



**TRANE®**

# **INSTALLATION      MANUAL**

---

---

All DC Inverter TVR 6G Series Outdoor Unit

Thank you very much for purchasing our air conditioner.  
Before using it, please read this manual carefully and keep it for future reference.



## CONTENTS

## PAGE

PRECAUTIONS.....	1
CONSTRUCTION CHECKPOINTS.....	2
ACCESSORIES.....	3
OUTDOOR UNIT INSTALLATION.....	3
REFRIGERANT PIPE.....	14
ELECTRICAL WIRING.....	21
COMMISSIONING.....	29

## 1. PRECAUTIONS

- This Installation manual is used for the outdoor unit.
- Please refer to the indoor unit installation manual to install indoor units.
- Please refer to the refrigerant branch pipe installation manual to install the refrigerant branch pipes.
- To gain full advantage of the unit's functions and to avoid malfunction due to mishandling, we recommend that you read this instruction manual carefully before use.

The precautions described herein are classified as WARNING and CAUTION. They both contain important information regarding safety. Be sure to observe all precautions without fail.



### 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.

After reading, keep this manual in convenient place so that you can refer to it whenever necessary. If the equipment is transferred to a new user, be sure also to hand over the manual.



### WARNING

- This unit should only be installed by a professional air conditioning installation engineer. Incorrect installation can cause electric shock, fire or leakage of water. Contact your dealer for installation.

- Follow these installation instructions strictly. Incorrect installation may cause water leaks or electrical fires.
- When installing the unit in a small room, keep the refrigerant concentration from exceeding allowable safety limits in case it leaks. Contact the place of purchase for more information. Excessive refrigerant in a closed ambient environment can lead to oxygen deficiency.
- Use the attached accessories and specified parts for installation. Otherwise, the unit may fall or leak or cause an electrical fire.
- Install in a robust location that can withstand the set's weight. Otherwise, the unit may fall and cause injury.
- The appliance must be installed in accordance with national wiring regulations
- The appliance must not be installed in laundry areas
- Before accessing the terminals, all supply circuits must be disconnected.
- The appliance must be positioned so that the plug is accessible.
- The enclosure of the appliance must be marked by word or symbols and include the direction of the fluid flow.
- For electrical work, follow the local national wiring standards, regulations, and these installation instructions. An independent circuit and single outlet must be used. If the electrical circuit capacity is not enough or a defect in the electrics exists, an electrical fire may result.
- Use the specified cable, connect it tightly and clamp it so that no external force can act on the terminal. If connection or fixing is imperfect, the unit may heat up or a fire may occur at the connection point.
- The wiring route must be properly arranged so that control board cover is fixed properly. If the control board cover is not fixed perfectly, the unit may heat up at the connection point of the terminal or a fire or electric shock may result.
- If the supply cord is damaged, it must be replaced by the manufacturer, a service agent, or a similarly qualified person so as to avoid a hazard.
- An all-pole disconnection device with at least 3 mm separation distance between all poles and a residual current device (RCD) with a rating above 10 mA must be incorporated into the fixed wiring according to national regulations.
- Carry out the specified installation work after considering strong winds, typhoons, and earthquakes. Improper installation may result in the equipment falling or accidents.
- The temperature of the refrigerant circuit will be high, so please keep the interconnection cable away from the copper tube.
- The power cord type designation is H07RN-F. Equipment must comply with IEC 61000-3-12.
- If the refrigerant leaks during installation, ventilate the area immediately.



## CAUTION

- This A/C is an amenity unit. Do not install it in places containing machines, precise instrument, food, plant, animal, artwork, or any area designated for another use.
- Ground the air conditioner.  
Do not connect the ground wire to gas or water pipes, lightning rods, or a telephone ground wire. Incomplete grounding may result in electric shocks.
- Install an earth leakage breaker.  
Failure to do so may result in electric shocks.
- Connect the outdoor unit wires, and then connect the indoor unit wires.  
Do not connect the air conditioner to the power source until the wiring and piping is completed.
- Install the drainage pipe to ensure proper drainage and insulate it to prevent condensation.  
Improper drain piping may result in water leaks and property damage.
- Install the indoor and outdoor units, power supply wiring, and connecting wires at least 1 meter away from televisions or radios to prevent interference or noise.  
Depending on the radio waves, 1 meter may not be sufficient to eliminate the noise.
- **The appliance is not intended for use by young children or the elderly without supervision.**
- **Young children should be supervised to ensure that they do not play with the appliance.**
- **Do not install the air conditioner in areas that contain:**
  - Petroleum.
  - Salty air (near the coast). (Except for corrosion-resistant models)
  - Caustic gas (e.g., sulfide) in the air (near a hot spring).
  - Voltage that vibrates significantly.
  - In buses or cabinets.
  - In kitchens full of vapor from cooking oil
  - Strong electromagnetic waves.
  - Flammable materials or gas.
  - Acid or alkaline liquid that evaporates.
  - Other special conditions.
- **The insulation of the metal parts of the building and the air conditioner should comply with the National Electric Standard.**







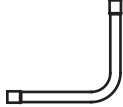


## 2. CONSTRUCTION CHECKPOINTS

- Acceptance and Unpacking
  - After the machine arrives, check whether it is damaged. If the surface or inner side of the machine is damaged, submit a written report to the shipping company.
  - Check whether the model, specifications, and quantity of the equipment complies with the contract.
  - After removing the outer packaging, store the operating instructions and count the accessories.
- Refrigerant pipe
  - Check the model and name to avoid installation mistakes.
  - An additionally purchased refrigerant branch pipes (branch joints and branch pipes) must be used to install the refrigerant pipes.
  - The refrigerant pipes must be the specified diameter. Nitrogen at a certain pressure must be filled into the refrigerant pipe before welding.
  - The refrigerant pipes must undergo heat insulation treatment.
  - After the refrigerant pipe is installed completely, the outdoor unit stop valves cannot be open before performing the airtight test and creating a vacuum. The gas-side and liquid-side pipes must undergo the gastightness test and vacuum drying.
  - Gastightness test  
The refrigerant pipes must undergo the gastightness test.
- Vacuum drying  
Use the vacuum pump to create a vacuum drying in the connection pipe at the gas side and liquid side concurrently.
- Charging refrigerant  
The additional refrigerant charge required depends on the lengths and diameters of the outdoor and indoor liquid pipes
- Electrical wiring
  - For outdoor unit power wire sizing and circuit breaker sizing, refer to "Outdoor units electrical characteristics" table in this manual.
  - To prevent misoperation of the air conditioner, do not interleave or entwine the power wire with the communication wires of the indoor/outdoor unit.
- Power on the indoor unit after performing the gastightness test and vacuum drying.
- Trial run
  - Before operation, remove the six pieces of PE foaming at the rear of the unit that protect the condenser. Be careful not to damage the fin, or the heat exchange performance may be affected.
  - Perform the trial run only after the outdoor unit has been powered on for over 12 hours.



### 3. ACCESSORIES

Table.3-1

Name	All units	Outline	Function
Outdoor unit installation manual	1		_____
Outdoor unit owner's manual	1		_____
Indoor unit owner's manual	2		_____
Erp information	1		_____
Screw bag (accessory)	1	_____	For maintenance
Flat-blade screwdriver	1	_____	Adjusting indoor and outdoor unit dial switches
90° elbow	1		For connecting pipes
Seal plug	8		Used in pipe flushing
Connection pipe	2		For connecting pipes
Matched resistor	2		Enhances communication stability
Wrench	1		Removing side plate

### 4. OUTDOOR UNIT INSTALLATION

#### 4.1 Outdoor unit combinations



#### CAUTION

- When all indoor units in the system are operating simultaneously, the total capacity of the indoor units should be less than or equal to the combined capacity of the outdoor units. Otherwise the cooling / heating effect was affected.
- When all indoor units in the system are not operating simultaneously, the maximum total capacity of the indoor units can 130% of the combined capacity of the outdoor units.
- If the system is used in cold environment (ambient temperature under -10°C) or in a high-heat overload scenario, the total capacity of the indoor units should be less than the combined capacity of the outdoor units.

Table 4-1

HP \ HP	8	10	12	14	16	18	20	22	24	26	28	30	32	Max Qty. of indoor units
8	•													13
10		•												16
12			•											20
14				•										23
16					•									26
18						•								29
20							•							33
22								•						36
24									•					39
26										•				43
28											•			46
30												•		50
32													•	53
34			•					•						56
36				•				•						59
38					•			•						63
40			•								•			64
42							•	•						64
44								••						64
46								•	•					64
48								•		•				64
50								•			•			64
52										••	•			64
54										•	•			64
56											••			64
58											•	•		64
60											•		•	64
62												•	•	64
64													••	64
66			•					•					•	64
68				•				•					•	64
70					•			•					•	64
72			•								•		•	64
74							•	•					•	64
76								••					•	64
78								•	•				•	64
80								•		•			•	64
82								•			•		•	64
84										••	•		•	64
86										•	•		•	64
88											••		•	64
90											•	•	•	64
92											•		••	64
94												•	••	64
96													•••	64

4.2 Dimension of outdoor unit

The figure shown above is for reference only and may be slightly different from the actual product.

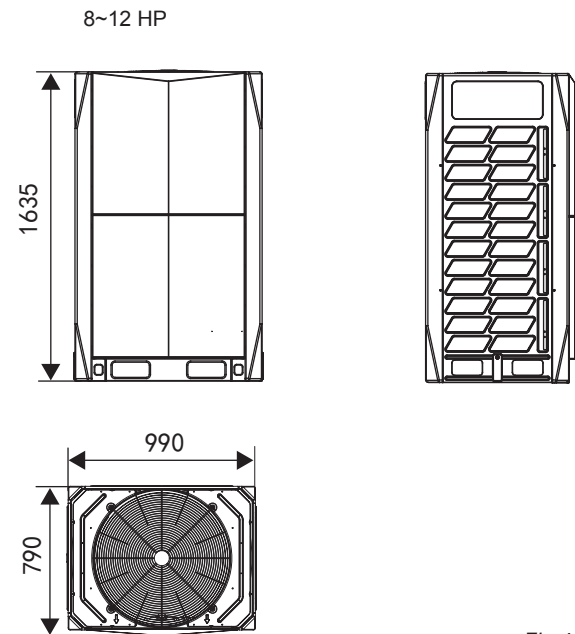


Fig.4-1

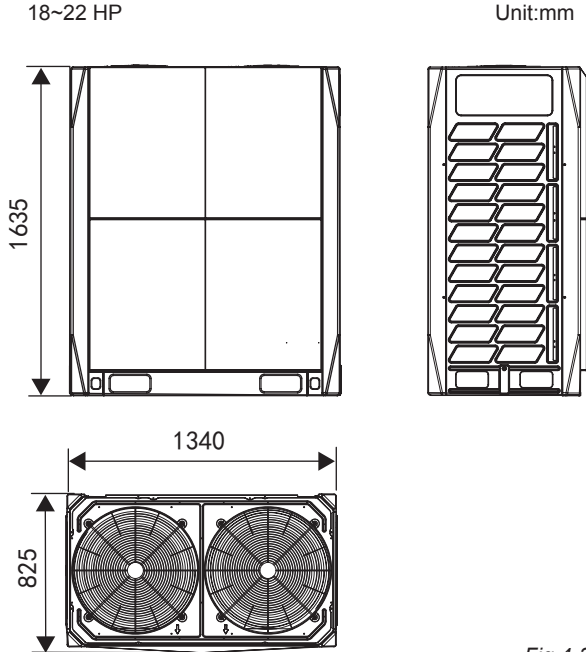


Fig.4-3

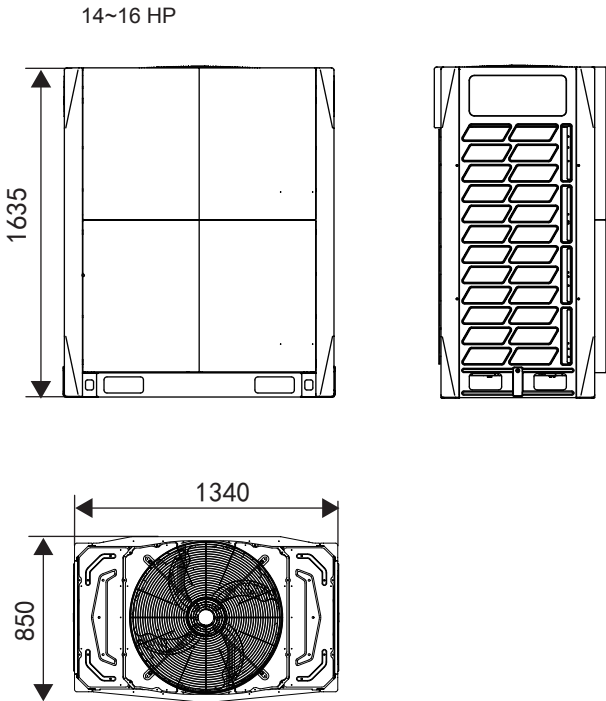


Fig.4-2

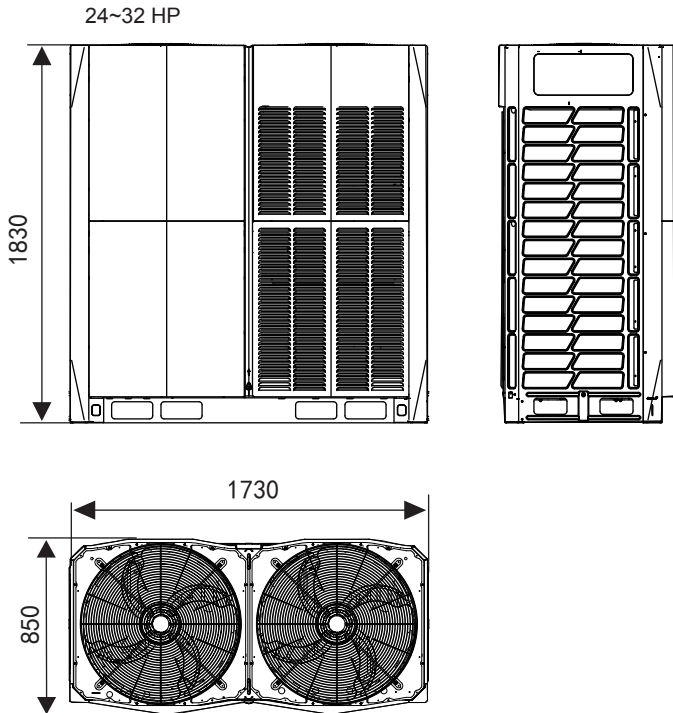


Fig.4-4

Connection piping dimensions (unit: mm)

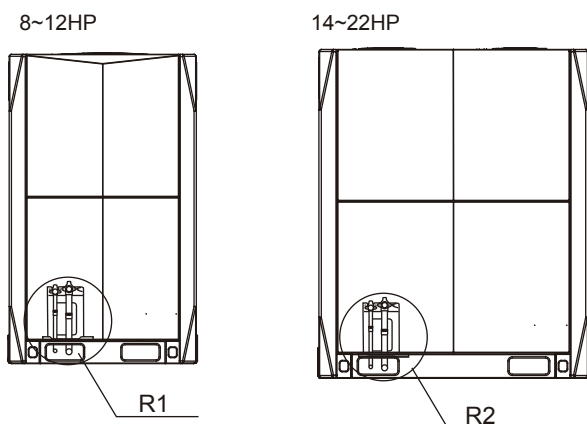


Fig. 4-5

Fig. 4-6

24~32HP

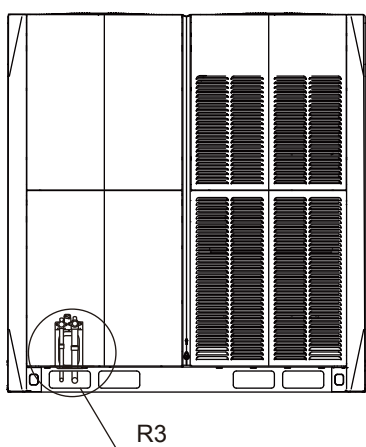


Fig. 4-7

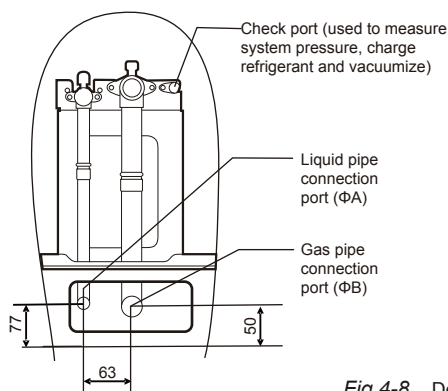


Fig. 4-8 Detail R1, R2

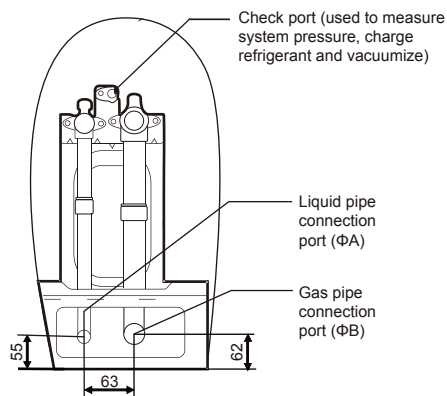


Fig. 4-9 Detail R3

Table 4-2

Unit: mm

HP	8-10	12	14-16	18-24	26-28	30-32
SIZE						
ΦA	12.7	15.9	15.9	19.1	22.2	22.2
ΦB	25.4	28.6	31.8	31.8	31.8	38.1

### 4.3 Unit placement and installation

Placement of outdoor units should take account of the following considerations:

- Air conditioners should not be exposed to direct radiation from a high-temperature heat source.
- Air conditioners should not be installed in positions where dust or dirt may affect heat exchangers.
- Air conditioners should not be installed in locations where exposure to oil or to corrosive or harmful gases, such as acidic or alkaline gases, may occur.
- Air conditioners should not be installed in locations where exposure to salinity may occur unless the anti-corrosion treatment for high-salinity areas customization option has been added.
- Outdoor units should be installed in well-drained, well-ventilated positions that are as close as possible to the indoor units.

### 4.4 Master and slave unit positioning

In systems with multiple outdoor units, the units should be placed in order from largest capacity unit to smallest capacity unit. The largest capacity unit must be placed on the first branch, and be set as the master unit, while the others should be set as slave units.

The example in Figure 4-10 illustrates the placing of units in a 66HP combination:

- Place the 32HP unit on the first branch and set it as the master unit.
- Place the 22HP and 12HP units on the next branches and set them as slave units.

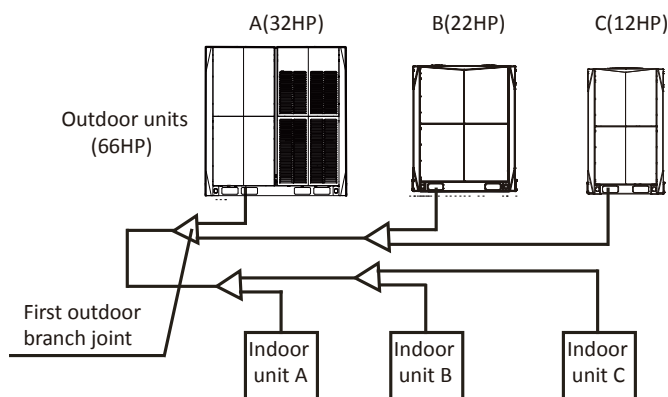


Fig. 4-10

4.5 Base structures

Outdoor unit base structure design should take account of the following considerations:

- A solid base prevents excess vibration and noise. Outdoor unit bases should be constructed on solid ground or on structures of sufficient strength to support the units' weight.
- Bases should be at least 200mm high to provide sufficient access for installation of piping.
- Either steel or concrete bases may be suitable.
- A typical concrete base design is shown in Figure 4-11. A typical concrete specification is 1 part cement, 2 parts sand and 4 parts crushed stone with  $\Phi 10$ mm steel reinforcing bar. The edges of the base should be chamfered.
- To ensure that all contact points are equally secure, bases should be completely level. Base design should ensure that the points on the units' bases designed for weight-bearing support are fully supported. Bolt spacings should be as per Figure 4-12 and Table 4-3.
- A drainage ditch should be provided to allow drainage of condensate that may form on the heat exchangers when the units are running in heating mode. The drainage should ensure that condensate is directed away from roadways and footpaths, especially in locations where the climate is such that condensate may freeze.

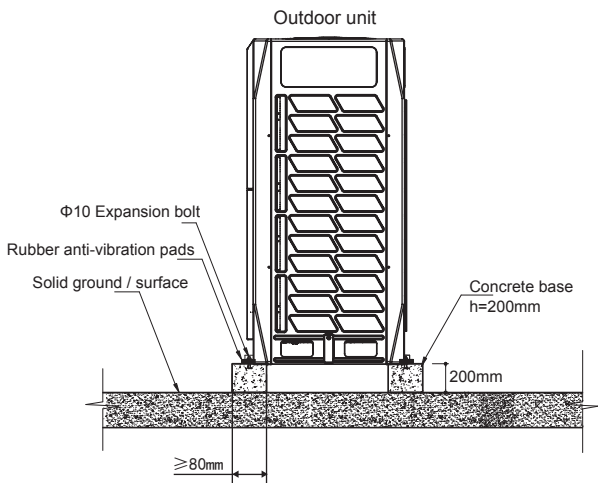


Fig.4-11

Expansion bolt positioning (Unit: mm)

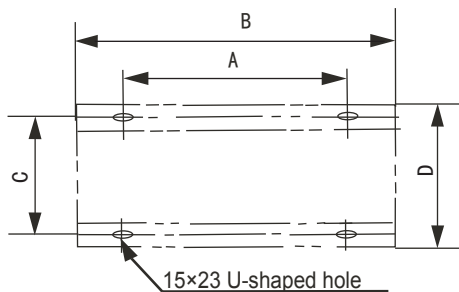


Fig.4-12

Table.4-3

Unit: mm

HP SIZE	8, 10, 12	14, 16, 18, 20, 22	24, 26, 28, 30, 32
A	740	1090	1480
B	990	1340	1730
C	723	723	723
D	790	790	790

4.6 Installation space requirements

Ensure enough space for maintenance. The units in the same system must be at the same height, refer to Fig.4-13.

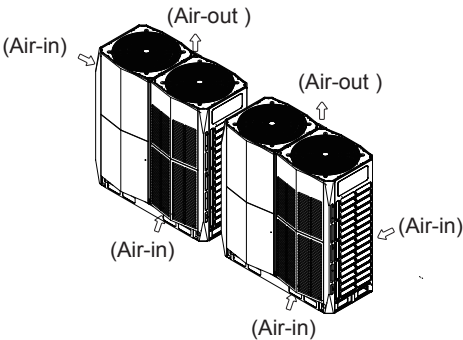


Fig.4-13

Outdoor units must be spaced such that sufficient air may flow through each unit. Sufficient airflow across heat exchangers is essential for outdoor units to function properly. Figures 4-14 to 4-15 show spacing requirements in different scenarios.

- For single row installation

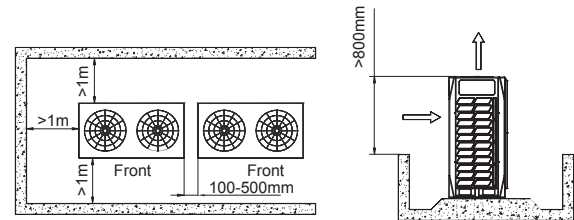


Fig.4-14

- For multi-row installation

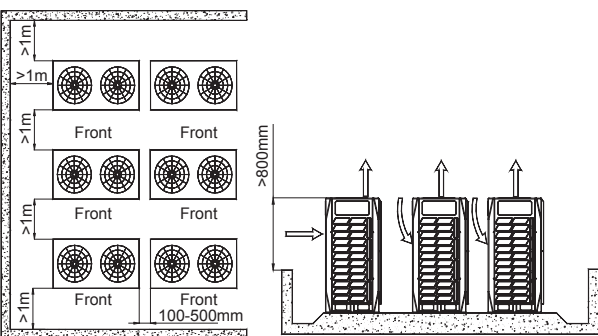


Fig.4-15

If obstacles are around the outdoor unit, they must be 800mm below the top of the outdoor unit. Otherwise, an mechanical exhaust device must be added.

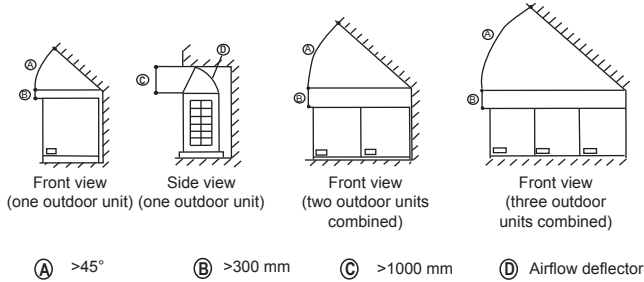


Fig. 4-16

If the particular circumstances of an installation require a unit to be placed closer to a wall. Depending on the height of adjacent walls relative to the height of the units, ducting may be required to ensure proper air discharge. In the situation depicted in Figure 4-17, the vertical section of ducting should be at least H-h high. If the outdoor unit needs ducting and the static pressure is more than 20Pa, the units should be customized for the corresponding static pressure.

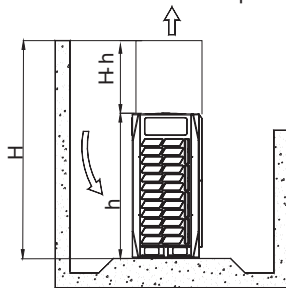


Fig. 4-17

## 4.7 Outdoor unit ducting

Outdoor unit ducting design should take account of the following:

- Before installing outdoor unit ducting, be sure to remove the unit's steel mesh cover, otherwise airflow will be adversely affected.
- Each duct should contain no more than one bend.
- Vibration isolation should be added to the connection between the unit and the ducting to avoid vibration/noise.
- Installing louvers is required as doing for safety, they should be installed at an angle no greater than  $15^\circ$  to the horizontal, to minimize the impact on airflow.
- If more than one outdoor units need ducting, each outdoor unit should has independent ducting, it cannot share one ducting for more than one outdoor units.

### Ducting for 8-12HP

Option A – Transverse ducting

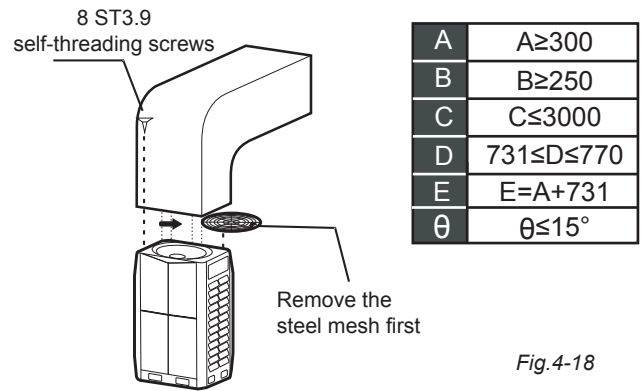
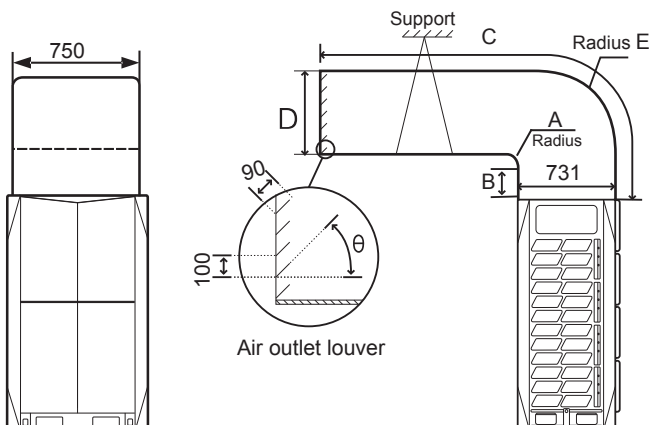


Fig. 4-18

Option B – Longitudinal ducting

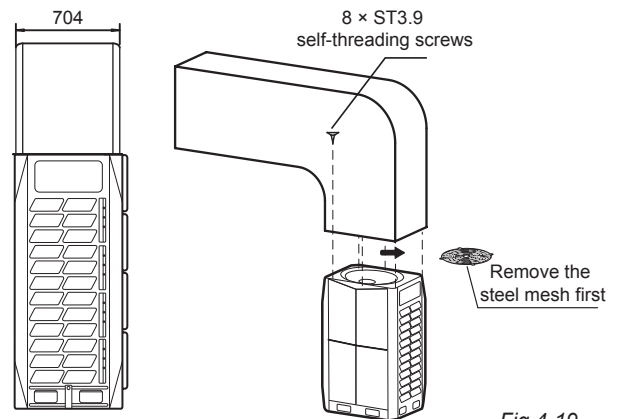
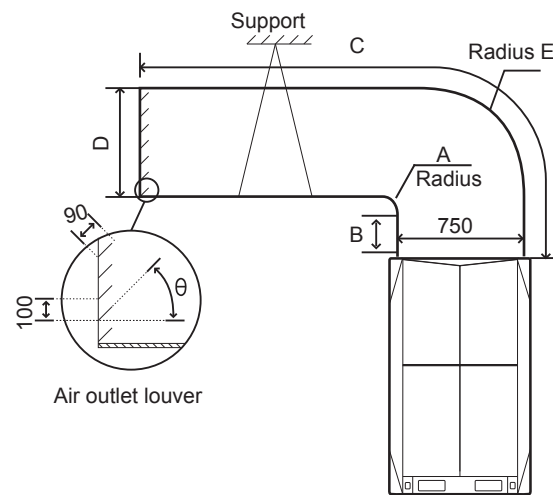


Fig. 4-19

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$D \geq 750$
E	$E = A + 750$
$\theta$	$\theta \leq 15^\circ$

Static pressure	Remark
0 Pa	Factory default
0-20 Pa	Remove steel mesh and connect to duct < 3m long
Above 20 Pa	Customization option

## Ducting for 14-16HP

### Option A – Transverse ducting

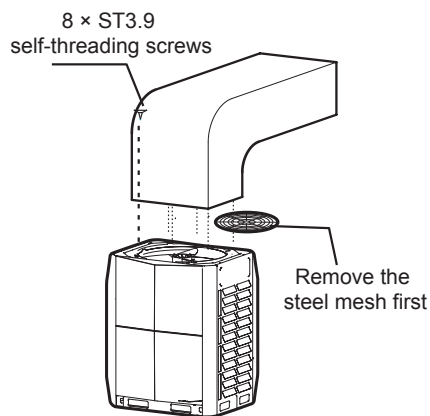
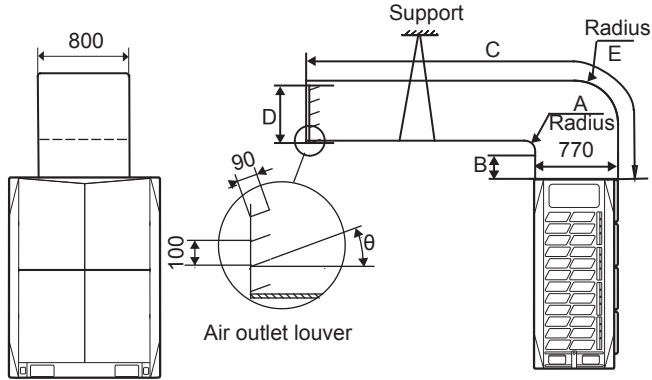


Fig.4-20

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$770 \leq D \leq 800$
E	$E = A + 770$
$\theta$	$\theta \leq 15^\circ$

### Option B – Longitudinal ducting

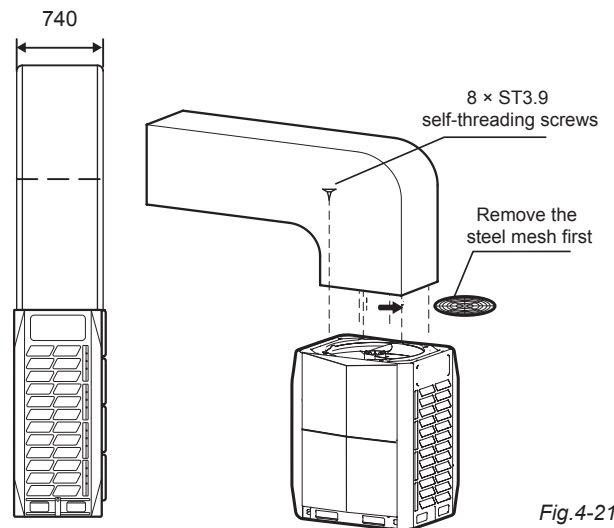
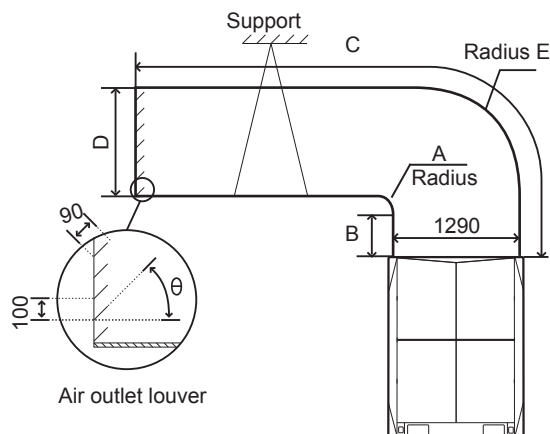


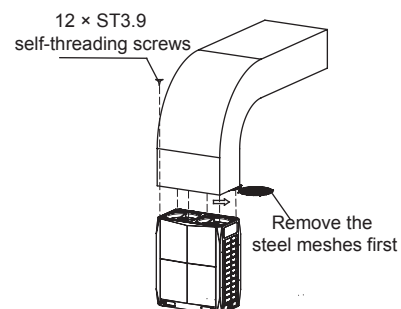
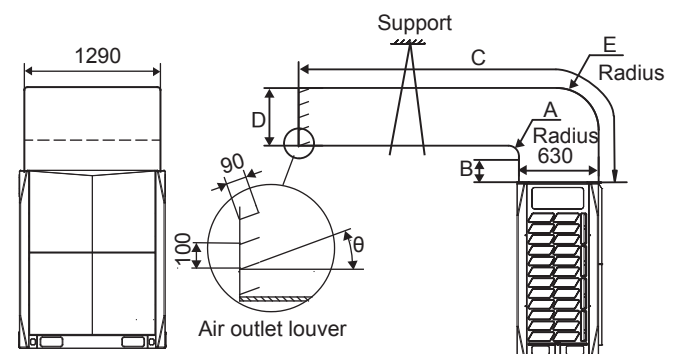
Fig.4-21

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$D \geq 1290$
E	$E = A + 1290$
$\theta$	$\theta \leq 15^\circ$

Static pressure	Remark
0 Pa	Factory default
0-20 Pa	Remove steel mesh and connect to duct < 3m long
Above 20 Pa	Customization option

## Ducting for 18-22HP

### Option A – Transverse ducting



A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$630 \leq D \leq 660$
E	$E = A + 630$
$\theta$	$\theta \leq 15^\circ$

Fig.4-22

Option B – Longitudinal ducting

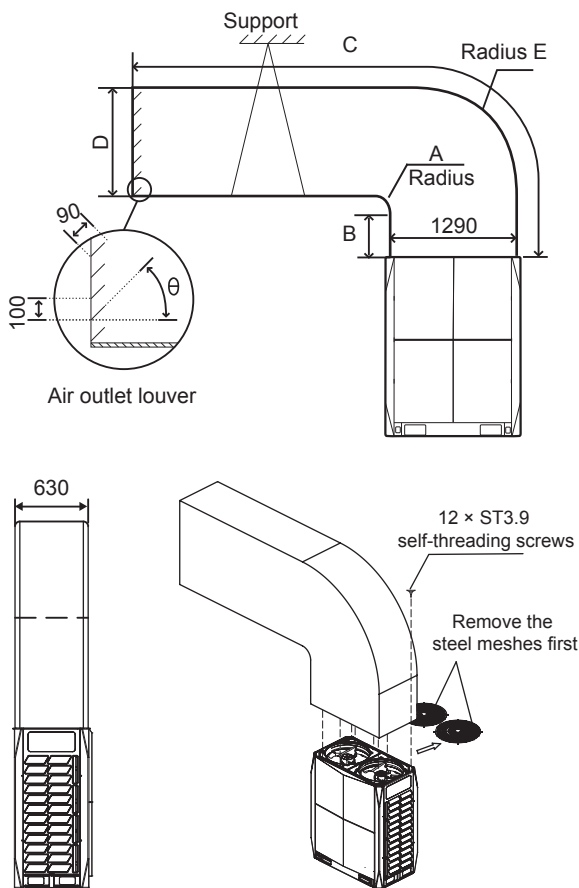


Fig.4-23

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$D \geq 1290$
E	$E = A + 1290$
$\theta$	$\theta \leq 15^\circ$

Static pressure	Remark
0 Pa	Factory default
0-20 Pa	Remove steel mesh and connect to duct < 3m long
Above 20 Pa	Customization option

Ducting for 24-32HP

Transverse ducting only

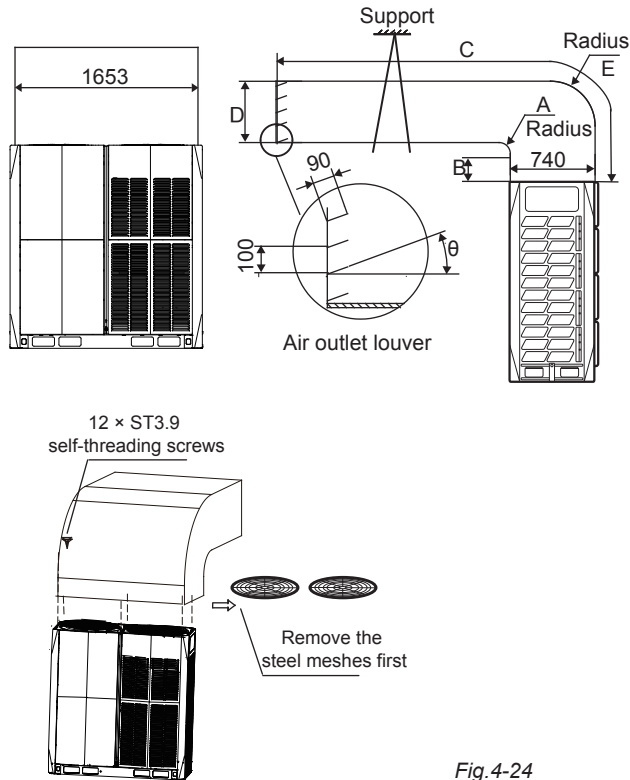


Fig.4-24

A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$740 \leq D \leq 770$
E	$E = A + 740$
$\theta$	$\theta \leq 15^\circ$

Static pressure	Remark
0 Pa	Factory default
0-20 Pa	Remove steel mesh and connect to duct < 3m long
Above 20 Pa	Customization option



## Fan performance

The default external static pressure of outdoor units' air outlets is zero. With the steel mesh cover removed the external static pressure is 20Pa.

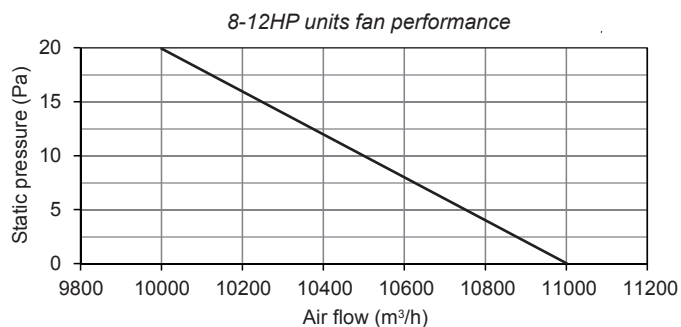


Fig.4-25

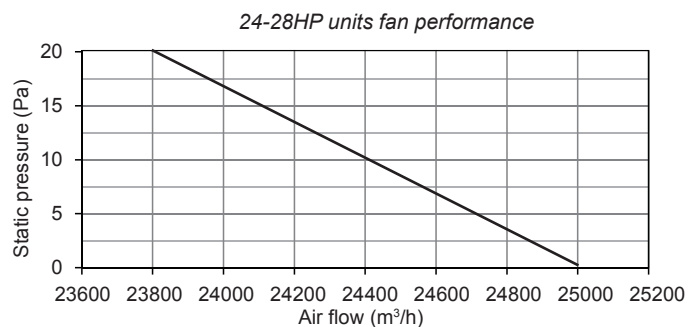


Fig.4-28

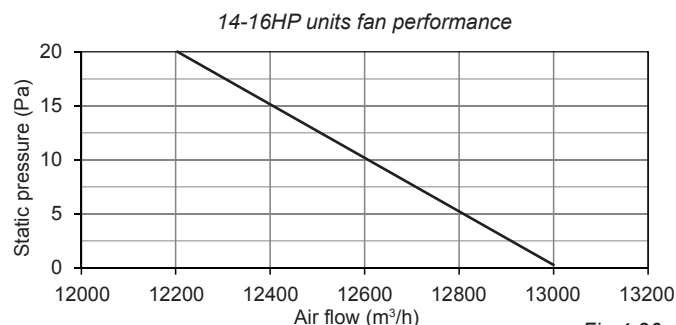


Fig.4-26

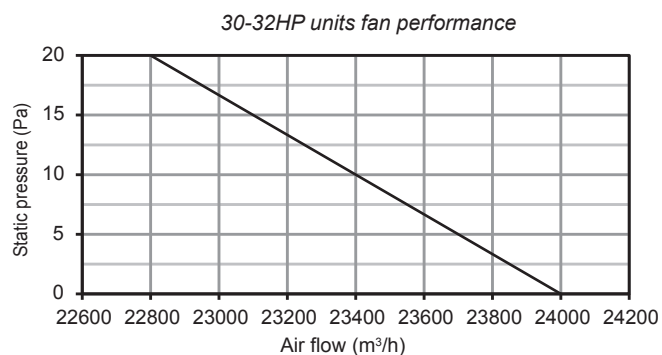


Fig.4-29

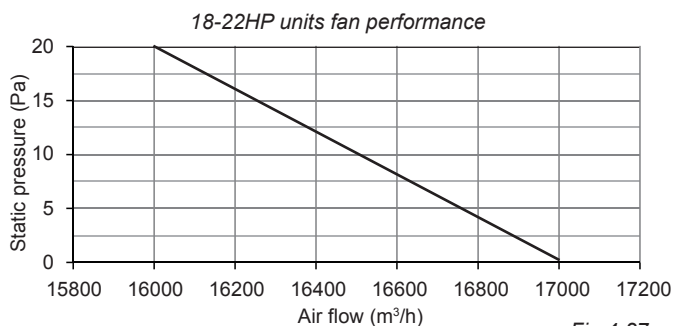


Fig.4-27

## 4.8 Snow shielding

In areas of high snowfall, snow shields should be installed on air inlets and outlets to prevent snow from entering the units. Additionally, the height of the base structures should be increased so as to raise the units further off the ground.

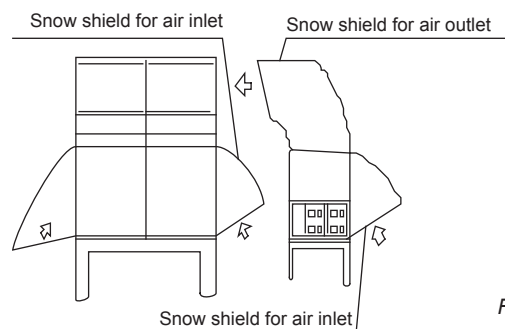


Fig.4-30

## 4.9 Panel dismantling

1. 8HP-22HP: Dismantle the left and right pillars: Remove the 4 screws from the left and right pillars. (Fig.4-31). Rotate both and then lift them 2 mm (Fig. 4-32) to remove them; 24HP-32HP: Dismantle the left, right, and middle pillars: Remove the 6 screws from the left and right pillars. (Fig. 4-31). (Fig. 4-32) to remove them; 24HP-32HP: Dismantle the left, right, and middle pillars: Remove the 6 screws from the left and right pillars. (Fig. 4-31).
2. Dismantle the upper panel: Remove 4 screws (8HP-22HP) or 6 screws (24HP-32HP) from the upper panel on left and right sides (Fig. 4-31 ). Dismantle the upper panel: Remove 4 screws (8HP-22HP) or 6 screws (24HP-32HP) from the upper panel on left and right sides (Fig. 4-31 and Fig.4-32). Then lift the panel 3mm to remove it.
3. Dismantle the lower panel: Remove 4 screws (8HP-22HP) or 6 screws (24HP-32HP) from the lower panel on left and right sides (Fig. 4-31 and Fig.4-32) and then lift the panel 3 mm to remove it.

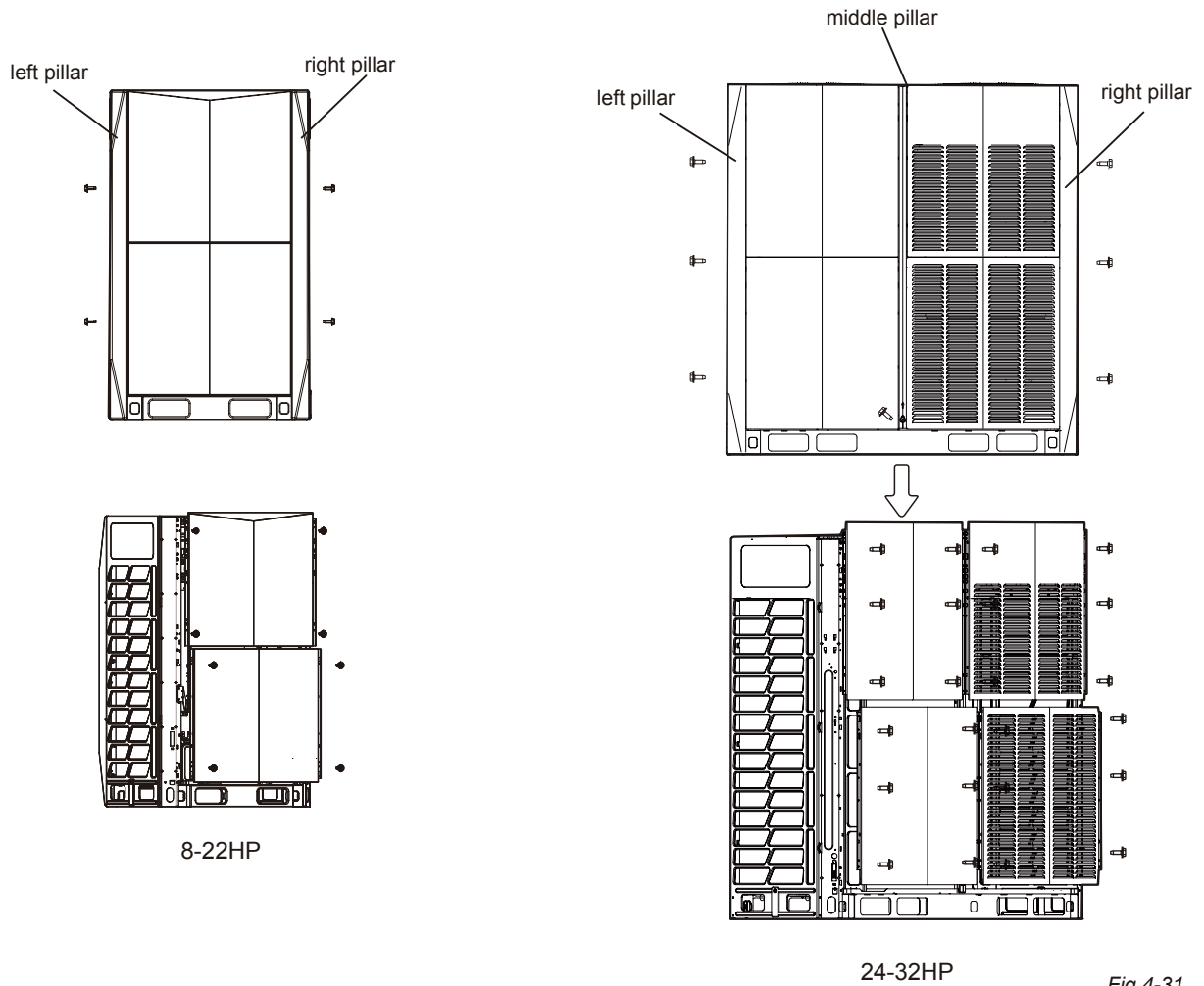


Fig.4-31

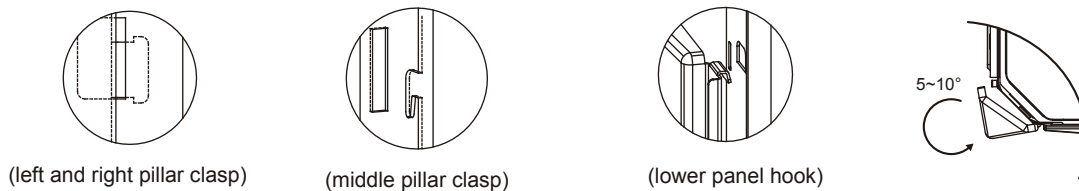
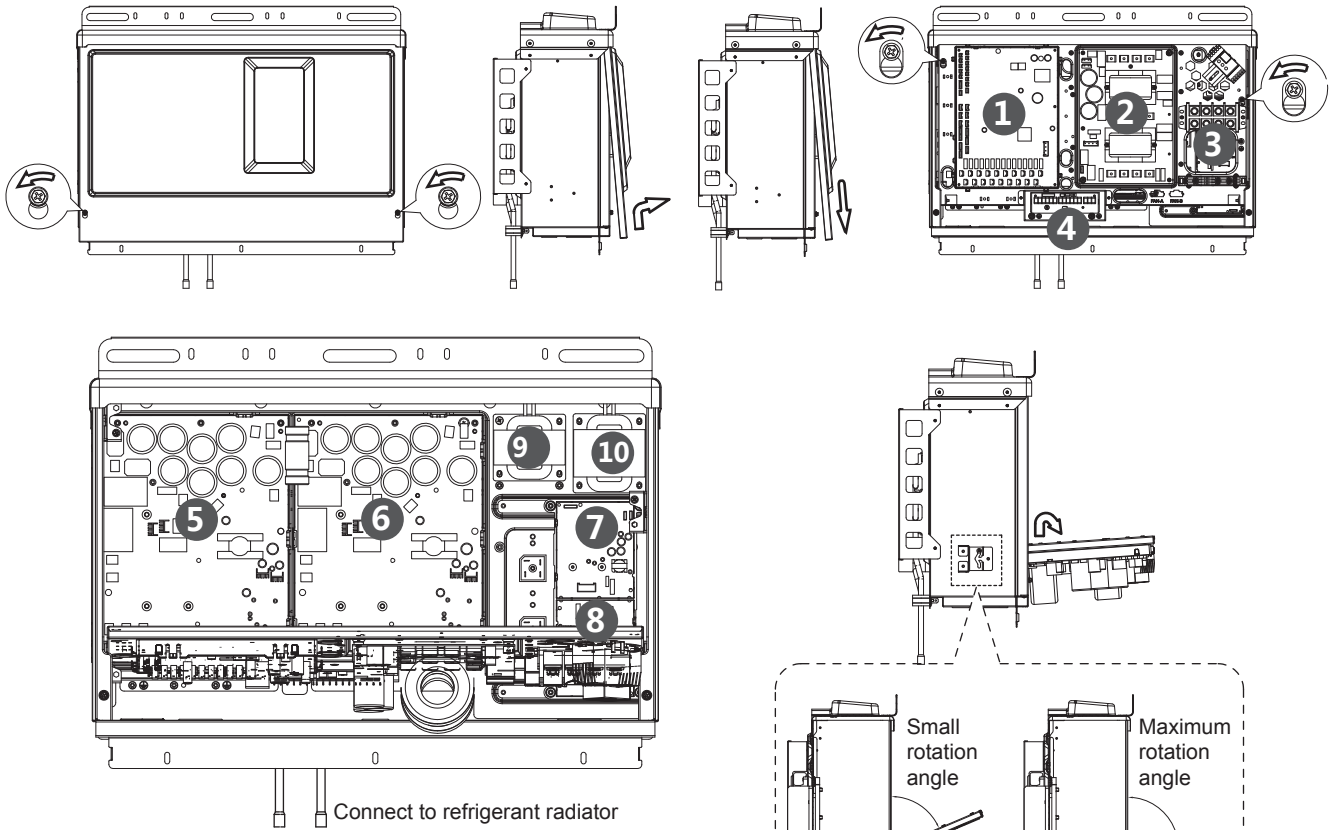


Fig.4-32

## 4.9 Disassembly of electric control box

1. Remove the cover of electric control box: (1) Loosen the two screws (by turning counter-clockwise for 1 to 3 turns) from the cover of the electric control box; (2) lift the cover up for 7 to 8 mm, and then turn it outward for 10 to 20 mm; (3) slide down the cover to remove it.
2. Open and rotate the partition plate in between: (1) Loosen the two screws (by turning counter-clockwise for 1 to 3 turns) from the partition plate in between; (2) lift the partition plate up for 4 to 6 mm, and then turn it outward to open the partition plate; (3) slide the hinge (which can slide up and down along a sliding slot) at the bottom of the partition plate to the uppermost position, to fully rotate the partition plate.



- (1) Main PCB
- (2) Power supply filter board
- (3) Power supply terminals
- (4) Communication terminals block
- (5) Compressor inverter module A
- (6) Compressor inverter module B
- (7) Fan module A
- (8) Fan module B
- (9) Reactor A
- (10) Reactor B



### CAUTION

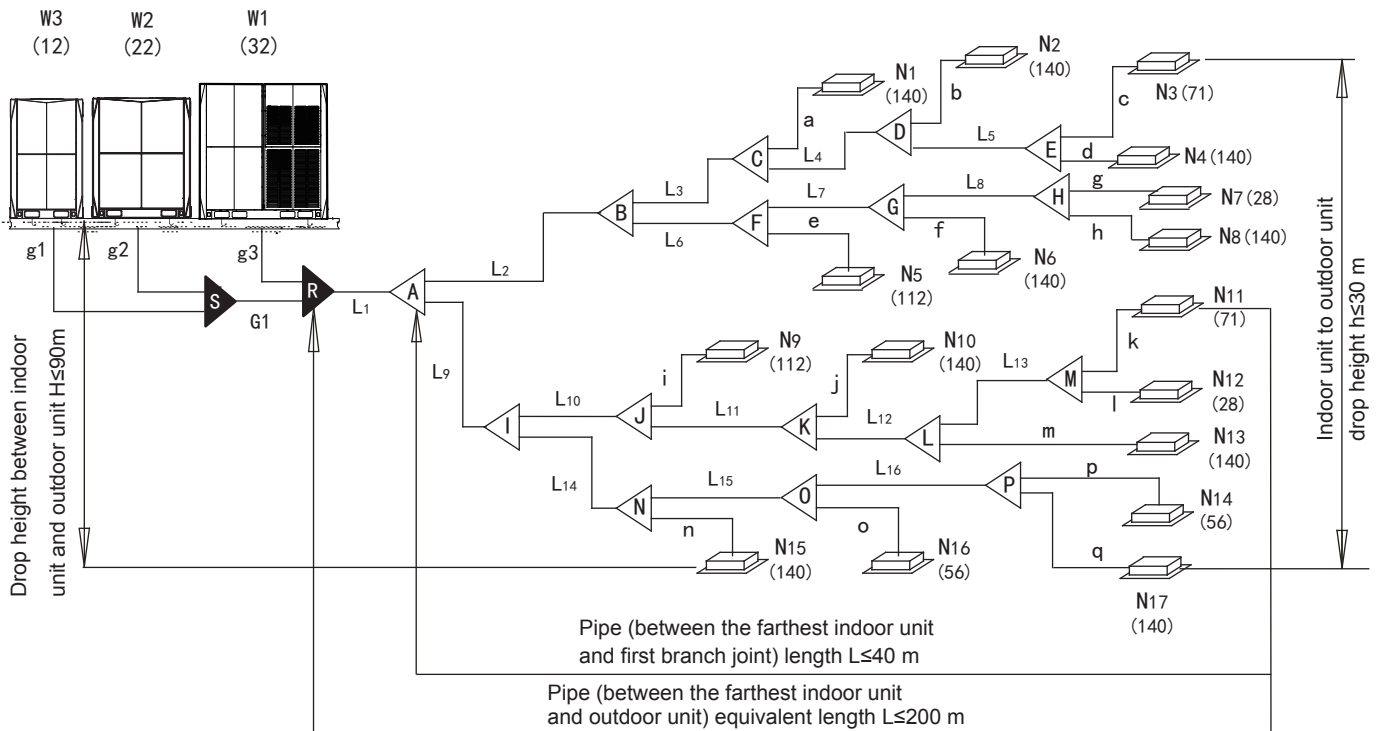
1. Disconnect power from the electric control box before performing installation or maintenance on it!
2. To remove the entire electric control box, firstly discharge the refrigerant from the system, disconnect the pipe connecting the refrigerant radiator at the bottom of the electric control box, and remove all cables connecting the electric control box and the internal components of air conditioner.
3. Product images are for illustrative purposes only and may differ from the actual product due to the model and upgrade.

## 5. REFRIGERANT PIPE

### 5.1 Length and drop height permitted of the refrigerant piping

Table.5-1

			Permitted value	Piping(refer to Fig.5-1)
Pipe length	Total pipe length (Total extended length)		1000m (Please refer to the caution 5 of conditions 2)	$L_1 + (L_2 + L_3 + L_4 + L_5 + L_6 + L_7 + L_8 + L_9 + L_{10} + L_{11} + L_{12} + L_{13} + L_{14} + L_{15} + L_{16}) \times 2 + a + b + c + d + e + f + g + h + i + j + k + l + m + n + o + p + q$
	Maximum piping (L)	Actual length	175m	$L_1 + L_9 + L_{10} + L_{11} + L_{12} + L_{13} + k$ (Pipe diameter requirements, please refers to table. 5-4 or 5-5)
		Equivalent length	200m (Please refer to caution 1)	
	Pipe(between the farthest indoor unit and first branch joint) length		40/90*m (Please refer to caution 5)	$L_9 + L_{10} + L_{11} + L_{12} + L_{13} + k$
Drop height	Indoor unit-outdoor unit drop height	Outdoor unit up	90m	(Please refer to caution 3)
		Outdoor unit down	110m	(Please refer to caution 4)
	Indoor unit to indoor unit drop height		30m	_____



\*1. Level differences cannot be above 90 m unless customization is requested (if the outdoor unit is above the indoor unit).

Fig.5-1

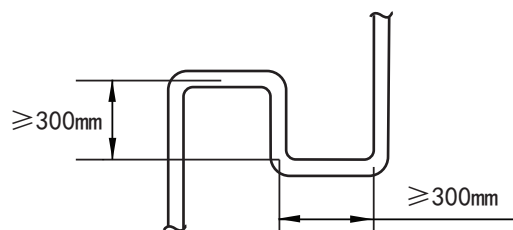


Fig.5-2



## CAUTION

1. The equivalent length of each branch joint is 0.5m.
2. The indoor units should be as equal as possible for installing on both sides of the U-shape branch joint.
3. If the outdoor unit is above and the level difference is greater than 20m, it is recommended that an oil return bend with dimensions as specified in Figure 5-2 is set every 10m in the gas pipe of the main pipe.
4. If the outdoor unit is below and the level difference is more than 40m, the liquid pipe of the main pipe (L1) should be increased one size.
5. The piping between the farthest indoor unit and first indoor branch joint should not exceed 40m in length unless the following conditions are met, in which case the permitted length is up to 90m.

The piping length and level difference requirements that apply are summarized in Table 5-1 and are fully described as follows (refer to Figure 5-1):

1. **Requirement 1:** The total length of piping in one refrigerant system should not exceed 1000m. When calculating the total length of piping, the actual length of the indoor main pipes (the piping between the first indoor branch joint and all other indoor branch joints, L2 to L16) should be doubled.
2. **Requirement 2:** The piping between the farthest indoor unit (N11) and the first outdoor branch joint (R) should not exceed 175m (actual length) and 200m (equivalent length). (The equivalent length of each branch joint is 0.5m.)
3. **Requirement 3:** The piping between the farthest indoor unit (N11) and first indoor branch joint (A) should not exceed 40m in length ( $\sum\{L9 \text{ to } L13\} + k \leq 40\text{m}$ ) unless the following conditions are met and the following measures are taken, in which case the permitted length is up to 90m:

### Conditions:

- a) Each indoor auxiliary pipe (from each indoor unit to its nearest branch joint) joint does not exceed 20 m in length (a to m each  $\leq 20\text{m}$ ).
- b) The difference in length between {the piping from first indoor branch joint (A) to the farthest indoor unit (N11)} and {the piping from the first indoor branch joint (A) to the nearest indoor unit (N1)} does not exceed 40m. That is:  $(\sum\{L9 \text{ to } L13\} + k) - (\sum\{L2 \text{ to } L3\} + a) \leq 40\text{m}$ .

### Measures:

- a) Increase the diameter of the indoor main pipes (the piping between the first indoor branch joint and all other indoor branch joints, L2 to L16) as follows, except for indoor main pipes which are already the same size as the main pipe (L1), for which no diameter increases are required.

$\phi 9.5 \rightarrow \phi 12.7$	$\phi 12.7 \rightarrow \phi 15.9$	$\phi 15.9 \rightarrow \phi 19.1$
$\phi 19.1 \rightarrow \phi 22.2$	$\phi 22.2 \rightarrow \phi 25.4$	$\phi 25.4 \rightarrow \phi 28.6$
$\phi 28.6 \rightarrow \phi 31.8$	$\phi 31.8 \rightarrow \phi 38.1$	$\phi 38.1 \rightarrow \phi 41.3$
$\phi 41.3 \rightarrow \phi 44.5$	$\phi 44.5 \rightarrow \phi 54.0$	

4. **Requirement 4:** The largest level difference between indoor unit and outdoor unit should not exceed 90m (if the outdoor unit is above) or 110m (if the outdoor unit is below). Additionally: (i) If the outdoor unit is above and the level difference is greater than 20m, it is recommended that an oil return bend with dimensions as specified in Figure 5-2 is set every 10m in the gas pipe of the main pipe; and (ii) if the outdoor unit is below and the level difference is more than 40m, the liquid pipe of the main pipe (L1) should be increased one size.
5. **Requirement 5:** The largest level difference between indoor units should not exceed 30m.

## 5.2 Selecting piping diameters

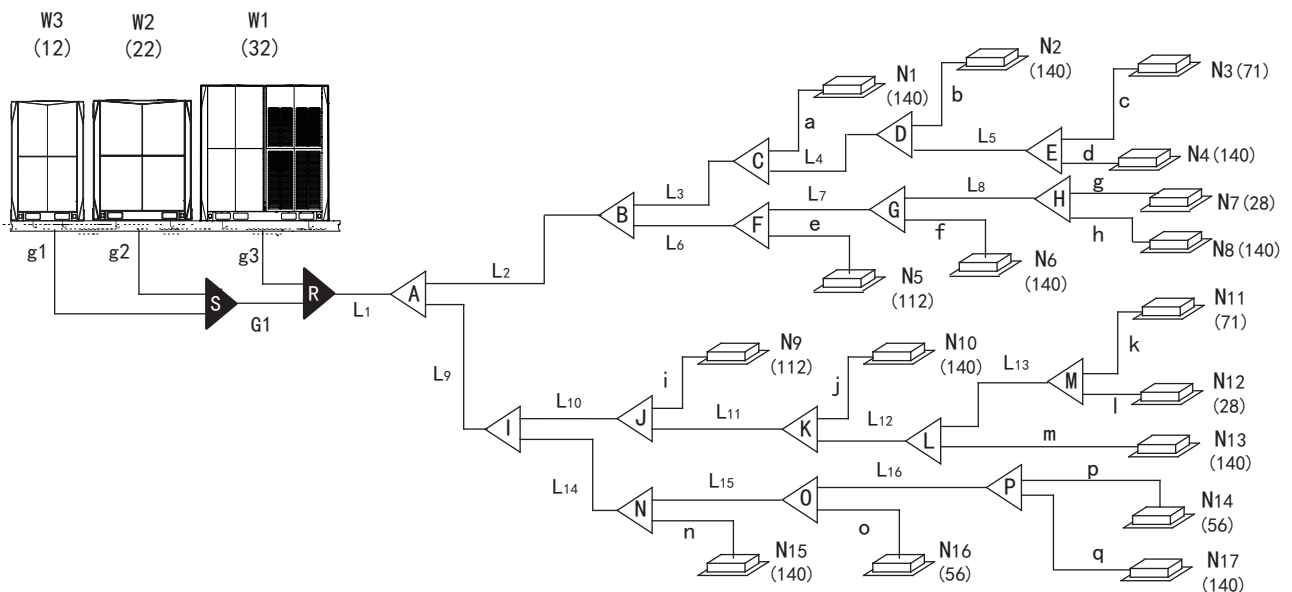


Fig. 5-3

### 5.2.1 Piping name definition

Table.5-2 Piping name definition

Pipe name	Code(refer to Fig.5-1)
Main pipe	L1
Indoor main pipes	L2, L3, L4, L5,... L16
Indoor auxiliary pipes	a, b, c, d,... q
Indoor branch joints	A, B, C, D, ... P
Outdoor branch joints	S, R
Outdoor connection pipes	g1, g2, g3, G1

### 5.2.2 Main pipe (L1), indoor main pipes (L2 to L16) and indoor branch joint kits selection

Table.5-3 Main pipe (L1), indoor main pipes (L2 to L16) and indoor branch joint kits selection

Total capacity of indoor units A (×100W)	Gas side (mm)	Liquid side (mm)	Branch joint kit
A<168	Φ15.9	Φ9.5	4TRDK01C
168≤A<224	Φ19.1	Φ9.5	4TRDK01C
224≤A<330	Φ22.2	Φ9.5	4TRDK02C
330≤A<470	Φ28.6	Φ12.7	4TRDK03C
470≤A<710	Φ28.6	Φ15.9	4TRDK03C
710≤A<1040	Φ31.8	Φ19.1	4TRDK03C
1040≤A<1540	Φ38.1	Φ19.1	4TRDK04C
1540≤A<1800	Φ41.3	Φ19.1	4TRDK05C
1800≤A<2450	Φ44.5	Φ22.2	4TRDK05C
2450≤A<2690	Φ54.0	Φ25.4	4TRDK06C
2690≤A	Φ54.0	Φ28.6	4TRDK07C

### 5.2.3 Main pipe (L1) and first indoor branch joint (A) selection

The main pipe (L1) and first indoor branch joint (A) should be sized according to whichever of Tables 5-3 and 5-4 / 5-5 indicates the larger size.

Example: A system consisting of three outdoor units (32HP + 22HP + 12HP). The system's equivalent total liquid piping length is in excess of 90m. Refer to Table 5-5, main pipe L1 is Φ44.5/ Φ22.2. The total capacity index of all indoor units is 1794, refer to Table 5-3, main pipe L1 is Φ41.3 / Φ19.1. Main pipe L1 is the larger of Φ44.5 / Φ22.2 and Φ41.3 / Φ19.1, hence Φ44.5/Φ 22.2.

Table.5-4 Main pipe (L1) and first indoor branch joint (A) selection

Model	Equivalent length of all liquid pipes < 90m		
	Gas side (mm)	Liquid side (mm)	The first indoor branch joint
8HP	Φ19.1	Φ9.53	4TRDK02C
10HP	Φ22.2	Φ9.53	4TRDK02C
12~14HP	Φ25.4	Φ12.7	4TRDK02C
16HP	Φ28.6	Φ12.7	4TRDK02C
18~24HP	Φ28.6	Φ15.9	4TRDK03C
26~34HP	Φ31.8	Φ19.1	4TRDK03C
36~54HP	Φ38.1	Φ19.1	4TRDK04C
56~66HP	Φ41.3	Φ19.1	4TRDK05C
68~82HP	Φ44.5	Φ22.2	4TRDK05C
84~96HP	Φ50.8	Φ25.4	4TRDK05C

Table.5-5 Main pipe (L1) and first indoor branch joint (A) selection

Model	Equivalent length of all liquid pipes ≥ 90m		
	Gas side (mm)	Liquid side (mm)	The first indoor branch joint
8HP	Φ22.2	Φ12.7	4TRDK02C
10HP	Φ25.4	Φ12.7	4TRDK02C
12~14HP	Φ28.6	Φ15.9	4TRDK03C
16HP	Φ31.8	Φ15.9	4TRDK03C
18~24HP	Φ31.8	Φ19.1	4TRDK03C
26~34HP	Φ38.1	Φ22.2	4TRDK04C
36~54HP	Φ41.3	Φ22.2	4TRDK04C
56~66HP	Φ44.5	Φ22.2	4TRDK05C
68~82HP	Φ54.0	Φ25.4	4TRDK06C
84~96HP	Φ54.0	Φ28.6	4TRDK07C

### 5.2.4 Outdoor branch pipe selection

Refer to Table.5-6 and Table.5-7 to select branch pipes for combination outdoor unit. Before installation, please read the Outdoor Unit Branch Joint Installation Manual carefully.

Table.5-6 Outdoor connection pipes

Outdoor unit Qty.	Illustration
2 units	
3 units	

Table.5-7 Outdoor connection pipes and branch joints selection

Outdoor unit Qty.	Outdoor connection pipes diameter	outdoor branch joint kits
2 units	g1, g2: 8~12HP: $\Phi 25.4/\Phi 12.7$ ; 14~22HP: $\Phi 31.8/\Phi 15.9$ 24~32HP: $\Phi 38.1/\Phi 19.1$	R: 4TODZ02C
3 units	g1, g2, g3: 8~12HP: $\Phi 25.4/\Phi 12.7$ ; 14~22HP: $\Phi 31.8/\Phi 15.9$ 24~32HP: $\Phi 38.1/\Phi 19.1$ G1: $\Phi 41.3/\Phi 22.2$	R+S: 4TODZ03C

Note: For systems with two or more outdoor units, outdoor branch joints (sold separately) are required.

### 5.2.5 Indoor auxiliary pipes selection (a to q)

Table.5-8

Unit: mm

Indoor unit capacity A( $\times 100W$ )	When branch joint's length $\leq 10m$		When the branch's joint's is length $> 10m$	
	Gas side (mm)	Liquid side (mm)	Gas side (mm)	Liquid side (mm)
$A \leq 45$	$\Phi 12.7$	$\Phi 6.4$	$\Phi 15.9$	$\Phi 9.5$
$A \geq 56$	$\Phi 15.9$	$\Phi 9.5$	$\Phi 19.1$	$\Phi 12.7$

## 5.3 Refrigerant piping selection example

The example below illustrates the piping selection procedure for a system consisting of three outdoor units (32HP + 22HP + 12HP) and 17 indoor units. The system's equivalent total liquid piping length is in excess of 90m; the piping between the farthest indoor unit and the first indoor branch joint is less than 40m in length; and each indoor auxiliary pipe (from each indoor unit to its nearest branch joint) is less than 10m in length, refer to Fig. 5-3.

- Select indoor auxiliary pipes  
Refer to Table 5-8 to select indoor auxiliary pipes (a-q)
- Select indoor main pipes and indoor branch joints B to P  
The indoor units (N3 and N4) downstream of indoor branch joint E have total capacity of  $14 + 7.1 = 21.1kW$ . Refer to Table 5-3. Indoor main pipe L5 is  $\Phi 19.1 / \Phi 9.5$ . Indoor branch joint E is 4TRDK01C

The indoor units (N1 to N8) downstream of indoor branch joint B have total capacity of  $14 \times 5 + 11.2 + 7.1 + 2.8 = 91.1kW$ . Refer to Table 5-3. Indoor main pipe L2 is  $\Phi 31.8 / \Phi 19.1$ . Indoor branch joint B is 4TRDK03C

The other indoor main pipes and indoor branch joints are selected in the same fashion.

- Select main pipe and indoor branch joint A  
The indoor units (N1 to N17) downstream of indoor branch joint A have total capacity of  $14 \times 9 + 11.2 \times 2 + 7.1 \times 2 + 5.6 \times 2 + 2.8 \times 2 = 179.4kW$ . The system's equivalent total piping length is in excess of 90m. The total capacity of the outdoor units is  $32 + 22 + 12 = 66HP$ . Refer to Tables 5-3 and 5-5. Main pipe L1 is the larger of  $\Phi 41.3 / \Phi 19.1$  and  $\Phi 44.5 / \Phi 22.2$ , hence  $\Phi 44.5 / \Phi 22.2$ . Indoor branch joint A is 4TRDK05C

- Select outdoor connection pipes and outdoor branch joints  
The master unit is 32HP and the slave units are 22HP and 12HP. Refer to Table 5-7. Outdoor connection pipes g1 is  $\Phi 25.4 / \Phi 12.7$ , g2 is  $\Phi 31.8 / \Phi 15.9$  and g3 is  $\Phi 38.1 / \Phi 19.1$ . Outdoor connection pipe G1 is  $\Phi 41.3 / \Phi 22.2$ .  
There are three outdoor units in the system. Refer to Table 5-7. Outdoor branch joints L and M are 4TODZ03C

## 5.4 Branch joints installation

Indoor branch joints may be installed either horizontally or vertically. Horizontal branch joints must be installed at an angle to the horizontal not exceeding  $10^\circ$  in order to avoid uneven distribution of refrigerant and possible malfunction. Refer to Figure 5-4.

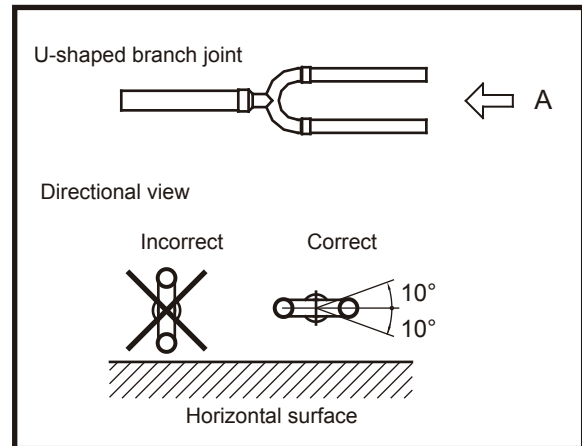


Fig. 5-4

To avoid accumulation of oil in the outdoor units, outdoor branch joints should be installed horizontally and must not be higher than the outdoor unit refrigerant outlets. Refer to Figure 5-5 to 5-8.

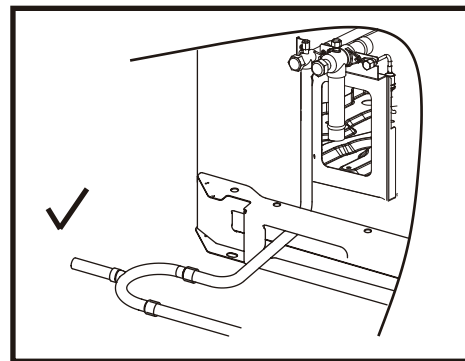


Fig. 5-5

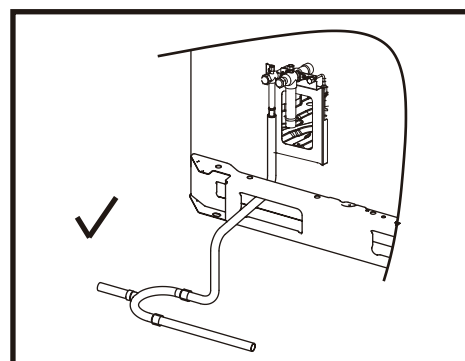


Fig. 5-6



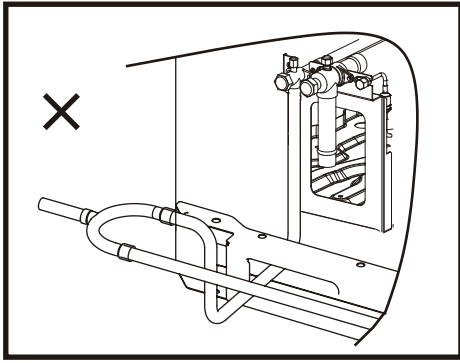


Fig. 5-7

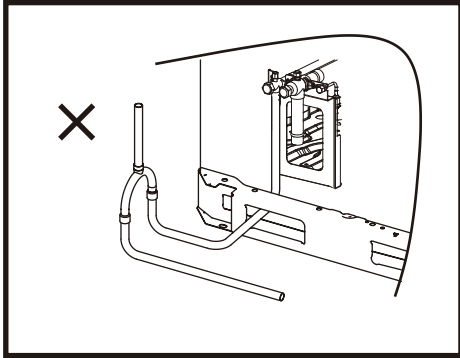
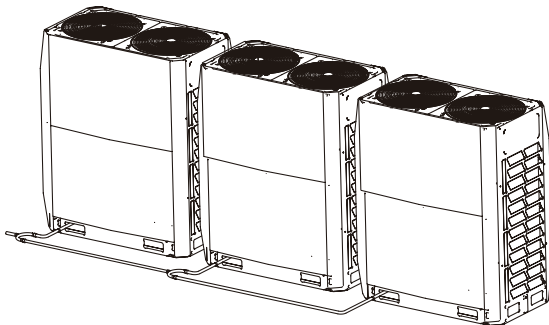


Fig. 5-8

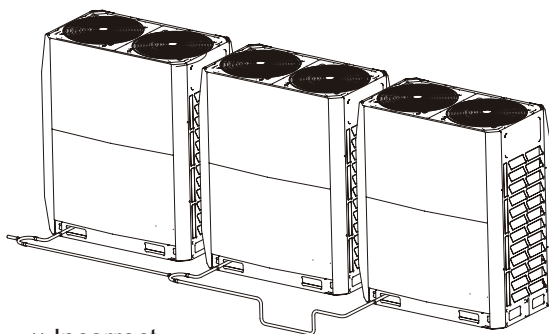
## 5.5 Piping connections between outdoor units

The piping connecting the outdoor units should be horizontal and must not be higher than the refrigerant outlets. If necessary, to avoid obstacles the piping may be vertically offset below the outlets. When inserting a vertical offset to avoid an obstacle, the whole outdoor piping should be offset, rather than just the section adjacent to the obstacle. Refer to Figure 5-9 to 5-12.



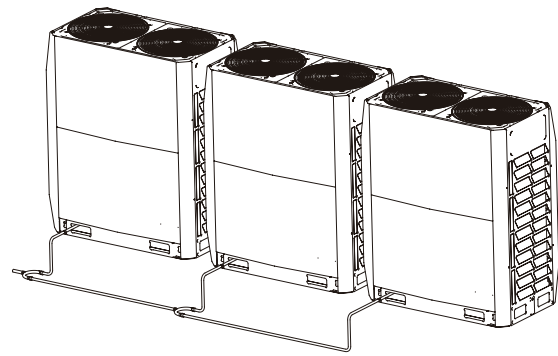
✓ Correct

Fig. 5-9



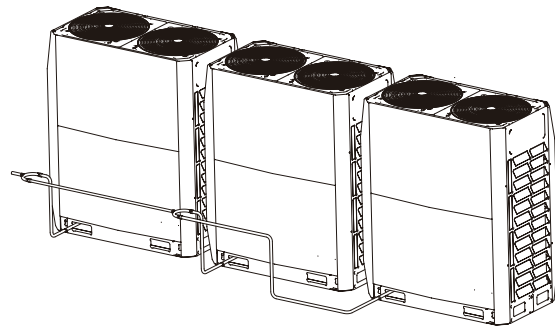
✗ Incorrect

Fig. 5-10



✓ Correct

Fig. 5-11



✗ Incorrect

Fig. 5-12

## 5.6 Piping flushing

To remove dust, other particles and moisture, which could cause compressor malfunction if not flushed out before the system is run, the refrigerant piping should be flushed using nitrogen. Pipe flushing should be performed once the piping connections have been completed with the exception of the final connections to the indoor units. That is, flushing should be performed once the outdoor units have been connected but before the indoor units are connected.



### CAUTION

- Only use nitrogen for flushing. Using carbon dioxide risks leaving condensation in the piping. Oxygen, air, refrigerant, flammable gases and toxic gases must not be used for flushing. Use of such gases may result in fire or explosion.

The liquid and gas sides can be flushed simultaneously; alternatively, one side can be flushed first and then Steps 1 to 8 repeated, for the other side. The flushing procedure is as follows:

1. Cover the inlets and outlets of the indoor units to prevent dirt getting blown in during pipe flushing. (Pipe flushing should be carried out before connecting the indoor units to the piping system.)
2. Attach a pressure reducing valve to a nitrogen cylinder.
3. Connect the pressure reducing valve outlet to the inlet on the liquid (or gas) side of the outdoor unit.
4. Use blind plugs to block all liquid (gas) side openings, except for the opening at the indoor unit which is furthest from the outdoor units ("Indoor unit A" in Figure 5-13).
5. Start to open the nitrogen cylinder valve and gradually increase the pressure to 0.5MPa.



6. Allow time for nitrogen to flow as far as the opening at indoor unit A.
7. Flush the first opening:
  - a) Using suitable material, such as a bag or cloth, press firmly against the opening at indoor unit A.
  - b) When the pressure becomes too high to block with your hand, suddenly remove your hand allowing gas to rush out.
  - c) Repeatedly flush in this manner until no further dirt or moisture is emitted from the piping. Use a clean cloth to check for dirt or moisture being emitted. Seal the opening once it has been flushed.
8. Flush the other openings in the same manner, working in sequence from indoor unit A towards the outdoor units. Refer to Figure 5-14.
9. Once flushing is complete, seal all openings to prevent dust and moisture from entering.

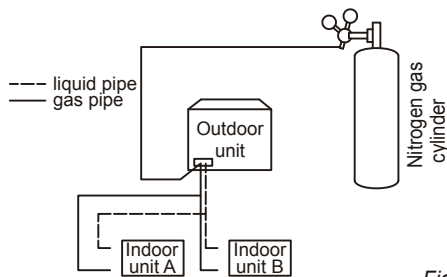


Fig. 5-13

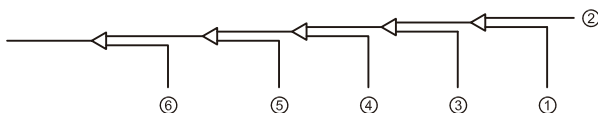


Fig. 5-14

4. If there are no small leakages, charge the piping with nitrogen at 4MPa and leave for at least 24 hours to check for micro leakages. Micro leakages are difficult to detect. To check for micro leakages, allow for any change in ambient temperature over the test period by adjusting the reference pressure by 0.01MPa per 1°C of temperature difference. Adjusted reference pressure = Pressure at pressurization + (temperature at observation – temperature at pressurization) x 0.01MPa. Compare the observed pressure with the adjusted reference pressure. If they are the same, the piping has passed the gastightness test. If the observed pressure is lower than the adjusted reference pressure, the piping has a micro leakage.
5. If the leakage is detected, refer to following part “Leak detection”. Once the leak has been found and fixed, the gastightness test should be repeated.
6. If not continuing straight to vacuum drying once the gastightness test is complete, reduce the system pressure to 0.5-0.8MPa and leave the system pressurized until ready to carry out the vacuum drying procedure

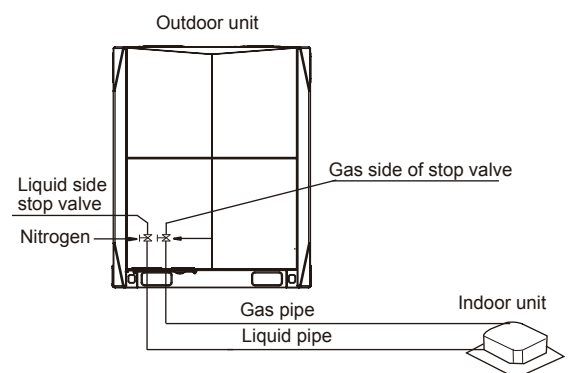


Fig. 5-15

## 5.7 Gastightness test

To prevent faults caused by refrigerant leakage, a gastightness test should be performed before system commissioning.



### CAUTION

- Only dry nitrogen should be used for gastightness testing. Oxygen, air, flammable gases and toxic gases must not be used for gastightness testing. Use of such gases may result in fire or explosion.
- Make sure that all the outdoor unit stop valves are firmly closed

The gastightness test procedure is as follows:

1. Once the piping system is complete and the indoor and outdoor units have been connected, vacuum the piping to -0.1MPa.
2. Charge the indoor piping with nitrogen at 0.3MPa through the needle valves on the liquid and gas stop valves and leave for at least 3 minutes (do not open the liquid or gas stop valves). Observe the pressure gauge to check for large leakages. If there is a large leakage, the pressure gauge will drop quickly.
3. If there are no large leakages, charge the piping with nitrogen at 1.5MPa and leave for at least 3 minutes. Observe the pressure gauge to check for small leakages. If there is a small leakage, the pressure gauge will drop distinctly.

## Leak detection

The general methods for identifying the source of a leak are as follows:

1. Audio detection: relatively large leaks are audible.
2. Touch detection: place your hand at joints to feel for escaping gas.
3. Soapy water detection: small leaks can be detected by the formation of bubbles when soapy water is applied to a joint.

## 5.8 Vacuum drying

Vacuum drying should be performed in order to remove moisture and non-condensable gases from the system. Removing moisture prevents ice formation and oxidization of copper piping or other internal components. The presence of ice particles in the system would cause abnormal operation, whilst particles of oxidized copper can cause compressor damage. The presence of non-condensable gases in the system would lead to pressure fluctuations and poor heat exchange performance.

Vacuum drying also provides additional leak detection (in addition to the gastightness test).



## CAUTION

- Before performing vacuum drying, make sure that all the outdoor unit stop valves are firmly closed.
- Once the vacuum drying is complete and the vacuum pump is stopped, the low pressure in the piping could suck vacuum pump lubricant into the air conditioning system. The same could happen if the vacuum pump stops unexpectedly during the vacuum drying procedure. Mixing of pump lubricant with compressor oil could cause compressor malfunction and a one-way valve should therefore be used to prevent vacuum pump lubricant seeping into the piping system.

During vacuum drying, a vacuum pump is used to lower the pressure in the piping to the extent that any moisture present evaporates. At 5mmHg (755mmHg below typical atmospheric pressure) the boiling point of water is 0°C. Therefore a vacuum pump capable of maintaining a pressure of -756mmHg or lower should be used. Using a vacuum pump with a discharge in excess of 4L/s and a precision level of 0.02mmHg is recommended. The vacuum drying procedure is as follows:

1. Connect the blue (low pressure side) hose of a pressure gauge to the master unit gas pipe stop valve, the red (high pressure side) hose to the master unit liquid pipe stop valve and the yellow hose to the vacuum pump.
2. Start the vacuum pump and then open the pressure gauge valves to start vacuum the system.
3. After 30 minutes, close the pressure gauge valves.
4. After a further 5 to 10 minutes check the pressure gauge. If the gauge has returned to zero, check for leakages in the refrigerant piping.
5. Re-open the pressure gauge valves and continue vacuum drying for at least 2 hours and until a pressure difference of 0.1Mpa or more has been achieved. Once the pressure difference of at least 0.1Mpa has been achieved, continue vacuum drying for 2 hours.
6. Close the pressure gauge valves and then stop the vacuum pump.
7. After 1 hour, check the pressure gauge. If the pressure in the piping has not increased, the procedure is finished. If the pressure has increased, check for leakages.
8. After vacuum drying, keep the blue and red hoses connected to the pressure gauge and to the master unit stop valves, in preparation for refrigerant charging.

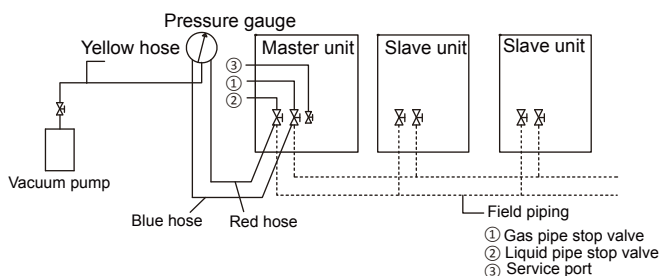


Fig. 5-16

## 5.9 Charging refrigerant



## CAUTION

- Only charge refrigerant after performing a gastightness test and vacuum drying.
- Never charge more refrigerant than required as doing so can lead to liquid hammering.
- Only use refrigerant R410A - charging with an unsuitable substance may cause explosions or accidents.
- Use tools and equipment designed for use with R410A to ensure required pressure resistance and to prevent foreign materials from entering the system.
- Refrigerant must be treated in accordance with applicable legislation.
- Always use protective gloves and protect your eyes when charging refrigerant.
- Open refrigerant containers slowly.

### Calculating additional refrigerant charge

The additional refrigerant charge required depends on the lengths and diameters of the outdoor and indoor liquid pipes. Table 5-9 shows the additional refrigerant charge required per meter of equivalent pipe length for different diameters of pipe. The total additional refrigerant charge is obtained by summing the additional charge requirements for each of the outdoor and indoor liquid pipes, as in the following formula, where T1 to T8 represent the equivalent lengths of the pipes of different diameters. Assume 0.5m for the equivalent pipe length of each branch joint.

Table. 5-9

Liquid side piping (mm)	Additional refrigerant charge per meter of equivalent length of piping (kg)
Φ6.4	0.022kg
Φ9.5	0.057kg
Φ12.7	0.110kg
Φ15.9	0.170kg
Φ19.1	0.260kg
Φ22.2	0.360kg
Φ25.4	0.520kg
Φ28.6	0.680kg

$$\text{Additional refrigerant charge R (kg)} = (T1@\Phi6.35) \times 0.022 + (T2@\Phi9.53) \times 0.057 + (T3@\Phi12.7) \times 0.110 + (T4@\Phi15.9) \times 0.170 + (T5@\Phi19.1) \times 0.260 + (T6@\Phi22.2) \times 0.360 + (T7@\Phi25.4) \times 0.520 + (T8@\Phi28.6) \times 0.680$$

The procedure for adding refrigerant is as follows:

1. Calculate additional refrigerant charge R (kg) .
2. Place a tank of R410A refrigerant on a weighing scale. Turn the tank upside down to ensure refrigerant is charged in a liquid state. (R410A is a blend of two different chemicals compounds. Charging gaseous R410A into the system could mean that the refrigerant charged is not of the correct composition).
3. After vacuum drying, the blue and red pressure gauge hoses should still be connected to the pressure gauge and to the master unit stop valves.
4. Connect the yellow hose from the pressure gauge to the R410A refrigerant tank.

5. Open the valve where the yellow hose meets the pressure gauge, and open the refrigerant tank slightly to let the refrigerant eliminate the air. Caution: open the tank slowly to avoid freezing your hand.
6. avoid freezing your hand.
7. Open the three valves on the pressure gauge to begin charging refrigerant.
8. When the amount charged reaches R (kg), close the three valves. If the amount charged has not reached R (kg) but no additional refrigerant can be charged, close the three valves on the pressure gauge, run the outdoor units in cooling mode, and then open the yellow and blue valves. Continue charging until the full R (kg) of refrigerant has been charged, then close the yellow and blue valves. Note: Before running the system, be sure to complete all the pre-commissioning checks and be sure to open all stop valves as running the system with the stop valves closed would damage the compressor.

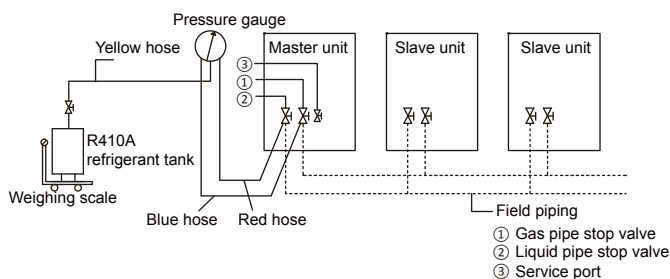


Fig. 5-17

## 6. ELECTRICAL WIRING

### 6.1 General



#### CAUTION

- All installation and wiring must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation.
- Electrical systems should be grounded in accordance with all applicable legislation.
- Overcurrent circuit breakers and residual-current circuit breakers (ground fault circuit interrupters) should be used in accordance with all applicable legislation.
- Wiring patterns shown in this manual are general connection guides only and are not intended for, or to include all details for, any specific installation.
- The refrigerant piping, power wiring and communication wiring are typically run in parallel. However the communication wiring should not be bound together with the refrigerant piping or power wiring. To prevent signal interference, the power wiring and communication wiring should not be run in the same conduit. If the power supply is less than 10A, a not be run in the same conduit. If the power supply is less than 10A, a wiring conduits should be maintained; if the power supply is in the range 10A to 50A then a separation of at least 500mm should be maintained.

This equipment complies with:

- EN/IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to the minimum Ssc value where the user's supply and public system interface.

- EN/IEC 61000-3-12 = European/International Technical Standard sets the limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16A and ≤ 75A per phase.
- The installer or user of the equipment must ensure, by consulting with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to the minimum Ssc value.
- European/International Technical Standard setting the limits for voltage changes, voltage fluctuations and flicker in public low-voltage supply systems for equipment with a rated current of ≤ 75A.
- The European/International Technical Standard sets the limits for harmonic currents produced by equipment connected to public low-voltage systems with an input current of > 16A and ≤ 75A per phase.

Table. 6-1

	Minimum Ssc value(KVA)
8HP	5207
10HP	5447
12HP	5687
14HP	5863
16HP	6023
18HP	6183



#### NOTE

- Select a power cord for these models separately according to relevant standard.
- The wiring diameter and the length in the table indicate the condition that the voltage drop range is within 2%. If the length exceeds the above figure, please select the wire diameter according to the relevant standard.

### 6.2 Power supply wiring

Power supply wiring design and installation should adhere to the following requirements:

- Separate power supplies should be provided for the indoor units and outdoor units.
- All the indoor units in a system (i.e. all the indoor units connected to the same set of outdoor units) should be tied into the same power circuit with the same power supply, overcurrent and residual current protection (leakage protection) and manual switch, as shown in Figure 6-1. Do not install separate protectors or manual switches for each indoor unit. Powering on and shutting down all indoor units in a system should be done simultaneously. The reason for this is that if an indoor unit that is running were to suddenly power off whilst the other indoor units continued running, the evaporator of the powered-off unit would freeze since refrigerant would continue flowing to that unit (its expansion valve would still be open) but its fan would have stopped. The indoor units that remain running would not get sufficient refrigerant so their performance remain running would not get sufficient refrigerant so their performance would suffer. Additionally, liquid refrigerant returning directly to the compressor from the powered-off unit would cause liquid hammering, potentially damaging the compressor.
- For outdoor unit power wire sizing and circuit breaker sizing, refer to Table 6-2 "Electrical Characteristics".

#### Outdoor unit power supply wiring

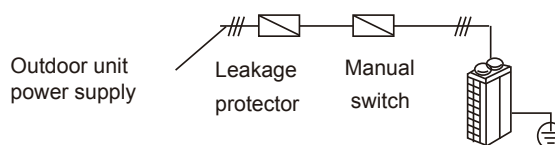


Fig. 6-1

### Indoor unit power supply wiring

Indoor power supply

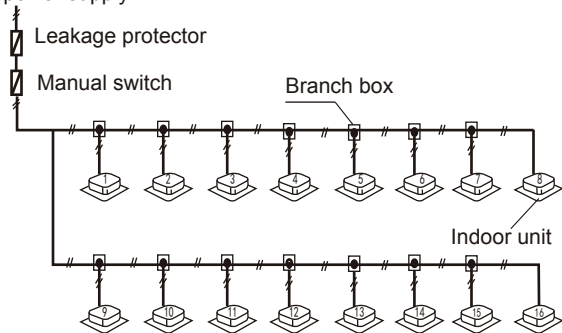


Fig.6-2



### CAUTION

- All the indoor units in a system should be tied into the same power circuit with the same power supply.
- Power wiring and communication wiring should not be run in the same conduit. If the power supply is less than 10A, a separation of at least 300mm between power wiring and communication wiring conduits should be maintained; if the power supply is in the range 10A to 50A then a separation of at least 500mm should be maintained.
- Make sure to set address to each outdoor unit for the combination outdoor units.

### 6.2.1 Outdoor unit 3-phase power supply terminals wiring connection

To 380-415V 3N~ 50/60Hz

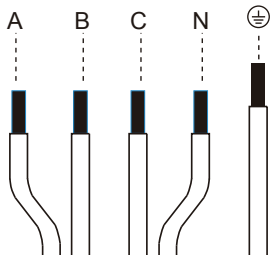
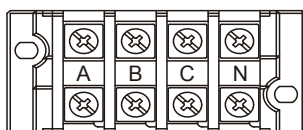
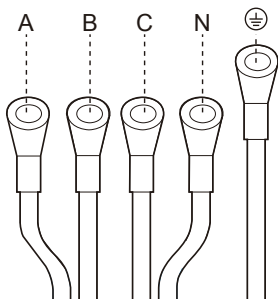
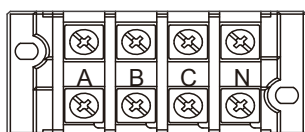


Fig.6-3

### 6.2.2 Power supply cable clips installation



### CAUTION

- First, connect the power wires and the terminals, and then groove the wires or it's hard to install.
- When installing the main power wire, strip the appropriate length of the insulation layer according to the grooving method and position of the cable clip.
- When installing the three fixed screws, the twisting length should ensure displacement is less than 2 mm when applying 100 N force onto the wires. Twisting to the end too hard may damage the power wire protective cover.

The attached cable clip includes 2 parts: the base part and the upper cover part. The base has been installed in the electric control box, located under the terminals. The upper cover is put together with the other accessories as an attachment. Both the front and back side of the cable clip can be used to groove the wire. Choose the appropriate way to groove the wire according to different sizes of power wire. The upper cover of the cable clip must be fixed with three M4\*30mm screws. When the cross-section area of the power wire is less than 10 mm<sup>2</sup>, groove the power wires as a whole. When stripping the outermost insulation layer, ensure the sum of the stripped length and terminal length are less than 70 mm. Shown as figure 6-4:

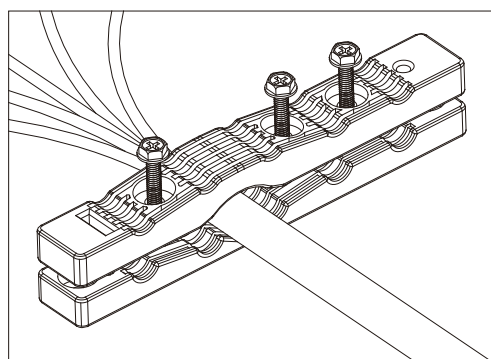


Fig.6-4

When the cross-section area of the power wire is more than 10 mm<sup>2</sup>, groove the power wires separately. When stripping the outermost, ensure the sum of stripped length and terminal length is between 100 mm and 200 mm, as shown in figure 6-5:

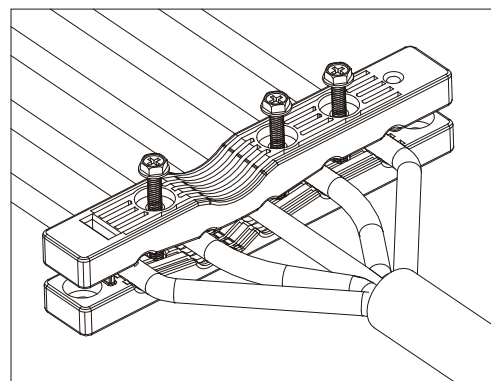


Fig.6-5

## Outdoor units electrical characteristics

Outdoor unit power wire sizing and circuit breaker sizing selection should be done in accordance with the applicable legislation based on below table.

Table 6-2

System	Outdoor Unit				Power Current			Compressor		OFM	
	Voltage (V)	Hz	Min. (V)	Max. (V)	MCA (A)	TOCA (A)	MFA (A)	MSC (A)	RLA (A)	KW	FLA (A)
8HP	380~415	50/60	342	440	24	30.9	35	-	10	0.56	6.3
10HP	380~415	50/60	342	440	25.2	30.9	35	-	10.6	0.56	6.3
12HP	380~415	50/60	342	440	26.4	31.5	35	-	15.4	0.56	6.9
14HP	380~415	50/60	342	440	33.1	40.3	45	-	25.8	0.92	7.3
16HP	380~415	50/60	342	440	33.1	40.3	45	-	25.8	0.92	7.3
18HP	380~415	50/60	342	440	40.8	59.3	70	-	14+13	0.56+0.56	10.1
20HP	380~415	50/60	342	440	43.9	60.1	70	-	17+16	0.56+0.56	10.9
22HP	380~415	50/60	342	440	47.9	60.1	70	-	19+18	0.56+0.56	10.9
24HP	380~415	50/60	342	440	48.4	62.3	70	-	17.4+16.6	0.92+0.92	13.1
26HP	380~415	50/60	342	440	52.9	62.3	70	-	20+19.8	0.92+0.92	13.1
28HP	380~415	50/60	342	440	58.7	64.1	70	-	22+21.8	0.92+0.92	14.9
30HP	380~415	50/60	342	440	64.9	72.5	80	-	20+30	0.92+0.92	14.9
32HP	380~415	50/60	342	440	66.9	72.5	80	-	22+30	0.92+0.92	14.9

### Notes:

1. Units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed range limits. Maximum allowable voltage variation between phases is 2%.
2. Select wire size based on the value of MCA.
3. TOCA indicates the total overcurrent amps value of each OC set.
4. MFA is used to select overcurrent circuit breakers and residual-current circuit breakers.
5. MSC indicates the maximum current on compressor start-up in amps.
6. RLA is based on the following conditions: indoor temperature 27°C DB, 19°C WB; outdoor temperature 35°C DB.

### Remark:

MCA: Min. Circuit Amps. (A)  
 TOCA: Total Over-current Amps. (A)  
 MFA: Max. Fuse Amps. (A)  
 MSC: Max. Starting Amps. (A)  
 RLA: Rated Load Amps. (A)  
 OFM: Outdoor Fan Motor.  
 FLA: Full Load Amps. (A)  
 KW: Rated Motor Output (KW)

6.3 Communication wiring

Communication wiring design and installation should adhere to the following requirements:

- 0.75mm2 three-core shielded cable should be used for communication wiring. Using other types of cable can lead to interference and malfunction.
- Indoor communication wiring:
  - The P Q E communication wires should be connected one unit after another in a daisy chain from the outdoor unit to the final indoor unit as shown in Figure 6-6. At the final indoor unit, a 120 Ω resistor should be connected between the P and Q terminals. After the final indoor unit, the communication wiring should NOT be continued back to the outdoor unit – that is, do not attempt to form a closed loop.
  - The P and Q communication wires and should NOT be grounded.
  - The shielding nets of the communication wires should be connected together and grounded. Grounding can be achieved by connecting to the metal casing adjacent to the P Q E terminals of the outdoor unit electrical control box.
- Outdoor communication wiring:
  - The H1 H2 E communication wires should be connected one unit after another in a daisy chain from the master outdoor unit to the final slave outdoor unit as shown in Figure 6-6.

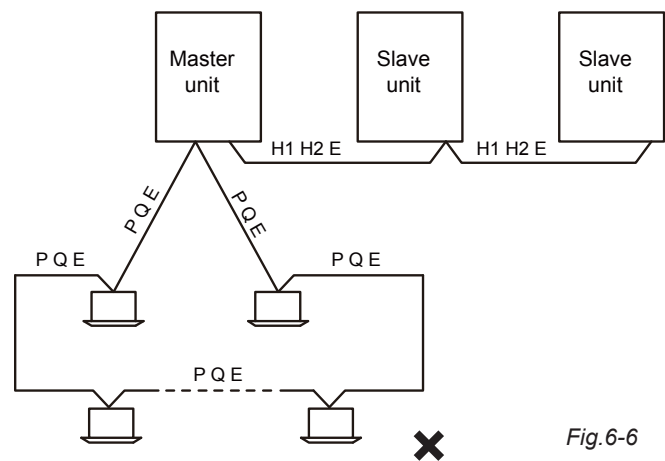


Fig.6-6

Master outdoor unit communication terminals

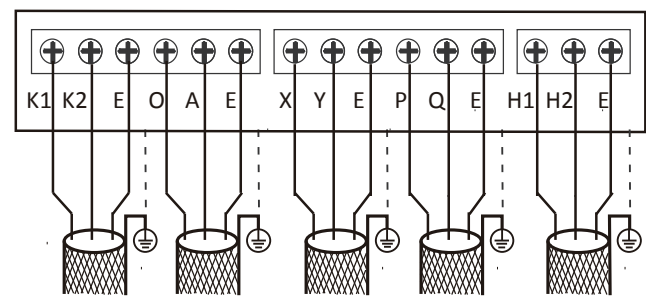


Fig.6-7

Communication wiring configurations – correct and incorrect examples

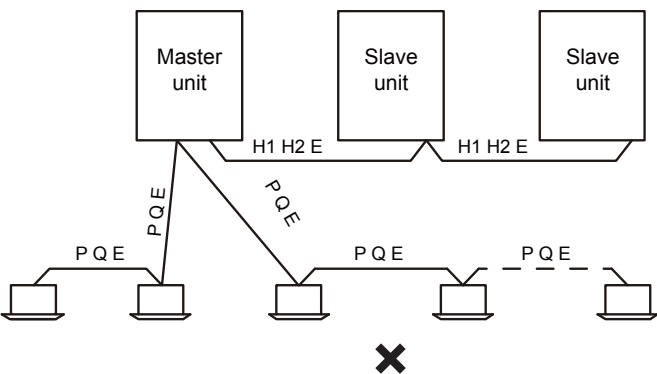
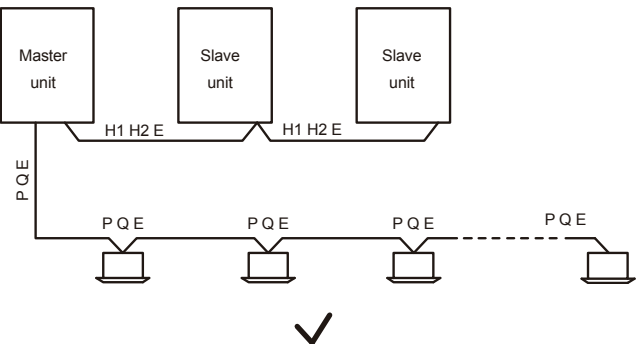


Table. 6-3 communication cnnctions

Terminals	Connection
K1 K2 E	Connect to outdoor unit centralized monitor
O A E	Connect to digital energy meter
X Y E	Connect to indoor unit centralized controller
P Q E	Connect between indoor units and master outdoor unit
H1 H2 E	Connect between outdoor units



## 6.4 Wiring example

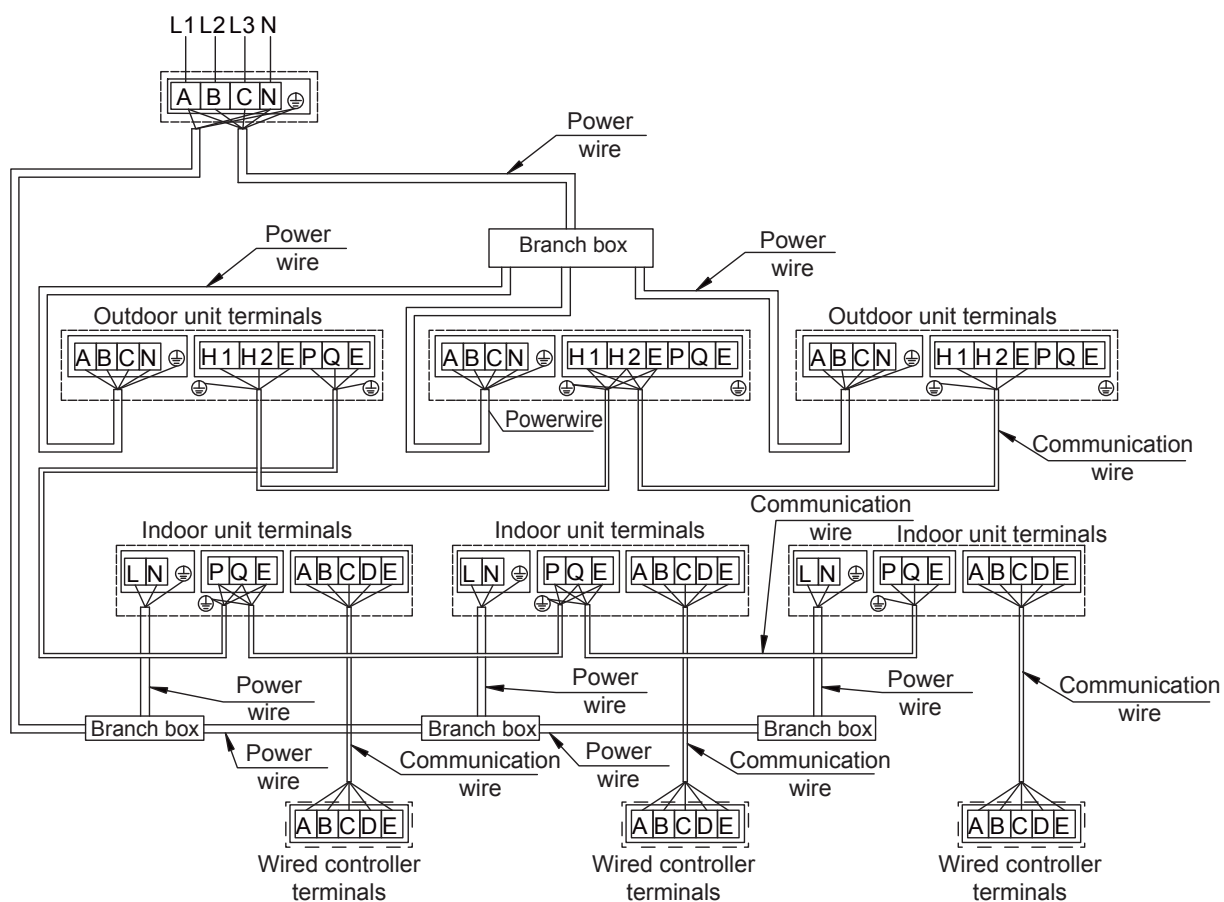


Fig.6-8

## 6.5 Outdoor unit field settings

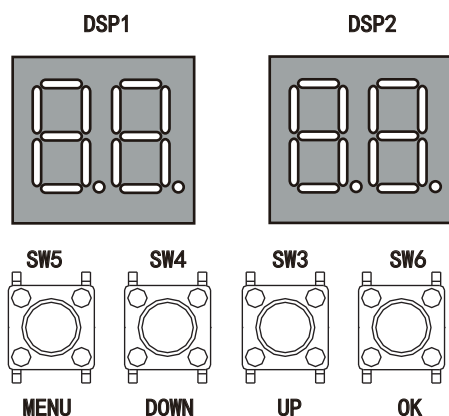


Fig.6-9

### 6.5.1 Button switch function










- 1) MENU: Long press 5 seconds to enter menu function mode, short press return to the previous menu
- 2) OK: Short press to enter the next level menu or confirm the selection
- 3) UP/DOWN:
  - a) Select different menus in menu function mode.
  - b) System check when it is not menu function mode.






## 6.5.2 Dial switch settings

Table 6-5

Dial code definitions:

Table 6-4

S4		000	Standard static pressure (default)
		001	Low static pressure mode (reserved)
		010	Medium static pressure mode (reserved)
		011	High static pressure mode (reserved)
		100	Super high static pressure mode (reserved)
S5		000	Auto priority (default)
		001	Cooling priority
		010	VIP priority or voting priority
		011	Heating only
		100	Cooling only
S6-1		0	Reserved
		1	Clear indoor unit addresses
S6-2		0	Auto addressing (default)
		1	Manual addressing
S6-3		0	Reserved
		1	Start-up time is 12 minutes (default)
S8-2		0	Start-up time is 7 minutes
		1	Reserved
S8-3		0	Reserved
		1	Reserved
S7		0	Reserved
S13		0	Use the new centralized controller (default)
		1	Use the old centralized controller

ENC1		0-2	Outdoor unit address setting, Only 0, 1, 2 should be selected (default is 0) 0 is for master unit; 1, 2 are for slave units.
ENC2		0-C	Outdoor unit capacity setting, Only 0 to C should be selected 0 to C are for 8HP to 32HP.
ENC4		0-7	Outdoor unit network address setting, Only 0 to 7 should be selected (default is 0).
ENC3 & S12		0-F	The number of indoor units is in the range 0-15
		000	0-9 on ENC3 indicate 0-9 indoor units; A-F on ENC3 indicate 10-15 indoor units
		0-F	The number of indoor units is in the range 16-31
		001	0-9 on ENC3 indicate 16-25 indoor units; A-F on ENC3 indicate 26-31 indoor units
		0-F	The number of indoor units is in the range 32-47
		010	0-9 on ENC3 indicate 32-41 indoor units; A-F on ENC3 indicate 42-47 indoor units
		0-F	The number of indoor units is in the range 48-63
ENC5		0	Night silent time is 6h/10h (default)
		1	Night silent time is 6h/12h
		2	Night silent time is 8h/10h
		3	Night silent time is 8h/12h
		4	No silent mode
		5	Silent mode 1 (only limit max. fan speed)
		6	Silent mode 2 (only limit max. fan speed)
		7	Silent mode 3 (only limit max. fan speed)
		8	Super silent mode 1 (limit max. fan speed and compressor frequency)
		9	Super silent mode 2 (limit max. fan speed and compressor frequency)
		A	Super silent mode 3 (limit max. fan speed and compressor frequency)
		B	Super silent mode 4 (limit max. fan speed and compressor frequency)
		F	Set silent mode via centralized controller (reserved)

Note:  means 0,  means 1.



### 6.5.3 System check table

Press UP/DOWN button to enter system check mode when it is not in menu function mode.

Table 6-6

DSP1 content	Parameters displayed on DSP2	Remarks
0	Unit address	0-2
1	Unit capacity	8-32HP
2	Number of outdoor units	①
3	Number of indoor units as set on PCB	①
4	Total capacity of outdoor unit	②
5	Total capacity requirement of indoor units	①
6	Total capacity requirement correction of master unit	①
7	Operating mode	③
8	Outdoor unit actual operating capacity	
9	Fan A speed index	
10	Fan B speed index	
11	T2/T2B average Temp (°C)	
12	Main heat exchanger pipe(T3) temperature (°C)	
13	Outdoor ambient(T4) temperature (°C)	
14	Plate heat exchanger cooling refrigerant inlet (T6A) temperature (°C)	
15	Plate heat exchanger cooling refrigerant outlet (T6B) temperature (°C)	
16	Discharge Temp. of compressor A (°C)	
17	Discharge Temp. of compressor B (°C)	
18	Inverter-module heatsink Temp. A (°C)	
19	Inverter-module heatsink Temp. B (°C)	
20	Plate exchanger degree of superheat (°C)	
21	Discharge superheat degree	
22	Inverter compressor A current (A)	
23	Inverter compressor B current (A)	
24	EXVA position	④
25	EXVB position	④
26	EXVC position	⑤
27	Compressor discharge pressure (MPa)	⑥
28	Reserved	Reserved
29	Number of indoor units currently in communication with master unit	
30	Number of indoor units currently operating	①
31	Priority mode	⑦
32	Silent mode	⑧
33	Static pressure mode	⑨
34	Reserved	
35	Reserved	
36	DC bus voltage A	⑩
37	DC bus voltage B	⑩
38	Reserved	
39	Address of VIP indoor unit	
40	Reserved	
41	Reserved	
42	Refrigerant state	⑪
43	Reserved	
44	Power mode	⑫
45	Most recent error or protection code	
--	--	Check end

- ① Available for master unit
- ② Only available for master unit, displayed on slave units has no sense;
- ③ Operation mode: 0-OFF; 2-Cooling; 3-Heating;4-Forced cooling
- ④ Opening angle of EEV: Actual value=Display value\*4(480P) or Actual value=Display value\*24(3000P)
- ⑤ Opening angle of EEV: Actual value=Display value\*4(480P)
- ⑥ High pressure: Actual value=Display value\*0.1MPa
- ⑦ Priority mode: 0-Auto priority, 1-cooling priority, 2-VIP priority or voting priority, 3-Heating only, 4-Cooling only
- ⑧ Silent mode: 0-Night silent time is 6h/8h, 1-Night silent time is 6h/12h, 2-Night silent time is 8h/10h, 3-Night silent time is 8h/12h, 7-Silent mode 3,8-Super silent mode 1, 9-Super silent mode 2, 10-Super silent mode 3, 11-Super silent mode 4;
- ⑨ Static pressure mode: 0-Standard static pressure, 1-Low Static pressure, 2-Medium static pressure, 3-High static pressure, 4-Super high static pressure;
- ⑩ DC bus voltage: Actual value=Display value\*10 V
- ⑪ Refrigerant quantity: 0-Normal, 1-Slightly excessive, 2-Significantly excessive, 11-Slightly insufficient, 12-Significantly insufficient, 13-Critically insufficient.
- ⑫ 0-100% capacity output, 1-90% capacity output, 2-80% capacity output, 3-70% capacity output, 4- 60% capacity output, 5-50% capacity output, 6- 40% capacity output. 10-Auto power save mode, 100% capacity output. 11-Auto power save mode, 90% capacity output, 12-Auto power save mode, 80% capacity output, 13-Auto power save mode, 70% capacity output, 14-Auto power save mode, 60% capacity output, 15-Auto power save mode, 50% capacity output, 16-Auto power save mode, 40% capacity output.

#### 6.5.4 Menu function mode

Only master unit has the full menu functions, slaves units only have error codes check and cleaning menu functions.

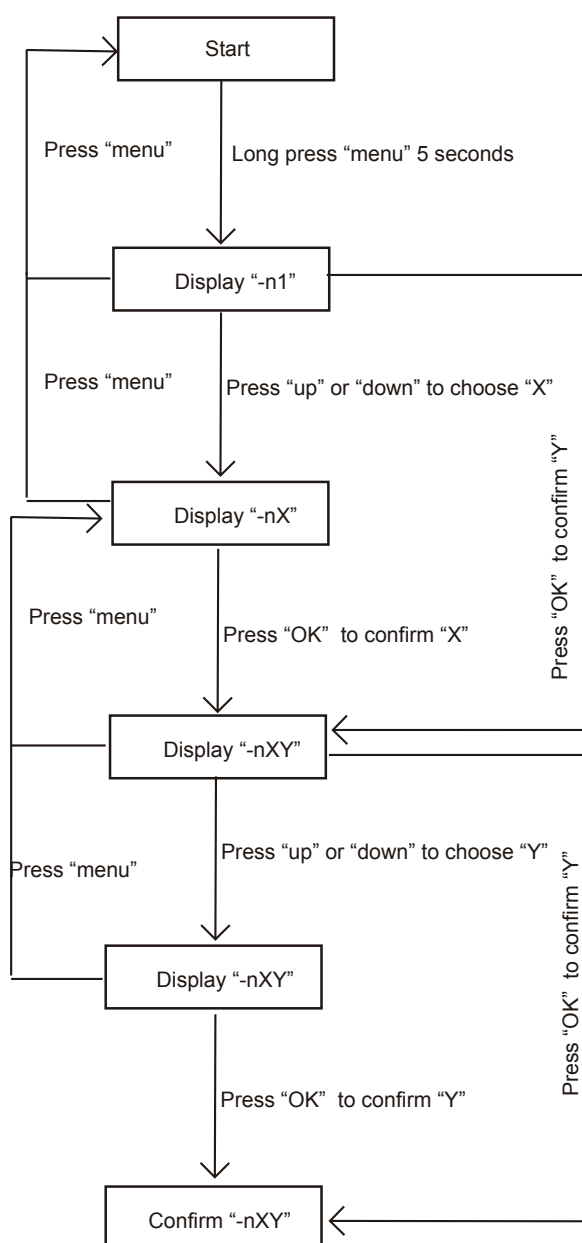
1. Long press "MENU" button 5 seconds, then display "n1", and enter the menu function mode.
  - a) Use "UP" and "DOWN" to select a different level 1 menu (for example,n3)
  - b) Press "OK" to enter a level 2 menu (for example,n31)
2. At level 2 menu status
  - a) Use "UP" and "DOWN" to select different level 2 menu (for example,n32)
  - b) Use "OK" to confirm the specified level 2 menu

Table 6-7

MENU	Description	Note
n14	Debug mode 1	①
n15	Debug mode 2	②
n16	Maintenance mode	③
n24	Reserved	
n25	Reserved	
n26	Backup run	④
n27	Vacuum mode	Display"R006"
n31	History codes	
n32	Cleaning history error	
n33	Reserved	
n34	Restore factory settings	⑤
n41	Power limitation mode 1	⑥
n42	Power limitation mode 2	⑦
n43	Power limitation mode 3	⑧
n44	Power limitation mode 4	⑨
n45	Power limitation mode 5	⑩
n46	Power limitation mode 6	⑪
n47	Power limitation mode 7	⑫
nb1	Fahrenheit degree (°F)	Only available for master unit
nb2	Celsius degree (°C)	Only available for master unit
nb3	Exit auto power save mode	Only available for master unit
nb4	Enter auto power save mode	Only available for master unit
nb5	Auto snow-blowing mode 1	
nb6	Auto snow-blowing mode 2	
nb7	Exit auto snow-blowing mode	
nb8	VIP address setting	
nF1	Reserved	
nF2	Reserved	

- ① Only available for master unit(all indoor units running in cooling mode)
- ② Only available for master unit(if all the indoor unit in the system are the 2nd generation indoor units, all the indoor units will run in heating mode. Once there is one or more old indoor unit in the system, all the indoor units will run in force cooling mode)
- ③ Only available for the master unit, the system does not check the indoor units' number.
- ④ Only available for outdoor unit with two compressors. If one of the two compressors is fail, the other compressor will keep running for up to 4 days and then stop automatically.
- ⑤ Only available for the master unit
- ⑥ Only available for the master unit, 100% capacity output
- ⑦ Only available for the master unit, 90% capacity output
- ⑧ Only available for the master unit, 80% capacity output
- ⑨ Only available for the master unit, 70% capacity output
- ⑩ Only available for the master unit, 60% capacity output
- ⑪ Only available for the master unit, 50% capacity output
- ⑫ Only available for the master unit, 40% capacity output

Menu function mode flowchart



## 7. COMMISSIONING

### 7.1 Outdoor unit address and capacity settings

Before running a system for the first time, set each outdoor unit's address on switch ENC1 on each outdoor unit's main PCB. The capacity of each outdoor unit (on switch ENC2 on each outdoor unit's main PCB) is factory-set and should not need changing. Check that the capacity settings are correct.

### 7.2 Multi-system projects

For projects with multiple refrigerant systems, each independent refrigeration system (i.e. each system of up to three outdoor units and their connected indoor units) should be given a test run independently, before the multiple systems that make up a project are run simultaneously.

### 7.3 Pre-commissioning checks

Before turning on the power to the indoor and outdoor units, ensure the following:

1. All indoor and outdoor refrigeration piping and communication wiring has been connected to the correct refrigeration system and the system to which each indoor and outdoor unit belongs is clearly marked on each unit or recorded in some other suitable place.
2. Pipe flushing, gastightness testing and vacuum drying have been satisfactorily completed as per instructions.
3. All condensate drain piping is complete and a watertightness test has been satisfactorily completed.
4. All power and communication wiring is connected to the correct terminals on units and controllers. (Check that the different phases of the 3-phase power supplies have been connected to the correct terminals).
5. No wiring has been connected in a short-circuit.
6. The power supplies to indoor and outdoor units have been checked and the power supply voltages are shown in table 6-2
7. All control wiring is 0.75mm<sup>2</sup> three-core shielded cable and the shielding has been grounded.
8. The outdoor units' address and capacity switches are set correctly and all other indoor and outdoor unit field settings have been set as required.
9. The additional refrigerant charge has been added correctly. Note: In some circumstances it may be necessary to run the system in cooling mode during the refrigerant charging procedure. In such circumstances, points 1 to 8 above should be checked before running the system for the purpose of charging refrigerant and the outdoor unit liquid and gas stop valves should be opened.

During commissioning, it is important that you:

- Keep a supply of R410A refrigerant at hand.
- Keep the system layout, system piping and control wiring diagrams at hand.

### 7.4 Commissioning trial runs

#### 7.4.1 Commissioning test run of single refrigerant system

Once all the pre-commissioning checks in Part "Pre-commissioning Checks" have been completed, a test run should be performed as described below and a Commissioning Report should be completed as a record of the operating status of the system during commissioning.

Note: When running the system for commissioning test runs, if the combination ratio is 100% or less, run all the indoor units and if the combination ratio is more than 100%, run indoor units with total capacity equal to the total capacity of the outdoor units.

The test run procedure is as follows:

1. Open the outdoor unit liquid, gas and oil balance valves.
2. Turn on the power to the outdoor units.
3. If manual addressing is being used, set the addresses of each indoor unit.
4. Leave the power on for a minimum of 12 hours prior to running the system to ensure that the crankcase heaters have heated the compressor oil sufficiently.
5. Run the system:
  - a) Run the system in cooling mode with the following settings: temperature 17°C; fan speed high.
  - b) After one hour, complete the system commissioning report then check the system parameters using the UP/DOWN system check button on each outdoor unit's main PCB.
  - c) Run the system in heating mode with the following settings: temperature 30°C; fan speed high.
  - d) After one hour, complete the system commissioning report then check the system parameters using the UP/DOWN system check button on each outdoor unit's main PCB.

#### 7.4.2 Commissioning test run of multiple refrigerant system

Once the commissioning test run of each refrigerant system has been satisfactorily completed as per "Commissioning test run of single refrigerant system", run the multiple systems that make up a project simultaneously and check for any abnormalities.

## 7.5 Caution on refrigerant leakage

- The refrigerant is R410A, which is safe and noncombustible.
- The room for the air conditioner should be big enough so that refrigerant leaks cannot reach critical thickness. You can also take other corrective measures.
- Critical thickness - the max thickness of Freon without any harm to people. R410A critical thickness is 0.42 kg/m<sup>3</sup>

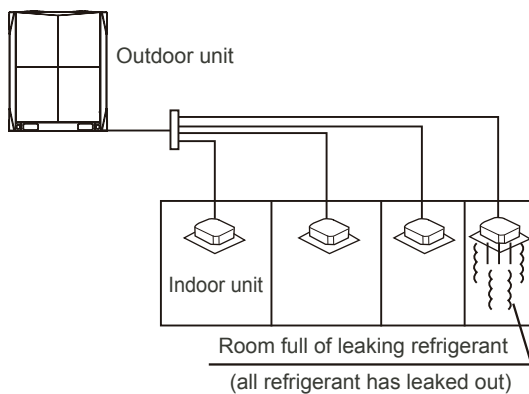


Fig.7-1

#### ■ Countermeasure against overhigh thickness:

1. Install a mechanical ventilator to reduce the refrigerant thickness under a critical level. (ventilate regularly)
2. Install the leak detector alarm device related to mechanical ventilator if you cannot regularly ventilate.

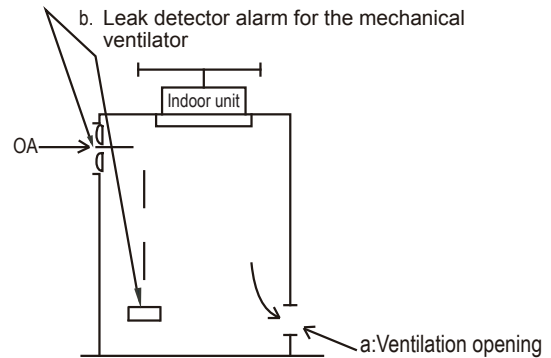


Fig.7-2

- Calculate the critical thickness through the following steps.
  1. Calculate the total refrigerant volume (Akg):  
Total refrigerant volume (Akg) = refrigerant charging in factory (displayed on nameplate) + additional charging refrigerant
  2. Calculate the minimum indoor room volume (Bm<sup>3</sup>)
  3. Calculate the refrigerant thickness as Akg / Bm<sup>3</sup> should be less than 0.42kg/m<sup>3</sup>.