



TRANE®

MINI-VRF DC Variable Frequency Outdoor Unit

Installation Manual



Applicable Types: TMR030SMAANAB
TMR040SMAANAB
TMR050SMAANAB
TMR060SMAANAB
TMR040SDAANAB
TMR050SDAANAB
TMR060SDAANAB
TMR070SDAANAB

Table of Contents

1 Safety Precaution	1
2 Key Points for Construction Inspection	1
3 Installation of Outdoor Unit	2
4 Installation of Connecting Pipe	4
5 Electrical Wiring	10
6 Trial Run	14

The equipment contains fluorinated
greenhouse gas R410A
Global Warming Potential(GWP):2087.5

1 Safety Precaution

WARNING

- * **This air conditioner is a comfortable unit. Don't use it in some special places for machine rooms, precise instruments, foods, plants, animals, artworks, etc.**
- The installation shall be done by the distributor or the professional staff. The installation staff must have related professional knowledge. Misoperation in the self-installation will result in fire, electric shock, injury, water leak, etc.
- If the air conditioner is installed in a small room, some proper measures shall be taken to make sure that the concentration of refrigerant leak in the room shall not exceed the critical level. For detailed measures, please consult the distributor.
- When connecting the power supply, comply with the regulations specified by the local power company. According to the law, the ground wire must be connected. The misconnection of the ground wire will result in electric shock.
- If the air conditioner needs to be moved or reinstalled, please inform the distributor or the professional staff to operate. Incorrect installation will result in fire, electric shock, injury, water leak, etc.
- The users are not permitted to rebuild or repair the air conditioner by their own. Incorrect repair will result in fire, electric shock, injury, water leak, etc.. Please inform the distributor or the professional staff to repair.

NOTE

- Make sure the water drainage ditch is useable.
- Make sure a current leakage protection switch is equipped. The current leakage protection switch must be equipped. If not, an electric shock will take place.
- It mustn't be installed in any potential leakage location of inflammable gas. In case of the inflammable gas leak around the outdoor unit, a fire takes place.
- Make sure the foundation and hoisting are firm and reliable. If not, it will result in a falling accident.
- Make sure all cables are correctly connected. The misconnection of the cables will result in the damage of electrical components.
- Pre-installation exposure to water or other moistures will result in short circuit of its electrical components.. Don't store it in any damp cellar or expose it to rain or water.
- In case of the refrigerant leaks during installation, the room must be ventilated at once. If the leaked refrigerant is exposed to flame, some toxic gases will be generated.
- After installation, make sure the refrigerant is not leaked.
- If the refrigerant gas in the room is exposed to flame source, such as a heater, a stove or an electric cooker, some toxic gases will be generated..
- A lightning protection device must be equipped according to national laws and regulations against the lightning strike.

2 Key Points for Construction Inspection

2.1 Arrival of goods and open-case inspection

- 1) When receiving the machine, check if there is any damage in transportation. If any surface or internal damage is found, please inform the transportation agency in a written form.
- 2) After receiving the machine, check if the type, specification and quantity of the machine conform to the contract.
- 3) When unpacking the product, please keep the Manual well and check all accessories.

2.2 Refrigerant pipe

- 1) The refrigerant pipe must be installed by the special refrigerant distributor made by our company (purchase).
- 2) The refrigerant pipe must use the pipe with specified diameter and wall thickness.
- 3) The welding of the copper pipe must be performed with nitrogen-filled protection. Before welding, the copper pipe must be filled with the nitrogen of 0.2kgf/cm^2 . After welding, the nitrogen must be cut off until the copper pipe is thoroughly cooled down.
- 4) The refrigerant pipe must be treated with thermal insulation.
- 5) After the refrigerant pipe is installed and before the air tightness test and vacuumization are performed, the indoor unit cannot be power-on.

2.3 Air tightness test

After the refrigerant pipe is installed, nitrogen of 40kgf/cm^2 (4.0MPa) must be filled from the gas side and liquid side simultaneously for 24-hour air tightness test.

2.4 Vacuumizing

After the air tightness test, vacuumization (-0.1MPa) must be performed from both the gas side and the liquid side simultaneously.

2.5 Refilling of refrigerant

- 1) The refilling volume of refrigerant is calculated by the diameter and length (actual length) of the pipe at the liquid sides of the indoor and outdoor units.
- 2) The refilling volume of refrigerant, diameter and length (actual length) of liquid pipe, and height difference of the indoor and outdoor units shall be recorded into the use confirmation table of the outdoor unit (on the cover plate of electronic control box) for future reference.

2.6 Electrical wiring

- 1) The power supply capacity and wire diameter shall be selected according to the design manual. Generally, the power line of the air conditioner is thicker than that of the motor.
- 2) To prevent misoperation of the air-conditioner, don't interlace or wind the power line (220-240V-/380V 3N-) with the connecting wires (low-voltage wires) of the indoor and outdoor units.
- 3) The indoor unit is power-on after air tightness test and vacuumization.

2.7 Trial Run

- 1) Trial run cannot be performed until the outdoor unit is power-on for more than 12 hours, or the system may be damaged.

3 Installation of Outdoor Unit



WARNING

- The air conditioner must be installed in the place, which is strong enough to support the weight of the machine.
- If it is not strong enough, the machine may fall down and cause some personal injury.
- The special installation must be performed against strong wind or earthquake.
- The falling-down because of incorrect installation may cause some accidents.

3.1 Selection of installation position

- 1) Enough space for installation and maintenance.
- 2) No barrier at the air inlet and the air outlet and away from strong wind.
- 3) Dry and ventilated.
- 4) The flat supporting surface is able to bear the weight of the outdoor unit. The outdoor unit shall be horizontally installed, without any noise or vibration.
- 5) Neighbors shall not be influenced by running noise and exhaust gas.
- 6) Without inflammable gas leak;
- 7) Convenient for installation of connecting pipe and electrical connection.

3.2 Dimensional drawing of outdoor unit (Unit: mm)

- 1) Model 08KW; 10KW:

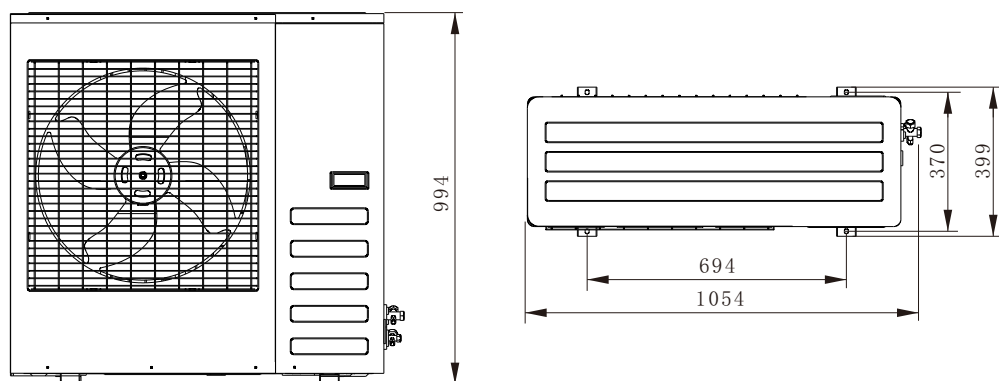


Fig. 3-1 Dimension of Outdoor Unit

- 2) Model 12.5KW; 14KW; 16KW; 18KW:

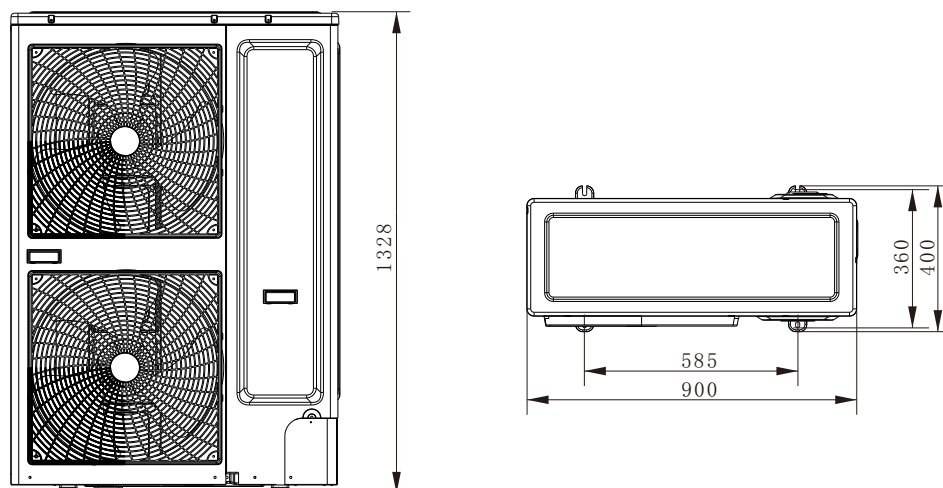


Fig. 3-2 Dimension of Outdoor Unit

3.4 Hoisting of outdoor unit

- 1) Don't remove any package upon hoisting. Two ropes (more than 8cm) shall be used to hoist the well-packaged machine stably and safely. If there is no package or the packaging material is broken, use some backing plates or packaging materials to protect the machine.
- 2) The outdoor unit shall be carried and hoisted vertically, within an inclination of less than 15 degrees. Care should be taken to safety during carrying and hoisting the machine.
- 3) The gravity of the machine is not in the center, so be careful to hoist the machine.
- 4) Don't hold the suction inlet of the housing, or it will be deformed.

3.5 Installation and maintenance space of outdoor unit

- 1) Provide a firm and adequate foundation to:
 - ① Prevent the outdoor unit from being sunken;
 - ② Prevent the outdoor unit from abnormal noise.
- 2) Foundation types
 - ① Steel structure
 - ② Concrete structure (Common practice is shown in the Fig. below)

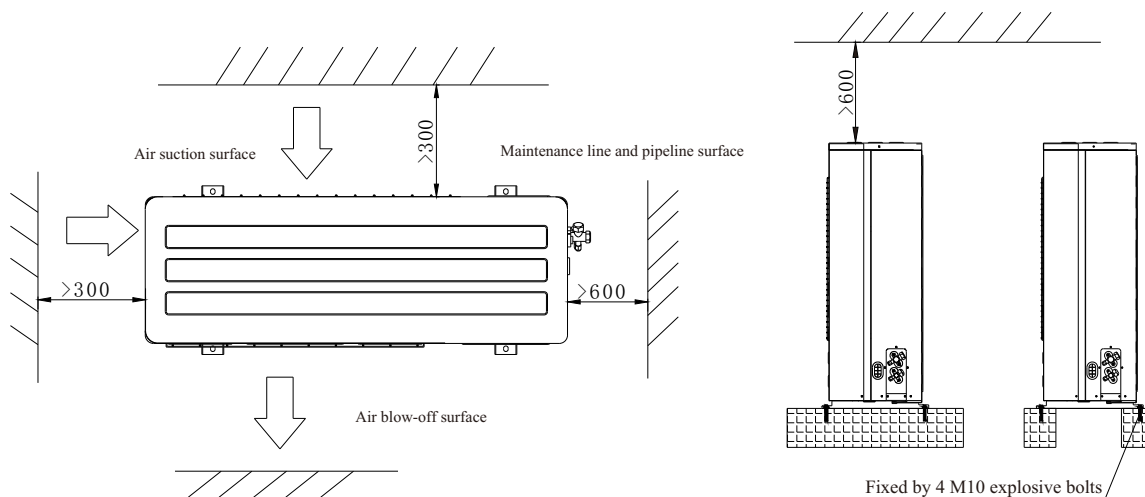


Figure 3-3 Space schematic diagram I for installation and maintenance of outdoor unit

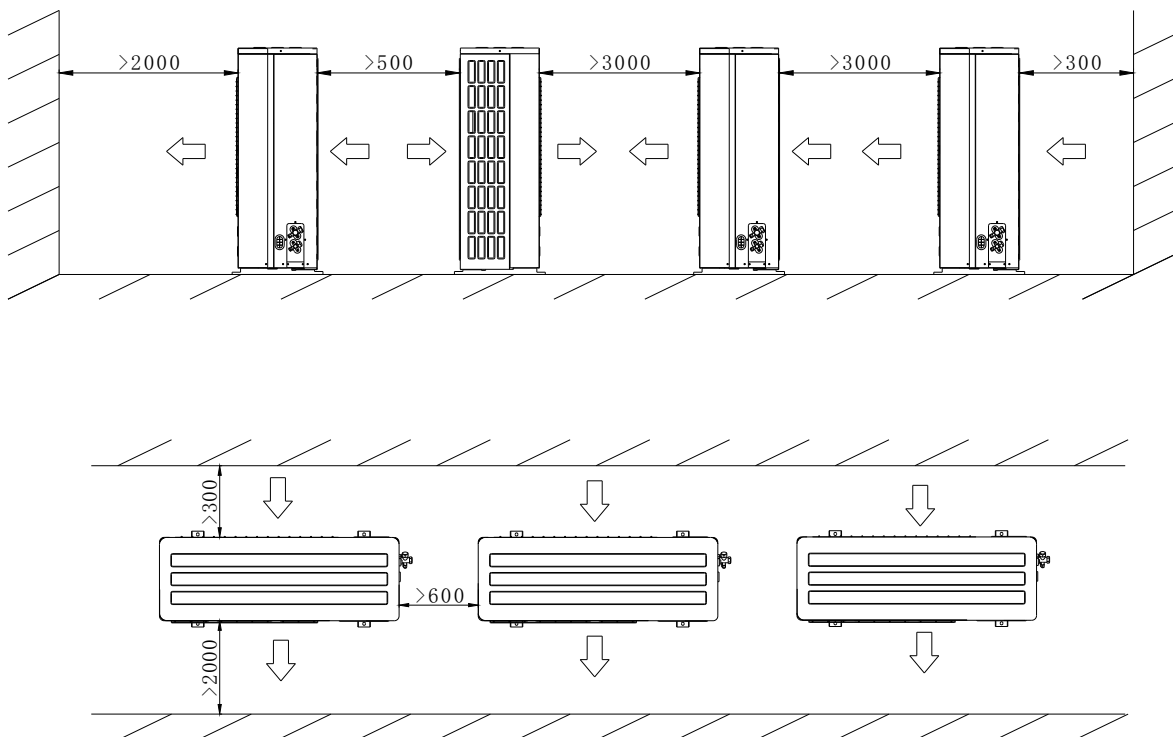


Figure 3-4 Space schematic diagram II for installation and maintenance of outdoor unit

3.6 Position and installation of outlet pipe

- 1) 08KW and 10KW(directly use the external stop valves to connect the pipes.
- 2) 12.5KW, 14KW, 16KW and 18KW use the connecting pipes to get in and out through the knock-off hole of sheet metal (as shown in Fig. 3-5).

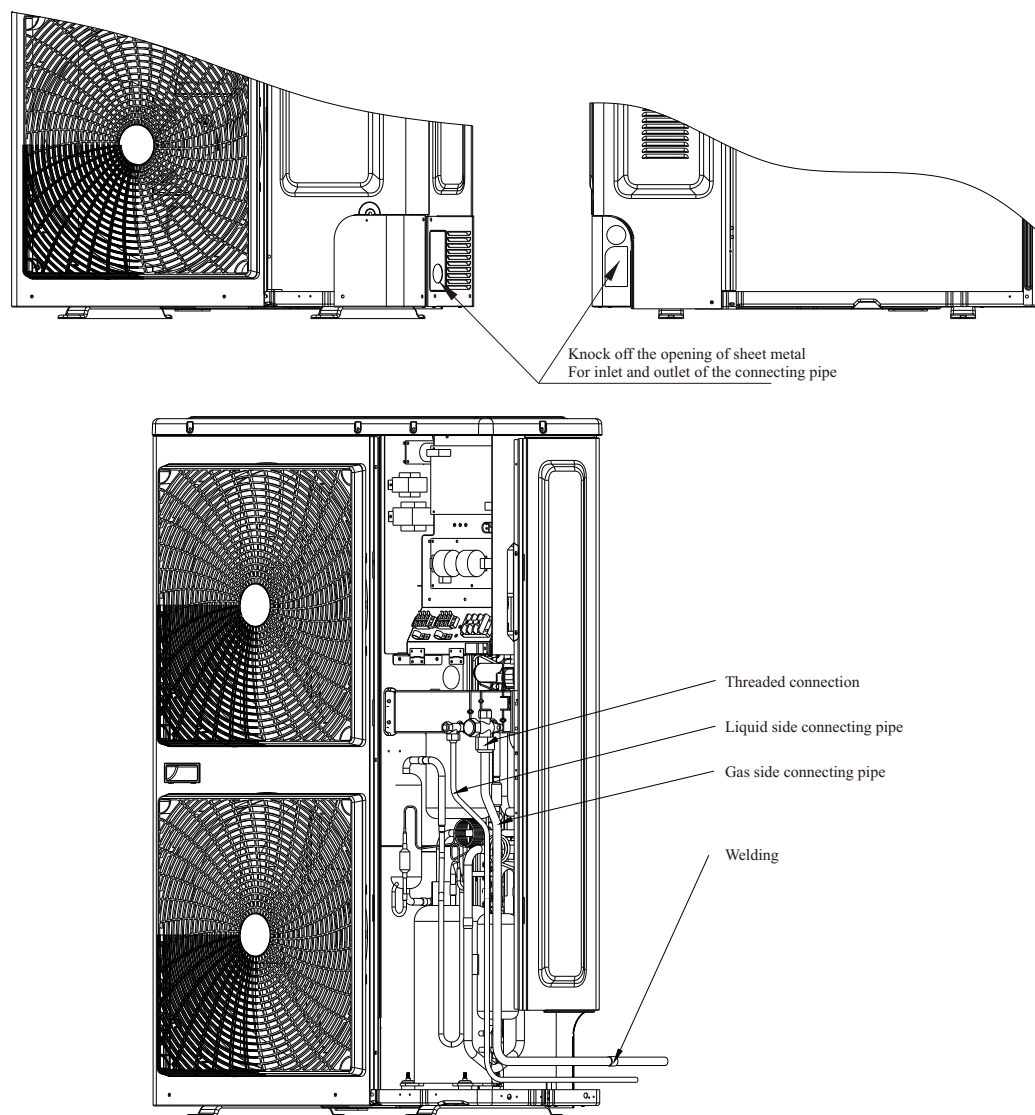


Fig. 3-5 Schematic Diagram for Connecting Pipe of Outdoor Unit

4 Installation of Connecting Pipe

4.1 Refrigerant pipe

1) Flaring

Use a pipe cutter to cut the refrigerant pipe and a pipe expander to flare

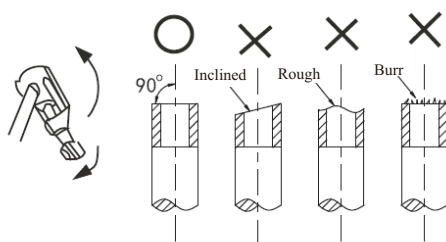
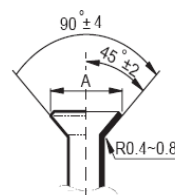


Fig. 4-1 Cutting Pipe of Connecting Pipe

Table 4-1 Flaring Dimension of Connecting Pipe

Outer Diameter (mm)	A (mm)	
	Maximum	Minimum
Φ 6.4	8.7	8.3
Φ 9.5	12.4	12.0
Φ 12.7	15.8	15.4
Φ 15.9	19.0	18.6



- 2) Fastening nut
Align the connecting pipe, tighten it by hand, and then by a wrench.

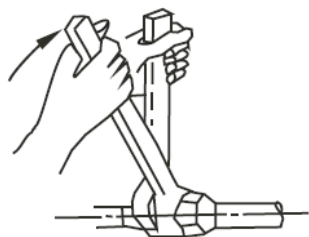


Fig. 4-2 Tightening Schematic Diagram

Table 4-2 Tightening Torque

Pipe Dimension (mm)	Tightening Torque (Nm)
Φ6.4	14.2~17.2 (144~176 kgf•cm)
Φ9.5	32.7~39.9 (333~407 kgf•cm)
Φ12.7	49.5~60.3 (504~616 kgf•cm)
Φ15.9	61.8~75.4 (630~770 kgf•cm)

NOTE

- To prevent the copper pipe from internal oxidation upon welding, the copper pipe shall be filled with nitrogen. Otherwise, the oxide skin will block the refrigeration system!
- When fastening the nut, too strong force will damage the flared socket, but too weak force will result in leakage. Please refer to the tightening torque in the table above to fasten the nuts!

4.2 Set refrigerant pipe dimension and pipe connecting steps

Table 4-3 Definition of Pipe

Name of Pipes	Connecting Position of Pipe	Code
Main pipe	Pipe between the outdoor unit and the first distributor at the indoor unit side	L ₁
Main pipe of indoor unit	Pipe behind the first distributor at the indoor side and indirectly connected to the indoor unit	L ₂ ~L ₅
Branch pipe of indoor unit	Pipe behind the distributor and directly connected to the indoor unit	A, b, c, d, e, f
Distributor components of indoor unit	Pipe components to connect the main pipe, main branch pipe and branch pipe	A, B, C, D, E

1) Connecting mode I

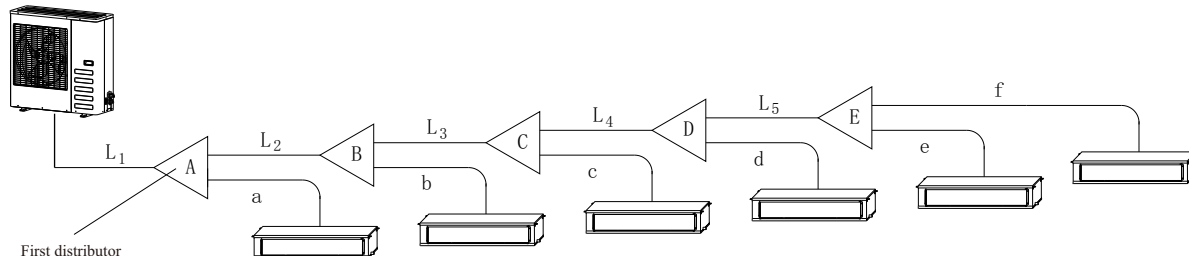


Fig. 4-3 Connecting mode I

2) Connecting mode II

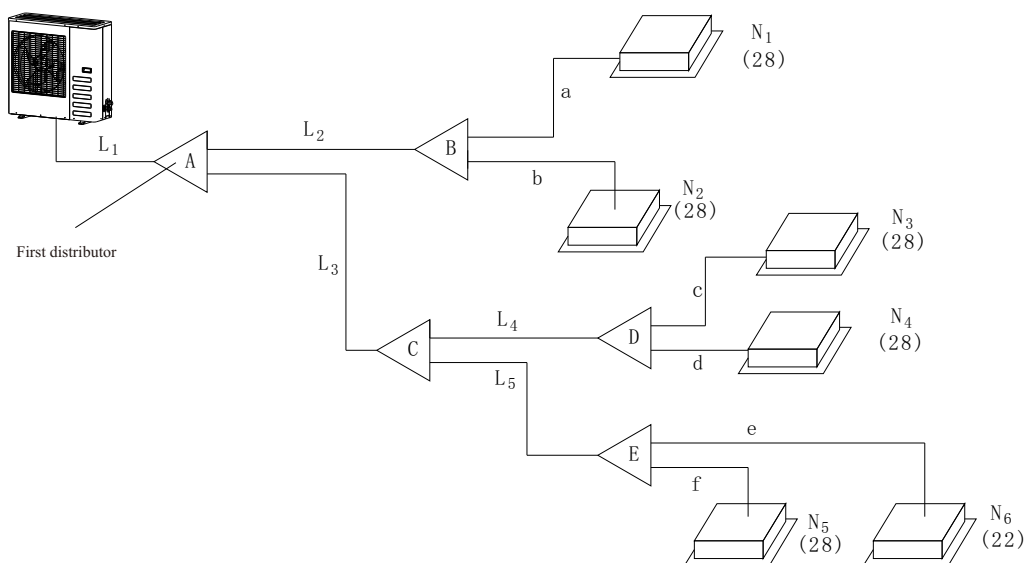


Fig. 4-4 Connecting mode II

NOTE

- All distributors must use our company's special distributors. Otherwise, it may cause severe faults of the system!
- The indoor unit shall be equally installed on both sides of the U-type distributor.

4.3 Determination of main pipe (L₁) diameter

Table 4-4 Diameter of Main Pipe

Capacity of Outdoor Unit (kW)	Pipe				
	Dimension of Main Pipe (mm)				
	L ₁ < 30m		L ₁ ≥ 30m		First distributor
	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe	
8/10	Φ9.52	Φ15.88	Φ9.52	Φ15.88	TRJ - I D01D
12.5/14/16	Φ9.52	Φ15.88	Φ9.52	Φ19.05	TRJ - I D01D
18	Φ9.52	Φ19.05	Φ9.52	Φ19.05	TRJ - I D01D

4.4 Determination of main pipe (L₂-L₅) diameter

Table 4-5 Diameter of Pipe

Capacity of Downstream Indoor Unit (kW)	Length of Downstream Equivalent Pipe		
	Dimension of main pipe of indoor unit		Applicable to distributor
	Liquid pipe	Gas pipe	
W < 6.5	Φ9.52	Φ12.7	TRJ - I D01D
6.5 ≤ W < 18	Φ9.52	Φ15.88	TRJ - I D01D
18 ≤ W < 22	Φ9.52	Φ19.05	TRJ - I D01D

4.5 Allowable length and height difference of the refrigerant pipe

1) Connecting mode 1

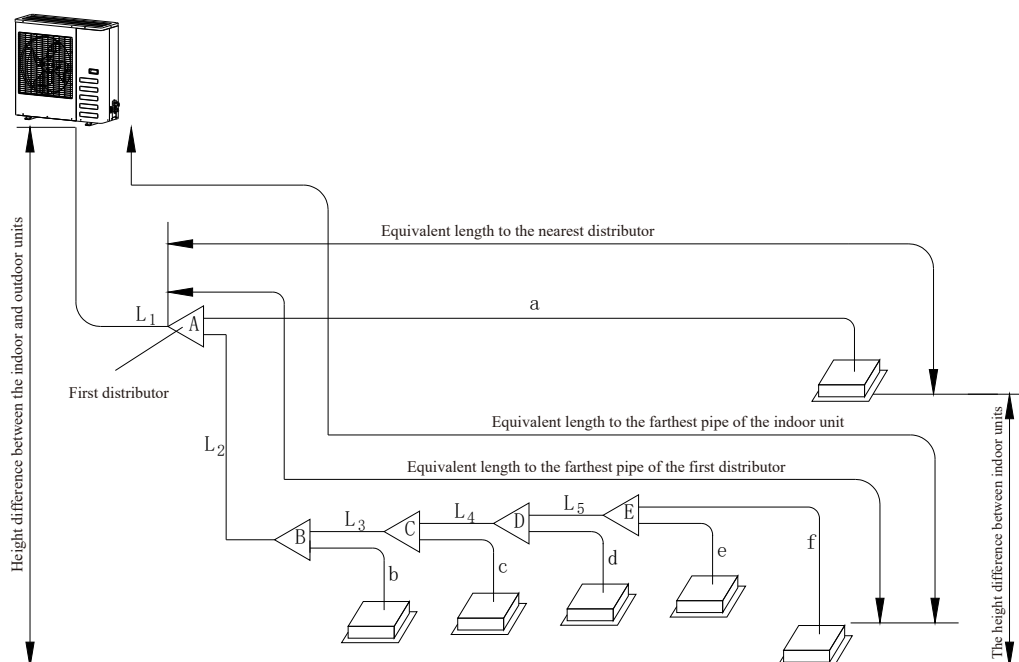


Fig. 4 -5 Connecting Mode 1

2) Connecting mode II

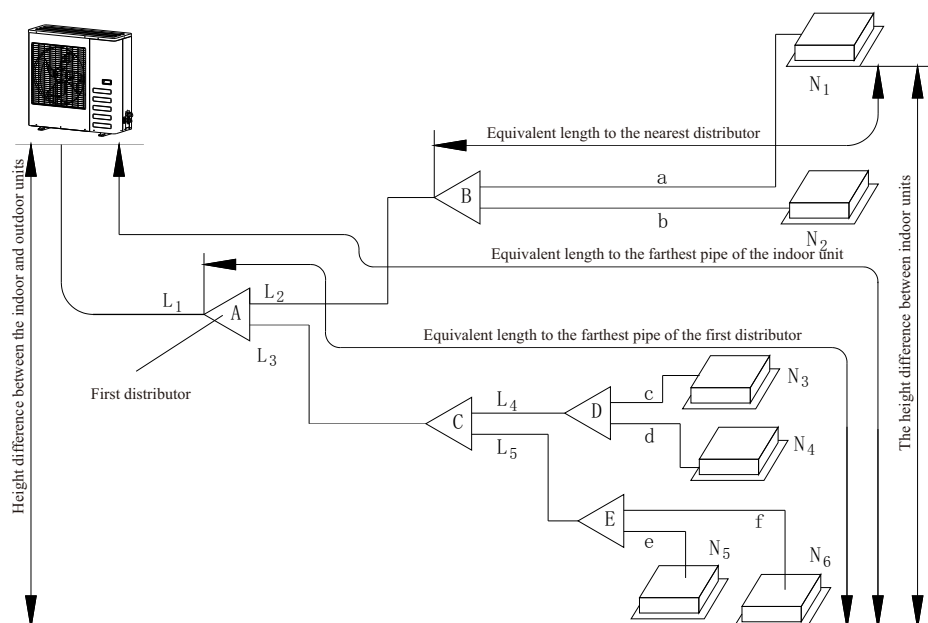


Fig. 4-5 Connecting Mode II

Table 4-6 Diameter of Pipe

Total Pipe Length		$\leq 100\text{m}$	$L_1+L_2+L_3+L_4+L_5+a+b+c+d+e+f$
Length of the farthest pipe L	Actual length	$\leq 60\text{m}$	$L_1+L_2+L_3+L_4+L_5+f$ (connecting mode I) 或 $L_1+L_3+L_5+f$ (connecting mode II)
	Equivalent length	$\leq 70\text{m}$	
Equivalent length to the farthest pipe of the first distributor		$\leq 20\text{m}$	$L_2+L_3+L_4+L_5+f$ (connecting mode I) 或 L_3+L_5+f (connecting mode II)
Equivalent length to the nearest distributor		$\leq 15\text{m}$	a、b、c、d、e、f
Height difference between the indoor and outdoor units	Outdoor upper	$\leq 30\text{m}$	—
	Outdoor lower	$\leq 20\text{m}$	—
Height difference between the indoor units		$\leq 8\text{m}$	—

4.6 Installation of distributor

- 1) The distributor shall use U-type or Y-type, instead of T-type.
- 2) The distributor shall be installed horizontally, with the deviation angle of no greater than $\pm 10^\circ$
- 3) The distributor cannot be turned directly, with the straight pipe of no less than 0.8 meter.

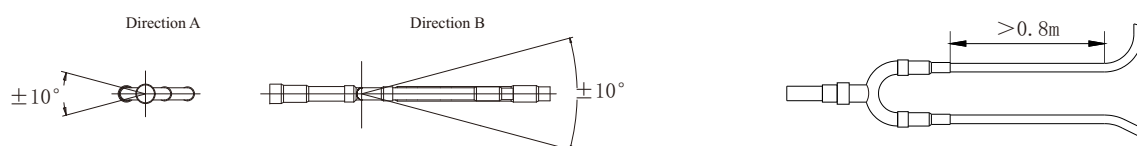


Fig. 4-6 Installation of Distributor

4.7 Oil return bend settings

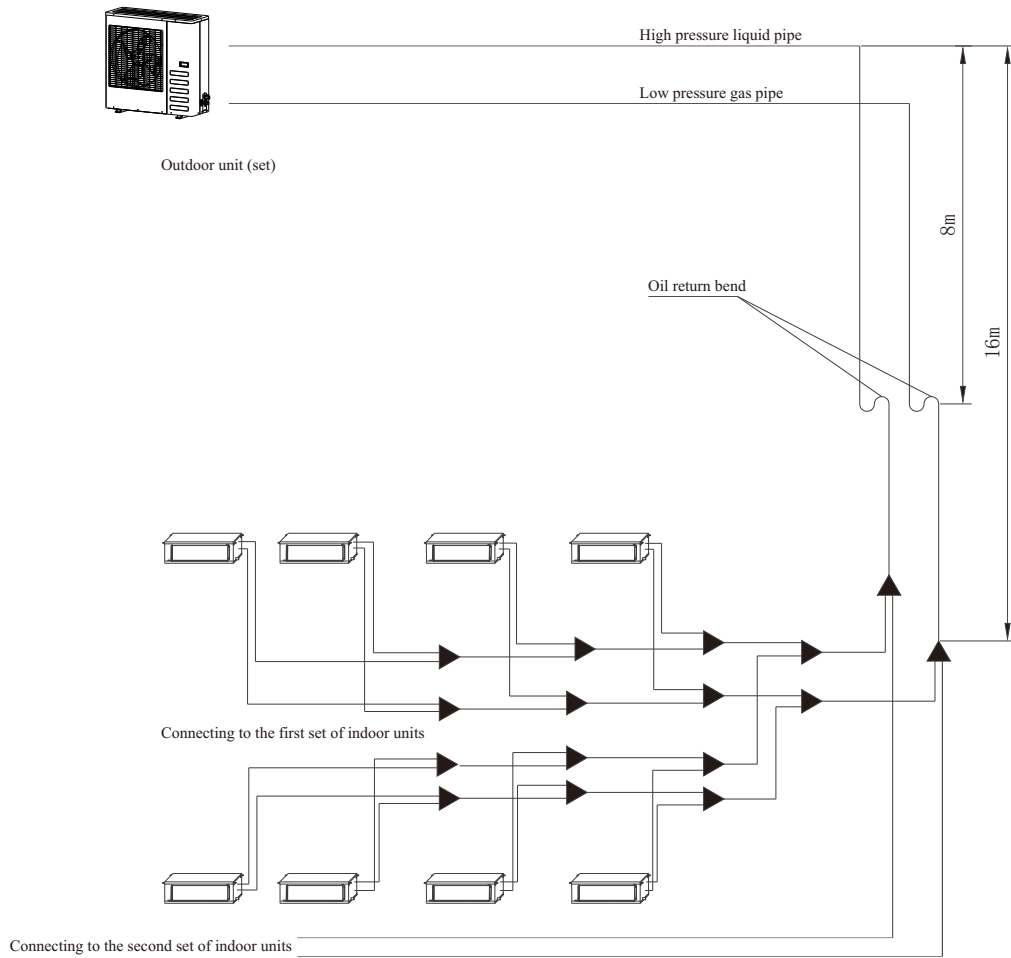


Fig. 4-7 Position of Oil Return Bend at the Height Direction

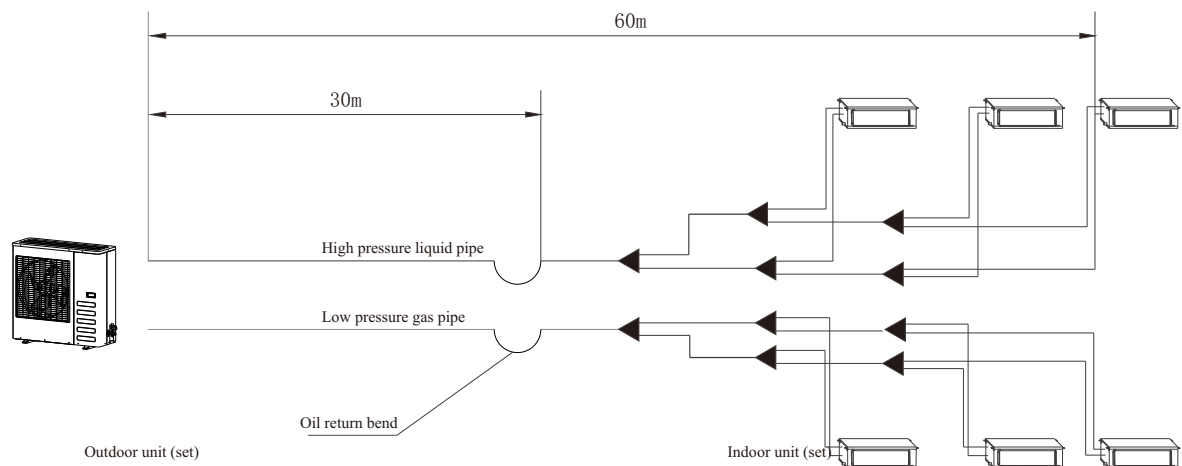


Fig. 4-8 Position of Oil Return Bend at the Horizontal Direction

4.8 Remove foreign materials in the pipeline.

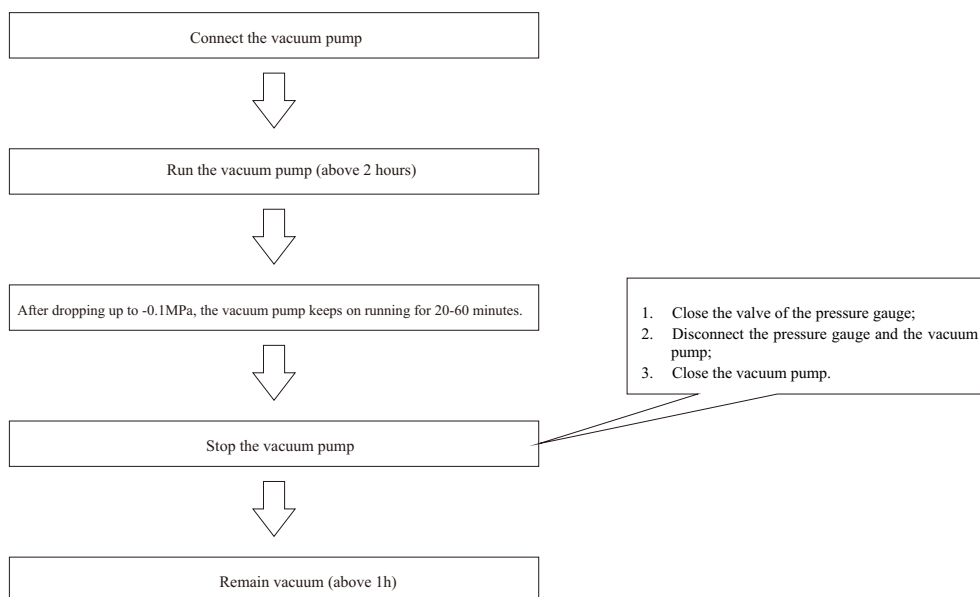
- 1) The foreign materials, which enter the refrigerant pipe during installation, shall be cleaned with high pressure nitrogen.
- 2) Don't connect with the indoor unit upon cleaning.
- 3) Use the nitrogen instead of refrigerant or flammable toxic gases like oxygen.

4.9 Air tightness test

- 1) After the refrigerant pipe is installed and connected to the indoor unit, and before the connecting pipes between the indoor and outdoor units are connected to the valves of the outdoor units, refill the nitrogen with the pressure of 40kgf/cm² (4.0MPa) from the gas side and the fluid side simultaneously, mark the pressure value, and then perform 24-hour air tightness test.
- 2) If the pressure drops, recheck the leakage of all interfaces and then maintain the pressure for 24 hours.
- 3) Don't connect with the outdoor unit during maintaining the pressure.

4.10 Vacuumizing

- 1) The vacuum pump has the vacuum degree of less than -0.1MPa and the air displacement of more than 40L/min.
- 2) It is unnecessary to vacuumize the outdoor unit. Don't open the check valves at the gas side and the liquid side of the outdoor unit.
- 3) Make sure the vacuum pump can drop up to -0.1MPa within 2 hours; if it fails to drop up to -0.1MPa after 3 hours, check moisture or air leak.
- 4) The vacuum pump must have a check valve.



NOTE

- Don't use tools and measuring apparatus using in different refrigerants or directly contacting the refrigerant.
- Don't exhaust air with refrigerant gas.
- If the vacuum degree cannot reach -0.1MPa, recheck its leakage. If not, keep the vacuum pump on for 1-2h.

4.11 Refilling volume of refrigerant

The refilling volume of refrigerant (R410A) is calculated according to the diameter and length of the pipe at the liquid side of the indoor and outdoor units.

Table 4-1 Refilling Volume of Refrigerant

Diameters of pipe at the liquid side (mm)	Refilling volume of refrigerant equal to the length of 1m pipe (unit: kg)
φ 6. 35	0. 023
φ 9. 52	0. 040

Note: The R410A refrigerant must be weighed by an electronic scale and filled in the liquid state.

4.12 Stop valve instructions

- 1) It is closed when leaving the factory;
- 2) Open the valve counterclockwise or close the valve clockwise with a 6mm socket head wrench;
- 3) After completing the operation, tighten the valve cover;
- 4) R410A special tool shall be used to vacuumize the valve and fill the refrigerant at the service entrance. Fill the refrigerant at the service entrance at the gas side, and vacuumize the valve at the service entrance at the liquid side and the gas side simultaneously.

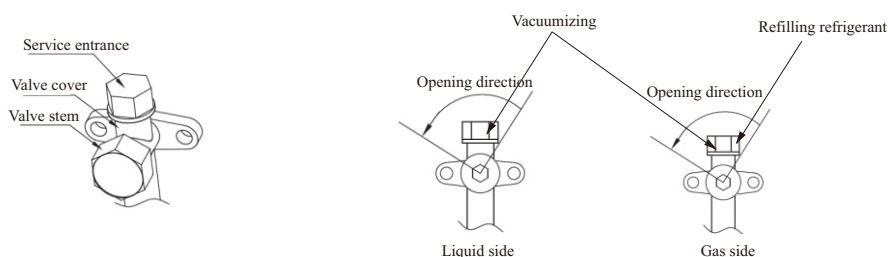


Fig. 4-9 Stop Valve Instructions

4.13 Thermal insulation of pipe

- 1) Apply thermal insulation to the pipes at the gas side and the liquid side respectively;
- 2) Use closed-cell thermal insulation materials, with the flame retardant grade of B1 and high temperature resistance of 120°C;
- 3) Outer diameter of copper pipe $\leq \phi 12.7$ and thickness of thermal insulation cotton $\geq 15\text{mm}$; outer diameter of copper pipe $\geq \phi 15.88$ and thickness of thermal insulation cotton $\geq 20\text{mm}$.
- 4) The nut joints of the indoor unit shall be performed thermal insulation

NOTE

- The power supplies for the indoor and outdoor units shall be separately designed.
- The power supply must be designed with a sub-circuit, and equipped with a current leakage protector and a manual switch.
- All indoor units in the same system shall be arranged on the same power circuit, and shall be turned on/off the power simultaneously. It is not allowed to equip each indoor unit with a power switch.
- The connecting wire system and the refrigerant pipe system of the indoor unit shall be incorporated into the same system.
- To reduce the interference, the indoor and outdoor communication cables shall use two-core or three-core shielded twisted-pair cables instead of ordinary multi-core cables.
- Conform to related national electrical standards.
- Electrical wiring shall be done by a professional electrician.

5 Electrical Wiring

5.1 Outdoor unit wiring

Table 5-1 Outdoor Unit Wiring

Power (kW)	Power Supply	Power Line (mm ²)	Breaker/Fuse (A)	Signal Wire of Indoor/Outdoor Units (mm) (Signal Wire of Weak Current)
8/10	Single-phase 220-240V~50Hz	3×4.0	40/30	three-core shielded cable 3×1.0 (two-core shielded cable 2×1.0)
	Three-phase 380V~50Hz	5×2.5	25/20	
12.5/14/16/18	Single-phase 220-240V~50Hz	3×6.0	63/45	
	Three-phase 380V~50Hz	5×2.5	25/20	

If needed, the user can purchase a centralized controller, as shown in the dashed box. For the specific method of installation, please contact your local supplier.

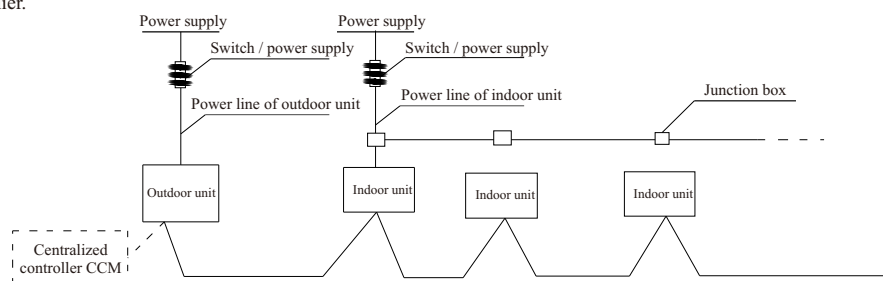


Fig. 5-1 Wiring and Control

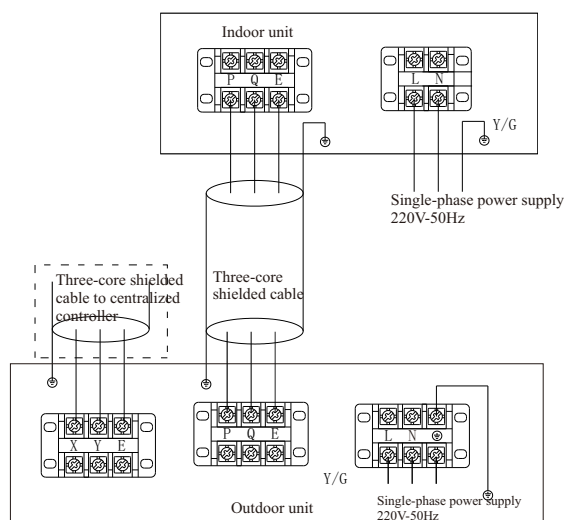


Fig. 5-2 Electrical Wiring of Single-phase Outdoor Units

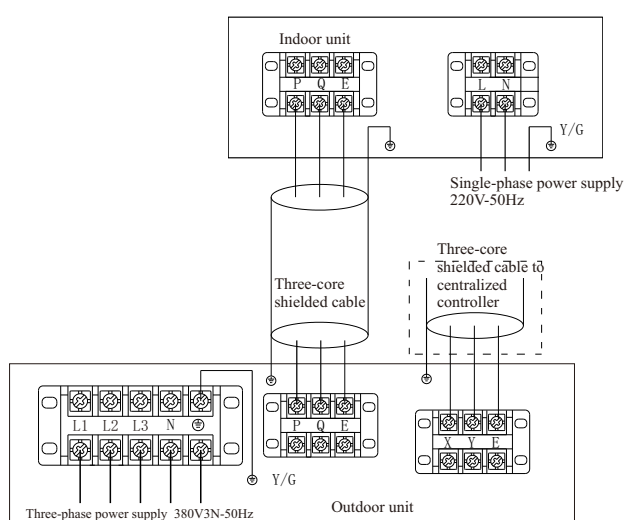


Fig. 5-3 Electrical Wiring of Three-phase Outdoor Units



NOTE

- When the signal line uses a two-core shielded cable, the shielding net shall be connected to “E” of the terminal block. When the signal line uses a three-core shielded cable, the shielding net shall be connected to the ground.
- Never connect the power line (strong current) to the terminal block of the signal line (weak current). Otherwise, the power board will be burnt out.

5.2 Indoor unit power supply wiring

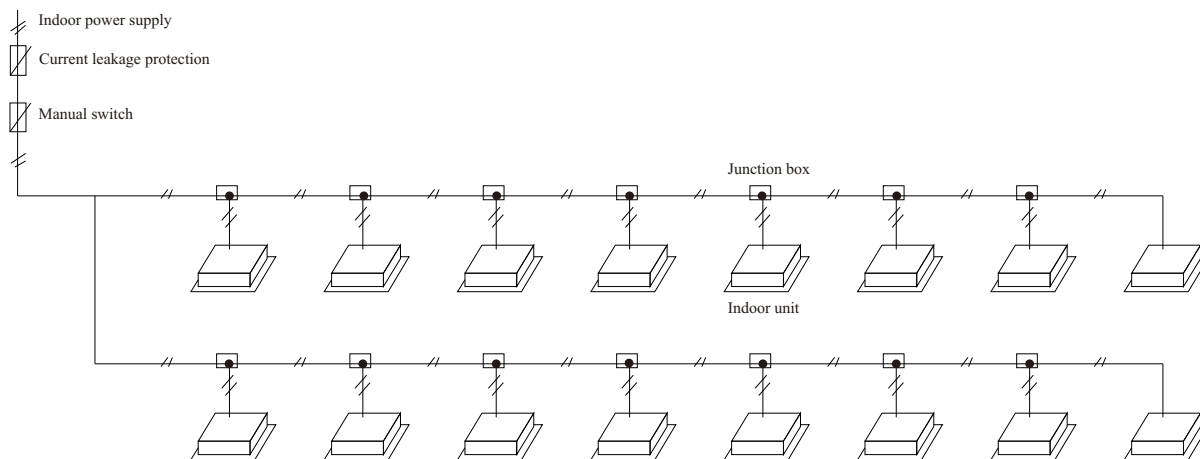


Fig. 5-4 Indoor Unit Power Supply Wiring



NOTE

When the power line is parallel to the signal line, please put the electrical wires into their own wire pipes, with proper wire spacing (10A or below: 300mm, 50A or below: 500mm).

5.3 Indoor unit signal line wiring

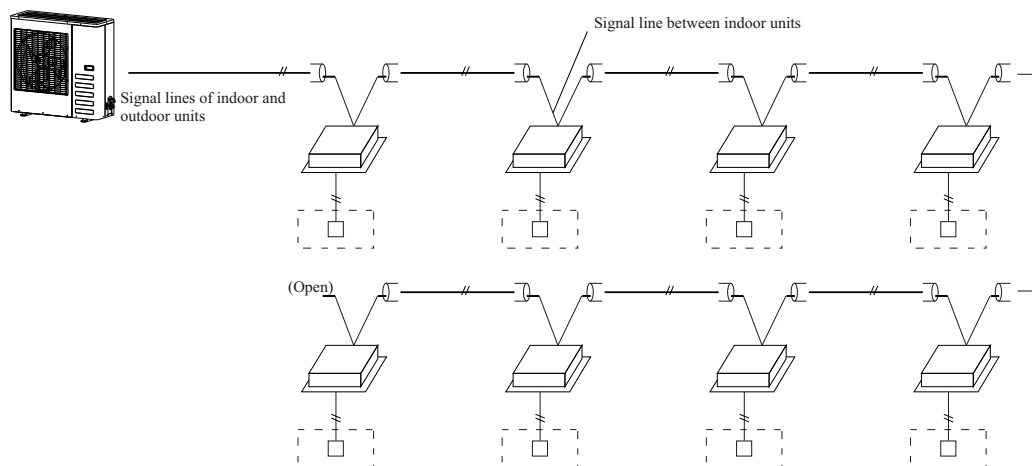


Fig. 5-5 Indoor Unit Power Supply Wiring

If needed, the user can purchase a wire controller, as shown in the dashed box.

5.4 Wiring diagram

For electrical wiring diagram of outdoor unit, refer to the wiring diagram at the side of the right side plate of the outdoor unit.

5.5 Dialing setting of main control board

Table 5-2 08/10KW Dialing

Dialing Content	Switch No.	Dialing Illustration	Set Value
Starting time setting	SW3		Starting time 12 minutes
			Starting time 3 minutes
Address setting	SW4+SW5		0-15
			16-31
			32-47
			48-63
Capacity setting	SW6		8kw
			10kw

Table 5-3 12. 5/14/16/18KW Dialing

Dialing Content	Switch No.	Dialing Illustration	Set Value
Starting time setting	SW3		Starting time 12 minutes
			Starting time 3 minutes
Address setting	SW4+SW5		0-15
			16-31
			32-47
			48-63
Capacity setting	SW6		12.5kw
			14kw
			16kw
			18kw

5.6 Outdoor unit spot-check instructions

Table 5-4 Outdoor Unit Spot-check Instructions

No.	Spot-check Content	No.	Spot-check Content
	Current frequency / number of indoor units (standby display)	11	Opening degree of electronic expansion valve = spot-check display value × 8
1	Capacity of outdoor unit	12	AC transformer current
2	Total capacity need of indoor unit	13	Secondary side current
3	Total capacity needs of corrected host	14	Input AC voltage
4	Operation mode (0-4)	15	Secondary side current - (spot-check display × 4)
5	Actual running ability of outdoor unit	16	Number of indoor
6	Gears of fan (0-7)	17	Number of indoor unit working
7	T2 / T2 B average temperature	18	Last fault protection code (no fault display -)
8	T3 temperature of outdoor condenser	19	Control parameters (only for use of development personnel), display "-"
9	T4 environmental temperature	20	Control parameters (only for use of development personnel)
10	T5 exhaust temperature	21	

Definition of operation mode: 0-OFF/Fan; 2-Cooling; 3-Heating; 4-Forced cooling.

Table 5-5 Outdoor Unit Fault Code

Fault Code	Fault Contents	Remark
E1	Outdoor unit phase-sequence fault	
E2	Communication fault between the outdoor unit and the host	20-minute break at first or 2-minute break later
E4	Environmental temperature sensor fault	
E6	Condenser pipe temperature sensor fault	
E9	AC over-voltage / under-voltage protection	
E10	EEPROM fault	
H0	DSP and 0513 communication failure	
H1	0513 and 0527communication failure	

Fault Code	Fault Contents	Remark
H4	Display P6 protection for 3 times within 30 minutes	
H5	Display P2 protection for 3 times within 30 minutes	20-minute break at first or 2-minute break later
H6	Display P4 protection for 3 times within 100 minutes	Restore when powering on
H7	The decrease in number of indoor unit	Indoor units are lost for more than 3 minutes. It can't be restored until number of indoor units are restored.
H9	Display P9 protection for 2 times within 10 minutes	Restore when powering on
H10	Display P3 protection for 3 times within 60 minutes	Restore when powering on
H11	Display P13 protection for 2 times within 10 minutes	Restore when powering on
P1	High pressure protection	
P2	Low pressure protection	Display H5 after P2 protection for 3 times within 30 minutes
P3	Various frequency over-current protection	
P4	Exhaust overheating protection	Display H6 for 3 times within 100 minutes
P5	T3 high temperature protection	
P6	Module protection	Display H4 after P6 protection for 3 times within 30 minutes
P9	DC fan fault	Display H9 after P9 protection for 2 times within 10 minutes
P10	Anti-typhoon protection	
P11	T2 high temperature protection	
P12	Fault of the heating fan continuously working for 5 minutes in area A	
P13	Current detection error protection	12, 5, 14, 16 and 18kW are effective. 8 and 10kW have no such faults.
L0	DC compressor module fault	
L1	DC bus low voltage protection	
L2	DC bus high voltage protection	
L4	MCE fault / sync / closed loop	
L5	Zero speed protection	
L7	Phase sequence error protection	
L8	Protection when the speed change of two successive periods exceeds 15Hz	
L9	Protection of speed change (> 15Hz) for the previous time and the next time	

6 Trial Run

6.1 Inspection and confirmation before debugging

- 1) Check and make sure the refrigerating pipeline and communication line connecting with the indoor and outdoor units are connected with the same refrigerating system. Otherwise, some running faults occur. .
- 2) The power supply voltage is within the rated voltage of $\pm 10\%$.
- 3) Check and make sure the power supply line and the control line are correctly connected.
- 4) Before power-on, make sure there is no short circuit.
- 5) Check if all units have passed 24-hour nitrogen pressure-maintaining ($40\text{kgf}/\text{cm}^2$) test.
- 6) Make sure the debugged system is fully vacuumized, dried and filled with the refrigerant as specified.

6.2 Preparation before debugging

- 1) Calculate the refilling volume of refrigerant for each set of units according to the length of on-site liquid pipe.
- 2) Prepare the required refrigerant.
- 3) Prepare the system plan, system piping diagram and control wiring diagram.
- 4) Mark the set address codes on the system plan.
- 5) Turn on the power supply switch of the outdoor unit in advance, and make sure it is power-on for more than 12 hours, so that the heater heats the compressor oil.
- 6) Fully open air pipe check valve, liquid pipe check valve and oil balance valve of the outdoor unit. If they are fully opened, the machine may be damaged.
- 7) Check if the power supply phase sequence of the outdoor unit is correct.
- 8) Check if all dialing switches of the indoor and outdoor units are set according to the technical requirements of the product.

6.3 Filling of names of connecting systems

Indoor unit type	
Room name Example: 2nd floor, first system, indoor (A) Remark: -2F-1A	

Fig. 6-1 Filling of Names of Connecting Systems

When the multiple indoor units are arranged, in order to distinguish the connecting systems of indoor and outdoor units, all systems shall be named respectively and recorded on the nameplate on the electronic control box cover of the outdoor unit.

6.4 Precautions against refrigerant leak

- 1) The refrigerant of the air conditioner is harmless and nonflammable.
- 2) The room for the air conditioner shall have an appropriate space. In case of refrigerant leak, it cannot go beyond the critical concentration. In addition, necessary measures can be taken.
- 3) The critical gas concentration harmless to the human body is 0.3 kg/m³.
- 4) Confirm the critical concentration according to the following steps and take corresponding measures.
 - a) Calculate the filling volume of refrigerant (A[kg])
 Volume of refrigerant = filling volume of refrigerant before delivery (see the nameplate) + refilling volume of refrigerant corresponding to the length of pipe
 - B) Calculate the indoor volume (B [m³]) (by the minimum volume)

$$\frac{A [\text{kg}]}{B [\text{m}^3]} \leq \text{Critical concentration: } 0.3 [\text{Kg/m}^3]$$

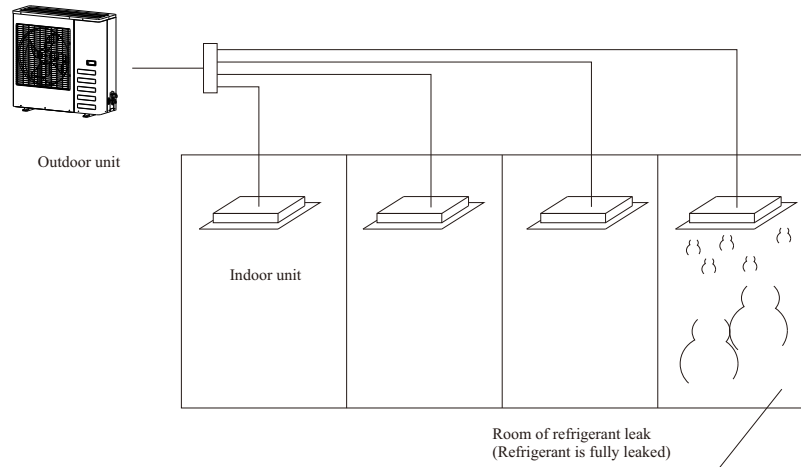
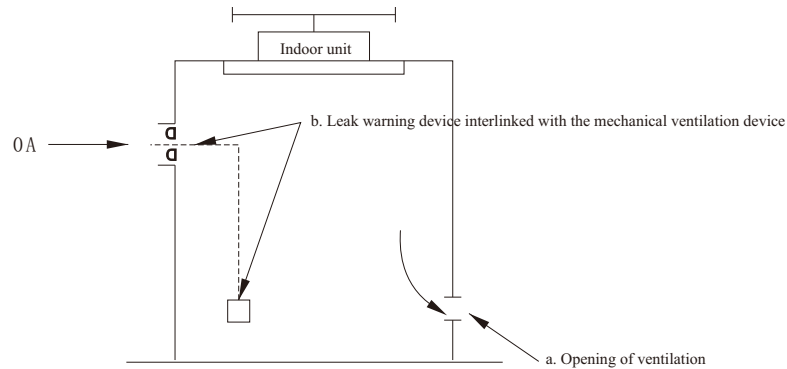


Fig. 6-2 Refrigerant Leak

- 5) Measures against exceeding the critical concentration
 - a) To reduce the refrigerant concentration below the critical concentration, install a mechanical ventilation device (for frequent ventilation).
 - b) If frequent ventilation cannot be performed, please install a leak warning device interlinked with the mechanical ventilation device.



(The leak warning device shall be installed in the gathering place of refrigerant.)

Fig. 6-3 Mechanical Ventilation Device

6.5 Hand over to the client

- 1) Hand over the Use Manual for the Indoor Unit and the Installation Manual for the Outdoor Unit to the client.
- 2) Explain the contents of Use and Installation Manual to the client carefully.



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