DAIKIN

INSTALLATION MANUAL

VRV X System Air Conditioner

RXQ6ARY1
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Installation manual

Contents

Thank you for purchasing this Daikin VRV X system.

The original instructions are written in English. All other languages are translations of the original instructions.

CAREFULLY READ THESE INSTRUCTIONS BEFORE INSTALLATION. THEY WILL TELL YOU HOW TO INSTALL AND HOW TO CONFIGURE THE UNIT PROPERLY. KEEP THIS MANUAL IN A HANDY PLACE FOR FUTURE REFERENCE.

1. Definitions

1.1 Meaning of warnings and symbols

Warnings in this manual are classified according to their severity and probability of occurrence.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE

Indicates situations that may result in equipment or property-damage accidents only.

INFORMATION

This symbol identifies useful tips or additional information.

Some types of danger are represented by special symbols:

Electric current.

Danger of burning and scalding.

1.2 Meaning of used terms

Installation manual:

Instruction manual specified for a certain product or application, explaining how to install, configure and maintain it.

Operation manual:

Instruction manual specified for a certain product or application, explaining how to operate it.

Maintenance instructions:

Instruction manual specified for a certain product or application, which explains (if relevant) how to install, configure, operate and/or maintain the product or application.

Dealer:

Sales distributor for products as per the subject of this manual.

Installer:

Technical skilled person who is qualified to install products as per the subject of this manual.

User:

Person who is owner of the product and/or operates the product.

Service company:

Qualified company which can perform or coordinate the required service to the unit.

Applicable legistlation:

All international, European, national and local directives, laws, regulations and/or codes which are relevant and applicable for a certain product or domain.

Accessories:

Equipment which is delivered with the unit and which needs to be installed according to instructions in the documentation.

Optional equipment:

Equipment which can optionally be combined to the products as per the subject of this manual.

Field supply:

Equipment which needs to be installed according to instructions in this manual, but which are not supplied by Daikin.

2. General safety precautions

The precautions listed here are divided into the following four types. They all cover very important topics, so be sure to follow them carefully.

DANGER: ELECTRICAL SHOCK

Switch off all power supply before removing the electrical component box service panel or before making any connections or touching electrical parts.

Do not touch any switch with wet fingers. Touching a switch with wet fingers can cause electrical shock. Before touching electrical parts, turn off all applicable power supply.

To avoid electric shock, be sure to disconnect the power supply 1 minute or more before servicing the electrical parts. Even after 1 minute, always measure the voltage at the terminals of the main terminal, main circuit capacitors or electrical parts and, before touching, be sure that those voltages are 50 V DC or less.

When service panels are removed, live parts can easily be touched by accident. Never leave the unit unattended during installation or servicing when the service panel is removed.

DANGER: DO NOT TOUCH PIPING AND INTERNAL PARTS

Do not touch the refrigerant piping, water piping or internal parts during and immediately after operation. The piping and internal parts may be hot or cold depending on the working condition of the unit.

Your hand may suffer burns or frostbite if you touch the piping or internal parts. To avoid injury, give the piping and internal parts time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.

Also, at least, following information shall be provided at an accessible place of the system:

- Instructions for shutting down the system in case of an emergency.
- Name and address of fire department, police and hospital.
- Name, address and day and night telephone numbers for obtaining service.

FIRST OF ALL

- This document is an installation manual for the Daikin RXQ Series VRV Inverter. Before installing the unit, read this manual thoroughly, and following the instructions contained in it. After installation, do a test run to make sure the unit runs properly, and then explain how to operate and take care of the unit to the customer, using the operation manual.
- Lastly, make sure the customer keeps this manual, along with the operation manual, in a safe place.
  This manual does not describe how to install the indoor unit.
- Refer to the installation manual included with the indoor unit for that.

2.1 Safety precautions

Please read these “Safety precautions” carefully before installing air conditioning unit and be sure to install it correctly.

After completing the installation, make sure that the unit operates properly during the start-up operation.

Also, inform customers that they should store this installation manual along with the operation manual for future reference.
After completing installation, conduct a trial operation to check for faults and explain to the customer how to operate the air conditioner and take care of it with the aid of operation manual. Ask the customer to store the installation manual along with the operation manual for future reference.

This air conditioner comes under the term “appliances not accessible to the general public”.
Please instruct the customer on how to operate the unit and keep it maintained.
Meaning of WARNING and CAUTION notices

WARNING.....Failure to follow these instructions properly may result in personal injury or loss of life.

CAUTION.....Failure to observe these instructions properly may result in property damage or personal injury, which may be serious depending on the circumstances.

⚠ WARNING

- Ask your dealer or qualified personnel to carry out installation work. Do not attempt to install the air conditioner yourself. Improper installation may result in water leakage, electric shocks or fire.
- Consult your local regarding what to do in case of refrigerant leakage, when the air conditioner is to be installed in a small room, it is necessary to take proper measures so that the amount of any leaked refrigerant does not exceed the concentration limit in the event of leakage. Otherwise, this may lead to an accident due to oxygen depletion.
- Install the air conditioner in accordance with the instructions in this installation manual.
  Improper installation may result in water leakage, electric shocks or 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 more information. Excessive refrigerant in a closed ambient can lead to oxygen deficiency.
- Be sure to use only the specified accessories and parts for installation work.
  Failure to use the specified parts may result in the unit falling, water leakage, electric shocks or fire.
- Install the air conditioner on a foundation strong enough to withstand the weight of the unit.
  A foundation of insufficient strength may result in the equipment falling and causing injury.
- Carry out the specified installation work after taking into account strong winds, typhoons or earthquakes.
  Failure to do so during installation work may result in the unit falling and causing accidents.
- Make sure that a separate power supply circuit is provided for this unit and that all electrical work is carried out by qualified personnel according to local laws and regulations and this installation manual.
  An insufficient power supply capacity or improper electrical construction may lead to electric shocks or fire.
- Make sure that all wiring is secured, the specified wires are used, and that there is no strain on the terminal connections or wires.
  Improper connections or securing of wires may result in abnormal heat build-up or fire.
- When wiring the power supply and connecting the remote controller wiring and transmission wiring, position the wires so that the EL.COMPO.BOX lid can be securely fastened.
  Improper positioning of the EL.COMPO.BOX lid may result in electric shocks, fire or the terminals overheating.
- If refrigerant gas leaks during installation, ventilate the area immediately.
  Toxic gas may be produced if the refrigerant comes into contact with fire.
- After completing installation, check for refrigerant gas leakage.
  Toxic gas may be produced if the refrigerant gas leaks into the room and comes into contact with a source of fire, such as a fan heater, stove or cooler.
- Do not directly touch refrigerant that has leaked from refrigerant pipes or other areas, as there is a danger of frostbite.
- Be sure to switch off the unit before touching any electrical parts.
- Do not allow children to climb on the outdoor unit and avoid placing objects on the unit.
  Injury may result if the unit becomes loose and falls.
- Be sure to earth the air conditioner.
  Do not earth the unit to a utility pipe, lightning conductor or telephone earth lead.
  Imperfect earthing may result in electric shocks or fire.
  A high surge current from lightning or other sources may cause damage to the air conditioner.
- Be sure to install an earth leakage breaker.
  Failure to install an earth leakage breaker may result in electric shocks or fire.

⚠ CAUTION

- While following the instructions in this installation manual, install drain piping to ensure proper drainage and insulate piping to prevent condensation.
  Improper drain piping may result in indoor water leakage and property damage.
- Install the indoor and outdoor units, power cord and connecting wires at least 1 meter away from televisions or radios to prevent picture interference and noise.
  (Depending on the incoming signal strength, a distance of 1 meter may not be sufficient to eliminate noise.)
- Remote controller (wireless kit) transmitting distance can be shorter than expected in rooms with electronic fluorescent lamps (inverter or rapid start types).
  Install the indoor unit as far away from fluorescent lamps as possible.
- Make sure to provide for adequate measures in order to prevent that the outdoor unit be used as a shelter by small animals.
  Small animals making contact with electrical parts can cause malfunctions, smoke or fire. Please instruct the customer to keep the area around the unit clean.
- Do not install the air conditioner in the following locations:
  1. Where there is a high concentration of mineral oil spray or vapour (e.g. a kitchen).
     Plastic parts will deteriorate, parts may fall off and water leakage could result.
  2. Where corrosive gas, such as sulphurous acid gas, is produced.
     Corroding of copper pipes or soldered parts may result in refrigerant leakage.
  3. Near machinery emitting electromagnetic radiation.
     Electromagnetic radiation may disturb the operation of the control system and result in a malfunction of the unit.
  4. Where flammable gas may leak, where there is carbon fibre or ignitable dust suspensions in the air, or where volatile flammables such as paint thinner or gasoline are handled.
     Operating the unit in such conditions may result in fire.
- In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2.2 Special notice of product

[REFRIGERANT]

VRV X System use R-410A refrigerant.

- The refrigerant R-410A requires that strict precautions be observed for keeping the system clean, dry and tightly sealed. Read the chapter "REFRIGERANT PIPING" carefully and follow these procedures correctly.
  A. Clean and dry
     Strict measures must be taken to keep impurities (including SUNISO oil and other mineral oils as well as moisture) out of the system.
  B. Tight sealed
     Take care to keep the system tight when installing.
     R-410A contains no chlorine, does not destroy the ozone layer and so does not reduce the earth's protection against harmful ultraviolet radiation.
     R-410A will contribute only slightly to the greenhouse effect if released into the atmosphere.

[DESIGN PRESSURE]

Since design pressure is 4.0 MPa or 40 bar (for R407C units : 3.3 MPa or 33 bar) the thickness of pipes must be greater than previously. Since R-410A is a mixed refrigerant, the required additional refrigerant must be charged in its liquid state. (If the system is charged with refrigerant in its gaseous state, due to compositions change, the system will not function normally). The indoor units is designed for R-410A use. See the catalogue for indoor unit models that can be connected. (Normal operation is not possible when connecting units that are originally designed for other refrigerants)

2.3 Disposal requirements

Dismantling of the unit, treatment of the refrigerant, of oil and of other parts must be done in accordance with relevant local and national legislation.

3. Introduction

3.1 General information

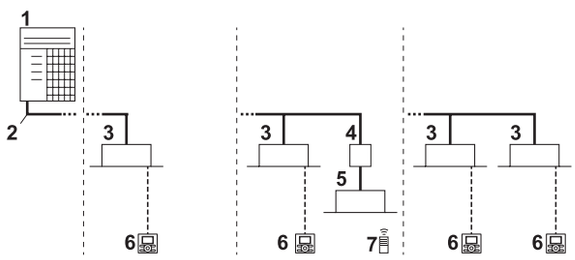
This installation manual concerns the VRV X, full inverter driven, cooling only system.

Depending on the type of outdoor unit which is chosen, some functionality will or will not exist. It will be indicated throughout this installation manual and brought to your attention. Certain features have exclusive model rights.

These units are intended for outdoor installation and aimed for cooling only applications including air to air applications.

These units have (in single use) cooling capacities rating from 16 to 56 kW. In multi combination cooling on go up till 168 kW.

The outdoor unit is designed to work in cooling mode at ambient temperatures from 10°C to 49°C.



1 VRV X Cooling only outdoor unit
2 Refrigerant piping
3 VRV indoor unit
4 BP unit (required to connect Residential Air (RA) indoor units)
5 Residential Air (RA) indoor units
6 User interface (dedicated depending on indoor unit type)
7 User interface (wireless, dedicated depending on indoor unit type)

3.2. Combination

The indoor units can be installed in the following range.

(Outdoor unit)		(Combination)	(Total capacity of indoor units)
RXQ6A	.....	Single unit	75 ~ 195
RXQ8A	.....	Single unit	100 ~ 260
RXQ10A	.....	Single unit	125 ~ 325
RXQ12A/AH	.....	Single unit/Multi[(a)]	150 ~ 390
RXQ14A/AH	.....	Single unit/Multi[(a)]	175 ~ 455
RXQ16A/AH	.....	Single unit/Multi[(a)]	200 ~ 520
RXQ18A/AH	.....	Single unit/Multi[(a)]	225 ~ 585
RXQ20A/AH	.....	Single unit/Multi[(a)]	250 ~ 650
RXQ22AN/H	.....	Multi unit	275 ~ 715
RXQ24AN/H	.....	Multi unit	300 ~ 780
RXQ26AN/H	.....	Multi unit	325 ~ 845
RXQ28AN/H	.....	Multi unit	350 ~ 910
RXQ30AN/H	.....	Multi unit	375 ~ 975
RXQ32AN/H	.....	Multi unit	400 ~ 1,040
RXQ34AN/H	.....	Multi unit	425 ~ 1,105
RXQ36AN/H	.....	Multi unit	450 ~ 1,170
RXQ38AN/H	.....	Multi unit	475 ~ 1,235
RXQ40AN/H	.....	Multi unit	500 ~ 1,300
RXQ42AN/H	.....	Multi unit	525 ~ 1,365
RXQ44AN/H	.....	Multi unit	550 ~ 1,430
RXQ46AN	.....	Multi unit	575 ~ 1,495
RXQ48AN	.....	Multi unit	600 ~ 1,560
RXQ50AN	.....	Multi unit	625 ~ 1,625
RXQ52AN	.....	Multi unit	650 ~ 1,690
RXQ54AN	.....	Multi unit	675 ~ 1,755
RXQ56AN	.....	Multi unit	700 ~ 1,820
RXQ58AN	.....	Multi unit	725 ~ 1,885
RXQ60AN	.....	Multi unit	750 ~ 1,950

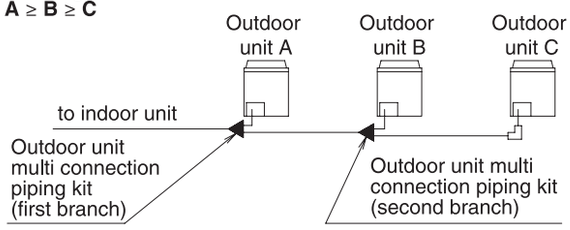
AN -> Standard model
AH -> High COP model
(a) -> Multi unit combination for high COP model only.

Note

- Be sure to connect an R-410A indoor unit.
- See the catalog for indoor unit models which can be connected.
- Refer to the technical engineering data for multi unit combinations.

NOTICE
When selecting the total capacity higher than mentioned in above, cooling capacity will drop.
For additional information see technical engineering data.

- If the total capacity of the connected indoor units exceeds the capacity of the outdoor unit, cooling performance may drop when running the indoor units. See the capacity table in the Engineering Data Book for details.
- There are restrictions on the refrigerant pipe connecting order between outdoor unit in the case of the multi system. Install so that the following restrictions are satisfied.
  <Restrictions>
  The capacities of outdoor units A, B and C must fulfill the following conditions.
  A ≥ B ≥ C



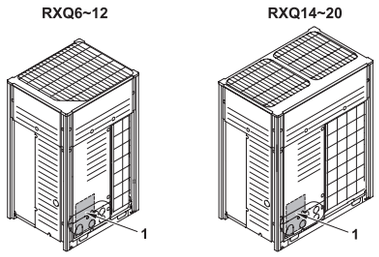
3.3 Scope of the manual

This manual describes the procedures for handling, installing and connecting the VRV X outdoor units. This manual has been prepared to ensure adequate maintenance of the unit, and it will provide help in case problems occur.

INFORMATION
The installation of the indoor unit(s) is described in the indoor unit installation manual provided with the indoor units.

4. Accessories

4.1 Accessories supplied with this unit



See location 1 in the figure above for reference to where following accessories are supplied with the unit.

Name	Tie wrap (1)	Tie wrap (2)	Tie wrap (3)	Gas accessory pipe (1)	
Quantity	9 pcs.	1 pcs.	1 pc.	1 pc.	
Shape	Small		Large	Front connection	
				6-18 HP	20 HP[(a)]

Name	Gas accessory pipe (2)			Liquid accessory pipe (1)	Liquid accessory pipe (2)	Others
Quantity	1 pc.			1 pc.	1 pc.	• Operation manual • Installation manual • Caution label (Addition refrigerant charge record)
Shape	Bottom connection			Front connection	Bottom connection	
	6-8HP, 20HP	10HP	12HP, 14-18HP			

Note

[(a)] For RXQ20, Front connection pipe require the combination of gas accessory pipe(1) and gas accessory pipe(2).

Do not leave any accessories supplied with this unit, until installation finished.

4.2 Optional accessory

To install the outdoor units, the following optional parts are also required. To select an optimum kit, refer to **"9.3 Selection of refrigerant branch kits."**

- **Refrigerant branching kit**

REFNET header	KHRP26M22H	KHRP26M33H	KHRP26M72H	KHRP26M73H
REFNET joint	KHRP26A22T6	KHRP26A33T6	KHRP26A72T6	KHRP26A73T6

- **Outdoor unit multi connection piping kit**

Number of outdoor units connected	2 units	3 units
Kit name	BHFP22P1006	BHFP22P1516

- **Pipe size reducer**

Kit name	KHRP26M73TP	KHRP26M73HP

- **Refnet Flare Header**

Kit name	BHF8RH6	BHF10RH6	BHF12RH6

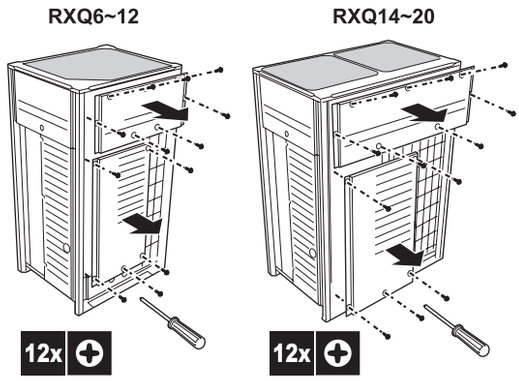
Note

Make sure that any separate purchased accessories are designed for use with R-410A.

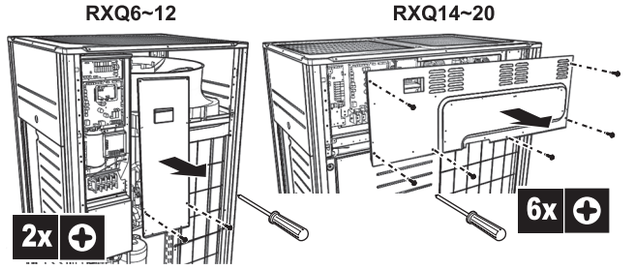
5. Overview of unit

5.1 Opening the unit

To gain access to the unit, front plates need to be opened as follows:



Once the front plates open, the electrical component box can be accessed by removing the electrical component box cover as follows.



For service purposes, the push buttons on the main PCB need to be accessed. To access these push buttons, the electrical component box cover does not need to be opened. See "13.Making field settings" .

DANGER: Electrical shock

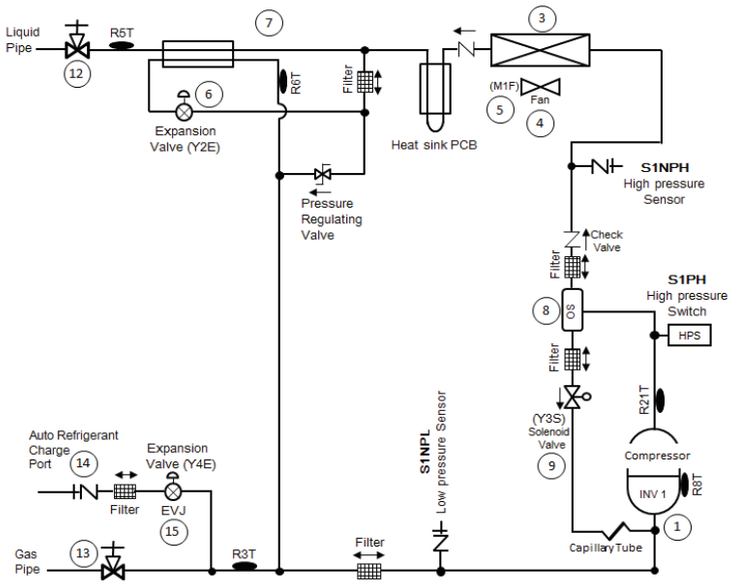
See "2.General safety precautions".

DANGER: Do not touch piping and internal parts.

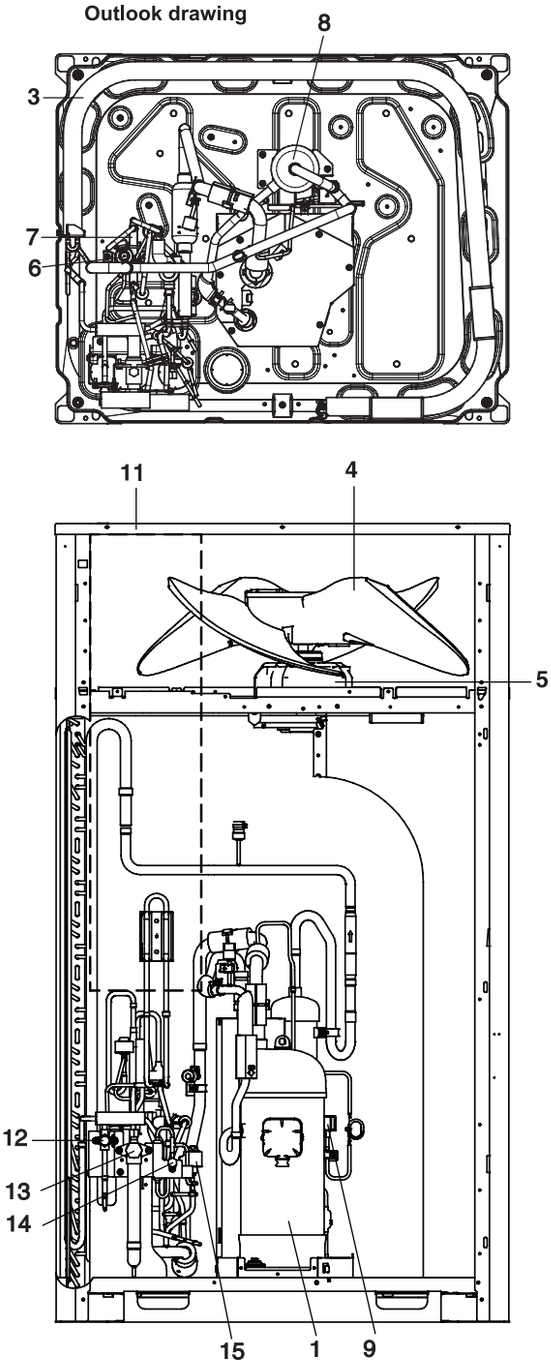
See "2.General safety precautions".

5.2.1 RXQ (6~12 HP)

Piping diagram



Outlook drawing



5.2 Main components in the unit

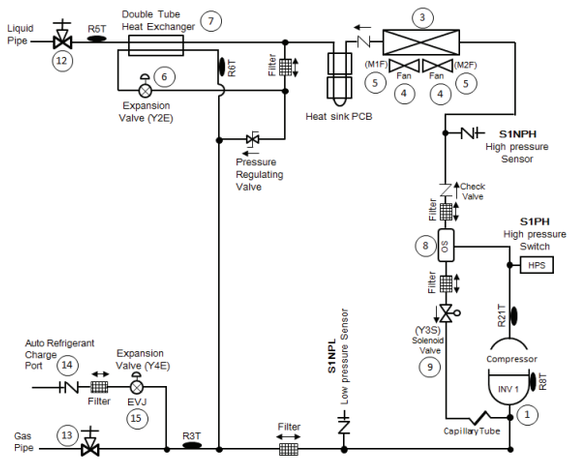
For all the models a piping diagram and outlook drawing are available. Depending on the model type some components in the main component list may not be existing in the unit.

Main components (see 5.2.1, 5.2.2, 5.2.3)

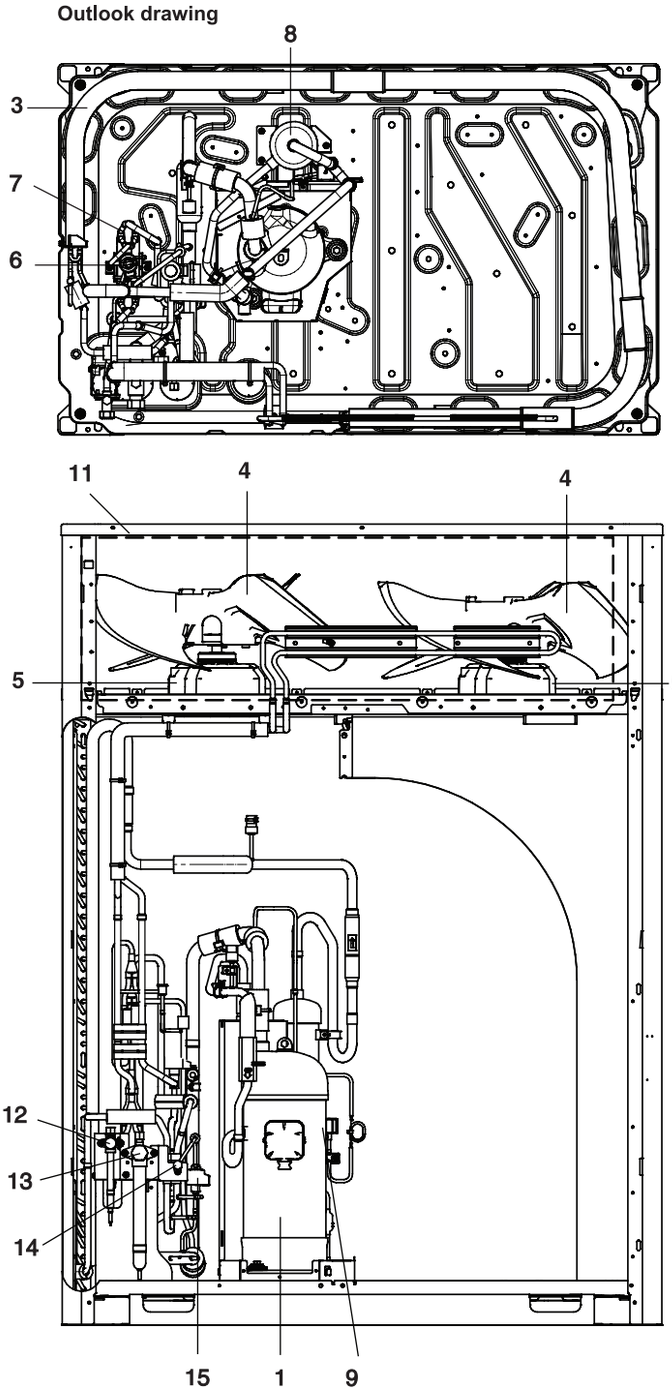
1 Compressor (M1C)
2 Compressor (M2C)
3 Heat exchanger
4 Fan
5 Fan motor (M1F, M2F)
6 Expansion valve, subcool heat exchanger (Y2E)
7 Subcool heat exchanger
8 Oil separator
9 Solenoid valve, oil separator 1 (Y3S)
10 Solenoid valve, oil separator 2 (Y4S)
11 Electrical component box
12 Stop valve, liquid
13 Stop valve, gas
14 Stop valve, refrigerant auto charge
15 Expansion valve, refrigerant auto charge (Y4E)

5.2.2 RXQ (14 HP)

Piping diagram

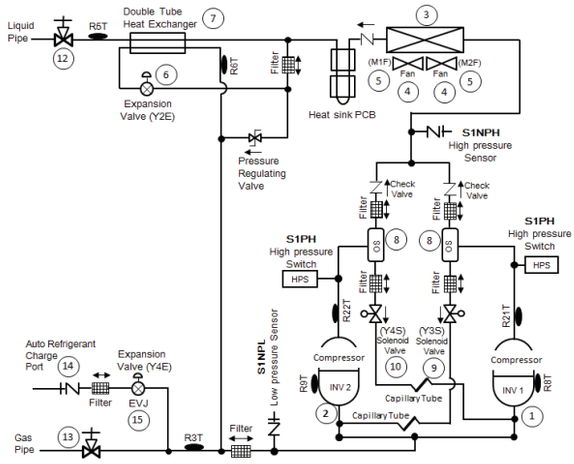


Outlook drawing

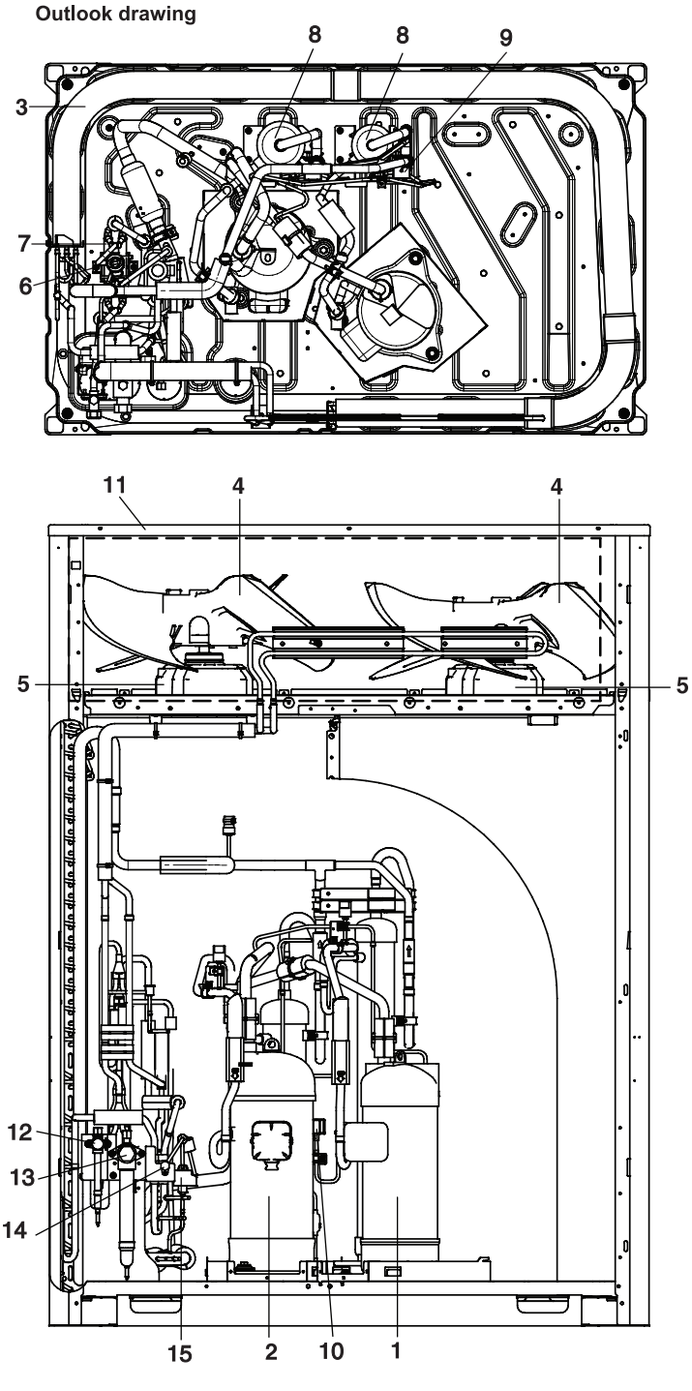


5.2.3 RXQ (16~20 HP)

Piping diagram

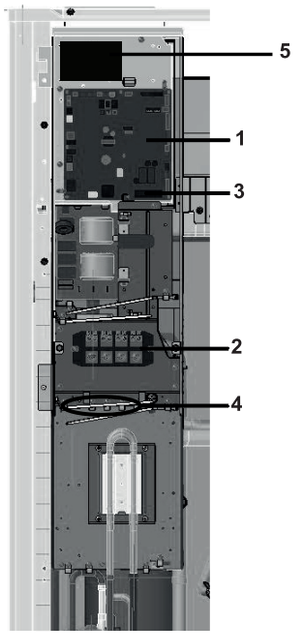


Outlook drawing

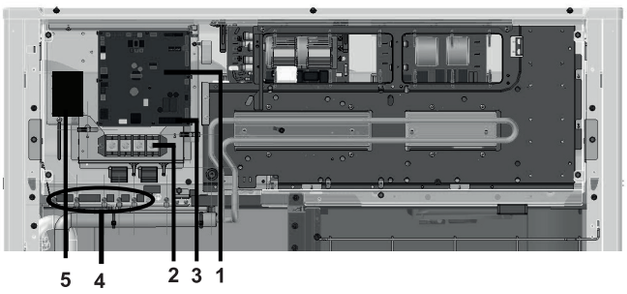


5.3 Main components in the electrical component box

RXQ6~12



RXQ14~20



1 Main PCB.
2 Terminal block X1M: main terminal block which allows easy connection of field wiring for power supply.
3 Terminal X1M on main PCB: terminal block for transmission wiring.
4 Cable tie mountings: the cable tie mountings allow to fix the field wiring with cable ties to the electrical component box to ensure strain relief.
5 Over voltage PCB.

INFORMATION

For more details refer to the wiring diagram of the units. The wiring diagram is located on the inside of the electrical component box.

6. Selecting an installation location

CAUTION

Appliance not accessible to the general public, install it in a secured area, protected from easy access.

This unit, both indoor and outdoor, is suitable for installation in a commercial and light industrial environment.

6.1 General precautions on installation

Select an installation site that meets the following requirements:

- The foundation must be strong enough to support the weight of the unit. The floor is flat to prevent vibrations and noise generation and to have sufficient stability.
- The space around the unit is adequate for maintenance and servicing. The space around the unit allows for sufficient air circulation.
- There is no danger of fire due to leakage of flammable gas.
- The equipment is not intended for use in a potentially explosive atmosphere.
- Select the location of the unit in such a way that the sound generated by the unit does not disturb anyone, and the location is selected according the applicable legislation.
- All piping lengths and distances have been taken into consideration.
- Take care that in the event of a water leak, water cannot cause any damage to the installation space and surroundings.
- When installing the unit in a smallroom, take measures in order to keep the refrigerant concentration from exceeding allowable safety limits in the event of a refrigerant leak.

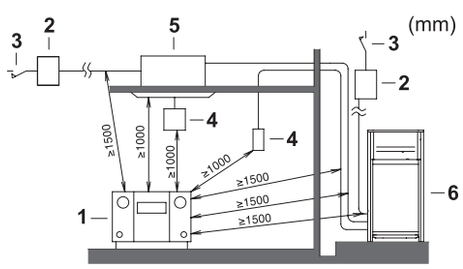
CAUTION

Excessive refrigerant concentrations in a closed room can lead to oxygen deficiency.

NOTICE

The equipment described in this manual may cause electronic noise generated from radio-frequency energy. The equipment complies to specifications that are designed to provide reasonable protection against such interference. However, there is no guarantee that interference will not occur in a particular installation.

It is therefore recommended to install the equipment and electric wires keeping proper distances away from stereo equipment, personal computers, etc.



1 Personal computer or radio
2 Fuse
3 Earth leakage protector
4 User interface
5 Indoor unit
6 Outdoor unit

In places with weak reception, keep distances of 3 m or more to avoid electromagnetic disturbance of other equipment and use conduit tubes for power and transmission lines.

- The refrigerant R-410A itself is nontoxic, non-flammable and is safe. If the refrigerant leak however, its concentration may exceed the allowable limit depending on room size. Due to this, it could be necessary to take measures against leakage. (See “18. Caution for refrigerant leaks”).
- Do not install in the following locations:
  - Locations where sulphurous acids and other corrosive gases may be present in the atmosphere. Copper piping and soldered joints may corrode, causing refrigerant to leak.
  - Locations where a mineral oil mist, spray or vapour may be present in the atmosphere. Plastic parts may deteriorate and fall off or cause water leakage.
  - Locations where equipment that produces electromagnetic waves is found. The electromagnetic waves may cause the control system to malfunction, preventing normal operation.
  - Locations where flammable gases may leak, where thinner, gasoline and other volatile substances are handled, or where carbon dust and other incendiary substances are found in the atmosphere. Leaked gas may accumulate around the unit, causing an explosion.
- When installing, take strong winds, typhoons or earthquakes into account, improper installation may result in the unit turning over.

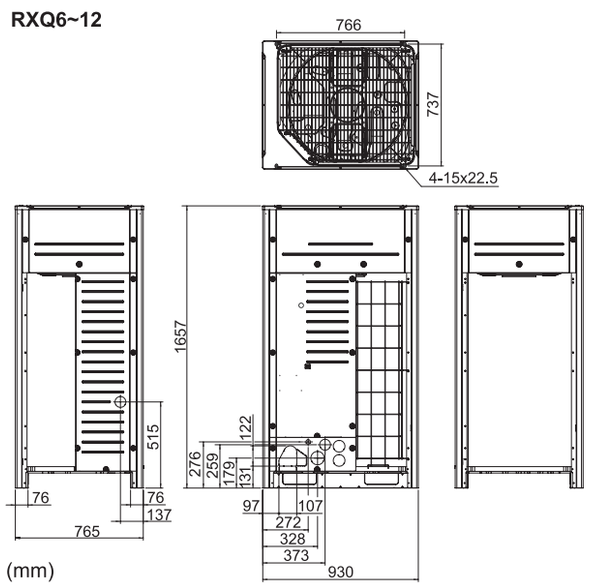
6.2 Weather related precautions

- Select a place where the rain can be avoided as much as possible.
- Be sure that the air inlet of the unit is not positioned towards the main wind direction. Frontal wind will disturb the operation of the unit. If necessary, use a screen to block the wind.
- Ensure that water cannot cause any damage to the location by adding water drains to the foundation and prevent water traps in the construction.
- Do not install the unit in areas where the air contains high levels of salt such as that near the ocean.

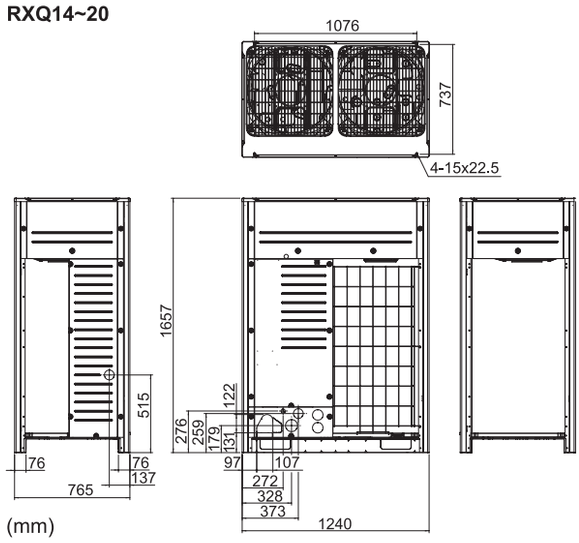
7. Dimensions and service space

7.1 Dimensions of outdoor unit

RXQ6~12

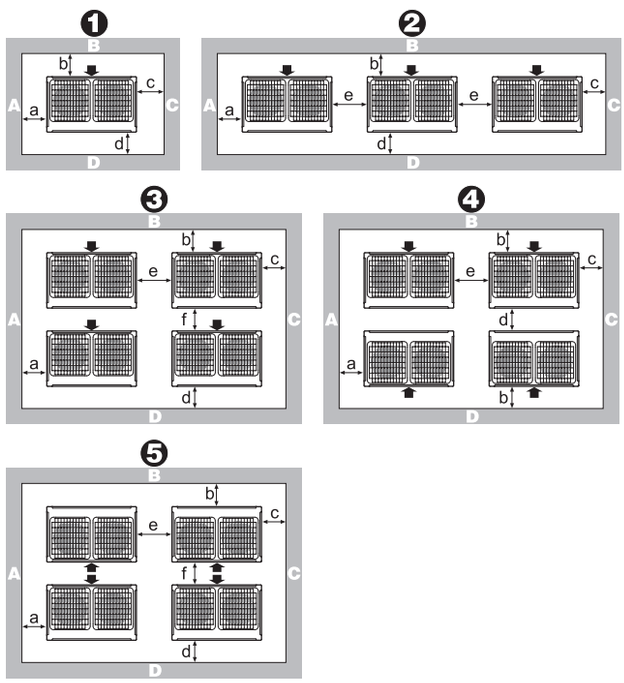


RXQ14~20

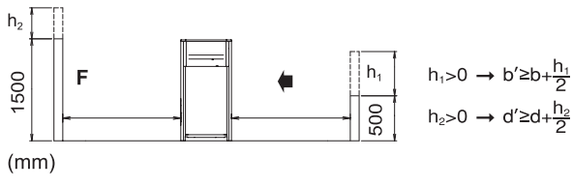


7.2 Service space

The space around the unit is adequate for servicing and the minimum space for air inlet and air outlet is available (refer to the figure below and choose one of the possibilities).



	A+B+C+D		A+B
❶	a≥10 mm b≥300 mm c≥10 mm d≥500 mm	a≥50 mm b≥100 mm c≥50 mm d≥500 mm	a≥200 mm b≥300 mm
❷	a≥10 mm b≥300 mm c≥10 mm d≥500 mm e≥20 mm	a≥50 mm b≥100 mm c≥50 mm d≥500 mm e≥100 mm	a≥200 mm b≥300 mm e≥400 mm
❸	a≥10 mm b≥300 mm c≥10 mm d≥500 mm e≥20 mm f≥600 mm	a≥50 mm b≥100 mm c≥50 mm d≥500 mm e≥100 mm f≥500 mm	
❹	a≥10 mm b≥300 mm c≥10 mm d≥500 mm e≥20 mm	a≥50 mm b≥100 mm c≥50 mm d≥500 mm e≥100 mm	
❺	a≥10 mm b≥500 mm c≥10 mm d≥500 mm e≥20 mm f≥900 mm	a≥50 mm b≥500 mm c≥50 mm d≥500 mm e≥100 mm f≥600 mm	



ABCD Sides along the installation site with obstacles
F Front side
Suction side

- In case of an installation site where sides A+B+C+D have obstacles, the wall heights of sides A+C have no impact on service space dimensions. Refer to the figure above for impact of wall heights of sides B+D on service space dimensions, calculate new b,d by refer above formulars.
- In case of an installation site where only the sides A+B have obstacles, the wall heights have no influence on any indicated service space dimensions.

INFORMATION

- The service space dimensions in above figure are based on cooling operation at 35°C ambient temperature (standard conditions).
- Further specifications can be found in the technical engineering data.

8. Inspecting and handling the unit

8.1 Inspection

At delivery, the unit must be checked and any damage must be reported immediately to the carrier's claims agent.

8.2 Handling

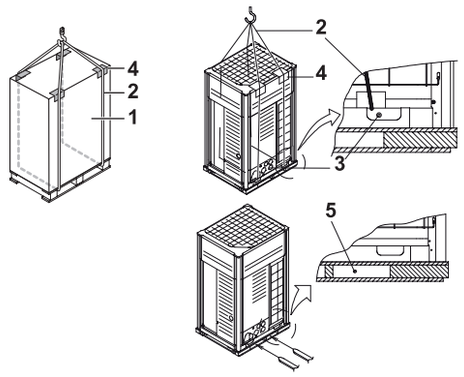
1 When handling the unit, take into account the following:

Fragile, handle the unit with care.

Keep the unit upright in order to avoid compressor damage.

2 Choose on beforehand the path along which the unit is to be brought in.

3 Bring the unit as close as possible to its final installation position in its original package to prevent damage during transport.



1 Packaging material
2 Belt sling
3 Product opening
4 Protector
5 Skid base opening

4 If use a forklift, insert the forks into the opening (large) of skid base.

5 Lift the unit preferably with a crane and 2 belts of at least 8 m long as shown in the figure above.
Always use protectors to prevent belt damage and pay attention to the position of the unit's centre of gravity.

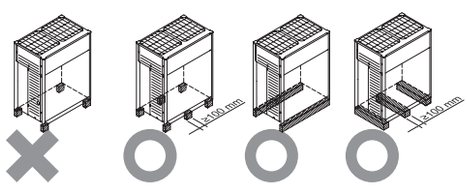
A forklift can only be used for transport as long as the unit remains on its pallet as shown above.

8.3 Installing the unit

Make sure the unit is installed level on a sufficiently strong base to prevent vibration and noise.

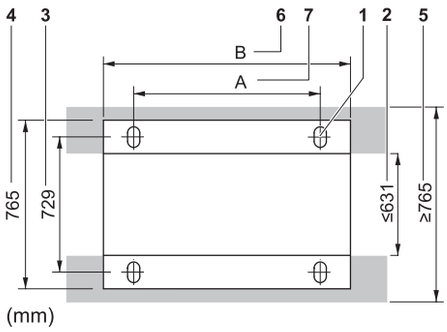
NOTICE

When the installation height of the unit needs to be increased, do not use stands, only support the corners.



X Not allowed
O Allowed

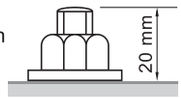
- The height of the foundation must at least be 150 mm from the floor.
- The unit must be installed on a solid longitudinal foundation (steel beam frame or concrete) and make sure the base under the unit is larger than the grey marked area.



1 Hole for foundation bolt (ø15 dia. : 4 positions)
2 Inner dimension of the base
3 Distance between foundation bolt holes
4 Depth of unit
5 Outer dimension of the base
6 Longitudinal foundation dimension
7 Distance between foundation bolt holes

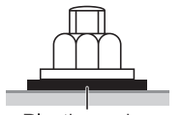
Model	A	B
6 · 8 · 10 · 12HP type	766	930
14 · 16 · 18 · 20HP type	1076	1240

- Fasten the unit in place using four foundation bolts M12. It is best to screw in the foundation bolts until their length remains 20mm above the foundation surface.



NOTICE

- When installed in a corrosive environment, use a nut with plastic washer to protect the nut tightening part from rust.



9. Refrigerant pipe size and allowable pipe length

9.1 Selection of piping material

NOTICE

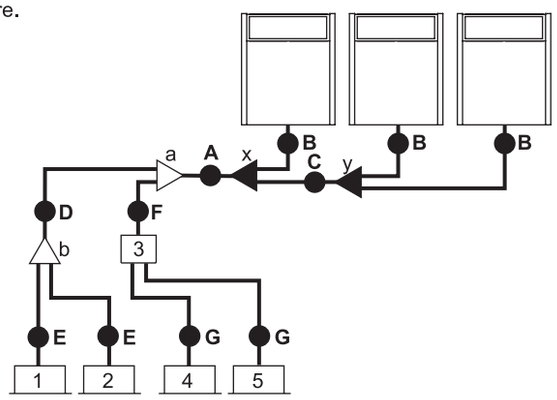
- Jointless phosphor-deoxidized copper pipe
- Select a thickness for the refrigerant piping which complies with national and local laws.
- Installation shall be done by a licensed installer, the choice of materials and installation shall conform completely with the applicable national and international codes.

- Foreign materials inside pipes (including oils for fabrication) must be ≤30 mg/10 m.
- Temper grade: use piping with temper grade in function of the pipe diameter as listed in table below.

Pipe Ø (mm)	Temper grade of piping material
≤15.9 (5/8″)	O (annealed)
≥19.1 (3/4″)	1/2H (half hard)

9.2 Selection of piping size

Determine the proper size referring to following tables and reference figure.



1,2 VRV indoor unit
3 BP box
4,5 RA indoor unit
a,b Indoor branch kit
x,y Outdoor multi connection kit

9.2.1 Piping between outdoor unit and (first) refrigerant branch kit: A, B, C

Choose from the following table in accordance with the outdoor unit total capacity type, connected downstream.

Outdoor unit capacity type (HP)	Piping outer diameter size (mm)	
	Gas pipe	Liquid pipe
6~8	Ø 19.1 (3/4″)	Ø 9.5 (3/8″)
10	Ø 22.2 (7/8″)	
12~16	Ø 28.6 (1 1/8″)	Ø12.7 (1/2″)
18~22		Ø15.9 (5/8″)
24	Ø 34.9 (1 3/8″)	
26~34		Ø19.1 (3/4″)
36~60	Ø 41.3 (1 5/8″)	

9.2.2 Piping between refrigerant branch kits: D

Choose from the following table in accordance with the indoor unit total capacity type, connected downstream. Do not let the connection piping exceed the refrigerant piping size chosen by the general system model name.

Indoor unit capacity index	Piping outer diameter size (mm)	
	Gas pipe	Liquid pipe
<150	Ø 15.9 (5/8″)	Ø 9.5 (3/8″)
150≤x<200	Ø 19.1 (3/4″)	
200≤x<290	Ø 22.2 (7/8″)	
290≤x<420	Ø 28.6 (1 1/8″)	Ø12.7 (1/2″)
420≤x<640		Ø15.9 (5/8″)
640≤x<920	Ø 34.9 (1 3/8″)	Ø19.1 (3/4″)
≥920	Ø 41.3 (1 5/8″)	

Example:
Downstream capacity for E=capacity index of unit 1
Downstream capacity for D=capacity index of unit 1+capacity index of unit 2

9.2.3 Piping between refrigerant branch kit and BP unit: F

Pipe size for direct connection on BP unit must be based on the total capacity of the connected indoor units (only in case RA indoor units are connected).

Total capacity index of connected indoor units	Gas pipe (mm)	Liquid pipe (mm)
20-62	Ø12.7 (1/2″)	Ø 6.4 (1/4″)
63-149	Ø15.9 (5/8″)	Ø 9.5 (3/8″)
150-208	Ø19.1 (3/4″)	
~250	Ø 22.2 (7/8″)	

Example:
Downstream capacity for F=capacity index of unit 4+capacity index of unit 5

9.2.4 Piping between BP unit and RA indoor unit: G

Only in case RA indoor units are connected.

Indoor unit capacity index	Gas pipe (mm)	Liquid pipe (mm)
20, 25, 30, 35	Ø 9.5 (3/8″)	Ø 6.4 (1/4″)
50	Ø12.7 (1/2″)	
60		Ø 9.5 (3/8″)
71 (c)	Ø15.9 (5/8″)	

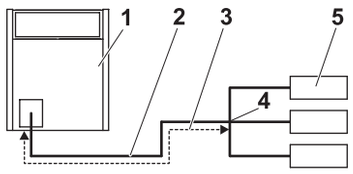
(c) In some indoor units, the piping size is difference. Choose from the size of each indoor units.

9.2.5 Piping between refrigerant branch kit and indoor unit: E

Pipe size for direct connection to indoor unit must be the same as the connection size of the indoor unit (in case indoor unit is VRV Indoor).

Indoor unit capacity index	Piping outer diameter size (mm)	
	Gas pipe	Liquid pipe
20, 25, 32, 40, 50	Ø12.7 (1/2″)	Ø 6.4 (1/4″)
63, 80, 100, 125, 140	Ø15.9 (5/8″)	Ø 9.5 (3/8″)
200	Ø19.1 (3/4″)	
250	Ø22.2 (7/8″)	
400	Ø28.6 (1 1/8″)	Ø 12.7 (1/2″)
500		Ø 15.9 (5/8″)

- When the equivalent pipe length between outdoor and indoor units is 90 m or more, the size of the main pipes (both gas side and liquid side) must be increased. Depending on the length of the piping, the capacity may drop, but even in such a case it is possible to increase the size of the main pipes.



1 Outdoor unit
2 Main pipes
3 Increase
4 First refrigerant branch kit
5 Indoor unit

Size up		
HP Class	Gas side (mm)	Liquid size (mm)
6~8	Ø19.1 (3/4″) → Ø22.2 (7/8″)	Ø9.5 (3/8″)→Ø12.7 (1/2″)
10	Ø22.2 (7/8″) → Ø25.4 (1″)(a)	
12~14	Ø28.6 (1 1/8″)(b)	Ø12.7 (1/2″)→Ø15.9 (5/8″)
16	Ø28.6 (1 1/8″) → Ø31.8 (1 1/4″)(a)	
18~22		Ø15.9 (5/8″)→Ø19.1 (3/4″)
24	Ø34.9 (1 3/8″)(b)	
26~34	Ø34.9 (1 3/8″) → Ø38.1 (1 1/2″)(a)	Ø19.1 (3/4″)→Ø22.2 (7/8″)
36~60	Ø41.3 (1 5/8″)(b)	

(a) If this pipe diameter is unobtainable on site, please do not size up a pipe diameter. (Without size up the pipe diameter, capacity will great decreased, but equivalent piping length can be extended up to 190m)

(b) Please use this pipe diameter only.(Without size up the pipe diameter, equivalent piping length can be extended up to 190m)

- The pipe thickness of the refrigerant piping shall comply with the applicable legislation. The minimal pipe thickness for R-410A piping must be in accordance with the table.

Pipe Ø (mm)	Minimal thickness t (mm)
Ø 6.4 (1/4″)	0.80
Ø 9.5 (3/8″)	
Ø12.7 (1/2″)	
Ø15.9 (5/8″)	0.99
Ø19.1 (3/4″)	0.80
Ø 22.2 (7/8″)	
Ø 25.4 (1″)	0.88
Ø 28.6 (1 1/8″)	0.99
Ø 31.8 (1 1/4″)	1.10
Ø 34.9 (1 3/8″)	1.21
Ø 38.1 (1 1/2″)	1.32
Ø 41.3 (1 5/8″)	1.43

In this case, the additional refrigerant calculation has to be adjusted as mentioned in “14.Charging refrigerant”.

9.3 Selection of refrigerant branch kits

Refrigerant REFNETS

For piping example, refer to "9.2. Selection of piping size".

- When using REFNET joints at the first branch counted from the outdoor unit side, choose from the following table in accordance with the capacity of the outdoor unit (example: REFNET joint a).

Outdoor unit capacity type (HP)	Model refrigerant branch kits
6~10	KHRP26A33T6
12~22	KHRP26A72T6
24~60	KHRP26A73T6 + KHRP26M73TP

- For REFNETS joints other than the first branch (example REFNET joint b), select the proper branch kit model based on the total capacity index of all indoor units connected after the refrigerant branch.

Indoor unit capacity index	Model refrigerant branch kits
<200	KHRP26A22T6
200≤x<290	KHRP26A33T6
290≤x<640	KHRP26A72T6
≥640	KHRP26A73T6 + KHRP26M73TP

- Concerning REFNET headers, choose from the following table in accordance with the total capacity of all the indoor units connected below the REFNET header.

Indoor unit capacity index	Model refrigerant branch kits
<200	KHRP26M22H
200≤x<290	KHRP26M33H
290≤x<640	KHRP26M72H (a)
≥640	KHRP26M73H+ KHRP26M73HP

(a) If the pipe size above the REFNET header is Ø34.9 or more, KHRP26M73HP is required.

INFORMATION

Maximum 8 branches can be connected to a header.

- How to choose an outdoor multi connection piping kit. Choose from the following table in accordance with the number of outdoor units.

Number of outdoor units	Branch kit name
2	BHFP22P1006
3	BHFP22P1516

NOTICE

Refrigerant branch kits can only be used with R-410A.

9.4 System piping (length) limitations

9.4.1 Piping length restrictions

Make sure to perform the piping installation within the range of the maximum allowable pipe length, allowable level difference and allowable length after branching as indicated below. The pattern will be discussed, including VRV indoor units combined with RA indoor units.

Definitions

Actual piping length: pipe length between outdoor(1) and indoor units.

Equivalent piping length(2) : pipe length between outdoor(1) and indoor units.

Total piping length: total piping length from the outdoor(1) to all indoor units.

Difference in height between outdoor and indoor units: H1.

Difference in height between indoor and indoor units: H2.

Difference in height between outdoor and outdoor units: H3.

Difference in height between outdoor and BP unit: H4.

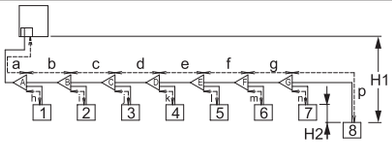
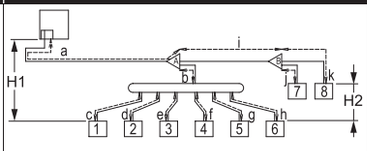
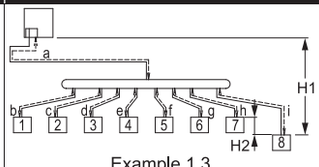
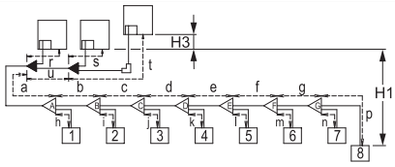
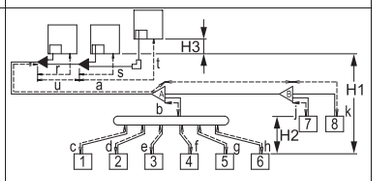
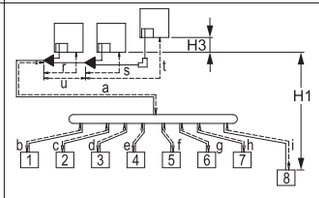
Difference in height between BP unit and BP unit: H5.

Difference in height between BP unit and RA indoor unit: H6.

(1) In case of multi outdoor system, re-read to the first outdoor unit multi connection piping kit as seen from the indoor unit.
(2) Assume equivalent piping length of REFNET joint=0.5 m and REFNET header=1 m (for calculation purposes).

9.4.2 System only containing VRV indoor units

System setup

	Branch with REFNET joint	Branch with REFNET joint and REFNET header	Branch with REFNET header
Single outdoor	 Example 1.1	 Example 1.2	 Example 1.3
Multi outdoor 1 Indoor unit A REFNET joint REFNET header Outdoor multi connection piping kit	 Example 2.1	 Example 2.2	 Example 2.3

Maximum allowable length

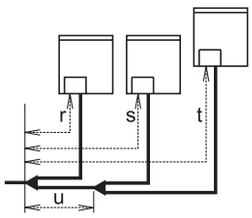
- Between outdoor and indoor units (refer the recommend combination type in Engineering data book).

		Example 1.1	Example 1.2	Example 1.3
Actual piping length	**165 m**	unit 8: a+b+c+d+e+f+g+p≤165 m	unit 6: a+b+h≤165 m unit 8: a+i+k≤165 m	unit 8: a+i≤165 m
Equivalent length(2)	**190 m**	—	—	—
Total piping length	**1000 m**	a+b+c+d+e+f+g+h+i+j+k+l+m+n+p≤1000 m	—	—

- Between outdoor and indoor units (free multi combinations).

		Example 2.1	Example 2.2	Example 2.3
Actual piping length	**135 m**	unit 8: a+b+c+d+e+f+g+p≤135 m	unit 6: a+b+h≤135 m unit 8: a+i+k≤135 m	unit 8: a+i≤135 m
Equivalent length(2)	**160 m**	—	—	—
Total piping length	**500 m**	a+b+c+d+e+f+g+h+i+j+k+l+m+n+p≤500 m	—	—

Example 3 : with standard multi layout



- Between outdoor branch and outdoor unit.

Actual piping length	10 m	Example 3 r, s, t≤10 m; u≤5 m
Equivalent length	13 m	—

Maximum allowable height difference

H1	≤50 m
H2	≤30 m
H3	≤5 m

In case the outdoor location is lower than indoor: extension is possible up till 90 m and following 1 condition must be fulfilled:
- Liquid piping size up (see table "Size up").

Maximum allowable length after branch

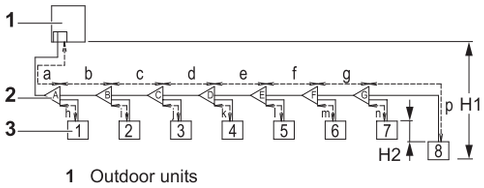
The pipe length from the first refrigerant branch kit to the indoor unit ≤40 m.

Example 1.1: unit 8: b+c+d+e+f+g+p≤40 m

Example 1.2: unit 6: b+h≤40 m, unit 8: i+k≤40 m

Example 1.3: unit 8: i≤40 m

However, extension is possible if all below conditions are met. In this case limitation can be extended up to 90 m.



1 Outdoor units
2 REFNET joints (A~G)
3 Indoor unit (1~8)

a. The piping length between all indoor to the nearest branch kit is ≤40 m.
Example: h, l, j … p≤40 m

b. It is necessary to increase the pipe size of the gas and liquid piping if the pipe length between the first branch kit and the farthest indoor unit is over 40 m.
If the increased pipe size is larger than the pipe size of the main pipe, then the pipe size of the main pipe has to be increased as well.
Increase the pipe size as follows:
9.5 → 12.7; 12.7 → 15.9; 15.9 → 19.1; 19.1 → 22.2; 22.2 → 25.4(3); 28.6 → 31.8(3); 34.9 → 38.1(3)
Example: unit 8: b+c+d+e+f+g+p≤90 m; increase the pipe size of b, c, d, e, f, g.

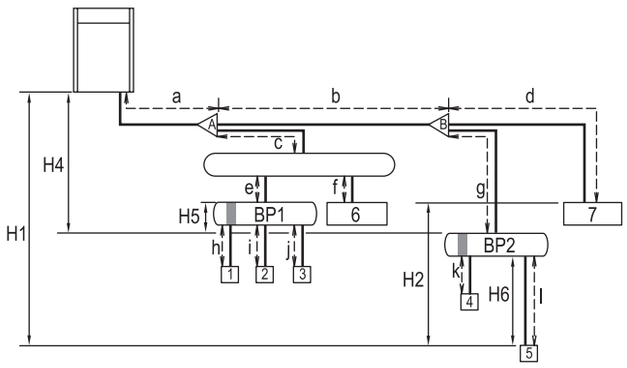
(3) If this pipe diameter is unobtainable on site, the piping length limitation cannot extended.

c. When the piping size is increased (step b), the piping length has to be counted as double (except for the main pipe and the pipes that are not increased in pipe size).
The total piping length has to be within limitations (see table above).
Example:
a+b*2+c*2+d*2+e*2+f*2+g*2+h+i+j+k+l+m+n+p≤1000 m (500 m).

d. The piping length difference between the nearest indoor from first branch to the outdoor unit and farthest indoor to the outdoor unit is ≤40 m.
Example: The farthest indoor unit 8. The nearest indoor unit 1 → (a+b+c+d+e+f+g+p)–(a+h)≤40 m.

9.4.3 System containing VRV indoor units and RA indoor units

System setup



Header
BP box
1~5 RA indoor units
6,7 VRV indoor units

Maximum allowable length

- Between outdoor unit and indoor unit.

Actual piping length	100 m	Example: a+b+g+l≤100 m
Equivalent length(a)	120 m	—
Total piping length	250 m	Example: a+b+d+g+l+k+c+e+f+h+i+j≤250 m

(a) Assume equivalent piping length of REFNET joint=0.5 m and REFNET header=1 m (for calculation purposes).

- Between BP unit and indoor unit.

Indoor unit capacity index	Pipe length
<60	2~15 m
60	2~12 m
71	2~8 m

Remark: **Minimum allowable length** between outdoor unit and first refrigerant branch kit>5 m (the refrigerant noise from the outdoor unit can be transmitted).

Example: a>5 m

Maximum allowable height difference

H1	≤50 m (40 m) (if outdoor is located below indoor units)
H2	≤15 m
H4	≤40 m
H5	≤15 m
H6	≤5 m

Maximum allowable length after branch

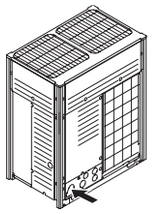
The pipe length from the first refrigerant branch kit to the indoor unit ≤50 m.

Example: b+g+l≤50 m

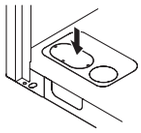
If the piping length between the first branch and BP unit or VRV indoor unit is over 20m, it is necessary to increase the gas and liquid piping size between the first branch and BP unit or VRV indoor unit. If the piping diameter of the sized up piping exceeds the diameter of the piping before the first branch kit, then the latter also requires a liquid piping and gas piping size up.

9.5 Multi system piping installation

- Front connection
  Remove the front plate knock out holes to connect (see figure below).



- Bottom connection
  Remove the knock out holes on the bottom frame and route the piping under the bottom frame (see figure below).



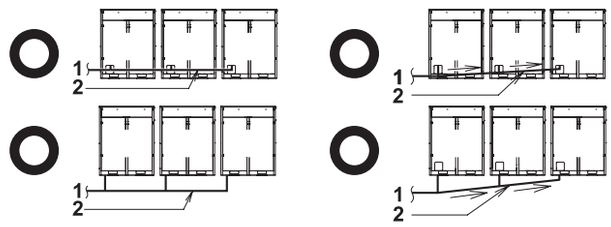
9.5.1 Precautions when connecting piping between outdoor units (multiple outdoor unit system)

- To connect the piping between outdoor units, an optional multi connection piping kit BHFP22P1006/1516 is always required. When installing the piping, follow the instructions in the installation manual that comes with the kit.
- Only proceed with piping work after considering the limitations on installing listed here and in the chapter "10.2. Connecting the refrigerant piping" always referring to the installation manual delivered with the kit.

9.5.2 Possible installation patterns and configurations

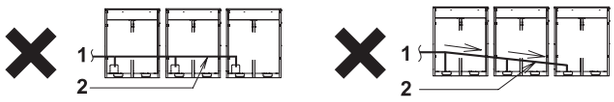
- The piping between the outdoor units must be routed level or slightly upward to avoid the risk of oil retention into the piping.

Pattern 1 **Pattern 2**



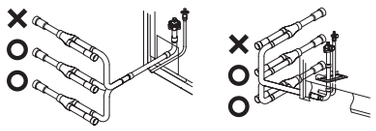
1 To indoor unit
2 Piping between outdoor units

Prohibited patterns: change to pattern 1 or 2.

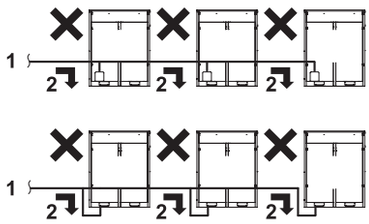


1 To indoor unit
2 Piping between outdoor units

- To avoid the risk of oil retention to the outmost outdoor unit, always connect the stop valve and the piping between outdoor units as shown in the 4 correct possibilities of the figure below.

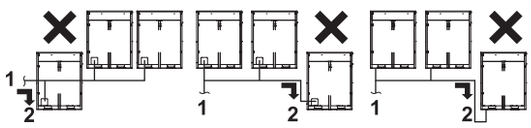


Prohibited patterns: change to pattern 1 or 2.



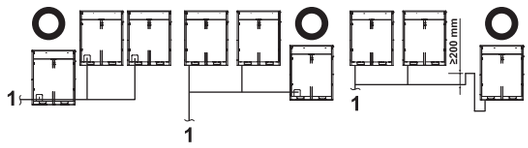
1 To indoor unit
2 Oil collects to the outmost outdoor unit

Change to configuration as in figures below



1 To indoor unit
2 Oil collects to the outmost outdoor unit when the system stops

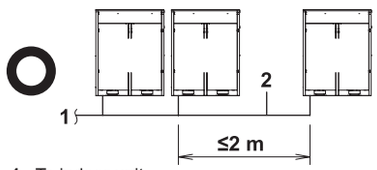
Correct configuration



1 To indoor unit

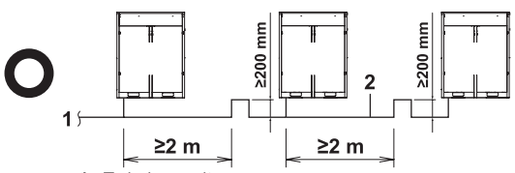
- If the piping length between the outdoor units exceeds 2m, create a rise of 200mm or more in the gas line within a length of 2m from the kit.

If ≤2 m



1 To indoor unit
2 Piping between outdoor units

If >2 m



1 To indoor unit
2 Piping between outdoor units

10. Precautions on refrigerant piping

- Do not allow anything other than the designated refrigerant to get mixed into the refrigerant cycle, such as air, nitrogen, etc. If any refrigerant gas leaks while working on the unit, ventilate the room thoroughly right away.
- Use R-410A only when adding refrigerant
- Installation tools:
  Make sure to use installation tools (gauge manifold, charge hose, etc.) that are exclusively used for R-410A installations to withstand the pressure and to prevent foreign materials (e.g., mineral oils and moisture) from mixing into the system.
- Vacuum pump:
  - Use a 2-stage vacuum pump with a non-return valve.
  - Make sure the pump oil does not flow oppositely into the system while the pump is not working.
  - Use a vacuum pump which can evacuate to –100.7 kPa (5Torr, –755 mm Hg).

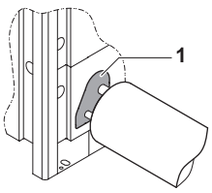
Protection against contamination when installing pipes

Take measures to prevent foreign materials like moisture and contamination from mixing into the system.

Place	Installation period	Protection method
	More than a month	Pinch the pipe
	Less than a month	Pinch or tape the pipe
	Regardless of the period	

Block all gaps in the holes for passing out piping and wiring using sealing material (field supply) (the capacity of the unit will drop and small animals may enter the machine).

Example: passing piping out through the front.



1 Close the areas marked with "▒▒". (When the piping is routed from the front panel.)

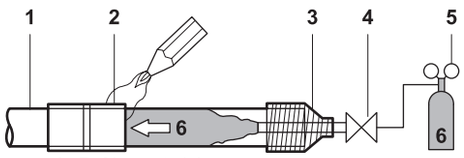
- Use clean pipes only.
- Hold the pipe end downwards when removing burrs.
- Cover the pipe end when inserting it through a wall so that no dust or dirt enters the pipe.

NOTICE

After all the piping has been connected, make sure there is no gas leak. Use nitrogen to perform a gas leak detection.

10.1 Caution for brazing

- Make sure to blow through with nitrogen when brazing. Blowing through with nitrogen prevents the creation of large quantities of oxidized film on the inside of the piping. An oxidized film adversely affects valves and compressors in the refrigerating system and prevents proper operation.
- The nitrogen pressure should be set to 0.02MPa (i.e., just enough so it can be felt on the skin) with a pressure-reducing valve.



1 Refrigerant piping
2 Part to be brazed
3 Taping
4 Handy valve
5 Pressure-reducing valve
6 Nitrogen

Do not use anti-oxidants when brazing the pipe joints. Residue can clog pipes and break equipment:

- Do not use flux when brazing copper-to-copper refrigerant piping. Use phosphor copper brazing filler alloy (BCuP) which does not require flux.
- Flux has an extremely harmful influence on refrigerant piping systems. For instance, if chlorine based flux is used, it will cause pipe corrosion or, in particular, if the flux contains fluorine, it will deteriorate the refrigerant oil.

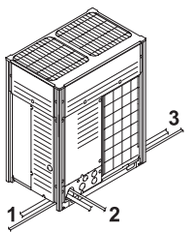
10.2 Connecting the refrigerant piping

NOTICE

Installation shall be done by an installer, the choice of materials and installation shall comply with the applicable legislation.

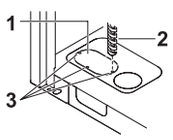
10.2.1 Decide front or side (bottom) connection

Installation of refrigerant piping is possible as front connection or side connection (when taken out from the bottom) as shown in the figure below.



1 Left-side connection
2 Front connection
3 Right-side connection

For side connections, the knockout hole on the bottom plate should be removed:



1 Large knockout hole
2 Drill
3 Points for drilling

NOTICE

Precautions when knocking out knockout holes:

- Be sure to avoid damaging the casing.
- After knocking out the knockout holes, we recommend you remove the burrs and paint the edges and areas around the edges using repair paint to prevent rusting.

- When passing electrical wiring through the knockout holes, wrap the wiring with protective tape to prevent damage as shown above.

10.2.2 Remove Sealed rubber plug

- When connecting refrigerant piping to an outdoor unit, remove the sealed rubber plug. (Refer to figure shown in below)
- Sealed rubber plug should be removed using the below procedure.

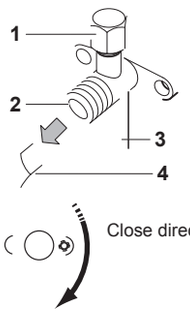
(Refer to figure shown in below)

1. Shutoff valve (liquid side · gas side)
2. Service port
3. Sealed rubber plug
4. Procedure 1:
   Confirm the shutoff valve is closed.
5. Procedure 2:
   Connect a charge hose to the service port of the liquid side and gas side shutoff valves and remove the gas from the pipe.

Procedure 1

Use the following procedure to remove the sealed rubber plug:

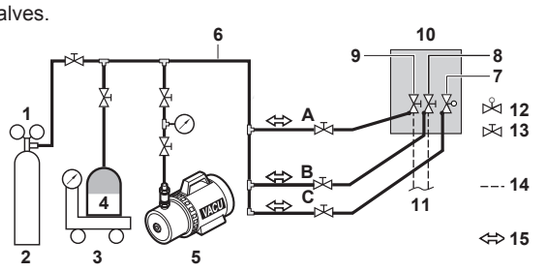
Remove the valve cover and make sure that the stop valves are fully closed.



1 Service port and service port cover
2 Stop valve
3 Field piping connection pipe
4 Stop valve cover

Procedure 2

1 Connect the vacuuming/recovery unit to service ports of all stop valves.



1 Pressure reducing valve
2 Nitrogen
3 Measuring instrument
4 Refrigerant R-410A tank (siphon system)
5 Vacuum pump
6 Charge hose
7 Refrigerant auto charge valve
8 Gas pipe stop valve
9 Liquid pipe stop valve
10 Outdoor unit
11 To indoor unit
12 Needle valve
13 Stop valve
14 Field piping
15 Gas flow
A Valve A
B Valve B
C Valve C

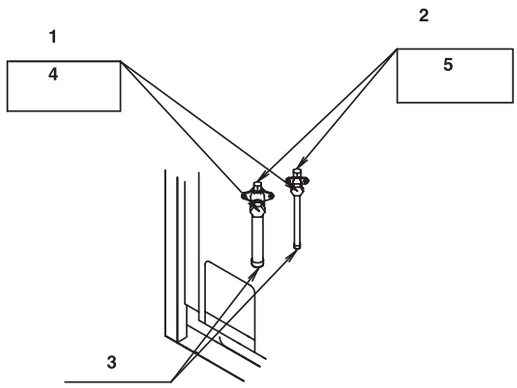
2 Recover gas and oil from the sealed rubber plug pipe by using a recovery unit.

3 When all gas and oil is recovered from the sealed rubber plug pipe, disconnect the charge hose and close the service ports.

4 Now remove the sealed rubber plug with the help of nose plier/ suitable instrument

CAUTION

Do not vent gases into the atmosphere.



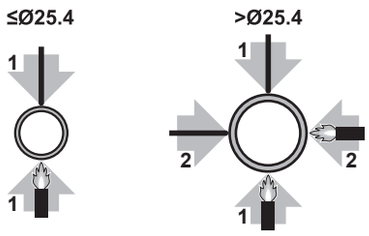
10.2.3 Connecting refrigerant piping to the outdoor unit

INFORMATION

All local inter unit piping are field supplied except the accessory pipes.

NOTICE

Precautions when connecting field piping. Add brazing material as shown in the figure.



NOTICE

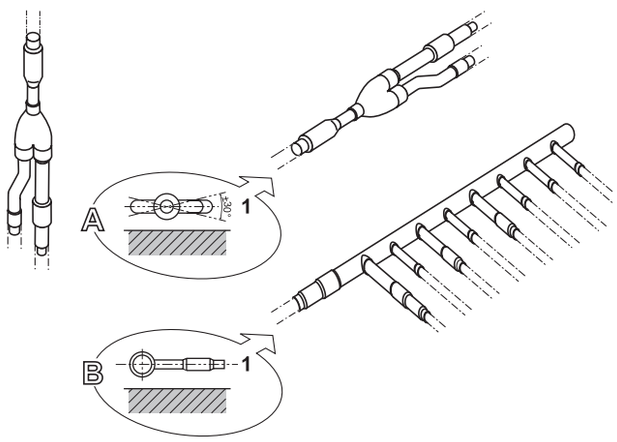
- Be sure to use the supplied accessory pipes when carrying out piping work in the field.
- Be sure that the field installed piping does not touch other pipes, the bottom panel or side panel. Especially for the bottom and side connection, be sure to protect the piping with suitable insulation, to prevent it from coming into contact with the casing.

Connection from the stop valves to the field piping can be done by using accessory pipes supplied as accessory.

The connections to the branch kits are the responsibility of the installer (field piping).

10.2.4 Branching the refrigerant piping

- For installation of the refrigerant branching kit, refer to the installation manual delivered with the kit.

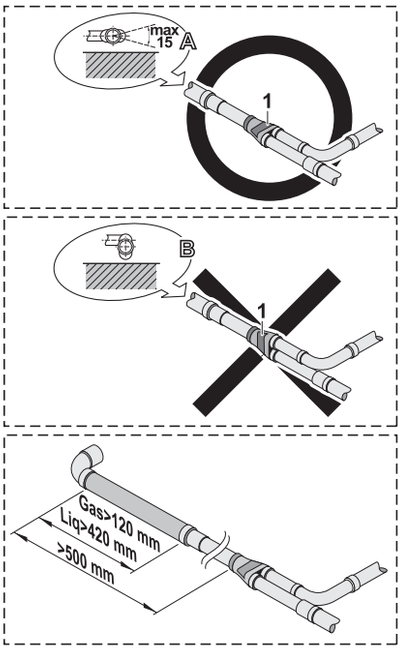


1 Horizontal surface

1 Mount the REFNET joint so that it branches either horizontally or vertically.

2 Mount the REFNET header so that it branches horizontally.

Installation of the multi connection piping kit.



1 Install the joints horizontally, so that the caution label (1) attached to the joint comes to the top.
- Do not tilt the joint more than 15° (see view A).
- Do not install the joint vertically (see view B).

2 Make sure that the total length of the piping connected to the joint is absolute straight for more than 500 mm.
Only if a straight field pipe length.
- Gas field pipe length > 120 mm.
- Liquid field pipe length > 420 mm.

3 Improper installation may lead to malfunction of the outdoor unit.

10.3.2 How to use the stop valve

Opening the stop valve

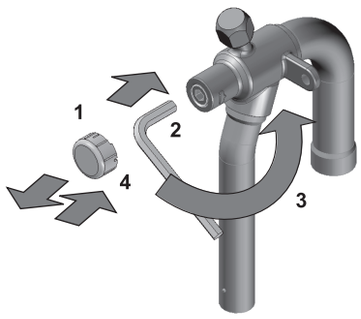
1 Remove the valve cover.

2 Insert a hexagon wrench into the stop valve and turn the stop valve counterclockwise.

3 When the stop valve cannot be turned any further, stop turning. The valve is now open.

4 After finish work fix valve cover.

To fully open the Ø19.1 or Ø25.4 gas line stop valve, turn the hexagonal wrench until a torque between 27 and 33 N•m is achieved. Inadequate torque may cause leakage of refrigerant and breakage of the stop valve cap.



NOTICE

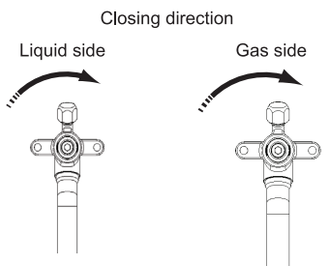
Pay attention that mentioned torque range is applicable for opening Ø19.1 and Ø25.4 gas line stop valves only.

Closing the stop valve

1 Remove the valve cover.

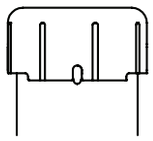
2 Insert a hexagon wrench into the stop valve and turn the stop valve clockwise.

3 When the stop valve cannot be turned any further, stop turning. The valve is now closed.



10.3.3 Cautions on handling the stop valve cover

- The stop valve cover is fixed where indicated by the arrow. Take care not to damage it.
- After handling the stop valve, make sure to fix the stop valve cover securely.
- Check for refrigerant leaks after tightening the stop valve cover.



10.3.4 Cautions on handling the service port

- Always use a charge hose equipped with a valve depressor pin, since the service port is a Schrader type valve.
- After handling the service port, make sure to tighten the service port cover securely. For the tightening torque, refer to the table below.
- Check for refrigerant leaks after tightening the service port cover.

10.3.5 Tightening torques

[Tightening torque]
The sizes of the shutoff valves on each model and the tightening torque for each size are listed in the table below.

<Size of Shutoff Valve>

	6 • 8 • 10HP type	12HP type	14HP type	16HP type	18HP type	20HP type
Liquid side shut-off valve	Ø 9.5 The 12HP type corresponds to the 12.7-diameter onsite piping using the included piping.		Ø 12.7 The 18~20HP type corresponds to the 15.9-diameter onsite piping using the accessory piping.			
Gas side shutoff valve	Ø 19.1 The 10HP type corresponds to the 22.2-diameter onsite piping using the accessory piping.	Ø 25.4 The 12~18HP type corresponds to the 28.6-diameter onsite piping using the accessory piping.				∅ 28.6

<Tightening torque>

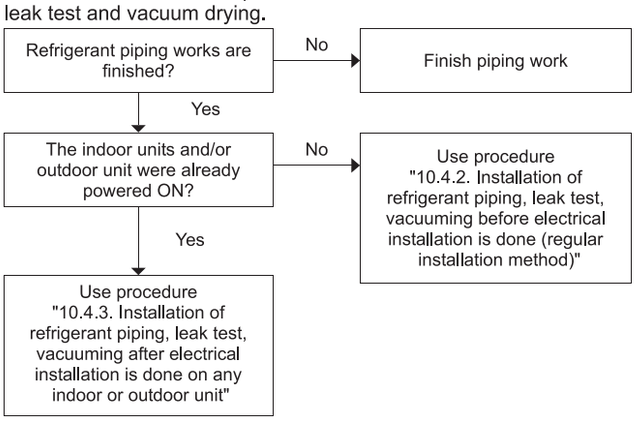
Shutoff valve size	Stop Valve Seal Structure	Tighten torque N•m (Turn clockwise to close)		
		Shaft (valve body)		Service port
Ø 9.5	Front - Seal Type	6.0±0.6	Hexagonal wrench 4 mm	12.7±1.2
Ø 12.7		9.0±0.9		
Ø 15.9		15.0±1.5	Hexagonal wrench 6 mm	
Ø 19.1	Front - Seal Type + Back - Seal Type	30.0±3.0	Hexagonal wrench 8 mm	
Ø 25.4				
Ø 28.6			Hexagonal wrench 10 mm	

10.4 Leak test and vacuum drying

It is very important that all refrigerant piping work is done before the units (outdoor or indoor) are powered on.

When the units are powered on, the expansion valves will initialize. This means that they will close. Leak test and vacuum drying of field piping and indoor units is impossible when this happens.

Therefore, there will be explained 2 methods for initial installation, leak test and vacuum drying.



10.4.1 General guidelines

- Use a 2-stage vacuum pump with a non-return valve which can evacuate to a gauge pressure of –100.7 kPa (5 Torr absolute, –755 mm Hg).
- Connect the vacuum pump to the service port of all 3 stop valves to increase efficiency (refer to "10.4.4.Setup").

NOTICE

Do not purge the air with refrigerants. Use a vacuum pump to evacuate the installation.

10.4.2 Installation of refrigerant piping, leak test, vacuuming before electrical installation is done (regular installation method)

When all piping work is complete, it is necessary to:

- Check for any leakages in the refrigerant piping.
- Perform vacuum drying to remove all moisture, air or nitrogen in the refrigerant piping.

If there is a possibility of moisture being present in the refrigerant piping (for example, rainwater may have entered the piping), carry out the vacuum drying procedure below until all moisture has been removed.

All piping inside the unit has been factory tested for leaks.

Only field installed refrigerant piping needs to be checked. Therefore, make sure that all the outdoor unit stop valves are firmly closed before performing leak test or vacuum drying.

NOTICE

Make sure that all (field supplied) field piping valves are OPEN (not outdoor unit stop valves!) before you start leak test and vacuuming.

10.4.3 Installation of refrigerant piping, leak test, vacuuming after electrical installation is done on any indoor or outdoor unit

Apply outdoor unit setting [2-21]=1 before starting leak test and vacuuming.
This setting will open field expansion valves to guarantee a R-410A piping pathway.

NOTICE

- Make sure that all (field supplied) field piping valves are OPEN (not outdoor unit stop valves!) before you start leak test and vacuuming.
- Make sure that all indoor units connected to the outdoor unit are powered on.
- Wait until the outdoor unit has finished the initialisation to apply setting [2-21].

When all piping work is complete, it is necessary to:

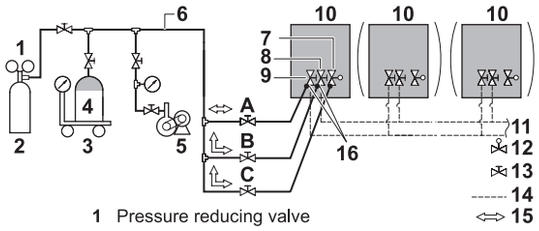
- Check for any leakages in the refrigerant piping.
- Perform vacuum drying to remove all moisture, air or nitrogen in the refrigerant piping.

If there is a possibility of moisture being present in the refrigerant piping (for example, rainwater may have entered the piping), first carry out the vacuum drying procedure below until all moisture has been removed.

All piping inside the unit has been factory tested for leaks.

Only field installed refrigerant piping needs to be checked. Therefore, make sure that all the stop valves are firmly closed before performing leak test or vacuum drying. (See “10.4.4 Set up” and “10.4 Leak test and vacuum drying”)

10.4.4 Setup



1 Pressure reducing valve
2 Nitrogen
3 Measuring instrument
4 Refrigerant R-410A tank (siphon system)
5 Vacuum pump
6 Charge hose
7 Refrigerant auto charge valve
8 Gas line stop valve
9 Liquid line stop valve
10 Outdoor unit
11 To indoor unit
12 Needle valve
13 Stop valve
14 Field piping
15 Gas flow
16 Stop valve service port
A Valve A
B Valve B
C Valve C

Which valves?	State of valves
State of the valves A and B and the stop valve	Performing the airtightness test and vacuum drying (Valve A always close, if not may be cause of refrigerant leakage)
Valve A	Open
Valve B	Open
Valve C	Close
Liquid side stop valve	Close
Gas side stop valve	Close

NOTICE

The connections to the indoor units and all indoor units should also be leak and vacuum tested. Keep any possible (field supplied) field piping valves open as well.

Refer to the indoor unit installation manual for more details. Leak test and vacuum drying should be done before the power supply is set to the unit. If not, see also the flow chart earlier described in this chapter (see "10.4.Leak test and vacuum drying").

10.4.5 Leak test

The leak test must satisfy the specifications of EN 378-2:

1 Vacuum leak test:

1.1 Evacuate the system from the liquid and gas piping to –100.7 kPa (5 Torr) for more than 2 hours.

1.2 Once reached, turn off the vacuum pump and check that the pressure does not rise for at least 1 minute.

1.3 Should the pressure rise, the system may either contain moisture (see vacuum drying below) or have leaks.

2 Pressure leak test:

2.1 Break the vacuum by pressurizing with nitrogen gas to a minimum gauge pressure of 0.2 MPa (2 bar). Never set the gauge pressure higher than the maximum operation pressure of the unit, i.e. 4.0 MPa (40 bar).

2.2 Test for leaks by applying a bubble test solution to all piping connections.

2.3 Discharge all nitrogen gas.

NOTICE

Make sure to use a recommended bubble test solution from your wholesaler. Do not use soap water, which may cause cracking of flare nuts (soap water may contain salt, which absorbs moisture that will freeze when the piping gets cold), and/or lead to corrosion of flared joints (soap water may contain ammonia which causes a corrosive effect between the brass flare nut and the copper flare).

10.4.6 Vacuum drying

To remove all moisture from the system, proceed as follows:

1 Evacuate the system for at least 2 hours to a target vacuum of –100.7 kPa.

2 Check that, with the vacuum pump turned off, the target vacuum is maintained for at least 1 hour.

3 Should you fail to reach the target vacuum within 2 hours or maintain the vacuum for 1 hour, the system may contain too much moisture.

4 In that case, break the vacuum by pressurizing with nitrogen gas to a gauge pressure of 0.05 MPa (0.5 bar) and repeat steps 1 to 3 until all moisture has been removed.

5 The outdoor stop valves can now be opened, and/or additional refrigerant can be charged (see "14.3 Method for adding refrigerant").

INFORMATION

After opening the stop valve, it is possible that the pressure in the refrigerant piping does not rise. This might be caused by e.g., the closed state of the expansion valve in the outdoor unit circuit, but does not present any problem for correct operation of the unit.

NOTICE

The connections to the indoor units and all indoor units should also be leak and vacuum tested. Keep, if existing, all (field supplied) field valves to the indoor units open as well.

Leak test and vacuum drying should be done before the power supply is set to the unit. If not, see "10.4 Leak test and vacuum drying" for more information.

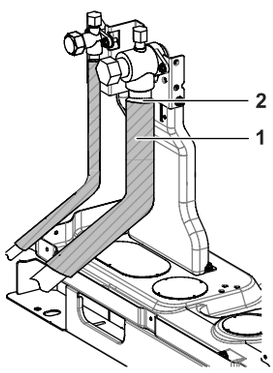
11. Pipe insulation

After finishing the leak test and vacuum drying, the piping must be insulated. Take into account the following points:

- Make sure to insulate the connection piping and refrigerant branch kits entirely.
- Be sure to insulate the liquid and gas piping (for all units).
- Use heat resistant polyethylene foam which can withstand a temperature of 70°C for liquid piping and gas piping.
- Reinforce the insulation on the refrigerant piping according to the installation environment.

Ambient temperature	Humidity	Minimum thickness
≤30°C	75% to 80% RH	15 mm
>30°C	>80% RH	20 mm

- If there is a possibility that condensation on the stop valve might drip down into the indoor unit through gaps in the insulation and piping because the outdoor unit is located higher than the indoor unit, this must be prevented by sealing up the connections. See below figure.



1 Insulation material
2 Caulking etc.

12. Electrical wiring work

12.1 Precautions on electrical wiring work

WARNING

Electrical installation. All field wiring and components must be installed by a licensed electrician and must comply with the applicable legislation.

NOTICE

Electrical wiring work recommendations. To persons in charge of electrical wiring work: Do not operate the unit until the refrigerant piping is complete. "10.4 Leak test and vacuum drying". Running the unit before the piping is ready will break the compressor.

DANGER: Electrical shock

See "2. General safety precautions".

WARNING

- A main switch or other means for disconnection, having a contact separation in all poles, must be incorporated in the fixed wiring in accordance with the applicable legislation.
- Use only copper wires.
- All field wiring must be carried out in accordance with the wiring diagram supplied with the unit and the instructions given below.
- Never squeeze bundled cables and be sure that it does not come in contact with the non-insulated piping and sharp edges. Be sure no external pressure is applied to the terminal connections.
- Power supply wires must be attached securely.
- If the power supply has a missing or wrong N-phase, equipment will break down.
- Be sure to establish an earth. Do not earth the unit to a utility pipe, surge absorber, or telephone earth. Incomplete earth may cause electrical shock.
- Be sure to install an earth leakage protector in accordance with the applicable legislation. Failure to do so may cause electric shock or fire.
- Be sure to use a dedicated power circuit, never use a power supply shared by another appliance.

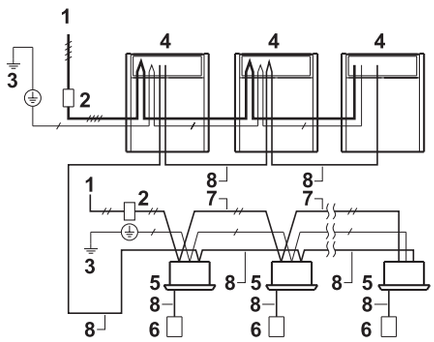
WARNING

- When installing the earth leakage protector be sure that it is compatible with the inverter (resistant to high frequency electric noise) to avoid unnecessary opening of the earth leakage protector.
- As this unit is equipped with an inverter, installing a phase advancing capacitor not only will deteriorate power factor improvement effect, but also may cause a capacitor abnormal heating accident due to high-frequency waves. Therefore, never install a phase advancing capacitor.
- Be sure to install the required fuses or circuit breakers.
- Do not operate until refrigerant piping work is completed. (If operated before completion of the piping work, the compressor may break down.)
- Never remove a thermistor, sensor, etc., when connecting power wiring and transmission wiring. (If operated without thermistor, sensor, etc., the compressor may break down.)
- The reversed phase protection detector of this product only functions when the product starts up. Consequently reversed phase detection is not performed during normal operation of the product.
- The reversed phase protection detector is designed to stop the product in the event of an abnormality when the product is started up.
- Replace two of the three phases (L1, L2, and L3) during reverse-phase protection abnormality.
- If there exists the possibility of reversed phase after a momentary black out and the power goes on and off while the product is operating, attach a reversed phase protection circuit locally. Running the product in reversed phase can break the compressor and other parts.

12.2 System overview of field wiring

Field wiring consists of power supply (always including earth) and indoor-outdoor communication (= transmission) wiring.

Examples:



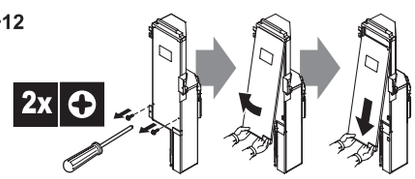
1 Field power supply (with earth leakage protector)
2 Main switch
3 Earth connection
4 Outdoor unit
5 Indoor unit
6 User interface
7 Power supply wiring (sheathed cable)
8 Transmission wiring (shielded cable) (16V)
Power supply 3N~ 50/60 Hz
Power supply 1~ 50/60 Hz
Earth wiring

12.3 Opening and closing the electrical component box

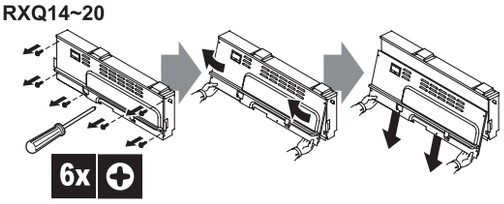
CAUTION

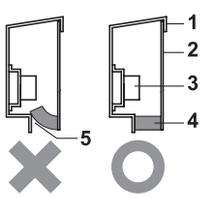
- Do not apply excessive force when opening the electronic component box cover. Excessive force can deform the cover, resulting in entering of water to cause equipment failure.
- When closing the electrical component box cover, make sure that the sealing material on the lower back side of the cover is not caught and bend towards the inside.

RXQ6~12



RXQ14~20





1 Electrical component box cover
2 Front side
3 Power supply terminal block
4 Sealing material
5 Moisture and dirt could enter
X Not allowed
O Allowed

12.4 Requirements

The power supply must be protected with the required safety devices, i.e. a main switch, a slow blow fuse on each phase and an earth leakage protector in accordance with the applicable legislation.

Selection and sizing of the wiring should be done in accordance with the applicable legislation based on the information mentioned in the table below.

Standard Model

Model	Minimum circuit ampere	Recommended fuses	Wire Size
RXQ6A	16.1 A	20 A	Select and install the power supply wiring in accordance with IEC 60335-1
RXQ8A	16.1 A	20 A	
RXQ10A	21.2 A	25 A	
RXQ12A	22.5 A	25 A	
RXQ14A	26.9 A	30 A	
RXQ16A	30.2 A	35 A	
RXQ18A	30.2 A	35 A	
RXQ20A	38.9 A	45 A	
RXQ22AN	43.7 A	50 A	
RXQ24AN	45.0 A	50 A	
RXQ26AN	49.4 A	60 A	
RXQ28AN	52.8 A	60 A	
RXQ30AN	52.8 A	60 A	
RXQ32AN	57.1 A	70 A	
RXQ34AN	60.5 A	70 A	
RXQ36AN	60.5 A	70 A	
RXQ38AN	69.1 A	80 A	
RXQ40AN	77.7 A	90 A	
RXQ42AN	75.3 A	90 A	
RXQ44AN	83.9 A	100 A	
RXQ46AN	84.0 A	100 A	
RXQ48AN	87.4 A	100 A	
RXQ50AN	87.4 A	100 A	
RXQ52AN	90.7 A	100 A	
RXQ54AN	90.7 A	100 A	
RXQ56AN	99.4 A	110 A	
RXQ58AN	108.0 A	125 A	
RXQ60AN	116.6 A	150 A	

For all models:
Phase and frequency: 3N~50/60 Hz
Voltage: 380-415 V
Transmission line section: 0.75~1.25mm^2, maximum length is 1000 m.
Remark: For other model please see detail in Engineering Data.
Note: Insulation of supply wiring must not lighter than 60245 IEC 57.

If the total transmission wiring exceeds these limits, it may result in communication error.

High COP Model

Model	Minimum circuit ampere	Recommended fuses	Wire Size
RXQ12AH	32.2 A	35 A	Select and install the power supply wiring in accordance with IEC 60335-1
RXQ14AH	32.2 A	35 A	
RXQ16AH	32.2 A	35 A	
RXQ18AH	37.3 A	45 A	
RXQ20AH	42.4 A	50 A	
RXQ22AH	48.3 A	60 A	
RXQ24AH	48.3 A	60 A	
RXQ26AH	53.4 A	60 A	
RXQ28AH	54.7 A	60 A	
RXQ30AH	59.8 A	70 A	
RXQ32AH	61.1 A	70 A	
RXQ34AH	66.2 A	70 A	
RXQ36AH	70.6 A	80 A	
RXQ38AH	71.9 A	80 A	
RXQ40AH	76.3 A	80 A	
RXQ42AH	80.7 A	90 A	
RXQ44AH	84 A	90 A	

For all models:

Phase and frequency: 3N~50/60 Hz

Voltage: 380-415 V

Transmission line section: 0.75~1.25mm2, maximum length is 1000 m.

Remark: For other model please see detail in Engineering Data.

Note: Insulation of supply wiring must not lighter than 60245 IEC 57.

NOTICE

When using residual current operated circuit breakers, be sure to use a high-speed type 200 mA rated residual operating current.

12.5 Routing

It is important to keep the power supply and the transmission wiring separated from each other. In order to avoid any electrical interference the distance between both wiring should always be at least 50 mm.

12.5.1 Transmission wiring routing

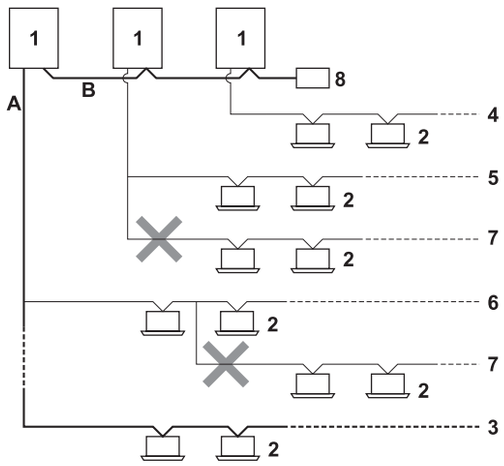
The transmission wiring outside the unit should be wrapped and routed together with the field piping.

Field piping can be routed from front or bottom of the unit (going left or right). Refer to "10.2.Connecting the refrigerant piping".

Rules for transmission wiring routing

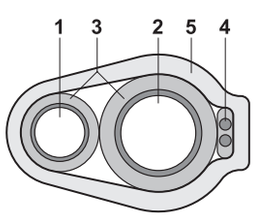
- Be sure to follow the limits below. If the unit-to-unit cables are beyond these limits, it may result in malfunction of transmission:
  - Maximum wiring length: 1000 m.
  - Total wiring length: 2000 m.
  - Maximum inter unit wiring length between outdoor units: 30 m.
  - Maximum number of branches: 16.
  - Maximum number of independent interconnectable systems: 10.

- Up to 16 branches are possible for unit-to-unit cabling. No branching is allowed after branching (see figure below).



1 Outdoor unit
2 Indoor unit
3 Main line
4 Branch line 1
5 Branch line 2
6 Branch line 3
7 No branch is allowed after branch
8 Central user interface (etc...)
A Transmission wiring between outdoor unit and indoor unit(s)
B Transmission wiring between outdoor units

- Never connect the power supply to transmission wiring terminal block. Otherwise the entire system may break down.
- Never connect 400 V to the terminal block of the transmission wiring. Doing so will break the entire system:
  - The wiring from the indoor units must be connected to the F1/F2 (In-Out) terminals on the PC board in the outdoor unit.
  - After installing the transmission wires inside the unit, wrap them along with the on-site refrigerant pipes using finishing tape, as shown in figure below.



1 Liquid pipe
2 Gas pipe
3 Insulator
4 Transmission wiring (F1/F2)
5 Finishing tape

For the above wiring, always use vinyl cords with 0.75 to 1.25mm^2 shielded or cables (2-core wires).

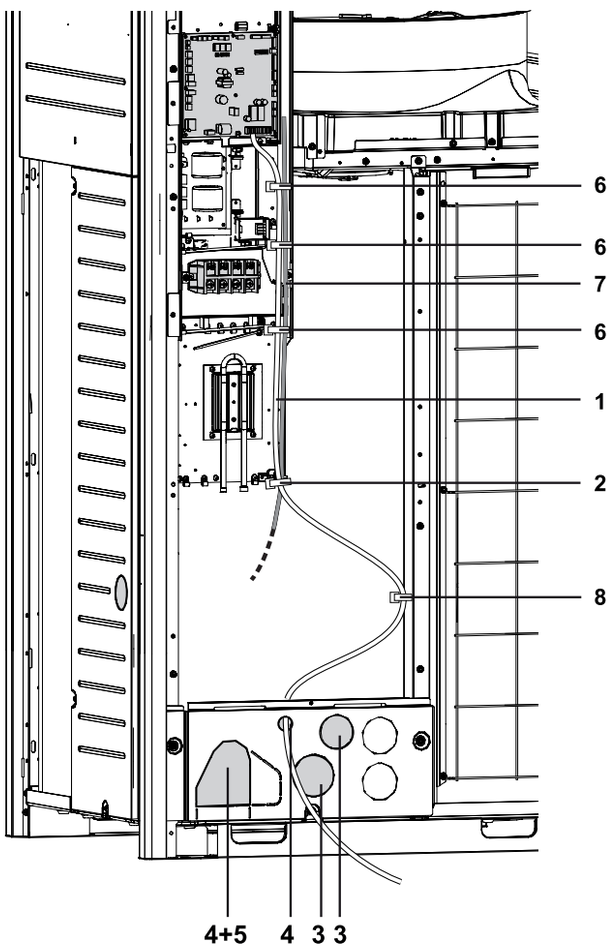
NOTICE

- Be sure to keep the power line and transmission line apart from each other. Transmission wiring and power supply wiring may cross, but may not run parallel.
- Transmission wiring and power supply wiring may not touch internal piping (except INV PCB cooling pipe) in order to avoid wire damage due to high temperature piping.
- Firmly close the lid and arrange the electrical wires so as to prevent the lid or other parts from coming loose.

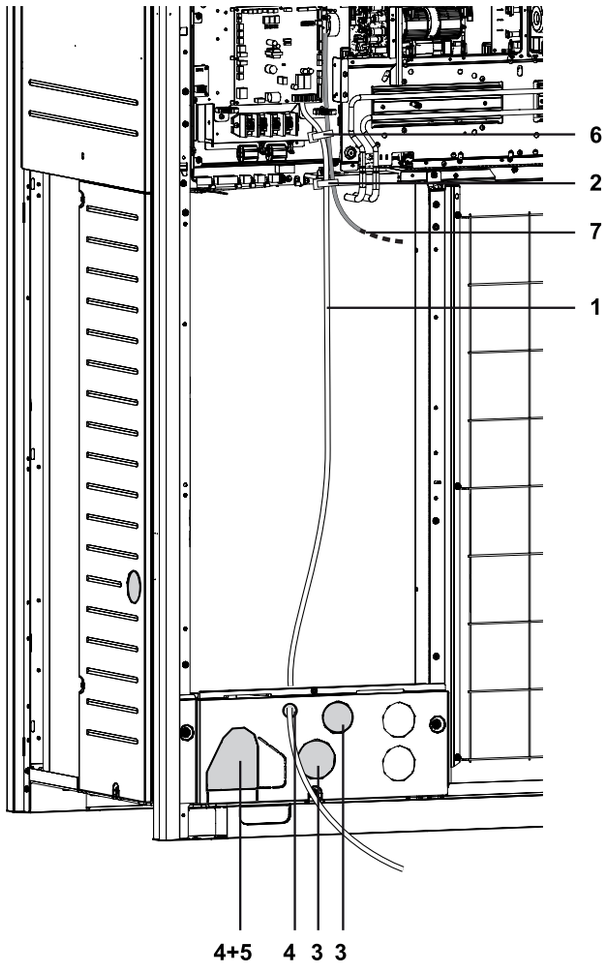
Transmission wiring routing to the unit and inside the unit.
Transmission wiring can be routed through the front side only:

- Fix transmission wire with tie wrap (1) to low voltage wiring. See figures below, item 6.
- Possible transmission wire entrance hole (close hole to avoid bugs/dirt from entering). See figures below, item 4.
- Possible transmission wire entrance hole (close hole to avoid bugs/dirt from entering). Fix transmission wiring to pipe insulation with tie wraps. See figures below, item 5.
- Inside the electronic component box, the transmission wire should be fixed on several locations with tie wraps to low voltage wiring. See figures below, items 2 and 6.
- Fix transmission wire with tie wrap (2) to heat exchanger fixing plate (hole). See figures below, item 8.

RXQ6~12



RXQ14~20



1 Transmission wiring
2 Fix wiring with tie wrap
3 Possible power supply wire entrance hole(a)
4 Possible transmission wire entrance hole(a)
5 Possible transmission wire entrance hole.(a) Fix wiring to pipe insulation with tie wraps
6 Inside the electronic component box, the wiring should be fixed on several locations with tie wraps to the factory mounted low voltage wiring.
7 Factory mounted low voltage wiring
8 Fix wiring with tie wrap (2) to heat exchanger fixing plate (hole).

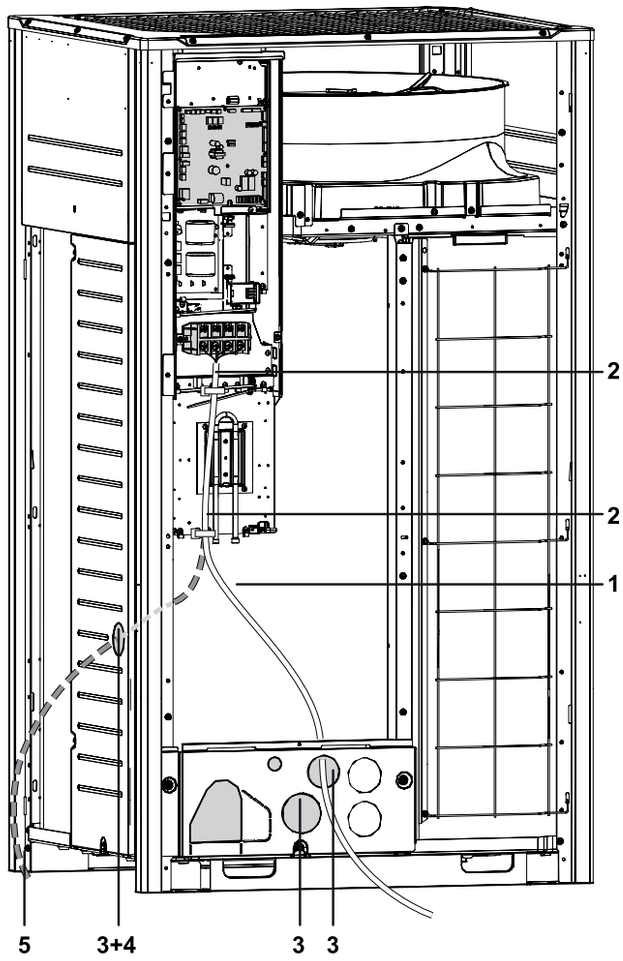
(a) Knockout hole has to be removed. Close the hole to avoid small animals or dirt from entering.

12.5.2 Power supply wiring routing

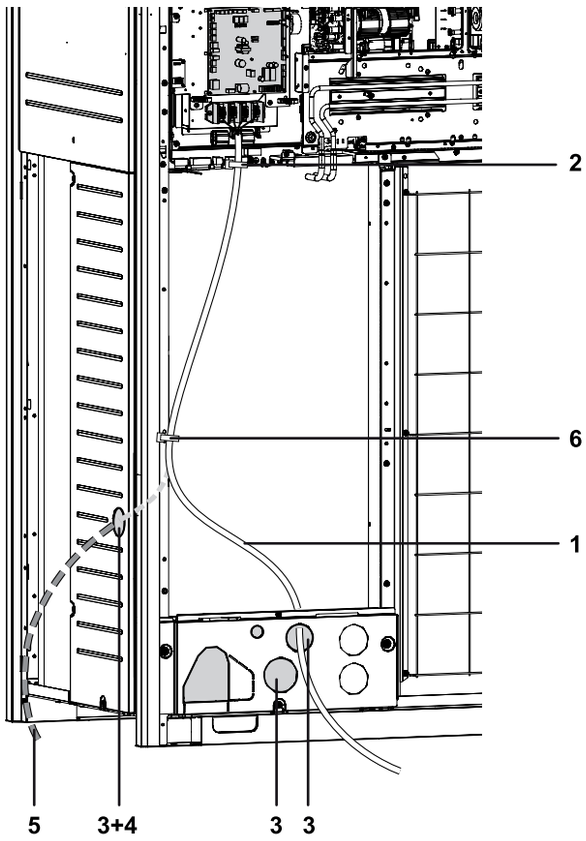
Power supply wire routing to the unit and inside the unit. The power supply wiring can be routed from the front and left side.

- Front side. In order to route the power supply from the front side, the available knockout holes can be used:
  - Fix the power supply cable to the foreseen wire clips with a tie wrap. See figures below, item 2.
  - Front plate: possible power supply wire entrance hole (close hole to avoid bugs/dirt from entering). See figures below, item 3.
  - Side plate: possible power supply wire entrance hole (close hole to avoid bugs/dirt from entering). Use conduit. See figures below, item 4.

RXQ6~12



RXQ14~20

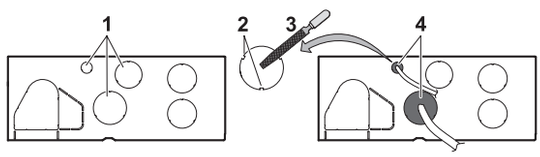


1 Power supply wire
2 Fix wiring with tie wrap
3+4 Possible power supply wire entrance hole(a)
5 Alternative power supply routing
6 Fix wiring with tie wrap to support plate.

(a) Knockout hole has to be removed. Close the hole to avoid small animals or dirt from entering.

12.5.3 Precautions when knocking out knockout holes

- To punch a knockout hole, hit on it with a hammer.
- After knocking out the holes, we recommend removing any burrs and paint the edges and areas around the holes using repair paint to prevent rusting.
- When passing electrical wiring through the knockout holes, prevent damage to the wires by wrapping the wiring with protective tape, putting the wires through field supplied protective wire conduits at that location, or install suitable field supplied wire nipples or rubber bushings into the knockout holes.



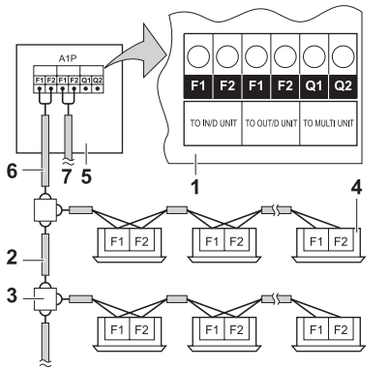
1 Knockout hole
2 Burr
3 Remove burrs
4 If there are any possibilities that small animals enter the system through the knockout holes, plug the holes with packing materials (to be prepared on-site)

12.6 Connection

This chapter gives an explanation how to route and connect the wiring within the unit.

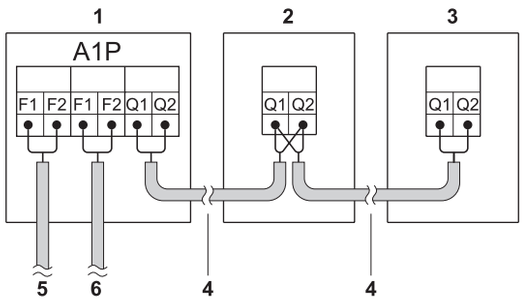
12.6.1 Connection of transmission wiring to the system

In case of single outdoor unit installation



1 Outdoor unit PCB board (A1P)
2 Use the conductor of shielded wire (2 wire) (no polarity)
3 Terminal board (field supply)
4 Indoor unit
5 Outdoor unit
6 Outdoor - indoor unit transmission (F1/F2)
7 Outdoor - other system transmission (F1/F2)

In case of multi outdoor unit installation

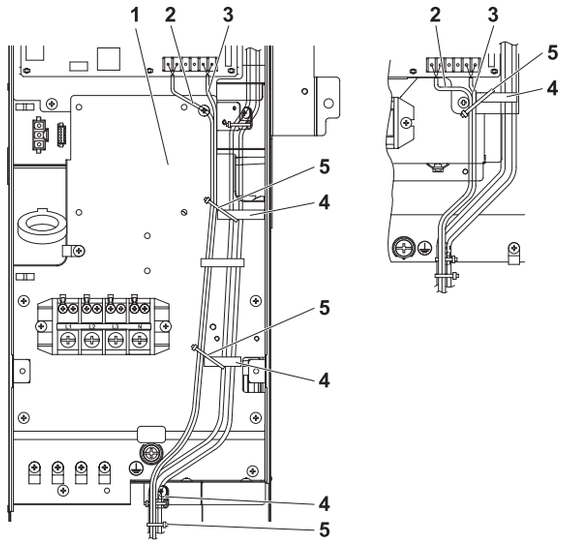


1 Unit A (master unit)
2 Unit B (slave unit)
3 Unit C (slave unit)
4 Inter unit transmission wiring (Q1/Q2)
5 Outdoor-indoor unit transmission (F1/F2)
6 Outdoor-other system transmission (F1/F2)

- The interconnecting wiring between the outdoor units in the same piping system must be connected to the Q1/Q2 (Out Multi) (4) terminals. Connecting the wires to the F1/F2 terminals results in system malfunction.
- The wiring for the other systems must be connected to the F1/F2 (Out-Out) (6) terminals of the PCB board in the outdoor unit to which the interconnecting wiring for the indoor units is connected.
- The base unit is the outdoor unit to which the interconnecting wiring for the indoor units is connected.

12.6.2 Connection of wiring to terminals

Transmission wiring in outdoor unit



1 Fix to the indicated plastic brackets using field supplied clamping material
2 Wiring between the units (indoor-outdoor) (F1/F2 left)
3 Internal transmission wiring (Q1/Q2)
4 Plastic bracket
5 Field supplied clamps

Care should be taken for connecting the wires to the terminal block.

See the table below for the tightening torque of the transmission wiring terminals.

Screw size	Tightening torque (N•m)
M3.5 (A1P)	0.88±0.08

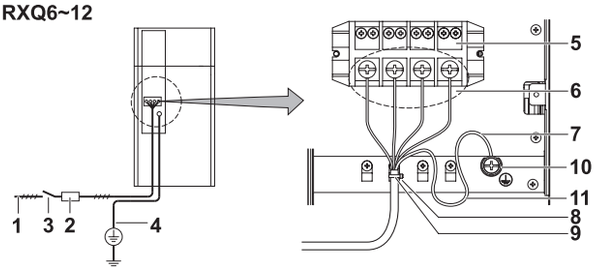
- Never connect the power supply to transmission wiring terminal block. Otherwise the entire system may break down.
- Be careful about polarity of the transmission wiring.

Power supply

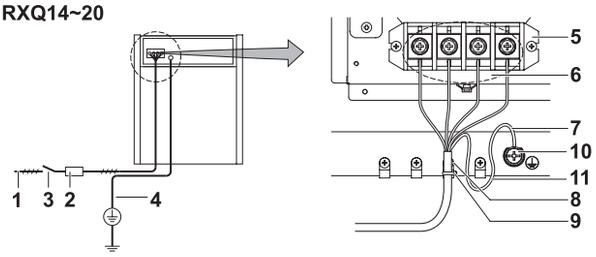
The power supply must be clamped to the plastic bracket using field supplied clamp material.

The green and yellow striped wire must be used for earthing only (refer to the figure below).

RXQ6~12



RXQ14~20



1 Power supply (380~415 V - 3N~ 50 Hz / 380 V - 3N~60 Hz)
2 Fuse
3 Earth leakage protector
4 Earth wire
5 Power supply terminal block
6 Connect each power wire: RED to L1, WHT to L2, BLK to L3 and BLU to N
7 Earth wire (GRN/YLW)
8 Clamp the power supply to the plastic bracket using a field supplied clamp to prevent external force being applied to the terminal.
9 Clamp (field supplied)
10 Cup washer
11 When connecting the earth wire, it is recommended to perform curling.

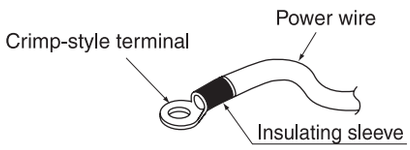
NOTICE

- When routing earth wires, secure clearance of 25 mm or more away from compressor lead wires. Failure to observe this instruction properly may adversely affect correct operation of other units connected to the same earth.
- When connecting the power supply, the earth connection must be made before the current-carrying connections are established. When disconnecting the power supply, the current-carrying connections must be separated before the earth connection is. The length of the conductors between the power supply stress relief and the terminal block itself must be as such that the current-carrying wires are tautened before the earth wire is in case the power supply is pulled loose from the stress relief.

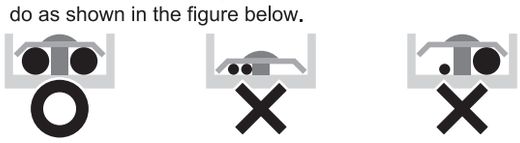
NOTICE

Precautions when laying power wiring:

- Do not connect wiring of different thicknesses to the power terminal block (slack in the power wiring may cause abnormal heat).
- Be sure to use crimp-style terminal with insulating sleeves for connections. (See the figure below.)



- When connecting wiring which is the same thickness, do as shown in the figure below.



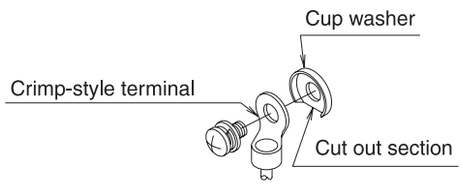
- For wiring, use the designated power wire and connect firmly, then secure to prevent outside pressure being exerted on the terminal board.
- Use an appropriate screwdriver for tightening the terminal screws. A screwdriver with a small head will damage the head and make proper tightening impossible.
- Over-tightening the terminal screws may break them.
- See the table below for tightening torque for the terminal screws.

Tightening torque (N•m)	
M8 (Power terminal block)	6.3±0.6
M8 (Ground)	
M3.5 (Inter-unit wiring terminal block)	0.88±0.08

NOTICE

Recommendations when connecting the earth wire

Wire it so that it comes through the cut out section of the cup washer. (An improper earth connection may prevent a good earthing from being achieved.) (See the figure below.)

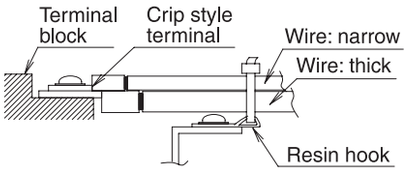


Connecting the power supply to multiple outdoor units

To connect the power supply for multiple outdoor units to each other, ring tongues have to be used. No bare cable can be used.

The ring washer which is standard provided should be removed in that case.

Attaching both cables to the power supply terminal should be done as indicated.



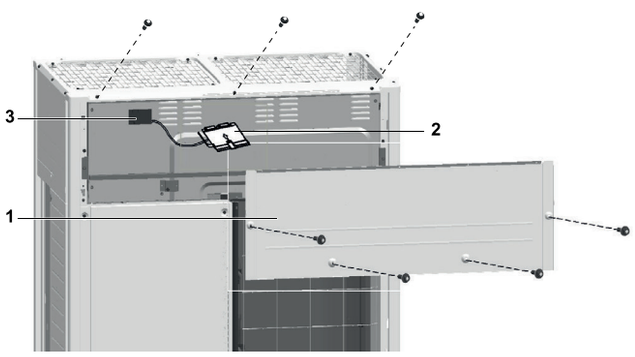
13. Making field settings

To continue the configuration of the VRV X cooling only system, it is required to give some input to the logic board of the unit. This chapter will describe how manual input is possible by operating the push buttons/DIP switches on the logic board and reading the feedback from the 7 segment displays.

13.1 Accessing the push buttons on the logic board

It is not required to open the complete electronic component box to access the push buttons on the logic board and read out the 7 segment display(s).

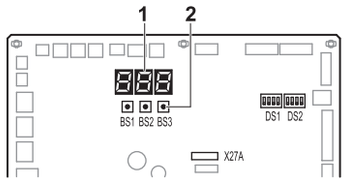
To access you can remove the front plate (see figure). Now you can open the inspection cover of the electrical component box front plate (see figure). You can see the three push buttons and the three 7 segment displays and DIP switches.



1 Front plate
2 Inspection cover
3 Main PCB with 3 seven segment display and 3 push buttons

Operate the switches and push buttons with an insulated stick (such as a closed ball-point pen) to avoid touching of live parts.

Location of the 7 segment displays, buttons and DIP switches:



BS1 MODE for changing the set mode
BS2 SET for field setting
BS3 RETURN for field setting
DS1, DS2 DIP switches
1 7 segment displays (3x)
2 Push buttons

Segment display indications:

Off
Blinking
On

13.2 Operating the push buttons and DIP switches on the logic board

13.2.1 Operating the push buttons

By operating the push buttons it is possible to:

- Perform special actions (test run, etc).
- Perform field settings (demand operation, low noise, etc).

Below procedure explains how to operate the push buttons to reach the required mode in the menu, select the correct setting and modify the value of the setting. This procedure can be used any time special settings and regular field setting are discussed in this manual.

Setting definition: [A-B]=C; A=mode; B=setting; C=setting value. A, B and C are numerical values for field settings. Parameter C has to be defined. It can be a chosen from a set (0, 1, 2, 3, 4, 5, …) or regarded as an ON/OFF (1 or 0) depending on the contents. This is informed when the field setting is explained.

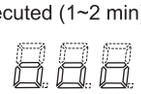
INFORMATION

During special operation (e.g., test run, etc.) or when an malfunction happened, information will contain letters and numerical values.

Functions of the push button switches which are located on the outdoor PCB (A1P)

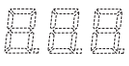
Turn on the power supply of the outdoor unit and all indoor units. When the communication between indoor units and outdoor unit(s) is established and normal, the segment indication state will be as below (default situation when shipped from factory).

When turning on the power supply: flashing as indicated. First checks on power supply are executed (1~2 min).



When no trouble occurs: lighted as indicated (8~10 min).

Ready for operation: blank display indication as indicated.



When above situation cannot be confirmed after 12 min, the malfunction code can be checked on the indoor unit user interface and the outdoor unit segment display. Solve the malfunction code accordingly. The communication wiring should be checked at first.

Accessing modes

BS1 is used to change the mode you want to access.

- **Access mode 1**
  Push BS1 one time. Segment indication changes to:

- **Access mode 2**
  Push BS1 for at least 5 seconds. Segment indication changes to:

INFORMATION

If you get confused in the middle of the process, push BS1. Then it returns to idle situation (no indication on segment displays: blank)

Mode 1

Mode 1 is used to set basic settings and to monitor the status of the unit.

- Changing and access the setting in mode 1:
  Once mode1 is selected (push BS1 1 time), you can select the wanted setting. It is done by pushing BS2. Accessing the selected setting's value is done by pushing BS3 1 time.
- To quit and return to the initial status, press BS1.

Example:

Checking the content of parameter [1-10] (to know how many indoor units are connected to the system).

[A-B]=C in this case defined as: A=1; B=10; C=the value we want to know/monitor:

- Make sure the segment indication is as during normal operation (default situation when shipped from factory).
- Push BS1 1 time; result segment display:

  Result: mode 1 is accessed.
- Push BS2 10 times; result segment display:

  Result: mode 1 setting 10 is addressed.
- Push BS3 1 time; the value which is returned (depending on the actual field situation), is the amount of indoor units which are connected to the system.
  Result: mode1 setting 10 is addressed and selected, return value is monitored information
- To leave the monitoring function, push BS1 1 time, you will return to the default situation when shipped from factory.

Mode 2

Mode2 is used to set field settings of the outdoor unit and system.

- Changing and access the setting in mode 2:
  Once mode 2 is selected (push BS1 for more than 5 seconds), you can select the wanted setting. It is done by pushing BS2. Accessing the selected setting's value is done by pushing BS3 1 time.
- To quit and return to the initial status, press BS1.
- Changing the value of the selected setting in mode 2:
  - Once mode 2 is selected (push BS1 for more than 5 seconds) you can select the wanted setting. It is done by pushing BS2.
  - Accessing the selected setting's value is done by pushing BS3 1 time.
  - Now BS2 is used to select the required value of the selected setting.
  - When the required value is selected, you can define the change of value by pushing BS3 1 time.
  - Press BS3 again to start operation according to the chosen value.

Example:

Checking the content of parameter [2-18] (to define the high static pressure setting of the outdoor unit's fan).

[A-B]=C in this case defined as: A=2; B=18; C=the value we want to know/change

- Make sure the segment indication is as during normal operation (default situation when shipped from factory).
- Push BS1 for over 5 seconds; result segment display:

  Result: mode 2 is accessed.
- Push BS2 18 times; result segment display:

  Result: mode 2 setting 18 is addressed.
- Push BS3 1 time; the value which is returned (depending on the actual field situation), is the status of the setting. In the case of [2-18], default value is "0", which means the function is not active.
  Result: mode2 setting 18 is addressed and selected, return value is the current setting situation.
- To change the value of the setting, push BS2 till the required value appears on the segment indication. When achieved, define the setting value by pushing BS3 1 time. To start operation according to the chosen setting, confirm again by pushing BS3.
- To leave the monitoring function, push BS1 2 times, you will return to the default situation when shipped from factory.

13.2.2 Operating the DIP switches

By operating the DIP switches it is possible to:

	What to do with DIP switch DS1
1	OFF=not installed=factory setting
2-4	NOT USED DO NOT CHANGE THE FACTORY SETTING
	What to do with DIP switch DS2
1-4	NOT USED DO NOT CHANGE THE FACTORY SETTING

14. Charging refrigerant

14.1 Precautions

NOTICE

- Refrigerant cannot be charged until field wiring has been completed.
- Refrigerant may only be charged after performing the leak test and the vacuum drying.
- When charging a system, care shall be taken that its maximum permissible charge is never exceeded, in view of the danger of liquid hammer.
- Charging with an unsuitable substance may cause explosions and accidents, so always ensure that the appropriate refrigerant R-410A is charged.
- Refrigerant containers shall be opened slowly.
- Always use protective gloves and protect your eyes when charging refrigerant.
- When the refrigerant system is to be opened, refrigerant must be treated according to the applicable legislation.

DANGER: Electrical shock

See "2. General safety precautions".

- To avoid compressor breakdown. Do not charge the refrigerant more than the specified amount.
- This outdoor unit is factory charged with refrigerant and depending on pipe sizes and pipe lengths some systems require additional charging of refrigerant.
- In case re-charge is required, refer to the name plate of the unit. It states the type of refrigerant and necessary amount.

14.2 Calculating the additional refrigerant charge

How to calculate the additional refrigerant to be charged

Additional refrigerant to be charged=R (kg). R should be rounded off in units of 0.1 kg.

R=[(X_1 @ **Ø22.2**) x 0.36+(X_2 @ **Ø19.1**) x 0.26+(X_3 @ **Ø15.9**) x 0.17+ (X_4 @ **Ø12.7**) x 0.11+(X_5 @ **Ø9.5**) x 0.057+(X_6 @ **Ø6.4**) x 0.022]+A

$X_{1...6}$ =Total length (m) of liquid piping size at **Øa**

A parameter (kg)	Total indoor unit capacity CR(a)	HP			
		6~8	10~12	14~18	20
Piping length≤30 m	50%≤CR≤105%	0			0.5
	105%<CR≤130%	0.5			1.0
	130%<CR≤160%	0.5			1.3
	160%<CR≤200%	0.5	0.7	1.0	1.5
Piping length>30 m	50%≤CR≤70%	0			0.5
	70%<CR≤85%	0.3	0.5		1.0
	85%<CR≤105%	0.7	1.0		1.5
	105%<CR≤130%	1.2	1.5		2.0
	130%<CR≤160%	1.2	1.5		2.3
	160%<CR≤200%	1.2	1.7	2.0	2.5

(a) CR=Connection ratio.

Piping length is considered the distance from the outdoor unit to the farthest indoor unit.

When using metric piping, please take into account following table concerning the weight factor to be allocated. It should be substituted in the formula for R.

Inch piping	
size (Ø) (mm)	Weight factor
Ø6.4 (1/4")	0.022
Ø9.5 (3/8")	0.057
Ø12.7 (1/2")	0.11
Ø15.9 (5/8")	0.17
Ø19.1 (3/4")	0.26
Ø22.2 (7/8")	0.36

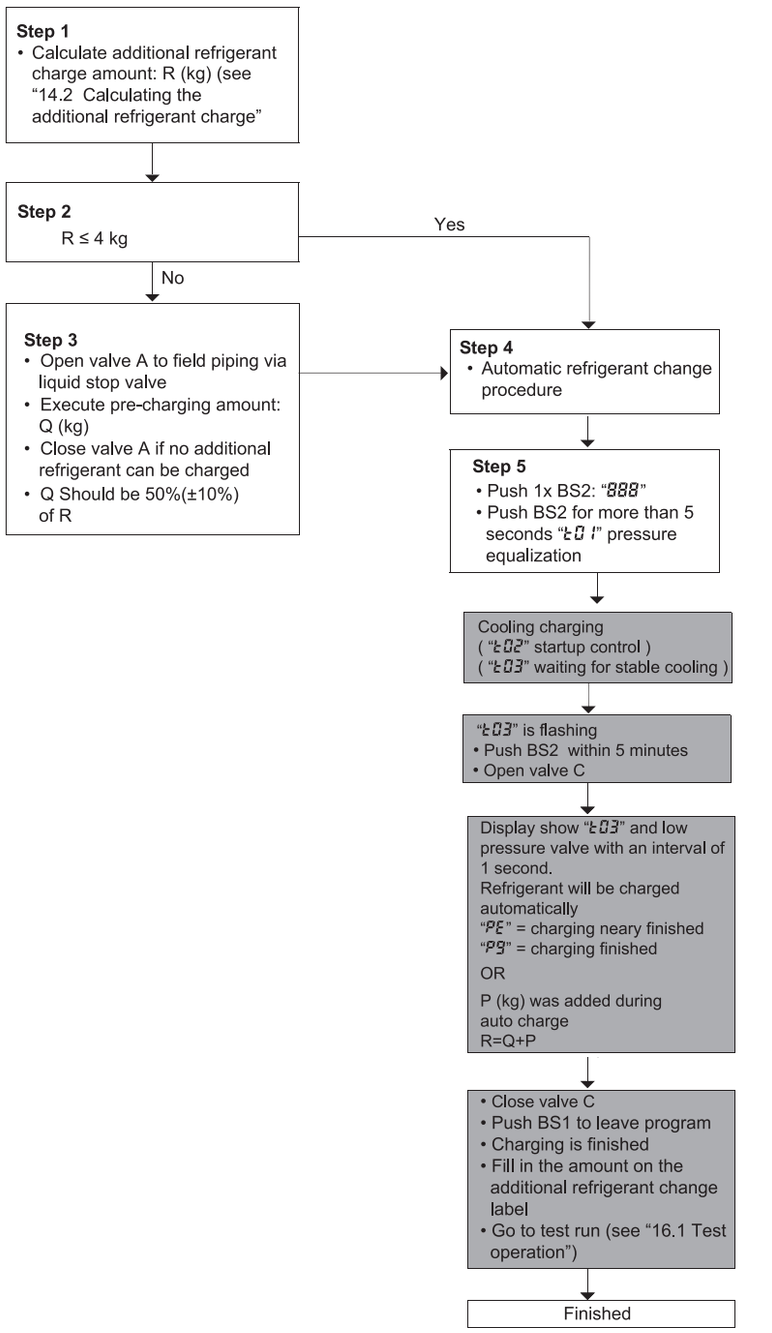
When selecting indoor unit, following table with connection ratio limitation has to be respected. More detailed information can be found in technical engineering data.

Used indoor units	Total capacity CR(a)	Allowable capacity connection ratio	
		VRV	RA
VRV	50~200%	50~200%	—
VRV + RA	50~130%	0~130%	0~130%
RA	50~130%	—	50~130%

(a) Connection ratio.

14.3 Method for adding refrigerant

14.3.1 Flow chart

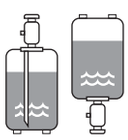


See figure "Location of valves" ; for more information refer to the text in this chapter.

Be sure to charge the specified amount of refrigerant in liquid state. Since this refrigerant is a mixed refrigerant, adding it in gas form may cause the refrigerant composition to change, preventing normal operation.

- Before charging, check whether the refrigerant cylinder is equipped with a siphon tube or not.

Charge the liquid refrigerant with the cylinder in upright position.



Charge the liquid refrigerant with the cylinder in upside-down position.

- Be sure to use tools exclusively for R-410A to ensure required pressure resistance and to prevent foreign materials from mixing into the system.

INFORMATION

The automatic refrigerant charging has limits as described below.

- Outdoor temperature: 0°C DB~49°C DB.
- Indoor temperature: 10°C DB~32°C DB.

NOTICE

Charging with an unsuitable substance may cause explosions and accidents, so always make sure that the appropriate refrigerant (R-410A) is charged.Refrigerant containers must be opened slowly.

CAUTION

- If charge refrigerant without automatic charging procedure, refrigerant amount might over the permissible quantity and result to liquid hammer.
- Always use protective gloves and protect your eyes when charging refrigerant.
- When the refrigerant charging procedure is done or when pausing, close the valve of the refrigerant tank immediatety. If the tank is left with the valve open, the amount of refrigerant which is properly charged may get off point. More refrigerant may be charged by any remaining pressure after the unit has stopped.

NOTICE

- If the power of some units is turned off, the charging procedure cannot be finished properly.
- In case of a multiple outdoor system, turn on the power of all outdoor units.
- Make sure to turn ON the power 6 hours before starting the operation. This is necessary to warm the crankcase by per-heating operation (automatic)
- If operation is performed within 12 minutes after the indoor and outdoor units are turned on, the compressor will not operate before the communication is established in a correct way between outdoor unit(s) and indoor units.
- Before starting charging procedures, check if the segment display indication of the outdoor unit A1P PCB is as normal (see "Functions of the push button switches which are located on the outdoor PCB (A1P)"). If a malfunction code is present, see "16.2. Malfunction code list".
- Make sure all connected indoor units are recognised
- Close the front panel before any refrigerant charge operation is executed. Without the front panel attached the unit cannot judge correctly whether it is operating properly or not.

NOTICE

In case of maintenance and the system (outdoor unit+field piping+indoor units) does not contain any refrigerant any more (e.g., after refrigerant reclaim operation), the unit has to be charged with its original amount of refrigerant (refer to the nameplate on the unit) by pre-charging before the automatic charging function can be started.

14.3.2 Charging method

As explained during vacuum drying method, once vacuum drying is finished, additional refrigerant charging can start.

A flow chart is available which gives an overview of the possibilities and actions to be taken (see “14.3.1 Flow chart”).

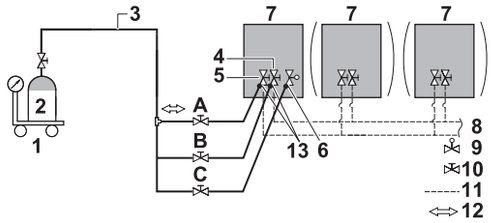
Follow the steps as described below and take into account whether you use the automatic charge function or pre-charging.

1 Calculate the additional amount of refrigerant to be added using the formula mentioned in "14.2 Calculating the additional refrigerant charge"

2 Check the additional refrigerant amount R (kg)
- Total additional refrigerant is 4 kg or less (R ≤ 4 kg) perform the automatic refrigerant charging procedure as explained in step 4.
- Total additional refrigerant amount more than 4 kg (R > 4 kg) perform the per-charging procedure as explained in step 3.

3 The first 50% (±10%) of additional refrigerant can be charged without outdoor unit operation.
- Pre-charging can be done without compressor running by connecting the refrigerant bottle only to the liquid stop valve service port (open valve A). Make sure that the stop valves are closed (valve C and valve B+gas line stop valve)

Location of valves



1 Measuring instrument
2 Refrigerant R-410A tank (siphon system)
3 Charge hose
4 Gas line stop valve
5 Liquid line stop valve
6 Refrigerant auto change valve
7 Outdoor unit
8 To indoor unit
9 Needle valve
10 Stop valve
11 Field piping
12 Gas flow
13 Stop valve service port
A Valve A
B Valve B
C Valve C

- After pre-charging, perform the refrigerant charge operation as shown below and charge the remaining refrigerant of the additional charging amount through valve C.
  Open the liquid and gas side stop valves.
  Valves A and B and C must remain closed !

INFORMATION

For a multi outdoor unit system, it is not required to connect all charge ports to a refrigerant tank.

The refrigerant will be charged with 22 kg in 1 hour time at an outdoor temperature of 30°C DB or with 6 kg at an outdoor temperature of 0°C DB.

If you need to speed up in case of a multiple outdoor system, connect the refrigerant tanks to each outdoor unit.

NOTICE

- The unit's internal piping is already factory charged with refrigerant, so be careful when connecting the charge hose.
- After adding the refrigerant, do not forget to close the lid of the refrigerant charging port. The tightening torque for the lid is 11.5 to 13.9 N•m.
- In order to ensure uniform refrigerant distribution, it may take the compressor ±10 minutes to start up after the unit has started operation. This is not a malfunction.

4 Adding refrigerant by using the automatic charging function.

5 The remaining additional refrigerant charge can be charged by operating the outdoor unit depending on the ambient limitation conditions (see the given information in page 31).
Procedure

- Idle (default) screen is shown.
- Push BS2 once, indication “ 888 ”.
- Push BS2 for more than 5 seconds, wait while the unit is preparing for operation. Segment display indication: “E01” (pressure control is executed):
  - Cooling operation is started: indication “E02” till “E03” will be displayed (start up control; waiting stable cooling operation).

■ When "t03" starts flashing (ready for charging), push BS2 within 5 minutes. Open valve C. If BS2 is not pushed within 5 minutes, a malfunction code will appear:
- Cooling operation: malfunction code "P2" will appear. Push BS1 to abort and restart the procedure.

Cooling (middle segment indicates "0")
Automatic charging will continue, the segment indication shows the current low pressure value and the status indication "t03" intermittent.
If the segment indication/user interface of indoor unit shows "PE" code, charging is almost finished. When the unit stops operating, close valve C and check whether the segment indication/user interface of indoor unit shows "P9".
This indicates the automatic charging in cooling program was finished successfully.

INFORMATION

When the charging amount is little, the "PE" code may not be displayed, but instead the "P9" code will be displayed immediately.

INFORMATION

■ When a malfunction is detected during the procedure (e.g, in case of closed stop valve), a malfunction code will be displayed. In that case, refer to "16.2 Malfunction code list" and solve the malfunction accordingly. Resetting the malfunction can be done by pushing BS1. The procedure can be restarted from 5).

■ Aborting the automatic refrigerant charge is possible by pushing BS1. The unit will stop and return to idle condition.

Information which may occur during additional refrigerant charging procedures:

P8: Indoor unit freeze up prevention
Action: Close valve C . Reset malfunction by pushing BS1. Retry auto charge procedure.

P2: Abnormal low pressure drop
Action: Clase valve C . Reset malfunction by pushing BS1. Check following items before retry auto charge procedure:
- Check if the gas side stop valve is opened correctly.
- Check if the valve of the refrigerant cylinder is opened.
- Check if the air inlet and outlet of the indoor units are not obstructed.

Other malfunction code: close valve C . Confirm the malfuntion code and take corresponding action, "16.2 Malfuction code list".

14.3.3 Checks after adding refrigerant

- Are the stop valves for liquid and gas open?
- Is the amount of refrigerant, that has been added, recorded on the refrigerant charge label?

NOTICE

Make sure to open all stop valves after (pre-) charging the refrigerant.

Operating with the stop valves closed will damage the compressor.

15. Monitoring function and field settings

The operation of the outdoor unit can further be defined by changing some field settings. Next to making field settings it is also possible to confirm the current operation parameters of the unit.

Below relevant Monitoring mode (mode 1) and Field setting mode (mode 2) settings are explained in detail. How to access them, how to change the value of the settings and how to confirm them is explained in "13. Making field settings" . In that chapter, an example is given on how to make a setting. It is advised to check this procedure before accessing, checking and changing below settings.

Once the default situation of the segment indication is confirmed (see "13. Making field settings"), the mode 1 and mode 2 can be accessed.

Making settings is done via the master outdoor unit.

15.1 Mode 1

Mode 1 can be used to monitor the current situation of the outdoor unit. Some field setting contents can be monitored as well.

Below the settings in mode 1 are explained.

[1-0]= shows whether the unit you check is a master, slave 1 or slave 2 unit
- No indication=undefined situation
- 0=outdoor unit is master unit
- 1=outdoor unit is slave 1 unit
- 2=outdoor unit is slave 2 unit

Master, slave 1 and slave 2 indications are relevant in multiple outdoor unit system configurations. The allocation of which outdoor unit is master, slave 1 or slave 2 are decided by the unit's logic.

The master unit should be used to input field settings in mode 2

[1-1]= shows the status of low noise operation
- 1=unit is currently operating under low noise restrictions
- 0= unit is currently not operating under low noise restrictions

Low noise operation reduces the sound generated by the unit compared to nominal operating conditions.

Low noise operation can be set in mode 2. There are two methods to activate low noise operation of the outdoor unit system.

The first method is to enable an automatic low noise operation during night time by field setting. The unit will operate at the selected low noise level during the selected time frames.

The second method is to enable low noise operation based on an external input. For this operation an optional accessory is required.

[1-2]= shows the status of power consumption limitation operation
- 1=unit is currently operating under power consumption limitation
- 0=unit is currently not operating under power consumption limitations

Power consumption limitation reduces the power consumption of the unit compared to nominal operating conditions.

Power consumption limitation can be set in mode 2. There are two methods to activate power consumption limitation of the outdoor unit system.

The first method is to enable a forced power consumption limitation by field setting. The unit will always operate at the selected power consumption limitation.

The second method is to enable power consumption limitation based on an external input. For this operation an optional accessory is required.

[1-5]= shows the current T_e target parameter position. Refer to "15.3 Energy saving and optimum operation" for more details about the contents of this value

[1-10]= shows the total number of connected indoor units.

It can be convenient to check if the total number of indoor units which are installed match the total number of indoor units which are recognized by the system. In case there is a mismatch, It is advised to check the communication wiring path between outdoor and indoor units (F1/F2 communication line).

[1-13]= shows the total number of connected outdoor units (in case of multiple outdoor system).

It can be convenient to check if the total number of outdoor units which are installed matches the total number of outdoor units which are recognized by the system. In case there is a mismatch, It is advised to check the communication wiring path between outdoor and outdoor units (Q1/Q2 communication line).

[1-17]= shows the latest malfunction code.

[1-18]= shows the malfunction code which occurred 1 time before current malfunction code.

[1-19]= shows the malfunction code which occurred 2 time before current malfunction code.

When the latest malfunction codes were reset by accident on an indoor unit user interface, they can be checked again through this monitoring settings. For the content or reason behind the malfunction code see “16.2 Malfunction code list”, where most relevant malfunction codes are explained. Detailed information about malfunction codes can be consulted in the service manual of this unit.

[1-38]= shows the number of RA indoor units connected to the system.

[1-40]= shows the current cooling comfort setting. See “15.3 Energy saving and optimum operation” for more details about this setting.

15.2 Mode 2

Mode 2 is used to change the field settings of the system. Consulting the current field setting value and changing the current field setting value is possible.

In general, normal operation can be resumed without special intervention after changing field settings.

Some field settings are used for special operation (e.g., 1 time operation, recovery/vacuuming setting, manual adding refrigerant setting, etc.). In such a case, it is required to abort the special operation before normal operation can restart. It will be indicated in below explanations.

[2-8]= T_e target temperature T_e fix control
Default value=2

Value [2-8]	T_e target
2	6 (Default)
3	7
4	8
5	9
6	10
7	11

Change [2-8]=2~7 in function of required operation method during cooling.

[2-11]= Activation VRT control and VRT Smart control via External control adaptor (Optinal).

Value [2-11]	Meaning
0	Inactive (Default)
1	VRT Smart active by demand terminal short-circuit
2	VRT Smart active by low noise terminal short-circuit

VRT Smart can be activated by short circuit the terminal on External control adaptor (Optional) according to [2-11] setting.

If the terminal on external control adapter is not connected by short circuit with [2-11]≠0, the system operates according to [2-8] setting.

[2-12]= Enable the low noise function and/or power consumption limitation via external control adaptor (DTA104A61/62)

If the system needs to be running under low noise operation or under power consumption limitation conditions when an external signal is sent to the unit, this setting should be changed. This setting will only be effective when the optional external control adaptor (DTA104A61/62) is installed.

Default value=0
To activate this function change [2-12]=1.

[2-18]= Fan high static pressure setting

In order to increase the static pressure the outdoor unit fan is delivering, this setting should be activated. For details about this setting,see technical specifications.

Default value=0.
To activate this function change [2-18]=1.

[2-21]= Refrigerant recovery/vacuuming mode

In order to achieve a free pathway to reclaim refrigerant out of the system or to remove residual substances or to vacuum the system it is necessary to apply a setting which will open required valves in the refrigerant circuit so the reclaim of refrigerant or vacuuming process can be done properly.

Default value=0
To activate function charge [2-21]=1

To stop the refrigerant recovery/vacuuming mode, push BS3. If BS3 is not pushed, the system will remain in refrigerant recovery/vacuuming mode.

[2-22]= Night time low noise setting and level.

By changing this setting, you activate the automatic low noise operation function of the unit and define the level of operation. Depending on the chosen level, the noise level will be lowered (4:Level4<3:Level3<2:Level2<1:Level1). The start and stop moments for this function are defined under setting [2-26] and [2-27].

Default value=0.
To activate function change [2-22]=1,2,3 or 4.

[2-23]= Activate T_e fix control.

In order to operate Te fix control, it is necessary to apply a setting below. T_e value depends on [2-8] setting.

Default value=0.
T_e fix control [2-23]=1

[2-25]= Low noise operation level via the external control adaptor.

If the system needs to be running under low noise operation conditions when an external signal is sent to the unit, this setting defines the level of low noise that will be applied (4:Level4<3:Level3<2:Level2<1:Level1).

This setting will only be effective when the optional external control adaptor (DTA104A61/62) is installed and the setting [2-12] was activated.

Default value=2
To activate function change [2-25]=1,2,3 or 4.

[2-26]= Low noise operation start time
Change [2-26]=1,2 or 3 in function of required timing.

Default value=2.

Value [2-26]	Start time automatic low noise operation (approximately)
1	20:00
2	22:00 (default)
3	24:00

This setting is used in conjunction with setting [2-22].

[2-27]= Low noise operation stop time
Default value=3

Value [2-27]	Stop time automatic low noise operation (approximately)
1	6:00
2	7:00
3	8:00 (default)

This setting is used in conjunction with setting [2-22].

[2-30]= Power consumption limitation level (step 1) via the external control adaptor (DTA104A61/62).

If the system needs to be running under power consumption limitation conditions when an external signal is sent to the unit, this setting defines the level power consumption limitation that will be applied for step 1. The level is according to the table.

Default value=3
Change [2-30]=1,2,3,4,5,6,7 or 8 in function of required limitation.

Value [2-30]	Power consumption limitation (approximately)
1	60%
2	65%
3	70% (default)
4	75%
5	80%
6	85%
7	90%
8	95%

[2-31]= Power consumption limitation level (step 2) via the external control adaptor (DTA104A61/62).

If the system needs to be running under power consumption limitation conditions when an external signal is sent to the unit, this setting defines the level power consumption limitation that will be applied for step 2. The level is according to the table.

Default value=1
Change [2-31]=1,2 or 3 in function of required limitation.

Value [2-31]	Power comsumption limitation (approximately)
1	40% (default)
2	50%
3	55%

[2-32]= Forced, all time, power consumption limitation operation (no external control adaptor is required to perform power consumption limitation).

If the system always needs to be running under power consumption limitation conditions, this setting activates and defines the level power consumption limitation that will be applied continuously. The level is according to the table.

Default value=0 (OFF)

Value [2-32]	Restriction reference
0	Function not active (default)
1	Follows [2-30] setting
2	Follows [2-31] setting

Change [2-32]=0,1 or 2 in function of required limitation.

[2-49]= Max, level difference setting
In case the outdoor location is higher than indoor, extension is possible up till 90 m, Refer to [2-49] for dedicated setting.

Value [2-49]	Max, level difference setting
0	OFF(default)
1	ON

[2-81]= Cooling comfort setting for VRT control
Default value=1

Value [2-81]	Cooling comfort setting
0	Eco
1	Mild (default)
2	Quick
3	Powerful

Change [2-81]=0,1,2 or 3 in function of required limitation.

For more information and advice about the impact of these settings, see “15.3 Energy saving and optimum operation”.

[2-83]= Master user interface allocation in case VRV indoor units and RA indoor units are used at the same time.

By changing setting [2-83], you can allow the VRV indoor unit to be the operation mode selector (system power OFF/ON is required after applying this setting).

- [2-83]=1 RA indoor unit has mode selection right (default setting).
- [2-83]=0 VRV indoor unit has mode selection right.

[2-95]= Eco level setting for VRT smart control.

Default value =0

Value [2-95]	Eco level setting
0	Standard (Default)
1	Middle
2	High

15.3 Energy saving and optimum operation

This VRV X cooling only system is equipped with two kinds of advanced energy saving functionality(VRT and VRT smart control). Detecting all connected indoor units type, advanced energy saving functionality type is selected automatically.Depending on the priority, emphasises can be put on energy saving or comfort level. Several parameters can be selected, resulting in the optimal balance between energy consumption and comfort for the particular application.

Several patterns are available and explained below. Modify the parameters to the needs of your building and to realize the best balance between energy consumption and comfort.

15.3.1 Four main operation methods are available:

- **Basic**
  The refrigerant temperature is fixed independent from the situation. It corresponds to the standard operation which is known and can be expected from/under previous VRV systems:

  - To activate this operation method under cooling operation: change field setting [2-23]=1 or disconnect the circuit between terminal on external control adaptor with [2-11]≠0.

- **Automatic for VRT control**
  The refrigerant temperature is set depending on the outdoor ambient conditions. As such adjusting the refrigerant temperature to match the required load (which is also related to the outdoor ambient conditions).
  E.g., when your system is operating in cooling, you do not need as much cooling under low outdoor ambient temperatures (e.g., 25°C) as under high outdoor ambient temperatures (e.g.,35°C). Using this idea, the system automatically starts increasing its refrigerant temperature, automatically reducing the delivered capacity and increasing the system's efficiency.

  - This operation is selected automatically with checking connected indoor unit type.

- **Automatic for VRT smart control**
  The refrigerant temperature is set depending on the required capacity sent from every indoor unit.

  - This operation is selected automatically with checking connected indoor unit type.

- **Hi-sensible**
  The refrigerant temperature is set higher (cooling) compared to basic operation. The focus under high sensible mode is comfort feeling for the customer. The selection method of indoor units is important and has to be considered as the available capacity is not the same as under basic operation. For details concerning to Hi-sensible applications, please contact your dealer.

  - To activate this setting under cooling operation: change field setting [2-8] to the appropriate value, matching the requirements of the pre-designed system containing a high sensible solution.

Value [2-8]	T_e target
3	7
4	8
5	9
6	10
7	11

15.3.2 Several comfort settings are available in VRT control

For each of above modes, automatic and hi-sensible, a comfort level can be selected. The comfort level is related to the timing and the effort (energy consumption) which is put in achieving a certain room temperature by temporarily changing the refrigerant temperature to different values in order to achieve requested conditions more quickly.

- **Powerful**
  Undershoot (during cooling operation) is allowed compared to the requested refrigerant temperature, in order to achieve the required room temperature very fast. The undershoot is allowed from the start up moment.
  In case of cooling operation the evaporating temperature is allowed to go down to 3°C on temporary base depending on the situation.

  When the request from the indoor units becomes more moderate, the system will eventually go to the steady state condition which is defined by the operation method above.

  - To activate the powerful comfort setting under cooling operation, change field setting [2-81]=3.

- **Quick**
  Undershoot (during cooling operation) is allowed compared to the requested refrigerant temperature, in order to achieve the required room temperature very fast. The undershoot is allowed from the start up moment.
  In case of cooling operation the evaporating temperature is allowed to go down to 6°C on temporary base depending on the situation.

  When the request from the indoor units becomes more moderate, the system will eventually go to the steady state condition which is defined by the operation method above.

  - To activate the quick comfort setting under cooling operation, change field setting [2-81]=2.

- **Mild**
  Undershoot (during cooling operation) is allowed compared to the requested refrigerant temperature, in order to achieve the required room temperature very fast. The undershoot is not allowed from the start up moment. The start up occurs under the condition which is defined by the operation mode above.
  In case of cooling operation the evaporating temperature is allowed to go down to 6°C on temporary base depending on the situation.

  When the request from the indoor units becomes more moderate, the system will eventually go to the steady state condition which is defined by the operation method above.
  The start up condition is different from the powerful and quick comfort setting.

  - To activate the mild comfort setting under cooling operation, change field setting [2-81]=1.

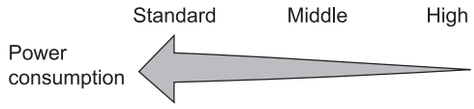
- **Eco**
  The original refrigerant temperature target, which is defined by the operation method (see above) is kept without any correction, unless for protection control.

  - To activate the eco comfort setting under cooling operation, change field setting [2-81]=0.

  No matter which control is selected, variations on the behaviour of the system are still possible due to protection controls to keep the unit operating under reliable conditions. The intentional target, however, is fixed and will used to obtain the best balance between energy consumption and comfort, depending on the application type.

15.3.3 Several Eco-level setting are available for VRT Smart control

Eco level can be selected by field setting [2-95] and according this setting, target Te is decided using capacity requirement from all indoor units.



16. Test run

16.1 Test operation

After installation and once the field settings are defined, the installer is obliged to verify correct operation. Therefore a test run must be performed according to the procedures described below.

16.1.1 Precautions before starting test operation

During test operation, the outdoor unit and the indoor units will start up:

- Make sure that the preparations of all indoor units are finished (field piping, electrical wiring, air purge, ...). See installation manual of the indoor units for details.

CAUTION

Do not insert fingers, rods or other objects into the air inlet or outlet. When the fan is rotating at high speed, it will cause injury.

CAUTION

Do not perform the test operation while working on the indoor units.

When performing the test operation, not only the outdoor unit, but the connected indoor unit will operate as well. Working on an indoor unit while performing a test operation is dangerous.

CAUTION

- During tests never pressurize the appliances with a pressure higher than the maximum allowable pressure (as indicated on the nameplate of the unit).
- If refrigerant gas leaks, ventilate the area immediately. Toxic gas may be produced if refrigerant gas comes into contact with fire.
- Never directly touch any accidental leaking refrigerant. This could result in severe wounds caused by frostbite.

DANGER: Do not touch piping and internal parts.

See "2. General safety precautions".

DANGER: Electrical shock

See "2. General safety precautions".

INFORMATION

Note that during the first running period of the unit, required power input may be higher. This phenomenon originates from the compressor that requires a 50 hour run elapse before reaching smooth operation and stable power consumption. Reason is that the scroll is made out of iron and that it takes some time to smooth the surfaces that make contact.

16.1.2 Test operation

The procedure below describes the test operation of the complete system. This operation checks and judges following items:

- Check of wrong wiring (communication check with indoor units).
- Check of the stop valves opening.
- Judgement of piping length.

On top of this system test operation, indoor units operation should also be checked separately.

- Make sure to carry out the system test operation after the first installation. Otherwise, the malfunction code U3 will be displayed on the user interface and normal operation or individual indoor unit test run cannot be carried out.
- Abnormalities on indoor units cannot be checked for each unit separately. After the test operation is finished, check the indoor units one by one by performing a normal operation using the user interface. Refer to the indoor unit installation manual for more details concerning the individual test run.

INFORMATION

- It may take 10 minutes to achieve a uniform refrigerant state before the compressor starts.
- During the test operation, the refrigerant running sound or the magnetic sound of a solenoid valve may become loud and the display indication may change. These are not malfunctions.

Procedure

1 Close all front panels in order to not let it be the cause of misjudgement (except the electrical component box inspection opening service cover).

2 Make sure all field settings you want are set.

3 Turn ON the power to the outdoor unit and the connected indoor units.

NOTICE

Be sure to turn on the power 6 hours before operation in order to have power running to the crankcase heater and to protect the compressor.

4 Make sure the default (idle) situation is existing; see "13.2 Operating the push buttons and DIP switches on the logic board" . Push BS2 for 5 seconds or more. The unit will start test operation.

- The test operation is automatically carried out, the outdoor unit display will indicate "t01" and the indication "Test operation" and "Under centralized control" will display on the user interface of indoor units.
  Steps during the automatic system test run procedure:
  - "t01": control before start up (pressure equalization)
  - "t02": cooling start up control
  - "t03": cooling stable condition
  - "t04": communication check
  - "t05": stop valve check
  - "t06": pipe length check
  - "t07": refrigerant amount check
  - "t08": in case [2-88]=0, detailed refrigerant situation check
  - "t09": pump down operation
  - "t 10": unit stop
- During the test operation, it is not possible to stop the unit operation from a user interface. To abort the operation, press BS3. The unit will stop after ±30 seconds.

5 Check the test operation results on the outdoor unit segment display.

- Normal completion: no indication on the segment display (idle)
- Abnormal completion: indication of malfunction code on the segment display
  Refer to “16.1.3 Correcting after abnormal completion of the test operation” to take action for correcting the abnormality.
  When the test operation is fully completed, normal operation will be possible after 5 minutes.

16.1.3 Correcting after abnormal completion of the test operation

The test operation is only completed if there is no malfunction code displayed on the user interface or outdoor unit segment display. In case of a displayed malfunction code, perform correcting actions as explained in the malfunction code table. Carry out the test operation again and confirm that the abnormality is properly corrected.

INFORMATION

Refer to the installation manual of the indoor unit for other detailed malfunction codes related to indoor units.

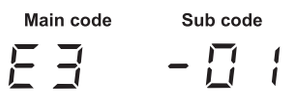
16.2 Malfunction code list

In case of a displayed malfunction code, perform correcting actions as explained in the malfunction code table.

After correcting the abnormality, press BS3 to reset the malfunction code and retry operation.

The malfunction code which is displayed on the outdoor unit will indicate a main malfunction code and a sub code. The sub code indicates more detailed information about the malfunction code. The malfunction code will be displayed intermittent.

Example:



With an interval of 1second, the display will switch between main code and sub code.

Below table gives an overview of the malfunction codes which may appear.

Malfunction code				Contents	Solution
Main code	Sub code				
	Master	Slave 1	Slave 2		
E3	01	03	05	High pressure switch was activated (S1PH) - A1P(X2A).	Check stop valve situation or abnormalities in (field) piping or airflow over air cooled coil.
	02	04	06	• Refrigerant overcharge. • Stop valve closed.	• Check refrigerant amount+recharge unit. • Open stop valve.
	13	14	15	Stop valve closed (liquid).	Open liquid stop valve.
		18		• Refrigerant overcharge. • Stop valve closed.	• Check refrigerant amount+recharge unit. • Open stop valve.
	20	21	22	High pressure switch was activated (S2PH) - A1P(X3A).	Check stop valve situation or abnormalities in (field) piping or airflow over air cooled coil.
E4	01	02	03	Low pressure malfunction : • Stop valve closed. • Refrigerant shortage. • Indoor unit malfunction.	• Open stop valve. • Check refrigerant amount+recharge unit. • Check the user interface's display or Transmission wiring between the outdoor unit and the indoor unit.
E9	01	05	08	Electronic expansion valve malfunction (main) (Y1E) - A1P(X21A).	Check connection on PCB or actuator.
	04	07	10	Electronic expansion valve malfunction (subcool) (Y2E) - A1P(X22A).	Check connection on PCB or actuator.
	26	27	28	Electronic expansion valve malfunction (refrigerant auto charge) (Y4E) - A1P(X25A).	Check connection on PCB or actuator.
F3	01	03	05	Discharge temperature too high (R21T/R22T) : • Stop valve closed. • Refrigerant shortage.	• Open stop valve. • Check refrigerant amount+recharge unit.
	20	21	22	Compressor casing temperature too high (R8T/R9T) : • Stop valve closed. • Refrigerant shortage.	• Open stop valve. • Check refrigerant amount+recharge unit.
F6		02		• Refrigerant overcharge. • Stop valve closed.	• Check refrigerant amount+recharge unit. • Open stop valve.
H9	01	02	03	Ambient temperature sensor malfunction (R1T) - A1P(X18A).	Check connection on PCB or actuator.
J3	16	22	28	Discharge temperature sensor malfunction (R21T): open circuit - A1P (X19A).	Check connection on PCB or actuator.
	17	23	29	Discharge temperature sensor malfunction (R21T): short circuit - A1P (X19A).	Check connection on PCB or actuator.
	18	24	30	Discharge temperature sensor malfunction (R22T): open circuit - A1P (X19A).	Check connection on PCB or actuator.
	19	25	31	Discharge temperature sensor malfunction (R22T): short circuit - A1P (X19A).	Check connection on PCB or actuator.
	38	42	44	Compressor casing temperature sensor malfunction (R9T): open circuit - A1P (X19A).	Check connection on PCB or actuator.
	39	43	45	Compressor casing temperature sensor malfunction (R9T): short circuit - A1P (X19A).	Check connection on PCB or actuator.
	47	49	51	Compressor casing temperature sensor malfunction (R8T): open circuit - A1P (X19A).	Check connection on PCB or actuator.
	48	50	52	Compressor casing temperature sensor malfunction (R8T): short circuit - A1P (X19A).	Check connection on PCB or actuator.
J5	01	03	05	Suction temperature sensor malfunction (R3T) - A1P (X30A).	Check connection on PCB or actuator.
J7	06	07	08	Liquid temperature sensor (after subcool HE) malfunction (R5T) - A1P (X30A).	Check connection on PCB or actuator.
J8	01	02	03	Liquid temperature sensor (coil) malfunction (R4T) - A1P (X30A).	Check connection on PCB or actuator.
J9	01	02	03	Gas temperature sensor (after subcool HE) malfunction (R6T) - A1P (X30A).	Check connection on PCB or actuator.
JA	06	08	10	High pressure sensor malfunction (S1NPH): open circuit - A1P (X32A).	Check connection on PCB or actuator.
	07	09	11	High pressure sensor malfunction (S1NPH): short circuit - A1P (X32A).	Check connection on PCB or actuator.
JC	06	08	10	Low pressure sensor malfunction (S1NPL): open circuit - A1P (X31A).	Check connection on PCB or actuator.
	07	09	11	Low pressure sensor malfunction (S1NPL): short circuit - A1P (X31A).	Check connection on PCB or actuator.
LC	14	15	16	Transmission outdoor unit - inverter: INV1 transmission trouble - A1P (X20A, X28A, X40A).	Check connection.
	19	20	21	Transmission outdoor unit - inverter: FAN1 transmission trouble - A1P (X20A, X28A, X40A).	Check connection.
	24	25	25	Transmission outdoor unit - inverter: FAN2 transmission trouble - A1P (X20A, X28A, X40A).	Check connection.
	30	31	32	Transmission outdoor unit - inverter: INV2 transmission trouble - A1P (X20A, X28A, X40A).	Check connection.

Malfunction code				Contents	Solution
Main code	Sub code				
	Master	Slave 1	Slave 2		
P1	01	02	03	INV1 unbalanced power supply voltage.	Check if power supply is within range.
	07	08	09	INV2 unbalanced power supply voltage.	Check if power supply is within range.
U2	01	08	11	INV1 voltage power shortage.	Check if power supply is within range.
	02	09	12	INV1 power phase loss.	Check if power supply is within range.
	22	25	28	INV2 voltage power shortage.	Check if power supply is within range.
	23	26	29	INV2 power phase loss.	Check if power supply is within range.
U3	02			Warning indication: Leak detection or refrigerant amount check not performed (system operation possible).	Execute system test run.
	03			Malfunction code: System test run not yet executed (system operation not possible).	Execute system test run.
	10			Malfunction code: System refrigerant auto charge run not yet executed.	Execute auto charge function (see manual).
	04			System test run abnormal ending.	Execute test run again.
U4	01			Faulty wiring to indoor - outdoor.	Check (F1/F2) wiring.
	03			Faulty indoor system.	Check indoor system transmissions wire.
U7	01			Warning: faulty wiring to Q1/Q2.	Check (Q1/Q2) wiring.
	02			Malfunction code: faulty wiring to Q1/Q2.	Check (Q1/Q2) wiring.
	11			• Too many indoor units are connected to F1/F2 line. • Bad wiring between outdoor and indoor units.	Check indoor unit amount and total capacity connected.
U9	01			• System mismatch. Wrong type of indoor units combined (R-410A, R407C, RA). • Indoor unit malfunction.	Check if other indoor units have malfunction and confirm indoor unit mix is allowed.
UA	03			Connection malfunction over indoor units or type mismatch (R-410A, R407C, RA).	Check if other indoor units have malfunction and confirm indoor unit mix is allowed.
	18			Connection malfunction over indoor units or type mismatch (R-410A, R407C, RA).	Check if other indoor units have malfunction and confirm indoor unit mix is allowed.
	31			Wrong unit combination (multi system).	Check if unit types are compatible.
	49			Wrong unit combination (multi system).	Check if unit types are compatible.
UH	01			Auto address malfunction (inconsistency).	Check if transmission wired unit amount matches with powered unit amount (by monitor mode) or wait till initialization is finished.
UF	01			Auto address malfunction (inconsistency).	Check if transmission wired unit amount matches with powered unit amount (by monitor mode) or wait till initialization is finished.
	05			Stop valve closed or wrong (during system test run).	Open stop valves.

INFORMATION

References can be found on the wiring diagram.

Information code	Contents	Solution
Main code		
Leak detection function related.		
E-1	Unit is not prepared to execute leak detection operation.	Refer to requirements to be able to execute leak detection operation.
E-2	Indoor unit is out of temperature range for leak detection operation.	Retry when ambient conditions are satisfied.
E-3	Outdoor unit is out of temperature range for leak detection operation.	Retry when ambient conditions are satisfied.
E-4	Too low pressure was noticed during leak detection operation	Restart leak detection operation.
E-5	Indicates an indoor unit which is not compatible with leak detection functionality is installed.	Refer to requirements to be able to execute leak detection operation.
Auto charging related.		
P2	Unusual low pressure on suction line.	Close valve C immediately. Push BS3 to reset. Check following items before retrying auto charge procedure: • Check if the gas side stop valve is opened correctly. • Check if the valve of the refrigerant cylinder is opened. • Check if the air inlet and outlet of the indoor unit are not obstructed.
P8	Freeze-up prevention indoor unit.	Close valve C immediately. Push BS3 to reset. Retry auto charge procedure.
PE	Automatic charging nearly finished.	Prepare for auto charge stopping.
P9	Automatic charging finished.	Finish auto charge mode.

17. Operation of the unit

Once the unit is installed and test operation of outdoor unit and indoor units is finished, the operation of the system can start.

For operating the indoor unit, the user interface of the indoor unit should be switched ON. Refer to the indoor unit operation manual for more details.

18. Caution for refrigerant leaks

18.1 Introduction

The installer and system specialist shall secure safety against leakage according to local regulations or standards. The following standards may be applicable if local regulations are not available.

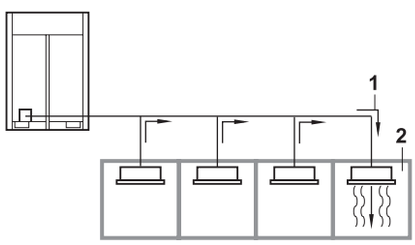
This system uses R-410A as refrigerant. R-410A itself is an entirely safe non-toxic, non-combustible refrigerant. Nevertheless care must be taken to ensure that air conditioning facilities are installed in a room which is sufficiently large. This assures that the maximum concentration level of refrigerant gas is not exceeded, in the unlikely event of major leak in the system and this in accordance to the local applicable regulations and standards.

18.2 Maximum concentration level

The maximum charge of refrigerant and the calculation of the maximum concentration of refrigerant is directly related to the humanly occupied space in to which it could leak.

The unit of measurement of the concentration is kg/m ^{3} (the weight in kg of the refrigerant gas in 1m ^{3} volume of the occupied space).

Compliance to the local applicable regulations and standards for the maximum allowable concentration level is required.



1 Direction of the refrigerant flow
2 Room where refrigerant leak has occurred (outflow of all the refrigerant from the system)

Pay special attention to places, such as basements etc., where refrigerant can stay, since refrigerant is heavier than air.

18.3 Procedure for checking maximum concentration

Check the maximum concentration level in accordance with steps 1 to 4 below and take whatever action is necessary to comply.

1 Calculate the amount of refrigerant (kg) charged to each system separately.

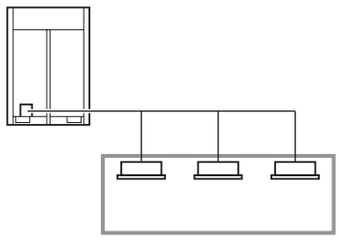
Amount of refrigerant in a single unit system (amount of refrigerant with which the system is charged before leaving the factory)	+	Additional charging amount (amount of refrigerant added locally in accordance with the length or diameter of the refrigerant piping)	=	Total amount of refrigerant (kg) in the system

NOTICE

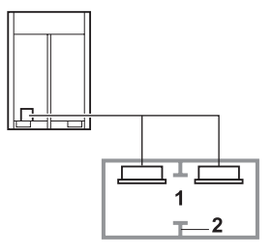
Where a single refrigerant facility is divided into 2 entirely independent refrigerant systems, use the amount of refrigerant with which each separate system is charged.

2 Calculate the volume of the room (m ^{3}) where the indoor unit is installed.
In a case such as the following, calculate the volume of (A), (B) as a single room or as the smallest room.

A Where there are no smaller room divisions:



B Where there is a room division, but there is an opening between the rooms sufficiently large to permit a free flow of air back and forth.



1 Opening between the rooms
2 Partition
(Where there is an opening without a door or where there are openings above and below the door which are each equivalent in size to 0.15% or more of the floor area.)

3 Calculating the refrigerant density using the results of the calculations in steps 1 and 2 above.

$$\frac{\text{Total volume of refrigerant in the refrigerant system}}{\text{Size (m}^3\text{) of smallest room in which there is an indoor unit installed}} \leq \text{Maximum concentration level (kg/m}^3\text{)}$$

If the result of the above calculation exceeds the maximum concentration level, a ventilation opening to the adjacent room shall be made.

4 After opening to the adjacent room are made, re-calculate.
If result of calculation exceeds the maximum concentration level. Room re-modified are required, please contact your dealer.

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3P508501-9F