Installation, Operation, and Maintenance

Variable Refrigerant Flow System

Outdoor Unit Series

Models:	(HP, 208–230 V)	(HP, 460 V)	(HR, 208–230 V)	(HR, 460V)
	4TVH072B300NB	4TVH072B400NB	4TVR072B300NB	4TVR072B400NB
	4TVH096B300NB	4TVH096B400NB	4TVR096B300NB	4TVR096B400NB
	4TVH120B300NB	4TVH120B400NB	4TVR120B300NB	4TVR120B400NB
	4TVH144B300NB	4TVH144B400NB	4TVR144B300NB	4TVR144B400NB

⚠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.

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VRF-SVN34A-EN

DB68-03592A(1)

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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Trademarks

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Table of Contents

Model Number Description

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

Digit 1: Refrigerant

4 = R410A

Digit 2: Brand name

T = Trane

Digit 3: System type

V = Variable Refrigerant Flow

Digit 4: Functional Type Outdoor Unit

T = Cooling Only, Digital Scroll (VRF)
F = Cooling Only, DC Inverter (VRF)
S = Heat Pump, Digital Scroll (VRF)
H = Heat Pump, DC Inverter (VRF)
R = Heat Recovery (3-pipe), DC Inverter (VRF)
K = Heat Recovery (3-pipe), Digital Scroll (VRF)

Digit 5: Reserved for future use

0 = Standard

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

036 = 36,000 Btu/h
048 = 48,000 Btu/h
060 = 53,000 Btu/h
072 = 72,000 Btu/h
096 = 96,000 Btu/h
120 = 120,000 Btu/h
144 = 144,000 Btu/h

Digit 9: Major development sequence

B = Second development sequence (Samsung)

Digit 10: Electric power supply characteristics

1 = 220/60/1
3 = 208–230/60/3
4 = 460/60/3
6 = 220/60/3

Digit 11: Coil fin protection

0 = Standard
B = Blue fin
C = Corrosion resistant

Digit 12: Reserved for future use

0 = Not currently used

Digit 13: Region of sale

N = North America (UL or ETL)

Digit 14: Minor design sequence

A = First design sequence
B = Second design sequence

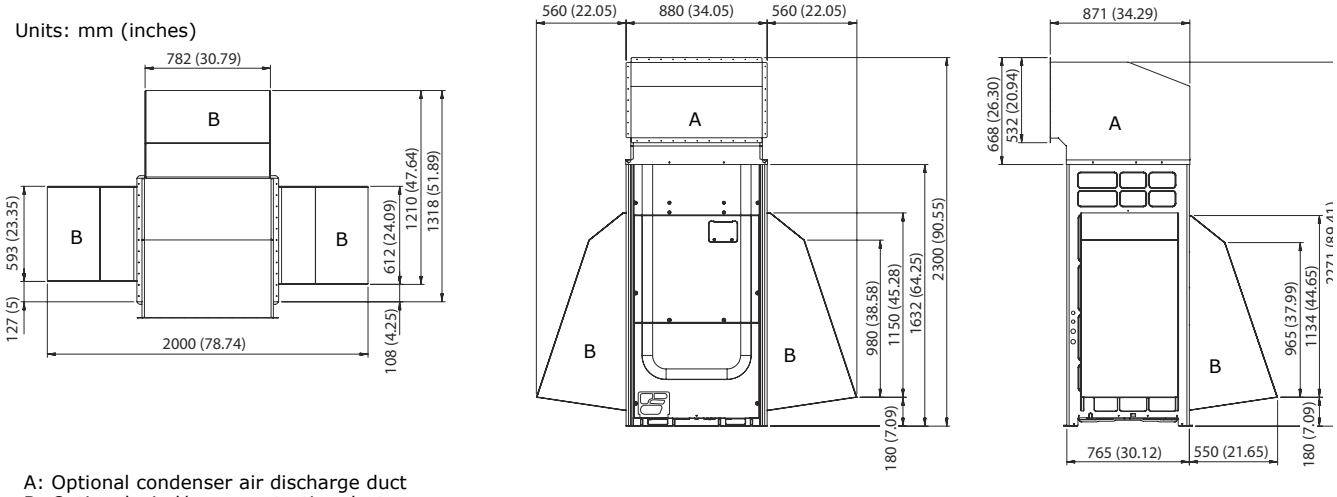
Preparing for Installation

Unit Dimensions and Weight

Table 1. Unit dimensions and weight

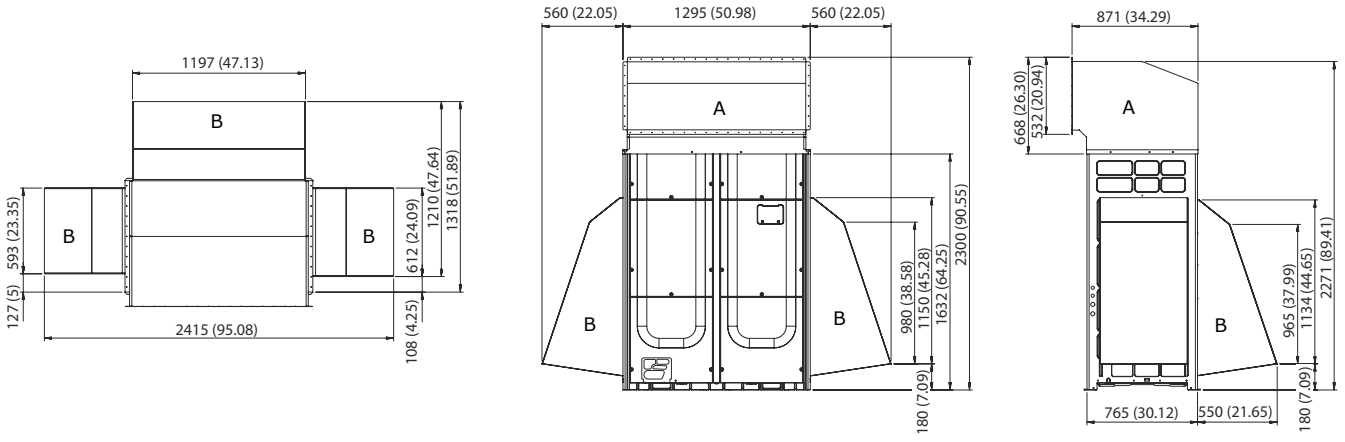
Unit type	Unit model number	Dimensions (WxHxD) in. (mm)	Weight lb (kg)	Shipping dimensions (WxHxD) in. (mm)	Shipping weight lb (kg)
Heat Pump (203–230 V)	4TVH0072B300NB	34.6x66.7x30.1 (880x1695x765)	425.5 (193)	37.3x75.3x32.8 (948x1912x832)	460.8 (209)
	4TVH0096B300NB	51.0x66.7x30.1 (1295x1695x765)	623.9 (283)	53.7X75.3x32.8 (1363x1912x832)	665.8 (302)
	4TVH0120B300NB				
	4TVH0144B300NB		657.0 (298)		698.9 (317)
Heat Recovery (203–230 V)	4TVR0072B300NB	34.6x66.7x30.1 (880x1695x765)	425.5 (193)	37.3x75.3x32.8 (948x1912x832)	460.8 (209)
	4TVR0096B300NB	51.0x66.7x30.1 (1295x1695x765)	637.1 (289)	53.7X75.3x32.8 (1363x1912x832)	679.0 (308)
	4TVR0120B300NB				
	4TVR0144B300NB		672.4 (305)		714.3 (324)
Heat Pump (460 V)	4TVH0072B400NB	34.6x66.7x30.1 (880x1695x765)	436.5 (198)	37.3x75.3x32.8 (948x1912x832)	471.8 (214)
	4TVH0096B400NB	51.0x66.7x30.1 (1295x1695x765)	540.1 (245)	53.7X75.3x32.8 (1363x1912x832)	582.0 (264)
	4TVH0120B400NB				
	4TVH0144B400NB		672.4 (305)		714.3 (324)
Heat Recovery (460 V)	4TVR0072B400NB	34.6x66.7x30.1 (880x1695x765)	445.3 (202)	37.3x75.3x32.8 (948x1912x832)	480.6 (218)
	4TVR0096B400NB	51.0x66.7x30.1 (1295x1695x765)	553.4 (251)	53.7X75.3x32.8 (1363x1912x832)	595.2 (270)
	4TVR0120B400NB				
	4TVR0144B400NB		692.3 (314)		734.1 (333)

Figure 1. Dimensional drawing: 4TVH072**/4TVR072****



A: Optional condenser air discharge duct
B: Optional wind/snow protection duct

Figure 2. Dimensional drawing: 4TVH096/120/144**/4TVR096/120/144****

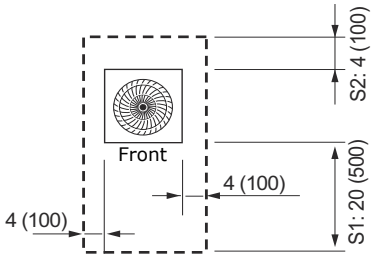


A: Optional condenser air discharge duct
B: Optional wind/snow protection duct

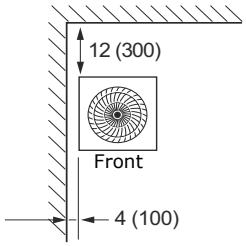
Service Clearances

Install units as shown in the illustrations below, observing ventilation and service requirements. Space requirements are based on cooling mode operation and an outdoor temperature of 95°F (35°C). More space is required if the outdoor temperature is higher than 95°F (35°C) or if the area is easily heated by solar radiation.

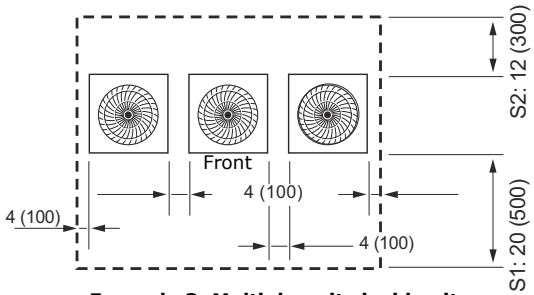
Figure 3. Minimum service clearances for single and multiple units



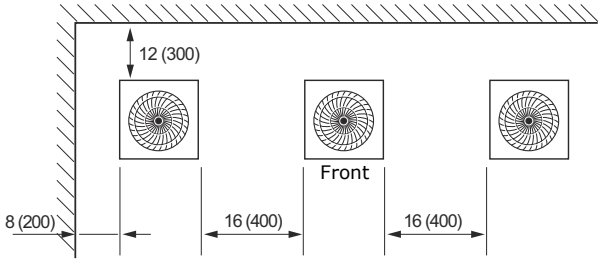
Example 1: Single unit inside pit



Example 2: Single unit inside wall



Example 3: Multiple units inside pit



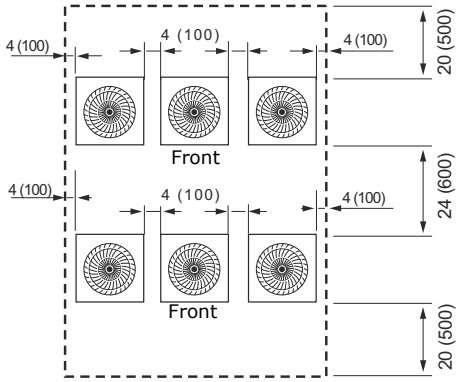
Example 4: Multiple units inside wall

Notes:
Units: inches (mm)

S1 = Front service clearance
S2 = Back service clearance
See Figure 4, p. 9 for details.

You may install multiple outdoor units with a minimum 1 in. (20 mm) of space between them, but reduced capacity may occur depending on the installation environment.

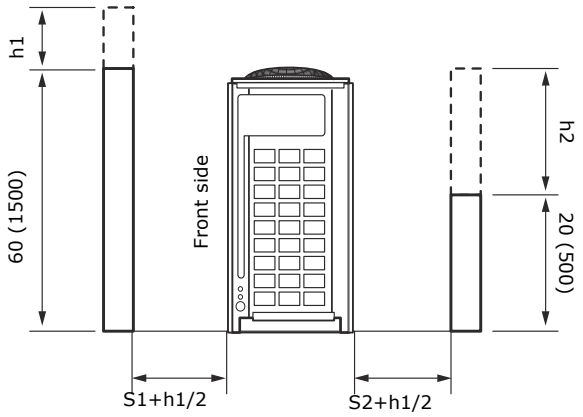
Clearance requirements are waived for any unit sides that have wind/snow protection ducts installed on them, due to the wind/snow protection duct size, which exceeds clearance requirements.



Example 5: Multiple units inside pit

Figure 4. Dimension limits for pit

Note: This figure refers to Figure 3, examples 1, 3, 5.



Front wall height recommendation: 60 in. (1500 mm) maximum.
Back wall height recommendation: 20 in. (500 mm) maximum.
Side wall height is unlimited.

If a wall exceeds the recommended height, an additional clearance of half of the exceeded height should be added to the service clearance. (Clearances are given in Figure 3, p. 8).

S1 = Front service clearance
S2 = Back service clearance
h1 = Wall height in excess of 60 in. (1500 mm)
h2 = Wall height in excess of 20 in. (500 mm)

Outdoor Unit Combinations

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

Follow these guidelines:

- Make sure to use indoor units that are compatible with the outdoor 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 2 and Table 3.
- 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 outdoor unit. The maximum quantity of connectable indoor units is 64 because the outdoor unit supports a maximum of 64 communication addresses.
- If you choose to select outdoor unit combination other than the ones in Table 2 or Table 3, the total capacity of connected indoor units is allowed to be 50%–130% of the outdoor unit capacity: [0.5 x total outdoor unit capacity ≤ total connected indoor unit capacity ≤ 1.3 x total outdoor unit capacity].

Table 2. Outdoor unit combinations: 6–20 ton capacity

Capacity		6 ton	8 ton	10 ton	12 ton	14 ton	16 ton	18 ton	20 ton
Outdoor unit combination number		4TV*0072*****	4TV*0096*****	4TV*0120*****	4TV*0144*****	4TV*0168*****	4TV*0192*****	4TV*0216*****	4TV*0240*****
Total number of individual outdoor units		1	1	1	1	2	2	2	2
Combined outdoor unit	4TV*0072*****	1				1	1	1	
	4TV*0096*****		1			1			
	4TV*0120*****			1			1		2
	4TV*0144*****				1			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	183000	207000	228000
	Heating (Btu/h)	77000	103000	129000	154000	180000	206000	231000	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 number of connectable indoor units		12	16	20	25	29	33	37	41

Table 3. Outdoor unit combinations: 22–36 ton capacity

Capacity		22 ton	24 ton	26 ton	28 ton	30 ton	32 ton	34 ton	36 ton
Model name for Combination		4TV*0264*****	4TV*0288*****	4TV*0312*****	4TV*0336*****	4TV*0360****	4TV*0384*****	4TV*0408****	4TV*0432*****
Total number of individual outdoor units		2	2	3	3	3	3	3	3
Combined outdoor unit	4TV*0072*****			1	1	1			
	4TV*0096*****			1					
	4TV*0120*****	1			1		2	1	
	4TV*0144*****	1	2	1	1	2	1	2	3
Nominal capacity	Cooling (Btu/h)	264000	288000	312000	336000	360000	384000	408000	432000
	Heating (Btu/h)	297000	324000	351000	378000	405000	432000	459000	486000
Rated capacity	Cooling (Btu/h)	252000	276000	299000	321000	345000	366000	390000	414000
	Heating (Btu/h)	283000	308000	334000	360000	385000	412000	437000	462000
Total capacity of indoor units (cooling)	Minimum (Btu/h)	132000	144000	156000	168000	180000	192000	204000	216000
	Maximum (Btu/h)	343200	374400	405600	436800	468000	499200	530400	561600
Maximum number of connectable indoor units		45	49	54	58	62	64	64	64

Accessories

Accessories that ship with the unit are:

- Instruction manual
- Brand label and instruction sheet
- Pipe installation sockets (see Table 4 and Figure 5).

Table 4. Pipe installation socket size chart

Model number	Connection type	Heat recovery				Heat pump		
		Gas	Liquid	High-pressure gas	Socket needed	Gas	Liquid	Socket needed
4TV*0072***** (6 ton)	Unit connection	3/4 in.	3/8 in.	5/8 in.	No	3/4 in.	3/8 in.	No
	Field connection							
4TV*0096***** (8 ton)[a]	Unit connection	1-1/8 in.	1/2 in.	7/8 in.	Yes	1 in.	1/2 in.	Yes
	Field connection	7/8 in.	3/8 in.	3/4 in.		7/8 in.	3/8 in.	
4TV*0120***** (10 ton)[a]	Unit connection	1-1/8 in.	1/2 in.	7/8 in.	Yes	1 in.	1/2 in.	Yes
	Field connection			3/4 in.		1-1/8 in.		
4TV*0144***** (12 ton)[a]	Unit connection	1-1/8 in.	5/8 in.	1-1/8 in.	Yes	1-1/8 in.	1/2 in.	No
	Field connection		1/2 in.	7/8 in.				

(a) Cut socket as needed for 8, 10, and 12 ton units.

Figure 5. Pipe installation sockets

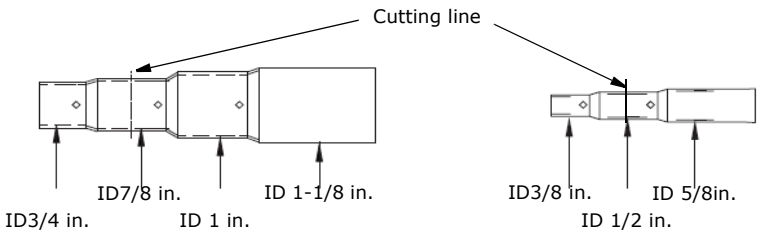


Table 5 shows optional accessories for outdoor units.

Table 5. Optional accessories

Accessory	Model number	Specification
Y-joint	4YDK1509B0051A	51 MBH and below
	4YDK2512B0138A	Over 51–136 MBH
	4YDK2812B0160A	Over 136–154 MBH
	4YDK2815B0240A	Over 154–240 MBH
	4YDK3419B0336A	Over 240–336 MBH
	4YDK4119B0468A	Over 336–461 MBH
	4YDK4422B0999A	Over 461 MBH
Y-joint (high-pressure gas for heat recovery units)	4YDK1500B0080A	76 MBH and below
	4YDK2500B0240A	Over 76–240 MBH
	4YDK3100B0468A	Over 240–461 MBH
	4YDK3800B0999A	Over 461 MBH
Y-joint for outdoor unit	4TDK3819B0000A	456 MBH and below
High-pressure Y-joint for outdoor unit	4TDK3100B0000A	456 MBH and below

Table 5. Optional accessories (continued)

Accessory	Model number	Specification
Distribution header	4HJK2512B0159A	154 MBH and below (for 4 rooms)
	4HJK3115B0241A	240 MBH and below (for 8 rooms)
	4HJK3819B0998A	Over 240 MBH (for 8 rooms)
Electronic expansion valve (EEV) kit[(a)]	4EEVEVA24SA000	Below 12 MBH (for 1 indoor unit)
	4EEVEVA32SA000	Over 18 MBH (for 1 indoor unit
	4EEVXDA24K132A	7-15.5 MBH (for 2 indoor units)
	4EEVXDA24K200A	7-15.5 MBH (for 2 indoor units)
	4EEVXDA32K200A	17-31 MBH (for 2 indoor units)
	4EEVXDA24K232A	7-15.5 MBH (for 3 indoor units)
	4EEVXDA24K300A	7-15.5 MBH (for 3 indoor units)
	4EEVXDA32K224A	17-31 MBH (for 3 indoor units)
	4EEVXDA32K300A	17-31 MBH (for 3 indoor units)

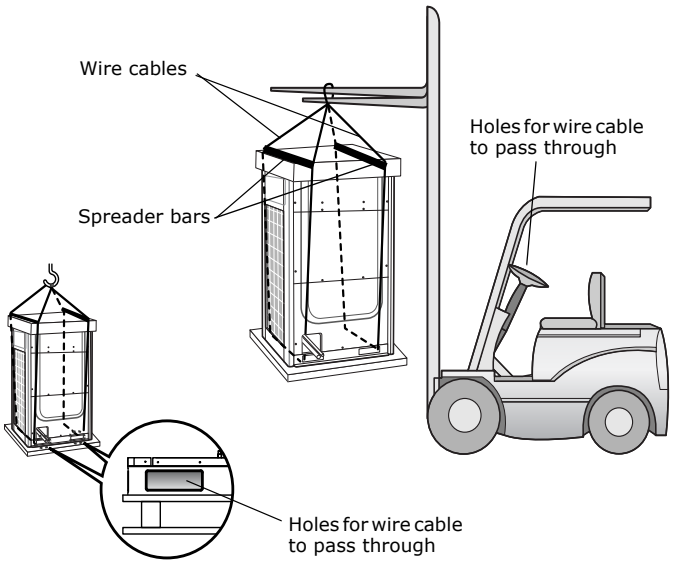
(a) Required for indoor units that do not have internal EEVs. Refer to the EEV kit installation guide (VRF-SVN43) for detailed information.

Moving the Outdoor Unit

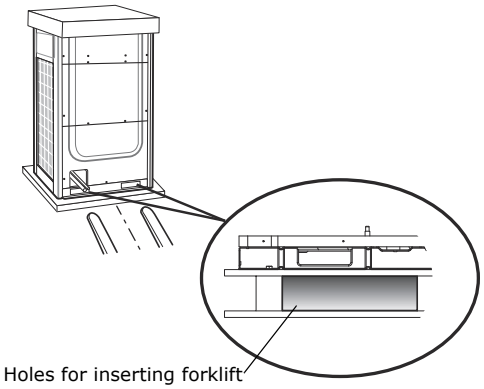
Follow these guidelines when moving the outdoor unit:

- Before moving the outdoor unit, determine a path that can support its weight.
- Do not lay the unit on its side and do tip it more than 30 degrees.
- Take care to avoid injury while moving the unit; the surface of the heat exchanger is sharp.
  - If moving the unit with a crane, fasten the wire rope as shown in the figure below. 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 outdoor unit. Be careful with to avoid damaging the unit with the forklift.

Moving with a crane



Moving with a forklift

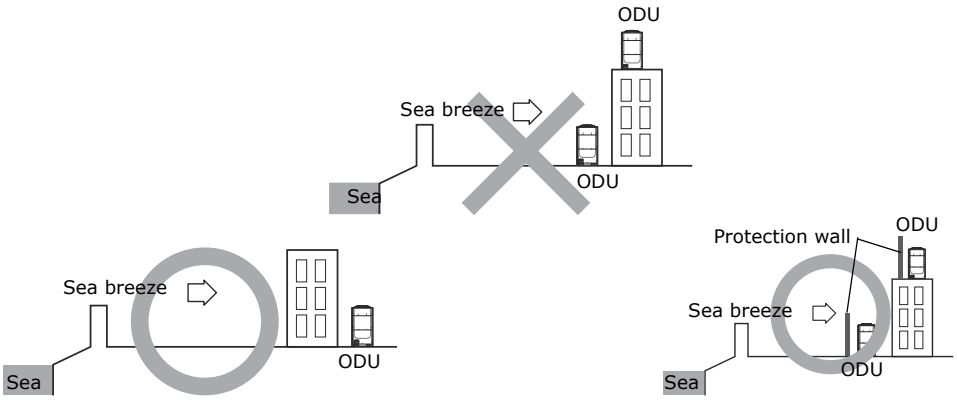


Location Considerations

Choose an installation location based on the following considerations.

- Install the outdoor unit:
  - On a supporting structure that can bear the weight of the outdoor unit. The supporting structure can be a base on the ground, on a waterproof roof, or in a pit.
  - With sufficient clearances around the unit for service and repairs.
  - On a flat surface that does not collect water
  - In a well ventilated location
  - Away from strong wind
  - Away from direct exposure to rain or snow
  - Where there is no risk of flammable gas leakage
  - Where there is no exposure to salt, machine oil, sulfide gas, or corrosive environmental conditions
  - Away from sea breeze

  Note: *For seacoast applications, block the unit from direct exposure to sea breeze by installing the outdoor unit (ODU) behind a structure (such as a building) or a protective wall that is 1.5 times higher than the unit, leaving 28 in. (700 mm) of space between the wall and unit for air circulation. Consult an installation expert about taking anti-corrosion measures, such as removing salinity on the heat exchanger and applying a rust inhibitor more frequently than once a year.*



  - 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.
  - Far enough away from people living and working nearby so that hot discharge air or noise do not disturb them.
  - Away from inflammable materials.
- Ensure that condensate water generated by the outdoor unit can drain smoothly away from the unit.
- Install the power and communication cables in a separately installed enclosure.
- If installing on a high place such as a roof, a fence or guard rail should be installed around it to safeguard from falls.
- If there is a potential for accumulated snow to block the air inlet or heat exchanger, install the unit on a base higher than the highest possible snow accumulation.

- 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 outdoor 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.
- Apply corrosion protection and any other protective coatings to the unit as appropriate to the environment.

Unit Installation

Follow these guidelines for installing the outdoor unit.

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

The outdoor unit must be installed:

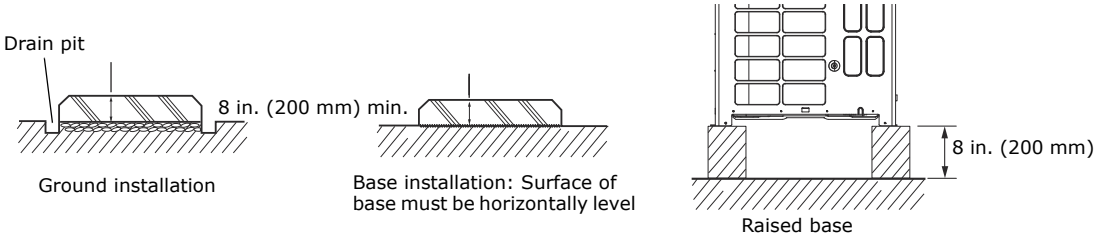
- On a horizontally level surface.
- On a surface that is strong enough to support the unit and to minimize noise.

Base Recommendations

A supporting base for the outdoor unit:

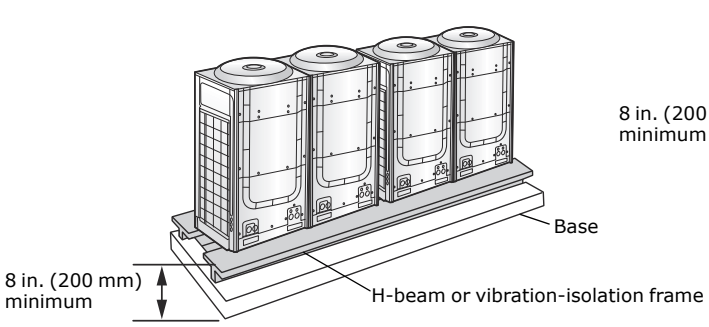
- Is typically made of concrete.
- Should typically be 1.5 times larger than the bottom of the outdoor unit. However, for installations that are subject to snow accumulation, the base should be no larger than the bottom of the unit.
- Should be 8 in. (200 mm) or higher to protect the outdoor unit from rain water or other conditions that may cause damage to the unit.

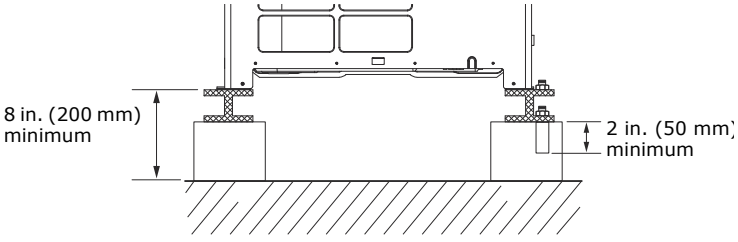
  Note: *The height of the base or, if the unit is installed on a frame (see "Minimizing Vibration" p. 15), the height of the base plus the frame should be greater than the highest expected snowfall.*
- If necessary, has wire mesh or steel bars added to the concrete to prevent damages or cracks.



Minimizing Vibration

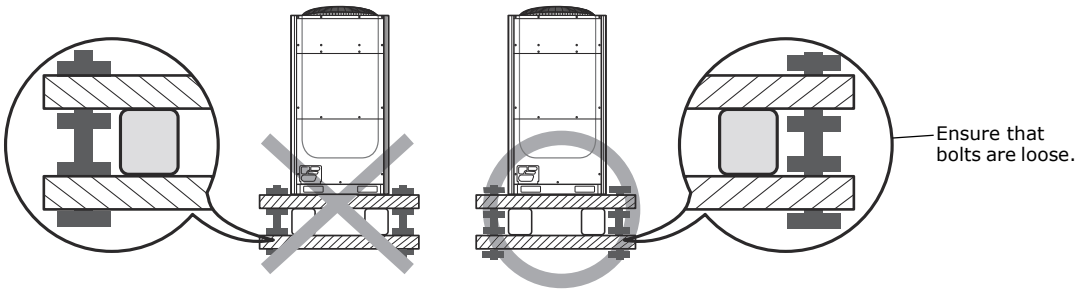
To minimize outdoor unit vibrations, use a vibration-minimizing structure such as an H-beam frame, a vibration-isolation frame, or an isolation pad (thickness > 1 in. [20 mm]). The load-bearing force of the structure must be 787 lbf (3.5 kN).





H-beam frame on concrete supports

After installing a vibration-isolation frame, loosen the bolts so that the isolators are capable of absorbing vibrations (refer to the figure below).



Vibration-isolation frame

Water Management Recommendations

If the outdoor unit base is on ground level, construct a drainage pit around it to prevent the drain water from collecting near the unit.

- Use wire mesh or steel bar for constructing the drainage pit.
- Construct the pit with a slope of 1:50.

Figure 6. Water management for single-unit installation

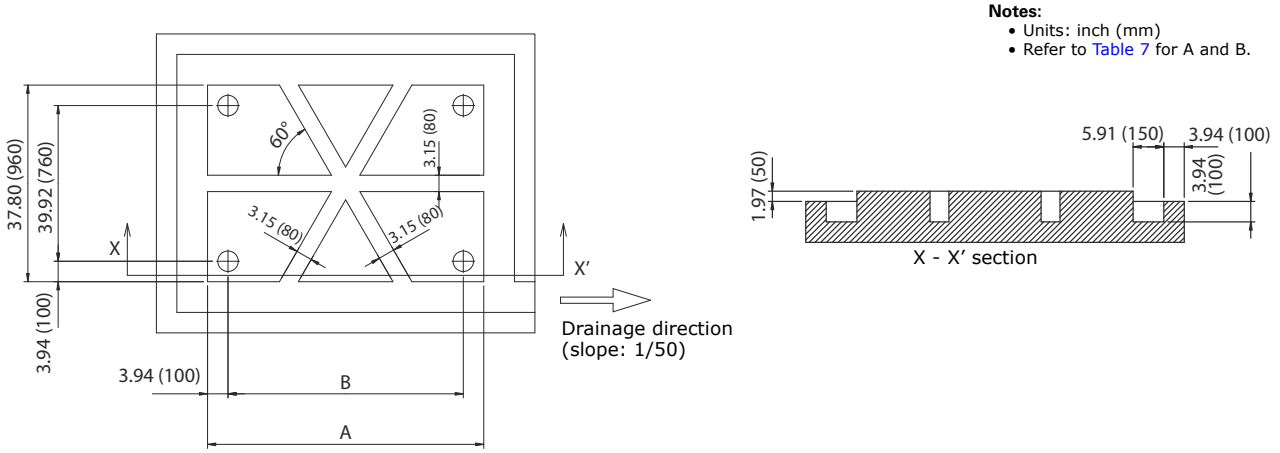
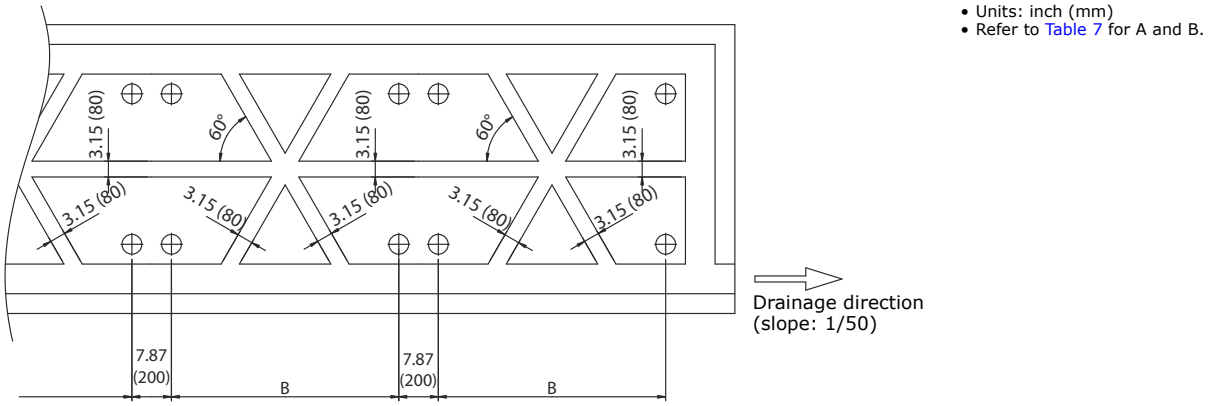


Figure 7. Water management for multiple-unit installation



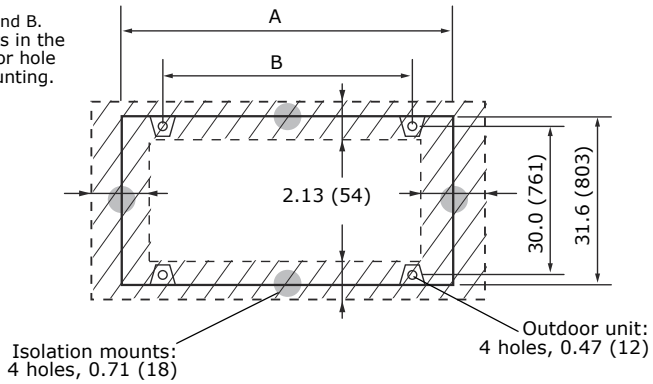
Securing the Outdoor Unit

Secure the outdoor unit firmly to the base with anchor bolts (see Figure 8 and Table 6).

- Use zinc-plated or stainless steel nuts and bolts.
- It must be able to withstand the wind speed of 67 mph (30 m/s).
- Use a rubber washer between the bolt and the outdoor unit to prevent bimetallic corrosion.
- If you cannot attach the outdoor unit to the base, secure it from the side or to an additional structure.

Figure 8. Bolt hole sizes and locations for mounting the outdoor unit

Notes:
- Units: inch (mm)
- Refer to Table 7 for A and B.
- Refer to the blueprints in the technical data book for hole specifications for mounting.



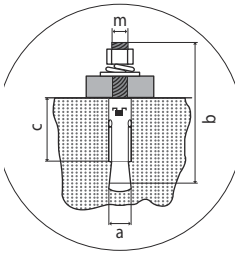


Table 6. Anchor specification

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)	265.5 in·lbf (30 N·m)

Table 7. Unit and bolt dimensions

Dimensions	4TVH072***** 4TVR072*****	4TVH096/120/144***** 4TVR096/120/144*****
Unit width (A)	37.01 in. (940 mm)	53.15 in. (1350 mm)
Distance between bolts (B)	29.13 in. (740 mm)	45.28 in. (1150 mm)

Condenser Air Discharge Duct (optional)

⚠CAUTION

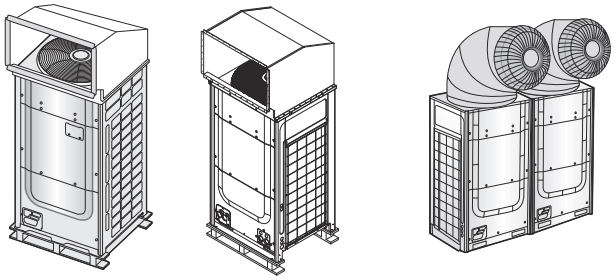
Sharp Edges!

Working with galvanized sheet metal involves working with sharp edges. To avoid being cut, technicians MUST put on all necessary Personal Protective Equipment (PPE), including gloves and arm guards.

If you remove the fan guard to install the discharge duct, make sure to install a safety net on the duct outlet to prevent foreign substances from entering the unit and to prevent the risk of personal injury from sharp fan blades.

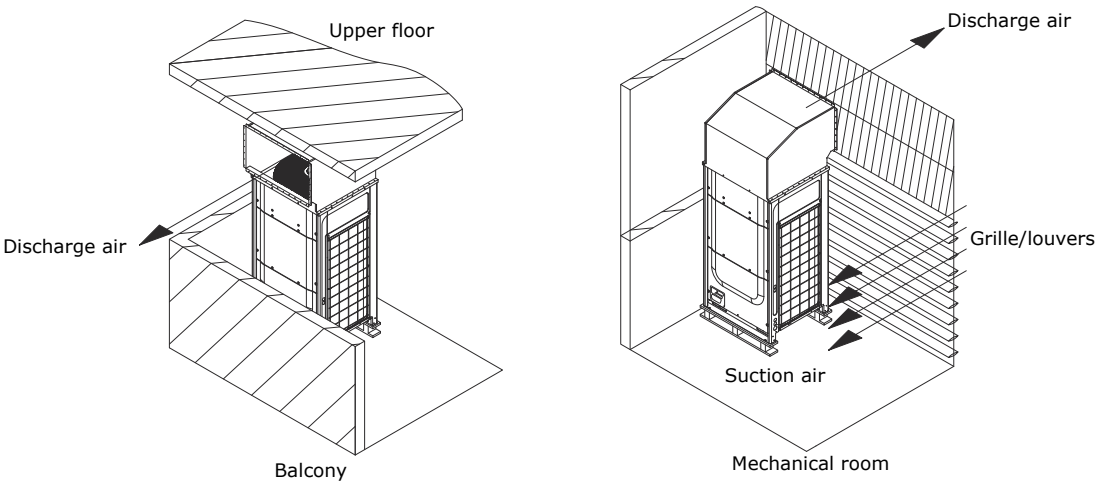
A discharge duct can be installed on the outdoor unit to prevent foreign substances from entering the unit.

The static pressure of the discharge duct should be within the standard specification of 0.02 inches of water (78.45 Pa) when installing the duct.



Examples of condenser air discharge ducts

If it is difficult to provide a minimum of 6.56 ft (2 m) of space between the air outlet and nearby obstacles, direct the discharge air horizontally from the fan.



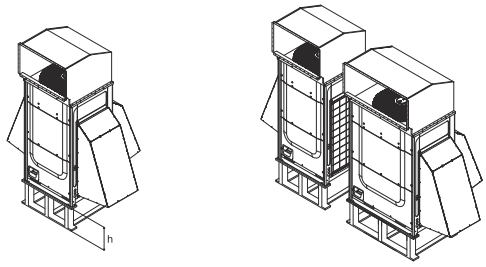
Wind/Snow Prevention Duct Installation (optional)

A wind/snow prevention should be installed:

- In snowy regions, to prevent snow from accumulating on the outdoor unit and the risk of accumulated frost, which may interfere with normal heating operation.
- In windy regions, such as near a sea shore, to protect the unit from humid air.

Install the duct so that:

- The discharge air and prevailing wind are not going the same direction.
- The discharge air is not directed to the enclosed area.
- Height (h) of the frame or base should be higher than the heaviest expected snowfall.



Refrigerant Piping

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

Selecting Refrigerant Piping

Refrigerant piping diameter, thickness, and temper is selected according to length, as specified in this section.

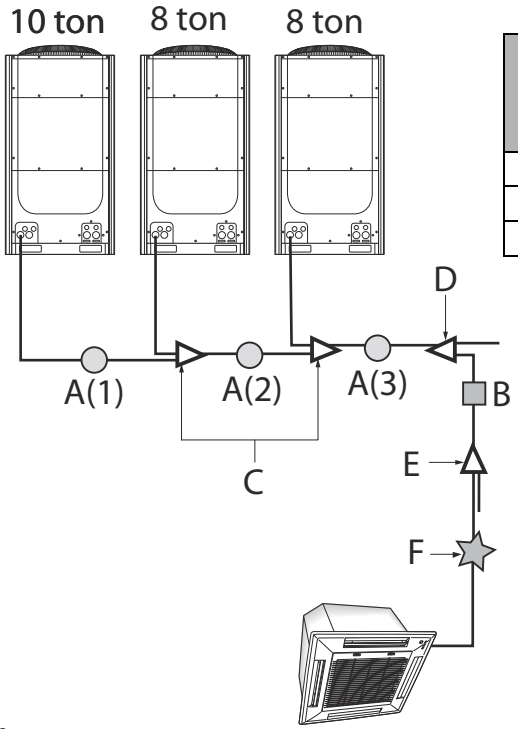
Notes:

- *Use insulated, unwelded, degreased, and deoxidized copper 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.*
- *If there is a risk of decreased performance caused by pipe length, use piping that is one size larger than that specified in this section.*

Heat Pump Applications

The example in Figure 9 shows a 26-ton capacity heat pump system with pipe diameters specified.

Figure 9. Heat pump system example



Outdoor unit capacity (ton)	Pipe A	Pipe size (OD)	
		Liquid in. (mm)	Gas in. (mm)
10	A(1)	1/2 (12.70)	1-1/8 (28.58)
18	A(2)	5/8 (15.88)	1-1/8 (28.58)
26	A(3)	3/4 (19.05)	1-3/8 (34.92)

Key

A(1): Select based on individual outdoor unit capacity (Table 8, p. 21).
A(2): Select based on the sum of outdoor unit capacity behind the first outdoor unit multi-connection (Table 8, p. 21).
A(3): Select based on the sum of outdoor unit capacity before the first branch joint (Table 8, p. 21).
B: Pipes between branch joints (Table 9, p. 21)
C: Outdoor joints between outdoor units (Table 14, p. 24)
D: First branch joint (Table 15, p. 24))
E: Branch joints to indoor units (Table 16, p. 25))
F: Pipe size between branch joints and indoor units (Table 13, p. 24)

Use Table 8 to determine the size of the main pipes based on pipe length. (Refer to A in Figure 13, p. 32)

Table 8. Outdoor unit main pipe size based on pipe length (A)

Outdoor unit capacity		Main pipe size (OD) when pipe length is ≤ 295.3 ft (90 m)		Main pipe size (OD) when pipe length > 295.3 ft (90 m)	
Ton	MBH	Liquid in. (mm)	Gas in. (mm)	Liquid in. (mm)	Gas in. (mm)
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 (25.4)[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 (28.1)[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)

(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.

Use Table 9 to determine the size of pipes between branch joints. (Refer to B in Figure 13, p. 32.)

Table 9. Pipe size between branch 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 (25.4)[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)

(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.

Use Table 10 to determine the size for pipes between branch joints and indoor units. (Refer to F in Figure 13, p. 32.)

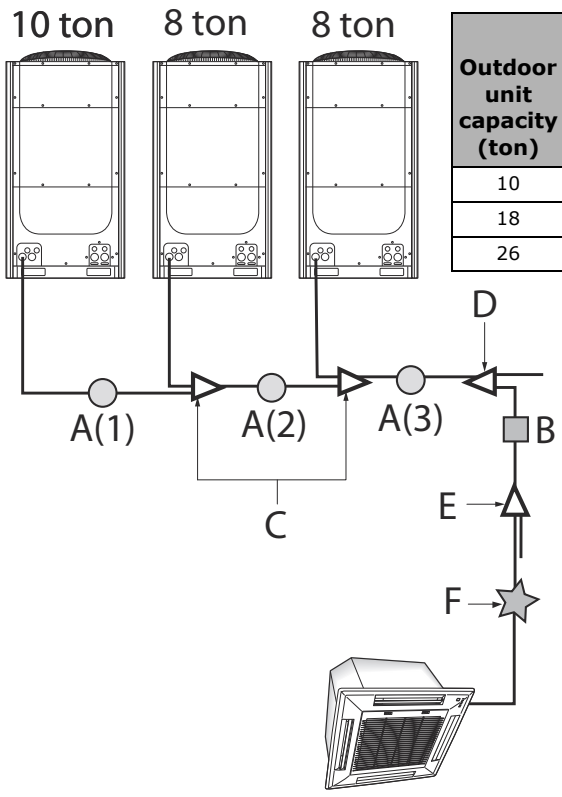
Table 10. Pipe size between the branch joint and indoor unit (F)

Indoor unit capacity (MBH)	Pipe size (OD)	
	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

The example in Figure 10 shows a 26-ton capacity heat recovery system with pipe diameters specified.

Figure 10. Heat recovery system example



Outdoor unit capacity (ton)	Pipe A	Pipe size (OD)		
		Liquid in. (mm)	Gas in. (mm)	High-pressure gas in. (mm)
10	A(1)	1/2 (12.70)	1-1/8 (28.58)	7/8 (22.22)
18	A(2)	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)
26	A(3)	3/4 (19.05)	1-3/8 (34.92)	1-1/8 (28.58)

Key

A(1): Select based on individual outdoor unit capacity (Table 11, p. 23).
A(2): Select based on the sum of outdoor unit capacity behind the first outdoor unit multi-connection (Table 11, p. 23).
A(3): Select based on the sum of outdoor unit capacity before the first branch joint (Table 11, p. 23).
B: Pipes between branch joints (Table 12, p. 23)
C: Outdoor joints between outdoor units (Table 14, p. 24)
D: First branch joint (Table 15, p. 24))
E: Branch joints to indoor units (Table 16, p. 25))
F: Pipes between branch joints and indoor units (Table 13, p. 24)

Use Table 11 to determine the size of the main pipes (A in Figure 10, p. 22) based on pipe length.

Table 11. Outdoor unit main pipe size based on pipe length (A)

Outdoor unit capacity		Main pipe size (OD) when pipe length is ≤ 295.3 ft (90 m)			Main pipe size (OD) when pipe length > 295.3 ft (90 m)		
Ton	MBH	Liquid in. (mm)	Gas in. (mm)	High-pressure gas in. (mm)	Liquid[a] in. (mm)	Gas in. (mm)	High-pressure gas in. (mm)
6	72	3/8 (9.52)	3/4 (19.05)	5/8 (22.22)	1/2 (12.70)	3/4 (25.4)	5/8 (22.22)
8	96	3/8 (9.52)	7/8 (22.22)	3/4 (25.4)	1/2 (12.70)	7/8 (22.22)	3/4 (25.4)
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)

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

Use Table 12 to determine the size of pipes between branch joints. (Refer to B in Figure 10, p. 22.)

Table 12. Pipe size between branch joints (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)	1-1/8 (28.58)
154–171.9	5/8 (15.88)	1-1/8 (28.58)	1-1/8 (28.58)
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)
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)

Use Table 13 to determine the size for the pipes between branch joints and indoor units. (Refer to F in Figure 10, p. 22.)

Table 13. Pipe size between the branch joint and indoor unit (F)

Indoor unit capacity (MBH)	Pipe size (OD)	
	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)

Identifying Branch Joints

Use Table 14, Table 15, and Table 16 to identify branch joint models.

Note: *High-pressure Y-joints are for heat recovery outdoor unit models only, as noted in each table.*

Table 14. Branch joint between outdoor units (C)

Branch joint between outdoor units (C)	Model
Y-joint	4TDK3819B0000A
High-pressure gas Y-joint (for heat recovery models)	4TDK3100B0000A

Use Table 15 to select the first branch joint according to outdoor unit capacity. (Refer to D in Figure 9, p. 20 (heat pump) or Figure 10, p. 22 (heat recovery.)

Table 15. First branch joint according to outdoor unit capacity (D)

First branch joint (D)	Outdoor unit capacity (ton)	Model
Y-joint	6, 8, 10	4YDK2512B0138A
	12	4YDK2812B0160A
	14, 16, 18, 20	4YDK2815B0240A
	22, 24, 26, 28	4YDK3419B0336A
	30, 32, 34, 36	4YDK4119B0468A
High-pressure gas Y-joint (for heat recovery models)	6	4YDK1500B0080A
	8–20	4YDK2500B0240A
	22–36	4YDK3100B0468A

Use Table 16 to select the branch joints connected after the first branch, according to the total capacity of all indoor units connected after the branch. (Refer to E in Figure 9, p. 20 (heat pump) or Figure 10, p. 22 (heat recovery).)

Table 16. Branch joints connected after the first branch, according to total indoor unit capacity (E)

Branch joints after the first branch (E)	Total indoor unit capacity (MBH)	Model
Y-joint	Less than 51	4YDK1509B0051A
	51—135.9	4YDK2512B0138A
	136—153.9	4YDK2812B0160A
	154—239.9	4YDK2815B0240A
	240—335.9	4YDK3419B0336A
	336—460.9	4YDK4119B0468A
	461 and over	4YDK4422B0999A
High-pressure gas Y-joint (for heat recovery models)	Less than 76	4YDK1500B0080A
	76—239.9	4YDK2500B0240A
	240—461	4YDK3100B0468A

Pipe Minimum Thickness and Temper Grade Based on Pipe Size

Table 17 specifies 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 17. 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 (0.9)	Drawn (C1220T-1/2H or C1220T-H)
7/8 (22.22)	0.035 (0.9)	
1 (25.40)	0.039 (1.0)	
1-1/8 (28.58)	0.043 (1.1)	
1-1/4 (31.75)	0.043 (1.1)	
1-3/8 (34.92)	0.048 (1.35)	
1-1/2 (38.10)	0.053 (2.0)	
1-5/8 (41.28)	0.056 (1.43)	
1-3/4 (44.45)	0.063 (2.10)	
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 18).

Table 18. 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 outdoor unit ships with the following amount of refrigerant. Evacuate the unit of all ship-with refrigerant before installing refrigerant piping.

Ship-with refrigerant amount by unit type			
6 ton unit	**8 ton unit**	**10 ton unit**	**12 ton unit**
12.1 lbs	16.3 lbs	16.3 lbs	19.2 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. 27, "Nitrogen Flushing While Brazing" p. 27, and "Flared Pipe Connections" p. 28.)
2. Make sure that pipes are free of dirt, debris, and moisture, and do not leak. (Refer to "Leak Testing Pipe Connections" p. 45).

3. Braze or use flared pipe connections to install piping. Refer to "Connecting Piping to the Outdoor Unit" p. 29) and to "Connecting Branch Joints" p. 30.

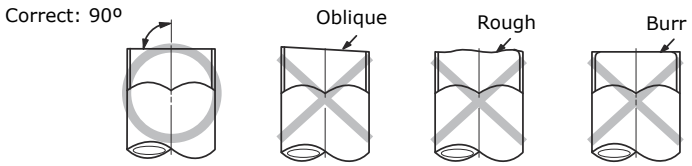
Pipe Cutting

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

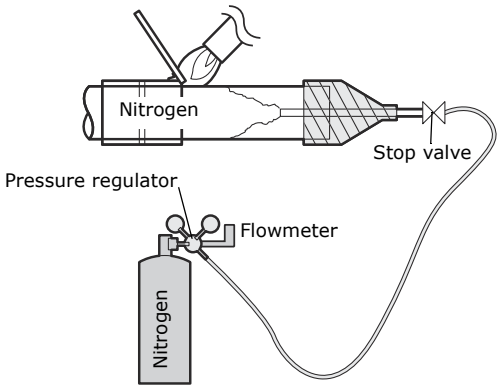
NOTICE

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 ft^3/h (0.05 m^3/h) or more.

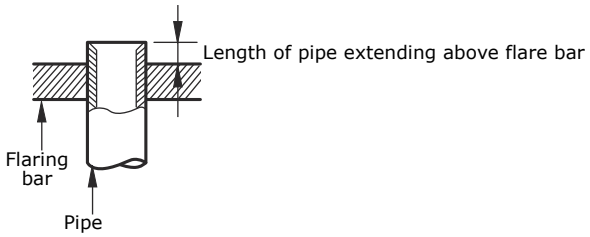
Figure 11. Nitrogen flushing while brazing refrigerant pipes

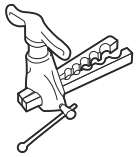


Flared Pipe Connections

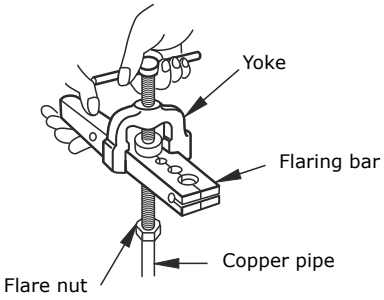
Clutch type and wing nut type flare tools are available for flared pipe connections.

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.

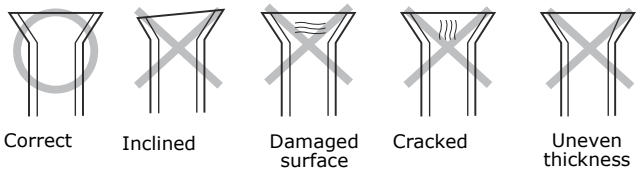


R-410A clutch type	Conventional flare tool	
	Clutch type	Wing nut type
0–0.020 in.	0.04–0.06 in.	0.06–0.08 in.
		

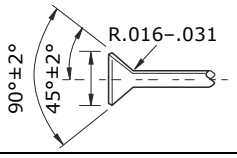
3. Attach the yoke to the flaring bar, centering the conical part over the end of the pipe that is extending above the flaring bar.
4. Tighten the yoke securely to flare the end of the pipe.



5. 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.



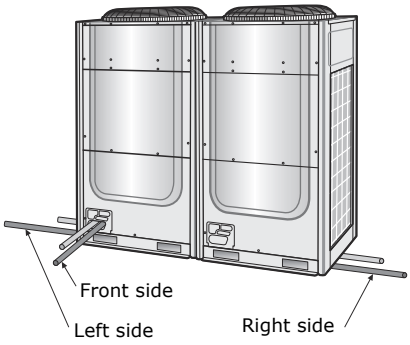
6. Align the pipes and tighten the flare nuts manually and then with a spanner torque wrench, applying the torque according to pipe dimensions:

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

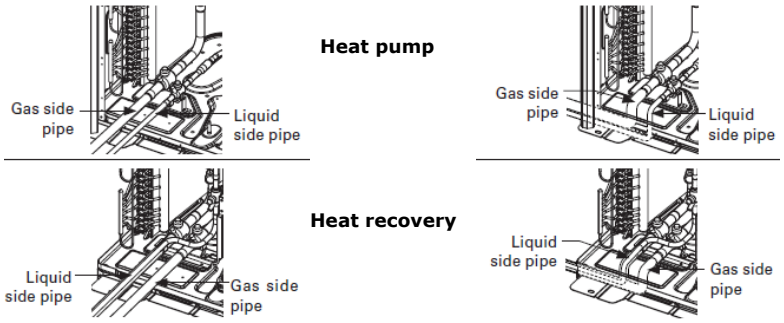
Connecting Piping to the Outdoor Unit

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

Pipes can be connected to the outdoor unit at the front, bottom left, or bottom right of the unit, as shown in the following figure:

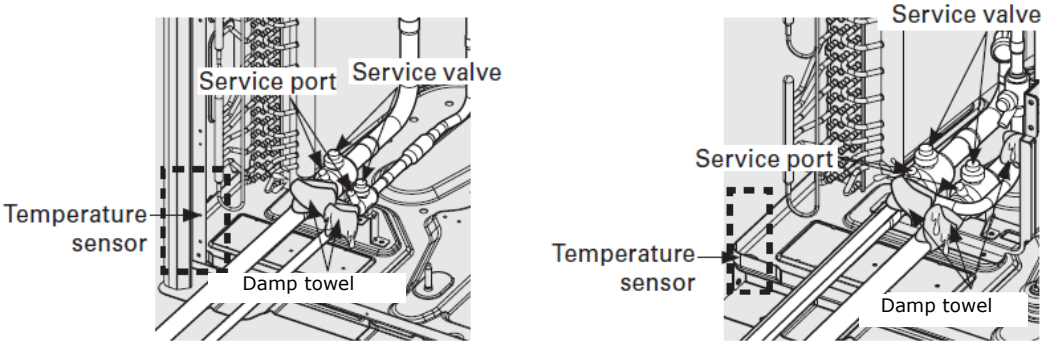


Pipe connections



1. Remove the pipe cover from the outdoor unit.
2. Remove knock-outs from only the holes that you are going to use. Unused holes should remain closed to prevent damage to the unit.
   - Take care to prevent damage to the exterior of the unit.
   - Remove burrs from knock-out hole edges and apply rust inhibitor.
3. Connect the pipes to the outdoor unit using flared connections or by brazing. If brazing the pipe connection, avoid damaging the service valve by wrapping it with a wet cloth as shown in Figure 12, p. 30.
   - Avoid damaging the temperature sensor.
   - Ensure that the connected pipes do not touch each other or make contact with the unit.
4. After making electrical connections (see “Electrical Wiring” p. 37) and insulating the pipes (see “Insulating Refrigerant Pipes” p. 48), replace the pipe cover and close the remaining gap.

Figure 12. Protecting the unit and temperature sensor while brazing the pipe connection



Connecting Branch Joints

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

Install outdoor joints as needed to connect multiple outdoor units to one another and Y-joints connect the outdoor unit(s) to indoor units. See the branch joint installation manual (VRF-SVN41) for details.

Note: *Outdoor units can be installed in any order.*

Table 19. Connecting outdoor units with branch joints

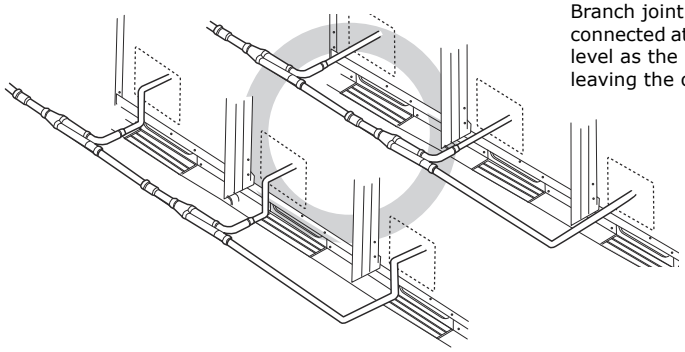
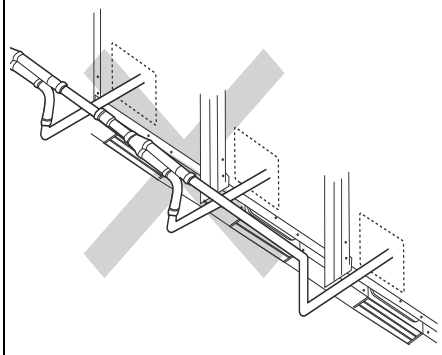
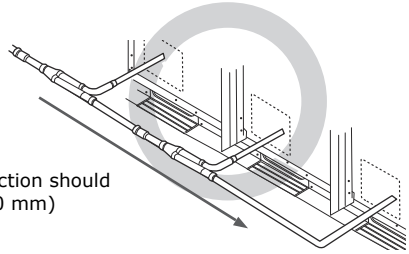
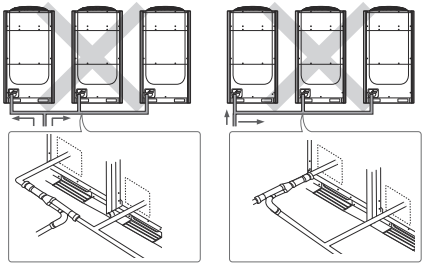
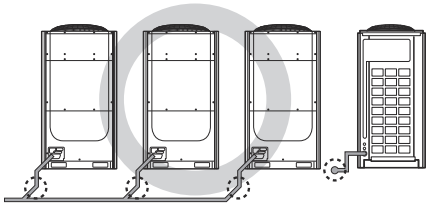
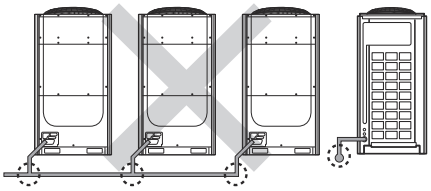
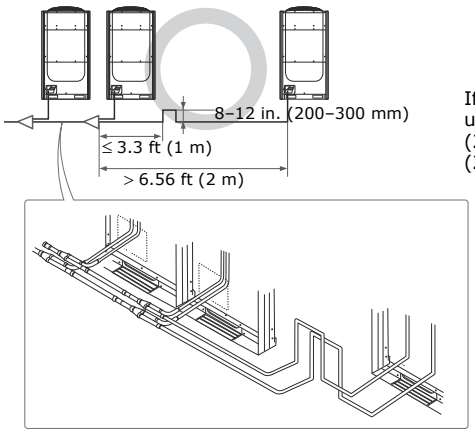
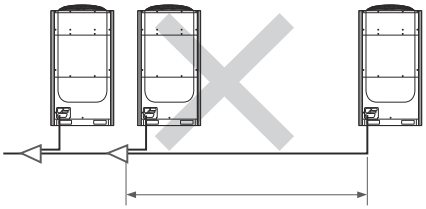
Correct installation	Incorrect installation
Branch joint should be connected at the same or lower level as the refrigerant pipes leaving the outdoor unit. 	
Refrigerant pipes must be connected in parallel with the unit.  Unit straight section should be ≥ 12 in. (300 mm)	

Table 19. Connecting outdoor units with branch joints (continued)

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

Refrigerant Piping Installation Examples: Heat Pump

Figure 13. Single installation with Y-joint: Heat pump

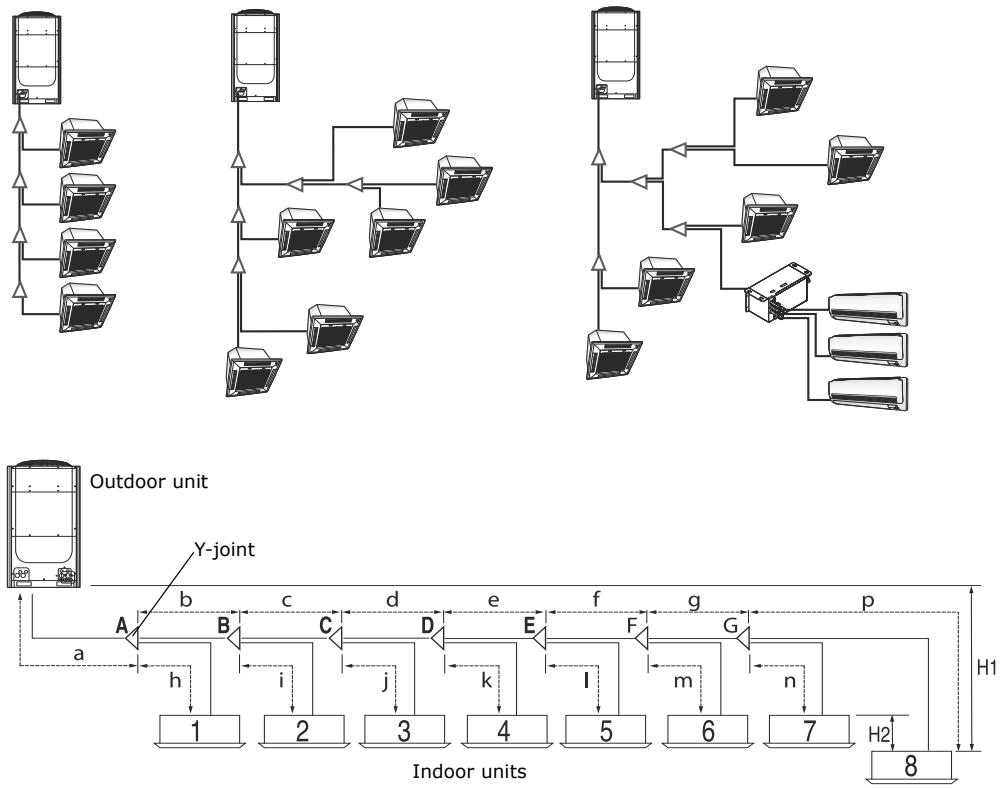


Figure 14. Single installation with distribution header: Heat pump

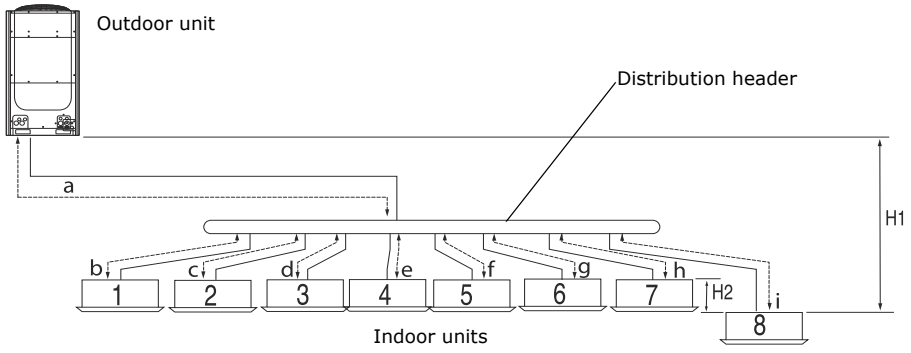


Figure 15. Single installation with Y-joint and distribution header: Heat pump

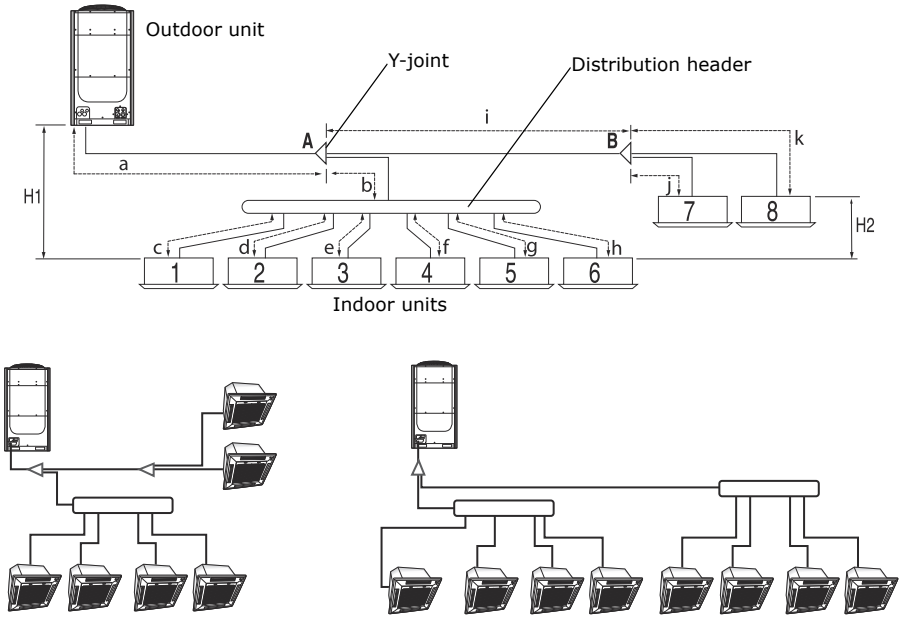


Figure 16. Module installation with Y-joint: Heat pump

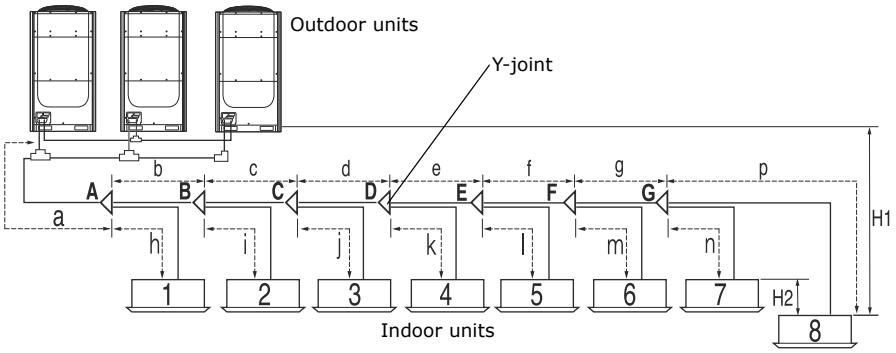


Figure 17. Module installation with distribution header: Heat pump

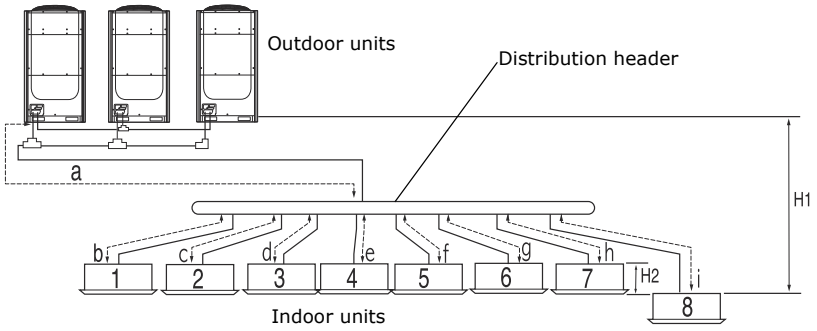


Figure 18. Module installation with Y-joint and distribution header: Heat pump

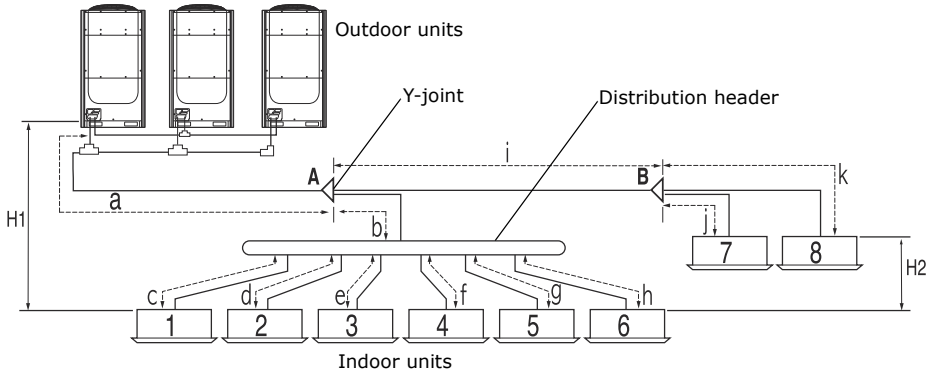
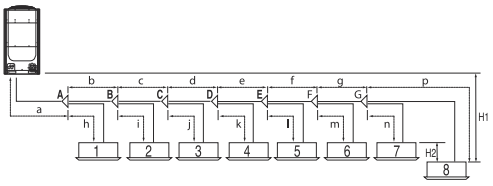


Table 20. Maximum allowable refrigerant piping length and height differences for heat pump installations

	Piping location	Piping length and height differences (ft [m])		Notes/Examples	
Maximum allowable piping length	Outdoor unit to indoor unit	Actual length [equivalent length][a]	656 ft (200 m) and below [722 ft (220 m) and below]	Y-joint only	a+b+c+d+e+f+g+p ≤656 [722] ft (200 [220] m)
				Distribution header only	a+i ≤ 656 [722] ft (200 [220] m)
				Y-joint and distribution header	a+b+h ≤ 656 [722] ft (200 [220] m a+i+k ≤ 656 [722] ft (200 [220] m
		Total piping length	3281 ft (1000 m) or less	Y-joint only	
				Distribution header only	a+b+c+d+e+f+g+p+h+i ≤3281 ft (1000 m)
				Y-joint and distribution header	
	Between outdoor units (module installation)	piping length	33 ft (10 m) or less	r ≤ 33 ft (10 m), s ≤ 33 ft (10 m), t ≤ 33 ft (10 m)	
		Equivalent length		r ≤ 43 ft (13 m), s ≤ 43 ft (13 m), t ≤ 43 ft (13 m)	
Maximum allowable piping height difference	Outdoor unit to indoor unit	361/131 ft (110/40 m)[b]		H1 ≤ 164/131 ft (50/40 m)	
	Indoor unit to indoor unit	164 ft (50 m) or less		H2 ≤ 164 ft (50 m)	
Maximum length after branch joint	First branch joint to farthest indoor unit	piping length	148 ft (45 m) or less	b+c+d+e+f+g+p ≤ 148 ft (45 m), i ≤ 148 ft (45 m)	
			(148–295 ft (45–90 m)	Required conditions must be satisfied (see Table 21, p. 35)	
Electronic expansion valve (EEV) kit[c]	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) Equivalent length Y-joint: 1.64 ft (0.5 m); distribution header: 3.28 ft (1 m).
(b) If the indoor unit is at a higher level than outdoor unit, the allowable height difference is 131 ft (40 m). If the indoor unit is located at a lower level than the outdoor unit, the allowable height difference is 361 ft (110 m). If the height difference exceeds 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.

Table 21. Required condition (note toTable 20, p. 34)

	Condition	Example
First branch joint to farthest indoor unit	148 ft (45 m) ≤ b+c+d+e+f+g+p ≤ 295 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 branch joint and the outdoor unit is *not* increased by 1 size, a+(b+c+d+e+f+g)x2+h+i+k+l+m+n+p ≤ 3281 ft (1000 m)	
	If the size of the pipe between the first branch joint and the outdoor unit is increased by 1 size, a+(b+c+d+e+f+g)x2+h+i+k+l+m+n+p > 3281 ft (1000 m)	
Each Y-joint to each indoor unit	h, i, j, ... p ≤ 148 ft (45 m)	
Difference between [the distance of the outdoor unit to the farthest indoor unit] and the nearest indoor unit and ≤148 ft (45 m), (a+b+c+d+e+g+p) ≤ 148 ft (45 m)		

Refrigerant Piping Installation Examples: Heat Recovery

Figure 19. Installation with Y-joints: Heat recovery

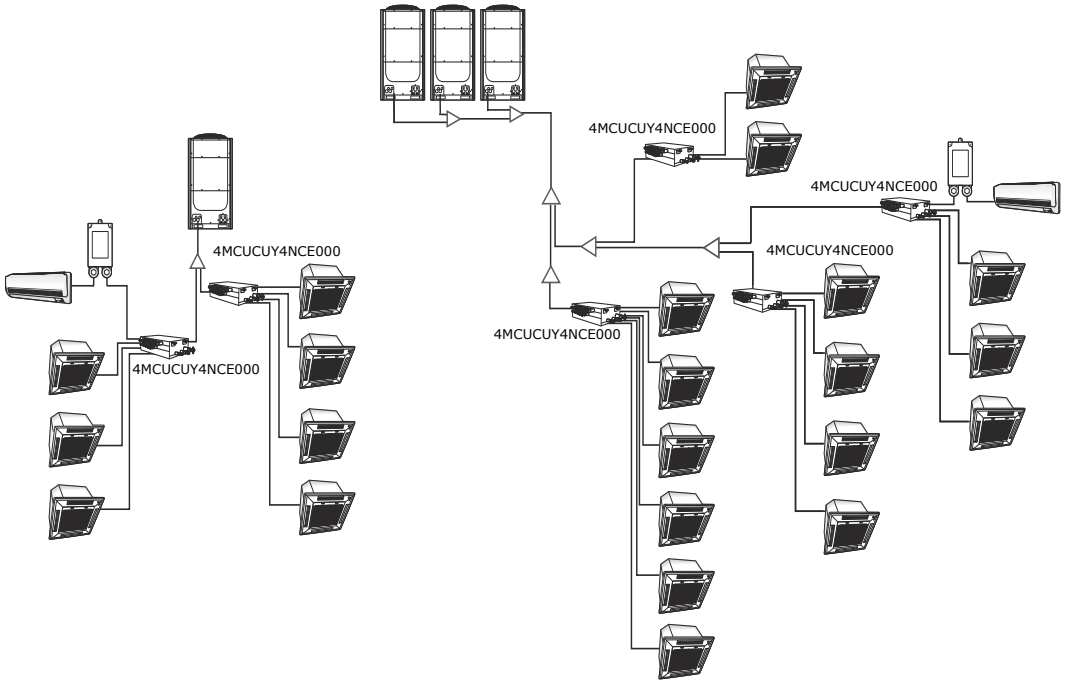


Figure 20. Installation with MCU: Heat recovery

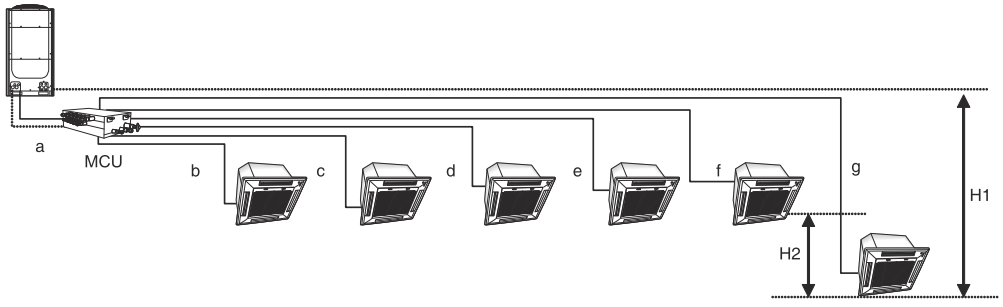


Figure 21. Installation with MCU and Y-joint: Heat recovery

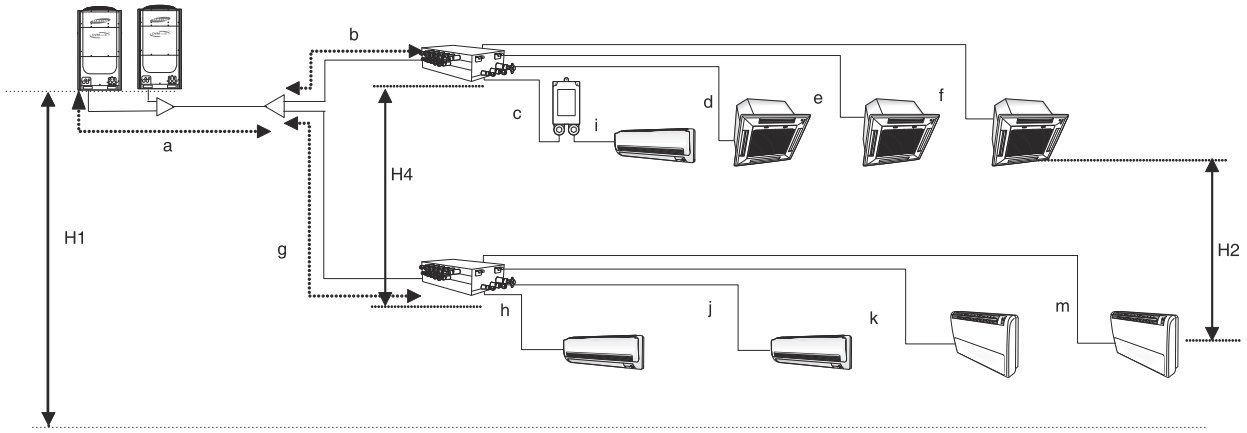
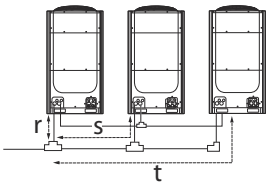


Table 22. Maximum allowable refrigerant piping length and height differences for heat recovery installations

	Piping location	Piping length and height differences		Notes/Examples	
Maximum allowable piping length	Outdoor unit to indoor unit	Piping [equivalent length][a]	656 [722] ft (200 [220] m)	MCU only	a+b+c+d+e+f+g ≤ 256 [722] ft (200 [220] m)
				Y-joint and MCU	a+g+m ≤ 656 [722] ft (200 [220] m)
		Total piping length	3281 ft (1000 m)	MCU only	a+b+c+d+e+f+g ≤ 3281 ft (1000 m)
				Y-joint and MCU	a+b+c+d+e+f+g+p+h+i+j+k+m ≤ 3281 ft (1000 m)
	Between outdoor units (module installation)	Piping length	33 ft (10 m)	r ≤ 33 ft (10 m), s ≤ 33 ft (10 m), t ≤ 33 ft (10 m)	
		Equivalent piping length	43 ft (13 m)	r ≤ 43 ft (13 m), s ≤ 43 ft (13 m), t ≤ 43 ft (13 m)	
Maximum allowable piping height difference	Outdoor unit to indoor unit	Piping	361 [131] ft (110 [40] m)[b]	H1 ≤ 361 [131] ft (110 [40] m)	
	Indoor unit to indoor unit		49 ft (15 m)	H2 ≤ 49 ft (15 m)	
	MCU to MCU		49 ft (15 m)	H4 ≤ 49 ft (15 m)	
Maximum allowable length after branch joint	First branch joint to farthest indoor unit		148 ft (45 m)	MCU only	148 ft (45 m)
				Y-joint and MCU	g+m ≤ 148 ft (45 m)
Electronic expansion valve (EEV) kit[c]	Indoor unit	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) 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 outdoor unit, the allowable height difference is 131 ft (40 m). If the indoor unit is located at a lower level than the outdoor unit, the allowable height difference is 361 ft (110 m). If the height difference exceeds 164 ft (50 m), request engineering support from Trane.
(c) Required for indoor units that do not have built-in 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

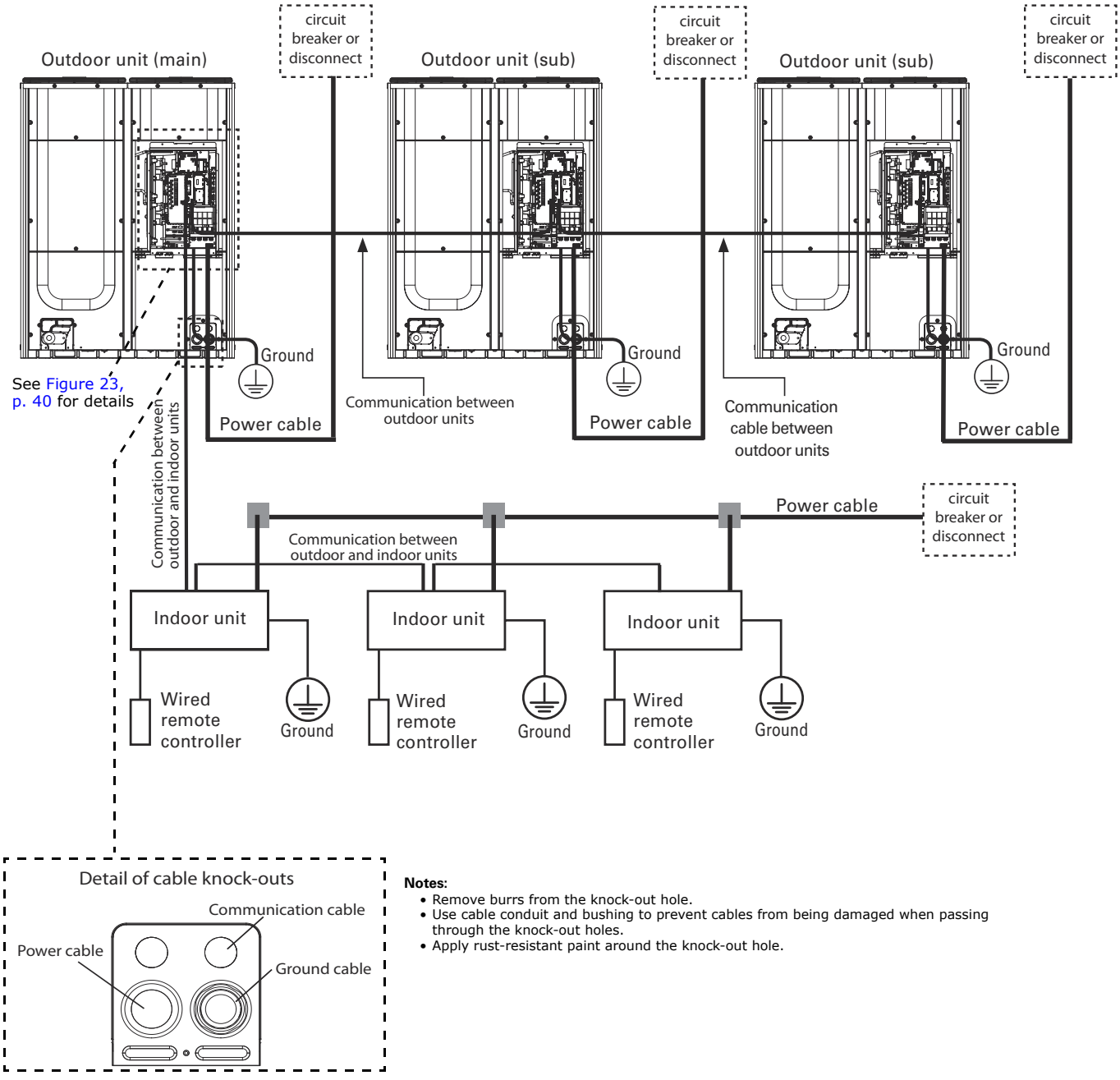
Use Copper Conductors Only!

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 22. Typical system installation wiring



Notes:

- Remove burrs from the knock-out hole.
- Use cable conduit and bushing to prevent cables from being damaged when passing through the knock-out holes.
- Apply rust-resistant paint around the knock-out hole.

Power Wiring

⚠WARNING

Avoid Risk of Fire or Explosion!

Do not let the power cable come into contact with the pipes inside the outdoor 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 24 and Table 25, p. 41 for power cable and circuit breaker specifications. Refer to Table 23, p. 39 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 23, p. 40).

Screw	Tightening torque for terminal	Power cable
M4	0.9–1.1 lbf/ft (1.2–1.5 N·m)	Single-phase 208-230 V/460 V power cable
M8	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 23.
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 23. 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 outdoor unit (see Figure 22, p. 38 for details).

Figure 23. Power wiring connections

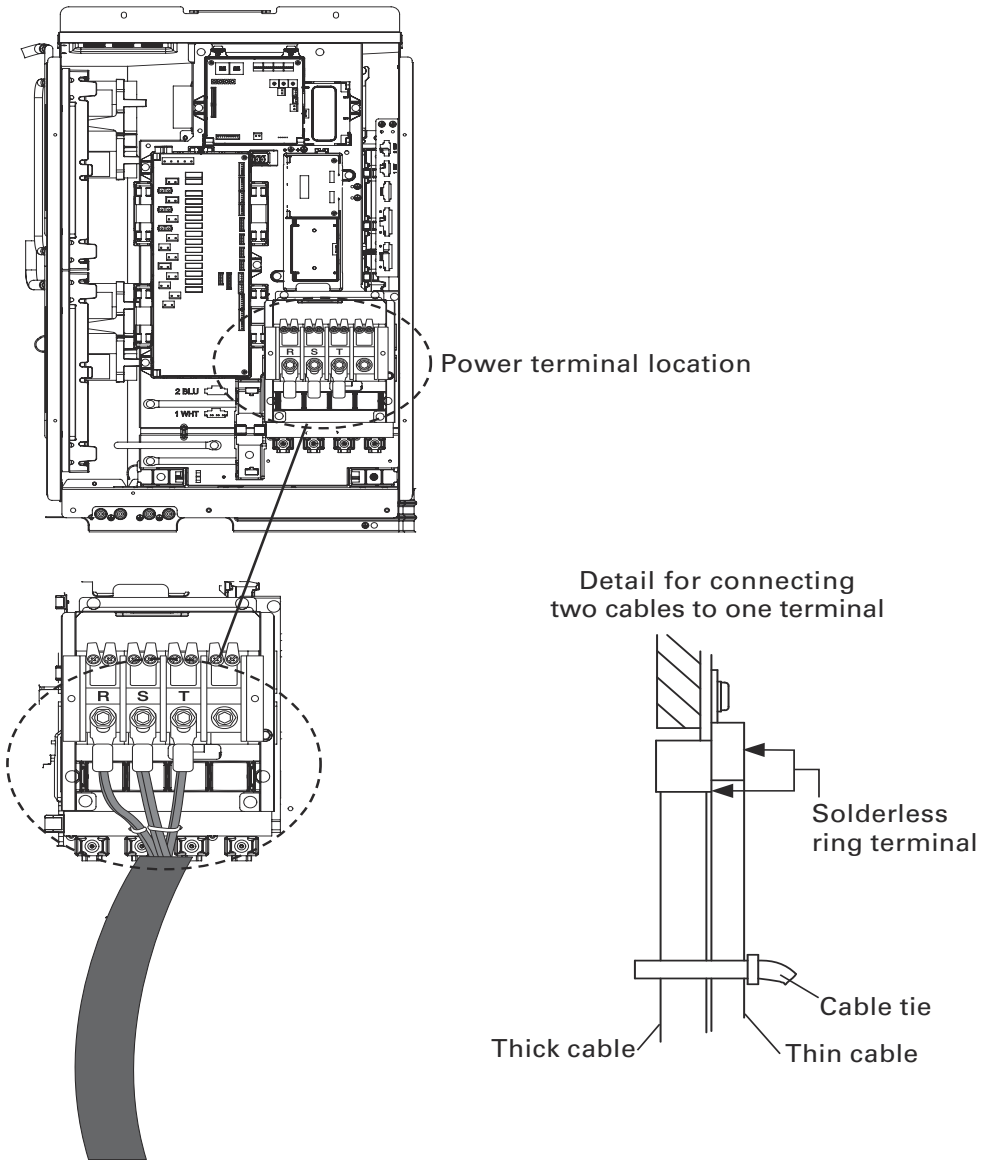


Table 24. Circuit breaker and power cable specifications—Heat pump/heat recovery: 208–230 V

Capacity	Model	Units		Module 1						Module 2						Module 3					
				RLA		FLA		Power supply		RLA		FLA		Power supply		RLA		FLA		Power supply	
		Hz	V	Comp 1	Comp 2	Fan1	Fan2	MCA	MOP	Comp 1	Comp 2	Fan 1	Fan 2	MCA	MOP	Comp 1	Comp 2	Fan 1	Fan 2	MCA	MOP
6 ton	4TV*072B300NB	60	208/230	14.3		4.0		28.0	35												
8 ton	4TV*0096B300NB	60	208/230	12.5	12.5	3.0	3.0	37.8	50												
10 ton	4TV*0120B300NB	60	208/230	14.8	14.8	3.0	3.0	43.0	50												
12 ton	4TV*0144B300NB	60	208/230	17.4	17.4	3.0	3.0	52.6	70												
14 ton	4TV*0168B300NB	60	208/230	14.3		4.0		28.0	35	12.5	12.5	3.0	3.0	37.8	50						
16 ton	4TV*0192B300NB	60	208/230	14.3		4.0		28.0	35	14.8	14.8	3.0	3.0	43.0	50						
18 ton	4TV*0216B300NB	60	208/230	14.3		4.0		28.0	35	17.4	17.4	3.0	3.0	52.6	70						
20 ton	4TV*0240B300NB	60	208/230	14.8	14.8	3.0	3.0	43.0	50	14.8	14.8	3.0	3.0	43.0	50						
22 ton	4TV*0264B300NB	60	208/230	14.8	14.8	3.0	3.0	43.0	50	17.4	17.4	3.0	3.0	52.6	70						
24 ton	4TV*0288B300NB	60	208/230	17.4	17.4	3.0	3.0	52.6	70	17.4	17.4	3.0	3.0	52.6	70						
26 ton	4TV*0312B300NB	60	208/230	14.3		4.0		28.0	35	12.5	12.5	3.0	3.0	37.8	50	17.4	17.4	3.0	3.0	52.6	70
28 ton	4TV*0336B300NB	60	208/230	14.3		4.0		28.0	35	14.8	14.8	3.0	3.0	43.0	50	17.4	17.4	3.0	3.0	52.6	70
30 ton	4TV*0360B300NB	60	208/230	14.3		4.0		28.0	35	17.4	17.4	3.0	3.0	52.6	70	17.4	17.4	3.0	3.0	52.6	70
32 ton	4TV*0384B300NB	60	208/230	14.8	14.8	3.0	3.0	43.0	50	14.8	14.8	3.0	3.0	43.0	50	17.4	17.4	3.0	3.0	52.6	70
34 ton	4TV*0408B300NB	60	208/230	14.8	14.8	3.0	3.0	43.0	50	17.4	17.4	3.0	3.0	52.6	70	17.4	17.4	3.0	3.0	52.6	70
36 ton	4TV*0432B300NB	60	208/230	17.4	17.4	3.0	3.0	52.6	70	17.4	17.4	3.0	3.0	52.6	70	17.4	17.4	3.0	3.0	52.6	70

Notes:

- RLA is based on AHRI 1230 cooling standard condition (indoor temperature: 80ºF (26.7ºC) DB/67ºF (19.46ºC) WB; outdoor temperature: 95ºF (35ºC) 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; FLA: Full load ampere; MCA: Minimum circuit amperes ; MOP: Maximum overcurrent protective device (amperes).

Table 25. Circuit breaker and power cable specifications—Heat pump/heat recovery: 460 V

Capacity	Model	Units		Module 1						Module 2						Module 3					
				RLA		FLA		Power supply		RLA		FLA		Power supply		RLA		FLA		Power supply	
		Hz	V	Comp 1	Comp 2	Fan 1	Fan 2	MCA	MOP	Comp 1	Comp 2	Fan 1	Fan 2	MCA	MOP	Comp 1	Comp 2	Fan 1	Fan 2	MCA	MOP
6 ton	4TV*0072B400NB	60	460	9.5		2.0		16.4	20												
8 ton	4TV*0096B400NB	60	460	11.5		1.5	1.5	19.0	25												
10 ton	4TV*0120B400NB	60	460	14		1.5	1.5	21.7	30												
12 ton	4TV*0144B400NB	60	460	10.1	10.1	1.5	1.5	26.4	40												
14 ton	4TV*0168B400NB	60	460	9.5		2.0		16.4	35	11.5		1.5	1.5	19.0	25						
16 ton	4TV*0192B400NB	60	460	9.5		2.0		16.4	20	14		1.5	1.5	21.7	30						
18 ton	4TV*0216B400NB	60	460	9.5		2.0		16.4	20	10.1	10.1	1.5	1.5	26.4	40						
20 ton	4TV*0240B400NB	60	460	14		1.5	1.5	21.7	30	14		1.5	1.5	21.7	30						
22 ton	4TV*0264B400NB	60	460	14		1.5	1.5	21.7	30	10.1	10.1	1.5	1.5	26.4	40						
24 ton	4TV*0288B400NB	60	460	10.1	10.1	1.5	1.5	26.4	40	10.1	10.1	1.5	1.5	26.4	40						
26 ton	4TV*0312B400NB	60	460	9.5		2.0		16.4	20	11.5		1.5	1.5	19	25	10.1	10.1	1.5	1.5	26.4	40
28 ton	4TV*0336B400NB	60	460	9.5		2.0		16.4	20	14		1.5	1.5	21.7	30	10.1	10.1	1.5	1.5	26.4	40
30 ton	4TV*0360B400NB	60	460	9.5		2.0		16.4	20	10.1	10.1	1.5	1.5	26.4	40	10.1	10.1	1.5	1.5	26.4	40
32 ton	4TV*0384B400NB	60	460	14		1.5	1.5	21.7	30	14		1.5	1.5	21.7	30	10.1	10.1	1.5	1.5	26.4	40
34 ton	4TV*0408B400NB	60	460	14		1.5	1.5	21.7	30	10.1	10.1	1.5	1.5	26.4	40	10.1	10.1	1.5	1.5	26.4	40
36 ton	4TV*0432B400NB	60	460	10.1	10.1	1.5	1.5	26.4	40	10.1	10.1	1.5	1.5	26.4	40	10.1	10.1	1.5	1.5	26.4	40

Notes:

- RLA is based on AHRI 1230 cooling standard condition (indoor temperature: 80ºF (26.7ºC) DB/67ºF (19.46ºC) WB; outdoor temperature: 95ºF (35ºC) 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; FLA: Full load ampere; MCA: Minimum circuit amperes ; MOP: Maximum overcurrent protective device (amperes).

Grounding

Important: *Grounding must be done by a qualified electrician.*

1. Select rated grounding cable by referring to the outdoor unit power cable specifications (Table 24, p. 41 and Table 25, p. 41).
2. Connect the grounding cable to the grounding hole inside the power supply box and pull it through the designated grounding knock-out (see Figure 24 for details).

Figure 24. Grounding cable connection location

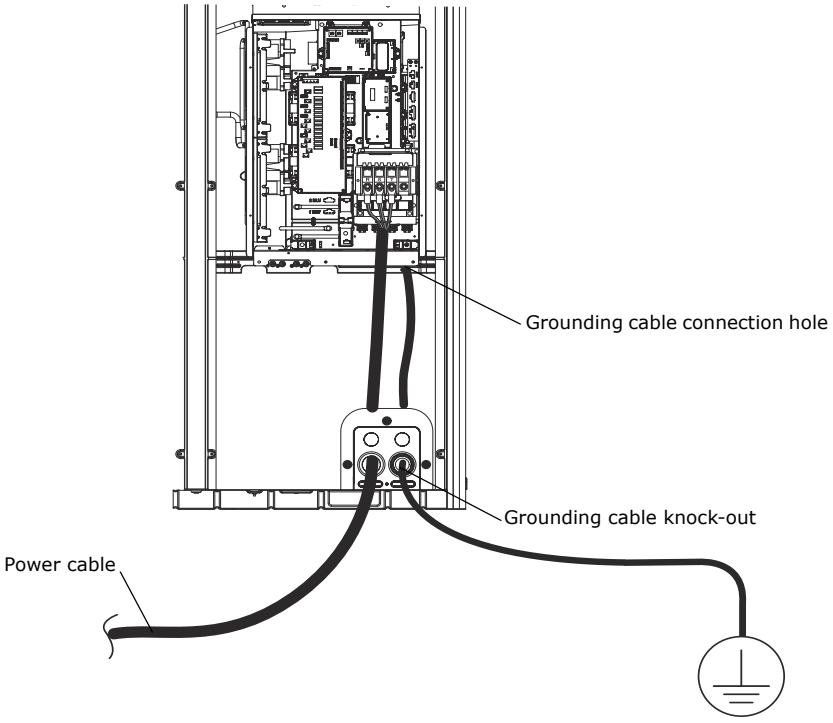
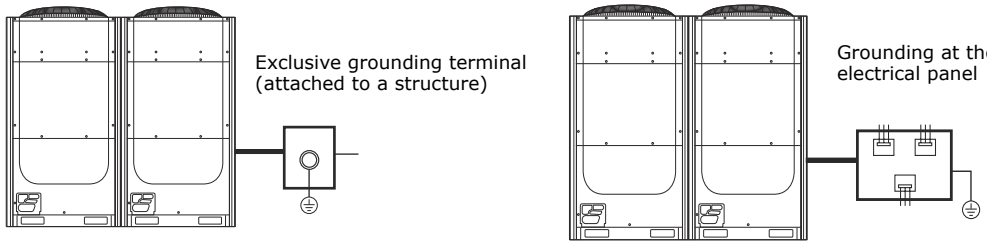


Table 26. Grounding resistance requirements

Power condition at installation site	High or average humidity	Low humidity
Voltage to ground is ≤ 150 V	• Ensure that the grounding resistance is <100 Ω. • If a circuit breaker is installed that disconnects the circuit within 0.5 seconds, the allowable grounding resistance is 30–500 Ω.	• Ideally, grounding resistance should be <100 Ω, and should not exceed 250 Ω.
Voltage to ground is > 150 V		• Ensure that the grounding resistance is <100 Ω. • If a circuit breaker is installed that disconnects the circuit within 0.5 seconds, the allowable grounding resistance is 30–500 Ω.

Figure 25. Outdoor unit grounding examples



Communications Wiring

⚠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.

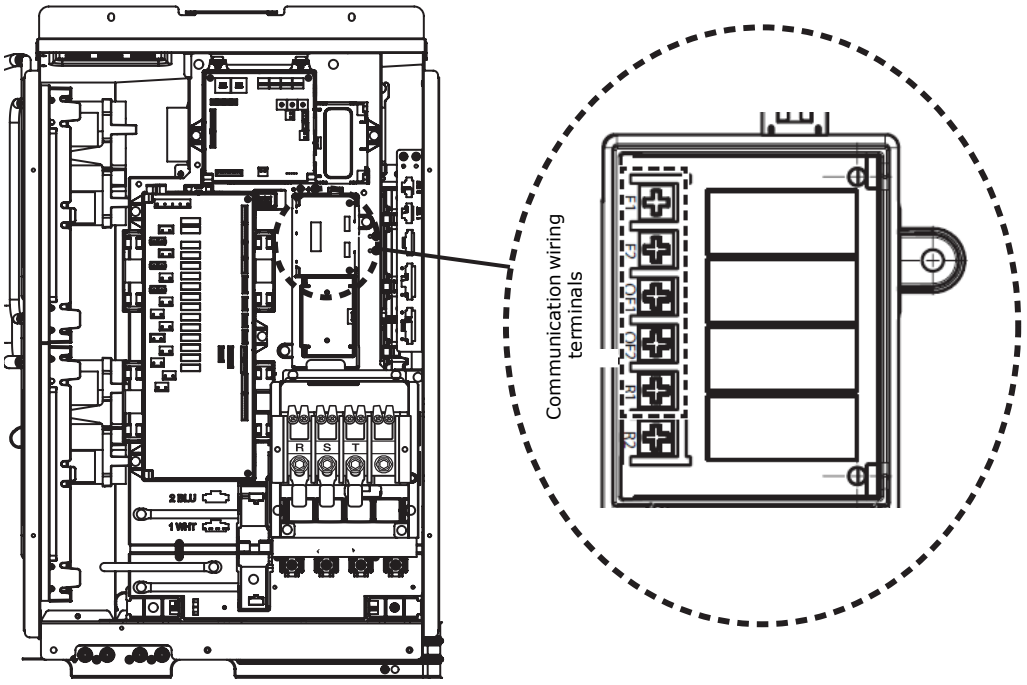
Connect the communications wiring as shown in Figure 26.

- Refer to Table 23, p. 39 for conduit specifications.
- Refer to BAS-SVX51 for communication wiring specifications and best practices.

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 outdoor units and between indoor and outdoor units has no polarity.

Figure 26. Communications board and wiring terminals

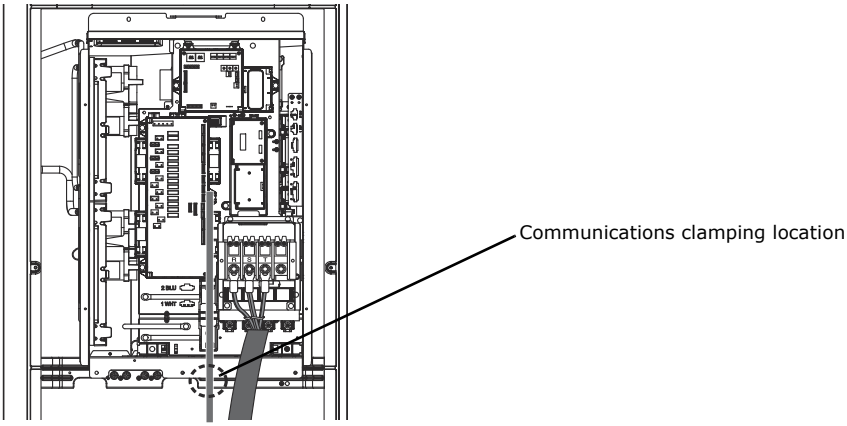


Terminal identification

F1	Communication between outdoor and indoor units
F2	
OF1	Communication between outdoor units
OF2	
R1	Higher-level controls
R2	

To provide strain relief, secure the communications cable with a clamp in the location shown in Figure 27.

Figure 27. Communications cable clamping location



Pull the communications cable through the designated knock-out at the bottom right of the outdoor unit (see Figure 22, p. 38 for details).

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.

Notes:

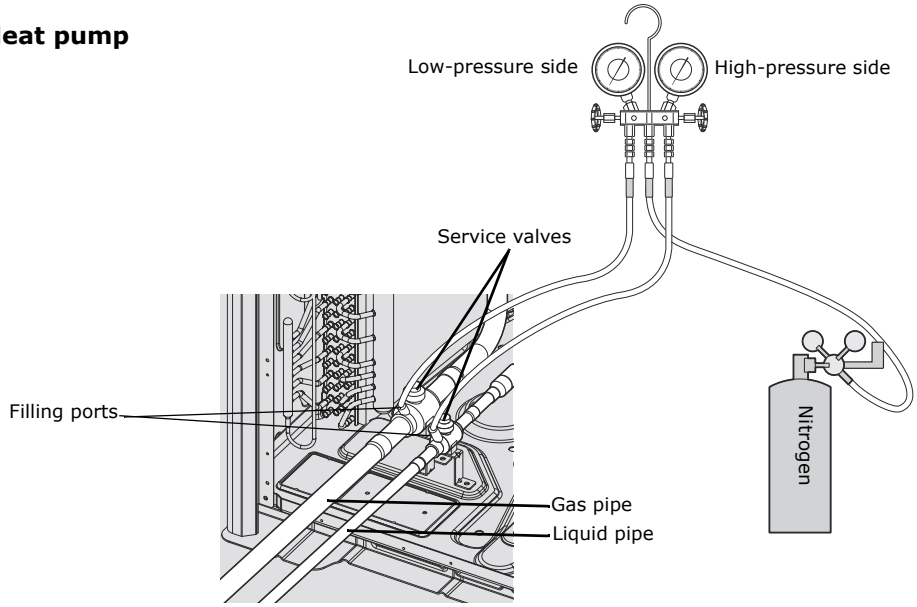
- *All required piping pressure tests must be completed in accordance with national and/or local codes.*
- *When leak-testing refrigerant systems, observe all safety precautions.*
- *Leak test only one circuit at a time to minimize system exposure to potentially harmful moisture in the air.*
- *Use R-410A refrigerant gas as a tracer for leak detection and use oil-pumped dry nitrogen to develop required test pressures.*
- *Use tools for R-410A to prevent the inflow of foreign substances and reduce the risk of high pressure.*
- *Do not remove the valve core of the charging port.*
- *Perform the leak test with the service valve of the outdoor unit closed.*

Leak Testing Pipe Connections

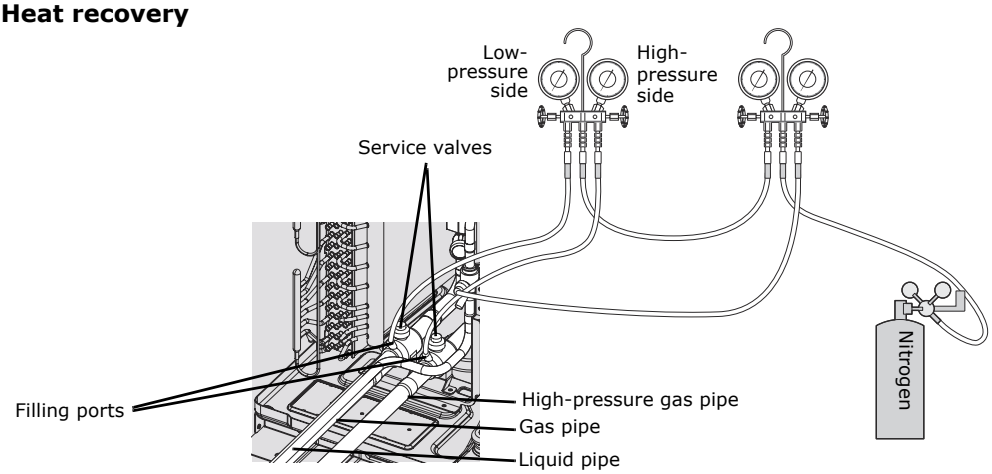
Use the following procedure for leak testing pipe connections. Refer to Figure 28.

Figure 28. Leak testing pipe connections

Heat pump



Heat recovery

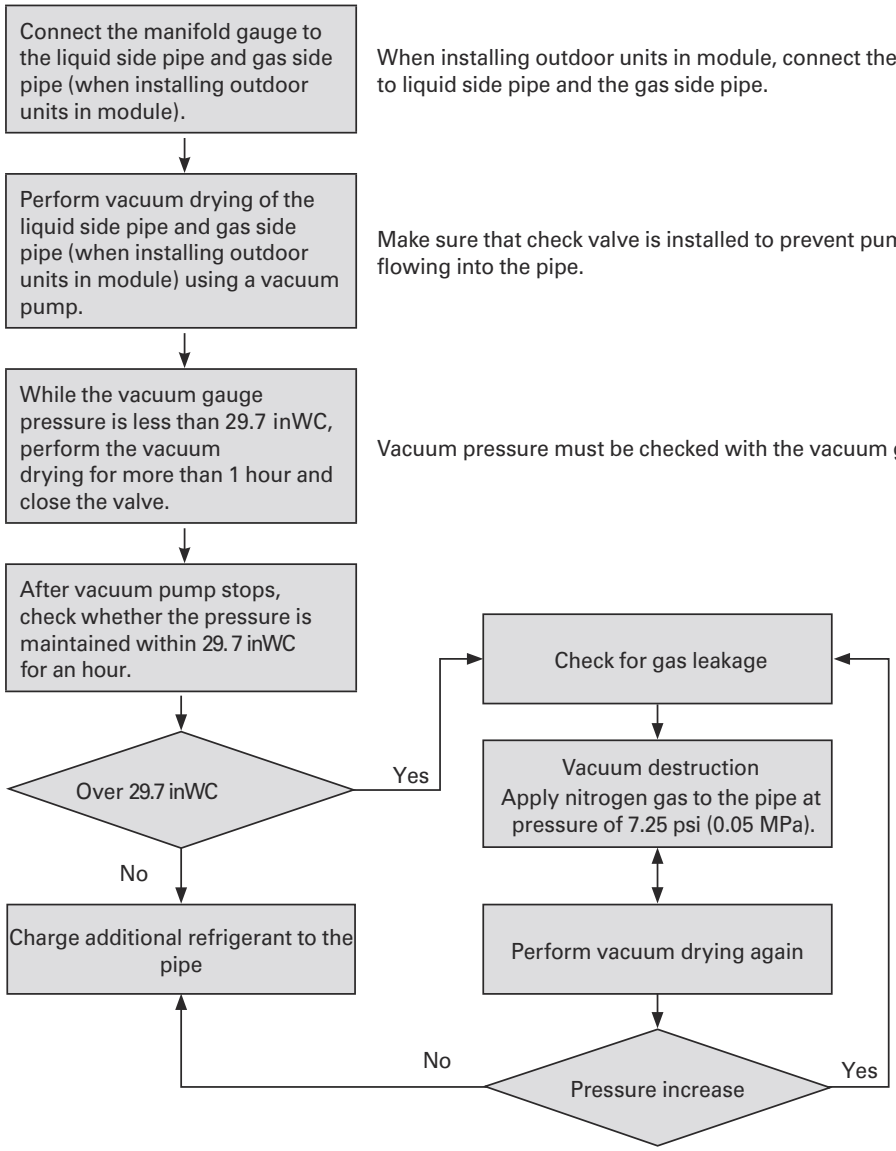


1. Apply pressure to the liquid side pipe and gas side pipe (when installing outdoor units in module) with nitrogen gas at 4.1 MPa (594.6 psi).
2. Keep it for minimum 24 hours to check if pressure drops. After applying nitrogen gas, check for a change in pressure, using a pressure regulator.
3. If the pressure drops, check for gas leakage. If the pressure is changed, apply soap water to check for leakage and check the pressure of the nitrogen gas again.
4. Maintain 145 psi (1.0 MPa) of the pressure before performing vacuum drying and check for further gas leakage. After checking the first gas leakage, maintain 145 psi (1.0 MPa) to check for further gas leakage.

Vacuum Procedure for the System

After performing a leak test, follow this vacuum procedure:

- Use tools for R-410A to prevent the inflow of foreign substances and resist against internal pressure.
- Use a vacuum pump that allows vacuuming under 29.7 inH_2O.
- Use a vacuum pump with a check valve to prevent pump oil from flowing backward while the vacuum pump is stopped.
- Completely close the liquid-gas side service valve of the outdoor unit.



Insulating Refrigerant Pipes

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

1. Use Table 27 to select the insulation thickness according to pipe size and humidity conditions.

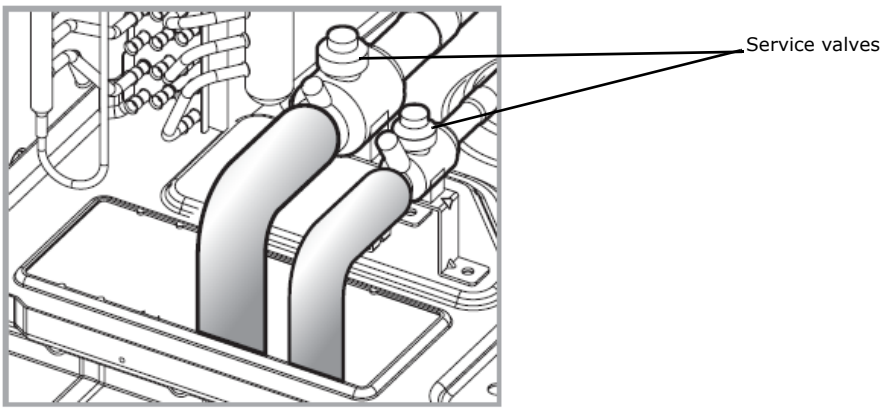
Table 27. Pipe insulation selector

Pipe	Pipe size in. (mm)	Insulation Type	
		Standard conditions 86°F (30°C), 85%	High humidity conditions[a] 86°F (30°C), over 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)

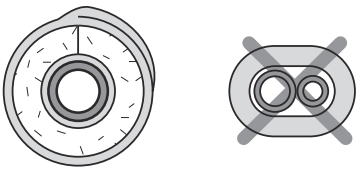
(a) When installing insulation in any of the following environments, use insulation required for high humidity conditions: Buildings with close proximity to bodies of water or hot springs or on the side of a hill in which the building is partly covered by earth; ceilings frequently exposed to moisture 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 outdoor unit, the branch joints, distribution header, and connection points on each pipe.

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



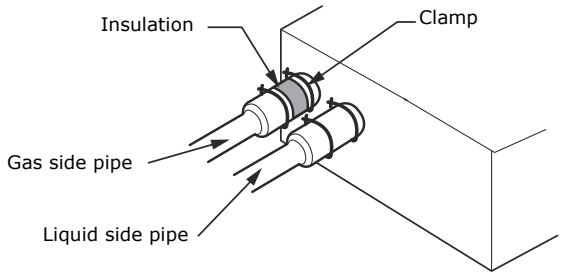
- Do not wrap the gas and liquid refrigerant pipes together.



- 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 Charging

⚠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.

After vacuuming and leak testing the system, charge the system with refrigerant as explained in the following procedure:

1. Calculate the correct amount of refrigerant using Table 28, p. 50 through Table 31, p. 51.
2. Open the liquid and gas service valves and 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.

Calculating Refrigerant

Table 28. Initial refrigerant quantity for each outdoor unit model

Model	4TV*0072*****	4TV*096*****	4TV*120*****	4TV*144*****
Initial refrigerant quantity: lb (kg)	12.1 (5.5)	16.3 (7.4)	16.3 (7.4)	19.2 (8.7)

Note: Add the initial refrigerant quantity shown in this table to the refrigerant calculated in Table 29 through Table 31, p. 51.

Table 29. 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 28) is 0.0067 lb/ft regardless of the pipe size.

Table 30. Refrigerant quantity for each indoor unit (b)

	Capacity (MBH)											
	7.5	**9**	**9.5**	**12**	**18**	**20**	**24**	**30**	**36**	**48**	**76.8**	**96**
Model	**Refrigerant quantity: lb (kg)**											
1-way cassette (4TVE00B100NB)**	0.55 (0.25)		0.55 (0.25)	0.55 (0.25)								
Mini 4-way cassette (4TVB00B100NB)**			0.82 (0.37)	0.82 (0.37)	0.82 (0.37)	0.82 (0.37)						
4-way cassette (4TVC00B100NB)**		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 (4TVL00B100NB)**	0.53 (0.24)		0.53 (0.24)	0.53 (0.24)	0.99 (0.45)		0.99 (0.45)	0.93 (0.42)	0.93 (0.42)	1.37 (0.62)		
MSP duct (4TVD00B100NB)**					0.62 (0.28)		0.62 (0.28)	1.19 (0.54)	1.19 (0.54)	1.50 (0.68)		
HSP duct (4TVA00B100NB)**									1.50 (0.68)	1.50 (0.68)	2.60 (1.18)	2.60 (1.18)
High-wall (4TVW00B100NB)**	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 (4TVX00B100NB)**					0.86 (0.39)		0.86 (0.39)					

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.

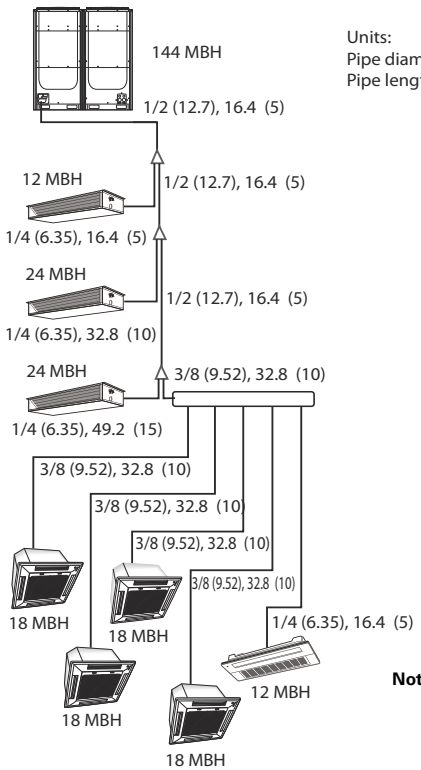
Table 31. Calculation example for refrigerant amount additional to basic unit amount

Liquid pipe (a) diameter in. (mm)	Pipe length (ft)	Refrigerant amount (lb/ft) from Table 29, p. 50)	Additional refrigerant amount (lb)	Total additional refrigerant (lb)
	(1)	(2)	(1) x (2)	Σ (1) x (2)
1/4 (6.35)	114.8	0.013	1.49	12.19
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 30, p. 50)	Additional refrigerant amount (lb)	Total additional refrigerant (lb)
	(1)	(2)	(1) x (2)	Σ (1) x (2)
4-way cassette (4TVC00B100NB)**	4	0.99	3.96	7.02
Slim duct (4TVL00B100NB)**	2	0.99	1.98	
Slim duct (4TVL00B100NB)**	1	0.53	0.53	
1-way cassette (4TVE00B100NB)**	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 4TV*144*****, the basic amount of refrigerant is 19.1 lb (8.7 kg). Therefore, the total amount of additional refrigerant (a) + (b) should not exceed 200.9 lb (91.3 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.
- When calculating refrigerant for heat recovery apps, make sure you add

Example:



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

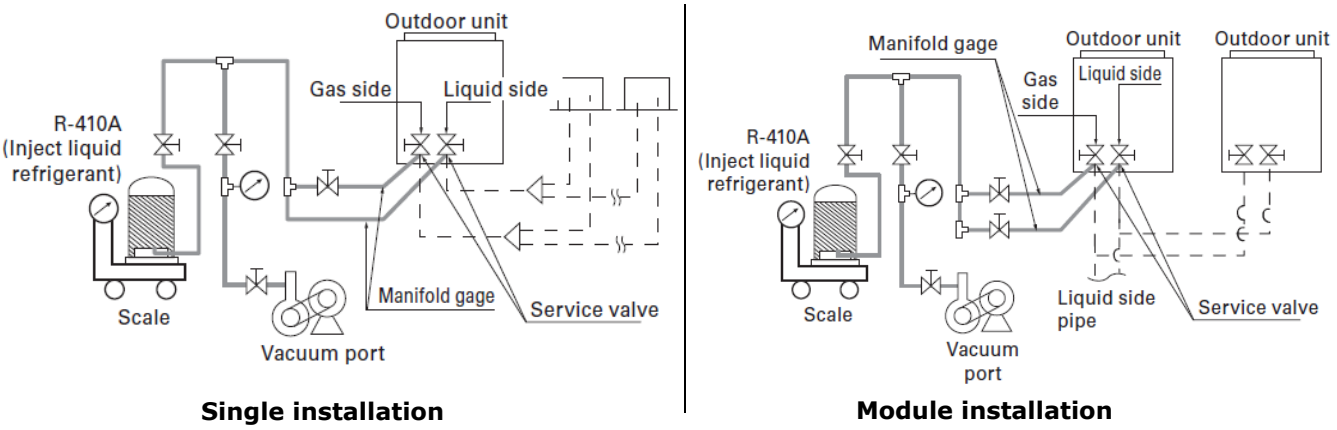
Note: For heat recovery systems, add 1.1 lb (0.5 kg) additional refrigerant for each MCU kit.

Charging Refrigerant

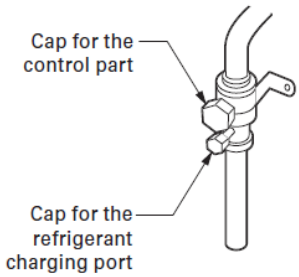
To charge refrigerant:

1. With the unit still in a vacuum, open the manifold gauge valve connected to the liquid side service valve and add the liquid refrigerant.
2. If you are unable to add all of the refrigerant needed into the liquid side, close the liquid side, remove the liquid manifold hose, then open the gas valve.
3. Press K2 once to initiate refrigerant charging in cooling mode.
4. To determine if the amount of refrigerant added is correct, use the automatic refrigerant function (see Figure , p. 64).

Figure 29. Charging additional refrigerant



5. 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 mm]): 7.4 lbf-ft (10 N-m)



Control System

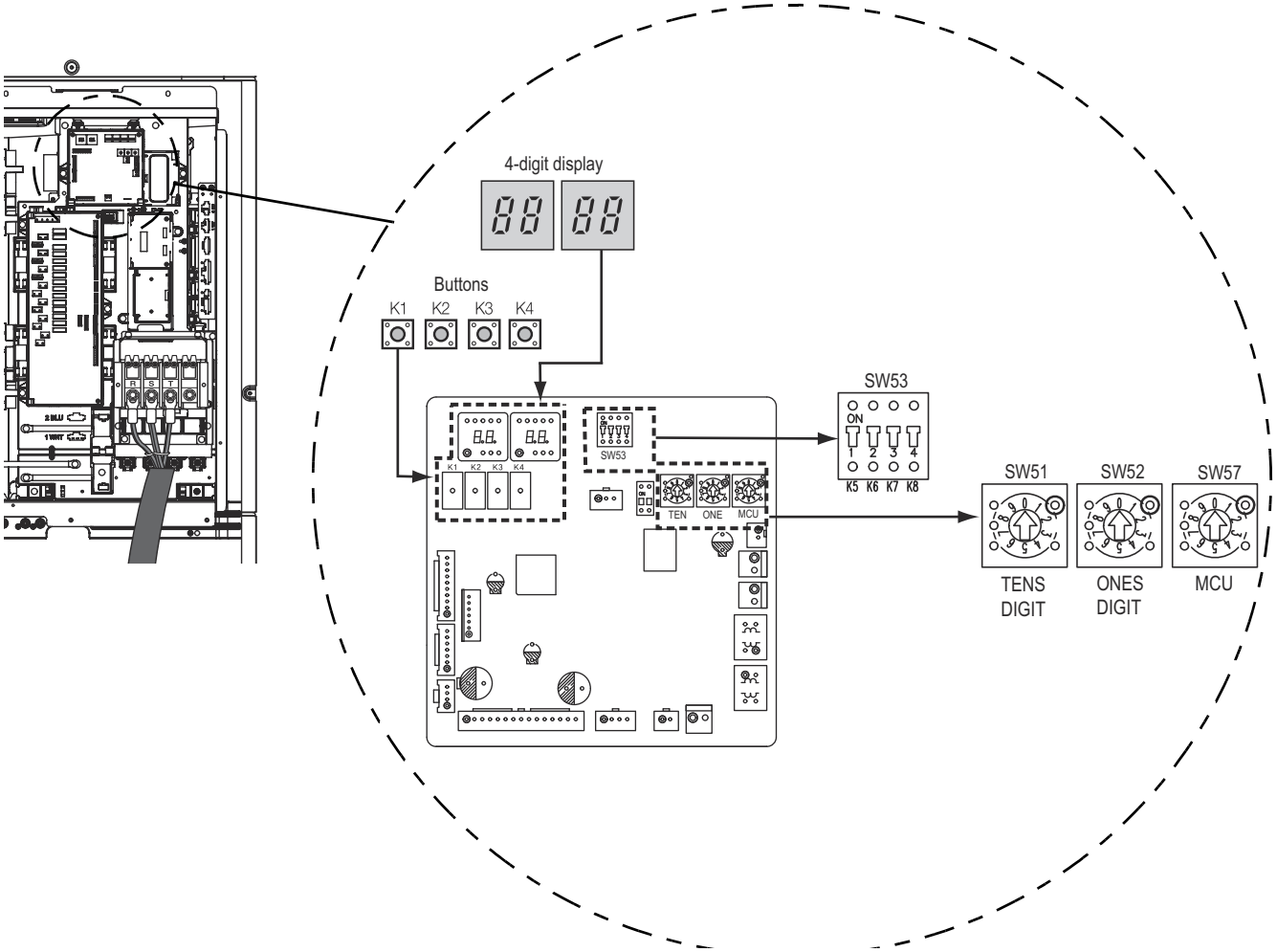
The control board (Fig 28) contains, a 4-digit display, a DIP switch, three rotary switches, and four buttons, as shown in Figure 30. Their functions are explained in this section.

⚠WARNING

Hazardous Voltage!

Before making contact with the inverter circuit board, wait for at least 15 minutes after powering down the outdoor 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 30. Control board



System Monitoring

The 4-digit display indicates system power and communication status.

Table 32. 4-digit 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) 4-digit display example showing power-up is shown in Figure 30.
(b) Mode change unit.

System Configuration: DIP and Rotary Switches

The outdoor unit control board contains one DIP switch and three rotary switches (Figure 31). Use them to configure the system as described in Table 33.

Figure 31. Switches on outdoor unit control board

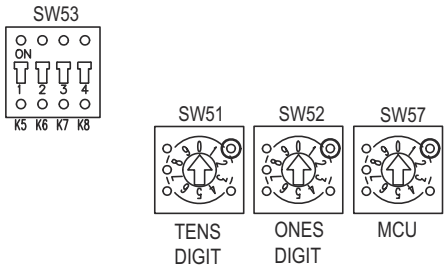


Table 33. System configuration using control board switches

Switch[a]	Function description and notes		
SW51/ SW52	Use to set total number of installed indoor units		Set at main outdoor unit only. **Note:** For example, if 12 indoor units are installed, SW51: 1, SW52: 2.
SW57	Use to set total number of connected MCUs		Set at main outdoor unit only. **Note:** For example, if 3 MCUs are installed, SW57: "3". If 10 MCUs are installed, SW57: "A".
SW53	K5	Off	Not used. Default: Off
	K6	On	Enables maximum capacity restriction for cooling operation. Use to restrict excessive capacity increase when operating indoor units with small capacity.
		Off	Disables maximum capacity restriction for cooling operation.
	K7	On	Use to set outdoor unit address: No. 1 (main unit)[b]
	K8	On	
	K7	On	Use to set outdoor unit address: No. 2 (sub-unit 1)
	K8	Off	
	K7	Off	Use to set outdoor unit address: No. 3 (sub-unit 2)
	K8	On	
	K7	Off	Not used
	K8	Off	

(a) For illustration of switches, refer to Figure 31.
(b) For module installations, one outdoor unit needs to be designated as the main unit. The remaining outdoor units must be designated as sub-units.

The control board has four buttons, K1–K4, and a 4-digit display for configuring system options.

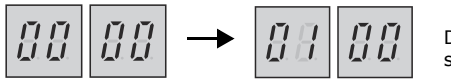
Figure 32. Buttons and 4-digit display on the outdoor unit control board

To set options:

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

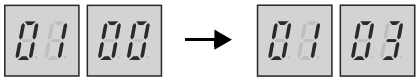
2. To select a different option, press K1 repeatedly until the number representing the selected option appears for digits 1 and 2. (See the "Digit 1" and "Digit 2" columns in Table 34, p. 56 for the list of option numbers.) For example, choose "01" on the main outdoor unit to select the cooling capacity correction option.

   Digits 1 and 2 change to the number representing the selected 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 34, p. 56 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).

   Digits 3 and 4 change to the number representing the selected value.

4. To save the value you have selected in Step 3, press and hold the K2 for 5 seconds. The 4-digit 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 34. Options and corresponding settings

Option	Outdoor 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)	
				0	6	55.4-59 (13-15)	
Heating capacity correction	Main	0	2	0	0	435.1 (3.0): factory default	Targeted high pressure: psi (MPa). When low pressure value is set, discharged air temperature of the indoor unit will decrease.
				0	1	362.6 (2.5)	
				0	2	377.1 (2.6)	
				0	3	391.6 (2.7)	
				0	4	406.1 (2.8)	
				0	5	420.6 (2.9)	
				0	6	449.6 (3.1)	
				0	7	464.1 (3.2)	
				0	8	478.6 (3.3)	
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	Disable snow prevention function (factory default)	
				0	1	Enable when installation is in a humid area such as near a river or lake	
Outdoor unit fan speed correction	Single	0	6	0	0	Factory default	
				0	1	Increase fan speed to maximum value	

Table 34. Options and corresponding settings (continued)

Option	Outdoor unit	Digit 1	Digit 2	Digit 3	Digit 4	Value	Comments
Night-time silent mode	Main	0	7	0	0	Disabled (factory default)	
				0	1	Level 1	
				0	2	Level 2	
				0	3	Level 3	
High-head condition setting	Main	0	8	0	0	Disabled (factory default)	
				0	1	Case 1: height difference type 1 (indoor unit is lower than outdoor unit)	When the outdoor unit is 131.23–262.47 ft (40–80 m) above the indoor unit.
				0	2	Case 2: height difference type 1 (indoor unit is lower than outdoor unit)	When the outdoor unit is more than 262.47 ft. (80 m) above the indoor unit.
				0	3	Height difference type 2 (outdoor unit is lower than indoor unit)	When the indoor unit is more than 98.43 ft (30 m) above the outdoor unit.
Long piping condition[a]	Main	0	9	0	0	Disabled (factory default)	When the equivalent length of the farthest indoor unit from the outdoor 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 outdoor 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 (factory default)	If enabled, continuous heating operation is possible but heating performance will decrease during rotation defrost operation.
				0	1	Enabled	
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	Enabled (factory default)	If enabled, the fan may rotate when the unit is not operating.
				0	1	Disabled	

(a) Enabling this setting is unnecessary if high-head condition is set.
(b) Heat recovery only.

System Configuration: Buttons K1–K4

Buttons K1 and K2 are used to initiate system operations. The 4-digit display responds as shown in the last column of the following tables.

Table 35. Button K1

Number of times button K1 is pressed	Operation	4-digit 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 (Outdoor unit address 1)	K - 3 - Blank - 1
4	Pump out in heating mode (Outdoor unit address 2)	K - 3 - Blank - 2
5	Pump out in heating mode (Outdoor unit address 3)	K - 3 - Blank - 3
6	Pump out in heating mode (Outdoor unit address 4)	K - 3 - Blank - 4
7	Vacuuming (Outdoor unit address 1)	K - 4 - Blank - 1
8	Vacuuming (Outdoor unit address 2)	K - 4 - Blank - 2
9	Vacuuming (Outdoor unit address 3)	K - 4 - Blank - 3
10	Vacuuming (Outdoor unit address 4)	K - 4- Blank - 4
11	Vacuuming (All)	K - 4- Blank - A
12	End operation	—

Table 36. Button K2

Number of times button K2 is pressed	Operation	4-digit 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 defrost	K - B - Blank - Blank
8	Forced oil collection	K - C - Blank - Blank
9	Inverter check compressor 1[b]	K - D - Blank - Blank
10	Inverter check for compressor 2[b]	K - E - Blank - Blank
11	Inverter check for fan 1[b]	K - F - Blank - Blank
12	Inverter check for fan 2[b]	K - G - Blank - Blank
13	End operation	—

(a) Discharge mode may not operate normally if an error code occurs. If an E464 or E364 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 4-digit display.

Table 37. Button K3

Number of times button K3 is pressed	Operation	4-digit display
1	Initialize (reset) operation	Same as power up: "8888"

Table 38. Button K4

Number of times button K4 is pressed	Operation	4-digit display	
		Digit 1	Digits 2, 3, 4
1	4TV*0072***** (6 ton)	1	Off, 0, 8
	4TV*0096***** (8 ton)		Off, 1, 0
	4TV*0120***** (10 ton)		Off, 1, 2
	4TV*0144***** (12 ton)		Off, 1, 4
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 ?) →0, 8, 7
9	IPM temperature of COMP2	9	188.6°F (87 ?) →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	-43.6°F (-42°C) →-, 4, 2
13	COND Out temperature	D	-43.6°F (-42°C) →-, 4, 2
14	Temperature of liquid pipe	E	-43.6°F(-42°C) →-, 4, 2
15	TOP temperature of COMP1	F	-43.6°F (-42°C) →-, 4, 2
16	TOP temperature of COMP2	G	-43.6°F (-42°C) →-, 4, 2
17	Outdoor temperature	H	-43.6°F (-42°C) →-, 4, 2
18	ESC inlet temperature	I	-43.6°F (-42°C) →-, 4, 2
19	ESC outlet temperature	J	-43.6°F (-42°C)→ -, 4, 2
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	Fan step (SSR or BLDC)	O	13 steps →0, 1, 3
25	Current frequency of COMP1	P	120 Hz →1,2,0
26	Current frequency of COMP2	Q	120 Hz →1,2,0
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

Table 39. Button K4 (pressed and held for 3 seconds)

Number of times K4 is pressed and held 3 seconds	Software version	4-digit 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	Inverter 1 version	"INV1"	"1412"		
4	Inverter 2 version	"INV2"	"1412"		
5	Fan 1 version	"FAN1"	"1412"		
6	Fan 2 version	"FAN2"	"1412"		
7	EEP version	"EEP"	"1412"		
			Digit 1	Digit 2	Digit 3, 4
			Address (example)		
8[a]	Automatically assigned unit addresses	"AUTO"	Indoor unit: "A" MCU: "C"	Indoor unit: "0" MCU: "1"	"07"
9[a]	Manually assigned unit addresses	"MAIN"	Indoor unit: "A" MCU: "C"	Indoor unit: "0" MCU: "1"	"15"

(a) Toggles between indoor unit and MCU.

Pre-Start Checks

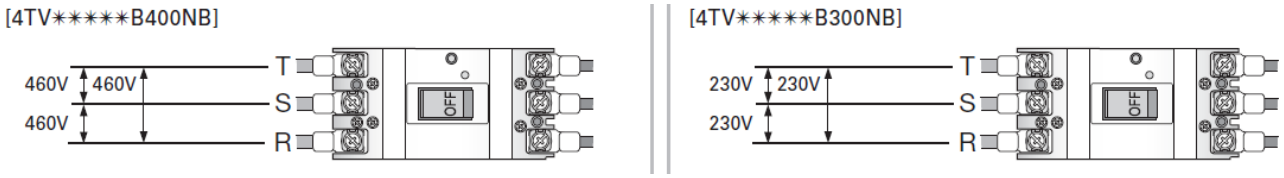
After installation and before the test operation is conducted, perform the following pre-start checks:

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 outdoor 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 outdoor 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).



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 40) has been completed.

Table 40. Pre-start checklist

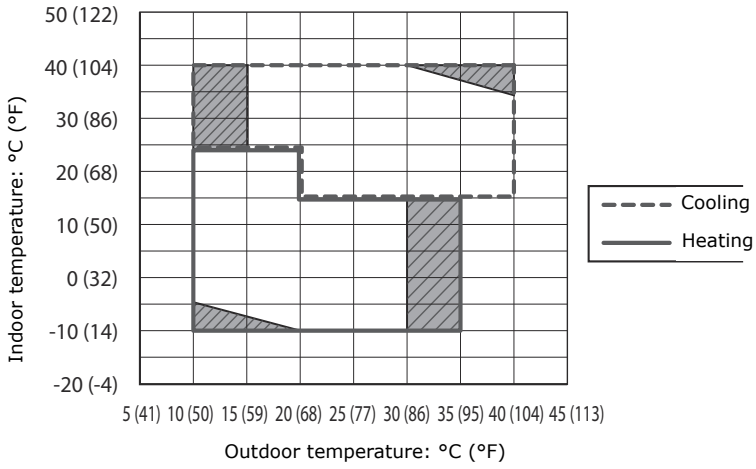
Installation	**Outdoor unit**	• Have you checked the external surface and the inside of the outdoor unit? • Is there any possibility of short circuit due to the heat of an outdoor unit? • Is the place well-ventilated and meets recommended requirements for clearances and service? • Is the outdoor unit installed securely to withstand the external force?
	Indoor unit	• 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		• 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 branch 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 outdoor unit.)

Table 40. Pre-start checklist

Drain pipe	• Have you checked whether the drain pipes of the indoor unit and outdoor unit are connected together? • Have you completed the drain test? • Is the drain pipe properly insulated?
Electrical	• 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 outdoor 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	• Are the address of the indoor and outdoor units properly set? • Are the address of the indoor and outdoor units properly set (when using multiple remote controllers)?
Option	• Ensure that the isolation frame is correctly installed.

Test Operation

Perform the test operation after all pre-start checks have been completed (See "Pre-Start Checks" p. 61) and within the following temperature conditions:



Notes:
- During the test operation, cooling/heating modes are selected automatically.
- In the temperature range marked with hashed lines, system protection control may trigger during operation. (If this occurs, the test operation may be difficult to judge correctly.
- When the temperature is outside of the guaranteed range, test operation accuracy of may decrease to the borderline area shown in the graph.

⚠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 Frostbit!

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 our frostbit.

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 outdoor 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 outdoor unit at least 6 hours before operating it.

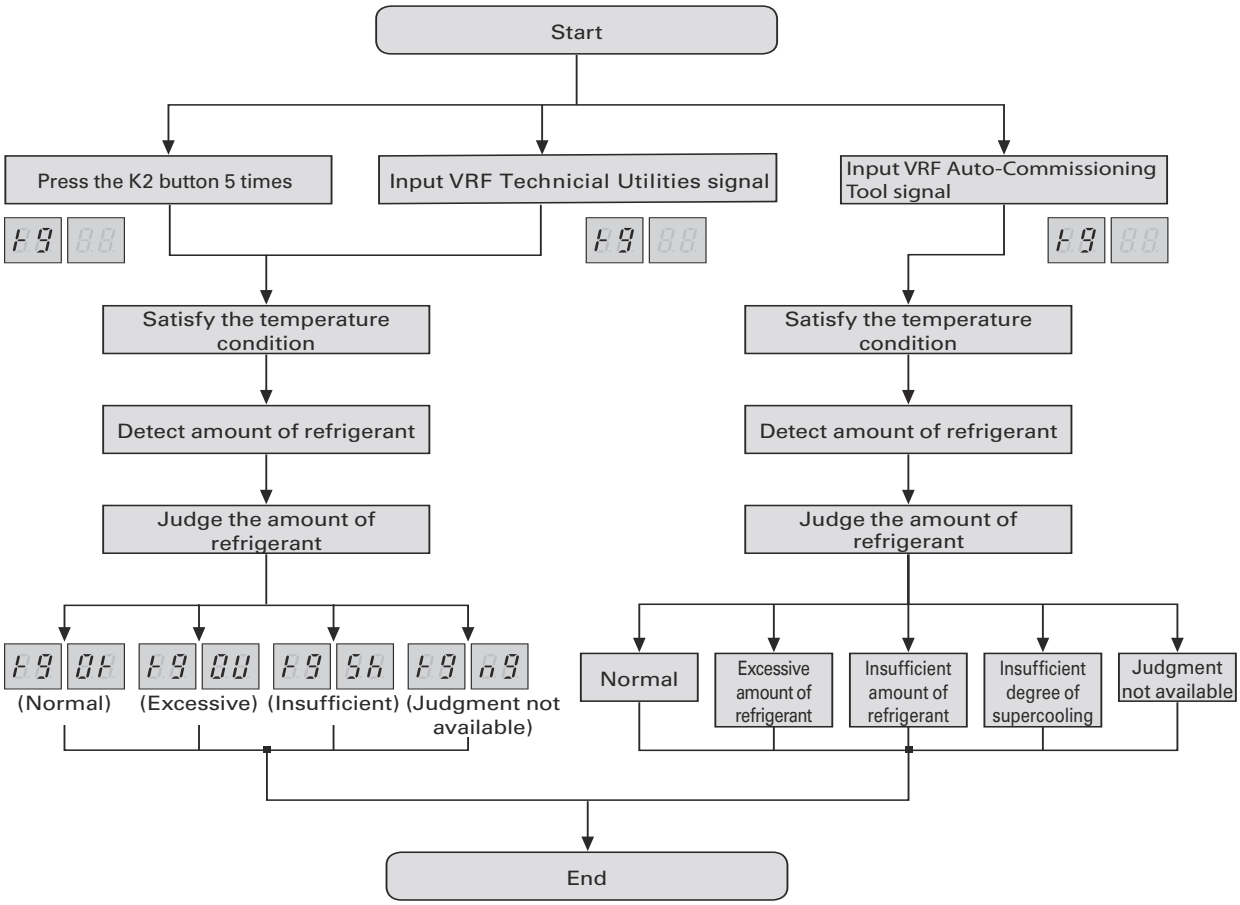
   Notes: *When power is supplied to the outdoor unit, it will check for and verify communications with the indoor units.*

2. Ensure that the front of the outdoor unit is closed.
3. Press and hold button K1 for 5 seconds to run the test operation (see Table 35, p. 58.)
   - 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. 65 or “Error code E505 and E506” p. 65. 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 “Automatic refrigerant detection operation” p. 64) 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 outdoor 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.

Automatic refrigerant detection operation

Use the refrigerant amount detection operation after operating the product 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.

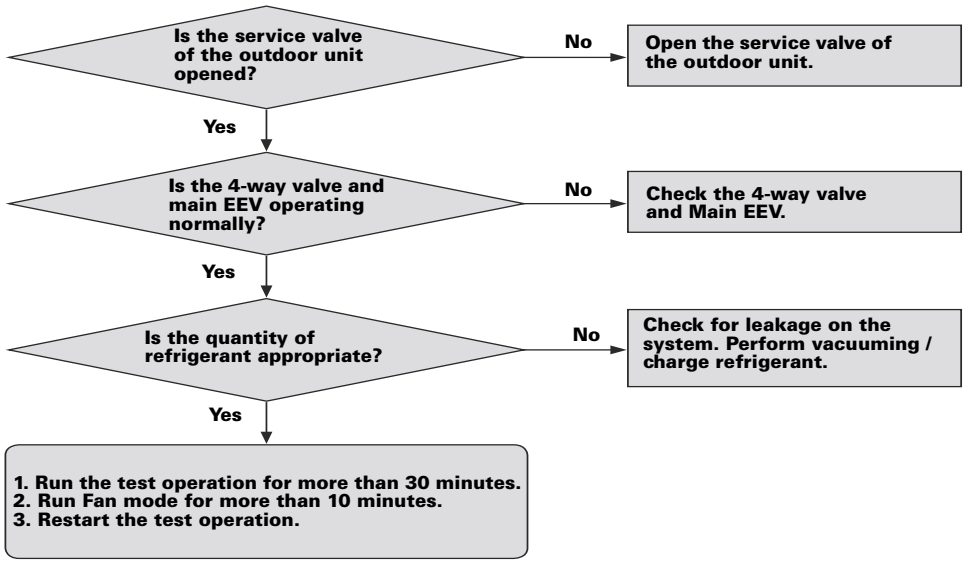


After the refrigerant detection operation is complete, take the following actions:

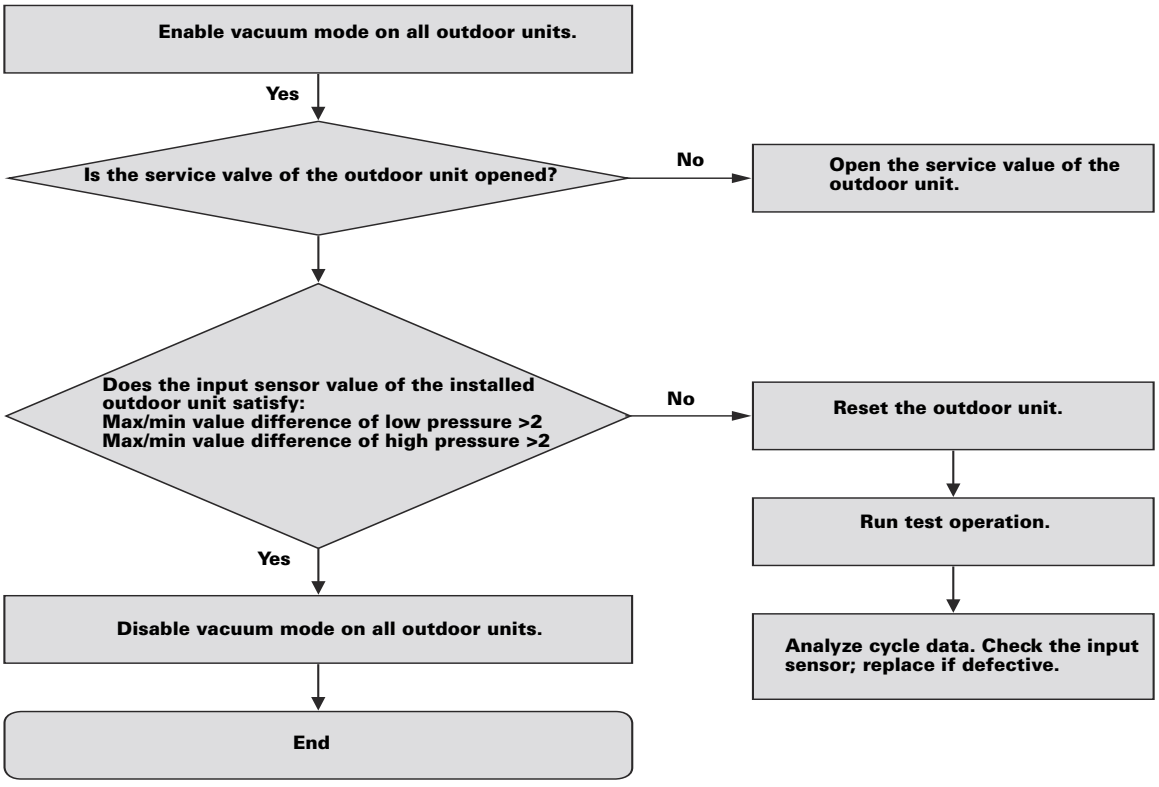
- If the amount of refrigerant is excessive, discharge 5% of the detected amount and restart the refrigerant amount detection operation.
- If the amount of refrigerant is insufficient, add 5% of the detected amount and restart the refrigerant amount detection operation.
- If the degree of supercooling 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.

Troubleshooting

Error code E503



Error code E505 and E506



Warranty For Trane Advantage™ VRF Systems and Related Accessories

Products Covered. This warranty is extended by Trane, and applies to all Trane Advantage™ VRF systems and accessories for these products which are sold by Trane and applied in accordance with Trane 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 Trane factory training class.
- A verified commissioning report from the Trane 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.

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, offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information,

has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

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