

Installation

Variable Refrigerant Flow (VRF) System Water-Source Unit Series

4TVP0072B300NB*
4TVP0096B300NB*
4TVP0120B300NB*

4TVP0192B300NB*
4TVP0072B400NB*
4TVP0096B400NB*

4TVP0120B400NB*
4TVP0192B400NB*

SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE recommended for the work being undertaken. **ALWAYS** refer to appropriate **MSDS** sheets and **OSHA** guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate **MSDS** sheets and **OSHA** guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling recommendations.
- If there is a risk of arc or flash, technicians **MUST** put on all PPE in accordance with **NFPA 70E** or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit.

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Model Number Description

4	T	V	P	0	0	9	6	B	3	0	0	N	B	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 1: Refrigerant

4 = R-410A

Digit 2: Brand name

T = Trane

Digit 3: System type

V = Variable Refrigerant Flow

Digit 4: Functional type outdoor unit

P = Hybrid Water Source, DC Inverter (VRF)

Digit 5: Efficiency tier and/or special application

0 = Standard

Digit 6, 7, 8: Nominal capacity (Btu/h x 1,000)

072 = 72,000 Btu/h

096 = 96,000 Btu/h

120 = 120,000 Btu/h

192 = 192,000 Btu/h

Digit 9: Major development sequence

B = Second development sequence

Digit 10: Electric power supply characteristics

3 = 208–230/60/3

4 = 460/60/3

Digit 11: Reserved for future use

0 = Standard

Digit 12: Miscellaneous digit

0 = Not currently used

Digit 13: Region of sale

N = North America (VRF)

Digit 14: Minor design sequence

A = First design sequence

B = Second design sequence

Digit 15: Service digit (not used for ordering)

A = First sequence

B = Second sequence

Preparing for Installation

Unit Dimensions and Weights

Table 1. Unit dimensions and weights

Unit type	Unit model number	Dimensions (WxHxD) in. (mm)	Weight lb	Shipping dimensions (WxHxD) in. (mm)	Shipping weight lb
Hybrid Water-Source Heat Recovery (208–230 V, 3 phase)	4TVP0072B300NB	30.3 x 39.4 x 21.5 (in) 770 x 1000 x 545 (mm)	353	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	368
	4TVP0096B300NB	30.3 x 39.4 x 21.5 (in) 770 x 1000 x 545 (mm)	353	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	368
	4TVP0120B300NB	30.3 x 39.4 x 21.5 (in) 770 x 1000 x 545 (mm)	353	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	368
	4TVP0192B300NB	43.3 x 39.4 x 21.5 (in) 1100 x 1000 x 545 (mm)	529	46.1 x 47.2 x 24.4 (in) 1170 x 1200 x 620 (mm)	551
Hybrid Water-Source Heat Recovery (460 V, 3 phase)	4TVP0072B400NB	31.1 x 39.4 x 21.5 (in) 790 x 1000 x 545 (mm)	368	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	384
	4TVP0096B400NB	31.1 x 39.4 x 21.5 (in) 790 x 1000 x 545 (mm)	368	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	384
	4TVP0120B400NB	31.1 x 39.4 x 21.5 (in) 790 x 1000 x 545 (mm)	368	33.1 x 47.2 x 24.4 (in) 840 x 1200 x 620 (mm)	384
	4TVP0192B400NB	44.1 x 39.4 x 21.5 (in) 1120 x 1000 x 545 (mm)	545	46.1 x 47.2 x 24.4 (in) 1170 x 1200 x 620 (mm)	567

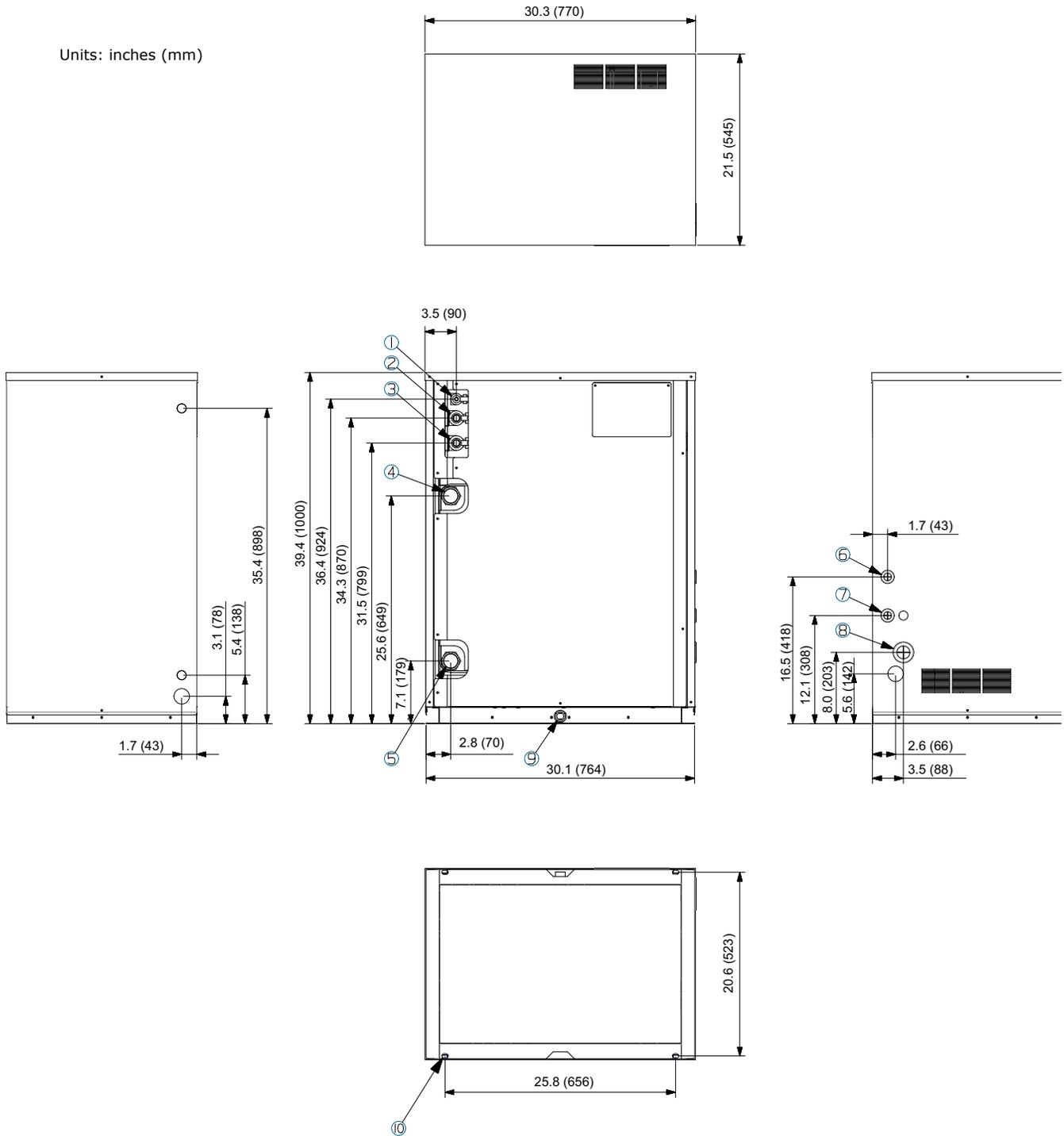
Table 2. Specifications for features in dimensional drawings: Figure 1 through Figure 4

Number (a)	Description	Size in. (mm)				Number (a)	Description	Size
		6 ton	8 ton	10 ton	16 ton			
1	Liquid refrigerant pipe	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	5/8 (15.88)	6	External contact wiring	N/A
2	High-pressure gas refrigerant pipe	3/4 (19.05)	3/4 (19.05)	7/8 (22.22)	1-1/8 (28.58)	7	Communication wiring	N/A
3	Low-pressure gas refrigerant pipe	7/8 (22.22)	7/8 (22.22)	1-1/8 (28.58)	1-1/8 (28.58)	8	Power wiring	N/A
4	Water outlet pipe	1-1/4 FPT				9	Drain socket	1/2 FPT
5	Water inlet pipe	1-1/4 FPT				10	Anchor bolt holes	N/A

(a) The numbers correspond to numbered features in Figure 1, p. 7, Figure 2, p. 8, Figure 3, p. 9, and Figure 4, p. 10.

Figure 1. Dimensional drawing: 4TVP0072/096/120B300NB

Units: inches (mm)



Preparing for Installation

Figure 2. Dimensional drawing: 4TVP0192B300NB

Units: inches (mm)

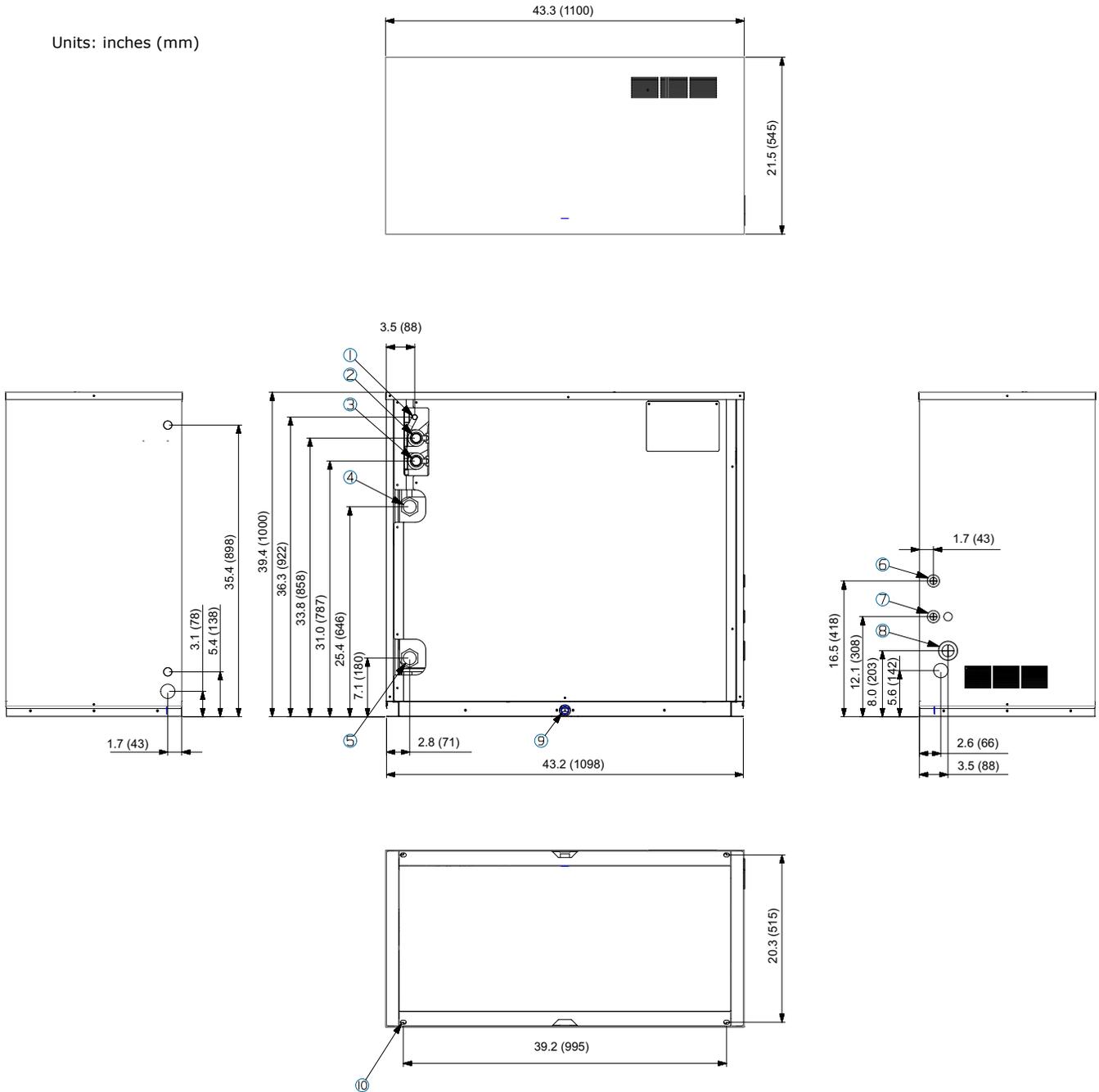
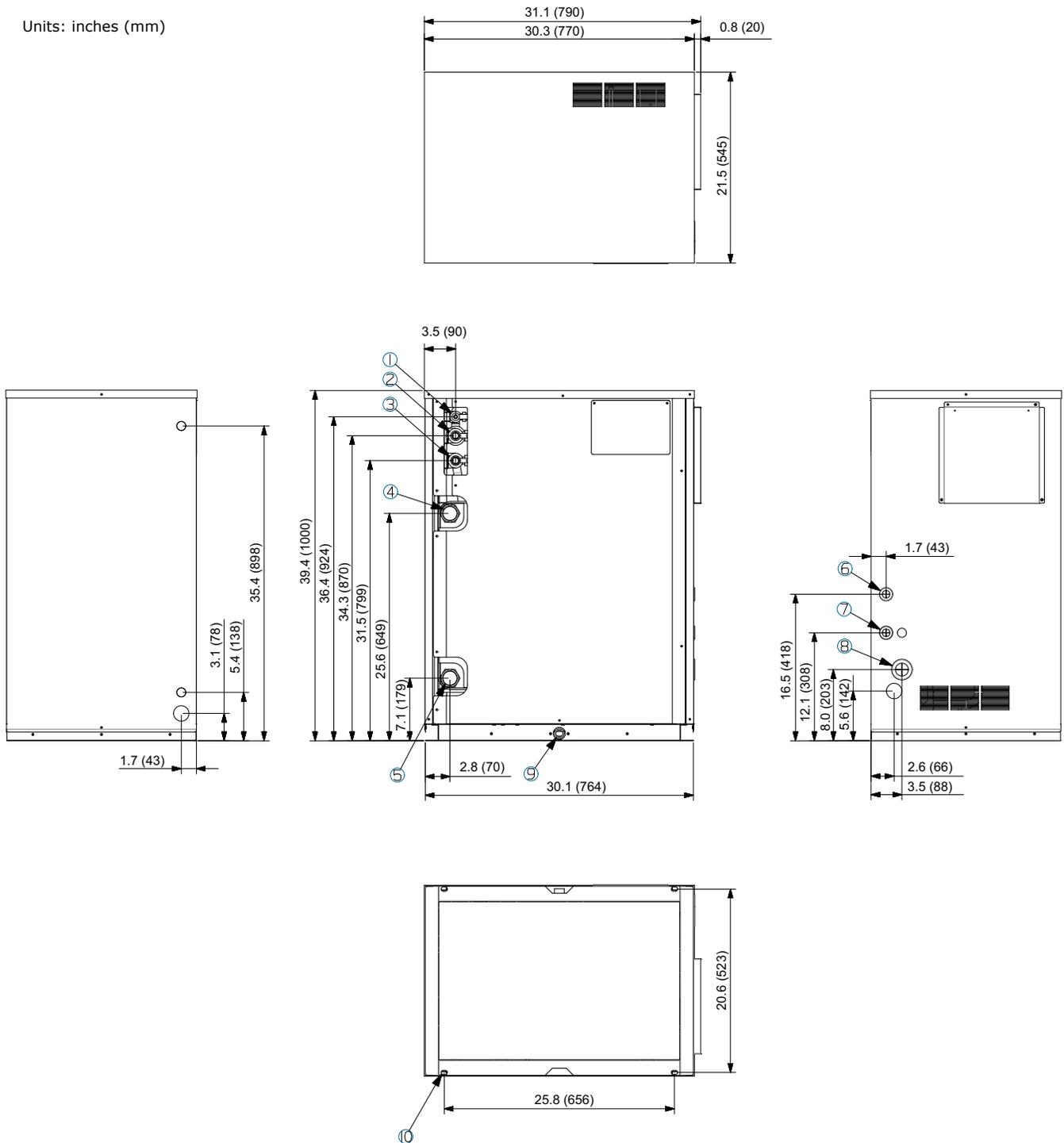


Figure 3. Dimensional drawing: 4TVP0072/096/120B400NB

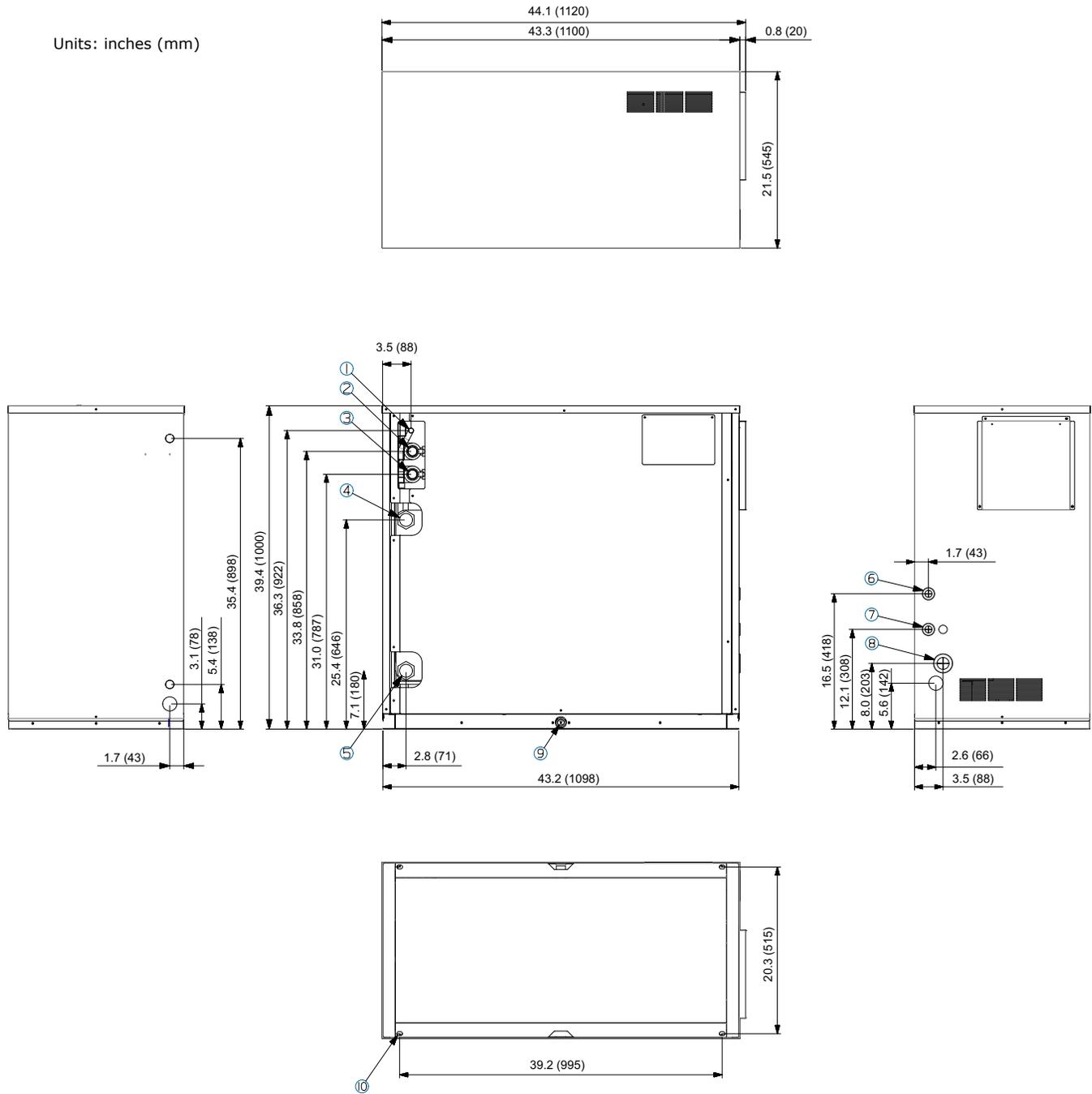
Units: inches (mm)



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Figure 4. Dimensional drawing: 4TVP0192B400NB

Units: inches (mm)

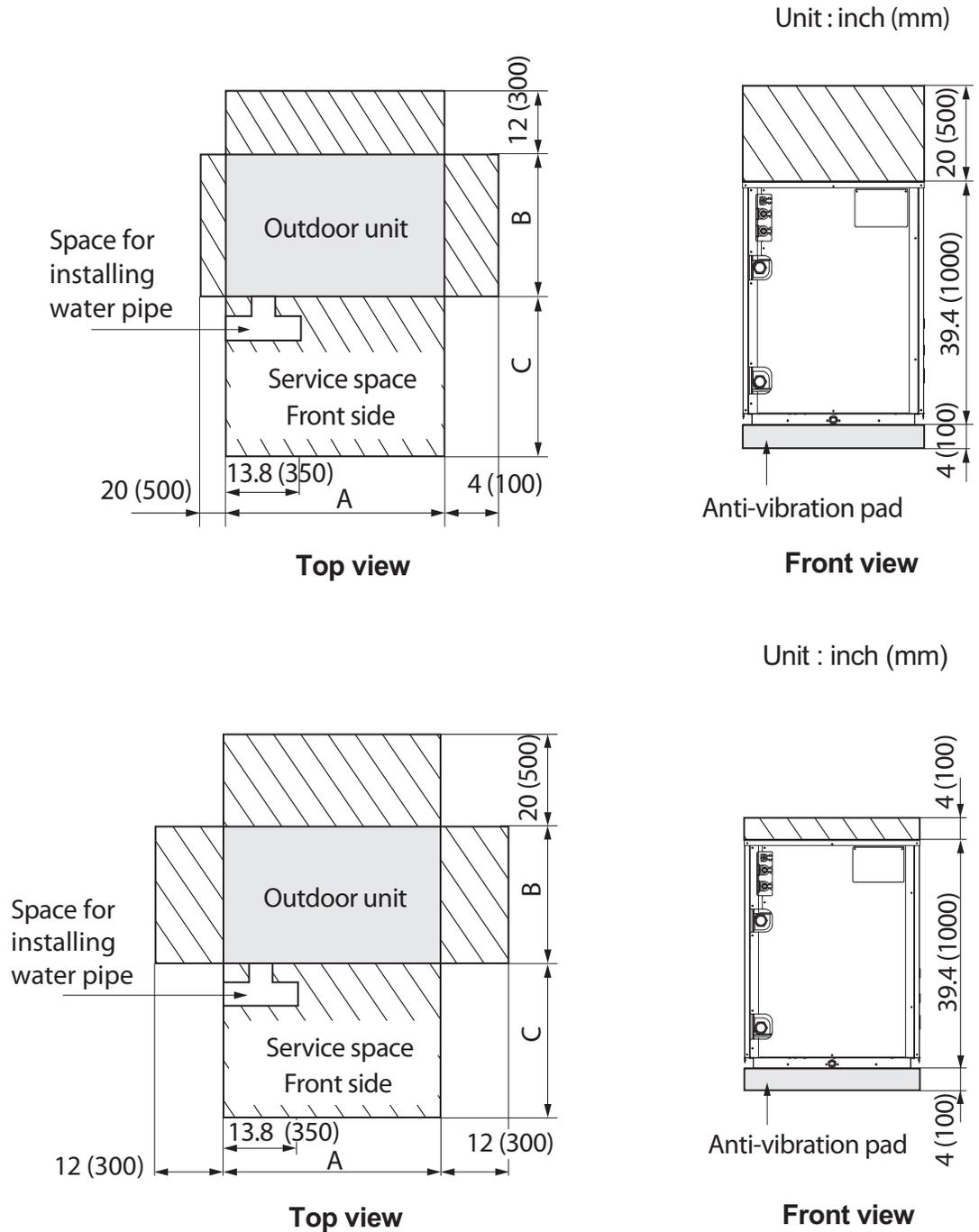


Service Clearances

Install units as shown in the illustrations below, observing ventilation and service requirements.

Note: If installation conditions do not meet the stated requirements, contact a qualified installation technician.

Figure 5. Minimum service clearances for single unit installations



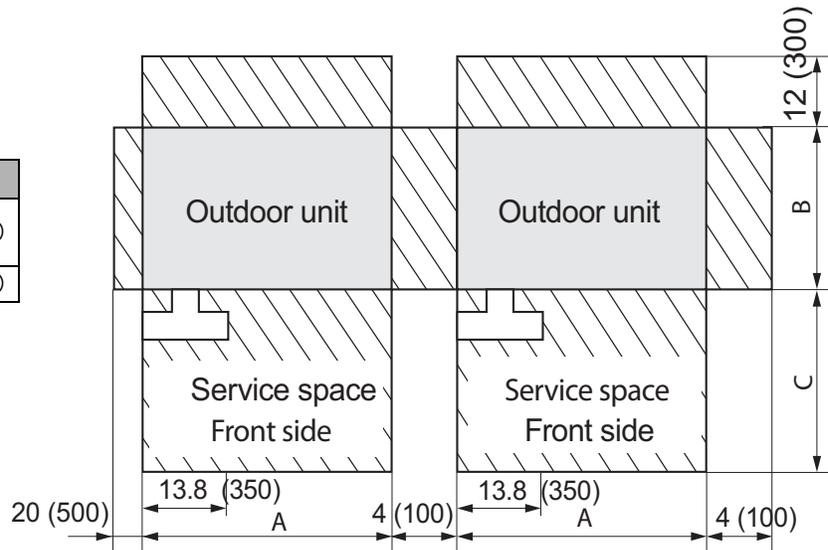
Preparing for Installation

Figure 6. Minimum service clearances for module installations

Unit : inch (mm)

Unit model	A	B	C
4TVP0072***** 4TVP0096***** 4TVP0120*****	30 (770)	21 (545)	24 (600)
4TVP0192*****	43 (1100)	21 (545)	24 (600)

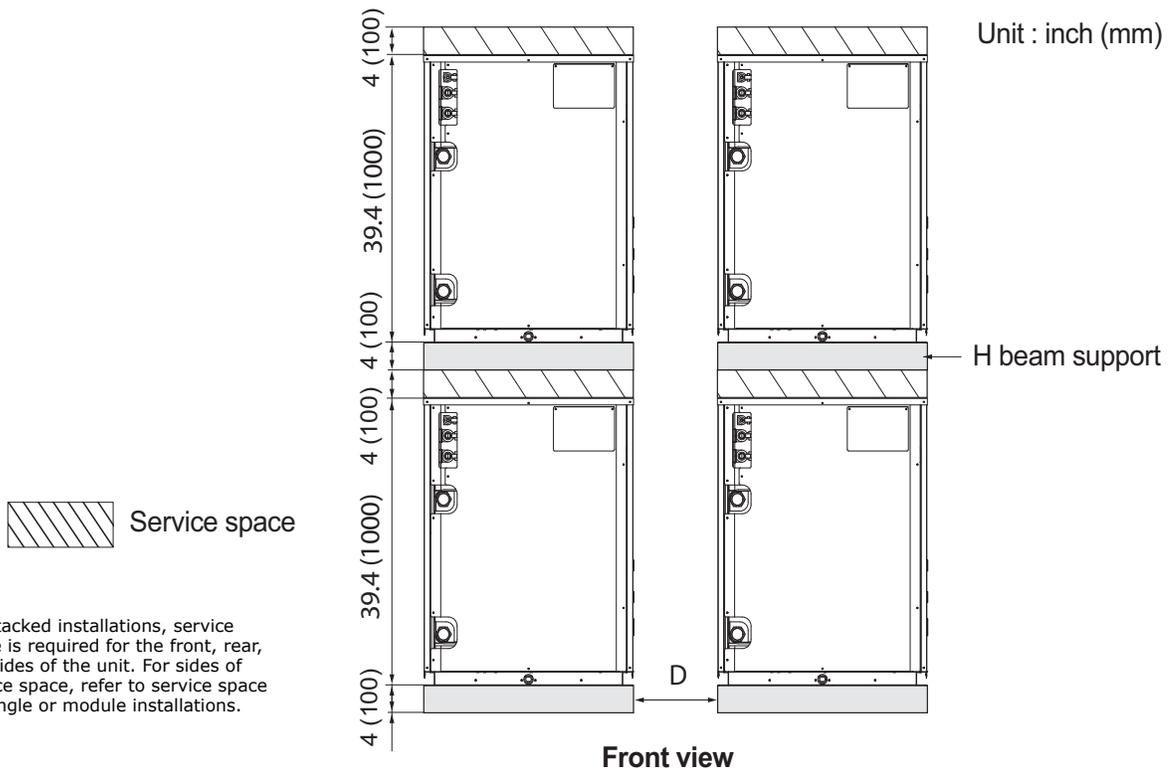
Note: If it is necessary to install the units closer to the walls than what is recommended, use cushioning materials to prevent unit vibrations from being transferred to the walls.



Top view

Figure 7. Minimum service clearance for stacked installations

Unit : inch (mm)



Front view

Note: For stacked installations, service space is required for the front, rear, and sides of the unit. For sides of service space, refer to service space for single or module installations.

Water-Source Unit Combinations

Use the following table to determine the size and number of water-source units needed to achieve the capacity requirements.

Follow these guidelines:

- Make sure to use indoor units that are compatible with the water-source unit.
- The minimum capacity of an indoor unit is 7.5 MBH (7500 Btu/h).
- Indoor units can be connected within the ranges indicated in [Table 3](#), [Table 4](#), and [Table 5](#).
- If the total capacity of the connected indoor units exceeds the indicated maximum capacity, the cooling and heating capacity of the indoor unit may decrease.
- You can connect a maximum of 64 indoor units to the water-source unit. The maximum quantity of connectable indoor units is 64 because the water-source unit supports a maximum of 64 communication addresses.
- If you choose to select a water-source unit combination other than the those specified in [Table 3](#), [Table 4](#), and [Table 5](#), the total capacity of connected indoor units is allowed to be 50%–130% of the water-source unit capacity: $[0.5 \times \text{total water-source unit capacity} \leq \text{total connected indoor unit capacity} \leq 1.3 \times \text{total water-source unit capacity}]$.

Table 3. Water-source unit combinations 6–20 ton capacity

Capacity		6 ton	8 ton	10 ton	12 ton	14 ton	16 ton	18 ton	20 ton
Water-source unit combination model number		4TVP0072B***NB	4TVP0096B***NB	4TVP0120B***NB	4TVP0144B***NB	4TVP0168B***NB	4TVP0192B***NB	4TVP0216B***NB	4TVP0240B***NB
Total number of individual water-source units		1	1	1	2	2	1	2	2
Combined water-source unit	4TVP0072B***NB	1			2	1			
	4TVP0096B***NB		1			1		1	
	4TVP0120B***NB			1				1	2
	4TVP0192B***NB						1		
Nominal capacity	Cooling (Btu/h)	72000	96000	120000	144000	168000	192000	216000	240000
	Heating (Btu/h)	81000	108000	135000	162000	189000	216000	243000	270000
Rated capacity	Cooling (Btu/h)	69000	92000	114000	138000	161000	184000	206000	228000
	Heating (Btu/h)	77000	103000	129000	154000	180000	206000	232000	258000
Total capacity of connected indoor units (cooling)	Minimum (Btu/h)	36000	48000	60000	72000	84000	96000	108000	120000
	Maximum (Btu/h)	93600	124800	156000	187200	218400	249600	280800	312000
Maximum quantity of connectable indoor units		12	16	20	25	29	33	37	41

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Table 4. Water-source unit combinations: 21–32 ton capacity

Capacity	22 ton	24 ton	26 ton	28 ton	30 ton	32 ton	
Water-source unit combination model number	4TVP0264B***NB	4TVP0288B***NB	4TVP0312B***NB	4TVP0336B***NB	4TVP0360B***NB	4TVP0384B***NB	
Total number of individual water-source units	2	2	2	3	3	2	
Combined water-source unit	4TVP0072B***NB	1		2	1		
	4TVP0096B***NB		1		1		
	4TVP0120B***NB			1			
	4TVP0192B***NB	1	1	1	1	2	
Nominal capacity	Cooling (Btu/h)	264000	288000	312000	336000	360000	384000
	Heating (Btu/h)	297000	324000	351000	378000	405000	432000
Rated capacity	Cooling (Btu/h)	253000	276000	298000	322000	345000	368000
	Heating (Btu/h)	283000	309000	335000	360000	386000	412000
Total capacity of indoor units (cooling)	Minimum (Btu/h)	132000	144000	156000	168000	180000	192000
	Maximum (Btu/h)	343200	374400	405600	436800	468000	499200
Maximum quantity of connectable indoor units	45	49	54	58	62	64	

Table 5. Water-source unit combinations: 34–48 ton capacity

Capacity	34 ton	36 ton	38 ton	40 ton	42 ton	48 ton	
Water-source unit combination model number	4TVP0408B***NB	4TVP0432B***NB	4TVP0456B***NB	4TVP0480B***NB	4TVP0504B***NB	4TVP0576B***NB	
Total number of individual water-source units	3	3	3	3	3	3	
Combined water-source unit	4TVP0072B***NB		1				
	4TVP0096B***NB	1		1			
	4TVP0120B***NB	1	2		1		
	4TVP0192B***NB	1	1	2	2	3	
Nominal capacity	Cooling (Btu/h)	408000	432000	456000	480000	504000	576000
	Heating (Btu/h)	459000	486000	513000	540000	567000	648000
Rated capacity	Cooling (Btu/h)	390000	412000	437000	460000	482000	552000
	Heating (Btu/h)	438000	464000	489000	515000	541000	618000
Total capacity of indoor units (cooling)	Minimum (Btu/h)	204000	216000	228000	240000	252000	288000
	Maximum (Btu/h)	530400	561600	592800	624000	655200	748800
Maximum quantity of connectable indoor units	64	64	64	64	64	64	

Heat Pump and Heat Recovery Applications

For **heat pump applications**, the liquid pipe and the high-pressure gas pipe are connected to an indoor unit.

For **heat recovery applications**, the liquid pipe and the high- and low-pressure gas pipes are connected to a mode control unit (MCU). The heat pump valve is closed and the K5 switch is set to Off.

For installation details, refer to "Refrigerant Piping," p. 22.

Accessories

Pipe installation sockets are shipped with the unit. Sockets should be applied based on the model and application as shown in Table 6 and Figure 8.

Table 6. Pipe installation socket size chart

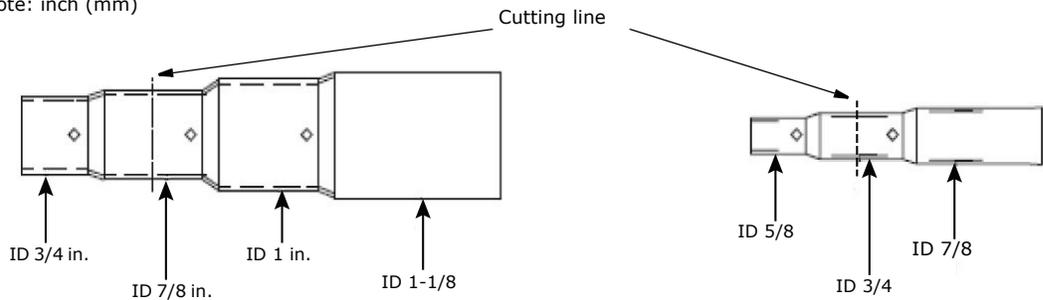
Unit model ^(a)	Connection type	Heat recovery (inch [mm])				Heat pump (inch [mm])		
		Gas	Liquid	High-pressure gas	Socket needed	Gas	Liquid	Socket needed
4TVP0072***** (6 ton)	Unit connection	7/8 (22.22)	3/8 (9.52)	3/4 (19.05)	Yes	3/4 (19.05)	3/8 (9.52)	No
	Field connection	3/4 (19.05)		5/8 (15.88)				
4TVP0096***** (8 ton) ^(b)	Unit connection	7/8 (22.22)	3/8 (9.52)	3/4 (19.05)	No	3/4 (19.05)	3/8 (9.52)	Yes
	Field connection					7/8 (22.22)		
4TVP0120***** (10 ton) ^(b)	Unit connection	1-1/8 (28.58)	3/8 (9.52)	7/8 (22.22)	No	7/8 (22.22)	3/8 (9.52)	Yes
	Field connection		1/2 (12.7)			1-1/8 (28.58)		

(a) No pipe installation socket is required for unit model 4TVP0192***** (16 ton).

(b) Cut socket as needed.

Figure 8. Pipe installation sockets

Note: inch (mm)



A field-supplied water strainer is required. Table 7 provides specifications.

Table 7. Water strainer specifications

Material (strainer/mesh)	Mesh size	Water pipe connection	Work pressure
AISI316/SUS304	50 mesh	32 A (internal thread)	284.3 psi (1.96 MPa)

Preparing for Installation

Optional accessories are listed in [Table 8](#).

Table 8. Optional accessories

Accessory	Model number	Specification
Indoor Y-joint	4YDK1509B0051A	51 MBH and below
	4YDK2512B0138A	52-136 MBH
	4YDK2812B0160A	137-154 MBH
	4YDK2815B0240A	155-240 MBH
	4YDK3419B0336A	241-336 MBH
	4YDK4119B0468A	337-461 MBH
	4YDK4422B0999A	Above 461 MBH
Indoor Y-joint for heat recovery (high-pressure gas)	4YDK1500B0080A	76 MBH and below
	4YDK2500B0240A	77-240 MBH
	4YDK3100B0468A	241-461 MBH
	4YDK3800B0999A	Above 461 MBH
Distribution header	4HJK2512B0159A	154 MBH and below (maximum number of connections: 4)
	4HJK3115B0241A	240 MBH and below (maximum number of connections: 8)
	4HJK3819B0998A	Above 240 MBH (maximum number of connections: 8)
Outdoor Y-joint	4TDK3819B0000A	456 MBH and below
	4TDK4422B0999A	Above 456 MBH
Outdoor Y-joint for heat recovery (high-pressure gas)	4TDK3100B0000A	456 MBH and below
	4TDK3800B0999A	Above 456 MBH

Location Considerations

Important: *The water-cooled unit uses a plate-type heat exchanger that requires water piping. Because of the presence of water, extra care must be taken when considering the installation location of the unit.*

Choose an installation location based on the following requirements and considerations.

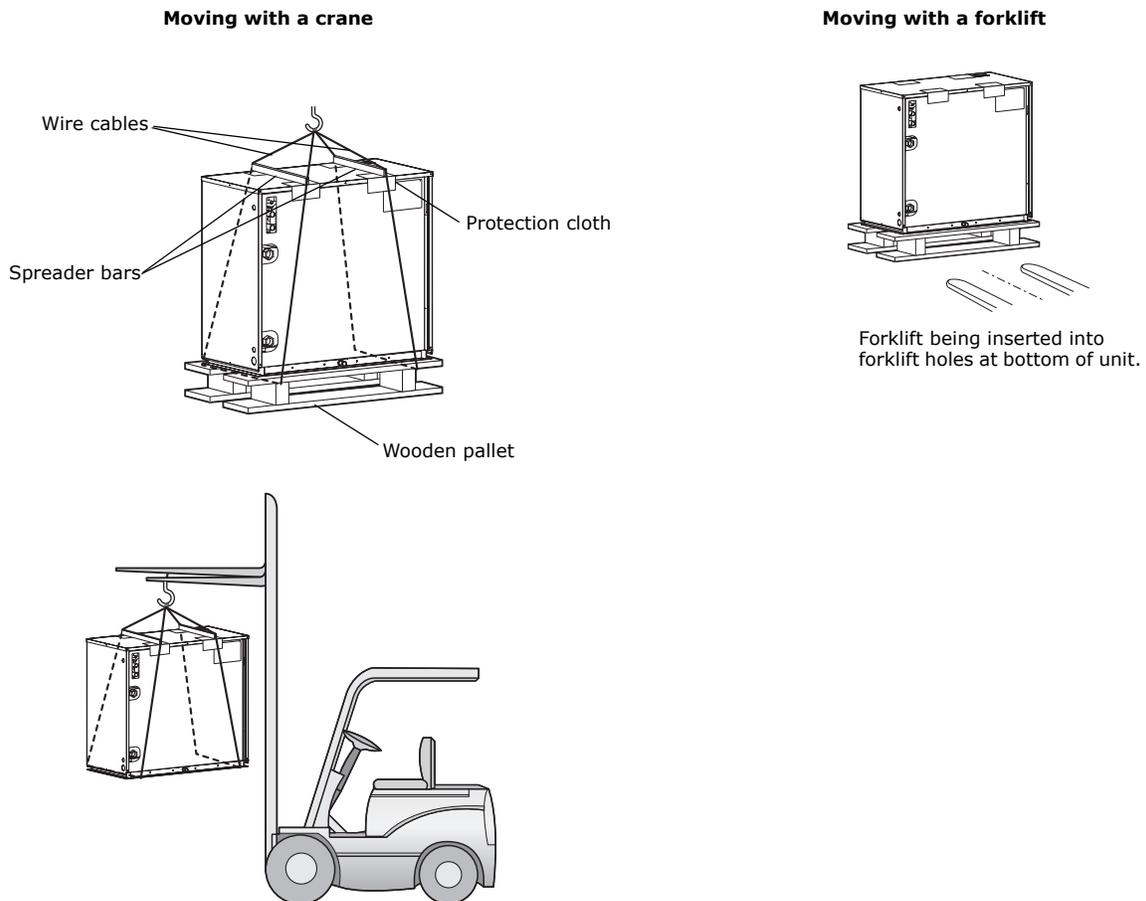
- Install the unit:
 - Indoors, preferably in a mechanical room.
 - On a supporting structure that can bear the weight of the water-source unit.
 - With sufficient clearances around the unit for service and repairs.
 - On a flat surface that does not collect water.
 - In a well-ventilated location.
 - Where there is no risk of flammable gas leakage.
 - Where there is no exposure to salt, machine oil, sulfide gas, or corrosive environmental conditions.
 - At least 9.84 ft (3 m) away from equipment that generates electromagnetic waves.
 - Away from interfering sources, such as radio, computer, and stereo equipment.
 - Away from inflammable materials.
 - In a location where the water source meets the standards of quality described in [“Cooling Water Management,” p. 84.](#)
- Ensure that condensate water generated by the water-source unit can drain smoothly away from the unit.
- Install the power and communication cables in a separately installed enclosure.
- R-410A refrigerant is a safe, nontoxic and nonflammable refrigerant. However, if there is a concern about a dangerous level of refrigerant concentration in the case of refrigerant leakage, add extra ventilation.
- Avoid installing the water-source unit where corrosive gases, such as sulfur oxides, ammonia, and sulfurous gas, are produced. If unavoidable, consult with an installation specialist about using a corrosion-proof or anti-rust additive to protect the unit coils.

Moving the Water-Source Unit

Follow these guidelines when moving the water-source unit:

- Before moving the water-source unit, determine a path that can support its weight.
- Do not lay the unit on its side and do not tip it more than 30 degrees.
- Take care to avoid injury while moving the unit.
 - If moving the unit with a crane, fasten the wire rope as shown in [Figure 9](#). To protect damage or scratches to the unit, use a spreader bar.
 - If moving the unit with a forklift, carefully insert forks into the forklift holes at the bottom of the water-source unit. Be careful with to avoid damaging the unit with the forklift.

Figure 9. Moving the water-source unit



Unit Installation

Follow these guidelines for installing the water-source unit.

Important: *The manufacturer is not responsible for damage incurred for installations that have not followed these guidelines.*

The water-source unit must be installed:

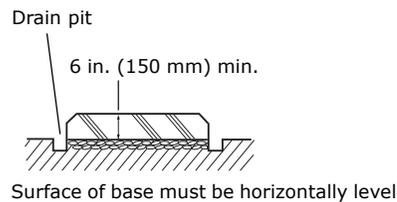
- On a horizontally level surface.
- On a surface that is strong enough to support the unit and to minimize noise.

Base Recommendations

General Guidelines

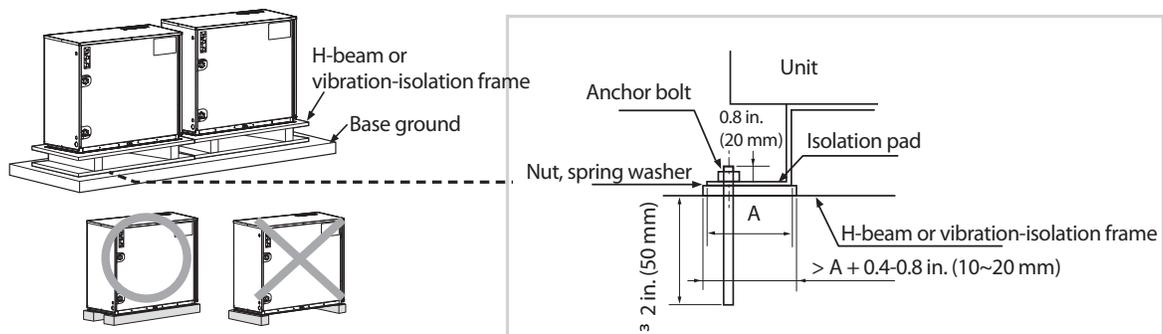
A supporting base for the water-source unit:

- Is typically made of concrete.
- If necessary, has wire mesh or steel bars added to the concrete to prevent damages or cracks.
- Should typically be 1.5 times larger than the bottom of the water-source unit.
- Should be 6 in. (150 mm) or higher.
- Should have a drain pit around the base.



Minimizing Vibration

To minimize water-source unit vibrations, use a vibration-minimizing structure such as an H-beam frame, a vibration-isolation frame, or an isolation pad (thickness > 1 in. [20 mm]). The load-bearing force of the structure must be 787 lbf (3.5 kN).



Securing the Unit

Secure the unit firmly to the base with anchor bolts, as specified in [Figure 10](#), [Table 9](#), and [Table 10](#).

- Use zinc-plated or stainless steel nuts and bolts.
- Use a rubber washer between the bolt and the water-source unit to prevent bimetallic corrosion.
- If you cannot attach the unit to the base, secure it from the side or to an additional structure.

Figure 10. Bolt hole sizes and locations for mounting the unit

Notes:

- Units: inch (mm)
- Refer to [Table 10](#) for A, B, C, and D.
- Refer to the blueprints in the technical data book for mounting hole specifications.

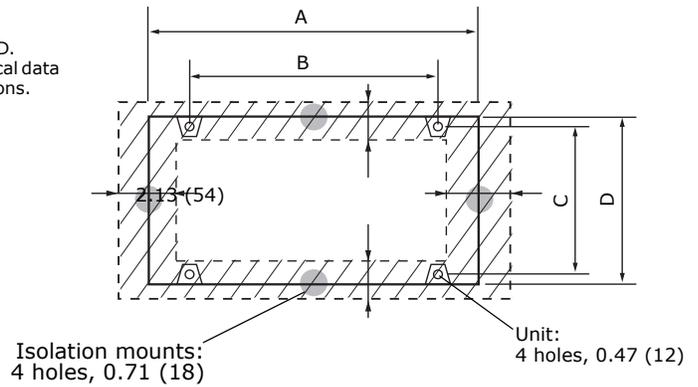


Table 9. Anchor specification

Size (M)	Drill bit diameter (a)	Anchor length (b)	Sleeve length (c)	Insertion depth	Fastening torque
10 mm	1/2 in. (14 mm)	3 in. (75 mm)	1-1/2 in. (40 mm)	2 in. (50 mm)	265-1/2 in·lbf (30 N·m)

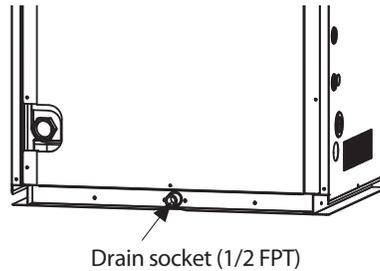
Table 10. Unit and bolt dimensions

Dimensions	4TVP0072/96/120*****	4TVP192*****
Unit width (A)	30.3 in. (770 mm)	43.3 in. (1100 mm)
Width between bolts (B)	25.5 in. (648 mm)	38.4 in. (976 mm)
Depth between bolts (C)	20.7 in. (527 mm)	20.8 in. (528 mm)
Unit depth (D)	21.7 in. (550 mm)	21.7 in. (550 mm)

Drain Pipe Installation

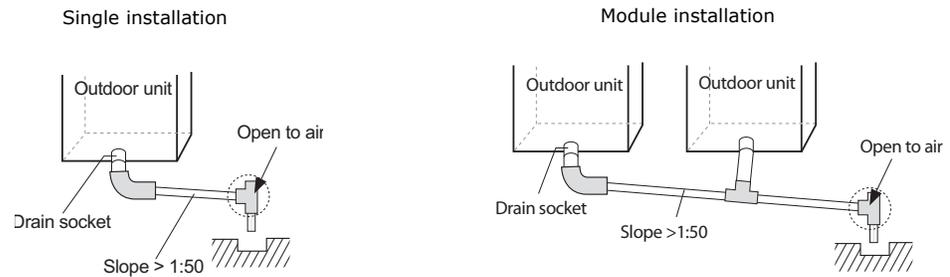
Follow these requirements:

Attach the drain pipe to the drain socket (1/2 FPT) located on the bottom of the unit.



- Ensure that the slope of the drain pipe is $>1:50$.
- Do not install a trap.
- Insulate the drain pipe and drain plug with insulation that is over 0.39 in. (10 mm) thick.
- Install a self-regulating heating cable on the drain pipe to prevent it from freezing.
- Refer to [Figure 11](#) for drain pipes on single and module installations.

Figure 11. Drain pipe installation



Refrigerant Piping

This section contains information on selecting, storing, and connecting refrigerant piping.

Selecting Refrigerant Piping

Use insulated, unwelded, degreased, and deoxidized copper ACR pipe (Cu-DHP type according to ISO 1337 or UNI EN 12735-1) suitable for an operating pressure of at least 609.15 psi (4200 kPa) and a burst pressure of at least 3002.28 psi (20,700 kPa). Copper pipe for hydro-sanitary applications is unsuitable.

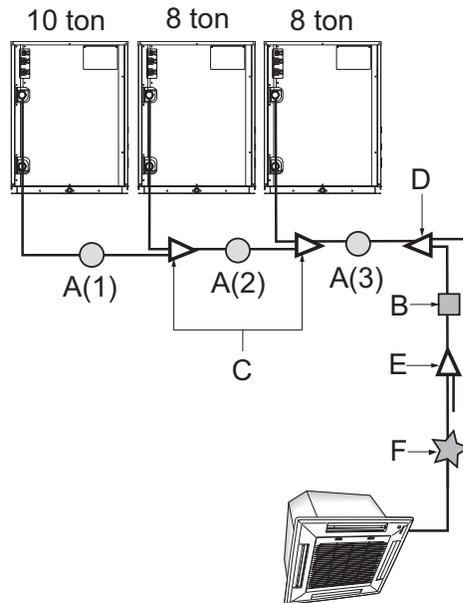
1. Select refrigerant piping according to length. Consider maximum piping length and height differences (Table 27, p. 39 [heat pump] or Table 29, p. 42 [heat recovery]).
2. Determine pipe and Y-joint size (see "Heat Pump Applications," p. 22 or "Heat Recovery Applications," p. 26).

Note: If there is a risk of decreased performance caused by pipe length, use piping that is one size larger in diameter than what is specified in this section.

Heat Pump Applications

Figure 12 shows an example of a typical water-source heat pump application. In this module installation example, all pipes and Y-joints are identified. Table 11, p. 23 through Table 16, p. 25 show how to determine their sizes.

Figure 12. Typical water-source heat pump installation, example 1

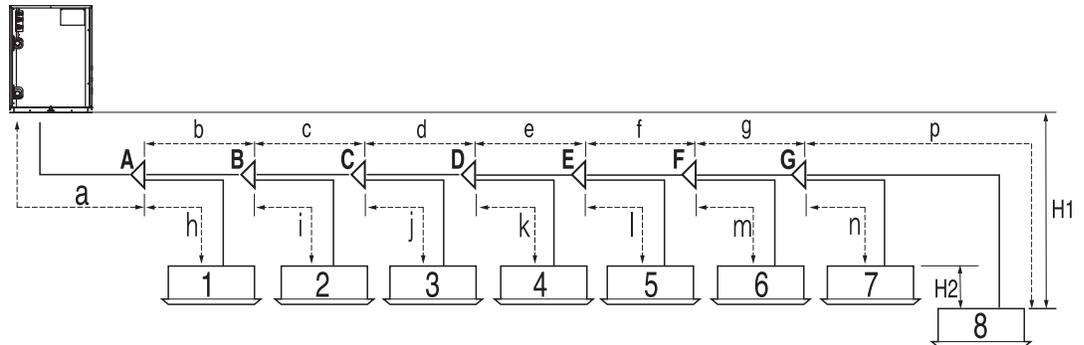


Key

- A(1), A(2), A(3): Main pipes (Table 11, p. 23).
- B: Pipe size between Y-joints (Table 12, p. 24).
- C: Y-joints between water-source units (Table 13, p. 24).
- D: First Y-joint according to water-source unit capacity (Table 14, p. 24).
- E: Y-joints connected after the first branch, according to indoor unit capacity (Table 15, p. 25).
- F: Pipe size between Y-joints and indoor units (Table 16, p. 25).

The capacity of the water-source unit(s), in addition to the distance from the water-source unit to the furthest indoor unit (IDU 8 in Figure 13), is used to determine the diameter of the main pipe (A in Figure 13).

Figure 13. Typical water-source heat pump system installation, example 2



Use Table 11 to determine the diameter of the main pipe. If distance $a+b+c+d+e+f+g+p > 295.3$ ft, the main pipe (A in Figure 13) must be upsized.

Table 11. Water-source main pipe size based on distance from water-source unit to furthest indoor unit: A

Water-source unit capacity		Main pipe size (OD) when distance from water-source unit to furthest indoor unit is ≤ 295.3 ft (90 m)		Main pipe size (OD) when distance from water-source unit to further indoor unit > 295.3 ft (90 m)	
		Liquid in. (mm)	Gas in. (mm)	Liquid in. (mm)	Gas in. (mm)
Ton	MBH				
6	72	3/8 (9.52)	3/4 (19.05)	1/2 (12.70)	7/8 (22.22)
8	96	3/8 (9.52)	7/8 (22.22)	1/2 (12.70)	1 (25.40) ^(a)
10	120	1/2 (12.70)	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)
12	144	1/2 (12.70)	1-1/8 (28.58)	5/8 (15.88)	1-1/4 (31.75) ^(b)
14	168	5/8 (15.88)	1-1/8 (28.58)	3/4 (19.05)	1-1/4 (31.75) ^(b)
16	192	5/8 (15.88)	1-1/8 (28.58)	3/4 (19.05)	1-1/4 (31.75) ^(b)
18	216	5/8 (15.88)	1-1/8 (28.58)	3/4 (19.05)	1-1/4 (31.75) ^(b)
20	240	5/8 (15.88)	1-1/8 (28.58)	3/4 (19.05)	1-1/4 (31.75) ^(b)
22	264	3/4 (19.05)	1-3/8 (34.92)	7/8 (22.22)	1-1/2 (38.1) ^(c)
24	288	3/4 (19.05)	1-3/8 (34.92)	7/8 (22.22)	1-1/2 (38.1) ^(c)
26	312	3/4 (19.05)	1-3/8 (34.92)	7/8 (22.22)	1-1/2 (38.1) ^(c)
28	336	3/4 (19.05)	1-3/8 (34.92)	7/8 (22.22)	1-1/2 (38.1) ^(c)
30	360	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
32	384	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
34	408	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
36	432	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
38	456	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
40	480	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	2-1/8 (53.98)
42	504	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	2-1/8 (53.98)
48	576	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	2-1/8 (53.98)

(a) If 1 (25.4) pipe is not available on site, use 1-1/8 (28.58) pipe.
 (b) If 1-1/4(31.75) pipe is not available on site, use 1-3/8 (34.92) pipe.
 (c) If 1-1/2 (38.1) pipe is not available on site, use 1-5/8 (41.28) pipe.

Refrigerant Piping

Use [Table 12](#) to determine pipe size between Y-joints (B in [Figure 12](#), p. 22).

Table 12. Pipe size between Y-joints: B

Indoor unit total capacity (MBH)	Branch pipe size (OD) when pipe is < 147.6 ft (45 m)		Branch pipe size (OD) when pipe is 147.6–295.3 ft (45–90 m)	
	Liquid in. (mm)	Gas in. (mm)	Liquid in. (mm)	Gas in. (mm)
Less than 51	3/8 (9.52)	5/8 (15.88)	1/2 (12.70)	3/4 (19.05)
51-75.9	3/8 (9.52)	3/4 (19.05)	1/2 (12.70)	7/8 (22.22)
76-95.9	3/8 (9.52)	7/8 (22.22)	1/2 (12.70)	1 (25.40) ^(a)
96-135.9	1/2 (12.70)	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)
136-153.9	1/2 (12.70)	1-1/8 (28.58)	5/8 (15.88)	1-1/4 (31.75) ^(b)
154-239.9	5/8 (15.88)	1-1/8 (28.58)	3/4 (19.05)	1-1/4 (31.75) ^(b)
240-335.9	3/4 (19.05)	1-3/8 (34.92)	7/8 (22.22)	1-1/2 (38.1) ^(c)
336-460.9	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	1-5/8 (41.28)
461-577	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.22)	2-1/8 (53.98)
Above 577	7/8 (22.22)	2-1/8 (53.98)	1 (25.40) ^(a)	2-1/8 (53.98)

(a) If 1 (25.40) pipe is not available on site, use 1-1/8 (28.58) pipe.

(b) If 1-1/4 (31.75) pipe is not available on site, use 1-3/8 (34.92) pipe.

(c) If 1-1/2 (38.1) pipe is not available on site, use 1-5/8 (41.28) pipe.

Use [Table 13](#), [Table 14](#), and [Table 15](#) to select Y-joints (C, D, and E in [Figure 12](#), p. 22).

Table 13. Outdoor Y-joint between water-source units: C

Outdoor Y-joint between water-source units: C	Total indoor unit capacity (MBH)	Model
Outdoor Y-joint	456 MBH and below	4TDK3819B0000A
	Above 456 MBH	4TDK4422B0999A

Table 14. First Y-joint according to water-source unit capacity: D

First indoor Y-joint: D	Water-source unit capacity (ton)	Model
Indoor Y-joint	6, 8, 10	4YDK2512B0138A
	12	4YDK2812B0160A
	14, 16, 18, 20	4YDK2815B0240A
	22, 24, 26, 28	4YDK3419B0336A
	30, 32, 34, 36, 38	4YDK4119B0468A
	40, 42, 48	4YDK4422B0999A

Table 15. Indoor Y-joints connected after the first Y-joint, according to total indoor unit capacity: E

Indoor Y-joints after the first indoor Y-joint: E	Total indoor unit capacity (MBH) ^(a)	Model
Indoor Y-joint	51 MBH and below	4YDK1509B0051A
	52–136	4YDK2512B0138A
	137–154	4YDK2812B0160A
	155–240	4YDK2815B0240A
	241–336	4YDK3419B0336A
	337–461	4YDK4119B0468A
	Above 461 MBH	4YDK4422B0999A

(a) Indoor Y-joints are selected based on downstream indoor unit capacity: the first indoor Y-joint will be the largest, the second indoor Y-joint will be smaller, and so on).

Use [Table 16](#) to determine pipe size between indoor Y-joints and indoor units (F in [Figure 18](#), p. 37).

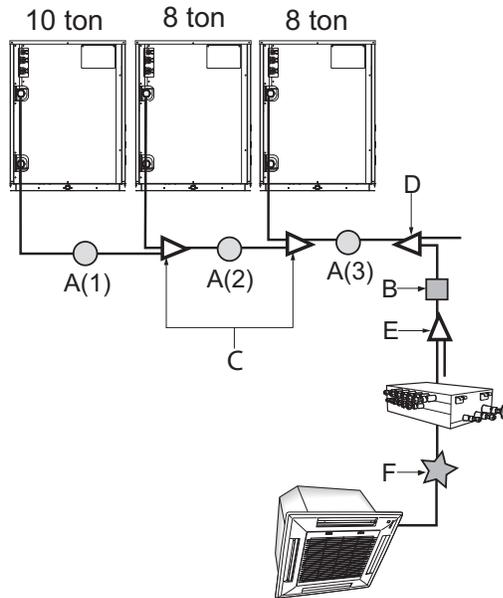
Table 16. Pipe size between the indoor Y-joint and indoor unit: F

Indoor unit capacity (MBH)	Pipe size (OD): F	
	Liquid in. (mm)	Gas in. (mm)
Less than 20	1/4 (6.35)	1/2 (12.70)
24-52	3/8 (9.52)	5/8 (15.88)
68-78	3/8 (9.52)	3/4 (19.05)
78-96	3/8 (9.52)	7/8 (22.22)

Heat Recovery Applications

Figure 14 shows an example of a typical water-source heat recovery application. In this module installation example, all pipes and Y-joints are identified. Table 17, p. 27 through Table 22, p. 29 show how to determine their sizes.

Figure 14. Typical water-source heat recovery system installation, example 1

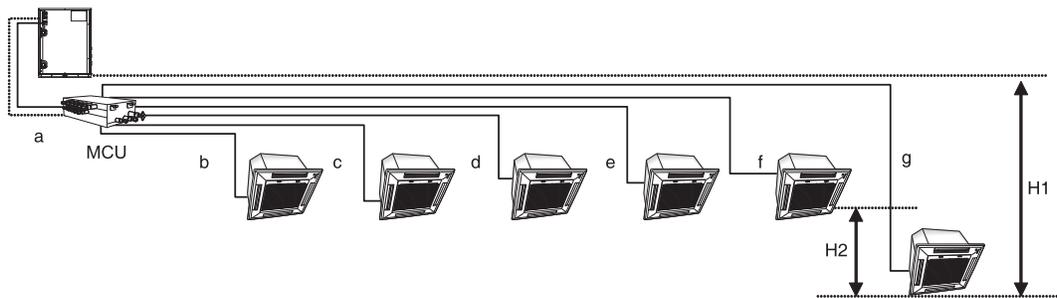


Key

- A(1), A(2), A(3): Main pipes (Table 17, p. 27).
- B: Pipe size between Y-joint and MCU (Table 18, p. 27).
- C: Outdoor Y-joints between water-source units (Table 19, p. 28).
- D: First Y-joint according to water-source unit capacity (Table 20, p. 28).
- E: Y-joints connected to MCUs or other Y-joints (Table 21, p. 29).
- F: Pipe size between MCUs and indoor units (Table 22, p. 29).

The capacity of the water-source unit(s), in addition to the distance from the water-source unit to the furthest indoor unit ("g" in Figure 15), is used to determine the diameter of the main pipe (A in Figure 15).

Figure 15. Typical water-source heat recovery installation, example 2



Use Table 17, p. 27 to determine the diameter of the main pipe. If distance $a+g > 295.3$ ft, the main pipe (A in Figure 15) must be upsized.

Table 17. Water-source unit main pipe size based on distance from water-source unit to furthest indoor unit: A

Water-source unit capacity		Main pipe size (OD) when distance from water-source unit to furthest indoor unit is ≤ 295.3 ft (90 m)			Main pipe size (OD) when distance from water-source unit to furthest indoor unit > 295.3 ft (90 m)		
		Liquid in. (mm)	Gas in. (mm)	High- pressure gas in. (mm)	Liquid ^(a) in. (mm)	Gas in. (mm)	High- pressure gas in. (mm)
Ton	MBH						
6	72	3/8 (9.52)	3/4 (19.05)	5/8 (15.88)	1/2 (12.70)	3/4 (19.05)	5/8 (15.88)
8	96	3/8 (9.52)	7/8 (22.22)	3/4 (19.05)	1/2 (12.70)	7/8 (22.22)	3/4 (19.05)
10	120	1/2 (12.70)	1-1/8 (28.58)	7/8 (22.22)	5/8 (15.88)	1-1/8 (28.58)	7/8 (22.22)
12	144	1/2 (12.70)	1-1/8 (28.58)	7/8 (22.22)	5/8 (15.88)	1-1/8 (28.58)	7/8 (22.22)
14	168	5/8 (15.88)	1-1/8 (28.58)	7/8 (22.22)	3/4 (19.05)	1-1/8 (28.58)	7/8 (22.22)
16	192	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)	3/4 (19.05)	1-1/8 (28.58)	1-1/8 (28.58)
18	216	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)	3/4 (19.05)	1-1/8 (28.58)	1-1/8 (28.58)
20	240	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)	3/4 (19.05)	1-1/8 (28.58)	1-1/8 (28.58)
22	264	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)	7/8 (22.22)	1-3/8 (34.92)	1-1/8 (28.58)
24	288	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)	7/8 (22.22)	1-3/8 (34.92)	1-1/8 (28.58)
26	312	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)	7/8 (22.22)	1-3/8 (34.92)	1-1/8 (28.58)
28	336	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)	7/8 (22.22)	1-3/8 (34.92)	1-1/8 (28.58)
30	360	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
32	384	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
34	408	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
36	432	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
38	456	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
40	480	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
42	504	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)
48	576	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)	7/8 (22.22)	1-5/8 (41.28)	1-3/8 (34.92)

(a) Increase the liquid pipe by one size if the pipe length > 295.3 ft (90 m), as specified in this column.

Use [Table 18](#) to determine pipe size between Y-joints (B in [Figure 14](#), p. 26).)

Table 18. Pipe size between Y-joints, and between Y-joint and MCU: B

Indoor unit total capacity (MBH)	Branch pipe size (OD)		
	Liquid in. (mm)	Gas in. (mm)	High-pressure gas in. (mm)
Less than 51	3/8 (9.52)	5/8 (15.88)	5/8 (15.88)
51-75.9	3/8 (9.52)	3/4 (19.05)	5/8 (15.88)
76-95.9	3/8 (9.52)	7/8 (22.22)	3/4 (19.05)
96-114.9	1/2 (12.70)	1-1/8 (28.58)	3/4 (19.05)
115-153.9	1/2 (12.70)	1-1/8 (28.58)	7/8 (22.22)
154-171.9	5/8 (15.88)	1-1/8 (28.58)	7/8 (22.22)
172-239.9	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)
240-335.9	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)
336-359.9	3/4 (19.05)	1-5/8 (41.28)	1-1/8 (28.58)

Table 18. Pipe size between Y-joints, and between Y-joint and MCU: B (continued)

Indoor unit total capacity (MBH)	Branch pipe size (OD)		
	Liquid in. (mm)	Gas in. (mm)	High-pressure gas in. (mm)
360–460.9	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)
461–577	3/4 (19.05)	1-5/8 (41.28)	1-3/8 (34.92)
Above 577	7/8 (22.22)	2-1/8 (53.98)	1-5/8 (41.28)

Use [Table 19](#), [Table 20](#), and [Table 21](#) to select Y-joints (C, D, and E in [Figure 14](#), p. 26).

Table 19. Outdoor Y-joint between water-source units: C

Outdoor Y-joint between water-source units: C	Model	Application
Outdoor Y-joint for low-pressure gas and liquid lines	4TDK3819B0000A	456 MBH and below
	4TDK4422B0999A	Above 456 MBH
Outdoor Y-joint for high-pressure gas line	4TDK3100B0000A	456 MBH and below
	4TDK3800B0999A	Above 456 MBH

Table 20. First indoor Y-joint according to water-source unit capacity: D

First indoor Y-joint: D	Water-source unit capacity (ton)	Model
Indoor Y-joint for low-pressure gas and liquid lines	6, 8, 10	4YDK2512B0138A
	12	4YDK2812B0160A
	14, 16, 18, 20	4YDK2815B0240A
	22, 24, 26, 28	4YDK3419B0336A
	30, 32, 34, 36, 38	4YDK4119B0468A
	40, 42, 48	4YDK4422B0999A
Indoor Y-joint for high-pressure gas line	6	4YDK1500B0080A
	8–20	4YDK2500B0240A
	22–38	4YDK3100B0468A
	40, 42, 48	4YDK3800B0999A

Table 21. Indoor Y-joint between MCUs or another Y-joint: E

Indoor Y-joints after the first Y-joint: E	Total indoor unit capacity (MBH) ^(a)	Model
Indoor Y-joint	51 MBH and below	4YDK1509B0051A
	52–136	4YDK2512B0138A
	137–154	4YDK2812B0160A
	155–240	4YDK2815B0240A
	241–336	4YDK3419B0336A
	337–461	4YDK4119B0468A
	Above 461 MBH	4YDK4422B0999A
High-pressure gas indoor Y-joint (for heat recovery models)	76 MBH and below	4YDK1500B0080A
	77–240	4YDK2500B0240A
	241–461	4YDK3100B0468A
	Above 461 MBH	4YDK3800B0999A

(a) Y-joints are selected based on downstream indoor unit capacity (first Y-joint will be largest, second Y-joint may be smaller, and so on).

Use [Table 22](#) to determine pipe size between Y-joints and MCUs (F in [Figure 14](#), p. 26).

Table 22. Pipe size between MCUs and indoor units: F

Indoor unit capacity (MBH)	Pipe size (OD): F	
	Liquid in. (mm)	Gas in. (mm)
Less than 20	1/4 (6.35)	1/2 (12.70)
24–52	3/8 (9.52)	5/8 (15.88)
68–78	3/8 (9.52)	3/4 (19.05)
78–96	3/8 (9.52)	7/8 (22.22)

Pipe Thickness and Temper Grade

Table 23 specifies pipe minimum thickness and temper grade based on pipe diameter.

⚠ CAUTION
Risk of Pipes Breaking!
If pipes with a diameter larger than 3/4 in. (19.05 mm) are specified, use semi-hard (C1220T-1/2H) or hard (C1220T-H) copper piping. If a softer copper pipe (C1220T-O) is used, the pipe may break due to its low pressure resistance and cause personal injury.

Table 23. Refrigerant pipe minimum thickness and temper grade

Outer diameter in. (mm)	Minimum thickness in. (mm)	Temper grade
1/4 (6.35)	0.028 (0.70)	Annealed (C1220T-O)
3/8 (9.52)	0.028 (0.70)	
1/2 (12.70)	0.031 (0.80)	
5/8 (15.88)	0.039 (1.00)	
3/4 (19.05)	0.035 (0.90)	
7/8 (22.22)	0.035 (0.90)	Drawn (C1220T-1/2H or C1220T-H)
1 (25.40)	0.039 (1.00)	
1-1/8 (28.58)	0.043 (1.10)	
1-1/4 (31.75)	0.043 (1.10)	
1-3/8 (34.92)	0.048 (1.21)	
1-1/2 (38.10)	0.053 (1.35)	
1-5/8 (41.28)	0.056 (1.43)	
1-3/4 (44.45)	0.063 (1.60)	
2 (50.80)	0.079 (2.00)	
2-1/8 (53.98)	0.083 (2.10)	

Storing Refrigerant Piping

To prevent foreign materials or water from entering the pipe, storing method and sealing method (especially during installation) is very important. Apply correct sealing method depending on the environment (see Table 24).

Table 24. Refrigerant pipe storage factors

Storage location	Storage time	Sealing type
Outdoor	Longer than one month	Pipe pinch
	Shorter than one month	Taping
Indoor	—	Taping

Evacuating Refrigerant

The water-source unit ships with the amount of refrigerant shown in [Table 25](#). Evacuate the unit of all ship-with refrigerant before installing refrigerant piping.

Table 25. Ship-with refrigerant amount by unit type

6 ton unit	8 ton unit	10 ton unit	16 ton unit
12.1 lbs	12.8 lbs	13.2 lbs	21.6 lbs

Installing Refrigerant Piping

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

NOTICE:

System Component Damage!

Do not remove the seal caps from refrigerant connections, or open the service valves until prepared to braze refrigerant lines to the connections. Excessive exposure to atmosphere (> 5 min.) may allow moisture or dirt to contaminate the system, damaging valve seals and causing ice formation in system components.

Overview

1. Cut or extend field-supplied piping as needed. To extend pipes, braze or using flared pipe connections (not supplied). Refer to ["Pipe Cutting," p. 31](#), ["Nitrogen Flushing While Brazing," p. 32](#), and ["Flared Pipe Connections," p. 32](#).)
2. Make sure that pipes are free of dirt, debris, and moisture, and do not leak. (Refer to ["Leak Testing Pipe Connections," p. 52](#)).
3. Braze or use flared pipe connections to install piping. Refer to ["Connecting Piping to the Water-Source Unit," p. 34](#)) and to ["Connecting Water-Source Units with Y-joints," p. 35](#).

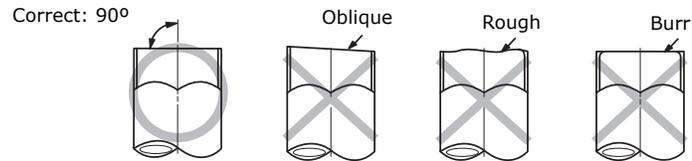
Pipe Cutting

Required tools:

- Pipe cutter
- Reamer
- Pipe holder

1. Using a pipe cutter, cut the pipe so that the cut edge is at 90° to the side of the pipe.
2. Use a reamer to remove all burrs at the cut edge.

See examples of correctly and incorrectly cut pipes.



Nitrogen Flushing While Brazing

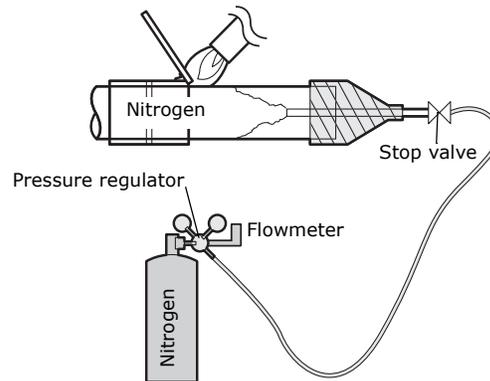
NOTICE

Avoid Unit Damage!

Never braze pipe connections without performing nitrogen flushing. Failure to perform this procedure will damage the unit, resulting in capacity loss and reduced long-term reliability.

While brazing refrigerant pipes, flush them with nitrogen gas. Use a pressure regulator to maintain a flow rate of 1.76 ft³/h (0.05 m³/h) or more.

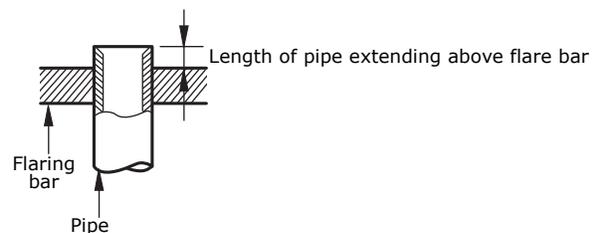
Figure 16. Nitrogen flushing while brazing refrigerant pipes



Flared Pipe Connections

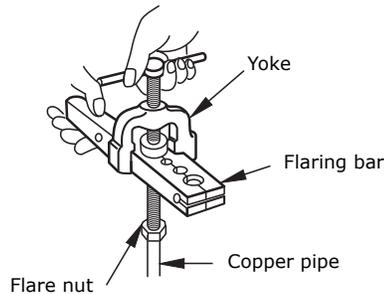
Clutch type and wing nut type flare tools are available for flared pipe connections.

1. Slide the flare nut over the pipe to be flared.
2. Slide the end of the pipe into the hole on the flaring bar that fits the pipe, leaving a length of pipe, determined by tool type (see table), extending above the flaring bar. Clamp it down.



R-410A clutch type	Conventional flare tool	
	Clutch type	Wing nut type
0–0.020 in.	0.04–0.06 in.	0.06–0.08 in.
		

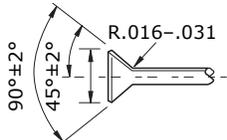
- Attach the yoke to the flaring bar, centering the conical part over the end of the pipe that is extending above the flaring bar.
- Tighten the yoke securely to flare the end of the pipe.



- Remove the pipe. The end of the pipe that you flared should look like the end of a trumpet. See examples of correctly and incorrectly flared pipes.



- Align the pipes and tighten the flare nuts manually and then with a spanner torque wrench, applying the torque according to pipe dimensions:

Outer diameter in. (mm)	Connection torque (ft·lb)	Flare dimension (in.)	Flare shape (in.)
1/4 (6.35)	10.3–13.3	0.34–0.36	
3/8 (9.52)	25.1–31.0	0.50–0.52	
1/2 (12.70)	36.1–45.0	0.64–0.65	
5/8 (15.88)	50.2–60.5	0.76–0.78	

Connecting Piping to the Water-Source Unit

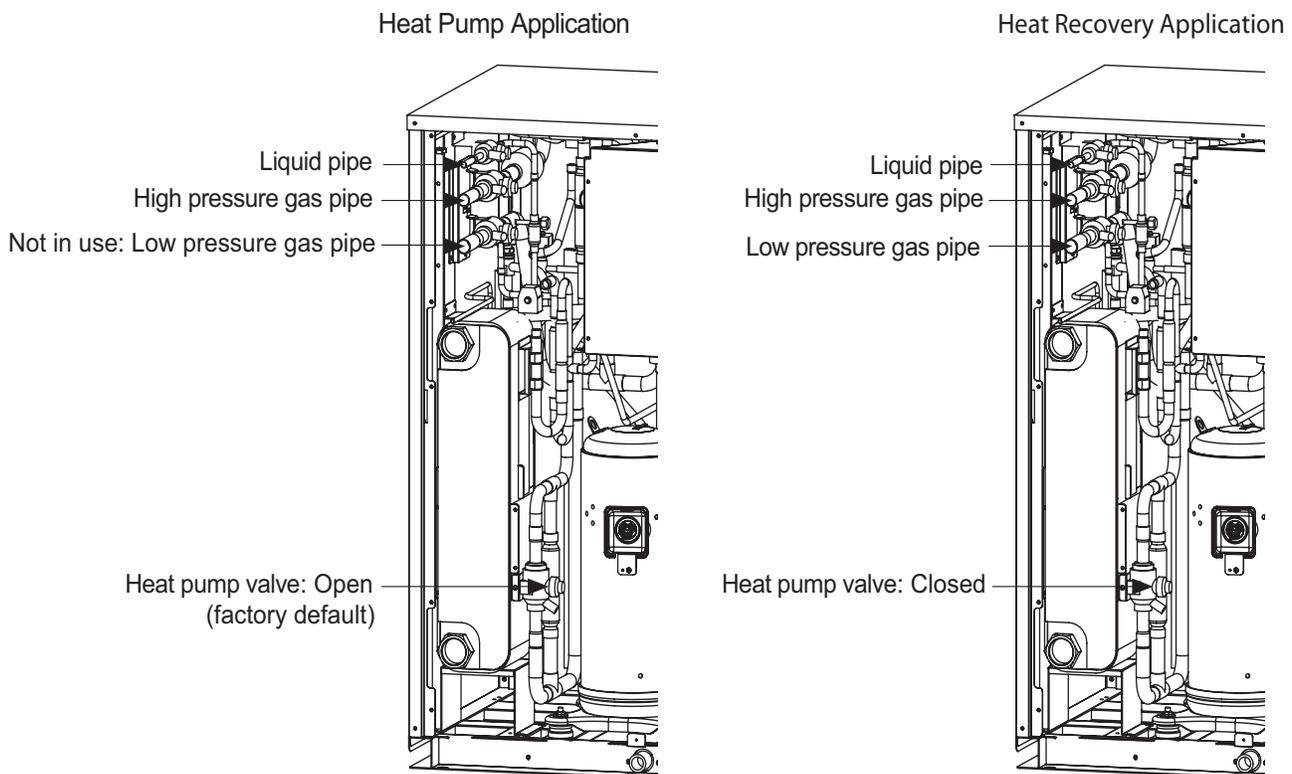
For **heat pump applications**, connect the liquid pipe and the high-pressure gas pipe to an indoor unit.

For **heat recovery applications**, connect the liquid pipe and the high- and low-pressure gas pipes to a mode control unit (MCU). Close the heat pump valve (see [Figure 17](#)) and set the K5 switch to Off (see [Table 41, p. 71](#)).

Note: Refer to the *Mode Control Unit (MCU) installation manual (VRF-SVN42)*.

For module installations, make sure that the heat pump valve and K5 switch on each unit are set correctly for the intended application.

Figure 17. Piping installation for heat pump and heat recovery applications



Important: Ensure that all pipe connections are accessible for servicing and maintenance.

1. Remove the pipe cover from the water-source unit.
2. Connect the pipes to the water-source unit using flared connections or by brazing. If brazing the pipe connection, avoid damaging the service valve by wrapping it with a wet cloth.
 - Avoid damaging the temperature sensor.
 - Ensure that the connected pipes do not touch each other or make contact with the unit.
3. After making electrical connections (see [“Electrical Wiring,” p. 43](#)) and insulating the pipes (see [“Insulating Refrigerant Pipes,” p. 56](#)), replace the pipe cover and close the remaining gap.

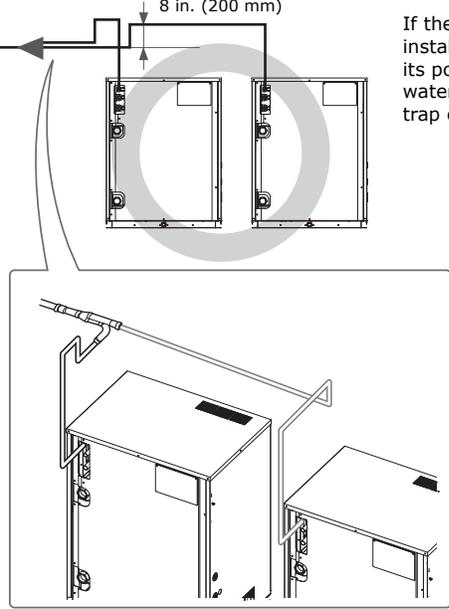
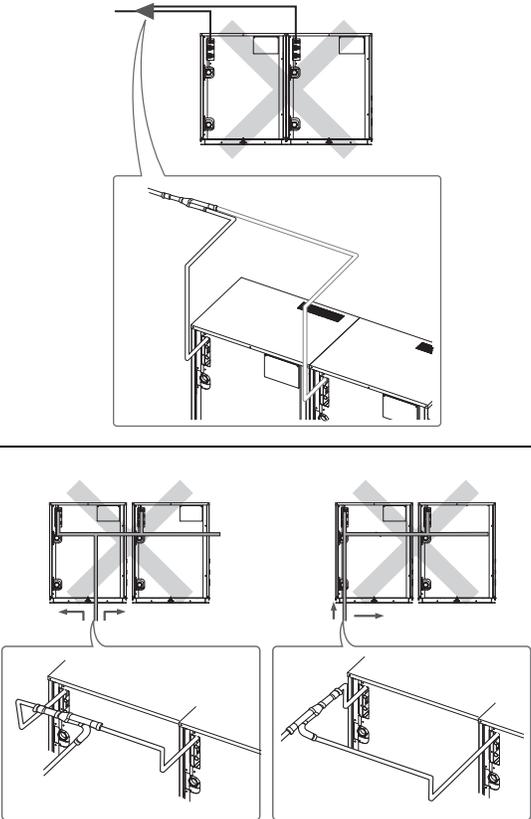
Connecting Water-Source Units with Y-joints

Important: Ensure that all pipe connections are accessible for servicing and maintenance. For optimal refrigerant distribution, use only factory joints.

Install outdoor Y-joints as needed to connect multiple water-source units to one another (refer to Table 26). Install Y-joints as needed to connect water-source units to indoor units. See the branch joint installation manual (VRF-SVN41) for details.

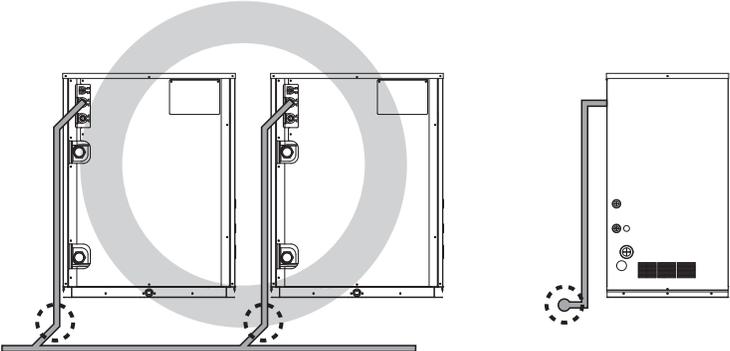
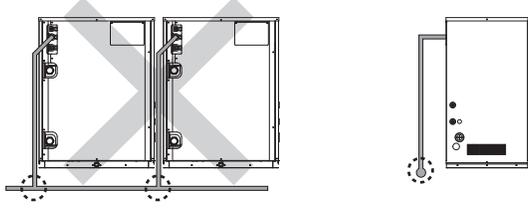
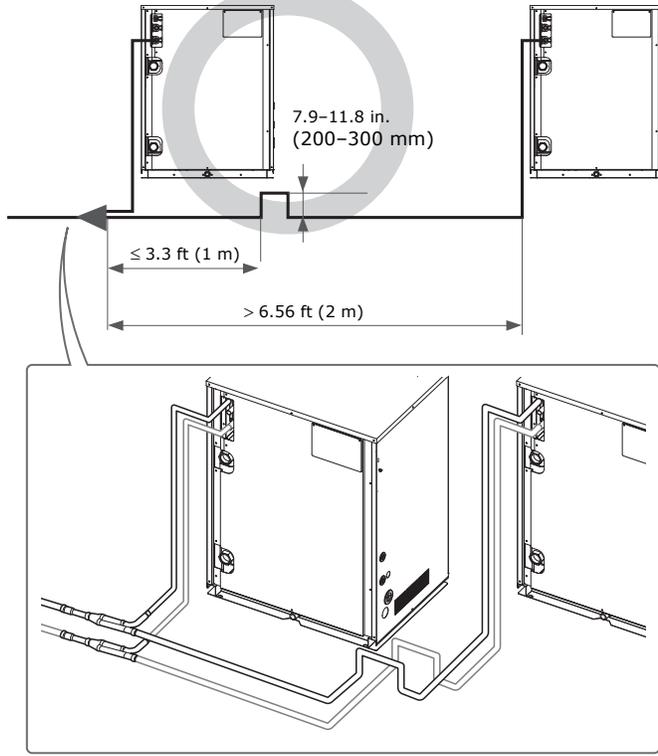
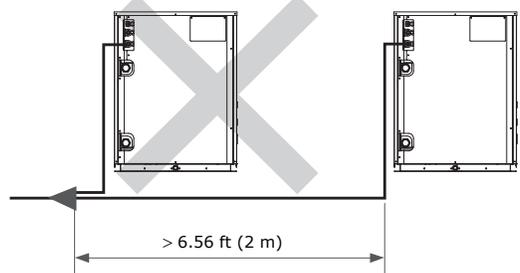
Note: Water-source units can be installed in any order.

Table 26. Connecting water-source units with Y-joints

Correct installation	Incorrect installation
 <p data-bbox="602 821 883 932">If the refrigerant pipe is installed at a higher level than its point of connection to the water-source unit, install a trap on the gas pipe.</p>	

Refrigerant Piping

Table 26. Connecting water-source units with Y-joints (continued)

Correct installation	Incorrect installation
<p>Y-joints between water-source units must be installed horizontally.</p> 	
<p>If the piping length between the water-source unit and the Y-joint exceeds 6.56 ft (2 m), install a vertical trap that is 8–12 in. (200–300 mm) high.</p> 	

Refrigerant Piping Installation Examples: Heat Pump

Notes:

- Y-joints are preferred over distribution headers. Distribution headers should be used only if unable to meet a minimum of 19.5 inches of straight piping entering a Y-joint.
- Install indoor units from largest to smallest capacity starting at the inlet of the distribution header.
- If there are unused ports on a distribution header, pinch off the ports first that are closest to the inlet.

Figure 18. Single installations with Y-joints: Heat pump

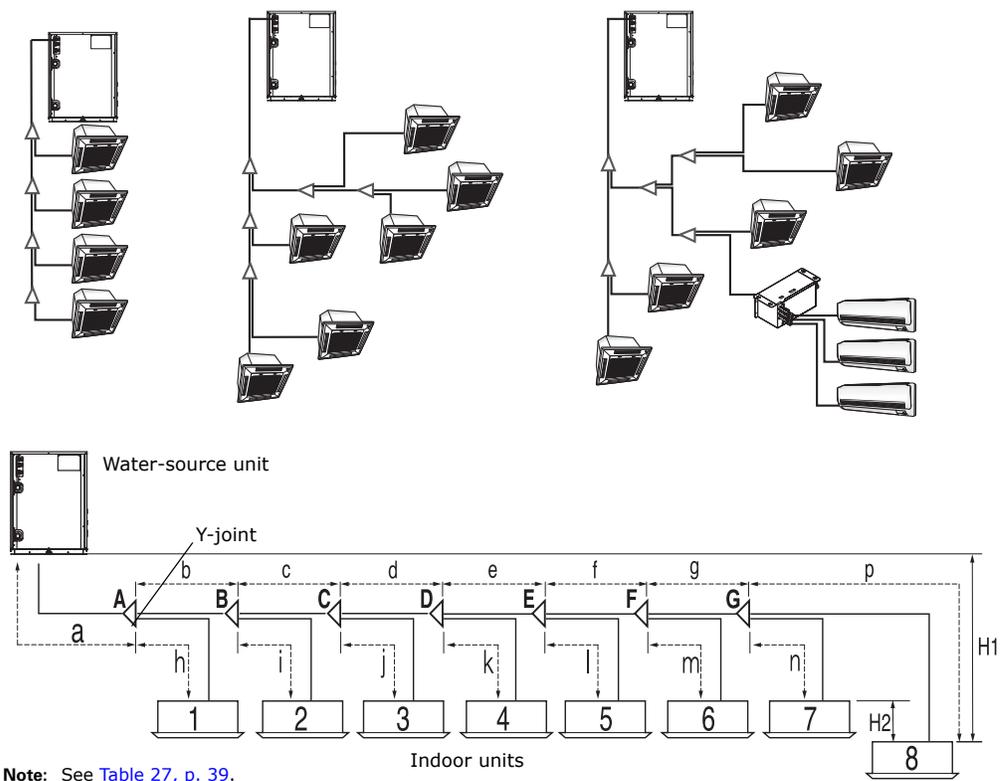


Figure 19. Single installation with distribution header: Heat pump

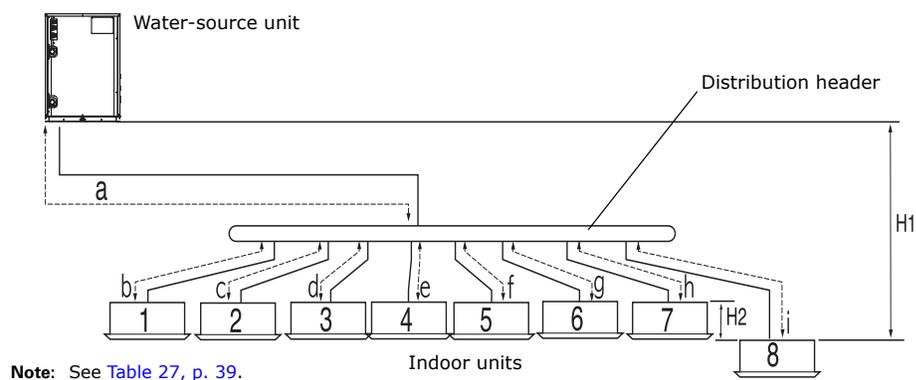


Figure 20. Single installations with Y-joint and distribution header: Heat pump

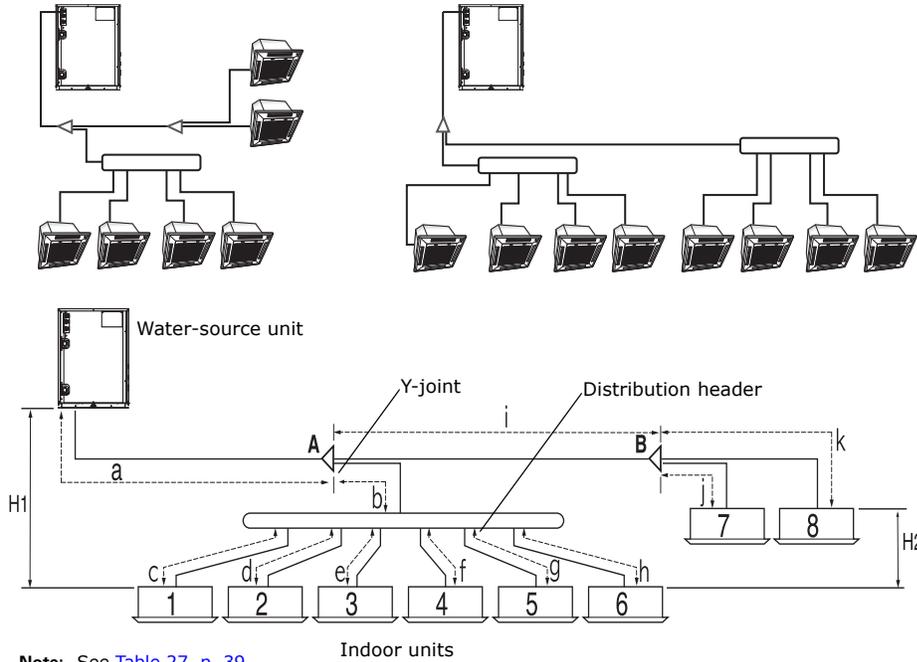


Figure 21. Module installation with Y-joint: Heat pump

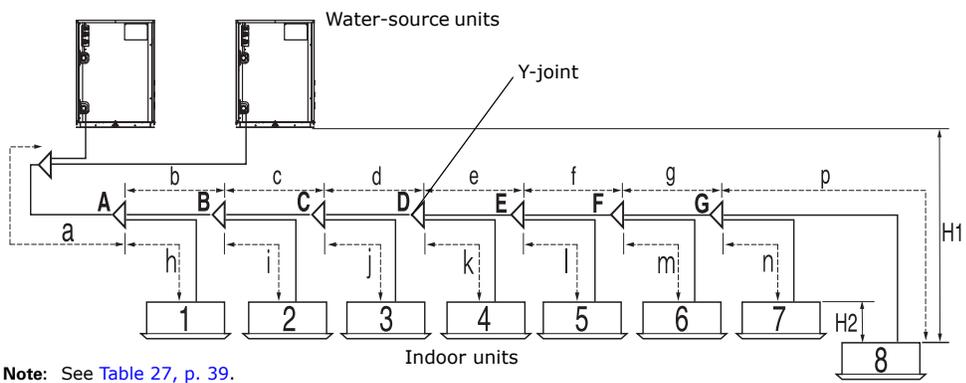


Figure 22. Module installation with distribution header: Heat pump

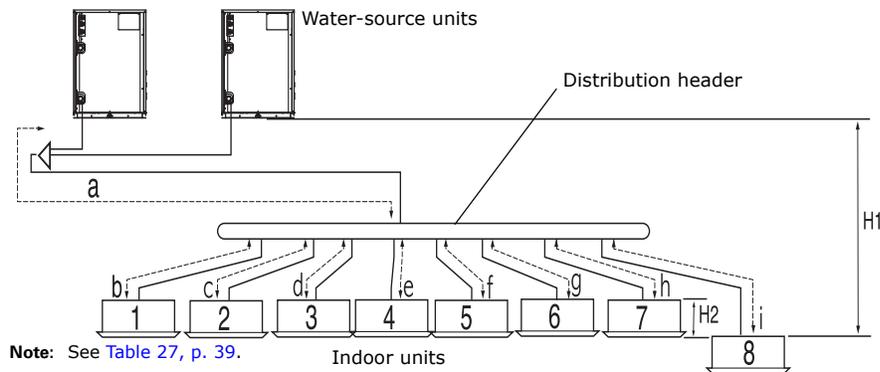
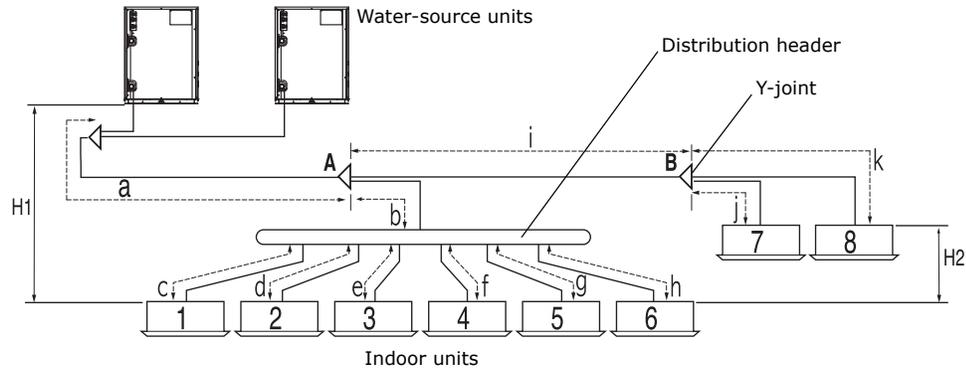


Figure 23. Module installation with Y-joint and distribution header: Heat pump



Note: See Table 27, p. 39.

Table 27. Maximum allowable refrigerant piping length and height differences for heat pump installations

	Piping location	Piping length and height differences ft (m)		Notes/Examples	
Maximum allowable piping length	Water-source unit to indoor unit	Actual length [equivalent length]	558[623] ft and below (170[190] m and below)	Y-joint only	$a+b+c+d+e+f+g+p \leq 558[623]$ ft (170[190] m); see Figure 18, p. 37 and Figure 21, p. 38
				Distribution header only	$a+i \leq 558[623]$ ft (200[220] m) see Figure 19, p. 37 and Figure 22, p. 38
				Y-joint and distribution header	$a+b+h \leq 558[623]$ ft (170[190] m) $a+i+k \leq 558[623]$ ft (170[190] m) see Figure 20, p. 38 and Figure 23, p. 39
		Total piping length	984 ft (300 m) or less	Y-joint only	$a+b+c+d+e+f+g+p+h+i+j+k+l+m+n \leq 984$ ft (300 m) see Figure 18, p. 37 and Figure 21, p. 38
				Distribution header only	$a+b+c+d+e+f+g+p+h+i \leq 984$ ft (300 m); see Figure 19, p. 37 and Figure 22, p. 38
				Y-joint and distribution header	$a+b+c+d+e+f+g+p+h+i+j+k \leq 984$ ft (300 m) see Figure 20, p. 38 and Figure 23, p. 39
Between water-source units (module installation)	Piping length	33 ft (10 m) or less	$r \leq 33$ ft (10 m), $s \leq 33$ ft (10 m), $t \leq 33$ ft (10 m)		
	Equivalent length	43 ft (13 m) or less	$r \leq 43$ ft (13 m), $s \leq 43$ ft (13 m), $t \leq 43$ ft (13 m)		
Maximum allowable piping height difference	Water-source unit to indoor unit	164/131 ft (50/40 m) ^(a)		$H1 \leq 164/131$ ft (50/40 m)	
	Indoor unit to indoor unit	49 ft (15 m) or less		$H2 \leq 49$ ft (15 m)	

Refrigerant Piping

Table 27. Maximum allowable refrigerant piping length and height differences for heat pump installations

	Piping location	Piping length and height differences ft (m)		Notes/Examples
Maximum length after Y-joint	First Y-joint to farthest indoor unit	Piping length	148 ft (45 m) or less	$b+c+d+e+f+g+p \leq 148$ ft (45 m), $i \leq 148$ ft (45 m)
			148–295 ft (45–90 m)	Required conditions must be satisfied (see Table 28, p. 40)
Electronic expansion valve (EEV) kit^(b)	Actual piping length	6.6 ft (2 m) or less	4EEVEVA24SA000 4EEVEVA32SA000	For 1 indoor unit
		66 ft (20 m) or less	4EEVXDA24K132A 4EEVXDA24K200A 4EEVXDA32K200A	For 2 indoor units
			4EEVXDA24K232A 4EEVXDA24K300A 4EEVXDA32K224A 4EEVXDA32K300A	For 3 indoor units

(a) If the indoor unit is at a higher level than water-source unit, the allowable height difference is 131 ft (40 m). If the indoor unit is located at a lower level than the water-source unit, the allowable height difference is 164 ft (50 m). If the height difference exceeds 164 ft (50 m), request engineering support from Trane.

(b) Required for indoor units that do not have internal EEVs. Refer to the EEV kit installation guide (VRF-SVN43) for detailed information.

Table 28. Required conditions (note to [Table 27](#))

	Condition	Example
First Y-joint to farthest indoor unit	$148 \text{ ft (45 m)} \leq b+c+d+e+f+g+p \leq 295 \text{ ft (90 m)}$: branch pipes (b, c, d, e, f, g) size must be increased by 1 size.	
Total length of extended pipe	If the size of the pipe between the first Y-joint and the water-source unit is <i>not</i> increased by 1 size, $a+(b+c+d+e+f+g) \times 2+h+i+j+k+l+m+n+p \leq 984 \text{ ft (300 m)}$	
	If the size of the pipe between the first Y-joint and the water-source unit is increased by 1 size, $(a+b+c+d+e+f+g) \times 2+h+i+j+k+l+m+n+p \leq 984 \text{ ft (300 m)}$	
Each Y-joint to each indoor unit	$h, i, j, \dots p \leq 148 \text{ ft (45 m)}$	
Difference between [the distance of the water-source unit to the farthest indoor unit] and the nearest indoor unit $\leq 148 \text{ ft (45 m)}$, $(a+b+c+d+e+g+p) - (a+h) \leq 148 \text{ ft (45 m)}$		

Refrigerant Piping Installation Examples: Heat Recovery

Figure 24. Single and module installations with Y-joints: Heat recovery

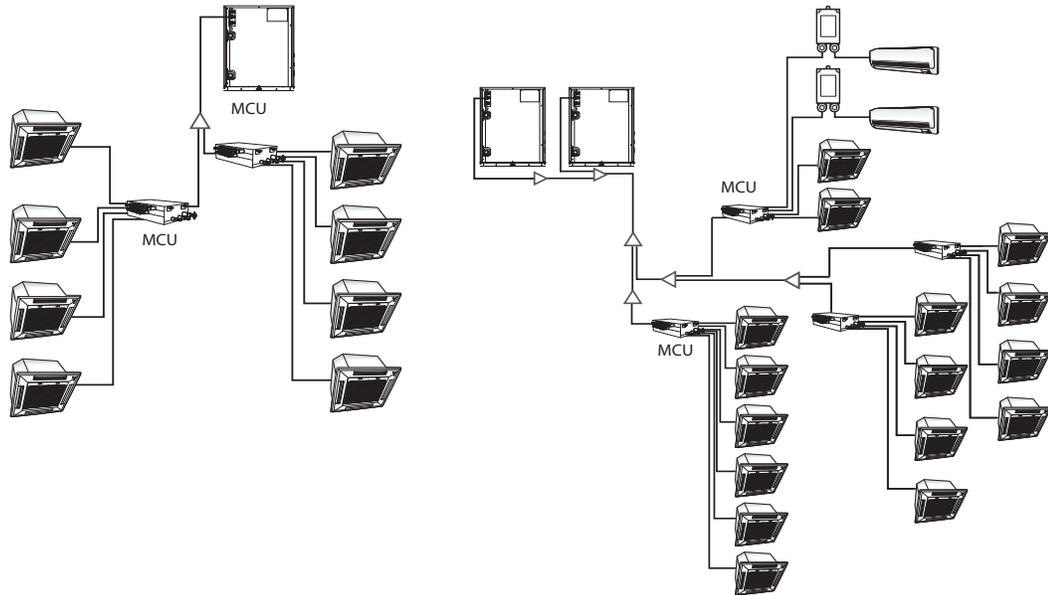
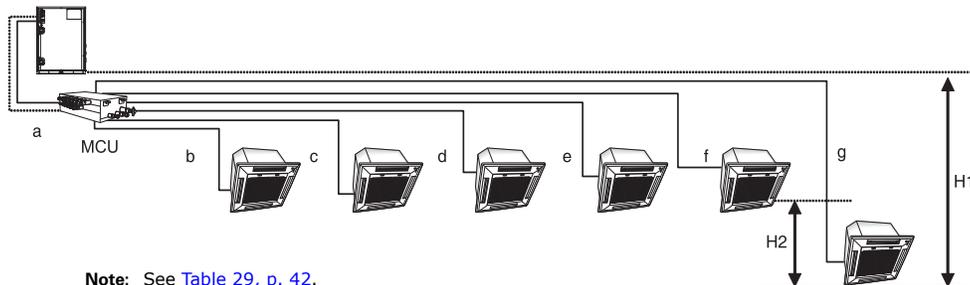
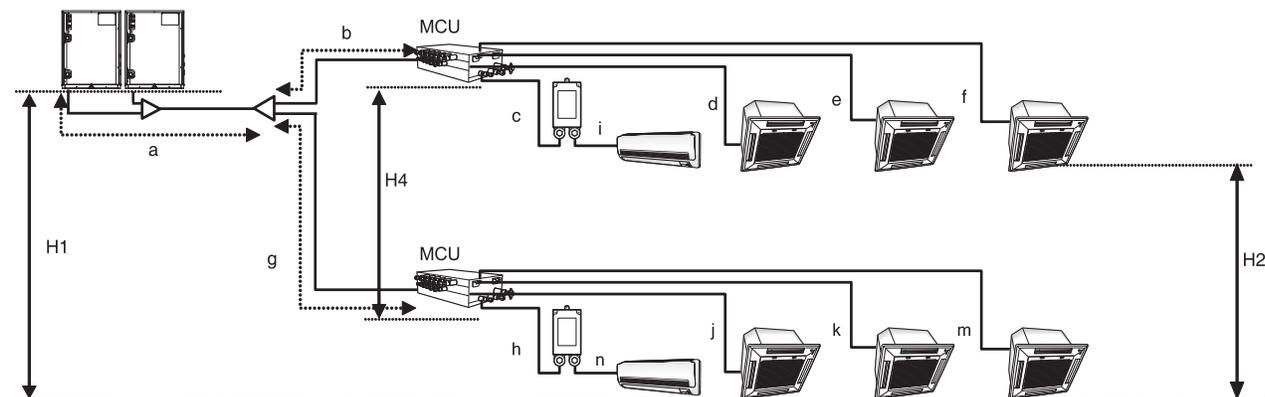


Figure 25. Single installation with MCU: Heat recovery



Note: See Table 29, p. 42.

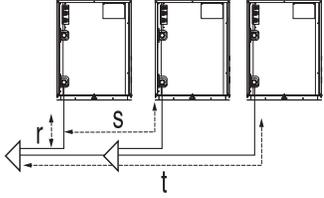
Figure 26. Module installation with MCU and Y-joint: Heat recovery



Note: See Table 29, p. 42.

Refrigerant Piping

Table 29. Maximum allowable refrigerant piping length and height differences for heat recovery installations

	Piping location	Piping length and height differences ft (m)		Notes/Examples	
Maximum allowable piping length	Water-source unit to indoor unit	Piping [equivalent length] ^(a)	558 [623] ft (170 [190] m)	MCU only	$a+b+c+d+e+f+g \leq 558[623]$ ft (170[190] m); see Figure 25, p. 41
				Y-joint and MCU	$a+g+m \leq 558[623]$ ft (170[190] m); Figure 26, p. 41
	Between water-source units (module installation)	Total piping length	984 ft (300 m)	MCU only	$a+b+c+d+e+f+g \leq 984$ ft (300 m); Figure 25, p. 41
				Y-joint and MCU	$a+b+c+d+e+f+g+p+h+i+j+k+m+n \leq 984$ ft (300 m); Figure 26, p. 41
		Piping length	33 ft (10 m)	$r \leq 33$ ft (10 m), $s \leq 33$ ft (10 m), $t \leq 33$ ft (10 m)	
		Equivalent piping length	43 ft (13 m)	$r \leq 43$ ft (13 m), $s \leq 43$ ft (13 m), $t \leq 43$ ft (13 m)	
Maximum allowable piping height difference	Water-source unit to indoor unit	Piping [equivalent length]	164[131] ft (50[40] m) ^(b)	$H1 \leq 164[131]$ ft (50[40] m)	
	Indoor unit to indoor unit		49 ft (15 m) or less	$H2 \leq 49$ ft (15 m)	
	MCU to MCU		49 ft (15 m) or less	$H4 \leq 49$ ft (15 m)	
Maximum allowable length after Y-joint	First Y-joint to farthest indoor unit	Piping length	148 ft (45 m) or less	MCU only	$g \leq 148$ ft (45 m)
				Y-joint and MCU	$g+m \leq 148$ ft (45 m)
EEV kit^(c)	Indoor unit		6.6 ft (2 m) or less	4EEVEVA24SA000 4EEVEVA32SA000	For 1 indoor unit

(a) Equivalent piping length—Y-joint: 1.64 ft (0.5 m); distribution header: 3.28 ft (1 m); MCU: 3.28 ft (1 m).

(b) If the indoor unit is at a higher level than the water-source unit, the allowable height difference is 131 ft (40 m). If the indoor unit is located at a lower level than the water-source unit, the allowable height difference is 164 ft (50 m). If the height difference is >164 ft (50 m), request engineering support from Trane.

(c) Required for indoor units that do not have internal EEVs. Refer to the EEV kit installation guide (VRF-SVN43) for detailed information.

Electrical Wiring

Observe the following precautions when making electrical connections.

WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

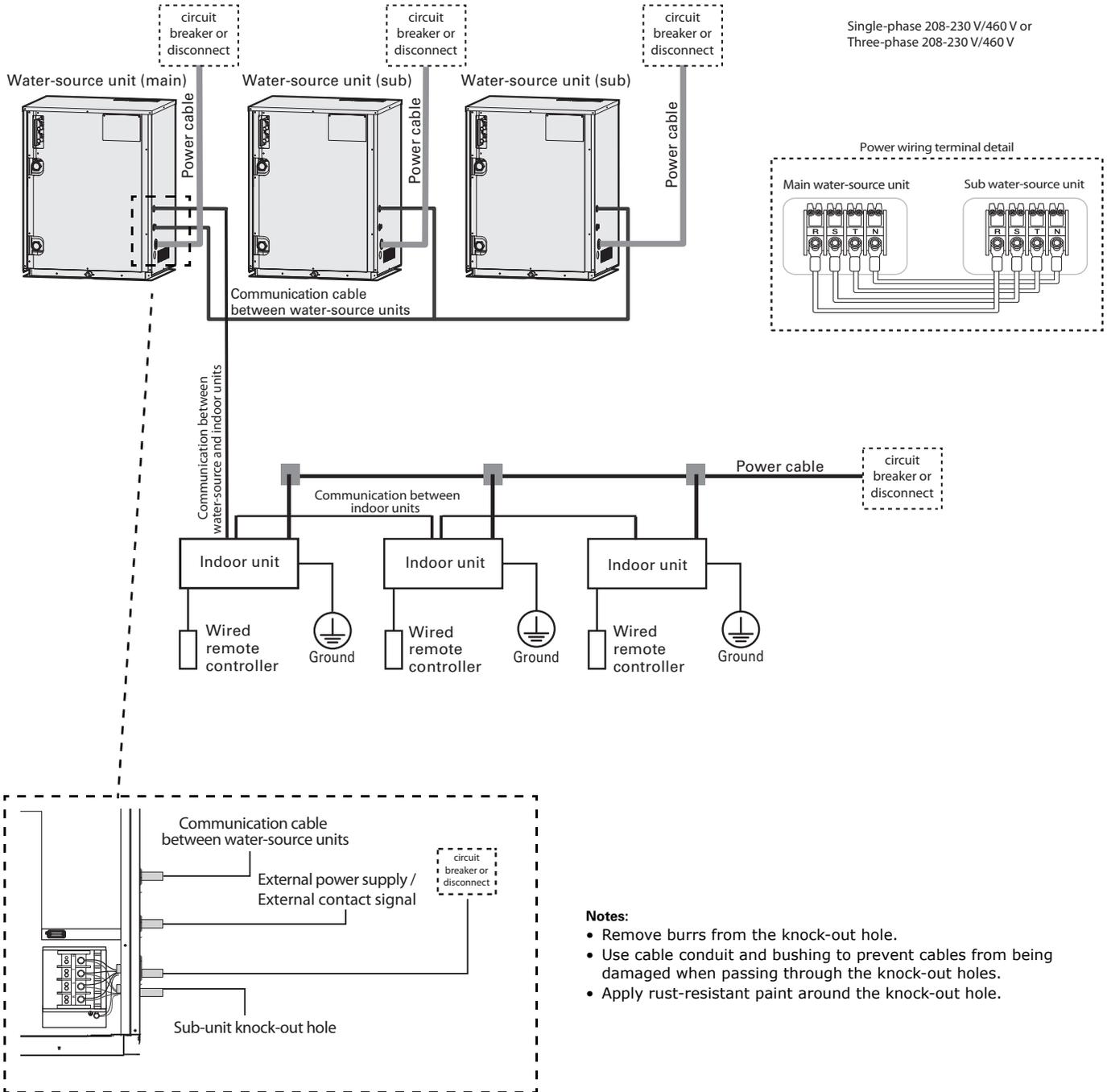
NOTICE

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors could result in equipment damage.

- Make all electrical connections in accordance with electrical codes and ordinances.
- Multi-pole circuit breaker or disconnect is required to fully isolate the unit from all power.
- Install circuit breakers/disconnects in accordance with local and national codes.
- Select the power cable in accordance with relevant local and national regulations.
- Power cable specifications are based on the following conditions: underground/ambient temperature of 86°F (30°C), single multi-conductor cables.
***Note:** If conditions are different from these, consult an electrical installation expert and re-select the power cable. If the length of power cable exceeds 164.04 ft (50 m), re-select the power cable considering the voltage drop.*
- Use a power cable made out of incombustible material for the insulator (inner cover) and the sheath (outer cover).
- All wiring must be protected from weather and damage.
- Do not use power cable that has exposed wire.
- Do not disconnect or change the factory wiring inside the unit.
- Provide strain relief for power and communication cables.
- Unbalanced power must be maintained within 10% of supply rating among all indoor units or the unit will stop and an error code will be generated. (Significantly unbalanced power may shorten the life of the system.)
- Maintain a distance of 2 in. (50 mm) or more between power and communication cables to prevent interference.

Figure 27. Typical system installation wiring



Note: See [Figure 28, p. 46](#) for power cable terminal details and [Figure 31, p. 50](#) for communication wiring terminal details.

Power Wiring

⚠ WARNING

Avoid Risk of Fire or Explosion!

Do not let the power cable come into contact with the pipes inside the water-source unit. If the power supply cable touches the pipes, the vibration of the compressor will be transferred to the pipes and can damage the power supply cables or pipes. The damage could result in fire or explosion, causing death or serious injury.

Follow this procedure:

1. Refer to [Table 31, p. 47](#) and [Table 32, p. 48](#) for power cable and circuit breaker specifications. Refer to [Table 29, p. 42](#) for conduit specifications.
2. Cut the power cable to an appropriate length and connect it to the terminals in the power supply box with a solderless ring terminal (see [Figure 28, p. 46](#)).

Screw	Tightening torque for terminal	Power cable
M4 (indoor units)	0.9–1.1 lbf/ft (1.2–1.5 N·m)	Single-phase 208-230 V/460 V power cable
M8 (water-source units)	4.1–5.4 lbf/ft (5.5–7.3 N·m)	Three-phase 208-230 V/460 V power cable

3. If two cables are connected to one terminal, place the cables back to back with the thin cable upward and the thick cable downward, as shown in the detail in [Figure 28](#).
4. Secure the cable(s) with a cable tie and provide strain relief.
5. Replace the cover on the terminal board.

Note: Make sure that the section of the power supply cable that has the sheath removed is inside the power supply box. If this is not possible, connect the power cable conduit to the power supply box.

Table 30. Cable conduit specifications

Name	Temper grade	Application conditions
Flexible PVC conduit	PVC	If conduit is installed indoors and not exposed to outside elements (embedded in concrete)
Class 1 flexible conduit	Galvanized steel sheet	If conduit is installed indoors but exposed to outside elements
Class 1 PVC-coated flexible conduit	Galvanized steel sheet and soft PVC compound	If conduit is installed outdoors and requires waterproofing

6. Pull the power cable through the designated knock-out at the bottom right of the water-source unit (see [Figure 27, p. 44](#) for details).

Figure 28. Power wiring terminal connections

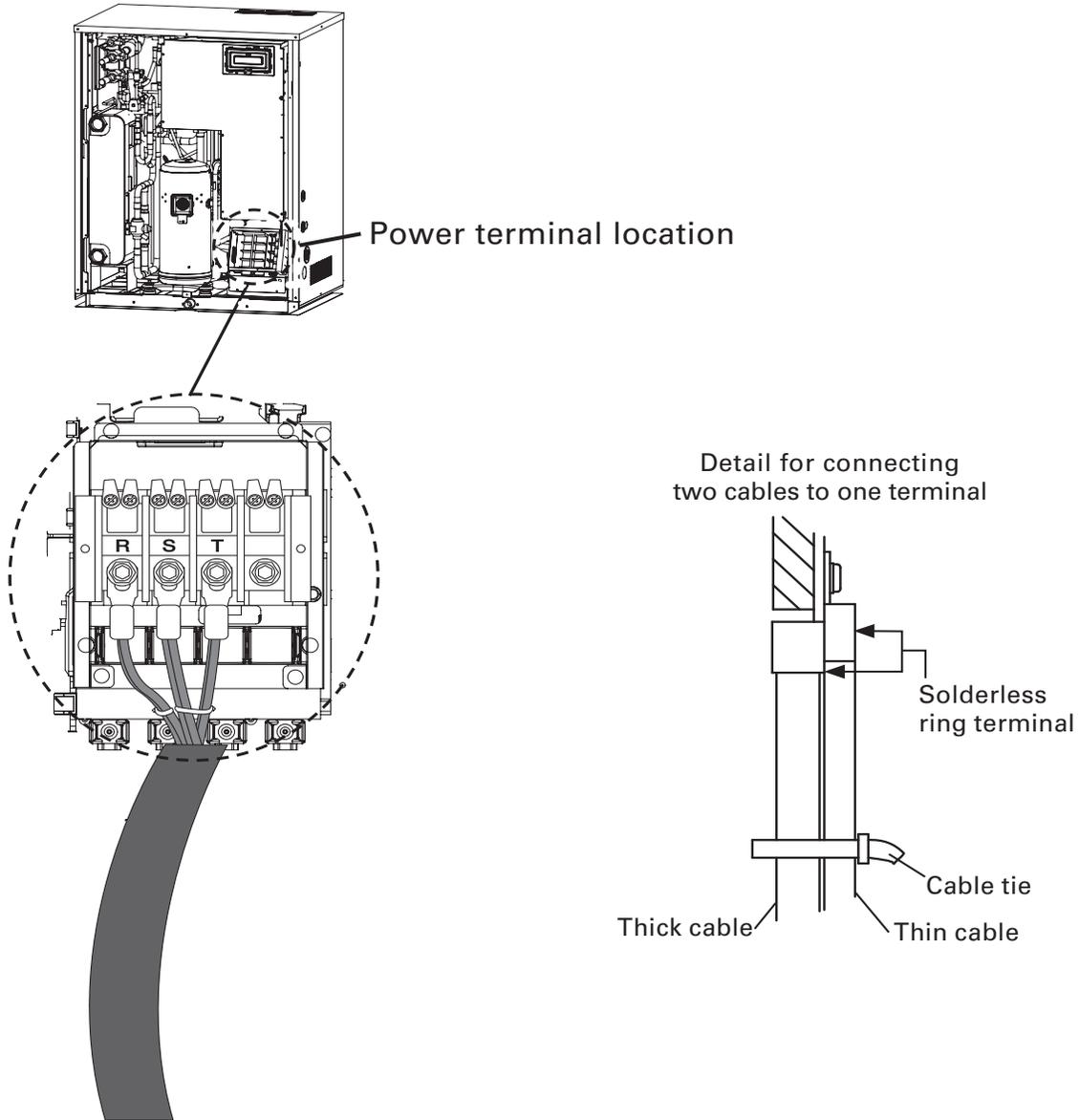


Table 31. Circuit breaker and power cable specifications—Water-source units: 208–230 V

Capacity	Model	Units		Module 1				Module 2				Module 3			
				RLA		Power supply		RLA		Power supply		RLA		Power supply	
		Hz	V	Comp1	Comp2	MCA	MOP	Comp1	Comp2	MCA	MOP	Comp 1	Comp 2	MCA	MOP
6 ton	4TVP0072B300NB	60	208/230	12.8		16	25								
8 ton	4TVP0096B300NB	60	208/230	18.4		23	40								
10 ton	4TVP0120B300NB	60	208/230	24		30	50								
12 ton	4TVP0144B300NB	60	208/230	12.8		16	25	12.8		16	25				
14 ton	4TVP0168B300NB	60	208/230	12.8		16	25	18.4		23	40				
16 ton	4TVP0192B300NB	60	208/230	17.6	17.6	39.6	50								
18 ton	4TVP0216B300NB	60	208/230	18.4		23	40	24		30	50				
20 ton	4TVP0240B300NB	60	208/230	24		30	50	24		30	50				
21 ton	4TVP0252B300NB	60	208/230	N/A											
22 ton	4TVP0264B300NB	60	208/230	12.8		16	25	17.6	17.6	39.6	50				
24 ton	4TVP0288B300NB	60	208/230	18.4		23	40	17.6	17.6	39.6	50				
26 ton	4TVP0312B300NB	60	208/230	24		30	50	17.6	17.6	39.6	50				
28 ton	4TVP0336B300NB	60	208/230	12.8		16	25	12.8		16	25	17.6	17.6	39.6	50
29 ton	4TVP0348B300NB	60	208/230	N/A											
30 ton	4TVP0360B300NB	60	208/230	12.8		16	25	18.4		23	40	17.6	17.6	39.6	50
32 ton	4TVP0384B300NB	60	208/230	17.6	17.6	39.6	50	17.6	17.6	39.6	50				
34 ton	4TVP0408B300NB	60	208/230	18.4		23	40	24		30	50	17.6	17.6	39.6	50
36 ton	4TVP0432B300NB	60	208/230	24		30	50	24		30	50	17.6	17.6	39.6	50
38 ton	4TVP0456B300NB	60	208/230	12.8		16	25	17.6	17.6	39.6	50	17.6	17.6	39.6	50
40 ton	4TVP0480B300NB	60	208/230	18.4		23	40	17.6	17.6	39.6	50	17.6	17.6	39.6	50
42 ton	4TVP0504B300NB	60	208/230	24		30	50	17.6	17.6	39.6	50	17.6	17.6	39.6	50
48 ton	4TVP0576B300NB	60	208/230	17.6	17.6	39.6	50	17.6	17.6	39.6	50	17.6	17.6	39.6	50

Notes:

- RLA is based on AHRI 1230 cooling standard condition (indoor temperature: 80°F (26.7°C) DB/67°F (19.46°C) WB; outdoor temperature: 95°F (35°C) DB.
- Voltage tolerance is ± 10%.
- Maximum allowable voltage between phases is 2%.
- Refer to module combination table for independent units information.
- Abbreviations: RLA: Rated load ampere; MCA: Minimum circuit amperes ; MOP: Maximum overcurrent protective device (amperes).

Electrical Wiring

Table 32. Circuit breaker and power cable specifications—Water-source units: 460 V

Capacity	Model	Units		Module 1				Module 2				Module 3			
				RLA		Power supply		RLA		Power supply		RLA		Power supply	
		Hz	V	Comp1	Comp2	MCA	MOP	Comp 1	Comp 2	MCA	MOP	Comp 1	Comp 2	MCA	MOP
6 ton	4TVP0072B400NB	60	460	8		10	15								
8 ton	4TVP0096B400NB	60	460	8.8		11	15								
10 ton	4TVP0120B400NB	60	460	12.5		15.6	25								
12 ton	4TVP0144B400NB	60	460	8		10	15	8		10	15				
14 ton	4TVP0168B400NB	60	460	8		10	15	8.8		11	15				
16 ton	4TVP0192B400NB	60	460	11.6	11.6	26.2	35								
18 ton	4TVP0216B400NB	60	460	8.8		11	15	12.5		15.6	25				
20 ton	4TVP0240B400NB	60	460	12.5		15.6	25	12.5		15.6	25				
21 ton	4TVP0252B400NB	60	460	N/A											
22 ton	4TVP0264B400NB	60	460	8		10	15	11.6	11.6	26.2	35				
24 ton	4TVP0288B400NB	60	460	8.8		11	15	11.6	11.6	26.2	35				
26 ton	4TVP0312B400NB	60	460	12.5		15.6	25	11.6	11.6	26.2	35				
28 ton	4TVP0336B400NB	60	460	8		10	15	8		10	15	11.6	11.6	26.2	35
29 ton	4TVP0348B400NB	60	460	N/A											
30 ton	4TVP0360B400NB	60	460	8		10	15	8.8		11	15	11.6	11.6	26.2	35
32 ton	4TVP0384B400NB	60	460	11.6	11.6	26.2	35	11.6	11.6	26.2	35				
34 ton	4TVP0408B400NB	60	460	8.8		11	15	12.5		15.6	25	11.6	11.6	26.2	35
36 ton	4TVP0432B400NB	60	460	12.5		15.6	25	12.5		15.6	25	11.6	11.6	26.2	35
38 ton	4TVP0456B400NB	60	460	8		10	15	11.6	11.6	26.2	35	11.6	11.6	26.2	35
40 ton	4TVP0480B400NB	60	460	8.8		11	15	11.6	11.6	26.2	35	11.6	11.6	26.2	35
42 ton	4TVP0504B400NB	60	460	12.5		15.6	25	11.6	11.6	26.2	35	11.6	11.6	26.2	35
48 ton	4TVP0576B400NB	60	460	11.6	11.6	26.2	35	11.6	11.6	26.2	35	11.6	11.6	26.2	35

Notes:

- RLA is based on AHRI 1230 cooling standard condition (indoor temperature: 80°F (26.7°C) DB/67°F (19.46°C) WB; outdoor temperature: 95°F (35°C) DB.
- Voltage tolerance is ± 10%.
- Maximum allowable voltage between phases is 2%.
- Refer to module combination table for independent units information.
- Abbreviations: RLA: Rated load ampere; MCA: Minimum circuit amperes ; MOP: Maximum overcurrent protective device (amperes).

Grounding

Important: Grounding must be done by a qualified electrician.

Refer to water-source unit grounding examples (Figure 29) and to grounding resistance requirements (Table 32).

Figure 29. Water-source unit grounding examples

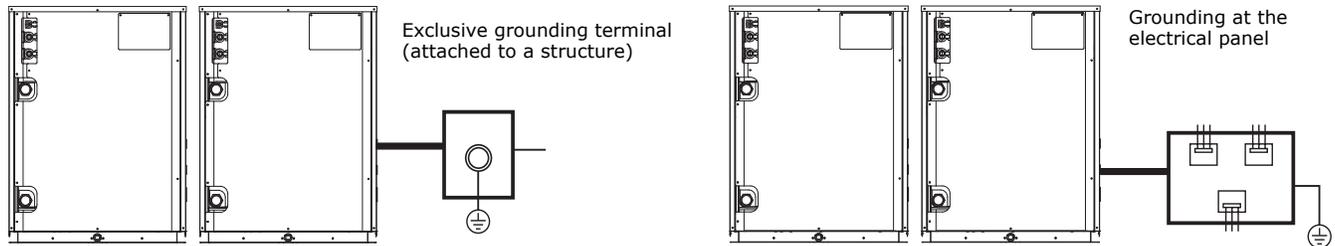
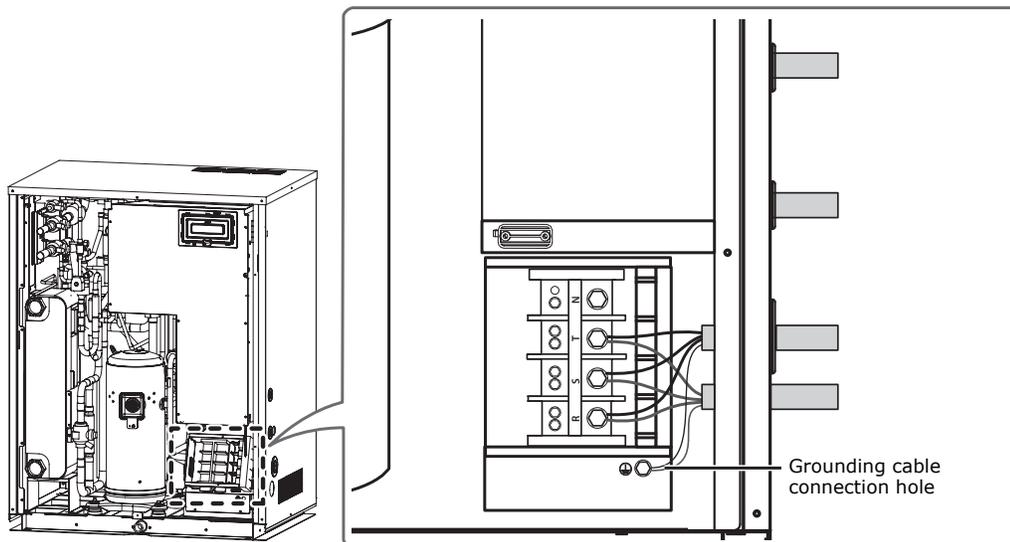


Table 33. Grounding resistance requirements

Power condition at installation site	High or average humidity	Low humidity
Voltage to ground is ≤ 150 V	<ul style="list-style-type: none"> Ensure that the grounding resistance is $<100 \Omega$. If a circuit breaker is installed that disconnects the circuit within 0.5 seconds, the allowable grounding resistance is 30–500 Ω. 	<ul style="list-style-type: none"> Ideally, grounding resistance should be $<100 \Omega$ and should not exceed 250 Ω.
Voltage to ground is > 150 V	<ul style="list-style-type: none"> Ensure that the grounding resistance is $<100 \Omega$. If a circuit breaker is installed that disconnects the circuit within 0.5 seconds, the allowable grounding resistance is 30–500 Ω. 	<ul style="list-style-type: none"> Ensure that the grounding resistance is $<100 \Omega$. If a circuit breaker is installed that disconnects the circuit within 0.5 seconds, the allowable grounding resistance is 30–500 Ω.

1. Select rated grounding cable by referring to the water-source unit power cable specifications (Table 30, p. 45 and Table 31, p. 47).
2. Connect the grounding cable to the grounding hole inside the power supply box (see Figure 30 for details).

Figure 30. Grounding cable connection location



Communications Wiring

Refer to [Table 30, p. 45](#) for conduit specifications.

Refer to BAS-SVX51 for communication wiring specifications and best practices.

⚠ WARNING

Hazardous Voltage!

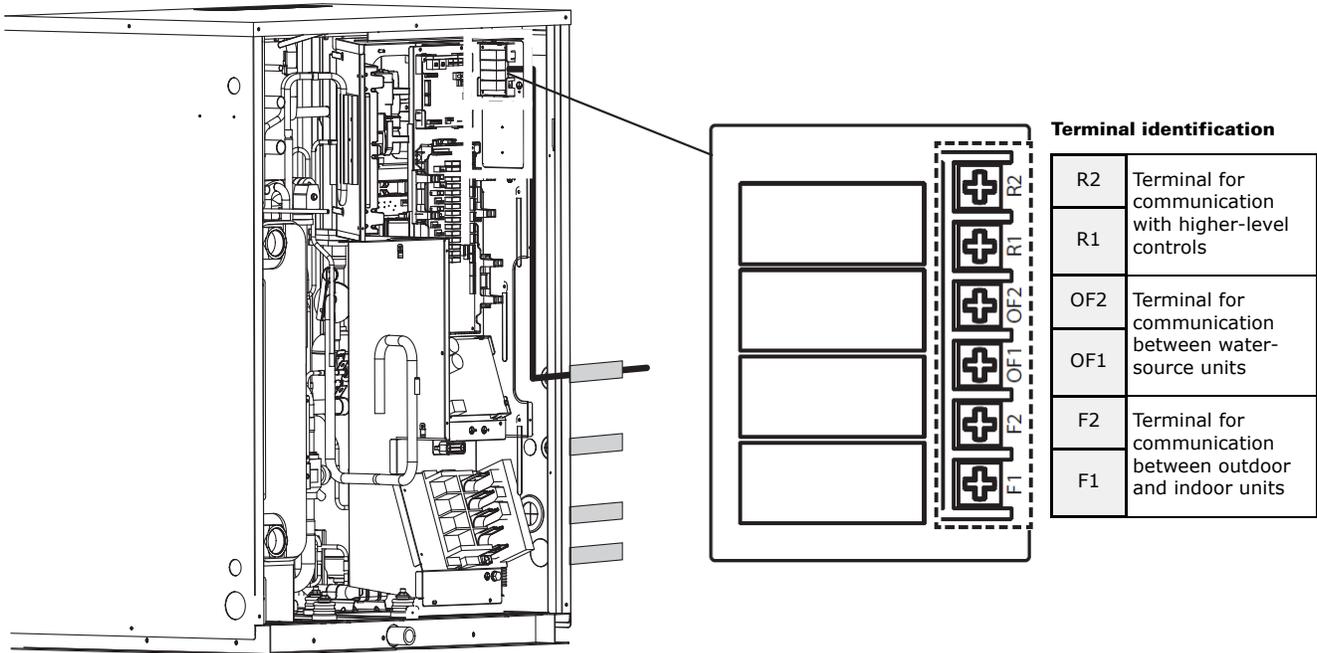
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Connect the communications wiring as shown in [Figure 31](#).

Notes:

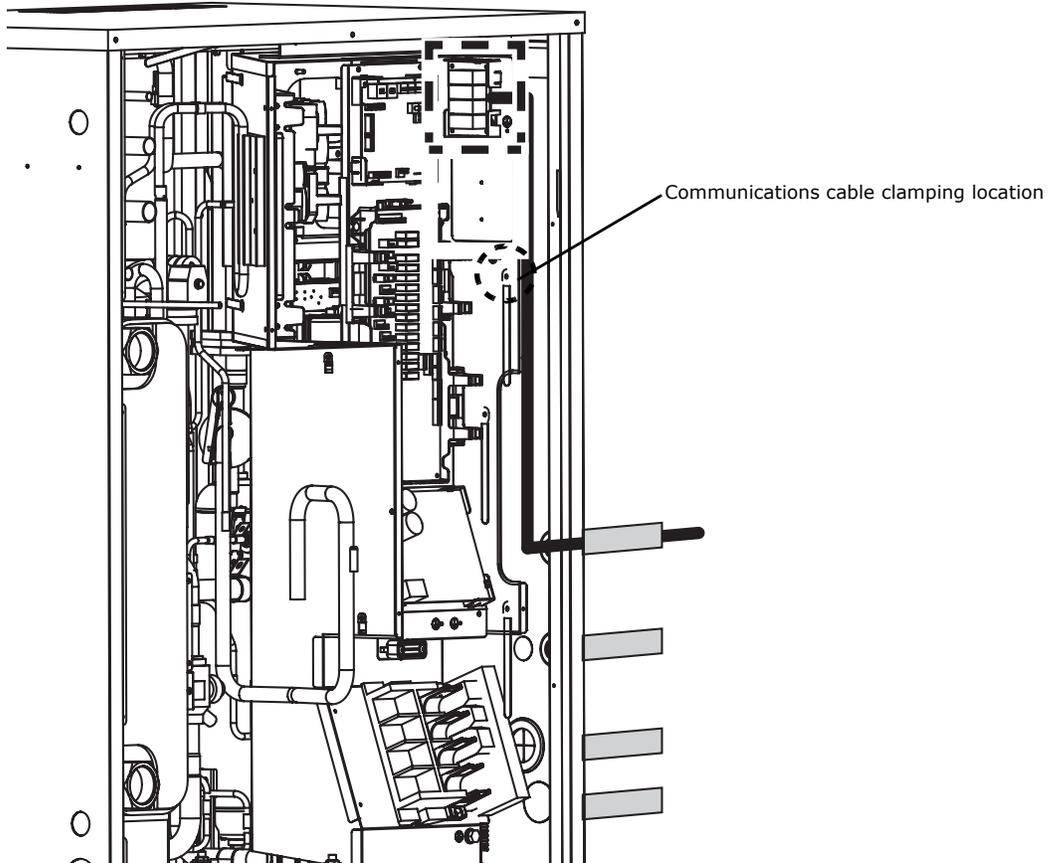
- Ensure that more than 1 in. (20 mm) of the outer sheath of the power and communication cable conduit are inside the electrical component box.
- To reduce interference, ensure that power and communication cables run in parallel or, if crossing is necessary, cross at 90 degrees.
- The communication cable between water-source units and between indoor and water-source units has no polarity.

Figure 31. Communications board and wiring terminals



2. To provide strain relief, secure the communications cable with a clamp in the location shown in [Figure 32, p. 51](#).
3. Pull the communications cable through the designated knock-out at the bottom right of the water-source unit.

Figure 32. Communications cable clamping location



Leak Testing Pipe Connections

Before leak testing pipe connections, read all safety precautions and notes.

⚠ WARNING

Confined Space Hazards!

Do not work in confined spaces where refrigerant or other hazardous, toxic or flammable gas may be leaking. Refrigerant or other gases could displace available oxygen to breathe, causing possible asphyxiation or other serious health risks. Some gases may be flammable and or explosive. If a leak in such spaces is detected, evacuate the area immediately and contact the proper rescue or response authority. Failure to take appropriate precautions or to react properly to such potential hazards could result in death or serious injury.

⚠ WARNING

Explosion Hazard!

Never use an open flame to detect gas leaks. It could result in an explosion. Use a leak test solution for leak testing. Failure to follow recommended safe leak test procedures could result in death or serious injury or equipment or property-only-damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units. Failure to follow these recommendations could result in death or serious injury or equipment or property-only damage.

Do not exceed unit nameplate design pressures when leak testing system. Failure to follow these instructions could result in an explosion causing death or serious injury.

NOTICE

Refrigerant Pipe Damage!

When performing a leak test, use a pressure regulator to prevent an excess amount of nitrogen (over 594.6 psi [4.1 MPa]) from entering the pipes. If the pipe is filled with over the specified amount of nitrogen in a short time, pipes may be damaged.

- All required pipe leak testing must be completed in accordance with national and/or local codes.
- Use R-410A refrigerant gas as a tracer for leak detection.
- Use oil-pumped dry nitrogen to develop required test pressures.
- Use tools for R-410A refrigerant.
- Perform the leak test with the water-source unit service valves closed.
- Do not remove the Schrader core from the service valves.
- Leak test only one circuit at a time to minimize system exposure to potentially harmful moisture in the air.

To perform the test:

1. Connect the refrigerant manifold gauge hoses to the liquid side and gas side service ports on the unit, and connect the center hose to a nitrogen gas tank fitted with a pressure regulator (see [Figure 33, p. 53](#) (heat pump) and [Figure 34, p. 53](#) (heat recovery)).
2. Fill the lines with nitrogen as described:
 - a. To 72 psi (0.5 MPa) for 5 minutes.
 - b. Then, to 220 psi (1.5 MPa) for 5 minutes.

- c. Then, to 590 psi (4.1 MPa) for 24 hours.
3. If the pressure drops for any reason other than verifiable temperature fluctuations, check for leaks and repair them. Use soapy water to check for leaks; bubbles will form if joints are not tight.
4. Release pressure in pipelines gradually.
5. Repair leaks.
6. Repeat the previous steps until the pressure remains constant.
7. Maintain 145 psi (1.0 MPa) of pressure at least 15 minutes. If the pressure drops
8. When testing is finished, remove hoses from service ports.

Figure 33. Leak testing pipe connections: Heat pump

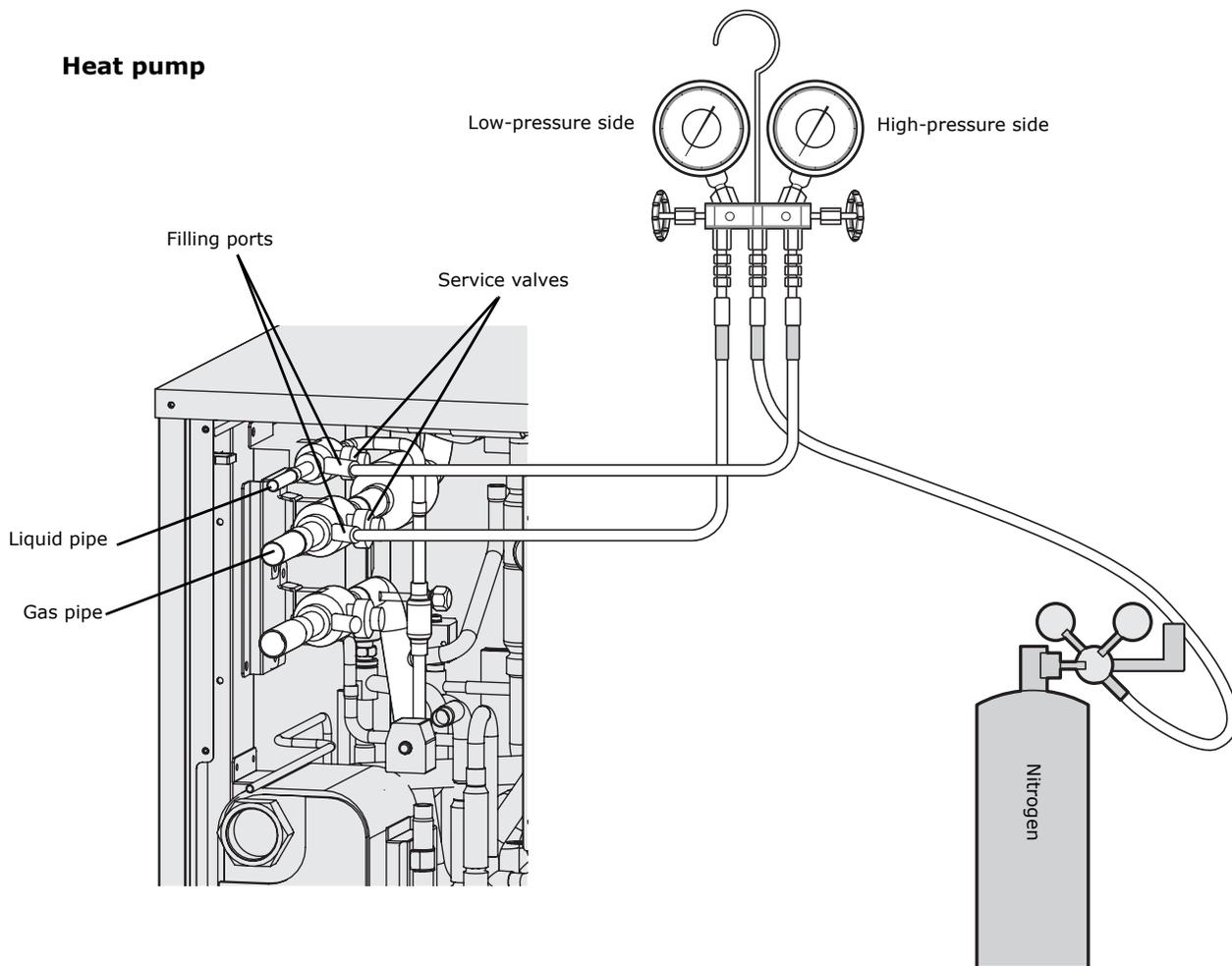
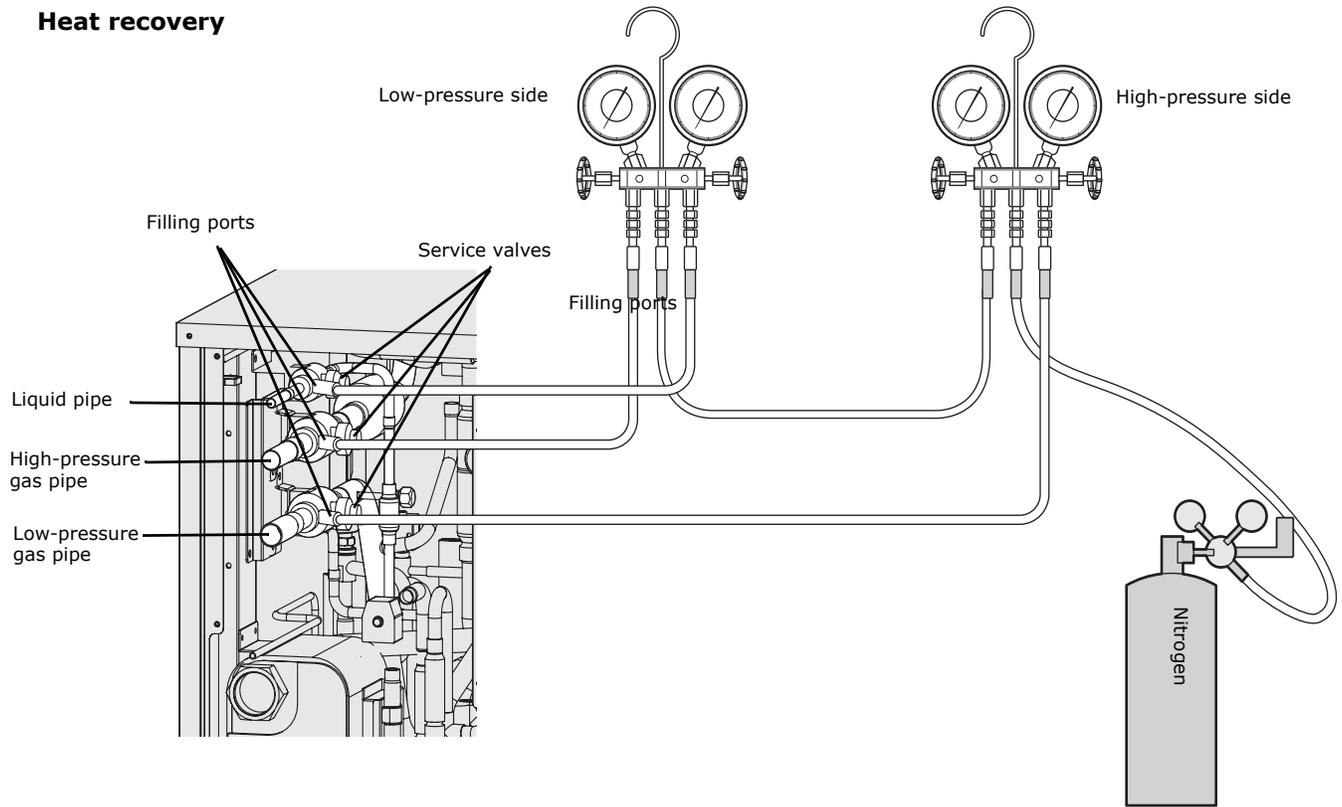


Figure 34. Leak testing pipe connections: Heat recovery

Leak Testing Pipe Connections

Heat recovery

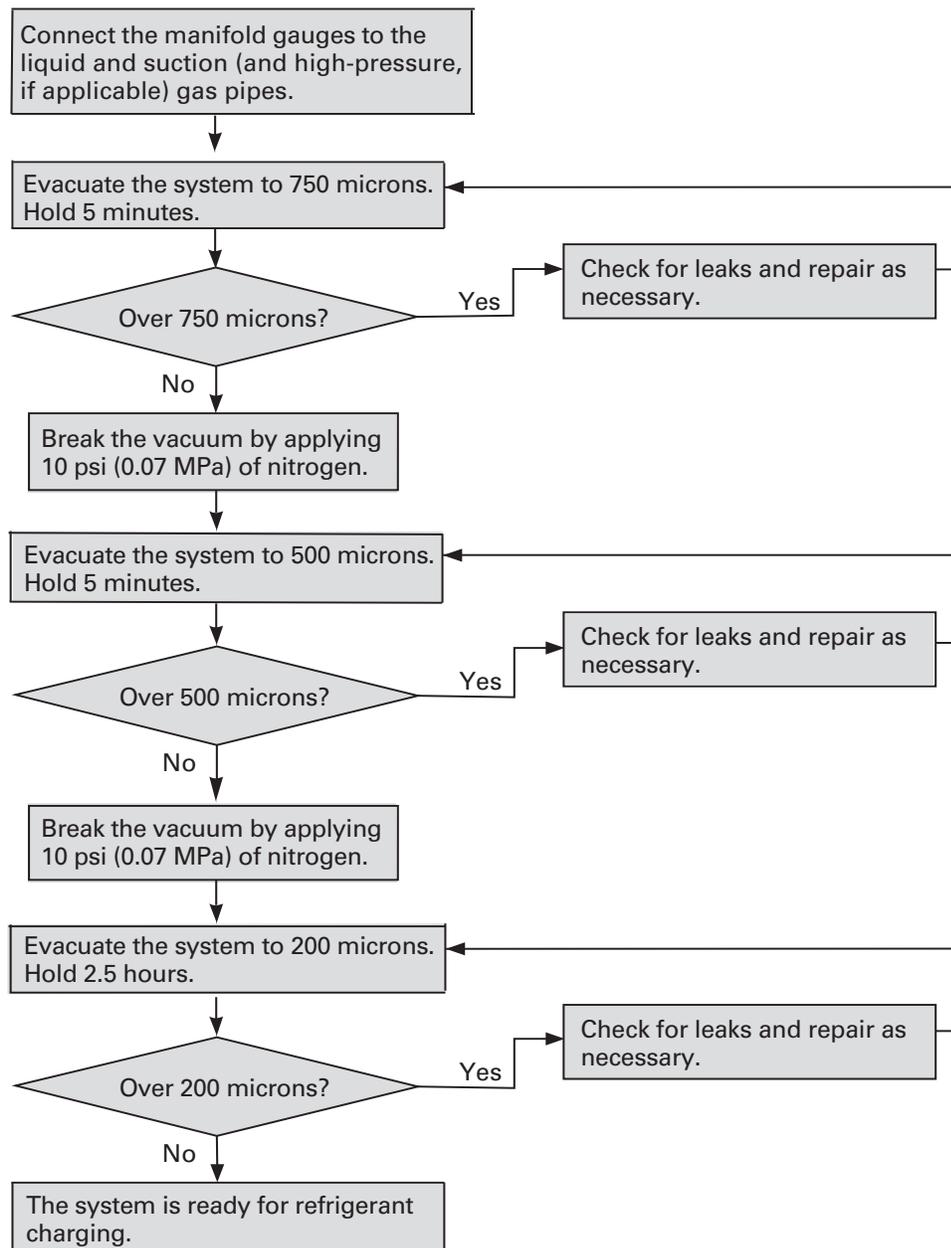


Vacuum Drying

After performing a leak test, use a vacuum pump to triple evacuate the system as described in the following flow chart:

Notes:

- Use vacuum rated hoses.
- Use a vacuum pump that allows vacuuming to 200 microns.
- Use a vacuum pump with a check valve to prevent pump oil from flowing backward while the vacuum pump is closed.
- Completely close the liquid-gas side service valve of the water-source unit.



Insulating Refrigerant Pipes

After determining that there are no leaks in the refrigerant pipes, insulate them as described:

1. Use [Table 34](#) to select the insulation thickness according to pipe size and humidity conditions.

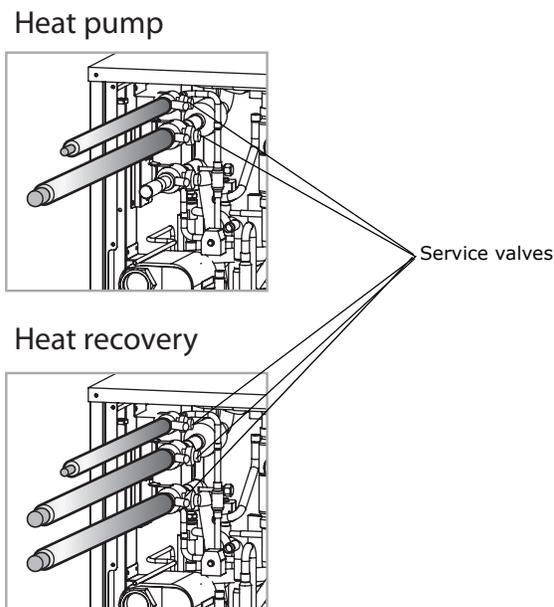
Table 34. Pipe insulation selector

Pipe	Pipe size in. (mm)	Insulation Type	
		Standard conditions 86°F (30°C) < 85%	High humidity conditions ^(a) 86°F (30°C) ≥ 85%
		EPDM or NBR (in. (mm))	
Liquid pipe	1/4 (6.35) – 3/8 (9.52)	3/8 (9)	3/8 (9)
	1/2 (12.70) – 2 (50.80)	1/2 (13)	1/2 (13)
Gas pipe ^(b)	1/4 (6.35)	1/2 (13)	3/4 (19)
	3/8 (9.52) – 1 (25.40)	3/4 (19)	1.0 (25)
	1-1/8 (28.58) – 1-3/4 (44.45)		1-1/4 (32)
	2 (50.80)	1.0 (25)	1-1/2 (38)

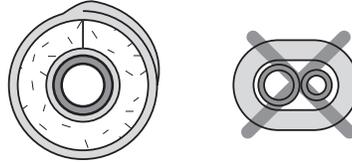
(a) When installing insulation in any of the following environments, use insulation required for high humidity conditions: Buildings with close proximity to bodies of water or hot springs or on the side of a hill in which the building is partly covered by earth; ceilings frequently exposed to moisture such as in restaurants, saunas, swimming pools, and corridors of dormitories or studios near a frequently-used outdoor exit; buildings with no ventilation system.
 (b) Internal temperature of gas pipe is higher than 248°F (120°C).

2. Wrap insulation around the entire surface of each pipe, including the refrigerant pipes from the indoor unit to the service valves inside the water-source unit, the Y-joints, distribution header, and connection points on each pipe.

Note: For details on insulating Y-joints and distribution headers, refer to the branch joint installation manual (VRF-SVN41).

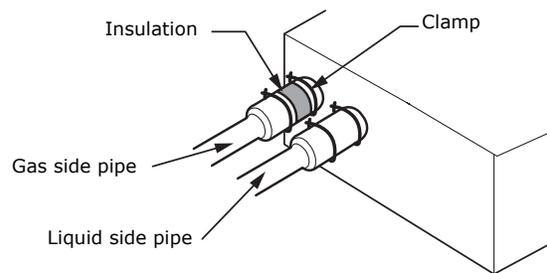


- Do not wrap the gas and liquid refrigerant pipes together.



- Overlap insulation to avoid gaps.
- Avoid compressing the insulation as much as possible.
- Be sure there are no cracks or deformities in the insulation at bends in pipes.
- If necessary double the insulation to prevent condensation from forming in warm or humid areas.

3. Clamp insulation tightly to the pipes.



4. Cut off excess insulation.

Refrigerant

After successful leak testing and vacuum drying, charge the system with refrigerant as explained in this section.

Calculating the Refrigerant

The initial refrigerant quantity (given in [Table 35, p. 58](#)) is charged into the unit at the factory. Calculate the total amount of additional refrigerant using [Table 36, p. 58](#) through [Table 38, p. 59](#).

Table 35. Initial refrigerant quantity for each water-source unit model

Model	4TVP0072*****	4TVP096*****	4TVP120*****	4TVP192*****
Initial refrigerant quantity: lb (kg)	12.1 (5.5)	12.8 (5.8)	13.2 (6.0)	21.6 (9.8)
Note: Add the initial refrigerant quantity shown in this table to the refrigerant calculated in Table 36 through Table 38, p. 59 .				

Table 36. Refrigerant quantity according to liquid pipe diameter and length (a)

Diameter of liquid pipe: in. (mm)	1/4 (6.35)	3/8 (9.52)	1/2 (12.7)	5/8 (15.88)	3/4 (19.05)	7/8 (22.23)	1 (25.4)
Additional refrigerant quantity: lb/ft (kg/m)	0.013 (0.02)	0.040 (0.06)	0.084 (0.125)	0.121 (0.18)	0.181 (0.27)	0.235 (0.35)	0.356 (0.53)

Note: For an indoor unit with a factory-installed EEV, the quantity of refrigerant in addition to the quantity based on the unit capacity ([Table 35](#)) is 0.0067 lb/ft regardless of the pipe size.

Table 37. Refrigerant quantity for each indoor unit (b)

Model	Capacity (MBH)													
	7.5	9	9.5	12	18	20	24	30	36	42	48	60	76.8	96
	Refrigerant quantity: lb (kg)													
1-way cassette (4TVE00**B100NB)	0.55 (0.25)		0.55 (0.25)	0.55 (0.25)										
Mini 4-way cassette (4TVB00**B100NB)			0.64 (0.29)	0.64 (0.29)	0.82 (0.37)	0.82 (0.37)								
4-way cassette (4TVC00**B100NB)		0.99 (0.45)		0.99 (0.45)	0.99 (0.45)		0.99 (0.45)	1.52 (0.69)	1.52 (0.69)		1.52 (0.69)			
Slim duct (4TVL00**B100NB)	0.77 (0.35)		0.77 (0.35)	0.77 (0.35)	0.99 (0.45)		0.99 (0.45)	0.93 (0.42)	0.93 (0.42)		1.37 (0.62)			
MSP duct (4TVD00**B100NB)					0.62 (0.28)		0.62 (0.28)	1.19 (0.54)	1.19 (0.54)		1.50 (0.68)			
HSP duct (4TVA00**B100NB)									1.50 (0.68)		1.50 (0.68)		2.60 (1.18)	2.60 (1.18)
High-wall with EEV (4TVW00**B100NB/C)	0.53 (0.24)		0.53 (0.24)	0.53 (0.24)	0.79 (0.36)	0.79 (0.36)	0.79 (0.36)							
Convertible ceiling/floor (4TVX00**B100NB)					0.86 (0.39)		0.86 (0.39)							
Convertible AHU (4TVM00**B100NB)					2.10 (0.95)		2.10 (0.95)	2.10 (0.95)	2.10 (0.95)	2.70 (1.22)	2.70 (1.22)	3.50 (1.59)		

- Notes:**
- Additional refrigerant charging of MCU is 1.1 lb (0.5 kg) for every MCU kit.
 - For an indoor unit with an AHU kit, add 0.04 lb (0.018 kg) of refrigerant for 1 MBH capacity of the AHU kit.

Table 38. Calculation example for refrigerant amount additional to basic unit amount

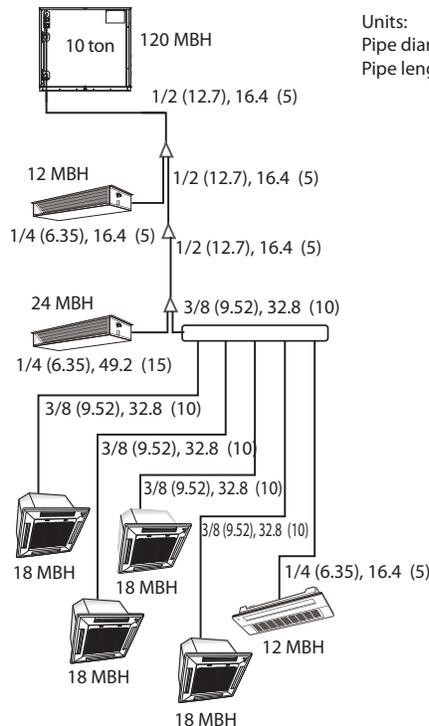
Liquid pipe (a) diameter in. (mm)	Pipe length (ft)	Refrigerant amount (lb/ft) from Table 35, p. 58	Additional refrigerant amount (lb)	Total additional refrigerant (lb)
	(1)	(2)	(1) x (2)	
1/4 (6.35)	82	0.013	1.07	11.76
3/8 (9.52)	164.0	0.040	6.56	
1/2 (12.70)	49.2	0.084	4.13	

Indoor unit (b) model	Number of units	Refrigerant amount (lb/each) from Table 36, p. 58	Additional refrigerant amount (lb)	Total additional refrigerant (lb)
	(1)	(2)	(1) x (2)	
4-way cassette (4TVC0018B100NB)	4	0.99	3.96	6.27
Slim duct (4TVL0024B100NB)	1	0.99	0.99	
Slim duct (4TVL0012B100NB)	1	0.77	0.77	
1-way cassette (4TVE0012B100NB)	1	0.55	0.55	

Notes:

- The total amount of refrigerant in the system must not exceed 220 lb (100 kg). If the refrigerant weight exceeds this amount, separate the modules into smaller modules (or units) so that the maximum weight is not exceeded. For example, for 4TVP0120B*00NB, the basic amount of refrigerant is 13.2 lb (6.0 kg). Therefore, the total amount of additional refrigerant (a) + (b) should not exceed 206.8 lb (94.0 kg).
- For each MCU kit, additional refrigerant charging is 1.1 lb (0.5 kg).
- For an indoor unit with an AHU kit, add 0.04 lb (0.018 kg) of refrigerant for 1 MBH capacity of the AHU kit.

Example:



Units:
Pipe diameter: in. (mm)
Pipe length: f (m)

Note: For heat recovery systems, add 1.1 lb (0.5 kg) additional refrigerant for each MCU kit.

Charging Refrigerant

After calculating the correct amount of refrigerant needed by the system (see ["Calculating the Refrigerant," p. 58](#)), charge the system as described in the following procedure and in [Figure 35](#).

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Do not heat the refrigerant container to speed up the charging process. An explosion could result, resulting in death or serious injury.

NOTICE

Risk of Unit Malfunction!

Do not leave the front panel open while charging refrigerant. If the front panel is open, the amount charged into the unit will be incorrect.

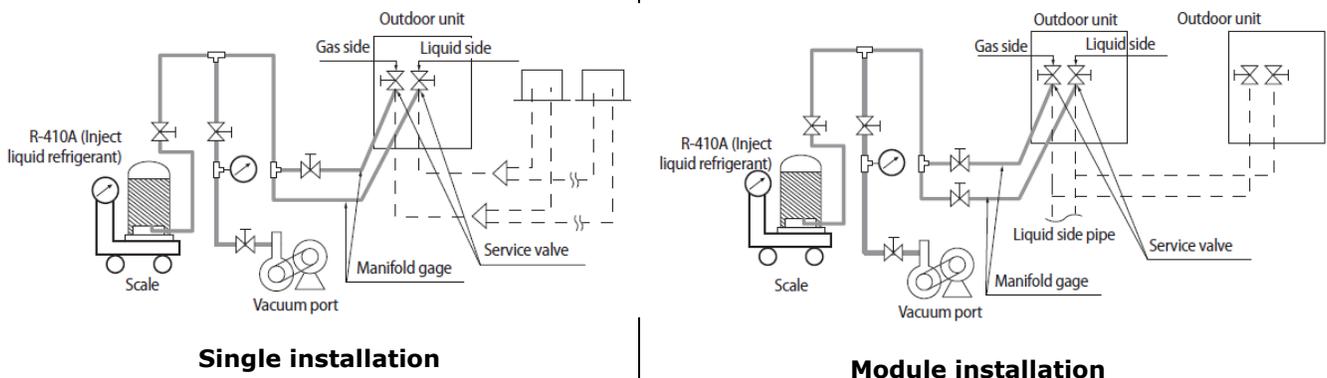
NOTICE

Unit Component Damage!

Open the gas side and liquid side service valves completely after charging the refrigerant. If you operate the unit with the service valves closed, the unit may be damaged.

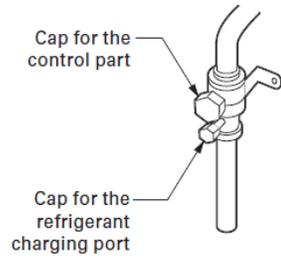
1. Attach the liquid manifold hose to the liquid side service port and open the manifold gauge valve.
2. Add the liquid refrigerant, making sure the refrigerant bottle is held in an upright position. Use a scale to determine that the correct amount has been added.
3. Close the refrigerant container immediately after adding the refrigerant.
4. If you are unable to add all of the refrigerant needed into the liquid side, close the liquid side service port and remove the liquid manifold hose.
5. Attach the gas manifold hose to the gas side service port and open the manifold gauge valve.

Figure 35. Charging additional refrigerant



6. Press K2 once to initiate refrigerant charging in cooling mode.
7. To determine if the amount of refrigerant added is correct, use the automatic refrigerant function (see ["Refrigerant Amount Detection Operation," p. 81](#)).

8. After charging the refrigerant, close both caps as shown in the figure below.
- Tightening torque for refrigerant port cap: 7.4–8.9 lbf-ft (10–12 N-m)
 - Tightening torque for control cap: 14.8–18.4 lbf-ft
 - Opening/closing torque for the valve (> 3/4 in. [19.05 mm]): 7.4 lbf-ft (10 N-m)



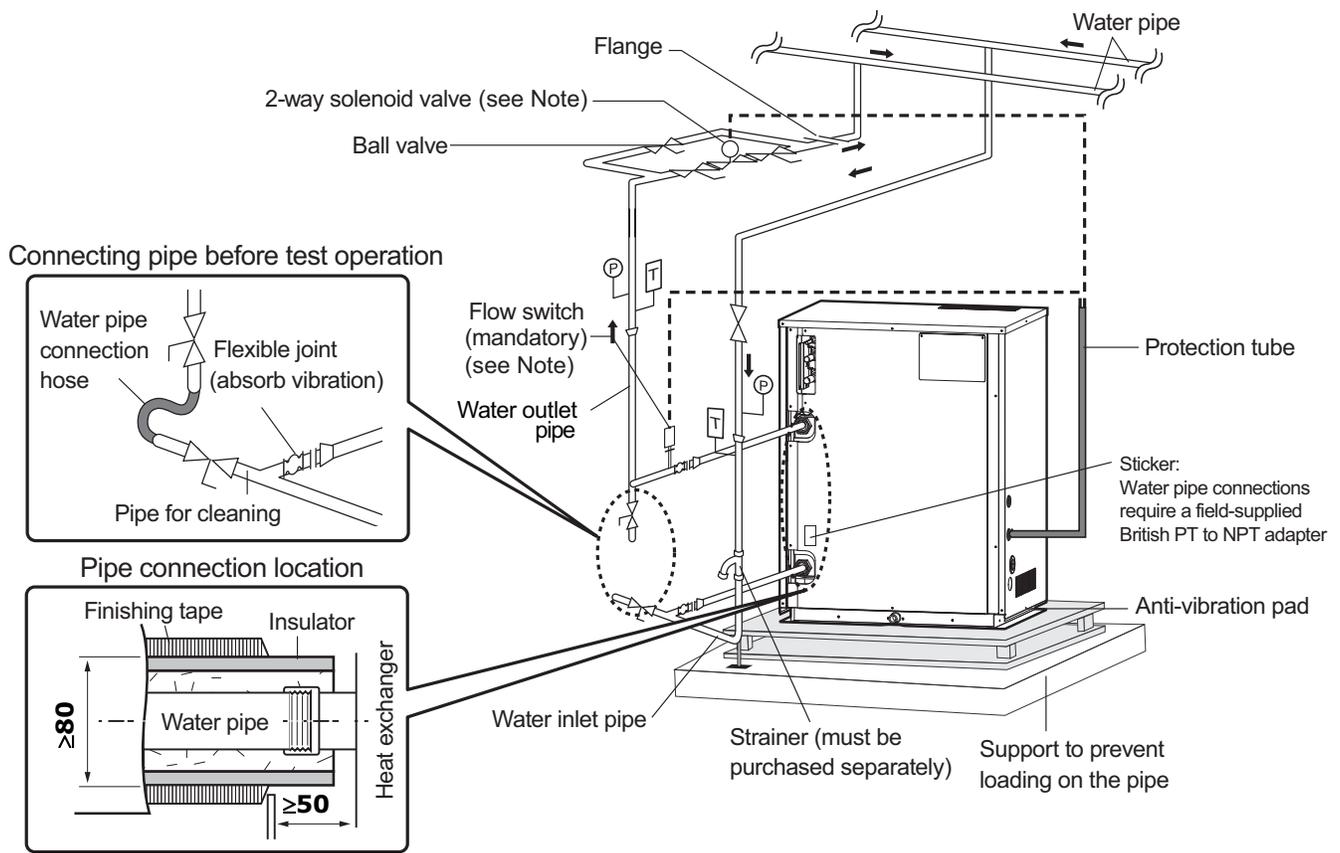
Water Pipe Installation

For water pipe installation, refer to the following recommendations.

NOTICE

Avoid Equipment Damage!
 For unit protection, a closed-circuit cooling tower or indirect water pipe circuit structure is recommended. If an open-circuit cooling tower is used, use an intermediate heat exchanger and make sure that the supplied heat source water system is closed circuit.

Figure 36. Water pipe installation



Note: The mandatory flow switch and the 2-way solenoid valve must be at least equivalent to the specification recommended in "External Contact Connection," p. 65, and they should be installed horizontally.

Table 39. Operating environment

Type	Circulating water	Operation	Inlet water temperature		Remarks
			Main usage range	Usage range limit	
Heat source water	Water loop	Cooling	68–95°F (20–35°C)	50–113°F (10–45°C)	Refer to "Cooling Water Management," p. 84
		Heating			
Ground heat source	Ground loop	Cooling	59–95°F (15–35°C)	50–113°F (10–45°C)	
		Heating	41–77°F (5–25°C)	23–113°F (-5–45°C) 14–113°F (-10–45°C)	

Notes:

1. Anti-freeze must be used when temperature of water inlet for heating is below 50°F (10°C) or ground heat source is used. Maintain appropriate concentration level of anti-freeze according to temperature of water inlet.
2. Strict management of anti-freeze concentration level is required. Consult Trane before application.
3. When inlet water temperature is outside of limit, consult Trane before installing water pipe.

- Water pipe connections are 1-1/4 FPT. A field-supplied British PT to NPT adapter is required to connect to standard NPT water pipes.
- If you install water-source units with different capacities, install a flow control valve to secure rated flow for each water-source unit. Socket must be connected within below tightening torque. The tightening torque should not exceed the values given in the table below, or damage could occur.

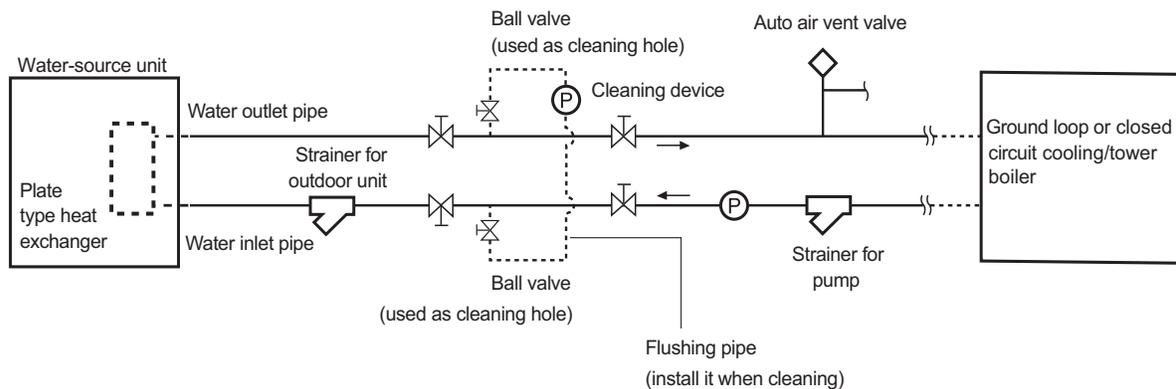
Outer diameter: in. (mm)	Connection torque: lb/ft (N·m)
0.39-0.79 (10–20)	18.44 (25)
0.83-1.18 (21–30)	36.88 (50)
1.22-1.97 (31–50)	73.76 (100)
2.01-3.15 (51–80)	162.26 (220)
3.19-4.53 (81–115)	442.54 (600)

- Use certified parts for the water pipe system. The water pressure of the water pipe system connected to water-source unit must remain under 1.96 MPa (285 psi).
- Water-source unit water pipes must be equipped with valves and other instrumentations as shown in the figure on the previous page. Strainer and flow switch must be installed within 3.3–6.6 ft (1–2 m) from the entrance pipe of the water-source unit. (Strainer must be installed on entrance side.)
 - If strainer is not installed, sand, dust or rust debris may cause product breakage.
 - Make sure to install a flow switch that works at minimum discharge. When optimal discharge level is not reached, heat exchanger within the water-source unit may break.
- Water inlet pipe is located at the bottom part of the heat exchanger and the water outlet pipe is at the top part of the heat exchanger.
- The water-source unit must be installed indoors at room temperature. The water inlet and outlet of the water-source unit must be insulated with the heat exchanger as shown in [Figure 37, p. 64](#).
- Ensure that damp-proof, cold reserving, and insulation work is performed thoroughly. This will prevent condensation from forming on the surface of the product and thereby prevent energy loss and potential property damage.

Water Pipe Installation

- If you stop the product for the night or other substantial periods of time, the water pipe circuit may freeze if the ambient temperature near the water-source unit is under 32°F (0°C). To avoid damage to the plate type heat exchanger if the water circuit freezes:
 - Drain remaining water in the water pipe
 - Operate the water pump continuously during water-source unit operation, 1–5 minutes before the operation and 1–5 minutes after operation stops.
 - Install a self-regulating heat cable on the water pipe.
- When inlet water temperature is lower than 50°F (10°C), appropriate anti-freeze must be used according to the temperature. (Set the water-source unit option switches K21 and K22 according to the usage temperature.)
 - If the lowest inlet water temperature is 23°F (-5°C), the freezing point of anti-freeze must be lower than 17.6°F (-8°C)
 - If the lowest inlet water temperature is 14°F (-10°C), the freezing point of anti-freeze must be lower than 5°F (-15°C)
- Install auto air vent valves at any point where air may remain within the water pipe (such as a vertical water pipe). If the pipe is not vented, it may cause performance decrease or corrosion on the product or pipes.
- Keep the inlet water temperature within the 'main usage range'. Otherwise, the unit may not run continuously.
- Regular chemical cleaning is necessary to prevent water scale from occurring on the plate type heat exchanger; the frequency of cleaning depends on the water quality (and the type of intermediary plate exchanger in open loop cooling tower applications).
- When installing water pipes, install a heat source water shut-off valve. Install a flushing pipe with a ball valve (for chemical cleaning) on the pipe installed between the shut-off valve and the water-source unit.
- Before trial operation, connect the cleaning pipes installed on inlet and outlet as shown in the [Figure 37](#). Then, take appropriate measures (such as blind flange, for example) to stop the circulation water from entering the water-source unit plate type heat exchanger, and use circulating pump to remove foreign substance within the water pipes and to clean the strainer.

Figure 37. Closed-loop water system



Notes:

- After flushing is completed, open the valve of the water pipe.
- Check that the water pipe is vented and that the amount of circulation is adequate before opening the service valve on the refrigerant side of the unit.
- If the circulating water stops during water-source unit operation, damage to the plate type heat exchanger could occur.

External Contact Connection

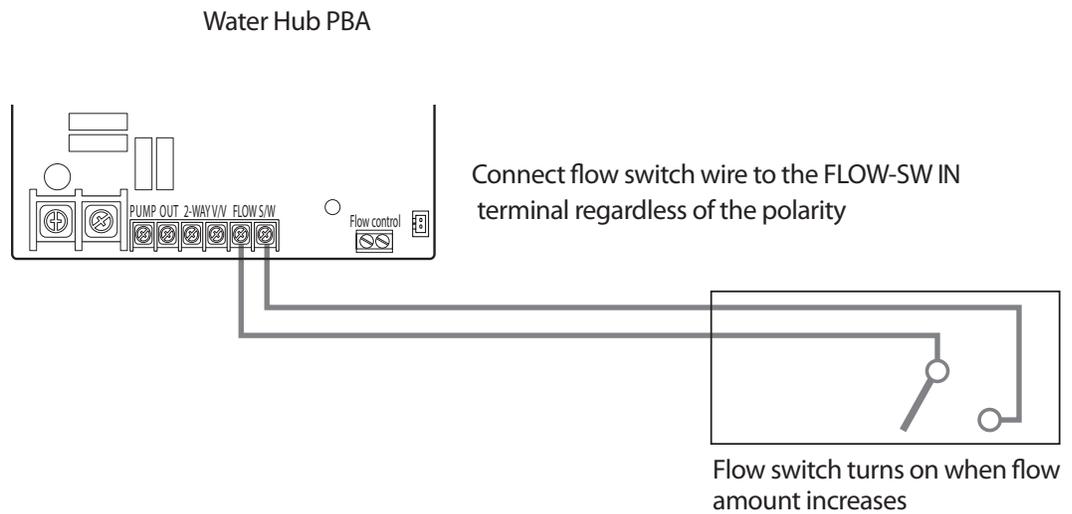
Flow Switch (Mandatory)

The mandatory flow switch receives a signal from the heat source water and detects if there is any problem with the water circulation before operating the water-source unit.

If there is no contact signal input to the flow switch, it is diagnosed as a “Problem with the heat source water circulation.” In this event, the water-source unit will stop operating to protect the water-source unit.

For installation location of the flow switch, refer to [Figure 37, p. 64](#).

Figure 38. Flow switch on water-source unit

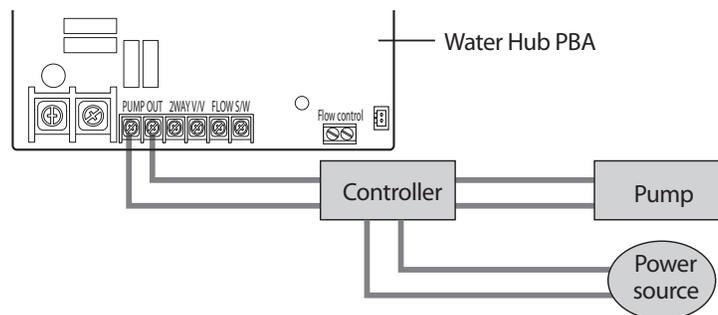


Note: A flow switch can be used individually or together with a two-way solenoid valve.

Pump out connection

When the main pump is installed to a common water pipe, a powerless contact signal will be provided. Refer to [Figure 46, p. 68](#).)

Figure 39. Pump out connection



Explanation of Optional Functions

Flow Control

After setting the water-source unit option switch, you may connect the variable flow control valve that is controlled at 0–10 V of input signal.

If the power of the variable flow control valve is 220–240 V, the internal power of the water-source unit can be used (refer to [Figure 40](#)). If the load of variable solenoid valve is maximum 250 V and current over 0.2 A, external power must be used (refer to [Figure 41](#)).

The output range of the variable flow control valve is dependent on water-source unit option switch setting ([Table 43, p. 75](#)).

Figure 40. Installation with flow control (208–230 V models)

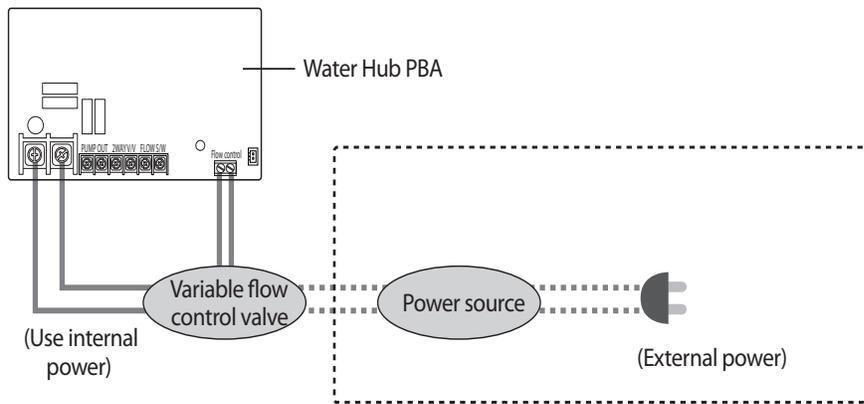
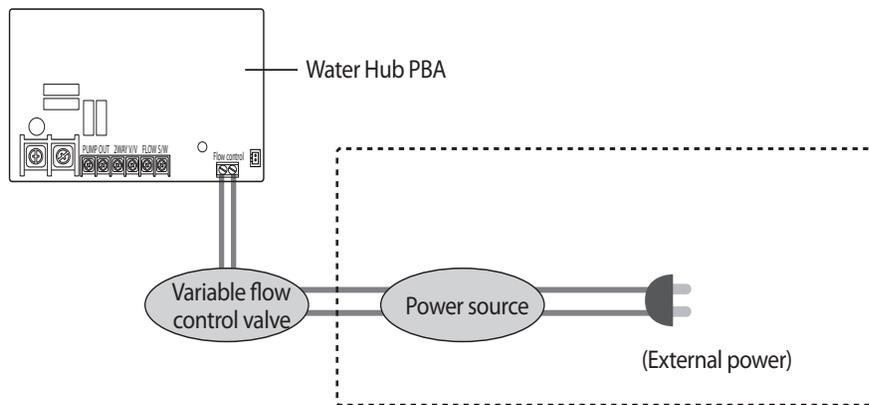


Figure 41. Installation with flow control (460 V models)



Two-Way Solenoid Valve

When installing multiple water-source units to a common water pipe, a two-way valve will cut the cooling water supply to a water-source unit that is not operating, so it will increase the overall efficiency of the system. A two-way solenoid valve operates automatically depending on the operation status of the indoor and water-source units. (Outputs contact signal).

A two-way solenoid valve uses AC 220-240 V, 50/60 Hz, and supports products with a current of 0.2 A or low. If the load of the solenoid valve is equal to or less than 250 V with a current of 0.2 A or less, internal power can be used. (Refer to [Figure 42](#) and [Figure 43](#).)

If these minimums are exceeded, use an external power source. (Refer to [Figure 44](#), p. 68 and [Figure 45](#), p. 68.) The external power cable for a two-way solenoid valve must be a 600 V, flame-resistant, double-layered cable.

Note:

- A two-way solenoid valve can be used individually or together with a flow switch.
- The 2-way valve terminal is not polarity sensitive.

Figure 42. Installation with a 2-way solenoid valve (208–230 V)

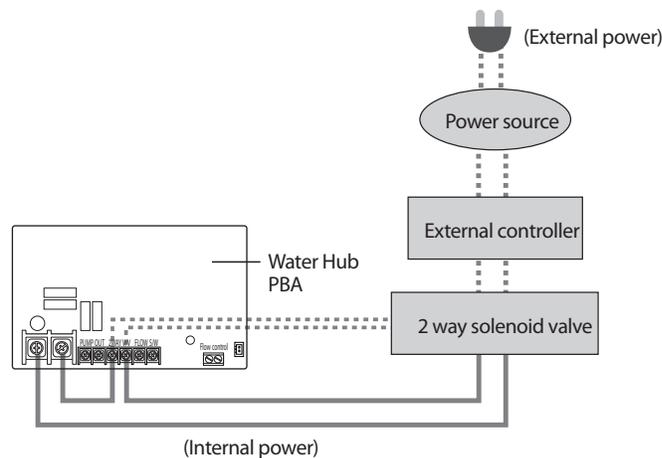


Figure 43. Wiring example: 208–230 Vac, direct operation type 2-way solenoid valve

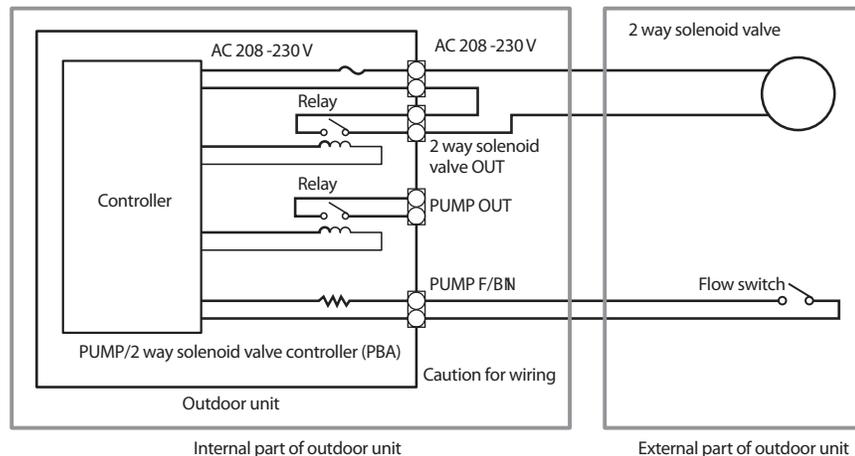


Figure 44. Installation with a 2-way solenoid valve (460 V)

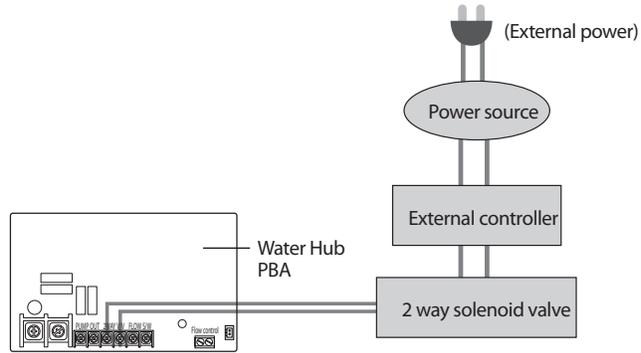
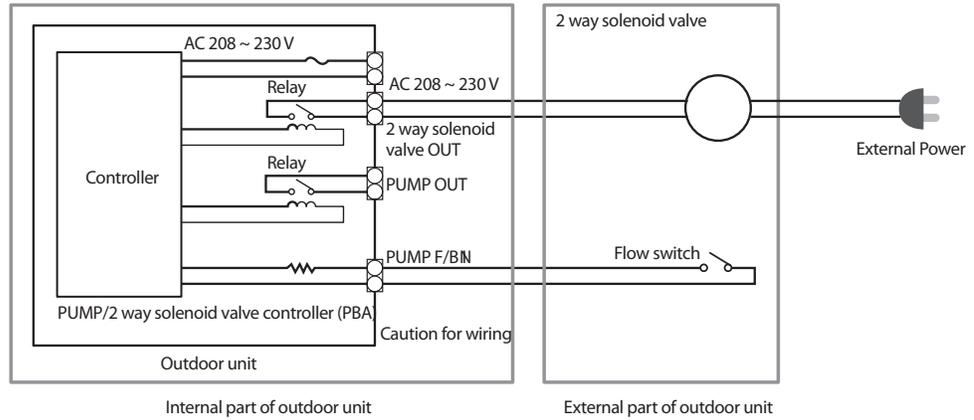


Figure 45. Wiring example: 460 Vac, direct operation type 2-way solenoid valve



If the operation type of the two-way solenoid valve is different, use an extra controller. Refer to [Figure 46](#).

- Also use an extra controller for the pump.
- The water-source unit provides the contact signal needed for the two-way solenoid valve and pump operation. Therefore, do not use the contact signal from the indoor unit directly.

Figure 46. Wiring example with an optional controller such as a 2-way solenoid valve and pump

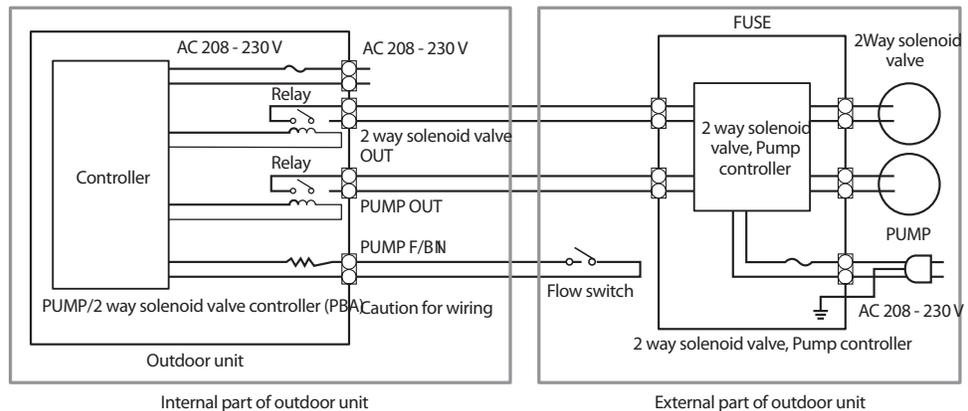
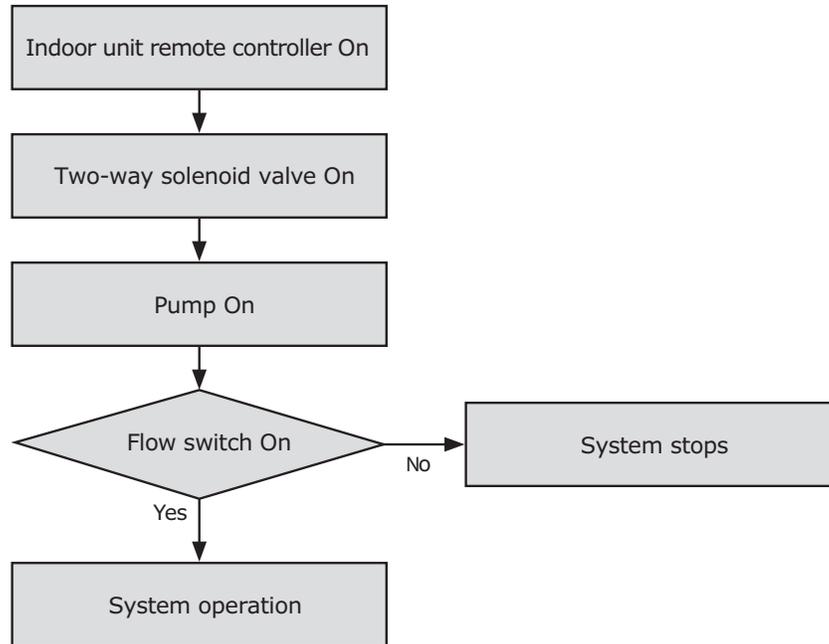


Figure 47. Flow chart of water-source unit external contract controller



- The flow switch detector circuit must be detected for more than 30 seconds within 3 minutes after the first operation signal output of the pump. (The water-source unit will not operate if there is no detection.)
- The water-source unit will stop operating if the flow switch contact turns Off.
- When the water-source unit stops operating, the cooling water pump will also stop.
- Even when you are not using the external contact control from air-cooled water-source unit, you may use other external control methods such as DDC, PLC or BMS and apply the flow chart shown in [Figure 47](#). Also apply control for freezing prevention of the water circulation during winter season.
- If you control pump/2way solenoid valve with extra controller, make sure to apply in control so that pump/2way solenoid valve operates for 3 minutes after the water-source unit stops operating.

Control System

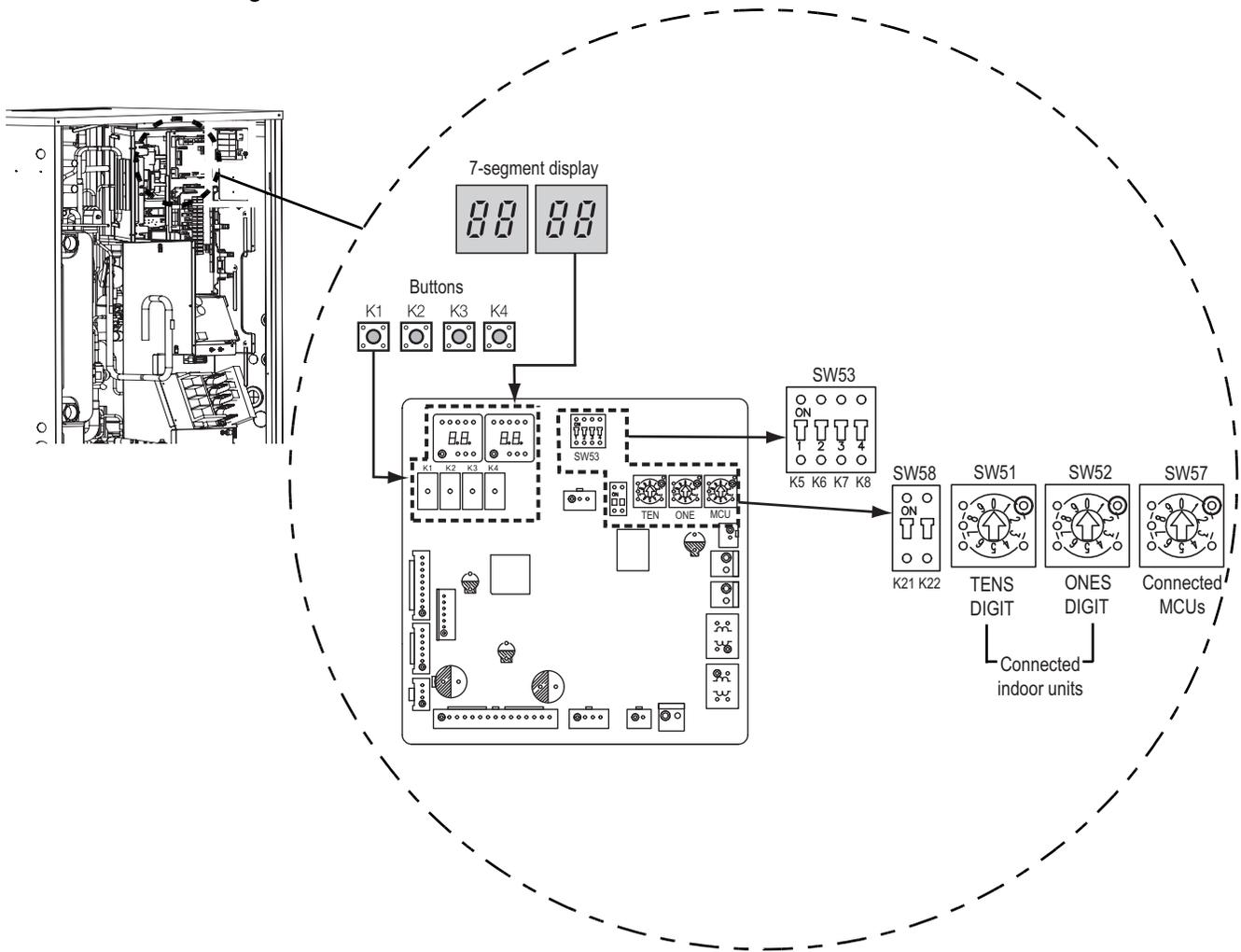
The control board contains a 7-segment display, a DIP switch, three rotary switches, and four buttons, as shown in [Figure 48](#). Their functions are explained in this section.

⚠ WARNING

Hazardous Voltage!

Before making contact with the inverter circuit board, wait for at least 15 minutes after powering down the water-source unit to allow the unit to fully discharge high DC voltage. Failure to allow the high DC voltage to discharge completely could result in death or serious injury.

Figure 48. Control board



Monitoring System Power and Communication Status

The 7-segment display indicates system power and communication status.

Table 40. 7-segment display

Event	Digit 1	Digit 2	Digit 3	Digit 4
Power up ^(a)	"8"	"8"	"8"	"8"
Establishing communication between outdoor and indoor units	"A"	"d"	Number of connected indoor units	
Transmit/receive (normal operation)	Indoor unit: "A" MCU ^(b) : "C"	Indoor unit: "0" MCU: "1"	Unit address (decimal number)	

(a) 7-segment display example showing power-up is shown in [Figure 48](#).
 (b) Mode change unit.

System Configuration

The water-source unit control board contains one DIP switch and three rotary switches ([Figure 49](#)). Use them to configure the system as described in [Table 41](#).

Figure 49. Switches on water-source unit control board

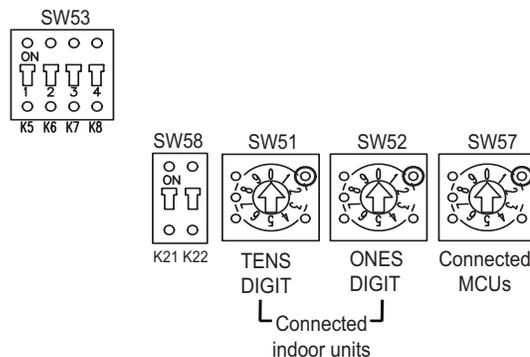


Table 41. System configuration using control board switches

Switch ^(a)	Function description and notes		
SW51/ SW52	Use to set total number of installed indoor units	Set at main water-source unit only. Note: For example, if 12 indoor units are installed, SW51: 1, SW52: 2.	
SW53	K5	On	Use for heat pump operation. (Factory default)
		Off	Use for heat recovery operation (closes heat pump valve).
	K6	On	Enables maximum capacity restriction for cooling operation. Restricts excessive capacity increase when operating indoor units with small capacity.
		Off	Disables maximum capacity restriction for cooling operation.
	K7	On	Use to set water-source unit address: No. 1 (main unit) ^(b)
	K8	On	
	K7	On	Use to set water-source unit address: No. 2 (sub-unit 1)
	K8	Off	
	K7	Off	Use to set water-source unit address: No. 3 (sub-unit 2)
	K8	On	
K7	Off	Not used	
K8	Off		

Table 41. System configuration using control board switches (continued)

SW57	Use to set total number of connected MCUs		Set at main water-source unit only. Note: For example, if 3 MCUs are installed, SW57: "3". If 10 MCUs are installed, SW57: "A".
SW58	K21	On	Water circulation
	K22	On	
	K21	On	Anti-freeze circulation (freezing point of anti-freeze must be below 17.6°F (-8°C). Minimum entering water temperature: 23°F (-5°C). ^(c)
	K22	Off	
	K21	Off	Anti-freeze circulation (freezing point of anti-freeze must be below 5°F (-15°C). Minimum entering water temperature: 14°F (-10°C). ^(c)
	K22	On	

(a) For illustration of switches, refer to [Figure 49](#).

(b) For module installations, one water-source unit must be designated as the main unit. The remaining water-source units must be designated as sub-units.

(c) Maintain appropriate level of anti-freeze (see "[Cooling Water Management](#)," p. 84).

The control board has four buttons, K1–K4, and a 7-segment display for configuring system options.

Figure 50. Buttons K1–K4 and 7-segment display on the water-source unit control board



To set options:

1. When the unit is not operating, press and hold K2 (5 seconds) to enter the option setting mode. The 7-segment display will appear as shown. (If compressor cut-off is enabled, digit 4 will be "1" or "2".)



2. To select a different option, press K1 repeatedly until the number representing the selected option appears for digits 1 and 2. (See the "Digit 1" and "Digit 2" columns in [Table 42, p. 73](#) for the list of option numbers.) For example, choose "01" on the main water-source unit to select the cooling capacity correction option.



3. To change the value for the option selected in Step 2, press K2 repeatedly for 1 second until the number representing the selected value appears for digits 3 and 4. (See the "Digit 3" and "Digit 4" columns in [Table 42, p. 73](#) for the list of values.)

For example, if you select "01" for digits 1 and 2, and "04" for digits 3 and 4, the cooling capacity correction selection is 50–53.6°F (10–12°C).



4. To save the value you have selected in Step 3, press and hold the K2 for 5 seconds. The 7-segment display will blink as it enters tracking mode. The selected value will be saved when the display returns to normal.

Note: To the previous value instead of saving the selection, press and hold K1 (5 seconds). To restore the factory default, press and hold K4 while in the option setting mode.

Table 42. System configuration using K1, K2, and the 7-segment display

Option	Water source unit	Digit 1	Digit 2	Digit 3	Digit 4	Value	Comments
Emergency operation for compressor malfunction	Single	0	0	0	0	Disabled (factory default)	E560 will occur if all compressors are set to malfunction state.
				0	1	Compressor 1: malfunction state	
				0	2	Compressor 2: malfunction state	
Cooling capacity correction	Main	0	1	0	0	44.6-48.2 (7-9): factory default	Targeted evaporating temperature: °F(°C). When low temperature value is set, indoor unit discharged air temperature will decrease.
				0	1	41-44.6 (5-7)	
				0	2	48.2-51.8 (9-11)	
				0	3	50-53.6 (10-12)	
				0	4	51.8-55.6 (11-13)	
				0	5	53.6-57.2 (12-14)	
Heating capacity correction	Main	0	2	0	0	406.1 (2.8): factory default	Targeted high pressure: psi (MPa). When low pressure value is set, discharged air temperature of the indoor unit will decrease.
				1	1	362.6 (2.5)	
				2	2	377.1 (2.6)	
				3	3	391.6 (2.7)	
				4	4	420.6 (2.9)	
				5	5	435.1 (3.0)	
				6	6	449.6 (3.1)	
				7	7	464.1 (3.2)	
Current restriction rate	Single	0	3	0	0	100%: factory default	Enabling this setting may decrease cooling and heating performance.
				0	1	95%	
				0	2	90%	
				0	3	85%	
				0	4	80%	
				0	5	75%	
				0	6	70%	
				0	7	65%	
				0	8	60%	
				0	9	55%	
				1	0	50%	
				1	1	No restriction	
Oil collecting interval	Main	0	4	0	0	Factory default	
				0	1	Shortens interval by 1/2	
Temperature for triggering defrost operation	Main	0	5	0	0	Disabled	Function is not available for this model.
				0	1		

Control System

Table 42. System configuration using K1, K2, and the 7-segment display (continued)

Option	Water source unit	Digit 1	Digit 2	Digit 3	Digit 4	Value	Comments	
Water-source unit fan speed correction	Single	0	6	0	0	Disabled	Function is not available for this model.	
				0	1			
Night-time silent mode	Main	0	7	0	0	Disabled	Function is not available for this model.	
				0	1			
				0	2			
				0	3			
High-head condition setting	Main	0	8	0	0	Disabled (factory default)	When the water-source unit is 131.23–262.47 ft (40–80 m) above the indoor unit.	
				0	1	Case 1: height difference type 1 (indoor unit is lower than water-source unit)		
				0	2	Case 2: height difference type 1 (indoor unit is lower than water-source unit)		When the water-source unit is more than 262.47 ft. (80 m) above the indoor unit.
				0	3	Height difference type 2 (water-source unit is lower than indoor unit)		When the indoor unit is more than 98.43 ft (30 m) above the water-source unit.
Long piping condition ^(a)	Main	0	9	0	0	Disabled (factory default)	When the equivalent length of the farthest indoor unit from the water-source unit is between 328.08–557.74 (100–170 m).	
				0	1	Level 1		
				0	2	Level 2		When equivalent length of farthest indoor unit from the water-source unit is over 557.74 ft (170 m).
Energy saving mode	Main	1	0	0	0	Disabled (factory default)	If enabled, energy saving mode triggers when the room temperature reaches setpoint while operating in heating mode.	
				0	1	Enabled		
Rotation defrost ^(b)	Main	1	1	0	0	Disabled	Function is not available for this model.	
				0	1			
Expand operational temperature range for cooling operation ^(b)	Main	1	2	0	0	Disabled (factory default)	If enabled, continuous cooling operation is possible even in low temperature condition down to 5°F (-15°C), but MCU noise will increase.	
				0	1	Enabled		
Channel address	Main	1	3	A	U	Automatic setting (factory default)	Used for centralized control.	
				0–15		Manual setting for channel: 0–15		
Snow accumulation prevention control	Main	1	4	0	0	Disabled	Function is not available for this model.	
				0	1			
Circulation water flow control	Single	1	5	0	0	Disable (factory default)	When the variable flow control valve is applied.	
				0	1	7–10 V		
				0	2	5–10 V		
				0	3	3–10 V		

(a) Enabling this setting is unnecessary if high-head condition is set.

(b) Heat recovery only.

Initiating System Operations

Buttons K1 and K2 are also used to initiate system operations. The 7-segment display responds as shown in the last column of the following tables.

Table 43. Button K1

Number of times button K1 is pressed	Operation	7-segment display
1 (hold for 5 seconds)	Test operation	K - K - Blank - Blank
1	Refrigerant charging in heating mode	K - 1 - Blank - Blank
2	Test operation in heating mode	K - 2 - Blank - Blank
3	Pump out in heating mode (Water-source unit address 1)	K - 3 - Blank - 1
4	Pump out in heating mode (Water-source unit address 2)	K - 3 - Blank - 2
5	Pump out in heating mode (Water-source unit address 3)	K - 3 - Blank - 3
6	Pump out in heating mode (Water-source unit address 4)	K - 3 - Blank - 4
7	Vacuuming (Water-source unit address 1)	K - 4 - Blank - 1
8	Vacuuming (Water-source unit address 2)	K - 4 - Blank - 2
9	Vacuuming (Water-source unit address 3)	K - 4 - Blank - 3
10	Vacuuming (Water-source unit address 4)	K - 4 - Blank - 4
11	Vacuuming (All)	K - 4 - Blank - A
12	End operation	—

Table 44. Button K2

Number of times button K2 is pressed	Operation	7-segment display
1	Refrigerant charging in cooling mode	K - 5 - Blank - Blank
2	Test operation in cooling mode	K - 6 - Blank - Blank
3	Pump down all units in cooling mode	K - 7 - Blank - Blank
4	Pipe inspection (heat pump: test operation)	K - 8 - Blank - Blank
5	Checking the amount of refrigerant	K - 9 - X - X (last digits may differ depending on status)
6	Discharge mode ^(a)	K - A - Blank - Blank
7	Forced oil collection	K - C - Blank - Blank
8	Inverter check compressor 1 ^(b)	K - D - Blank - Blank
9	Inverter check for compressor 2 ^(b)	K - E - Blank - Blank
10	Water pipe valve/Pump check	K - F - Blank - Blank
11	Cooling fan/Flow control valve check	K - G - Blank - Blank
12	End operation	—

(a) Discharge mode may not operate normally if an error code occurs. If an E464 or E364 error occurs, do not use the discharge mode because the power element may be damaged.

(b) If button K2 is pressed the specified number of times and the inverter check is not successful, an error code will appear on the 7-segment display.

Table 45. Button K3

Number of times button K3 is pressed	Operation	7-segment display
1	Initialize (reset) operation	Same as power up: "8888"

Monitoring System Settings and Software Versions

Button K4 is used to monitor system settings and software versions.

Table 46. Button K4

Number of times button K4 is pressed	Description	7-segment display	
		Digit 1	Digits 2, 3, 4
1	4TVP0072***** (6 ton)	1	0, 0, 8
	4TVP0096***** (8 ton)		0, 1, 0
	4TVP0120***** (10 ton)		0, 1, 2
	4TVP0192***** (16 ton)		0, 2, 0
2	Command frequency of the compressor 1	2	120 Hz → 1, 2, 0
3	Command frequency of the compressor 2	3	120 Hz → 1, 2, 0
4	High pressure	4	220.46 psi (1.52 MPa) → 1, 5, 2
5	Low pressure	5	62.37 psi (0.43 MPa) → 0, 4, 3
6	Discharge temperature of COMP1	6	188.6°F (87°C) → 0, 8, 7
7	Discharge temperature of COMP2	7	188.6°F (87°C) → 0, 8, 7
8	IPM temperature of COMP1	8	188.6°F (87°C) → 0, 8, 7
9	IPM temperature of COMP2	9	188.6°F (87°C) → 0, 8, 7
10	CT sensor value of COMP1	A	2 A → 0, 2, 0
11	CT sensor value of COMP2	B	2 A → 0, 2, 0
12	Suction temperature	C	59°F (15°C) → 0, 1, 5
13	COND Out temperature	D	149°F (65°C) → 0, 6, 5
14	Temperature of liquid pipe	E	86°F (30°C) → 0, 3, 0
15	TOP temperature (compressor 1)	F	176°F (80°C) → 0, 8, 0
16	TOP temperature (compressor 2)	G	176°F (80°C) → 0, 8, 0
17	Water temperature	H	95°F (35°C) → 0, 3, 5
18	EVI inlet temperature	I	59°F (15°C) → 0, 1, 5
19	EVI outlet temperature	J	77°F (25°C) → 0, 2, 5
20	Main EEV1 step	K	2000 steps → 2, 0, 0
21	Main EEV2 step	L	2000 steps → 2, 0, 0
22	ESC EEV step	M	300 steps → 3, 0, 0
23	HR EEV step	N	300 steps → 3, 0, 0
24	—	O	13 steps → -, -, -
25	Current frequency of COMP1	P	120 Hz → 1,2,0
26	Current frequency of COMP2	Q	120 Hz → 1,2,0

Table 46. Button K4 (continued)

Number of times button K4 is pressed	Description	7-segment display	
		Digit 1	Digits 2, 3, 4
27	Suction 2 temperature (HR)	R	-43.6°F (-42°C) → -, 4, 2
28	Master indoor unit address	S	If master indoor unit is not selected → Blank, N, D If indoor unit No. 1 is selected as master indoor unit → 0, 0, 1
29	Temperature of control box	T	-43.6°F (-42°C) → -, 4, 2

Table 47. Button K4 (pressed and held for 3 seconds)

Number of times K4 is pressed and held 3 seconds	Software version/ Unit address	7-segment display: toggles between (1) and (2)			
		Device (1)	Version (2): examples		
1	Main circuit board version	"MAIN"	"1412"		
2	Hub circuit board version	"HUB"	"1412"		
3	Water hub board version	"HUB2"	1412		
4	Inverter 1 circuit board version	"INV1"	"1412"		
5	Inverter 2 circuit board version	"INV2"	"1412"		
6	EEP version	"EEP"	"1412"		
			Digit 1	Digit 2	Digit 3, 4
			Address example		
7(a)	Automatically assigned unit addresses	"AUTO"	Indoor unit: "A" MCU: "C"	Indoor unit: "0" MCU: "1"	"07"
8(a)	Manually assigned unit addresses	"MANU"	Indoor unit: "A"	Indoor unit: "0"	"15"

(a) Toggles between indoor unit and MCU.

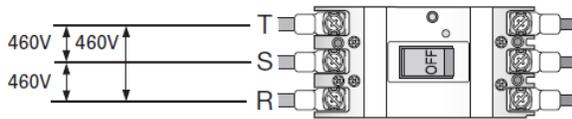
Pre-Start Checks

After installation and before the test operation is conducted, perform the following pre-start checks:

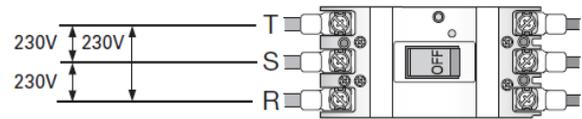
NOTICE
Avoid Damage to the Communication Circuit!
Do not measure the communication terminal with an insulation tester. Doing so will damage the communication circuit.

1. Ensure that the power and communication cables of the indoor and water-source units are properly connected.
2. Before supplying power, use a 500 Vdc (4TV*****B400NB) or 600 Vdc (4TV*****B300NB) insulation resistance tester to measure the power terminal (3 phase: R, S, T) and the water-source unit grounding. The resistance measurement should be over 30 MΩ .
3. Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase between wires (R-S, S-T, T-R): 460 V (TV*****B400NB) or 230 V (4TV*****B300NB).

[4TV*****B400NB]



[4TV*****B300NB]



4. Ensure that the indoor units are connected.
5. The protection system cuts power to the PCB for overvoltage when N phase is cross-wired to the R, S, and T terminals. Check the power connection from N phase if the PCB is not turned on.
6. Check for a short-circuit between the communication terminal and ground.
7. Ensure that the pre-start checklist (Table 48) has been completed.

Table 48. Pre-start checklist

Installation	Water-source unit	<ul style="list-style-type: none"> • Have you checked the external surface and the inside of the water-source unit for damage? • Is there any possibility of short circuit due to the heat produced by an water-source unit? • Is the place well-ventilated and meets recommended requirements for clearances and service? • Is the water-source unit installed securely to withstand the external force? (Refer to the installation procedure in "Water Pipe Installation," p. 62.)
	Indoor unit	<ul style="list-style-type: none"> • Have you checked the external surface and the inside of the indoor unit? • Is there enough space for service? • Have you ensured that the center of the indoor unit is installed horizontally and is level?
Refrigerant pipe		<ul style="list-style-type: none"> • Have you selected the correct pipes? • Are the liquid and gas valve open? • Is the total number of connected indoor units within the allowable range? • Are the length and the height difference between the refrigerant pipes within the allowable range? • Are the Y-joints properly installed? • Has the connection of liquid and gas pipes been correctly performed? • Have you selected correct insulator for pipes and insulated them correctly? • Is the pipe or connection part properly insulated? • Is the quantity of the additional refrigerant correctly weighed in? (You must record the amount of additional refrigerant charging on the service record paper placed outside the water-source unit.)

Table 48. Pre-start checklist (continued)

Electrical	<ul style="list-style-type: none"> • Are the power cable and communication cable tightened firmly on the terminal board within the rated torque recommendations? • Have you checked for cross connection of the power and communication cables? • Have the water-source unit been properly grounded?? Is shielded cable used for the communication cable? • Is the wire length within the recommended limit? • Is the wiring route correct?
Setting address	<ul style="list-style-type: none"> • Are the address of the indoor and water-source units properly set? • Are the address of the indoor and water-source units properly set (when using multiple remote controllers)?
Option	<ul style="list-style-type: none"> • Ensure that the isolation frame is correctly installed.

Test Operation

- Make sure that the circulation water condition matches the K21/K22 setting of the outdoor unit option switch (see [Table 41, p. 71](#)).
- Make sure that water pipe facility work of the building is done appropriately.
 - Check the installation location of strainer, air discharge valve (air ventilation), auto water supply valve, and expansion tank and make sure their location is appropriate.
 - Pour enough water in the expansion tank and execute individual water pipe pump operation to discharge all the air within the water pipe system.
- Measure the pressure loss at the inlet and outlet of the plate type heat exchanger to find out if there is adequate heat source water supplied to the unit.
 - Check each unit for sufficient amount of water.
 - When there is air or an insufficient amount of water is flowing, it may cause plate type heat exchanger to freeze.
 - If the amount of water is not adequate, stop the operation and take appropriate corrective measures.
- When the outdoor temperature is low, turn on the main power 6 hours before beginning the operation to avoid damage to the unit.
- Do not touch the refrigerant pipe during or immediately after the operation to avoid personal injury.
- Do not operate the product with its panel or protection nets off to avoid personal injury.
- After stopping unit operation, wait at least 5 minutes before turning off the main power.
- Connect all the indoor units and the power supply for the outdoor unit and run the auto address setting. Also, run auto address setting after changing the indoor unit control board.

WARNING

Hazardous Voltage, Rotating Components!

Do not operate the product with the panel or duct outlet protection net off. There is risk of personal injury from parts that rotate or contain high voltage.

⚠ CAUTION

Risk of Burn or Frostbite!

Refrigerant pipe may be hot or cold during or right after the operation depending on the status of the refrigerant which flows through the refrigerant pipe, compressor, and other parts of the refrigerant cycle. Do not touch the refrigerant pipe during or right after the operation to avoid getting burned or frostbitten.

NOTICE

Avoid Unit Damage!

Wait at least 5 minutes before turning off the main power after the inspection test is finished. If you do not, water leakage or other problems may occur.

Wait at least 6 hours after power is supplied to the water-source unit before operating it to allow time for the crank case heater to pre-heat. If the crank case heater is not pre-heated before operation, unit parts are at risk of being seriously damaged.

1. Provide power to the water-source unit at least 6 hours before operating it.
Notes: When power is supplied to the water-source unit, it will check for and verify communications with the indoor units.
2. Ensure that the front of the water-source unit is closed.
3. Press and hold button K1 for 5 seconds to run the test operation (see [Table 43, p. 75.](#))
 - While the test operation is running and after the communication check, **UP (UnPrepared)** appears on the digital display and the compressor is restricted from operating. The display will clear automatically when the test operation is completed.
 - The test operation may proceed from 20 minutes to maximum 2 hours depending on the operating status.
 - During the test operation, noise may occur due to valve inspection. (Examine the unit if abnormal noise continually occurs.)
4. If error codes E503, E505, or E506 occur during the test operation, refer to "[Error code E503, p. 88](#)" or "[Error code E505 and E506, p. 88](#)". If any other errors occur or if an inspection is needed, refer to the service manual.
5. When the test operation ends, use VRF Enterprise Management Software or VRF Auto Commissioning Tool to issue a test results report. If any items in the report are marked with an "inspection required" sign, refer to the service manual for information on correcting the items and run the test operation again.
6. Ensure the following:
 - The system has the correct refrigerant amount (see "[Refrigerant Amount Detection Operation, p. 81](#)") after the unit has been operating in cooling mode for at least 30 minutes
 - Cooling/heating operation runs normally.
 - Air flow direction and fan speed of indoor units runs normally.
 - There are no abnormal operating noises from indoor or water-source units.
 - During cooling operation, the indoor units drain properly.
7. Use VRF Enterprise Management Software to check operating status details.
8. Explain to the user how to use the indoor unit, and leave indoor unit manual with the user for their reference.

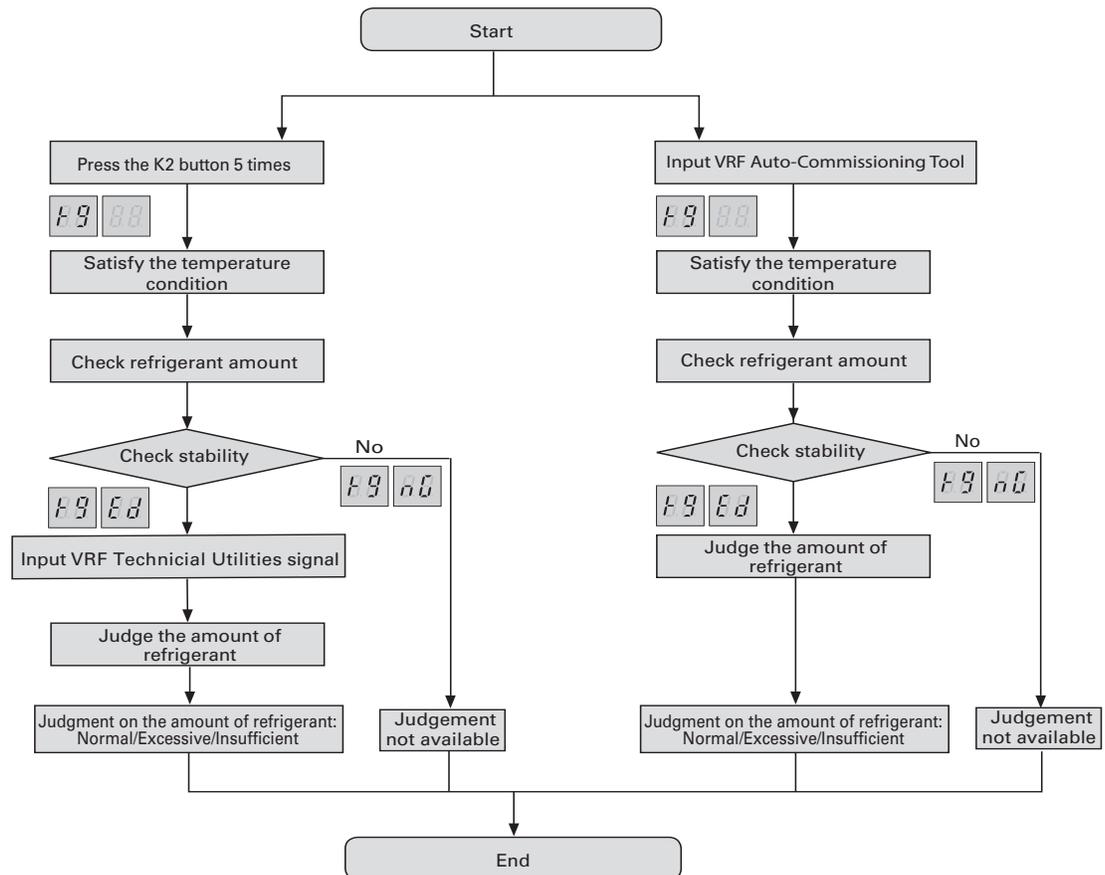
Refrigerant Amount Detection Operation

Perform the refrigerant amount detection operation only under after the unit has been operating in cooling mode for at least 30 minutes

If the unit operation cycle is unstable, the refrigerant detection operation may end before it is completed.

The refrigerant detection operation result may be inaccurate if

- If the refrigerant detection operation is run after the unit has been shut down for a long period of time.
- If the unit installation environment causes the unit to trigger protection controls.



After the refrigerant detection operation is complete, take the following actions:

- If the amount of refrigerant is excessive, discharge 5% of the detected amount and restart the refrigerant amount detection operation.
- If the amount of refrigerant is insufficient, add 5% of the detected amount and restart the refrigerant amount detection operation.
- If the degree of supercooling is insufficient, add 10% of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- If the result is unavailable, check that the refrigerant detection operation was executed within the guaranteed temperature range. Perform a test operation to determine if there are any other problems with the system.

Maintenance

Note: Tell the owner to keep this installation manual.

If the unit was not operated for a long period of time:

1. Ensure that the water quality meets the standard.
2. Clean the strainer.
3. Ensure that the water flow is adequate.
4. Check the water pressure, amount of water, and temperature of water at inlet/outlet.
5. If you are using a ground heat source, check the concentration level of the anti-freeze before operation. The freezing point must be below 17.6 °F (-8 °C). (Refer to the Mandatory checklist for ground heat exchanger circulation water (anti-freeze) usage in ["Cooling Water Management," p. 84.](#)

It is not possible to disassemble the plate heat exchanger for cleaning or part replacement. Therefore, it must be cleaned by following methods:

1. Check if there is any cleaning hole for chemical cleaning at the inlet water pipe. For water scale cleaning use diluted (down to 5%) citric acid, oxalic acid, acetic acid, phosphoric acid. However, do not use a cleaning solution containing hydrochloric acid, sulfuric acid or nitric acid since they are highly corrosive.
2. Determine if there is valve on the inlet/outlet of the plate type heat exchanger.
3. Connect an exclusive pipe for cleaning to the inlet/outlet pipe of the plate type heat exchanger and fill with detergent at a temperature of 122–140°F (50–60°C). Circulate the detergent for about 2–5 hours. The cleaning time will vary depending on the temperature of the detergent or degree of water scale. Judge the degree of water scale removal by the color of the liquid detergent.
4. After cleaning, discharge the detergent within the plate type heat exchanger and fill the plate type heat exchanger with a water mixed with 1–2% of sodium hydroxide or sodium bicarbonate. Circulate the water mixture for 15–20 minutes to neutralize it.
5. After neutralizing the pipes, rinse the plate type heat exchanger with distilled water.
6. If you are using the detergent sold at local retail stores, make sure that it does not cause any corrosion to the stainless steel or copper.
7. For detail information on cleaning method (and proper use of detergent), contact the detergent manufacturer.
8. After the cleaning operation is finished, check to see if the unit operates normally.

Table 49. Inspection schedule

Inspection goal	What to inspect	Inspection frequency	Symptoms of inadequate maintenance
Forced drainage	Is the electric conductivity value set properly?	Once a week	Corrosion, water scale, or slime
	Is the electric conductivity sensor working properly?		
	Is the auto valve working properly?		
Cooling water and water quality	Is the cooling water contaminated? Does it have floating particles in it?	Once a month	Corrosion, water scale, or slime
	Does the water contain rust?		
	Is the water subject to "red tides" (harmful algal blooms)?		
	Is the level of antifreeze maintained at the appropriate level?	Once a year (before the winter season)	—

Table 49. Inspection schedule (continued)

Inspection goal	What to inspect	Inspection frequency	Symptoms of inadequate maintenance
Internal/external part of the cooling tower	Does any water scale or slime exist?	Once a month	Corrosion, water scale, or slime
	Are there any signs of metal corrosion?		
	Are there any plant growth in the water?		
Heat source water device	Is the make-up water supply valve set properly?	Daily	Operation problems at the cooling tower or intensified water concentration
	Is there amount of make-up water excessive/deficient?		
	Is the water level in the tank normal for operation?		

Cooling Water Management

Cooling Water Quality: Standards and Frequency of Inspections

Notes:

- Comply with water quality management standards.
- If the system water has a source other than the local water supply, check the quality of the water.

Cooling water with a high level of foreign substances can cause pipe corrosion or creation of water scale, which will affect the performance and the lifespan of the system. Use the appropriate heat source water according to [Table 50](#).

Table 50. Standard for cooling water quality for air conditioning and the number of water quality inspections

Classification	Item	Closed-type system		Effects		Recommended frequency of water quality inspections
		Circulating water	Supplemented water	Corrosion	Scale	
Standard value	pH (77°F [25°C])	7.0–8.0	7.0–8.0	○	○	Twice a month
	Electric conductivity (77°F [25°C]) (mS/m)	30 or below	30 or below	○	○	
	Chloride ion (Cl ppm)	50 or below	50 or below	○		
	Sulfate ion (SO ₄ ²⁻ / ppm)	50 or below	50 or below	○	○	Once a month
	M alkali level [pH 4.8] (CaCO ₃ ppm)	50 or below	50 or below		○	
	Total hardness (CaCO ₃ ppm)	70 or below	70 or below		○	
	Calcium hardness (CaCO ₃ ppm)	50 or below	50 or below		○	
	Ionized silica (SiO ₂ ppm)	30 or below	30 or below		○	
Reference	Iron (Fe ppm)	1.0 or below	0.3 or below	○	○	Once a month
	Copper (Cu ppm)	1.0 or below	1.0 or below	○		
	Sulfate ion (S ²⁻ ppm)	Not to be detected	Not to be detected	○		
	Ammonium ion (mg NH ₄ ⁺ ppm)	0.3 or below	0.1 or below	○		
	Residual chlorine (Cl/L ppm)	0.25 or below	0.3 or below	○		
	Free carbon dioxide (CO ₂ ppm)	0.4 or below	0.4 or below	○		
	Stability index	—	—	○	○	

Notes:

- Circle (○) denotes the factor relevant to corrosion or water scale.
- When the water temperature is over 104°F (40°C), steel without a protective coating may corrode when exposed to water. Applying corrosion-prevention material or degassing can be an effective measure to prevent corrosion.
- Supplied water or make-up water should be tap water, industrial water, or groundwater. Purified water, neutralized water, and softened water should not be supplied.

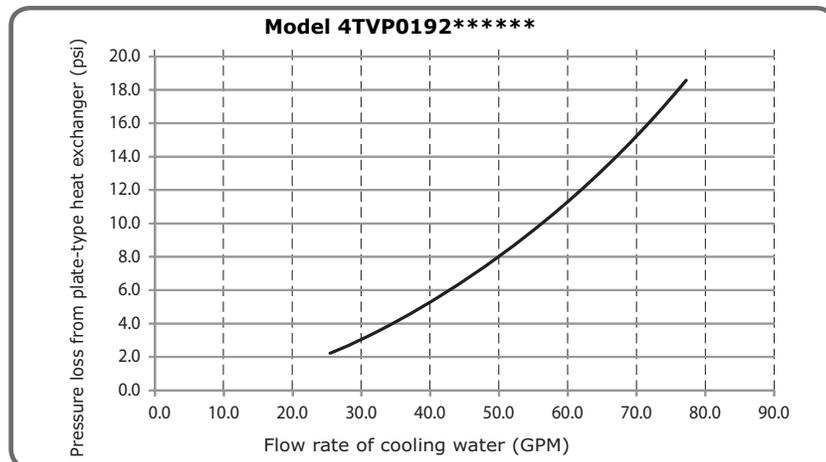
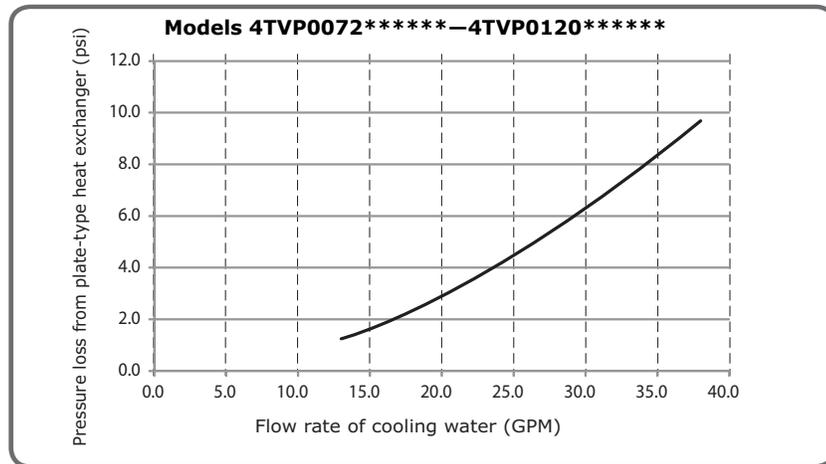
Operation range of water

If the amount of cooling water is out of the operation range (60–120% of the standard amount of water flow), stop the water-source unit and resolve the problem before restarting operation.

Table 51. Flow rate of cooling water (GPM)

Model number		4TVP0072B300NB 4TVP0072B400NB	4TVP0096B300NB 4TVP0096B400NB	4TVP0120B300NB 4TVP0120B400NB	4TVP0192B300NB 4TVP0192B400NB
Standard condition	Cooling/Heating	21.1	25.4	30.1	50.2
Operation range	Cooling/Heating	12.7–25.4	15.3–30.4	18–36.2	30.1–60.2

Figure 51. Flow rate of cooling water (GPM)



Mandatory Checklist for Ground Heat Exchanger Circulation Water (Anti-freeze) Usage

If using a ground heat source, use anti-freeze to manage the freezing point so that pipes are prevented from freezing.

Note: The manufacturer does not take responsibility for any damage that may result.

- All the circulating water (anti-freeze) and additives (corrosion inhibitor, bacteria inhibitor, foam inhibitors) must be used after consulting with the local code officials or supervisor for its impact on environment, toxicity, corrosiveness, and harmfulness to humans.
- The contractor must take extra care regarding with handling, packaging, and transporting anti-freeze.
- Do not use anti-freeze that is harmful to humans or equipment. Anti-freeze must be injected to the pipe according to specification and concentration level that is actually required by system. Do not directly inject undiluted solution. Consult ordering personnel or supervisor if undiluted solution is brought to the site.)
- Before injecting the anti-freeze, evacuate any air that may remain in the system and apply pressure to check for leakage.
- User must monitor and manage periodically to maintain initially designed concentration level of the anti-freeze.
- If the concentration level decreases due to leakage or the passing of time. pipes may freeze and burst.
- Usage condition of the anti-freeze when ground heat exchanger is installed (mandatory):
 - Flash point of the anti-freeze must be over 194°F (90°C).
 - Biochemical oxygen demand: Amount of oxygen in 1 g of anti-freeze at 50°F (10°C) must be within 0.1–0.2 g and this value must be maintained for 5 days.
 - Freezing point: Maintain concentration level of the anti-freeze so that freezing point of the anti-freeze complies to the setting of the option switch (K21/K22).
 - Toxicity: LD50 per each 1 kg of anti-freeze must be less than 5 g.
 - Storage stability: Anti-freeze must not be separate when heated or cooled, and turbidity should not be increased.
 - Corrosion resistance: Anti-freeze must be corrosion resistant to all the metallic material used for ground heat pumps and pipes.
 - Scale that has been accumulated on the plate type heat exchanger for one year of performance should not cause performance decrease over 15%.

Standard Data for Status of Anti-freeze (Based on Temperature of Anti-freeze at 59°F (15°C))

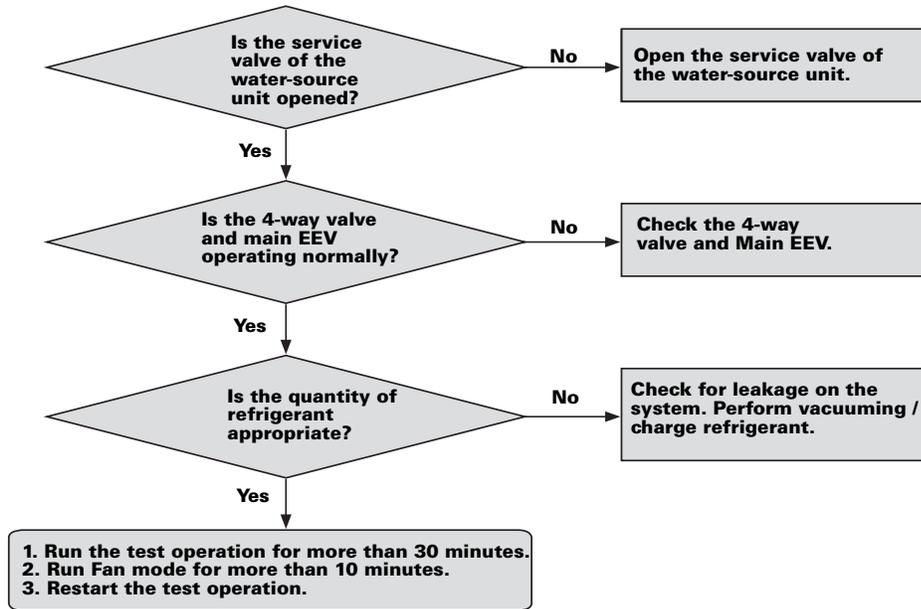
Type of anti-freeze (based on 59°F [15°C])	Concentration (% Wt.)	Freezing temperature		Density	
		°F	°C	lb/ft ³	kg/m ³
Methanol	10	21.9	-5.6	61.4	983.60
	20	10.9	-11.7	60.9	975.60
Ethanol	10	25.0	-3.9	61.4	983.60
	20	17.1	-8.3	60.7	972.40

Cooling Water Management

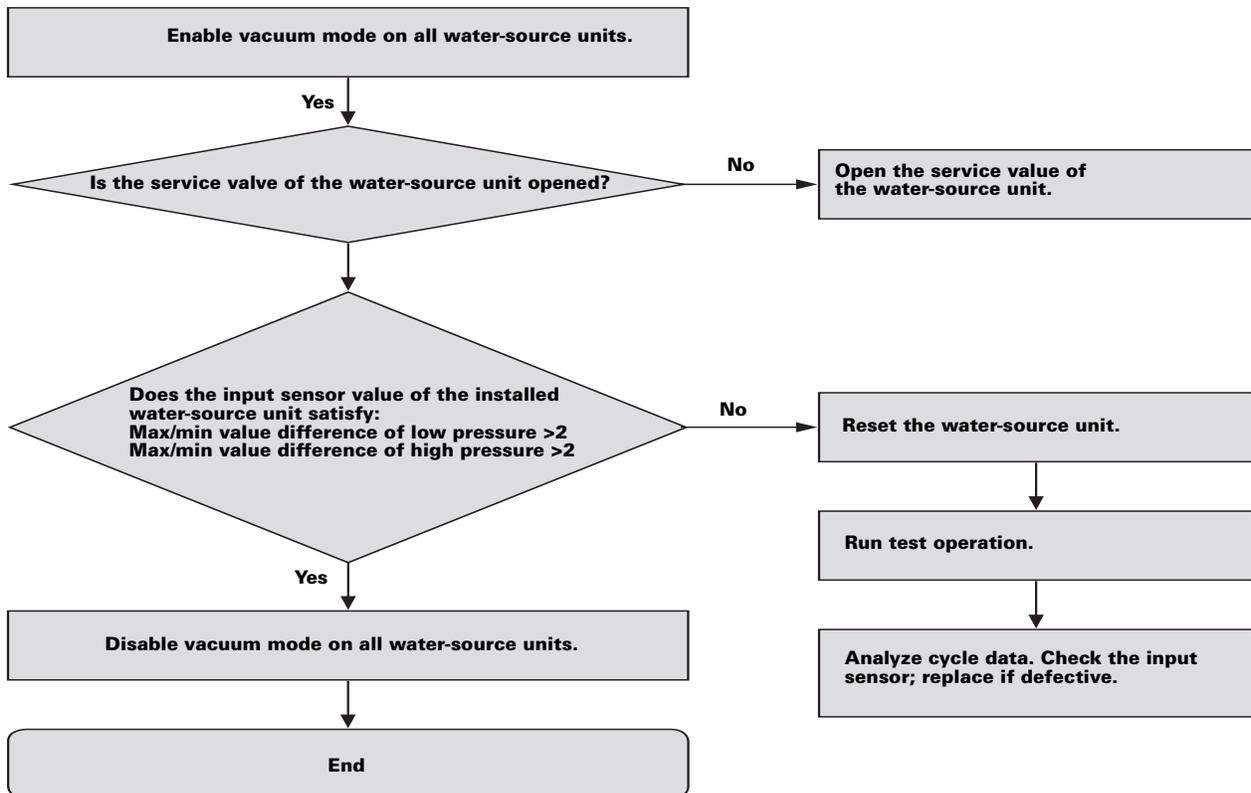
Type of anti-freeze (based on 59°F [15°C])	Concentration (% Wt.)	Freezing temperature		Density	
		°F	°C	lb/ft ³	kg/m ³
Ethylene glycol	10	26.2	-3.2	63.4	1014.87
	20	18.0	-7.8	64.4	1031.39
	30	6.6	-14.1	65.4	1047.07
	40	-8.1	-22.3	66.3	1061.65
Propylene glycol	10	26.1	-3.3	63.0	1009.75
	20	19.2	-7.1	63.7	1020.91
	30	9.1	-12.7	64.3	1030.51
	40	-6.0	-21.1	64.8	1038.65

Troubleshooting

Error code E503



Error code E505 and E506



Installation Check Card

Calculation of Additional Charging Weight of the Refrigerant		
High Pressure Pipe	Total Pipe length (m)	Additional Refrigerant (kg)
ø6.35(1/4")		
ø9.52(3/8")		
ø12.70(1/2")		
ø15.88(5/8")		
ø19.05(3/4")		
ø22.23(7/8")		
ø25.40(1")		

Installation condition for a water pipe

Date of Installation	DD	MM	YY
Date of Test Run	DD	MM	YY

Water Pipe Installation Company	Company name	
	Contact	
Cooling Water	Type and Capacity	
Boiler	Type and Capacity	
Anti-Freeze Specification	Type	
	Concentration	%
Flow switch (Compulsory)	Type	Manufacturer: Model name:
	Installed Direction	Horizontal installation
2Way Valve (Optional)	Type	Manufacturer: Model name:
	Installed Direction	Horizontal installation
Variable Flow Control Valve (Optional)	Type	Manufacturer: Model name:
	Installed Direction	Horizontal installation

Self-Checklist for Installer

Item	Checklist	Check standard	Check result	
Preparation				
Distribution board	Did you install the separate circuit breakers to cut the power of each indoor unit?	Separate circuit breaker must be used to install indoor unit power		
Outdoor unit power	Did you connect the outdoor unit power cable in correct order of RST power?	Visual check		
	Did you connect the outdoor unit power cable with solderless ring terminal by applying rated torque?	Use solderless ring terminal and follow rated torque for connection		
Outdoor unit communication	Did you set the number of indoor units connected to the outdoor unit?	Check S/W combination of the outdoor unit PCB with the actual diagram		
	Did you connect the communication cable (F1, F2) between the indoor and outdoor units without dividing it multiple times from one indoor unit?	Check the connection status of communication cable		
Outdoor unit	Is there enough space around the outdoor unit?	Check the standards in the installation manual		
	Did you select the appropriate location for installation?	Surrounding temperature within 32–104°F (0–40°C) and humidity within 80%		
	Did you apply anti-vibration frame or pad according to the standards stated in the installation manual?	Visual check		
	Did you install drain pipe for outdoor unit?	Visual check		
	Did you remove the stopper nut and washer used to fix the compressor?	Visually check that the compressor is fixed only with the nut washer		
Water supply system	Is there any leakage on the pipe?	Visual check		
	Check if the temperature and pressure sensor is installed on the inlet/outlet of the outdoor unit.	Visual check (total of 4). Notify the water pipe installer if they are not installed.		
	Check if the shut-off valve and flexible joint is installed on the inlet/outlet of the outdoor unit.	Visual check (total of 4). Notify the water pipe installer if they are not installed.		
	Check if foreign substances and welding slugs in the pipe were cleaned.	Check whether or not flushing work has been performed and check the water quality. Notify the water pipe installer if flushing work has not been done.		
	Check if the strainer on the inlet water pipe were cleaned.	Clean the strainer. Notify the water pipe installer if the strainer was not cleaned.		
	Check if the flow control switch is installed on the outlet water pipe and connected to the product. (Installed in a vertical position on horizontal water pipe.)	Visual check. Notify the water pipe installer if the flow switch is not installed.		
	Check if the drain valve (for discharging water) is installed.	Visual check. Notify the water pipe installer if the drain valve was not installed.		
	Is there countermeasure for maintaining the amount of water flow between the outdoor units?	Visual check. Notify the water pipe installer if flow control switch is not installed.		
	Ground heat	Is the internal pressure of the pipe at 14.2–56.9 psi (1–4 kg/cm ²), when the ground water circulation pump is stopped?	Visually check the pressure gauge	
		What is the value of ground thermal conductivity?	Check the value of ground thermal conductivity on ground heat usage review	
Did you check the concentration level of the anti-freeze among the circulation water?		Check the Brine concentration measurement (Based on the installation manual)		
Trial operation				

Self-Checklist for Installer

Item	Checklist	Check standard	Check result
Outdoor unit	Is the inlet water temperature appropriate?	Check the temperature gauge (Based on the installation manual)	
	Is the supplied amount of water flow within the maximum/minimum range	Check the standards in the installation manual	
	Is the contact signal input for flow switch normal?	Check with clamp meter (Check for on/off contact when water pipe is on/off)	
	Is there error display on outdoor unit PCB?	Check error	
	Is there abnormal vibration or noise on outdoor unit cabinet?	Visual check	
Indoor unit	Is there abnormal operation noise on indoor unit?	Check for abnormal noise	
	Is the cooling/heating discharge temperature of indoor unit appropriate?	Check for abnormal temperature	
	Is the blade movement of cassette type indoor unit appropriate?	Visual check	
	Is the discharged air volume for duct and indoor unit appropriate?	Check the temperature	
	Is there any water leakage on the drain pipe near the indoor unit?	Visual check	
	Is there any error display on indoor unit panel?	Check for error	
Controller	Do you see any gaps or bent part on the panel of the cassette type indoor unit?	Visual check	
	Can you turn on/off the power with the controller?	Visual check	

Warranty for VRF Systems and Related Accessories

Products Covered. This warranty is extended by Trane U.S., Inc. (“Company”) and applies to all VRF systems and accessories for these products which are sold by the Company and applied in accordance with Company specifications.

Basic Warranty

The warrantor warrants for a period of 12 months from the initial start-up or 18 months from date of shipment, whichever is less, against failure due to defects in material and manufacture and that it has the capacities and ratings set forth in Company’s catalogs and bulletins (“Warranty”).

If the following conditions are met, the warrantor extends this basic warranty period to five (5) years from date of start-up:

- The system is designed using an approved application tool (VRF Select).
- The system is installed by a contractor who has successfully completed a Company factory training course.
- A verified commissioning report from the Company VRF Commissioning Tool is submitted.

Exclusions and Limitations

Exclusions from this Warranty include damage or failure arising from: wear and tear; corrosion, erosion, deterioration; modifications made by others to the Equipment; repairs or alterations by a party other than Company that adversely affects the stability or reliability of the Equipment; vandalism; neglect; accident; adverse weather or environmental conditions; abuse or improper use; improper installation; commissioning by a party other than Company; unusual physical or electrical or mechanical stress; operation with any accessory, equipment or part not specifically approved by Company; refrigerant not supplied by Company; and/or lack of proper maintenance as recommended by Company. Company shall not be obligated to pay for the cost of lost refrigerant or lost product. Company's obligations and liabilities under this Warranty are limited to furnishing replacement equipment or parts, at its option, FCA (Incoterms 2000) factory or warehouse (f.o.b. factory or warehouse for US domestic purposes) at Company-designated shipping point, freight-allowed to Company's warranty agent's stock location, for all non-conforming Company-manufactured Equipment (which have been returned by Customer to Company. Returns must have prior written approval by Company and are subject to restocking charge where applicable. Equipment, material and/or parts that are not manufactured by Company are not warranted by Company and have such warranties as may be extended by the respective manufacturer. **COMPANY MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, REGARDING PREVENTION OF MOLD/MOULD, FUNGUS, BACTERIA, MICROBIAL GROWTH, OR ANY OTHER CONTAMINATES.** No warranty liability whatsoever shall attach to Company until Customer's complete order has been paid for in full and Company's liability under this Warranty shall be limited to the purchase price of the Equipment shown to be defective. EXCEPT FOR COMPANY'S WARRANTY EXPRESSLY SET FORTH HEREIN, COMPANY DOES NOT MAKE, AND HEREBY EXPRESSLY DISCLAIMS, ANY WARRANTIES, EXPRESS OR IMPLIED CONCERNING ITS PRODUCTS, EQUIPMENT OR SERVICES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF DESIGN, MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR OTHERS THAT ARE ALLEGED TO ARISE FROM COURSE OF DEALING OR TRADE.

Additional warranty protection is available on an extra-cost basis and must be in writing and agreed to by an authorized signatory of the Company. Additional terms and conditions of warranty coverage are applicable for refrigeration equipment. If you wish further help or information concerning this warranty, contact: Trane—Warrantor, 2701 Wilma Rudolph Blvd., Clarksville, TN 37040.

Warranty for VRF Systems and Related Accessories

Warranty for VRF Systems and Related Accessories

The manufacturer optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, the manufacturer offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.IRCO.com.

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