



Installation, Operation, Maintenance

Outdoor Unit Series Trane TVR™ II DC Inverter VRF System



Unit Model:

Outdoor Unit

4TVH0086AD	4TVH0182AD	4TVH0327AD	4TVH0492AD
4TVH0096AD	4TVH0192AD	4TVH0347AD	4TVH0502AD
4TVH0115AD	4TVH0211AD	4TVH0366AD	4TVH0521AD
4TVH0135AD	4TVH0231AD	4TVH0386AD	4TVH0541AD
4TVH0155AD	4TVH0251AD	4TVH0405AD	4TVH0560AD
	4TVH0270AD	4TVH0425AD	4TVH0580AD
	4TVH0290AD	4TVH0445AD	4TVH0600AD
	4TVH0310AD	4TVH0465AD	4TVH0620AD

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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Warnings, Cautions, and Notices

Warnings, cautions, and notices are provided in appropriate places throughout this document:

⚠ 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 accidents.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical, mechanical, and chemical hazards. Failure to follow recommendations could result in death or serious injury.

- **Before installing/servicing this unit, technicians MUST put on all Personal Protective Equipment (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 necessary Personal Protective Equipment (PPE) in accordance with NFPA70E for arc/flash protection PRIOR to servicing the unit.**

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Model Number Description

Outdoor Unit Nomenclature

4
1
T
2
V
3
H
4
0
5
0
6
8
7
6
8
A
9
D
10
0
11
0
12
0
13
A
14
A
15

Digit #1 = Refrigerant

- 2 = R22
- 4 = R-410a

Digit #2 = Brand Name

- T = Trane
- R = Ingersoll Rand

Digit #3 = System Type

- V = Variable Refrigerant Flow
- W = Variable Water Flow

Digit #4 = Functional Type

- F = Cooling Only, Digital Scroll (VRF)
- C = Cooling Only, DC Inverter (VRF)
- B = Heat Pump, Digital Scroll (VRF)
- H = Heat Pump, DC Inverter (VRF)
- X = Heat Recovery (3-pipe), DC Inverter (VRF)
- D = Heat Recovery (3-pipe), Digital Scroll (VRF)

Digit #5 = Reserved for Future Use

- 0 = Not currently used

Digit #6, 7, 8 = Nominal Capacity (Btu/h x 1,000)

- 086 = 86,000 Btu/h
- 096 = 96,000 Btu/h
- 115 = 115,000 Btu/h
- 135 = 135,000 Btu/h
- 155 = 155,000 Btu/h

Digit #9 = Major Development Sequence

- A = First Development Sequence

Digit #10 = Electric Power Supply Characteristics

- B = 220-240V/1ph/50Hz
- D = 380-415V/3ph/50Hz

Digit #11, 12, 13 = Reserved for Future Use

- 0 = Not currently used

Digit #14 = Minor Design Sequence

- A = First Design Sequence

Digit #15 = Device Digit

- A = First Sequence



General Information

Precautions before reading the Installation manual.

- **This Installation manual is for the outdoor unit.**
- **Refer to the indoor unit Installation manual for indoor parts installation.**
- **Please read the power source unit Installation manual to install the power source unit.**
- **Please refer to the refrigerant distributor Installation manual to install the refrigerant distributor.**

The safety precautions listed here are divided into two categories. In either case, important safety information is listed, which must be read carefully.

WARNING

Failure to observe a warning may result in death. The appliance shall be installed in accordance with national wiring regulations.

CAUTION

Failure to observe a caution may result in injury or damage to the equipment.

After completing the installation, make sure that the unit operates properly during the start-up operation. Please instruct the customer on how to operate the unit and keep it maintained. Also, inform customers that they should store this installation manual along with the user manual for future reference.

WARNING

Be sure only trained and qualified service personnel to install, repair or service the equipment. Improper installation, repair, and maintenance may result in electric shocks, short-circuit, leaks, fire or other damage to the equipment.

Install according to this installation instructions strictly.

If installation is defective, it will cause water leakage, electrical shock and fire.

When installing the unit in a small room, take measures against to keep refrigerant concentration from exceeding allowable safety limits in the event of refrigerant leakage.

Contact the place of purchase for information. Excessive refrigerant in a closed ambient can lead to oxygen deficiency.

Use the attached accessories parts and specified parts for installation.

Otherwise, it will cause the set to fall, water leakage, electrical shock and fire.

Install at a strong and firm location which is able to withstand the set's weight.

If the strength is not enough or installation is not properly done, the set will drop and cause injury.

The appliance shall be installed in accordance with national wiring regulations.

The appliance must be installed 2.5m above floor.

The appliance shall not be installed in the laundry.

Before obtaining access to terminals, all supply circuits must be disconnected.

The appliance must be positioned so that the plug is accessible.

The enclosure of the appliance shall be marked by word, or by symbols, with the direction of the fluid flow.

For electrical work, follow the local national wiring standard, regulation and this installation instructions. An independent circuit and single outlet must be used.

If electrical circuit capacity is not enough or defect in electrical work, it will cause electrical shock and fire.

Use the specified cable and connect tightly and clamp the cable so that no external force will be acted on the terminal.

If connection or fixing is not perfect, it will cause heat-up or fire at the connection.

Wiring routing must be properly arranged so that control board cover is fixed properly.

If control board cover is not fixed perfectly, it will cause heat-up at connection point of terminal, fire or electrical shock.

If the supply cord is damaged, it must be replaced by the manufacture or its service agent or a similarly qualified person in order to avoid a hazard. The appliance shall not be installed in the laundry.

An all-pole disconnection switch having a contact separation of at least 3mm in all poles should be connected in fixed wiring.

When carrying out piping connection, take care not to let air substances go into refrigeration cycle.

Otherwise, it will cause lower capacity, abnormal high pressure in the refrigeration cycle, explosion and injury.

Do not modify the length of the power supply cord or use of extension cord, and do not share the single outlet with other electrical appliances.

Otherwise, it will cause fire or electrical shock.

The temperature of refrigerant circuit will be high. Please keep the interconnection cable away from the copper tube.

The power cord type designation is H07RN-F.

Equipment complying with IEC 61000-3-12.

If the refrigerant leaks during installation, ventilate the area immediately.

Toxic gas may be produced if the refrigerant leaks into the room and comes into contact with fire.

After completing the installation work, check that the refrigerant does not leak.

Toxic gas may be produced if the refrigerant leaks into the room and comes into contact with a source of fire, such as a fan heater, stove or cooker.

CAUTION

This A/C is a kind of amenity unit. Don't install it at the place where for storing machine, precise instrument, food, plant, animal, artwork or any other special used occasion.

Ground the air conditioner.

Do not connect the ground wire to gas or water pipes, lightning rod or a telephone ground wire. Incomplete grounding may result in electric shocks.

Be sure to install an earth leakage breaker.

Failure to install an earth leakage breaker may result in electrical shock.

Connect the outdoor unit wires, then connect the indoor unit wires.

You are not allowed to connect the air conditioner with the power source until wiring and piping of the air conditioner is done.



General Information

While following the instructions in this installation manual, install drain piping in order to ensure proper drainage and insulate piping in order to prevent condensation.

Improper drain piping may result in water leakage and property damage.

Install the indoor and outdoor units, power supply wiring and connecting wires at least 1 meter away from televisions or radios in order to prevent image interference or noise.

Depending on the radio waves, a distance of 1 meter may not be sufficient enough to eliminate the noise.

The appliance is not intended for use by young children or infirm persons without supervision.

Young children should be supervised to ensure that they do not play with the appliance.

Don't install the air conditioner in the following locations:

- There is petrolatum existing.
- There is salty air surrounding (near the coast).
- There is caustic gas (the sulfide, for example) existing in the air (near a hot spring).
- The Volt vibrates violently (in the factories).
- In buses or cabinets.
- In kitchen where it is full of oil gas.
- There is strong electromagnetic wave existing.
- There are inflammable materials or gas.
- There is acid or alkaline liquid evaporating.
- Other special conditions.

The insulation of the metal parts of the building and the air conditioner should comply with the regulation of National Electric Standard.

Construction Checkpoints

Acceptance and Unpacking

- After the machine arrives, check whether it is damaged during the shipment. If the surface or inner side of the machine is damaged, submit a written report to the shipping company.
- Check whether the model, specification and quantity of the equipment conform to the contract.
- After removing the outer package, please keep the operation instructions well and count the accessories.

Refrigerant pipe

- Check the model and name to avoid mistaken installation.
- An additionally purchased refrigerant distributor (manifold adapter and manifold pipe) must be used for installing the refrigerant pipes.
- The refrigerant pipes must have the specified diameter. Nitrogen of a certain pressure must be filled into the refrigerant pipe before welding.
- The refrigerant pipe must undergo heat insulation treatment.
- After the refrigerant pipe is installed completely, the indoor unit cannot be powered on before performing the airtight test and creating a vacuum. The gas side and liquid-side pipes must undergo the airtight test and vacuum extraction.

Airtight test

The refrigerant pipe must undergo the airtight test [with 2.94 MPa (30kgf/cm²) nitrogen].

Creating a vacuum

Be sure to use the vacuum pump to create a vacuum of the refrigerant pipe at the gas side and liquid side concurrently.

Refrigerant replenishment

- If the length is greater than the reference pipe, the refrigerant replenishment quantity for each system should be calculated through the formula obtained according to the actual length of pipe.
- Record the refrigerant replenishment quantity, actual length of pipe and the height difference of the indoor & outdoor unit onto the operation confirmation table of the outdoor unit in advance for future reference.

Electrical wiring






- Select the power supply capacity and wire size according to the design manual. The power cable of the air conditioner is generally thicker than the power cable of the motor.
- In order to prevent misoperation of the air conditioner, do not interleave or entwine the power cable with the connection wires (low-voltage wires) of the indoor/outdoor unit.
- Power on the indoor unit after performing the airtight test and making a vacuum.
- For details of setting the address of the outdoor unit, see Outdoor unit address bits.

Trial run

- Before operation, remove the six pieces of PE foaming which are used at the rear of the unit for protecting the condenser. Be careful not to damage the fin. Otherwise, the heat exchange performance may be affected.
- Perform the trial run only after the outdoor unit has been powered on for over 12 hours.

Accessories

Table1

Name	All of units	Outline	Function
Outdoor unit installation manual	1		---
Outdoor unit user manual	1		Be sure to deliver it to the customer
Indoor unit user manual	1		Be sure to deliver it to the customer
Toggling flathead screw	1	---	For toggling of indoor and outdoor units
Gauge point subassembly	1		For purpose of airtight test
90° mouting elbow	1	---	For connecting pipes
Seal plug	8	---	For pipe Cleaning
Refrigerant pipe accessory	1		Connect to the side of liquid pipe
Bolt bage	1	---	Stone for service

Outdoor Unit Installation

Outdoor Unit Combination

Table 2

HP	Mode	Model	Max. Connectable Indoor Unit
8	8HP x 1	4TVH0086AD	13
10	10HP x 1	4TVH0096AD	16
12	12HP x 1	4TVH0115AD	16
14	14HP x 1	4TVH0135AD	16
16	16HP x 1	4TVH0155AD	20
18	8HP + 10HP	4TVH0182AD (4TVH0086AD + 4TVH0096AD)	20
20	10HP x 2	4TVH0192AD (4TVH0096AD x 2)	24
22	10HP + 12HP	4TVH0211AD (4TVH0096AD + 4TVH0115AD)	24
24	10HP + 14HP	4TVH0231AD (4TVH0096AD + 4TVH0135AD)	28
26	10HP + 16HP	4TVH0251AD (4TVH0096AD + 4TVH0155AD)	28
28	14HP x 2	4TVH0270AD (4TVH0135AD x 2)	28
30	14HP + 16HP	4TVH0290AD (4TVH0135AD + 4TVH0155AD)	32
32	16HP x 2	4TVH0310AD (4TVH0155AD x 2)	32
34	10HP x 2 + 14HP	4TVH0327AD (4TVH0096AD x 2 + 4TVH0135AD)	36



Outdoor Unit Installation

Table 3

HP	Mode	Model	Max. Connectable Indoor Unit
36	10HP x 2 + 16HP	4TVH0347AD (4TVH0096AD x 2 + 4TVH0155AD)	36
38	10HP + 12HP + 16HP	4TVH0366AD (4TVH0096AD + 4TVH0115AD + 4TVH0155AD)	36
40	10HP + 14HP + 16HP	4TVH0386AD (4TVH0096AD + 4TVH0135AD + 4TVH0155AD)	42
42	14HP x 3	4TVH0405AD (4TVH0135AD x 3)	42
44	14HP x 2 + 16HP	4TVH0425AD (4TVH0135AD x 2 + 4TVH0155AD)	42
46	14HP + 16HP x 2	4TVH0445AD (4TVH0135AD + 4TVH0155AD x 2)	48
48	16HP x 3	4TVH0465AD (4TVH0155AD x 3)	48
50	8HP + 10HP + 16HP x 2	4TVH0492AD (4TVH0086AD + 4TVH0096AD + 4TVH0155AD x 2)	54
52	10HP x 2 + 16HP x 2	4TVH0502AD (4TVH0096AD x 2 + 4TVH0155AD x 2)	54
54	10HP + 12HP + 16HP x 2	4TVH0521AD (4TVH0096AD + 4TVH0115AD + 4TVH0155AD x 2)	54
56	10HP + 14HP + 16HP x 2	4TVH0541AD (4TVH0096AD + 4TVH0135AD + 4TVH0155AD x 2)	58
58	14HP x 3 + 16HP	4TVH0560AD (4TVH0135AD x 3 + 4TVH0155AD)	58
60	14HP x 2 + 16HP x 2	4TVH0580AD (4TVH0135AD x 2 + 4TVH0155AD x 2)	58
62	14HP + 16HP x 3	4TVH0600AD (4TVH0135AD + 4TVH0155AD x 3)	64
64	16HP x 4	4TVH0620AD (4TVH0155AD x 4)	64

Outdoor Unit Dimension

Figure 1

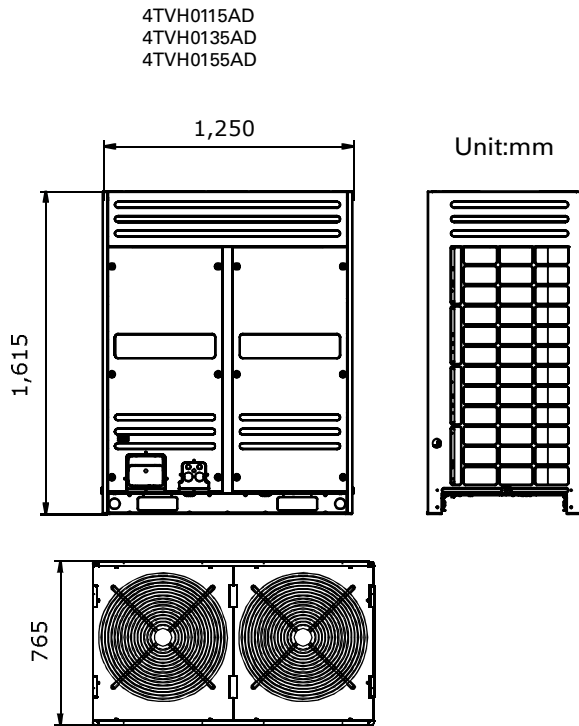
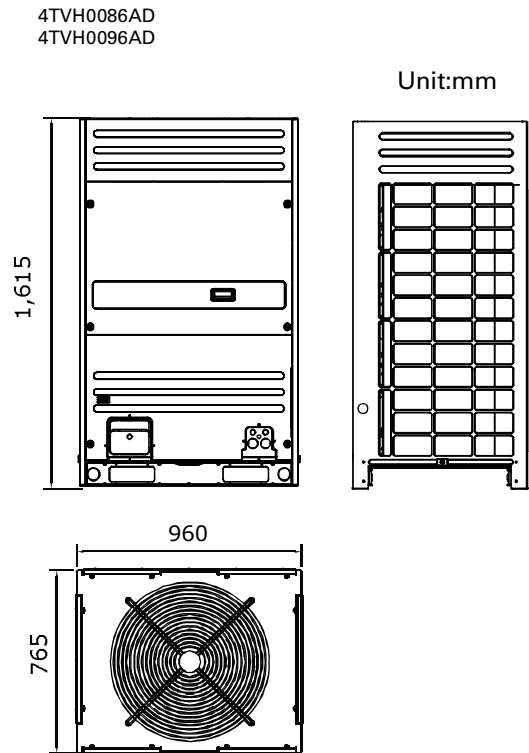


Figure 2



Installation Position Selection

- Ensure that the outdoor unit is installed in a dry, well-ventilated place.
- Ensure that the noise and exhaust ventilation of the outdoor unit do not affect the neighbors of the property owner or the surrounding ventilation.
- Ensure that the outdoor unit is installed in a well-ventilated place that is possibly closest to the indoor unit.
- Ensure that the outdoor unit is installed in a cool place without direct sunshine exposure or direct radiation of high-temp heat source.
- Do not install the outdoor unit in a dirty or severely polluted place, so as to avoid blockage of the heat exchanger in the outdoor unit.
- Do not install the outdoor unit in a place with oil pollution, salt or high content of harmful gases such as sulfurous gas.

Base for Outdoor Unit

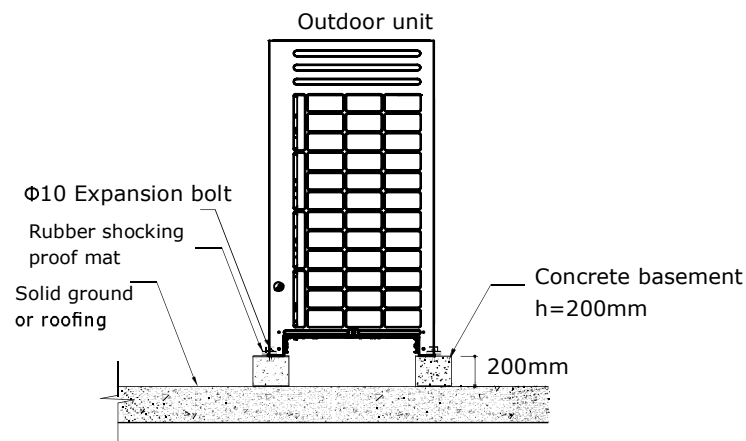
A solid, correct base can:

- Avoid the outdoor unit from sinking.
- Avoid the abnormal noise generated due to base.

Base types

- Steel structure base
- Concrete base (see the figure below for the general making method)

Figure 3



CAUTION

The key points to make basement:

- The master unit's basement must be made on the solid concrete ground. Refer to the structure diagram to make concrete basement in detail, or make after field measurements.
- In order to ensure every point can contact equality, the basement should be on complete level.

- If the basement is placed on the roofing, the detridus layer isn't need, but the concrete surface must be flat. The standard concrete mixture ratio is cement 1/ sand and 2/ carpolite 4, and add 10 strengthen reinforcing steel bar, the surface of cement and sand plasm must be flat, border of the basement must be chamfer angle.
- Before construct the unit base, please ensure the base is directory supporting the rear and front folding edges of the bottom panel vertically, for the reason that these edges are the actual supported sites to the unit.
- In order to drain off the seeper around the equipment, a discharge ditch must be setup around the basement.
- Please check the affordability of the roofing to ensure the load capacity.
- When piping from the bottom of the unit, the base height should be no less than 200mm.

Position illustration of screw bolt (Unit: mm)

Figure 4

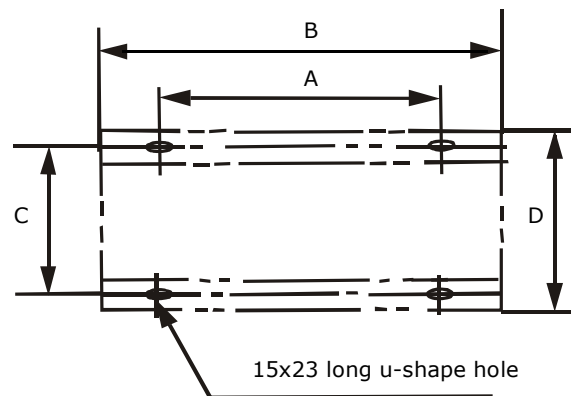


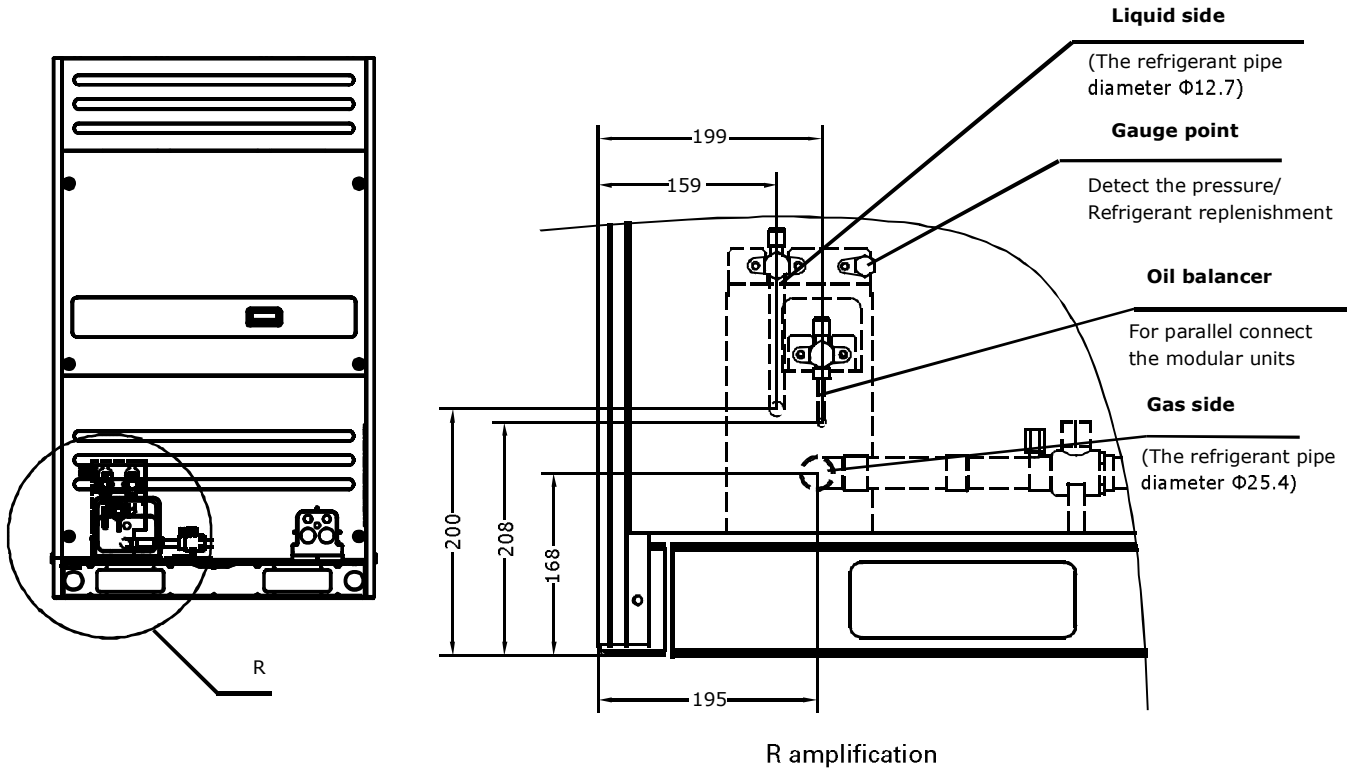
Table 4

Model	4TVH0086AD 4TVH0096AD	4TVH0115AD 4TVH0135AD 4TVH0155AD
SIZE		
A	830	1,120
B	960	1,250
C	736	736
D	765	765

Outdoor Unit Installation

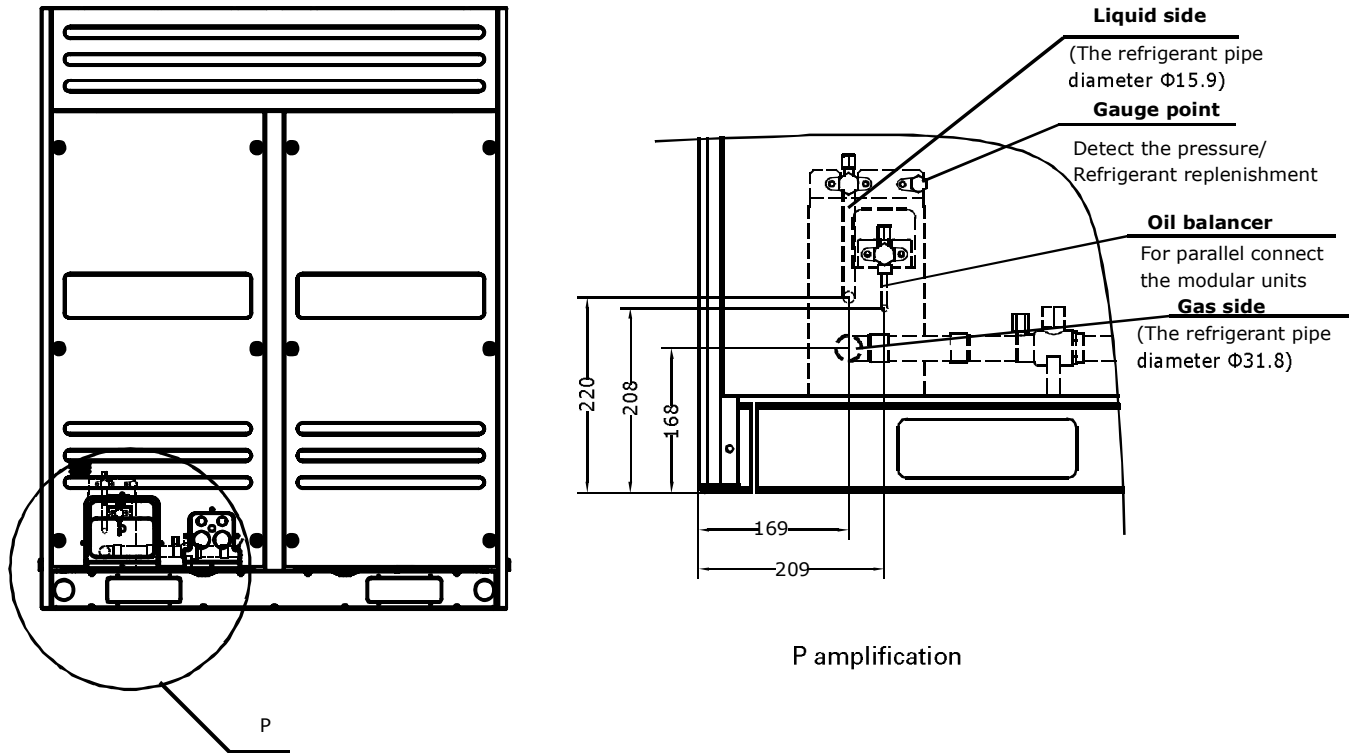
Centering position illustration of each refrigerant pipe (Unit: mm)
1) 4TVH0086AD, 4TVH0096AD

Figure 5



4TVH0115AD, 4TVH0135AD, 4TVH0155AD

Figure 6



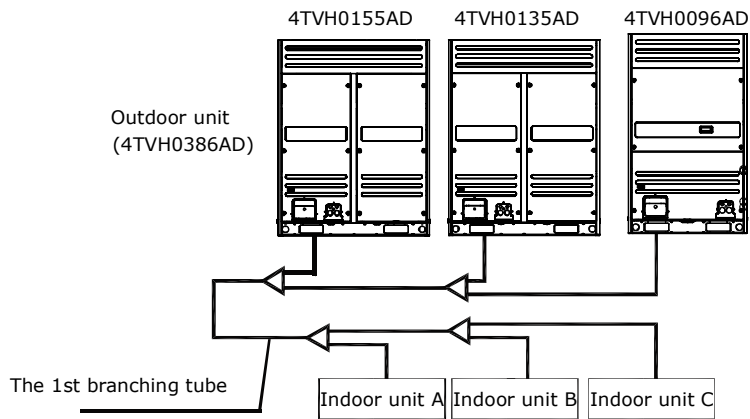
P amplification

Outdoor Units' Placement Sequence & Master and Slave Units' Settings

A system, which provide with more than two outdoor units, will be set as the followings method: The outdoor units in this system should place sequentially from the large to the small capacity; the largest capacity outdoor unit must be mounted at the first branching site; and set the largest capacity outdoor unit address as the master Unit, while the other setting as the Slave Unit. Take 4TVH0386AD (composed by 4TVH0096AD, 4TVH0135AD, and 4TVH0155AD) as an example:

- Place the 4TVH0155AD at a side of the first branching site.
- Place the unit from the large capacity to the small (See the detailed placement illustration)
- Set 4TVH0155AD as the master unit, while the 4TVH0135AD and the 4TVH0096AD as the aux. unit.

Figure 7



Installation Space for Outdoor Unit

Ensure enough space for maintenance. The modules in the same system must be on the same height. (see the Fig.8)

When installing the unit, leave a space for maintenance shown in Fig.9. Install the power supply at the side of the outdoor unit. For installation procedure, see the power supply device Installation manual.

In case any obstacles exist above the outdoor unit, refer to Fig.14.

Figure 8

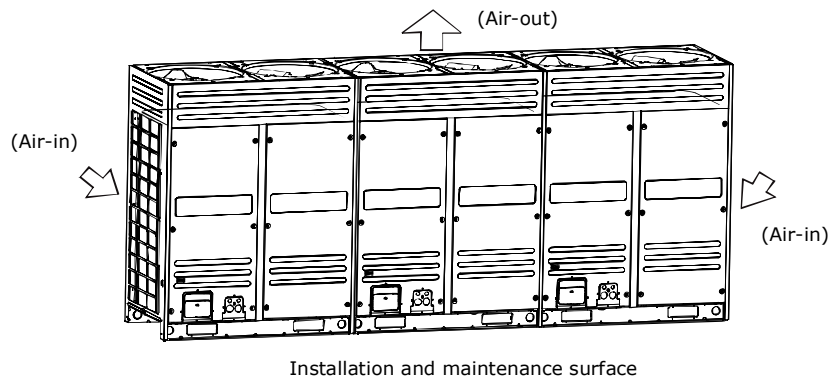
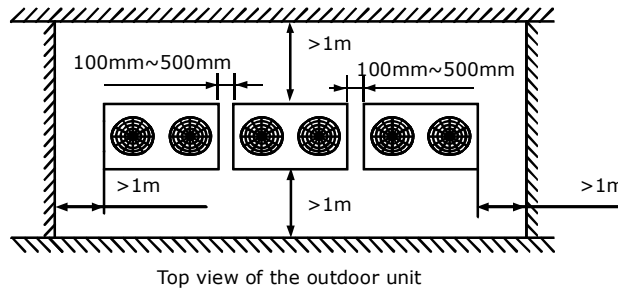


Figure 9

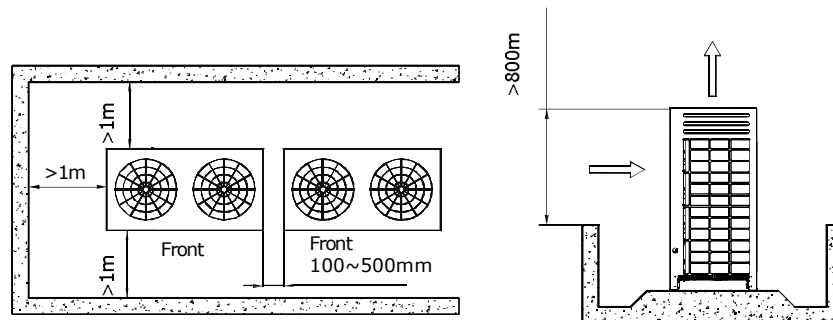


Layout

When the outdoor unit is higher than the surrounding obstacle

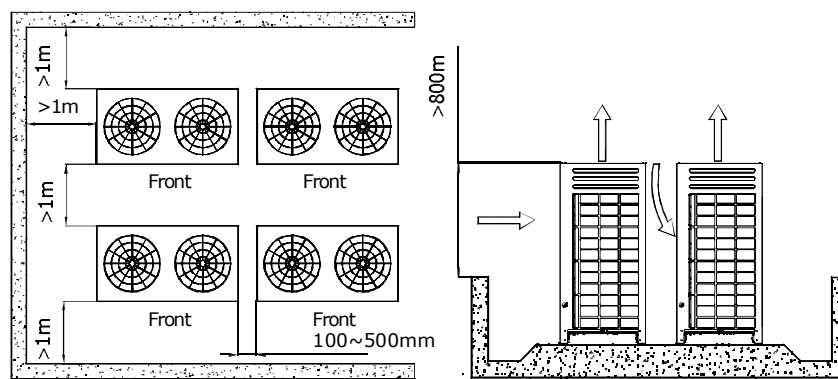
- One row.

Figure 10



- Two rows.

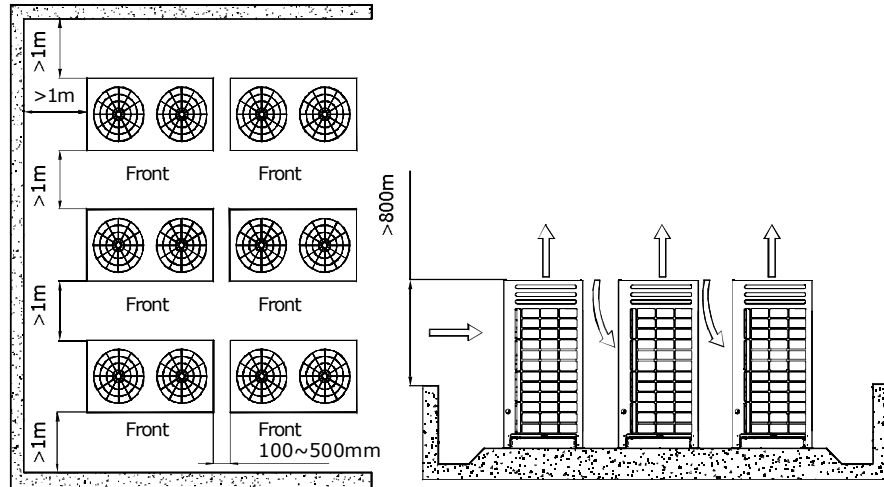
Figure 11



Outdoor Unit Installation

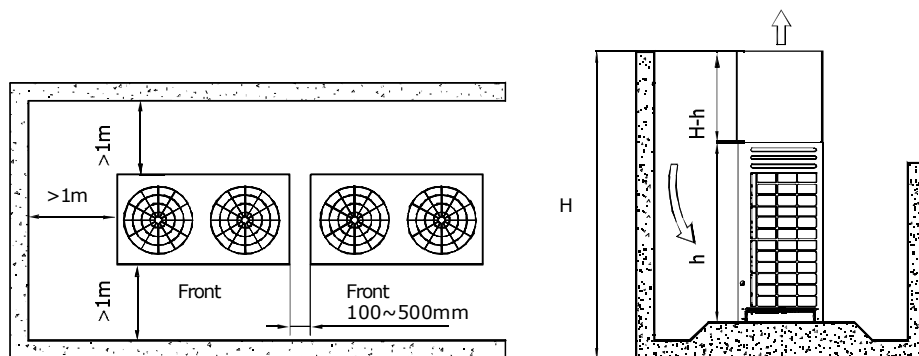
- More than two rows

Figure 12



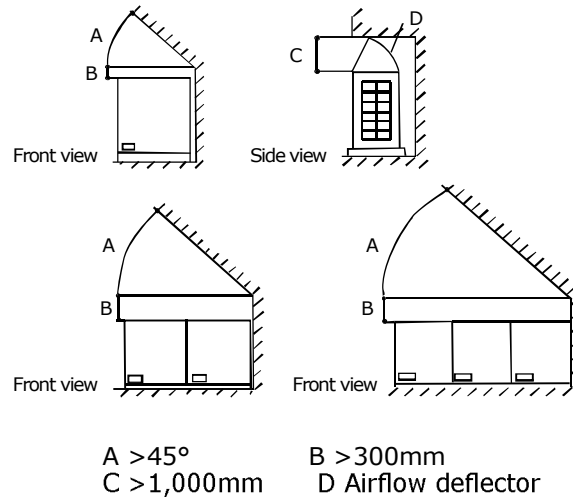
When the outdoor unit is lower than the surrounding obstacle, refer to the layout used when the outdoor unit is higher than the surrounding obstacle. However, to avoid cross connection of the outdoor hot air from affecting the heat exchange effect, please add an air director onto the exhaust hood of the outdoor unit to facilitate heat dissipation. See the figure below. The height of the air director is HD (namely $H-h$). Please make the air director on site.

Figure 13



If miscellaneous articles are piled around the outdoor unit, such articles must be 800mm below the top of the outdoor unit. Otherwise, a mechanic exhaust device must be added.

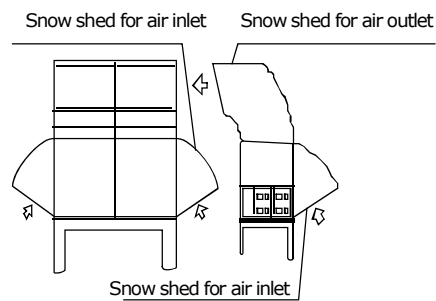
Figure 14



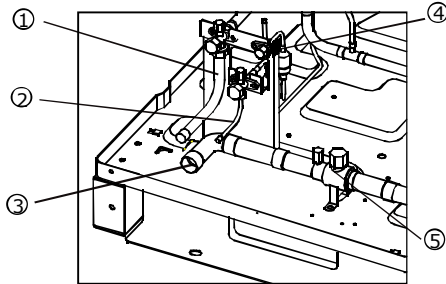
Set the Snow-Proof Facility

In snowy areas, facilities should be installed to prevent snow. (See the figure below) (defective facilities may cause malfunction.) Please lift the bracket higher and install snow shed at the air inlet and air outlet.

Figure 15



Explanation of Valve

Figure 16

Table 5

①	Connect the liquid pipe (accessory, field installation)
②	Oil balancer
③	Connect the gas pipe
④	Gauge point
⑤	Low pressure float valve

Note:

- For a single modular that is not necessary to connect with oil balancer.

Mount The Air Deflector

If the static pressure of outdoor unit is over 20Pa, the unit needs to be customized.

4TVH0086AD, 4TVH0096AD Installation illustration
Example A

Figure 17

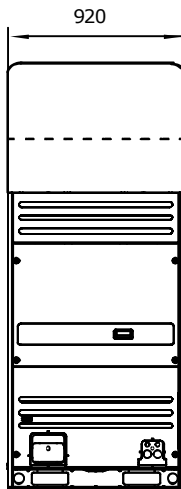


Figure 18

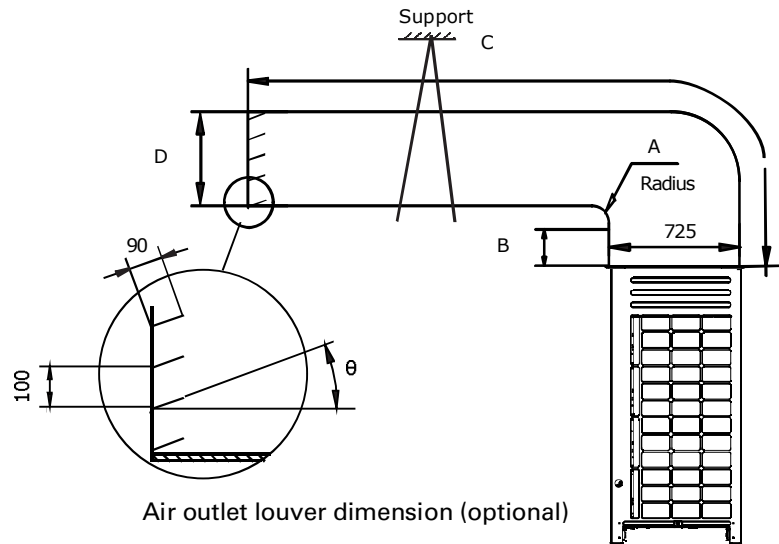


Figure 19

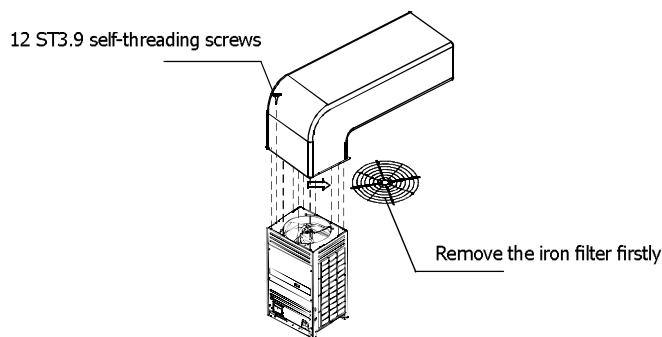
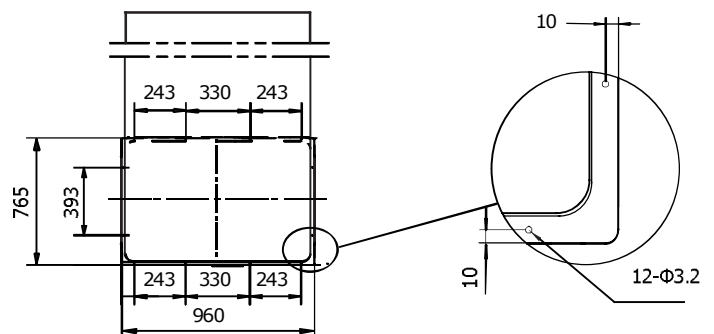


Table 6

Unit: mm

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 8,000$
D	$600 \leq D \leq 760$
θ	$\theta \leq 15^\circ$

Figure 20



Outdoor Unit Installation

Example B

Figure 21

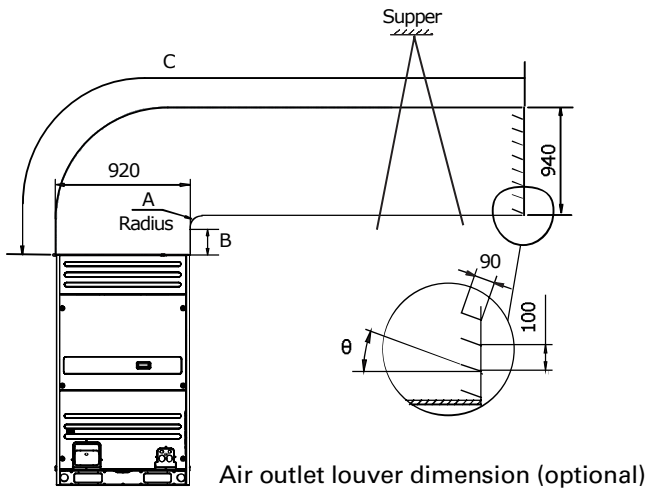


Figure 22

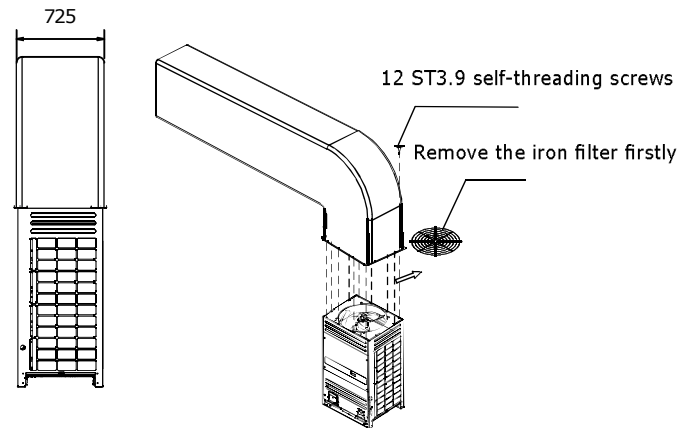
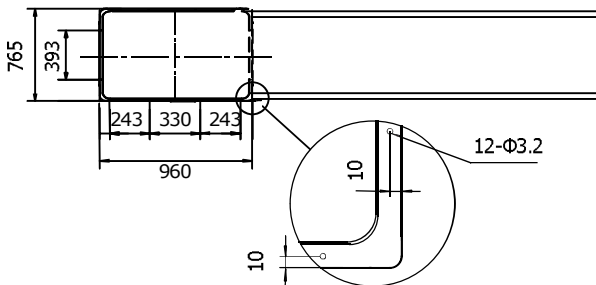


Table 7

Unit: mm

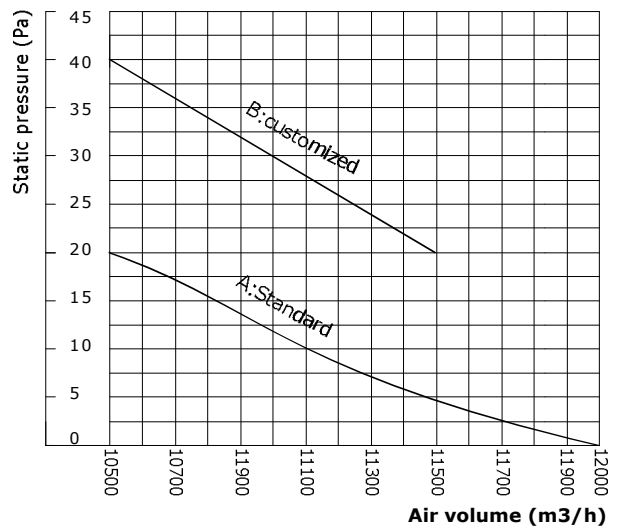
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 8,000$
θ	$\theta \leq 15^\circ$

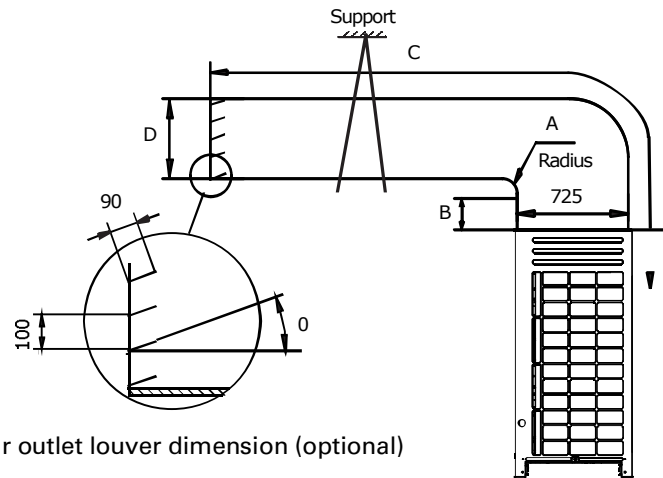
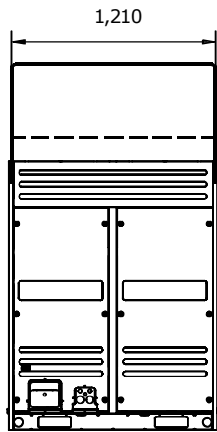
Figure 23



Curve diagram of static pressure, air flow volumn.

Figure 24

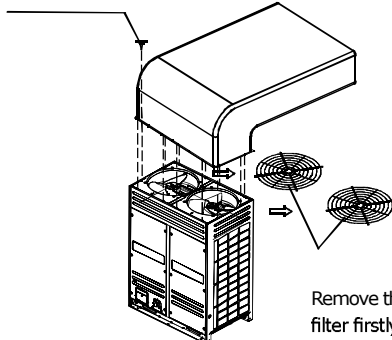




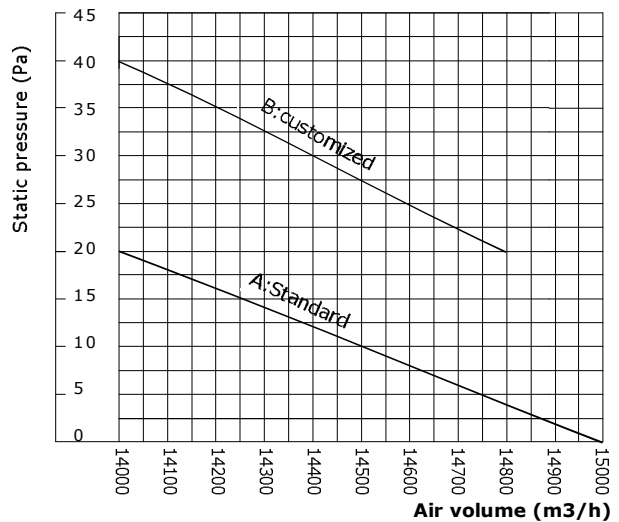
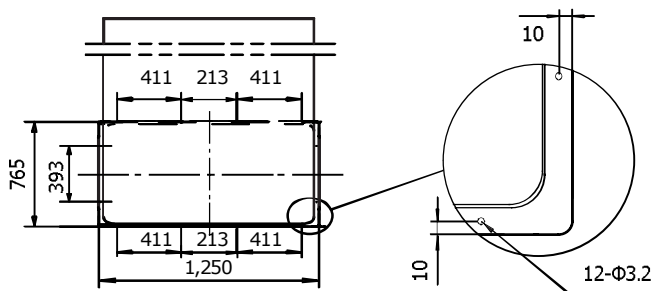
Air outlet louver dimension (optional)

Unit: mm

12 ST3.9 self-threading screws



A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 8,000$
D	$600 \leq D \leq 760$
θ	$\theta \leq 15^\circ$



Outdoor Unit Installation

Example B

Figure 30

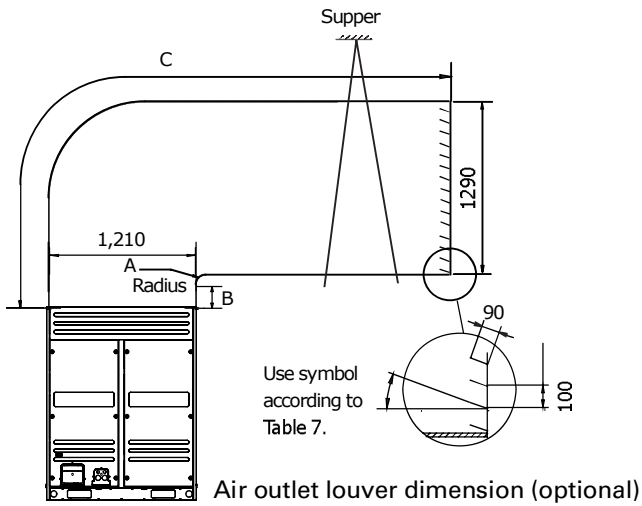


Figure 31

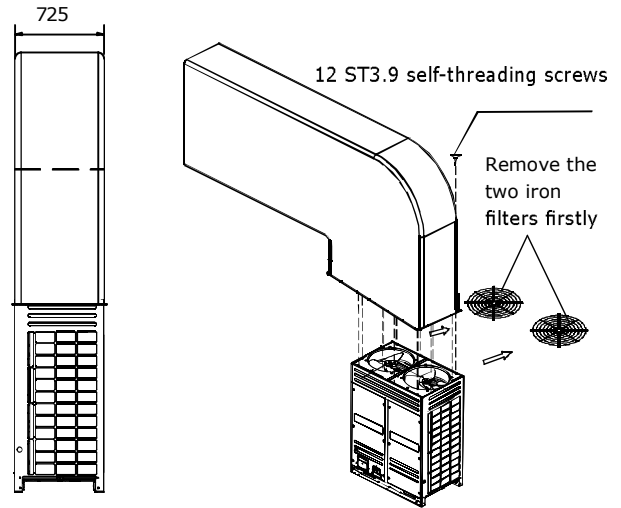


Figure 32

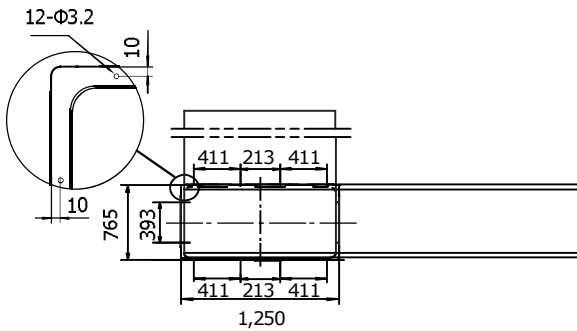


Table 8

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 8,000$
θ	$\theta \leq 15^\circ$

Note:

- Before install the air deflector, please ensure the mesh enclosure has been taken off, otherwise the air supply efficiency would be blocked down.
- Once mounting the shutter to the unit, air volumn, cooling (heating) capacity and efficiency would be blocked. Moreover, this would enhance the angle of the shutter. Therefore, it is not recommended to mount the shutter. If it is necessary in use, please adjust the angle of shutter to be no larger than 15°.
- Only one bending site is allowed in the air duct (see as the above figure), otherwise, misoperation may occur.

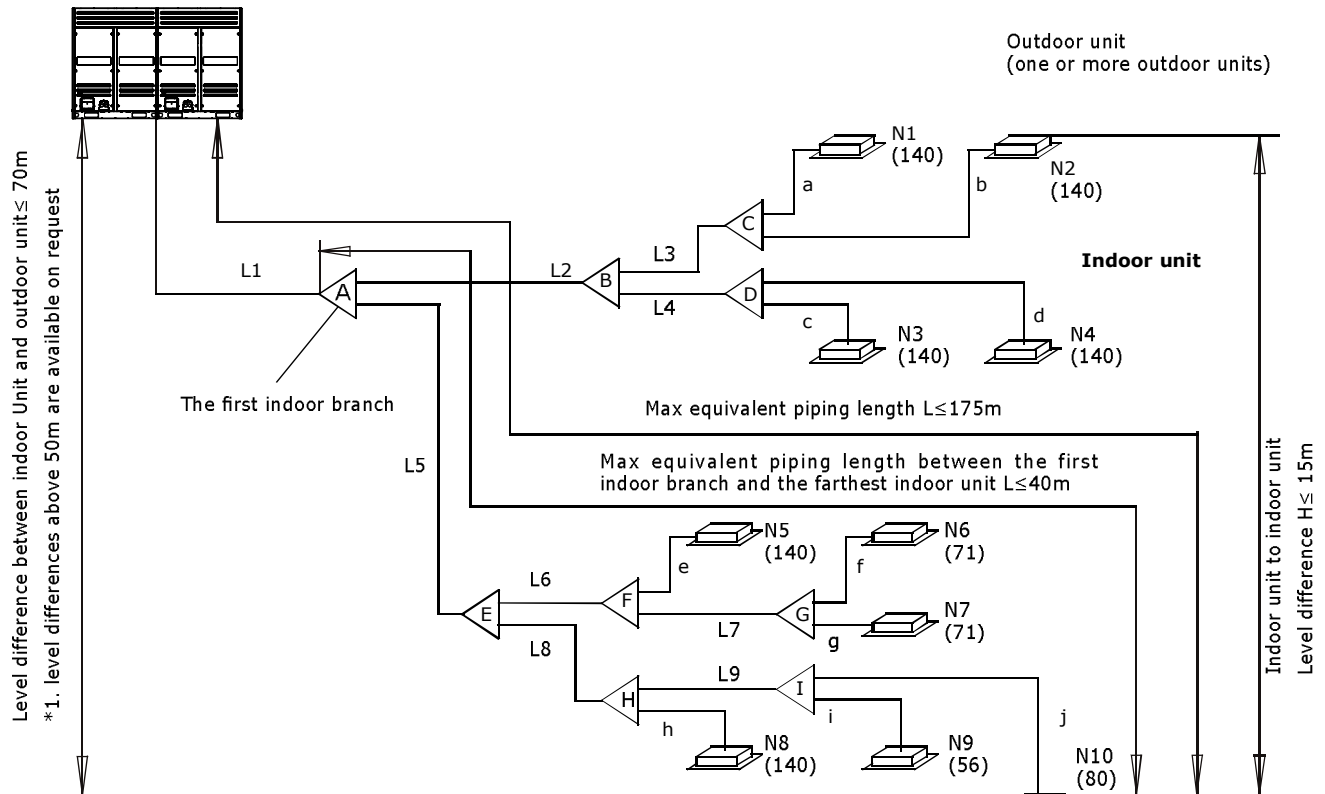
Refrigerant Pipe

Allowable Refrigerant Piping Length and Level Difference

Note:

- Reduced length of the branching tube is the 0.5m of the equivalent length of the pipe.

Figure 33



*1. level difference above 50m are not supported by default but are available on request for customized. (if the outdoor unit is above the indoor unit)

Table 10

		Permitted value		Piping
Max. allowable piping length	Total actual piping length	≤30HP	350m	L1+L2+L3+L4+L5+L6+L7+L8+L9 +a+b+c+d+e+f+j+h+i+j
		>30HP	500m	
	Actual piping length	150m		L1+L5+L8+L9+J
Equivalent piping length	175m			
Max. allowable level difference	Equivalent piping length between the first indoor branch and the farthest indoor unit		40m	L5+L8+L9+J
	Between indoor units and out door units	Outdoor unit is above	70m (*1 Available on request)	--
		Outdoor unit is below	70m	--
Between indoor units		15		--

Select The Refrigerant Piping Type

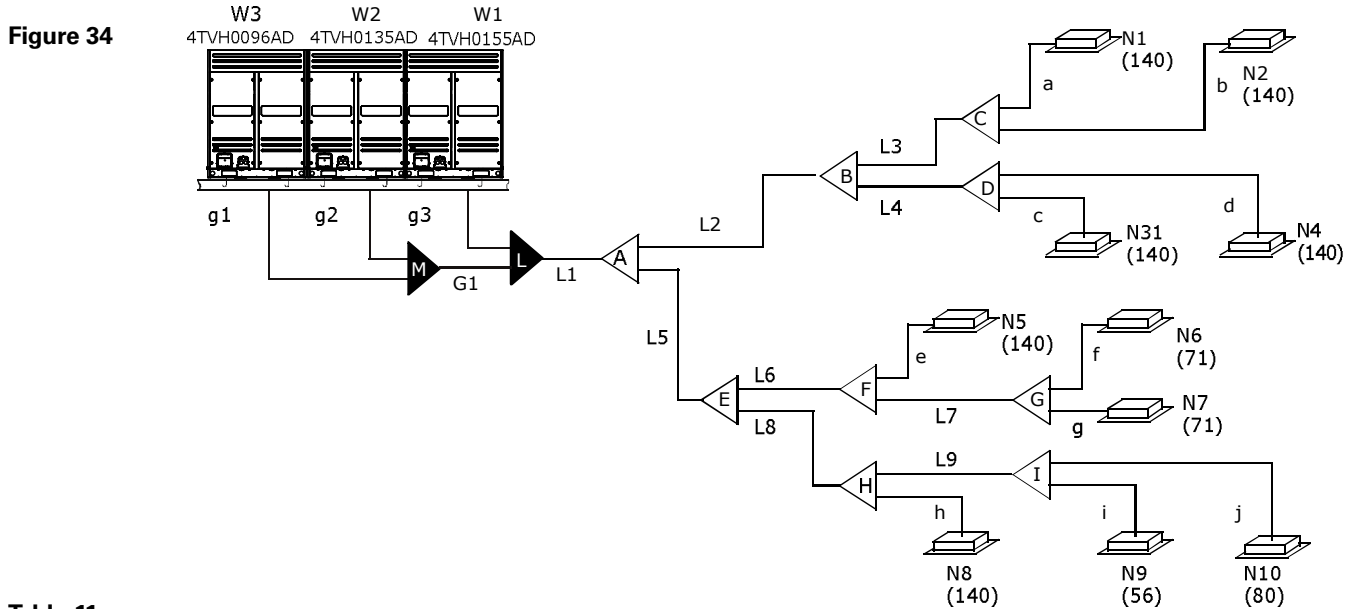


Table 11

Pipe name	Code (As per the Fig.34)
Main pipe	L1
Indoor unit main pipe	L2~L9
Indoor unit aux. pipe	a, b, c, d, e, f, g, h, i, j
Indoor unit branching pipe assembly	A, B, C, D, E, F, G, H, I
Outdoor unit branching pipe assembly	L, M
Outdoor unit refrigerant pipe	g1, g2, g3, G1

Size of Joint Pipes for Indoor Unit

Table 12

Size of joint pipes for 410A indoor unit

Capacity of indoor unit (A)	Mode		
	Gas side	Liquid side	Available branching pipe
A<166	Φ19.1	Φ9.5	TRDK056A
166≤A<230	Φ22.2	Φ9.5	TRDK112A
230≤A<330	Φ22.2	Φ12.7	TRDK112A
330≤A<460	Φ28.6	Φ12.7	TRDK225A
460≤A<660	Φ28.6	Φ15.9	TRDK225A
660≤A<920	Φ34.9	Φ19.1	TRDK314A
920≤A<1350	Φ41.3	Φ19.1	TRDK768A
1350≤A	Φ44.5	Φ22.2	TRDK768A

e.x.1: Refer to Fig.34 , the capacity of downstream units to L2 is 140×4=560, i.e. the gas pipe for L2 is 28.6, liquid pipe is Φ15.9.

Size of Joint Pipes for Outdoor Unit

Base on the following tables, select the diameters of the outdoor unit refrigerant pipes. In case that the main accessory pipe is larger than the main pipe, take the larger one for the selection.

Example: parallel connect with the three outdoor units 4TVH0135AD+4TVH0155AD+4TVH0155AD (the total capacity is 46HP), all indoor units total capacity is 1360, provided that the equivalent length of all pipes are $\geq 90\text{m}$, according to the Table 14 the main pipe diameter are 41.3/ 22.2; in according to all indoor unit capacity 1360, we could find out the master unit diameter is 44.5/ 22.2 base on Table 12. Take the larger one for the selection, we finally confirm the main pipe diameter is 44.5/ 22.2.

Table 13

Size of joint pipes for 410A outdoor unit

Model	When the equivalent length of all liquid pipes < 90m, the size of main pipe (mm)		
	Gas side	Liquid side	Available branching pipe
4TVH0086	Φ22.2	Φ12.7	TRDK112A
4TVH0096	Φ25.4	Φ12.7	TRDK112A
4TVH0115	Φ28.6	Φ12.7	TRDK225A
4TVH0135-0155	Φ28.6	Φ15.9	TRDK225A
4TVH0182-0211	Φ31.8	Φ15.9	TRDK225A
4TVH0231	Φ34.9	Φ15.9	TRDK314A
4TVH0251-0310	Φ34.9	Φ19.1	TRDK314A
4TVH0327-0465	Φ41.3	Φ19.1	TRDK768A
4TVH0492-0620	Φ44.5	Φ22.2	TRDK768A

Table 14

Size of joint pipes for 410A outdoor unit

Model	When the equivalent length of all liquid pipes $\geq 90\text{m}$, the size of main pipe (mm)		
	Gas side	Liquid side	Available branching pipe
4TVH0086	Φ25.4	Φ12.7	TRDK112A
4TVH0096	Φ25.4	Φ12.7	TRDK112A
4TVH0115	Φ28.6	Φ15.9	TRDK225A
4TVH0135-0155	Φ31.8	Φ15.9	TRDK225A
4TVH0182-0211	Φ31.8	Φ19.1	TRDK225A
4TVH0231	Φ34.9	Φ19.1	TRDK314A
4TVH0251-0310	Φ38.1	Φ22.2	TRDK314A
4TVH0327-0465	Φ41.3	Φ22.2	TRDK768A
4TVH0492-0620	Φ44.5	Φ25.4	TRDK768A

Refrigerant Pipe

Branch Pipes for Outdoor Unit

Table 15

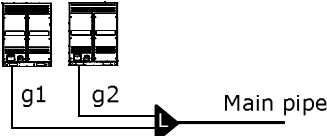
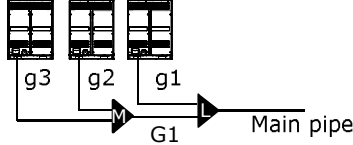
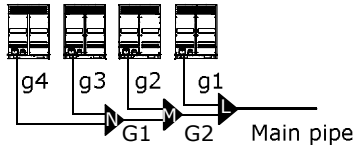
Model	Outdoor unit pipe connective opening dimension (mm)	
	Gas side	Liquid side
4TVH0086AD, 4TVH0096AD	Φ25.4	Φ12.7
4TVH0115AD, 4TVH0135AD, 4TVH0155AD	Φ31.8	Φ15.9

Branch Pipes for Indoor Unit

Base on Table 16 and Table 17 select the multi refrigerant pipes of outdoor unit. Before installation, please read the Outdoor Unit Branching Pipe Installation Manual carefully.

Table 16

Outdoor unit multi-refrigerant pipe assembly (Illustration)

Outdoor unit Qty	Illustration
2 units	
3 units	
4 units	

Outdoor unit multi-refrigerant pipe assembly

Table 17

Outdoor unit Qty	Outdoor unit refrigerant pipe diameter	Parallel connect with the branching pipes	Main pipe
2 units	g1, g2: 8, 10HP: Φ25.4/12.7; 12~16HP: Φ31.8/Φ15.9	L: TODK002A	Refer to Table 13 or 14 for main pipe dimension
3 units	g1, g2, g3: 8, 10HP: Φ25.4/12.7; 12~16HP: Φ31.8/15.9; G1: Φ38.1/Φ19.1	L+M: TODK003A	
4 units	g1, g2, g3, g4: 8, 10HP: Φ25.4/12.7; 12~16HP: Φ31.8/Φ15.9; G1: Φ38.1/Φ19.1; G2: Φ41.3/Φ22.2	L+M+N: TODK004A	

Note:

- The pipe assemblies in above table is special for this model, which must be purchased separately.

Example

Take 4TVH0386AD (4TVH0096AD+4TVH0135AD+4TVH0155AD) that composed by three modules as an example to clarify the pipe selection.

Take Fig.35 as an example. Provided that the equivalent length of all pipes in this system is larger than 90m.

Table 18

Unit:mm

Indoor unit capacity A (×100W)	When branching pipe's length ≤10m		When branching pipe's length >10m	
	Gas side	Liquid side	Gas side	Liquid side
A≤45	Φ12.7	Φ6.4	Φ15.9	Φ9.5
A≥56	Φ15.9	Φ9.5	Φ19.1	Φ12.7

1) The branching pipe at the inside of the unit.

There are a~j branching pipes at the inside of the unit, the branching pipe diameter should be selected as per Table 18.

2) Main pipe at the inside the unit (Refer to Table 12)

- The main pipe L3 with N1, N2 downstream indoor units that total capacity is $140 \times 2 = 280$, the pipe L3 diameter is $\Phi 22.2 / \Phi 12.7$, thus select TRDK112A for the branching pipe C.
- The main pipe L4 with N3, N4 downstream indoor units that total capacity is $140 \times 2 = 280$, the pipe L3 diameter is $\Phi 22.2 / \Phi 12.7$, thus select TRDK112A for the branching pipe D.
- The main pipe L2 with N1~N4 downstream indoor units that total capacity is $140 \times 4 = 560$, the pipe L2 diameter is $\Phi 28.6 / \Phi 15.9$, thus select TRDK225A for the branching pipe B.
- The main pipe L7 with N6, N7 downstream indoor units that total capacity is $71 \times 2 = 142$, the pipe L7 diameter is $\Phi 19.1 / \Phi 9.5$, thus select TRDK056A for the branching pipe G.
- The main pipe L6 with N5 N7 downstream indoor units that total capacity is $140 + 71 \times 2 = 282$, the pipe L6 diameter is $\Phi 22.2 / \Phi 12.7$, thus select TRDK112A for the branching pipe F.
- The main pipe L9 with N9, N10 downstream indoor units that total capacity is $56 + 80 = 136$, the pipe L9 diameter is $\Phi 9.1 / \Phi 9.5$, thus select TRDK056A for the branching pipe I.
- The main pipe L8 with N8~N10 downstream indoor units that total capacity is $140 + 56 + 80 = 276$ the pipe L8 diameter is $\Phi 22.2 / \Phi 12.7$, thus select TRDK112A for the branching pipe H.
- The main pipe L5 with N5~N10 downstream indoor units that total capacity is $140 \times 2 + 56 + 71 \times 2 + 80 = 558$, the pipe L5 diameter is $\Phi 28.6 / \Phi 15.9$, thus select TRDK225A for the branching pipe E.
- The main pipe A with N1~N10 downstream indoor units that total capacity is $140 \times 6 + 56 + 71 \times 2 + 80 = 1118$, thus select TRDK768A for the branching pipe A.

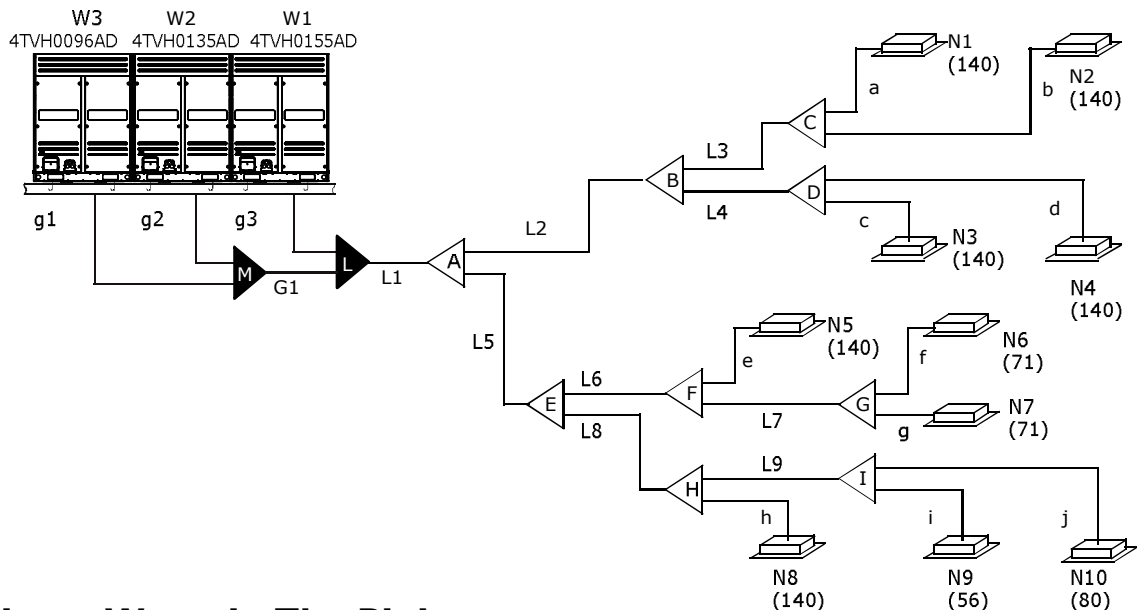
3) Main pipe (Refer to Table 12, Table14):

Main pipe L1 in the Fig.35, which upstream outdoor units total capacity is $96 + 135 + 155 = 386$ (4TVH0386), base on table 14, the gas/liquid pipe diameter are $\Phi 41.3 / \Phi 22.2$, total capacity of the downstream indoor unit is $140 \times 6 + 56 + 71 \times 2 + 80 = 1118$, base on table 12, the gas/liquid pipe diameter are $\Phi 41.3 / \Phi 19.1$, take the large one for your selection, final confirm the main pipe diameter is: gas/liquid pipe $\Phi 41.3 / \Phi 22.2$.

4) Parallel connect the outdoor units

- The outdoor unit linked by Pipe g1 is 4TVH0096AD, parallel connects with outdoor unit. the connective pipe diameter to be selected according to its connector size is $\Phi 25.4/\Phi 12.7$;
- The outdoor unit linked by Pipe g2 is 4TVH0135AD, parallel connects with outdoor unit. the connective pipe diameter to be selected according to its connector size is $\Phi 31.8/\Phi 15.9$;The outdoor unit linked by Pipe g3 is 4TVH0155AD, parallel connects with outdoor unit. the connective pipe diameter to be selected according to its connector size is $\Phi 31.8/\Phi 15.9$.
- The upstream of G1 is the two parallel connected outdoor units, refer to Table 16 select the three parallel connected outdoor unit, the pipe diameter is $\Phi 38.1/\Phi 19.1$.
- Parallel connect the three pipes outdoor units, refer to Table 16 should select TODK003A for outdoor unit connective pipes (L+M).

Figure 35



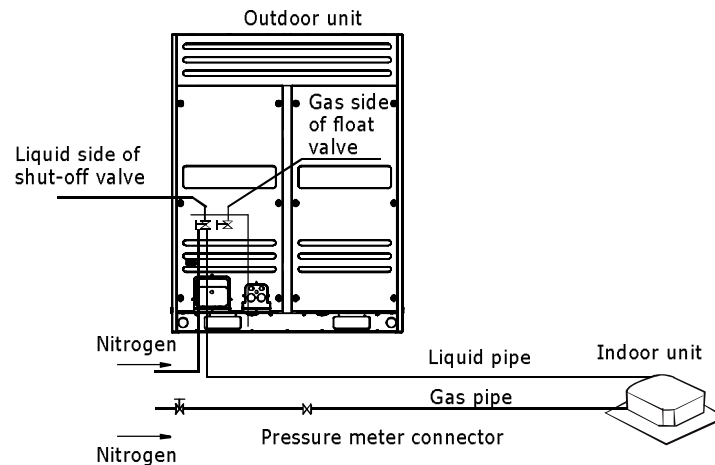
Remove Dirt or Water in The Piping

Make sure there is no any dirt or water before connecting the piping to the outdoor units.

Wash the piping with high pressure nitrogen, never use refrigerant of the outdoor unit.

Gas Tight Test

- Upon set up the indoor unit pipeline, please connect the Hi-pressure pipe with shut-off valve firstly.
- Weld the pipe at the low pressure side to the meter connector.
- Close the vacuum pump, charge 40kgf/cm^2 nitrogen gas from the piston of shut-off valve and from the meter connector. Pressure inside should be maintained least 24 hrs.
- Upon the airtightness test, do a good welding between float valve and pipe at the low pressure side.

Figure 36


CAUTION

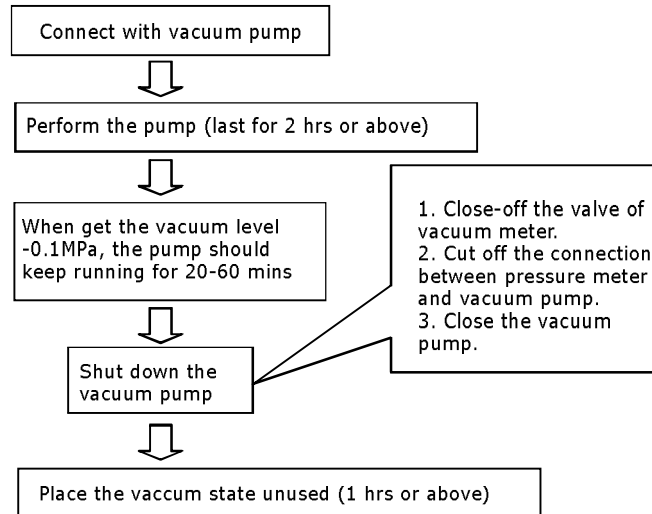
- Pressurized nitrogen (3.9MPa/40kgf/cm²) is used for airtightness test.
- It is not allowed to bring pressure on the float valve directly. (See Fig. 36)
- It is not allowed to use oxygen, combustible gas or toxic gas to conduct the airtightness test.
- When welding, please use wet cloth to insulate the low pressure valve for protection.
- To avoid the equipment being damaged, the pressure maintained time should not last too long.

Vacuum with Vacuum Pump

- Use the vacuum pump whose vacuum level is lower than -0.1MPa and the air discharge capacity is above 40L/min.
- The outdoor unit is not necessary to vacuum, Don't open the outdoor unit gas and liquid pipe shut-off valves.
- Make sure the vacuum pump could result as -0.1MPa or below after over 2 hours' operation. If the vacuum pump could not achieve to be -0.1MPa or below after more than 3 hours' operation, please check whether there is water mix or gas leakage inside of the pipe.

Refrigerant Pipe

Figure 37



CAUTION

Don't mix up the different refrigerants or abuse the tools and measurements which directly contact with refrigerants.

Don't adopt refrigerant gas for air vacuuming.

If vacuum level could not get to -0.1MPa, please check whether it is resulted from leakage and confirm the leakage site. If no leakage, please operate the vacuum pump again 1 or 2 hrs.

Refrigerant Amount to be Added

Calculate the added refrigerant according to the diameter and the length of the liquid side pipe of the outdoor/indoor unit connection. The refrigerant is R410A.

Table 19

Pipe size on liquid side	Refrigerant to be Added per meter
Φ6.4	0.023kg
Φ9.5	0.060kg
Φ12.7	0.120kg
Φ15.9	0.180kg
Φ19.1	0.270kg
Φ22.2	0.380kg
Φ25.4	0.520kg
Φ28.6	0.680kg

The Key Points for The Installation of Refrigerated Pipes between Outdoor Units

- Connect the pipes between outdoor units, the pipes should be placed horizontally (Figure 38, Fig.39), It does not allow the concave at junction site (Refer to Fig.40).

- All connective pipes between the outdoor units are not allowed to be over the height of every outlets of the pipes (Refer to Fig.41).

Figure 38

√ Correct way

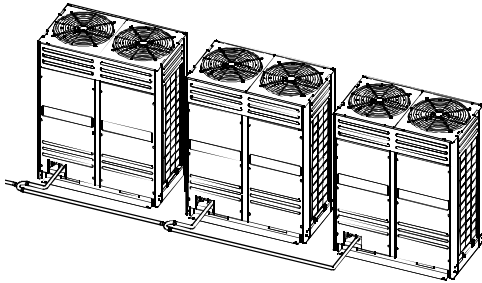


Figure 39

√ Correct way

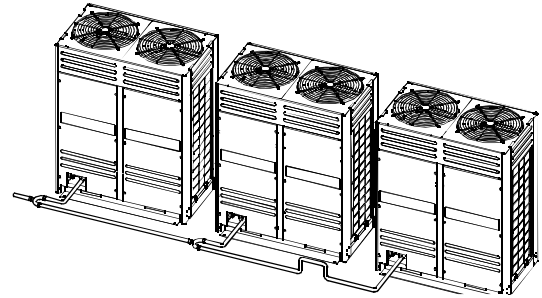


Figure 40

× Wrong way

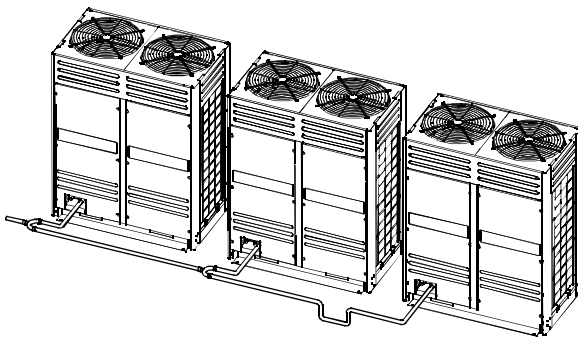
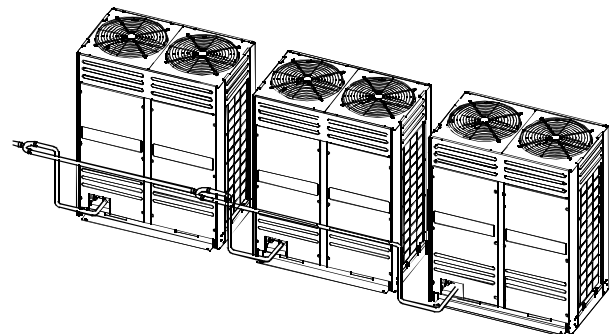


Figure 41

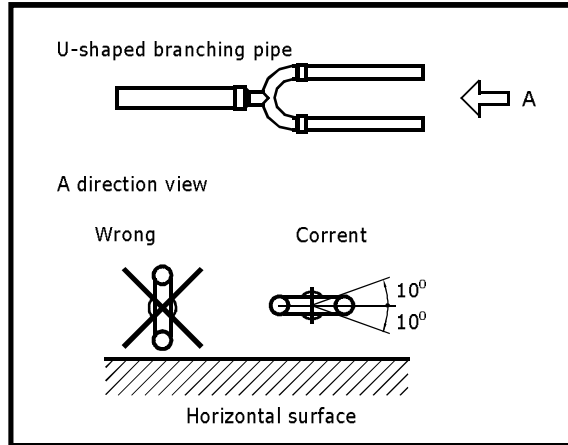
× Wrong way



Refrigerant Pipe

- The branching pipe must be installed horizontally, error angle of it should not be larger than 10°. Otherwise, malfunction will occur.

Figure 42



- To avoid oil accumulating at the outdoor unit, please install the branching pipes properly.

Figure 43

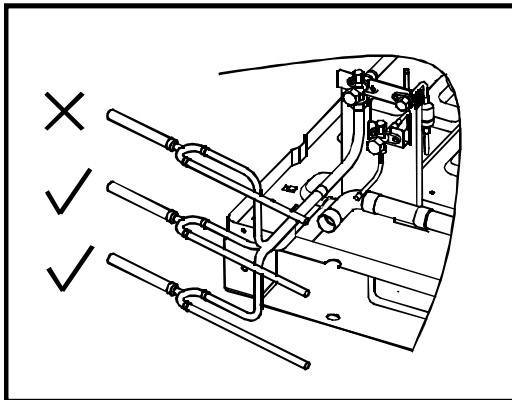
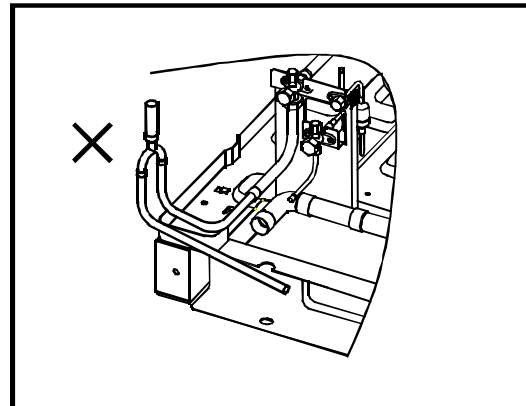


Figure 44



Electrical Wiring

SW1 Query Instructions

Use application of the SW1 spot check

Table 20

No	Display content (Normal display)	Note
1	Outdoor unit address	0, 1, 2, 3
2	Outdoor unit capacity	86, 96, 115, 135, 155
3	Modular outdoor unit qty.	Available for master unit
4	Outdoor unit total capacity	Capacity requirement
5	Indoor unit total capacity requirement	Available for master unit
6	The correct total capacity of master unit	Available for master unit
7	Operation mode	0, 1, 2, 3, 4
8	The actual operation capacity of this outdoor unit	Capacity requirement
9	Fan status	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
10	T2B/T2 average temp.	Actual value
11	T3 pipe temp.	Actual value
12	T4 ambient temp	Actual value
13	Inverter air discharge temp.	Actual value
14	Fixed frequency 1 air discharge temp.	Actual value
15	Fixed frequency 2 air discharge temp.	Actual value
16	Inverter current	Actual value
17	Fixed frequency 1 current	Actual value
18	Fixed frequency 2 current	Actual value
19	TXV opening angle	Actual value×8
20	Air discharge pressure	Actual value×0.1MPa
21	The limitation of Indoor unit proformed mode	0, 1, 2, 3, 4
22	Indoor unit qty	Actual value
23	The last time error or protective code	Without protection or error displays as 00
24	---	Spot inspection end

Normal display:

When in standby, it displays the indoor unit qty. When receive the capacity requirement, it will display the compressor rotation frequency (indoor unit qty. is the unit qty. that could communicate with outdoor unit)

Operation mode: 0—OFF; 1—Air supply; 2—cooling; 3—heating; 4-Constraint cooling

Rotation speed: 0—fan stop; 1-9 rotation speed turn down sequentially, 9 is the maximum speed

The limitation of Indoor unit proformed mode : 0—Heating Priority Mode; 1—Cooling Priority Mode; 2—Priority Mode; 3—Only Respond The Heating Mode;4—Only Respond The Cooling Mode. PMV opening angle: pulse count=display value×8; ENC1: Outdoor unit address setting switch; ENC2: Outdoor unit capacity setting switch; ECN3: Network address setting switch.

SW1: spot check button; SW2: forced cooling button; 86, 96, 115MBH none-fixed frequency 2 air discharge temp; fixed frequency 2 current. (Includes the connective wire that through the CT2 mutual-current inductor connect with HEAT 2)

Terminal Base Function

Figure 45

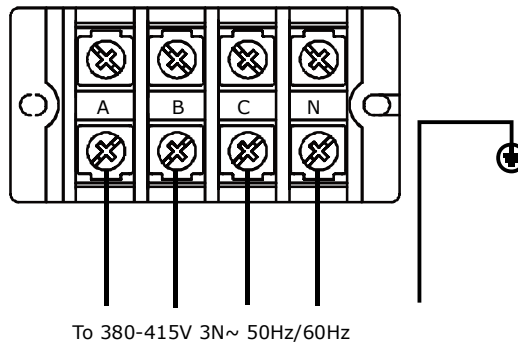
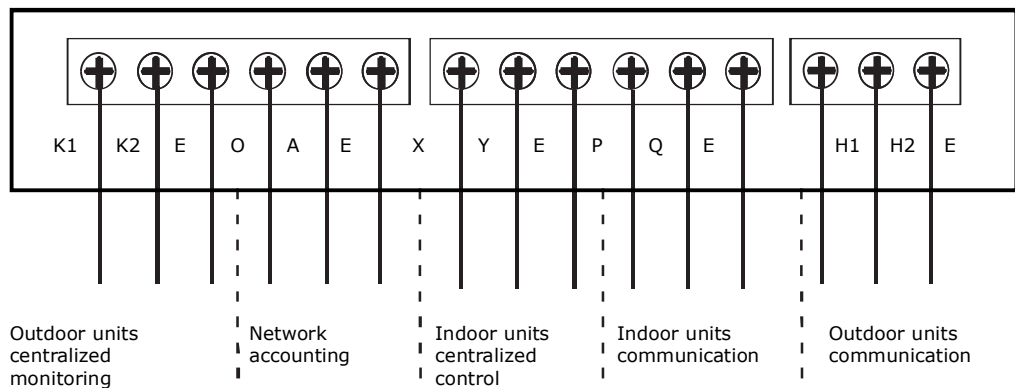
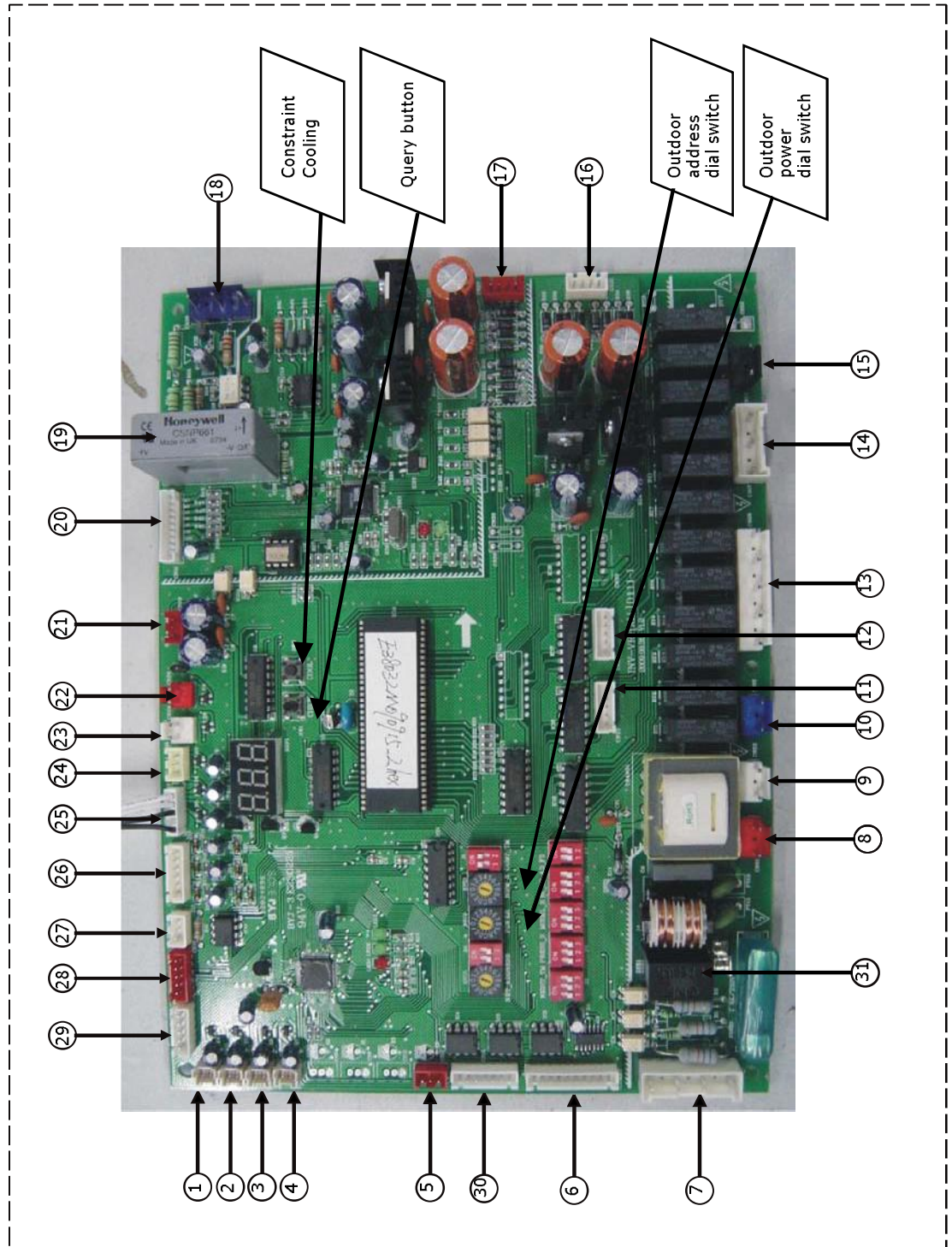


Figure 46



Explanation of Main Board

Figure 47



Electrical Wiring

Explanation of main board

Table 21

No	Content
1	Reserve
2	Air discharge temp. sensed port at the No.2 fixed frequency compressor
3	Air discharge temp. sensed port at the No.1 fixed frequency compressor
4	Air discharge temp. sensed port at the inverter compressor
5	Power supply port in the Mid-adapted panel
6	Communication between indoor and outdoor units, indoor unit network, outdoor unit network and terminal of network accounting
7	Phase inspection port
8	Power input of the No.1 transformer
9	Power input of the No.2 transformer
10	Loading output terminal
11	NO.2 EXV activation port
12	NO.1 EXV activation port
13	Loading output terminal
14	Loading output terminal
15	Loading output terminal
16	Power output of the No.1 transformer
17	Power output of the No.2 transformer
18	Port for inverter module voltage inspection
19	Mutual inductor for DC main lead current inspection
20	Activation port of inverter module
21	Power supply connected port of the main control panel
22	ON/OFF signal input port for system low pressure inspection
23	ON/OFF signal input port for system Hi-pressure inspection
24	Input port for system pressure inspection
25	Inspection port for outdoor ambient temp. and condensator coil temp
26	Current inspection port of the inverter, No.1 and No.2 fixed frequency compressors
27	Communication ports among outdoor units
28	Control port of DC fan 1
29	Control port of DC fan 2
30	Reserve
31	C phase power supply

Dial Codes Definition

Figure 48

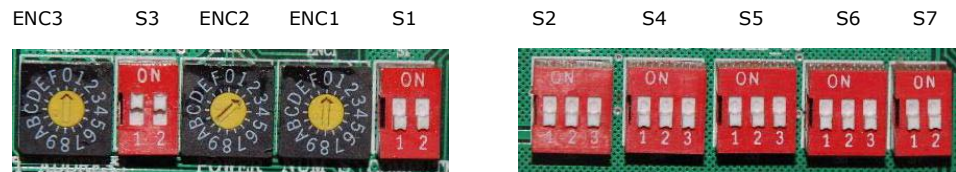


Table 22

SW1 definition

	<p>Starting time is set about 3 minutes</p>
	<p>Starting time is set about 12 minutes (Default the Factory Set)</p>

SW2 definition

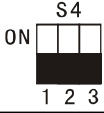
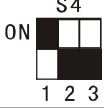
	<p>Night time selection is 6h/10h (Default the Factory Set)</p>
	<p>Night time selection is 8h/10h</p>
	<p>Night time selection is 6h/12h</p>
	<p>Night time selection is 8h/8h</p>

SW3 definition


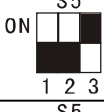

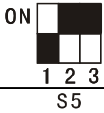

	<p>Reserve</p>
--	----------------

Electrical Wiring

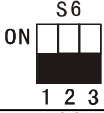
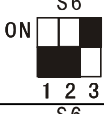
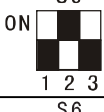
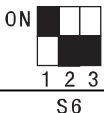

SW4 definition

	Static pressure mode is 0 MPa (Default the Factory Set)
	Static pressure mode is high pressure


SW5 definition

	Heating priority mode (Default the Factory Set)
	Cooling priority mode
	Priority mode
	Only Respond the heating mode
	Only Respond the cooling mode

SW6 definition

	Night noise control mode and automatic search address.
	Night noise control mode and nonauto-matic search address. (The communication way of the original digital indoor unit) (Default the Factory Set)
	Clean the indoor unit addresses.
	Non-night noise control mode and automatic search address.
	Non-night noise control mode and non-automatic search address. (The communication way of the original digital indoor unit)

SW7 definition

	Reserve
---	---------

Electrical Wiring System and Installation

CAUTION

- Please select power supply for indoor unit and outdoor unit separately.
- The power supply should have specified branch circuit with leakage protector and manual switch.
- The power supply, leakage protector and manual of all the indoor units connected to the same outdoor unit should be universal. (Please set all the indoor unit power supply of one system into the same circuit. It should turn on or shut down the unit at the same time, otherwise, the service life would affect seriously, even the unit may be turned on.)
- Please put the connective wiring system between indoor unit and outdoor unit with refrigerant piping system together.
- It is suggested to use 3-core shielded wire as signal wire between indoor and outdoor units, multi-core wire is unavailable.
- Please comply with relevant National Electric Standard.
- Power wiring should be done by professional electrician.

Outdoor unit power wiring

Separate Power Supply (without power facility) (See Table.23)

Table 23

Item Model	Power supply	Min.Power wire diameter (mm ²) Wiring of mental and synthetic resin		Manual switch (A)		Leakage protector
		Size (Continuous length of pipe m)	Grounding wire	Capacity	Fuse	
4TVH0086AD 4TVH0096AD 4TVH0115AD	380-415V 3N~50Hz 60Hz	4x10mm ² (<20) 4x16mm ² (<50)	1x10mm ²	30	25	100mA 0.1 sec or less
4TVH0135AD 4TVH0155AD		4x16mm ² (<20) 4x25mm ² (<50)				

Note:

- Select power cord for these five models separately according to relevant standard. 4TVH0086AD, 4TVH0096AD, 4TVH0115AD, 4TVH0135AD, 4TVH0155AD.
- The wiring diameter and the length in the table indicate the condition that the voltage dropping range is within 2%. If the length exceeds the above figure, please select the wire diameter according to relevant standard.

With power facilities

Figure 49

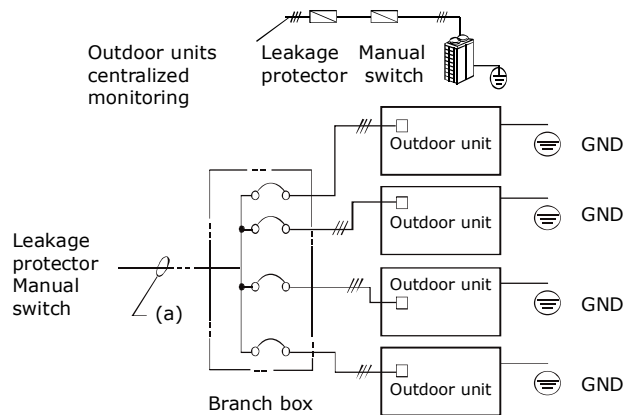
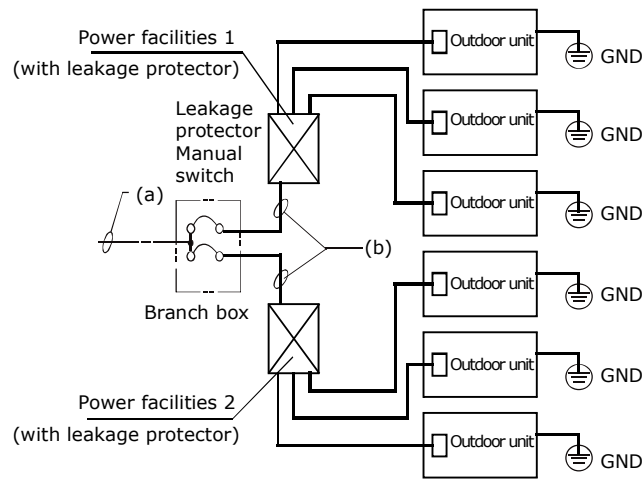


Figure 50



Select the wire diameter

Power wiring refer to the main wire (a) connecting to branch box and the wiring (b) between branch box and power facilities. Please select the wire diameter according to the following requirement

- Diameter of main wire (a) Depends on the outdoor unit model and following table. E.g In system: 4TVH0262AD (4TVH0086AD+4TVH0086AD+4TVH0096AD) (Table.24) size of wire=35mm²(within 50m)
- Wiring(b): between branch box and power equipment. Depends on the number of combined outdoor unit. If fewer than 5, the diameter is the same as that of main wire (a); if more than 6, there will be 2 electric control boxes, and the diameter of wiring depends on the total horsepower of outdoor units connecting to each electric control box and following table.
- Select wire diameter (≥) (Table.24) (unit :mm²)

Table 24

 Unit: mm²

Model	<20m	<50m
4TVH0086AD	10	16
4TVH0096AD	10	16
4TVH0115AD	10	16
4TVH0135AD	16	25
4TVH0155AD	16	25
4TVH0182AD	16	25
4TVH0192AD	16	25
4TVH0211AD	16	25
4TVH0231AD	25	35
4TVH0251AD	25	35
4TVH0270AD	25	35
4TVH0290AD	35	50
4TVH0310AD	35	50
4TVH0327AD	35	50
4TVH0347AD	35	50
4TVH0366AD	35	50
4TVH0386AD	35	50
4TVH0405AD	50	70
4TVH0425AD	50	70
4TVH0445AD	50	70
4TVH0465AD	50	70
4TVH0492AD	70	95
4TVH0502AD	70	95
4TVH0521AD	70	95
4TVH0541AD	70	95
4TVH0560AD	70	95
4TVH0580AD	70	95
4TVH0600AD	70	95
4TVH0620AD	70	95

Select the capacity of manual switch and fuse of the branch box.

- See following table when without power facilities, depends on the outdoor unit it connects to.
- See table.25 below when there is power facility, depends on the total horsepower.

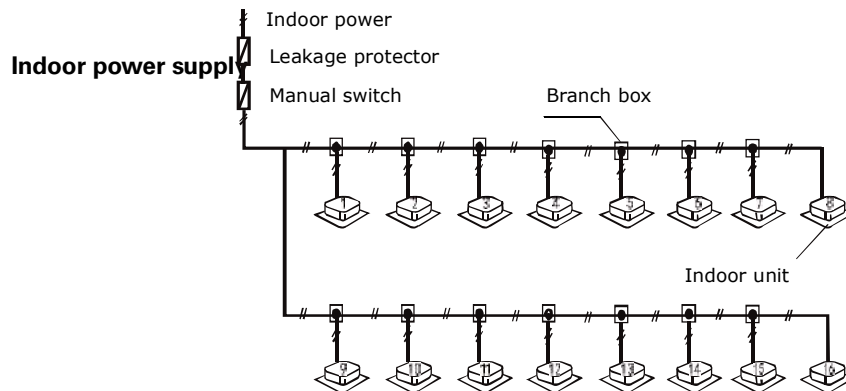
Electrical Wiring

Table 25

Model, capacity of manual switch and fuse

Model	Manual switch (A)	Fuse (A)
4TVH0086 - 4TVH0115	32	25
4TVH0135 - 4TVH0155	40	35
4TVH0182 - 4TVH0211	63	50
4TVH0231 - 4TVH0270	80	63
4TVH0290 - 4TVH0327	80	70
4TVH0347 - 4TVH0386	100	80
4TVH0405 - 4TVH0465	125	100
4TVH0492 - 4TVH0541	150	125
4TVH0560 - 4TVH0620	200	150

Figure 51



CAUTION

- Set refrigerant piping system, signal wires between indoor-indoor unit, and that between outdoor-outdoor unit into one system.
- Power must adopt unified supply to all indoor units in the same system.
- Please do not put the signal wire and power wire in the same wire tube; keep distance between the two tubes. (Current capacity of power supply: less than 10A--300mm, less than 50A--500mm.)
- Make sure to set address of outdoor unit in case of parallel multi-outdoor units.

Control System and Installation

The control line should be shielded wire. Using other wiring shall create signal interference, thus leading to error operation.

The shielded nets at the two sides of shielded wires are either grounded to the earth, or connected with each other and jointed to the sheet metal along to the earth.

Control wire could not be bound together with refrigerant pipeline and power wire. When power wire and control wire is distributed in parallel form, keep gap between them above 300mm so as to prevent signal interference.

Control wire could not form closed loop.

Control wire has polarity, so be careful when connecting.

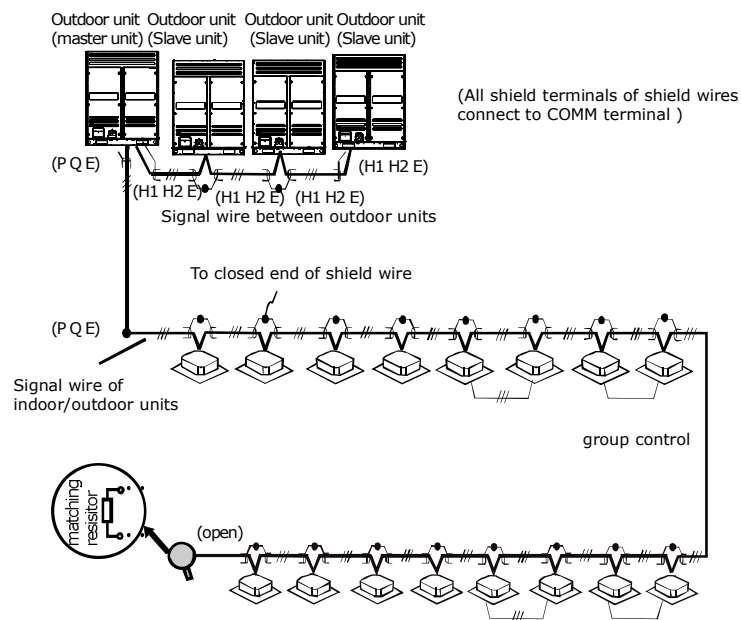
Note:

- The shield net should be grounded at the wiring terminal of outdoor unit. The inlet and outlet wire net of indoor communication wire should be connected directly and could not be grounded, and form open circuit at the shield net of final indoor unit.

Signal Wire of Indoor/Outdoor Units

Signal wire of indoor/outdoor unit adopts 3-core shielded wire ($\geq 0.75\text{mm}^2$) which has polarity, please connect it correctly.

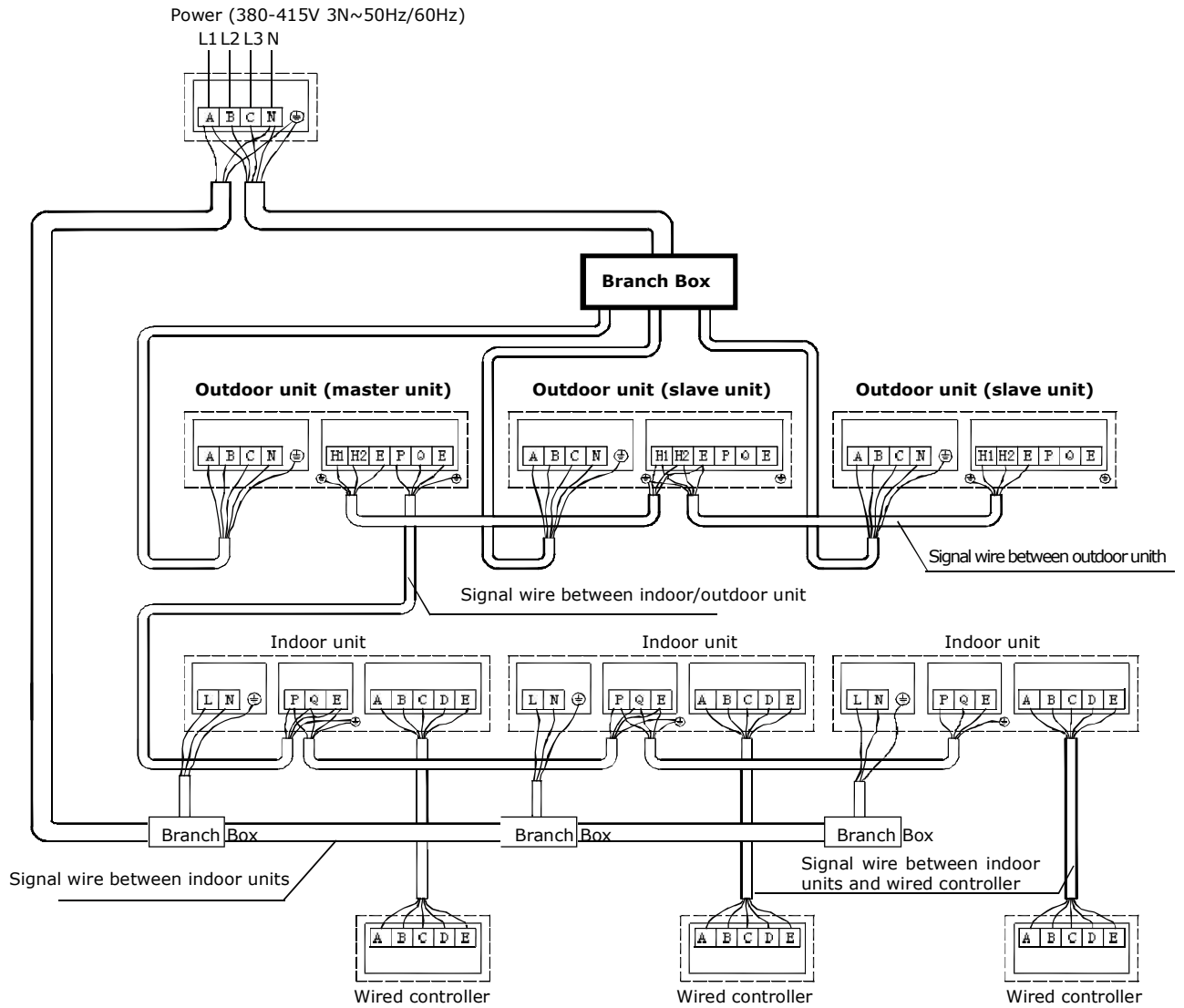
Figure 52



The indoor unit at the terminal of communication system should parallelly connect a impedance between port P and port Q.

Example for Power Wired Connection

Figure 53



Trial Run

Inspection and Confirmation before Debugging

Check and confirm that refrigeration pipe line and communication wire with indoor and outdoor unit have been connected to the same refrigeration system. Otherwise, operation troubles shall occur.

Power voltage is within $\pm 10\%$ of rated voltage.

Check and confirm that the power wire and control wire are correctly connected.

Check whether wire controller is properly connected.

Before powering on, confirm there is no short circuit to each line.

Check whether all units have passed nitrogen pressure-keeping test for 24 hours with R410A: 40kg/cm².

Confirm whether the system to debugging has been carried out vacuum drying and packed with refrigeration as required.

Preparation before Debugging

Calculating the additional refrigerant quantity for each set of unit according to the actual length of liquid pipe.

Keep required refrigerant ready.

Keep system plan, system piping diagram and control wiring diagram ready.

Record the setting address code on the system plan.

Turn on power switches outdoor unit in advance, and keep connected for above 12 hours so that heater heat up refrigerant oil in compressor.

Turn on air pipe stop valve, liquid pipe stop valve, oil balance valve and air balance valve totally. If the above valves are not turned on totally, the unit should be damaged.

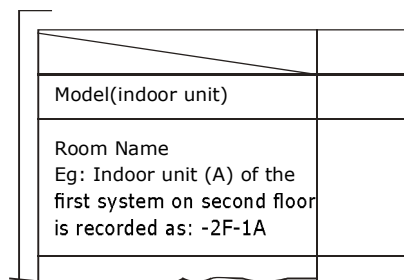
Check whether the power phase sequence of outdoor unit is correct.

All dial switch to indoor and outdoor unit have been set according to the Technical Requirement of Product.

Fill The Name of Refrigerated System

To clearly identify the connected systems between two or more indoor units and outdoor unit, select names for every system and record them on the nameplate on the outdoor electric control box cover.

Figure 54



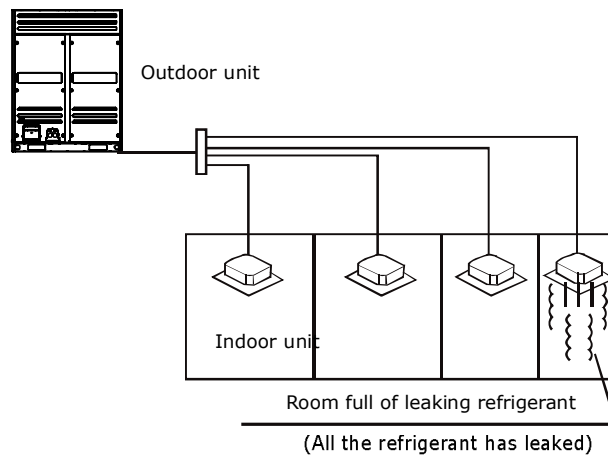
Caution on Refrigerant Leakage

This air conditioner adopts R410A as refrigerant, which is safe and noncombustible.

The room for air conditioner should be big enough so that refrigerant leakage can not reach the critical thickness. Besides this, you can take some action on time.

Critical thickness-----the max thickness of Freon without any harm to person. R410A critical thickness:0.3 [kg/m³]

Figure 55



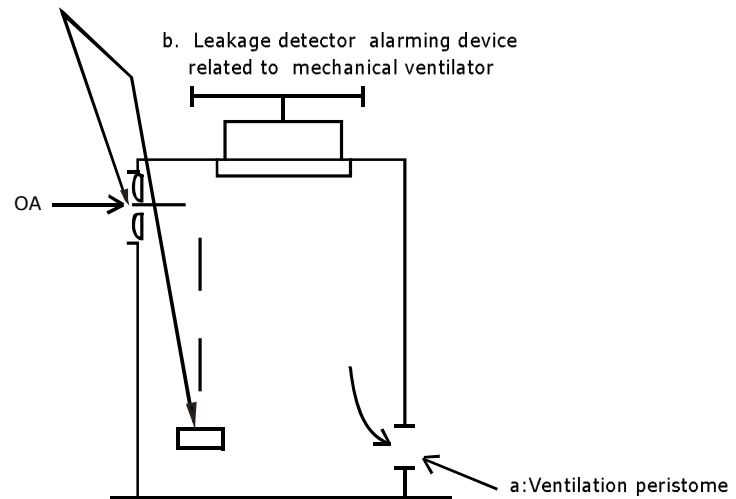
Calculate the critical thickness through following steps, and take necessary actions.

- Calculate the sum of the charge volume (A[kg]) Total refrigerant volume=refrigerant volume when delivered (nameplate)+superaddition
- Calculate the indoor cubage (B[m³]) (as the minimum cubage)
- Calculate the refrigerant thickness.
- $\frac{A \text{ [kg]}}{B \text{ [m}^3\text{]}} \leq \text{Critical thickness } 0.3 \text{ [kg/m}^3\text{]}$

Countermeasure against overhigh thickness.

- Install mechanical ventilator to reduce the refrigerant thickness under critical level. (ventilate regularly)
- Install leakage detector alarming device related to mechanical ventilator if you can not regularly ventilate.

Figure 56



Turn Over to Customer

Be sure to deliver the Installation Manual of the indoor unit, and the outdoor unit to the user.



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