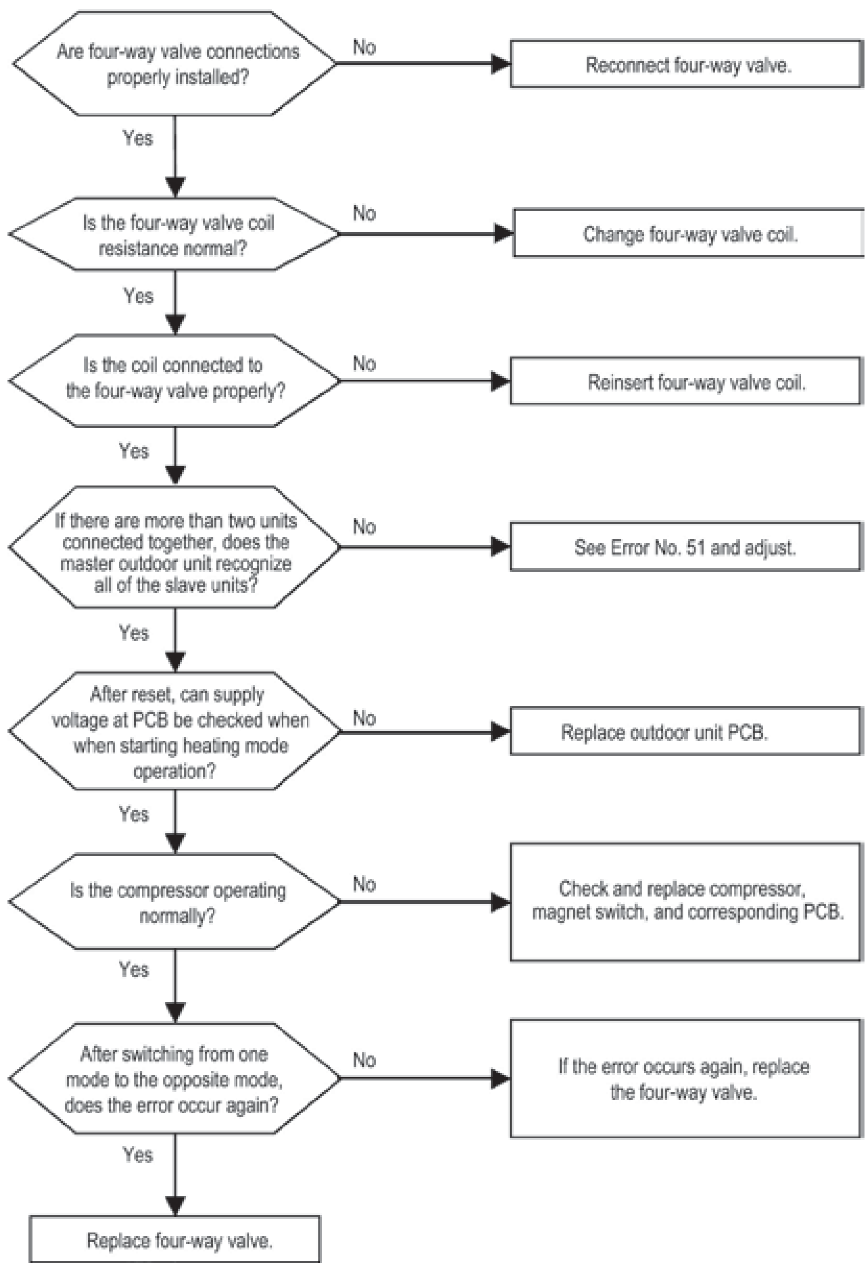
Error No.	Description	Details	Causes
113 Master: 11 → 131 Slave 1: 12 → 132 Slave 2: 13 → 133	Outdoor unit liquid pipe (condenser) temperature sensor error.	• Disconnection or short circuit of outdoor unit liquid pipe (condenser) temperature sensor. • Sensor resistance value is not normal.	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or short circuited. 3. Temperature sensor is defective. 4. Outdoor unit PCB is defective.
115 Master 11 → 151 Slave 1: 12 → 152 Slave 2: 13 → 153	Outdoor unit subcooling outlet temperature sensor error.	• Disconnection or short circuit of outdoor unit subcooling outlet temperature sensor. • Sensor resistance value is not normal.	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or short circuited. 3. Temperature sensor is defective. 4. Outdoor unit PCB is defective.



[1] *Error is generated when the resistance value is >100kΩ (open) or <100Ω (short).*

Standard values of sensor resistance occur at different temperatures (±5% variation).
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.

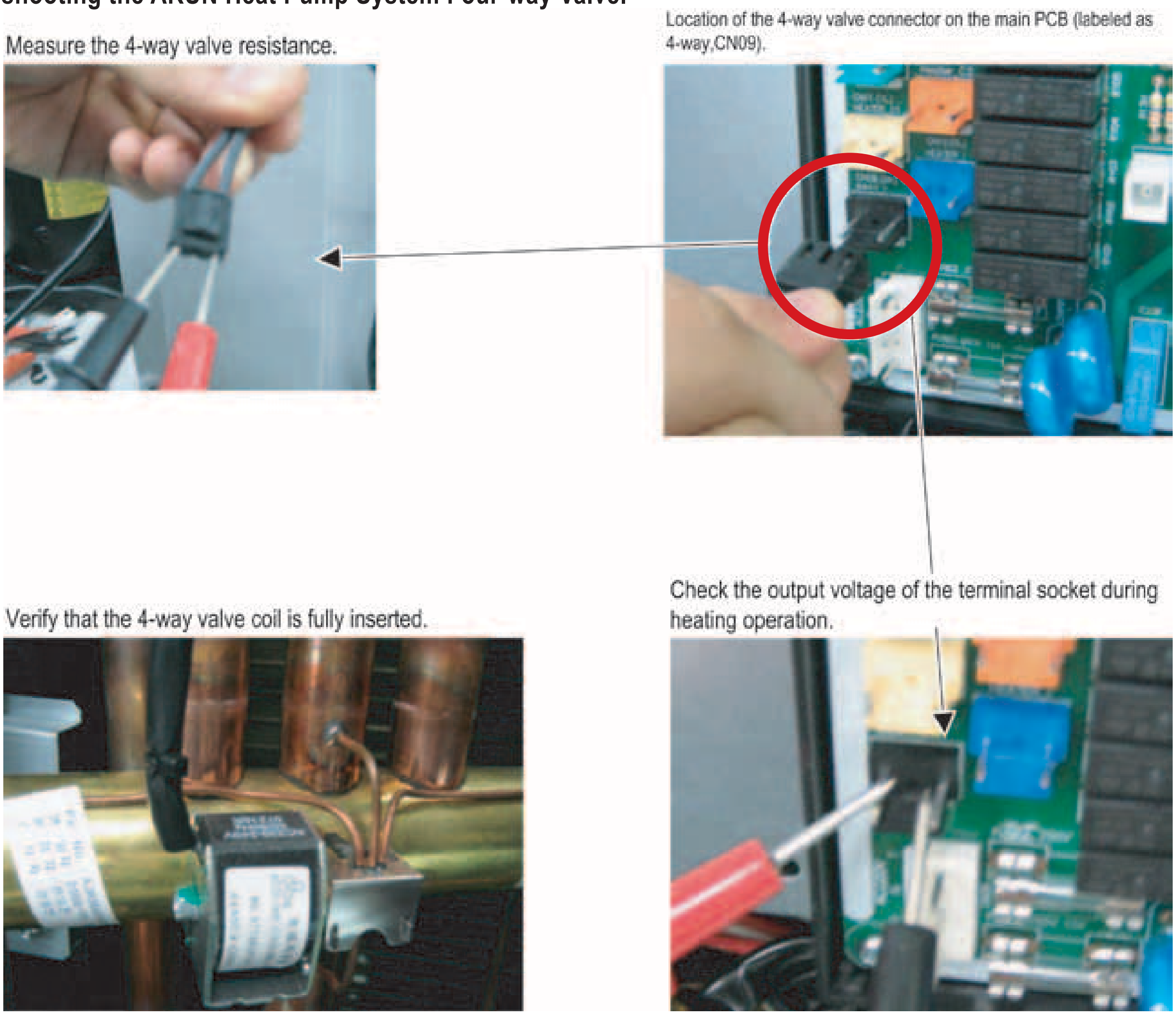
Error No.	Description	Details	Causes
151 Master: 11 → 511 Slave 1: 12 → 512 Slave 2: 13 → 513	Outdoor unit four-way reversing valve error.	Function error in the master or slave outdoor unit four-way reversing valve(s).	1. Problem with four-way valve operation because of sludge, inflow, etc. 2. No pressure difference because of compressor error. 3. Installation of inside / outside common pipe is wrong. 4. Four-way valve is defective.



SERVICE TROUBLESHOOTING

Error No. 151, continued.

Troubleshooting the ARUN Heat Pump System Four-way Valve.



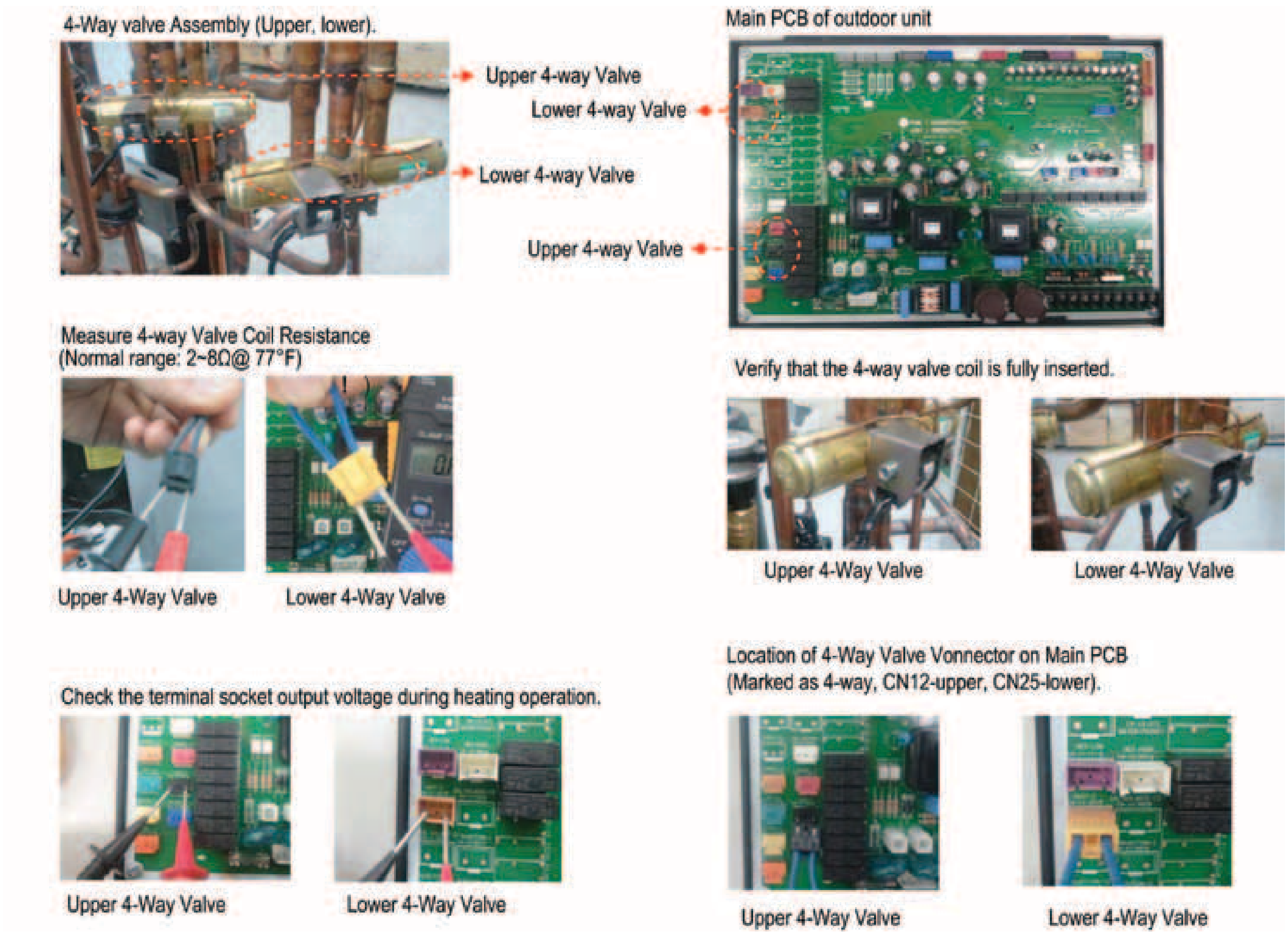
Power is supplied in the order below:
Slave 2 → Slave 1 → Master.
Outdoor unit information is displayed one after the other at the main PCB LED.

1. Model identification → 6-ton: 62, 8-ton: 63, 10-ton: 64, 12-ton: 65.
2. Total Capacity → Displayed with unit.
3. Outdoor unit type → Heat pump: 2.
4. Normal mode: 25.
5. Refrigerant → R410A: 41.

To check a four-way valve when there are three outdoor units in a system: (Master + Slave1 + Slave2)

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, Slave1, Slave2).
4. If there is a unit where the difference does not increase, then the four-way valve of that unit is defective.

Troubleshooting the ARUB Heat Recovery System Four-way Valve.



Power is supplied in the order below:

Slave 2 → Slave 1 → Master.

Outdoor unit information is displayed one after the other at the main PCB LED.

1. Model identification → 6-ton: 190, 8-ton: 191, 10-ton: 192, 12-ton: 193.
2. Total Capacity → Displayed with unit.
3. Outdoor unit type → Heat recovery: 4.
4. Normal mode: 25.
5. Refrigerant → R410A: 41.

Error No. 151, continued.

Troubleshooting the ARUB Heat Recovery System Four-way Valve, continued.

To check a four-way valve when there are three outdoor units in a system: (Master + Slave 1 + Slave 2)

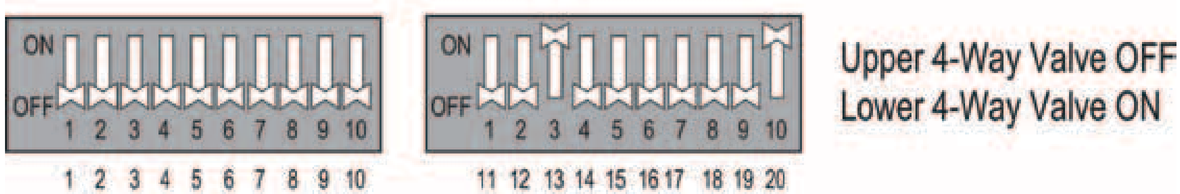
1. Close all of the high-pressure vapor pipe service valves.
2. Operate the system.
3. Check the difference between the high and low pressures with LGMV for each unit (Master, Slave 1, Slave 2).
4. If there is a unit where the difference does not increase, then the four-way valve of that unit is defective.

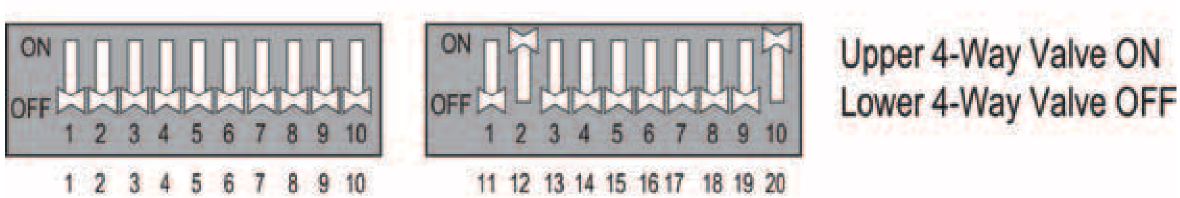
To check a four-way valve when there is only one outdoor unit in a system (manual procedure):

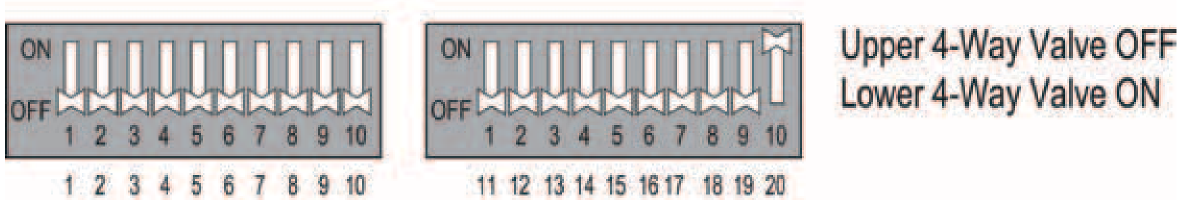
1. Turn dip switches 12, 13, 20 to ON (upper and lower four-way valves ON).
2. Turn dip switches 13, 20 to ON (lower four-way valve ON).
3. Turn dip switches 12, 20 to ON (upper four-way valve ON).
4. Turn dip dip switch 20 to ON (upper and lower four-way valve OFF).
5. Perform procedure above one or two times until the defective four-way valve(s) is (are) found.
6. Turn off all dip switches after steps are finished.

⚠ ***Note:***

Perform manual procedure under 290 psi.



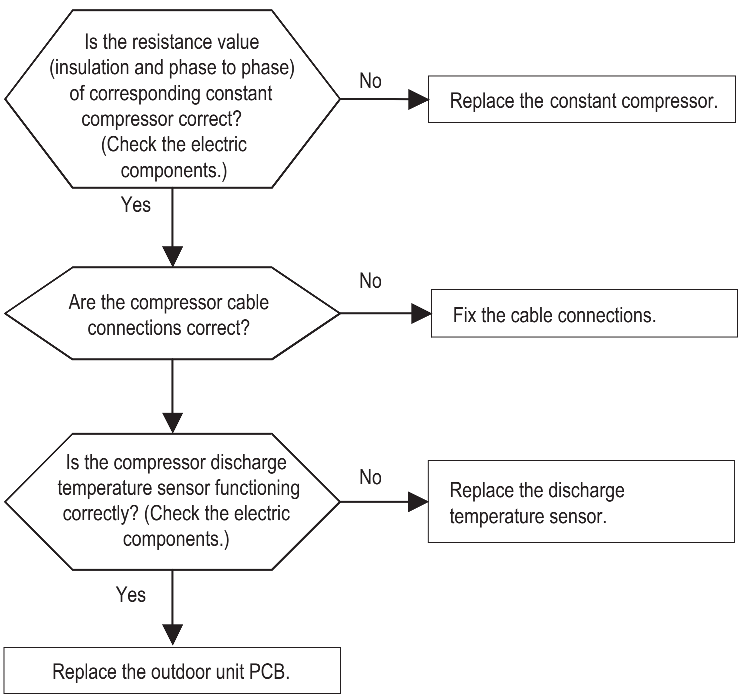




SERVICE TROUBLESHOOTING

Error Nos. 173 and 174

Error No.	Description	Details	Causes
173 Master: 11 → 731 Slave 1: 12 → 732 Slave 2: 13 → 733	Overcurrent in outdoor unit constant speed1 compressor.	• Error in constant speed1 compressor. • Error in constant speed1 compressor drive.	1. Constant speed1 compressor has been damaged. 2. Overcurrent in constant speed1 compressor input. 3. Discharge temperature sensor is defective.
174 Master 11 → 741 Slave 1: 12 → 742 Slave 2: 13 → 743	Overcurrent in outdoor unit constant speed2 compressor.	• Error in constant speed2 compressor. • Error in constant speed2 compressor drive.	1. Constant speed2 compressor has been damaged. 2. Overcurrent in constant speed2 compressor input. 3. Discharge temperature sensor is defective.



208-230V Heat Pump and Heat Recovery Outdoor Units.

Cable connections between constant compressor and magnetic switch.

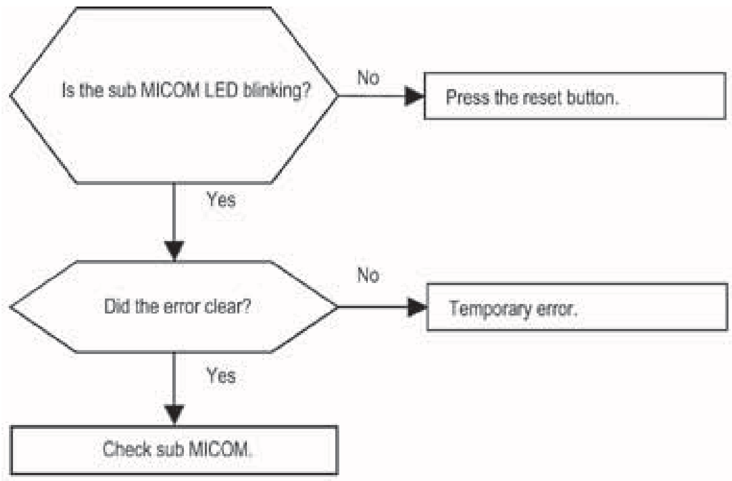
460V Heat Pump and Heat Recovery Outdoor Units.

Cables connections between constant compressor and magnetic switch.

SERVICE TROUBLESHOOTING

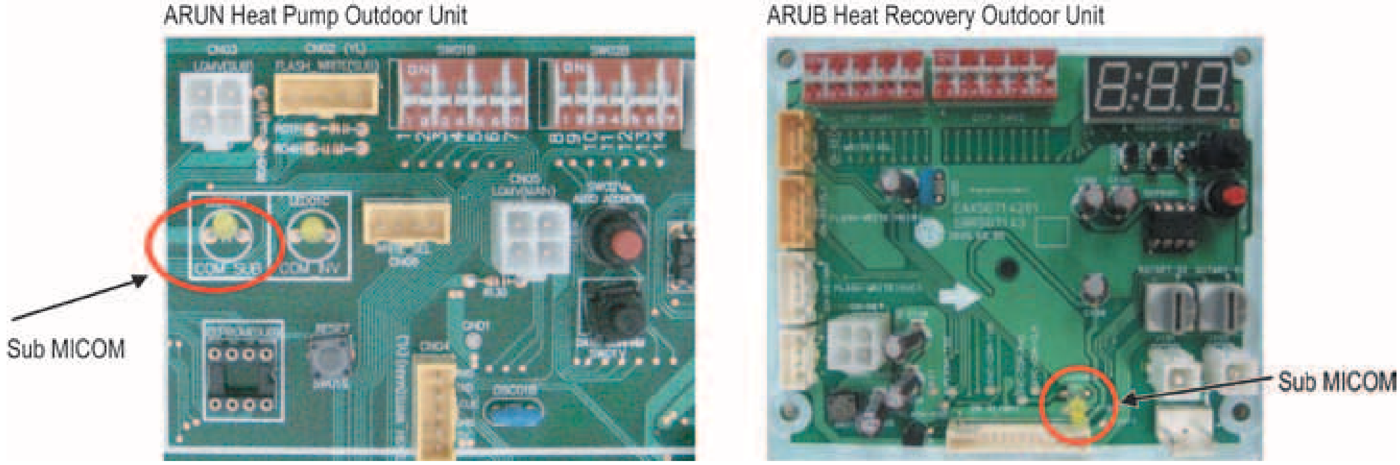
Error No. 182

Error No.	Description	Details	Causes
182 Master: 11 → 821 Slave 1: 12 → 822 Slave 2: 13 → 823	Communication error between main-sub MICOM of outdoor unit main PCB.	Failure in receiving signal between main-sub MICOM of outdoor unit main PCB.	Failure in receiving signal between main-sub MICOM of outdoor unit main PCB.



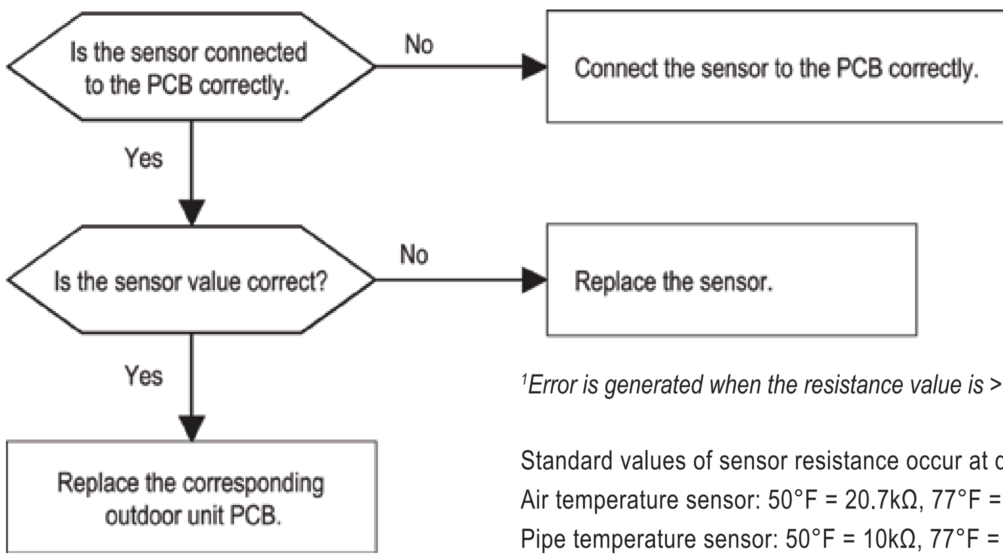
ARUN Heat Pump Outdoor Unit

ARUB Heat Recovery Outdoor Unit



Error Nos. 184 and 185 (For ARUB Heat Recovery Systems only)

Error No.	Description	Details	Causes
184 Master: 11 → 841 Slave 1: 12 → 842 Slave 2: 13 → 843	Oil equalizing pipe temperature sensor error.	Oil equalizing pipe temperature sensor has disconnected or has shorted out.	1. Air temperature sensor connection is defective. 2. Oil temperature sensor has disconnected or has shorted out. 3. Outdoor unit PCB is defective.
185 Master 11 → 851 Slave 1: 12 → 852 Slave 2: 13 → 853			

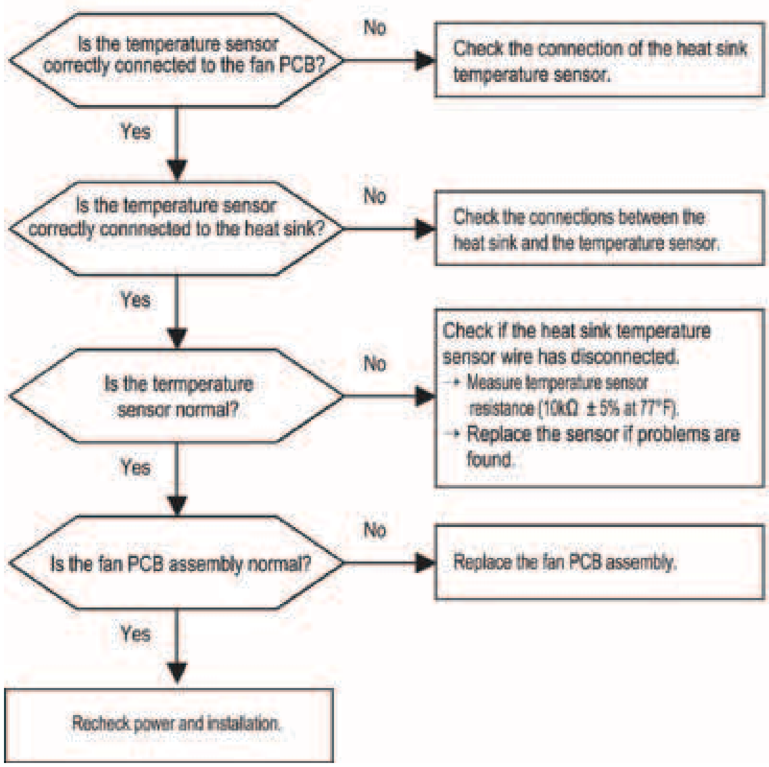


[1]Error is generated when the resistance value is >100kΩ (open) or <100Ω (short).

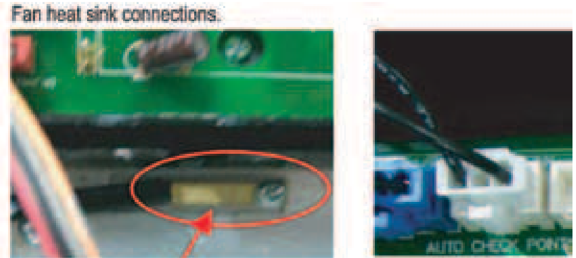
Standard values of sensor resistance occur at different temperatures (±5% variation).
Air temperature sensor: 50°F = 20.7kΩ, 77°F = 10kΩ, 122°F = 3.4kΩ.
Pipe temperature sensor: 50°F = 10kΩ, 77°F = 5kΩ, 122°F = 1.8kΩ.

Error Nos. 193 and 194

Error No.	Description	Details	Causes
193 Master: 11 → 931 Slave 1: 12 → 932 Slave 2: 13 → 933	Excessive increase in fan PCB heat sink temperature.	Heat sink temperature is >203°F.	1. Heat sink temperature sensor is defective. 2. Fan PCB assembly is defective.
194 Master 11 → 941 Slave 1: 12 → 942 Slave 2: 13 → 943	Fan PCB heat sink temperature sensor error.	Heat sink temperature sensor error.	1. Heat sink temperature sensor has disconnected or has shorted out. 2. Temperature sensor connection is not correct. 3. Fan PCB assembly is defective.

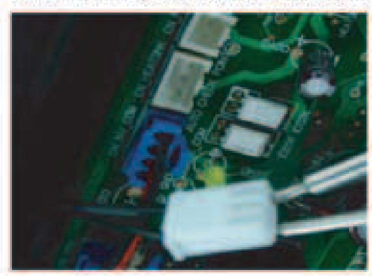


Fan heat sink connections.



Check connections.

Check if the temperature sensor has disconnected.



Error No. 2001 (ARUB Heat Recovery Systems only)

Error No.	Description	Details	Causes
2001 Master: 21 → 001	Pipe detection error.	The auto addressing procedure has completed, but the number of indoor units detected is different from the number of communicating indoor units.	1. Heat recovery unit power cable or communications cable is defective. 2. After auto addressing, the indoor unit is not addressed correctly. 3. Indoor unit power or communication cable is defective. 4. Indoor unit PCB is defective. 5. Heat recovery unit rotary or dip switches are not set properly. 6. Heat recovery unit PCB is defective.

Troubleshooting the Heat Recovery Unit Pipe Detection Error

1. Check if the green transmission LED on the heat recovery unit PCB is blinking. When it begins to blink consistently, then:
   - Check if the heat recovery unit input power is 220V±10%.
   - After the power to the outdoor unit is reset, wait at least thirty (30) minutes for pipe temperatures to cool down, then perform the auto addressing procedure.
   - While the heat recovery unit power is on, check the display for the total number of connected indoor units (see CH05).
2. Check the rotary and dip switch settings, and reset the power to the outdoor and heat recovery units. Wait at least thirty (30) minutes for pipe temperatures to cool down, then perform the pipe detection procedure.
3. If the number of indoor units differs between actual installed and what the auto addressing procedure detected, check if pipe installation is correct.
   Outdoor unit → Heat recovery unit → Indoor unit.
4. If heat recovery unit valve number 1 does not have an indoor unit connected to it, then pipe addressing must be performed manually.

How to Check the Outdoor Unit Main PCB Display

“88”: Indoor quantity detected through the auto addressing procedure.

“88”: Indoor quantity detected through the pipe detection procedure.

SERVICE TROUBLESHOOTING

Error Nos. 201, 202 and 203 (For ARUB Heat Recovery Systems only)

Error No.	Description	Details	Causes
201 C + Number of Heat Recovery Unit	Heat recovery unit liquid pipe temperature sensor error.	• Disconnection or short circuit of heat recovery unit liquid pipe temperature sensor. • Sensor resistance value is not normal.	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or has shorted out. 3. Outdoor unit PCB is defective.
202 C + Number of Heat Recovery Unit	Heat recovery unit sub-cooling inlet pipe temperature sensor error.	• Disconnection or short circuit of heat recovery unit sub-cooling inlet pipe temperature sensor. • Sensor resistance value is not normal.	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or has shorted out. 3. Outdoor unit PCB is defective.
203 C + Number of Heat Recovery Unit	Heat recovery unit sub-cooling discharge pipe temperature sensor error.	• Disconnection or short circuit of heat recovery unit sub-cooling discharge pipe temperature sensor. • Sensor resistance value is not normal.	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or has shorted out. 3. Outdoor unit PCB is defective.

Troubleshooting the Heat Recovery Unit Temperature Sensors.

1. Check temperature sensor and lead cable connections.
2. Check the value of the temperature sensor. If not normal, then replace the sensor. (Normal temperature sensor values: 50°F = 10kΩ, 77°F = 5kΩ, 122°F = 1.8kΩ.
3. If the sensor connection and value is correct, replace the outdoor unit PCB.

Heat Recovery Unit Error Numbers.

Heat Recovery Unit Number	HR #1	HR #2	HR #3	HR #4	HR #5	HR #6	HR #7	HR #8	HR #9	HR #10	HR #11	HR #12	HR #13	HR #14	HR #15	HR #16
Error Displayed	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16

Example of an Heat Recovery Unit Error Display.

#16 Heat recovery unit sub-cooling inlet pipe temperature sensor error 200 → C16 (Repeat).

C: Heat recovery unit.

#: Heat recovery unit number.

Error No. 204 (For ARUB Heat Recovery Systems only)

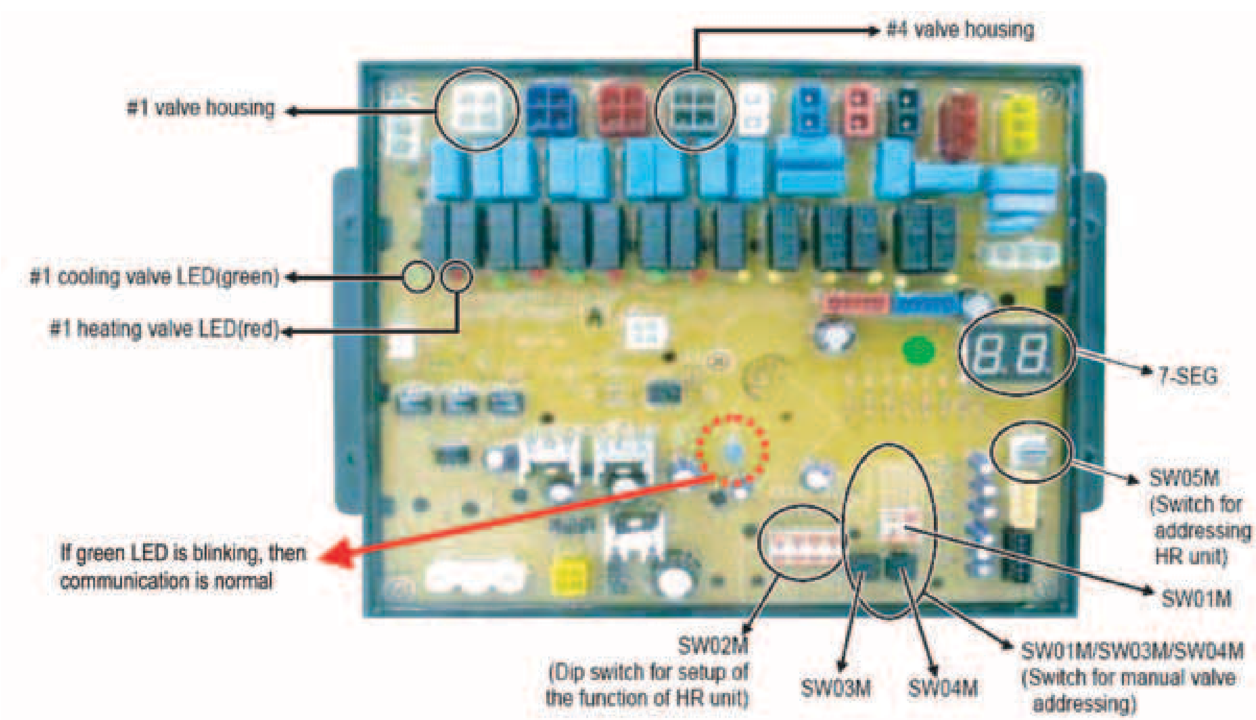
Error No.	Description	Details	Causes
204 C + Number of Heat Recovery Unit	Transmission error between the heat recovery unit and the outdoor unit.	Transmission error between the heat recovery unit and the outdoor unit.	1. Heat recovery unit power supply and / or communication cable connection(s) is / are defective. 2. Heat recovery unit rotary and / or dip switch(es) is / are not set correctly. 3. Heat recovery unit PCB is defective.

Troubleshooting the Heat Recovery Unit Transmission Error.

1. Check power and communication cable connections.
2. Check if the green transmission LED on the heat recovery unit PCB is blinking. If normal, then verify if the heat recovery rotary and dip switches are set correctly (see CH200).
3. Reset the power to the outdoor and heat recovery units. (If there is a heat recovery communication error, the code cannot be released until the outdoor unit power is reset.)
4. If the green communication LED is on but not blinking, check the communication condition of total indoor units (see CH05). Even if the communication condition is normal, replace the heat recovery unit PCB.

⚠CAUTION

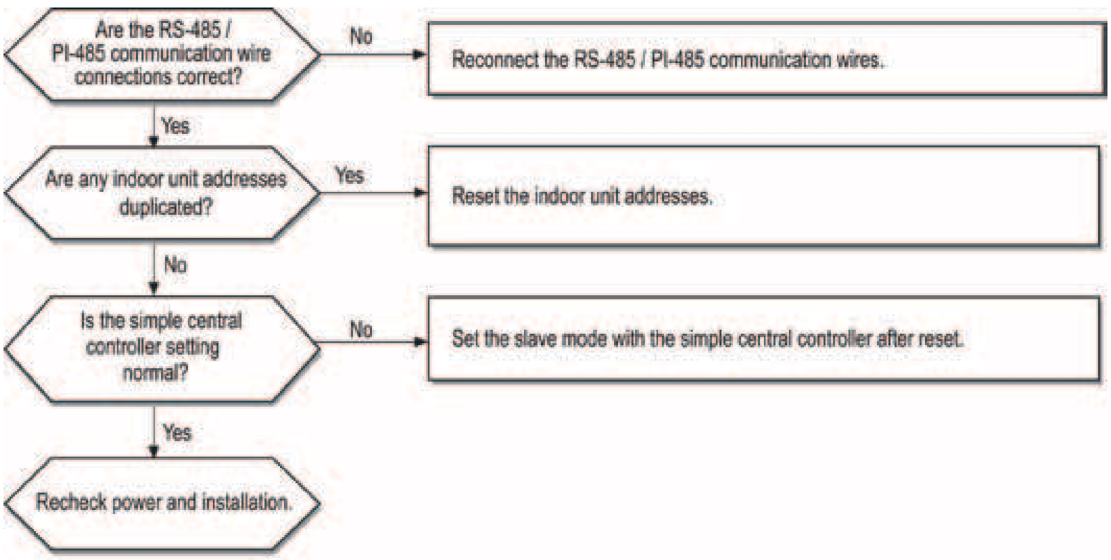
If the indoor and heat recovery unit communication cables are accidently switched with the 220V power cables, both the indoor units and the heat recovery unit communication cables will burn up.



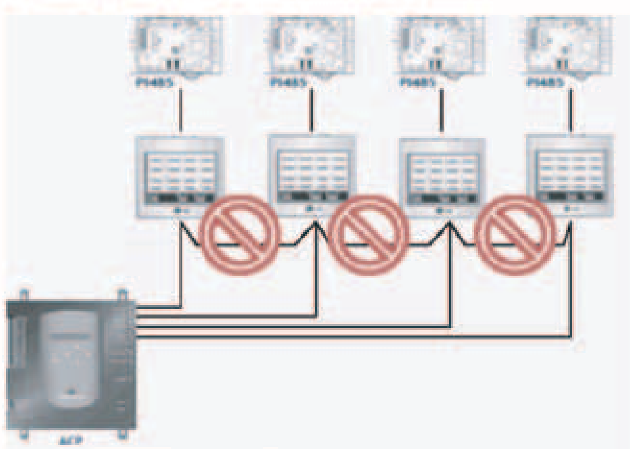
SERVICE TROUBLESHOOTING

Error No. 242

Error No.	Description	Details	Causes
242	Network error.	Network error of central controller.	1. RS-485 / PI-485 communication wires are defective. 2. Communication error between remote controller and indoor unit. 3. RS-485 / PI-485 dip switch setting error. 4. Indoor unit address setting error on the central controller.



Incorrect RS-485 / PI-485 Communication Wire Connection



MULTI V III

INSTALLATION CHECKLIST

Materials

Copper	Check
Description	
Over 5/8 inches—Rigid ACR only	
5/8 inches and under—Can use soft ACR	
15% silver brazing material only	
Minimum 1/2 inch-thick 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	Check
Description	
Power to outdoor unit(s) per electrical code requirements	
Power to indoor units and heat recovery units per electrical code requirements	
Control wire—Daisy chain starting from the outdoor unit minimum of 18/2 AWG stranded, shielded wire	
LG-supplied cable to connect wired remote controllers (thermostats) to indoor units	

Other	Check
Description	
Dry nitrogen for purging during brazing (1-3 psi while brazing)	
Condensate piping—PVC recommended	

Installation

Copper piping	Check
Description	
Do not install any piping until the actual lengths that are to be installed have been recalculated in LATS Multi V to verify the piping sizes and that unit capacity meets heat load requirements	
Keep all pipes capped; 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 a torque wrench and a 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. Recommended use of purchased linesets.	
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 are facing in 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 unit ports on all lines (recommended for serviceability)	
First Y-branch located more than three (3) feet from the outdoor unit(s)	
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 units	
Install equalizer line between multiple frames if needed on heat pump systems	
Power and control wiring (Do not apply power to the indoor units or heat recovery units unless instructed by the commissioning agent.)	
Unit to unit control wiring to be daisy chained (including heat recovery units)	
Communication type RS-485–BUS type	
Wire all shields together and ground only at outdoor unit(s)	
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

Other	**Check**
Description	
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	
Condensate drains complete and not trapped	
Packing material and literature removed from unit cabinets	
Duct work and ground wiring complete	

Pipe 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 that the main lines do not have leaks	
Second check with indoor unit (and heat recovery units if applicable) and the outdoor 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 outdoor unit system	
Check all units for power at disconnect (including heat recovery 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 frame outdoor units, if applicable	
Leave only micron gauge connected when evacuation is complete to place near indoor unit	
Energize power to outdoor units (only for crankcase heater operation) at least six (6) hours prior to startup. (Do not open any outdoor 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 the "Factory Assisted Commissioning Request Form"	
Complete this checklist in its entirety	
Provide all necessary documents to distributor for forwarding to LG	

Inverter

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