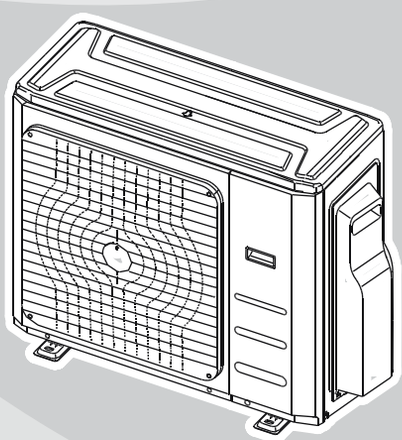
MULTI-ZONE
DUCTLESS INVERTER
SPLIT AIR CONDITIONER
WITH HEAT PUMP

•INSTALLATION MANUAL•

OUTDOOR CONDENSER



INVERTER

IMPORTANT NOTE:

- Read this manual carefully before installing or operating your new air conditioning unit. Make sure to save this manual for future reference.
- This manual only describes features of the **OUTDOOR UNIT** in depth. When looking for information on the indoor unit, refer to the indoor unit manuals: (”Installation Manual • Wall Mounted Type” “Owner’s Manual • Wall Mounted Type”)

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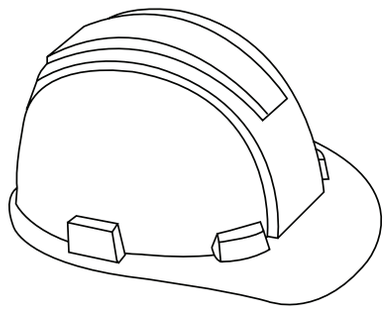

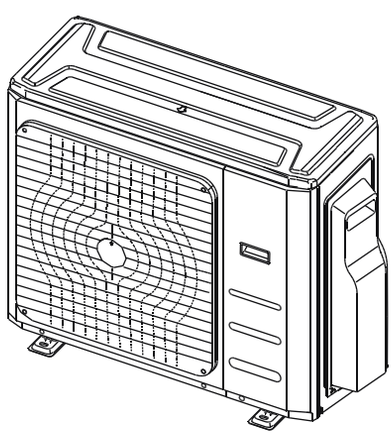

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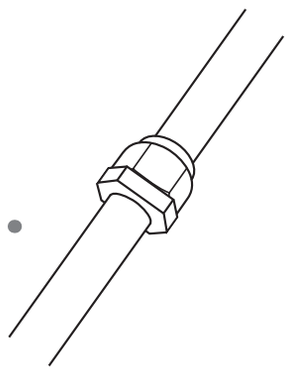

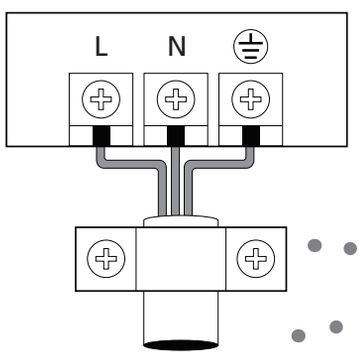

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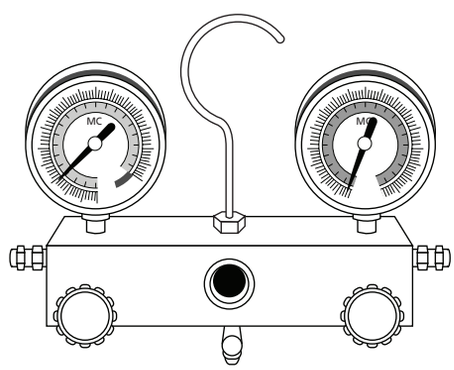

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Accessories

1

The air conditioning system comes with the following accessories. Use all of the installation parts and accessories to install the air conditioner. Improper installation may result in water leakage, electrical shock, or fire, or cause the equipment to fail.

Name			Shape	Quantity
Installation plate				1
Plastic expansion sheath				5-8 (depending on the models)
Self-tapping screw AST3.9X25				5-8 (depending on the models)
Drain joint (some models)				1
Seal ring (some models)				1
Connecting pipe assembly	Liquid side	Ø 6.35		Parts you must purchase (consult your technician for the proper size)
		Ø 9.52		
	Gas side	Ø 9.52		
		Ø 12.7		
		Ø 15.9		
User's manual				1
Installation manual				1
Transfer connector (packed with the indoor unit or outdoor unit, depending on the model) (NOTE: Pipe sizes differ from appliance to appliance. To meet different pipe size requirements, sometimes a transfer connector must be installed on the outdoor unit.)				Optional part (one piece per indoor unit)
				Optional part (1-5 pieces per outdoor unit, depending on the model)
Magnetic ring (After installation, hitch this on the connective cable between the indoor and outdoor units.)				Optional part (One piece per cable)
Cord protection rubber ring (If the cord clamp cannot fasten the cord because the cord is too small, wrap the cord protection rubber ring (supplied with the accessories) around the cord. Then fix it with the cord clamp.)				1 (on some models)

Optional Accessories

There are two types of remote controls: wired and wireless.
Select a remote control according to the customer's request and install it in an appropriate place.
To select a suitable remote control, refer to catalogues and technical literature.

Safety Precautions

2

Read safety precautions before installation

Incorrect installation due to ignoring instructions can cause serious damage or injury.
The seriousness of potential damage or injuries is classified as either a WARNING or CAUTION.

WARNING

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

CAUTION

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

⚠ WARNING

- Carefully read the safety precautions before installation.
- In certain functional environments, such as kitchens, server rooms, etc., the use of specially designed air-conditioning units is highly recommended.
- Only trained and certified technicians should install, repair, and service this air conditioning unit.
- Improper installation may result in electrical shock, short circuit, leaks, fire, or other damage to equipment and personal property.
- Strictly follow the installation instructions set forth in this manual.
- Before you install the unit, consider strong winds, typhoons, and earthquakes that might affect your unit and locate it accordingly. Failure to do so could cause damage to the unit.
- After installation, ensure there are no refrigerant leaks and that the unit is operating properly. Refrigerant is toxic and flammable and poses a serious health and safety risk.

Note about Fluorinated Gasses

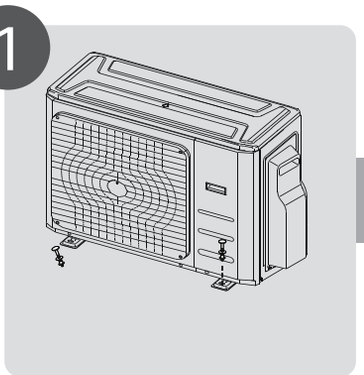
1. This air conditioning unit contains fluorinated gasses. For specific information on the type of gas and the amount, please refer to the relevant label on the unit itself.
2. Installation, service, maintenance, and repair of this unit must be performed by a certified technician.
3. Product uninstallation and recycling must be performed by a certified technician.
4. If the system has a leak-detection system installed, it must be checked for leaks at least every 12 months.
5. When the unit is checked for leaks, proper record-keeping of all checks is strongly recommended.

Installation Overview

3

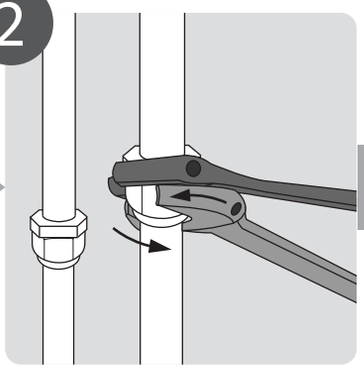
INSTALLATION ORDER

1



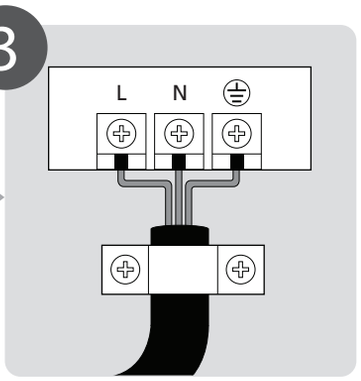
Install the outdoor unit
(Page 9)

2



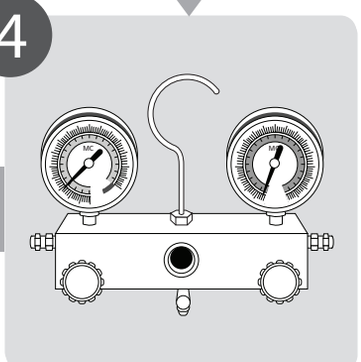
Connect the refrigerant pipes
(Page 12)

3



Connect the wires
(Page 14)

4



Evacuate the refrigeration system
(Page 20)

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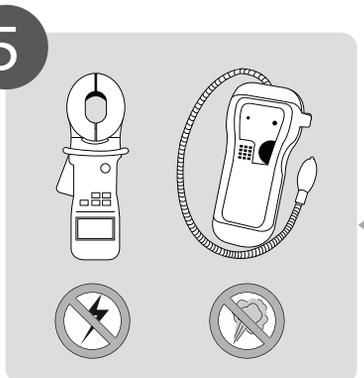


Perform a test run
(Page 22)

Installation Diagram

4

Installation Diagram

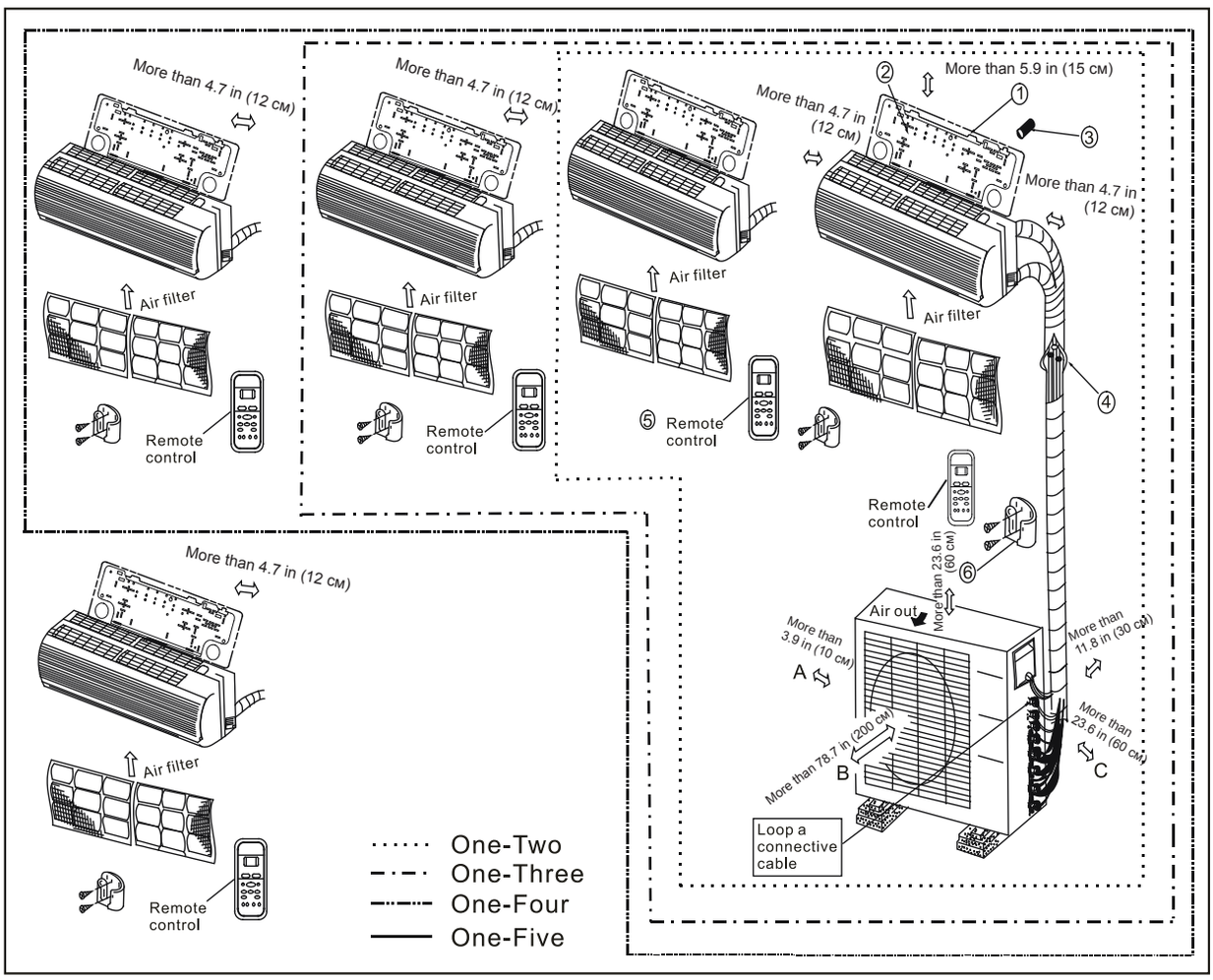


Fig. 4.1

Safety Precautions

CAUTION

- This illustration is for explanation purposes only. The actual shape of your air condtioner may be slightly different.
- Copper lines must be insulated independently.

CAUTION

- To prevent unnecessary damage to the wall, use a stud finder to locate studs.
- A minimum pipe run of 9.8 ft (3 m) is required to minimize vibration and excessive noise.
- Two of the A, B, and C directions should be free from obstructions.

Specifications

5

Table 5.1

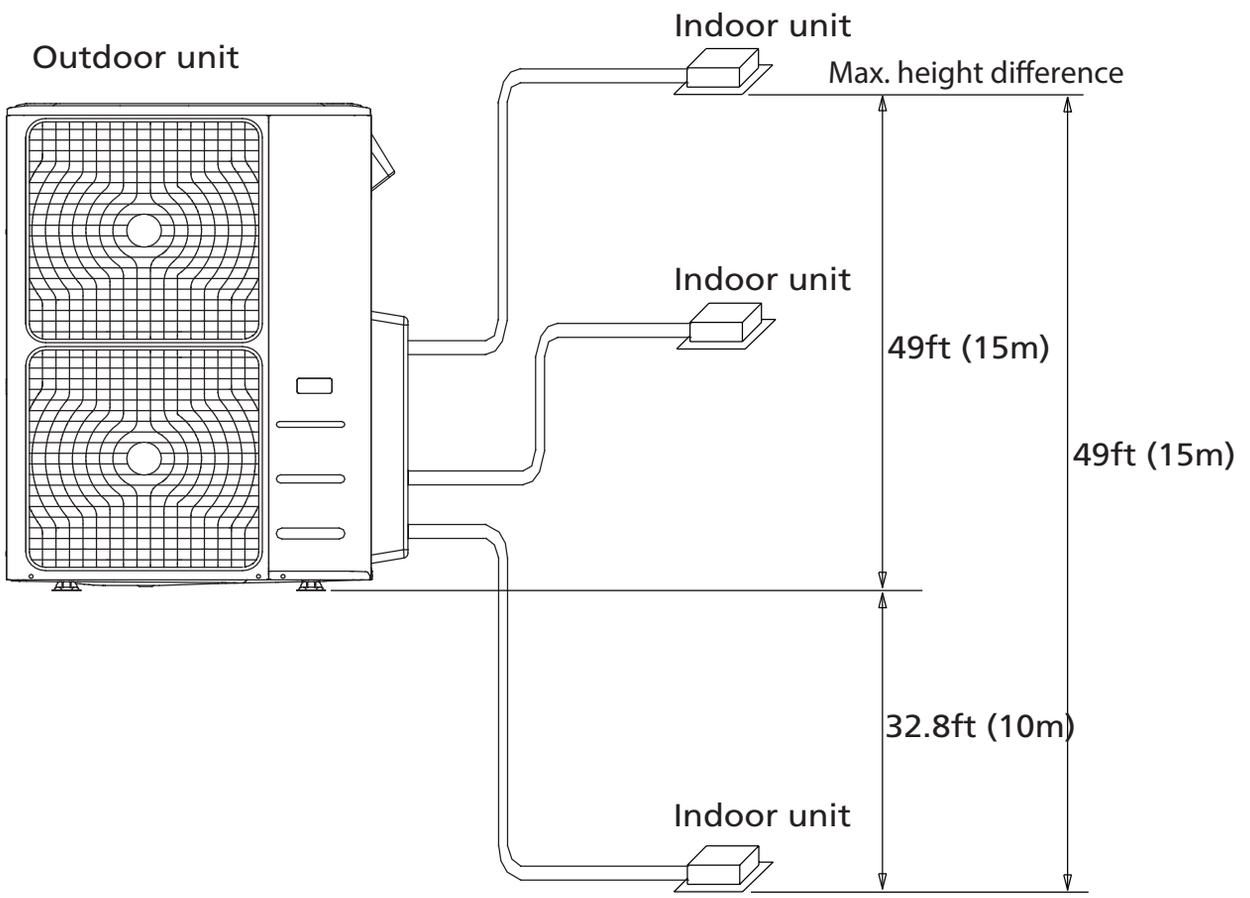
Indoor units that can be used in combination	Number of connected units	1-5 units
Compressor stop/start frequency	Stop time	3 minutes or more
Power source voltage	Voltage fluctuation	within ± 10% of rated voltage
	Voltage drop during start	within ± 15% of rated voltage
	Interval unbalance	within ± 3% of rated voltage

Table 5.2

Unit: ft/m

		1 drive 2	1 drive 3	1 drive 4	1 drive 5
Max. length for all rooms		98.4/30	147.6/45	196.8/60	246/75
Max. length for one indoor unit		65.6/20	82/25	98.4/30	98.4/30
Max. height different between indoor and outdoor unit	OU higher than IU	32.8/10	32.8/10	32.8/10	32.8/10
	OU lower than IU	49/15	49/15	49/15	49/15
Max. height difference between indoor units		32.8/10	32.8/10	32.8/10	32.8/10

When installing multiple indoor units to a single outdoor unit, ensure that the length of the refrigerant pipe and the drop height between the indoor and outdoor units meet the following requirements:



Outdoor Unit Installation

6

Outdoor Unit Installation Instructions

Step 1: Select installation location

When choosing a location to install the outdoor unit, consider the following:

- ☑ Place the outdoor unit as close to the indoor unit as possible.
- ☑ Ensure that there is enough room for installation and maintenance.
- ☑ The air inlet and outlet must not be obstructed or exposed to strong wind.
- ☑ Ensure the location of the unit will not be subject to snowdrifts, accumulation of leaves, or other seasonal debris. If possible, provide an awning for the unit. Ensure the awning does not obstruct airflow.
- ☑ The installation area must be dry and well ventilated.
- ☑ There must be enough room to install the connecting pipes and cables and to access them for maintenance.

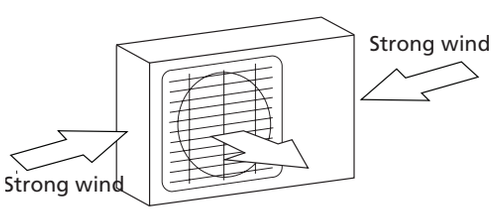


Fig. 6.1

Step 2: Install outdoor unit

Fix the outdoor unit with anchor bolts (M10)

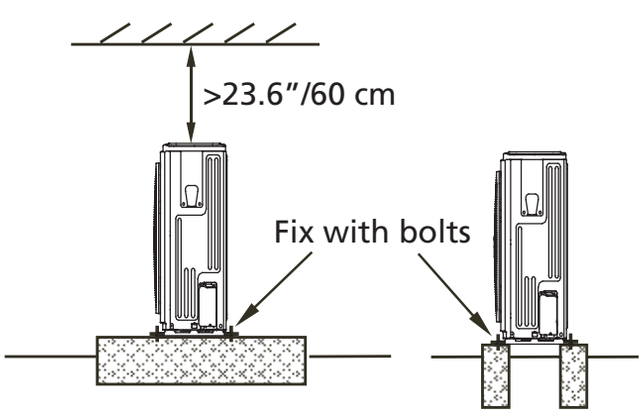


Fig. 6.3

- ☑ The area must be free of combustible gases and chemicals.
- ☑ The pipe length between the outdoor and indoor units must not exceed the maximum allowable pipe length.
- ☑ If possible, DO NOT install the unit where it will be exposed to direct sunlight.
- ☑ If possible, make sure the unit is located far away from your neighbors' property so that the noise from the unit will not disturb them.
- ☑ If the location is exposed to strong winds (for example, near a seaside), place the unit against the wall to shelter it from the wind. If necessary, use an awning (see Fig. 6.1 & 6.2).
- ☑ Install the indoor and outdoor units, cables, and wires at least 1 meter from televisions or radios to prevent static or image distortion. Depending on the radio waves, a 39.3 in (1 meter) distance may not be enough to eliminate all interference.

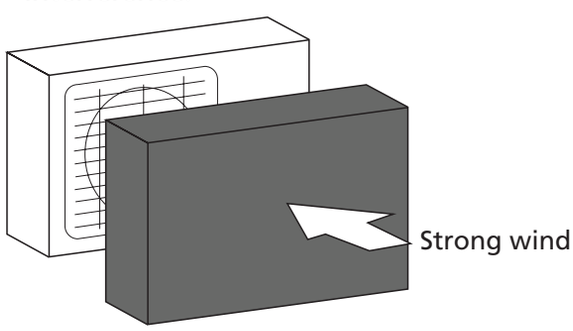


Fig. 6.2

CAUTION

- Be sure to remove any obstacles that may block air circulation.
- Be sure to refer to Length Specifications to ensure there is enough room for installation and maintenance.

Split Type Outdoor Unit
(Refer to Fig 6.4, 6.5, 6.6, 6.10, and Table 6.1)

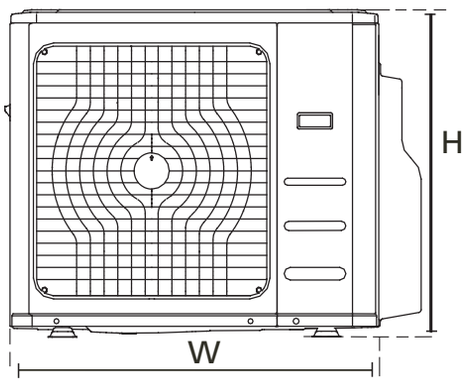


Fig. 6.4

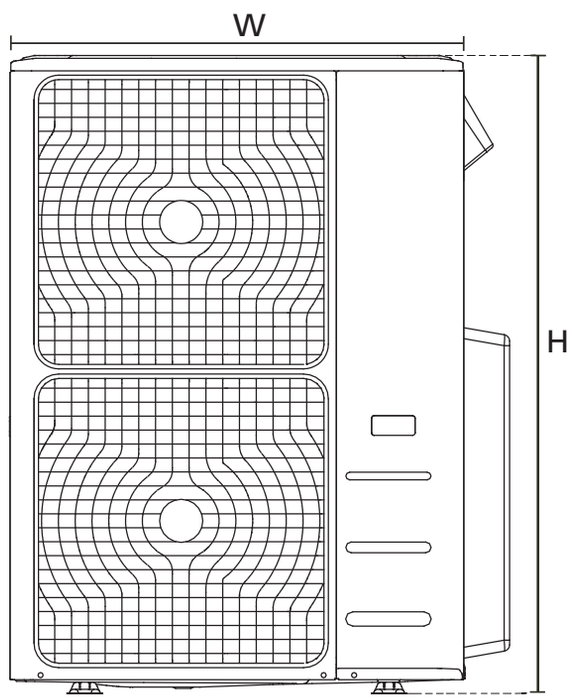


Fig. 6.5

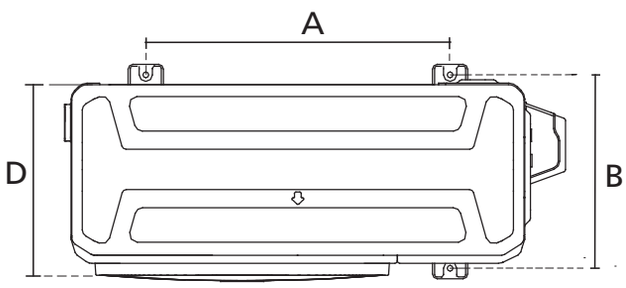


Fig. 6.6

Table 6.1: Length Specifications of Split Type Outdoor Unit (unit: inch/mm)

Outdoor Unit Dimensions W x H x D	Mounting Dimensions	
	Distance A	Distance B
760 x 590 x 285 (29.9 x 23.2 x 11.2)	20.85 (530)	11.4 (290)
810 x 558 x 310 (31.9 x 22 x 12.2)	21.6 (549)	12.8 (325)
845 x 700 x 320 (33.27 x 27.5 x 12.6)	22 (560)	13.2 (335)
900 x 860 x 315 (35.4 x 33.85 x 12.4)	23.2 (590)	13.1 (333)
945 x 810 x 395 (37.2 x 31.9 x 15.55)	25.2 (640)	15.95 (405)
990 x 965 x 345 (38.98 x 38 x 13.58)	24.58 (624)	14.4 (366)
938 x 1369 x 392 (36.93 x 53.9 x 15.43)	24.96 (634)	15.9 (404)
900 x 1170 x 350 (35.4 x 46 x 13.8)	23.2 (590)	14.88 (378)
800 x 554 x 333 (31.5 x 21.8 x 13.1)	20.24 (514)	13.39 (340)
845 x 702 x 363 (33.27 x 27.6 x 14.3)	21.26 (540)	13.8 (350)
946 x 810 x 420 (37.2 x 31.9 x 16.53)	26.5 (673)	15.87 (403)
946 x 810 x 410 (37.2 x 31.9 x 16.14)	26.5 (673)	15.87 (403)
952 x 1333 x 410 (37.5 x 52.5 x 16.14)	24.96 (634)	15.9 (404)
952 x 1333 x 415 (37.5 x 52.5 x 16.14)	24.96 (634)	15.9 (404)

NOTE: The minimum distance between the outdoor unit and walls described in the installation guide does not apply to airtight rooms. Be sure to keep the unit unobstructed in at least two of the three directions (M, N, and P) (see Fig. 6.7).

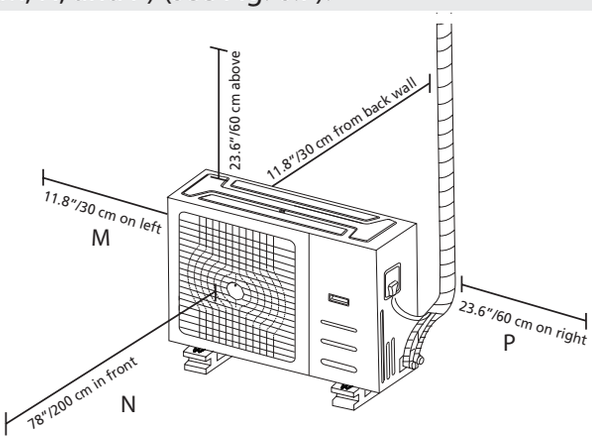


Fig. 6.7

Drain Joint Installation

Before bolting the outdoor unit in place, install the drain joint at the bottom of the unit. (See Fig. 6.8)

1. Fit the rubber seal on the end of the drain joint that will connect to the outdoor unit.
2. Insert the drain joint into the hole in the base pan of the unit.
3. Rotate the drain joint 90° until it clicks in place facing the front of the unit.
4. Connect a drain hose extension (not included) to the drain joint to redirect water from the unit during heating mode.

NOTE: Make sure the water drains to a safe location where it will not cause water damage or a slipping hazard.

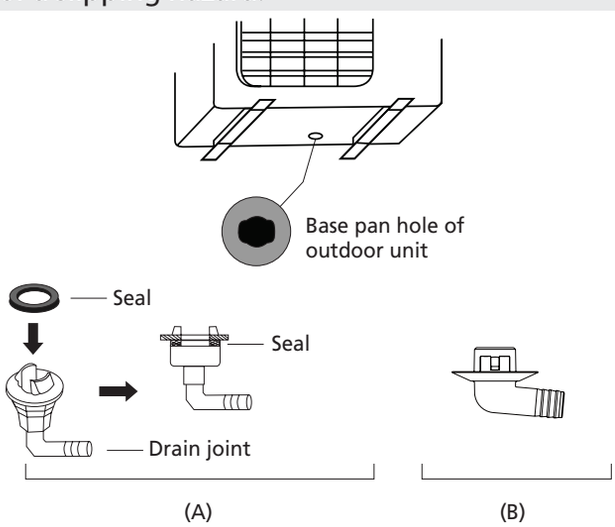


Fig. 6.8

Notes on Drilling the Hole in the Wall

You must drill a hole in the wall for the refrigerant piping and the signal cable that will connect the indoor and outdoor units.

1. Determine the location of the wall hole based on the location of the outdoor unit.
2. Using a 2.5" (65 mm) core drill, drill a hole in the wall.

   NOTE: When drilling the wall hole, make sure to avoid wires, plumbing, and other sensitive components.

3. Place the protective wall cuff in the hole. This will protect the edges of the hole and will help seal it when you finish the installation process.

When Selecting a 24K Indoor Unit

The 24K indoor unit can only be connected with an A system. If there are two 24K indoor units, they can be connected with an A and B system (see Fig. 6.9).

Table 6.2: Connective pipe size of an A and B system (unit: inch)

Indoor Unit capacity (Btu/h)	Liquid	Gas
7K/9K/12K	1/4	3/8
12K/18K	1/4	1/2
24K	3/8	5/8

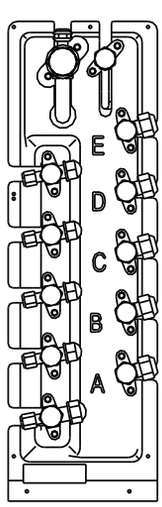


Fig. 6.9

Refrigerant Piping Connection

7

Safety Precautions

WARNING

- All field piping must be completed by a licensed technician and must comply with local and national regulations.
- When the air conditioner is installed in a small room, measures must be taken to prevent the refrigerant concentration in the room from exceeding the safety limit in the event of refrigerant leakage. If the refrigerant leaks and its concentration exceeds its proper limit, hazards due to lack of oxygen may result.
- When installing the refrigeration system, ensure that air, dust, moisture, or foreign substances do not enter the refrigerant circuit. Contamination in the system may cause poor operating capacity, high pressure in the refrigeration cycle, explosion, or injury.
- Ventilate the area immediately if there is refrigerant leakage during the installation. Leaked refrigerant gas is both toxic and flammable. Ensure there is no refrigerant leakage after completing the installation work.

Refrigerant Piping Connection Instructions

CAUTION

- The branching pipe must be installed horizontally. An angle of more than 10° may cause malfunction.
- DO NOT install the connecting pipe until both the indoor unit and the outdoor unit have been installed.
- Insulate the gas and liquid piping to prevent water leakage.

Step1: Cut pipes

When preparing refrigerant pipes, take extra care to cut and flare them properly. This will ensure efficient operation and minimize the need for future maintenance.

1. Measure the distance between the indoor and outdoor units.
2. Using a pipe cutter, cut the pipe a little longer than the measured distance.

CAUTION

DO NOT deform pipe while cutting. Be extra careful not to damage, dent, or deform the pipe while cutting. This will drastically reduce the heating efficiency of the unit.

1. Make sure the pipe is cut at a perfect 90° angle. Refer to Fig. 7.1 for examples of bad cuts.

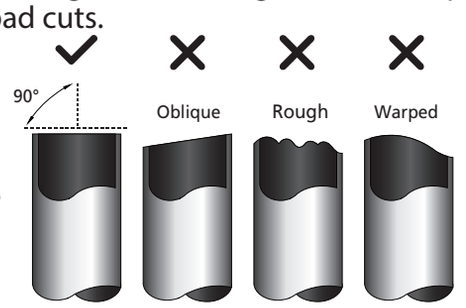


Fig. 7.1

Step 2: Remove burrs

Burrs can affect the air-tight seal of the refrigerant piping connection. They must be completely removed.

1. Hold the pipe at a downward angle to prevent burrs from falling into the pipe.
2. Using a reamer or deburring tool, remove all burrs from the cut section of the pipe.

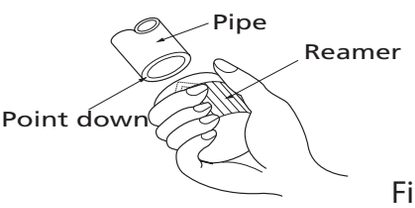


Fig. 7.2

Step 3: Flare pipe ends

Proper flaring is essential to achieve an airtight seal.

1. After removing burrs from the cut pipe, seal the ends with PVC tape to prevent foreign materials from entering the pipe.
2. Sheath the pipe with insulating material.
3. Place flare nuts on both ends of the pipe. Make sure they are facing in the right direction because you can't put them on or change their direction after flaring (see Fig. 7.3).

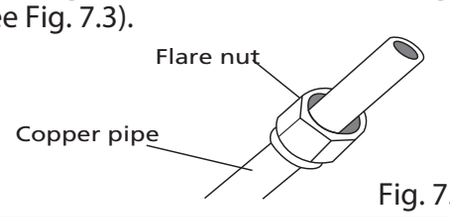


Fig. 7.3

4. Remove the PVC tape from the ends of the pipe when you're ready to perform the flaring work.
5. Clamp the flare form on the end of the pipe. The end of the pipe must extend beyond the flare form.

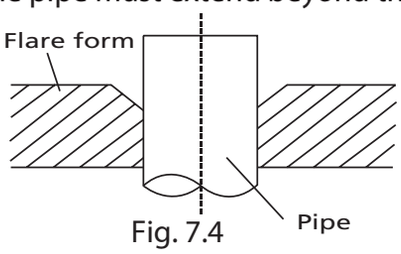


Fig. 7.4

6. Place the flaring tool onto the form.
7. Turn the handle of the flaring tool clockwise until the pipe is fully flared. Flare the pipe in accordance with the dimensions shown in table 7.1.

Table 7.1: PIPING EXTENSION BEYOND FLARE FORM

Pipe gauge	Tightening torque	Flare dimension (A) (Unit: in/mm)		Flare shape
		Min.	Max.	
Ø 6.4	14.2-17.2 N.m (144-176 kgf.cm)	0.3/8.3	0.3/8.3	
Ø 9.5	32.7-39.9 N.m (333-407 kgf.cm)	0.48/12.4	0.48/12.4	
Ø 12.7	49.5-60.3 N.m (504-616 kgf.cm)	0.6/15.4	0.6/15.8	
Ø 15.9	61.8-75.4 N.m (630-770 kgf.cm)	0.7/18.6	0.74/19	
Ø 19.1	97.2-118.6 N.m (990-1210 kgf.cm)	0.9/22.9	0.91/23.3	
Ø 22	109.5-133.7 N.m (1117-1364 kgf.cm)	1.06/27	1.07/27.3	

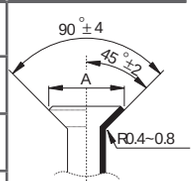


Fig. 7.5

8. Remove the flaring tool and flare form, then inspect the end of the pipe for cracks and even flaring.

Step 4: Connect pipes

Connect the copper pipes to the indoor unit first, then connect them to the outdoor unit. First connect the low-pressure pipe, then the high-pressure pipe.

1. When connecting the flare nuts, apply a thin coat of refrigeration oil to the flared ends of the pipes.
2. Align the center of the two pipes that you will connect.

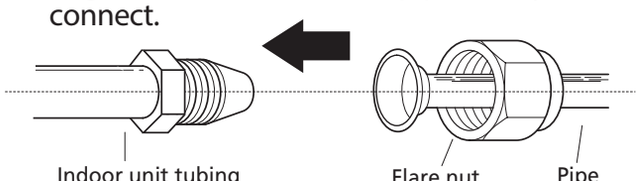


Fig. 7.6

3. Tighten the flare nut as tightly as possible by hand.
4. Using a spanner, grip the nut on the unit tubing.
5. While firmly gripping the nut, use a torque wrench to tighten the flare nut according to the torque values in table 7.1.

NOTE: Use both a spanner and a torque wrench when connecting or disconnecting pipes to/from the unit.

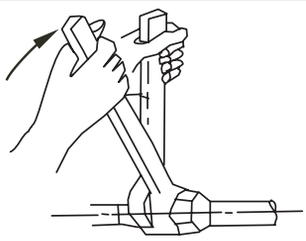


Fig. 7.7

CAUTION

- Be sure to wrap insulation around the piping. Direct contact with the bare piping may result in burns or frostbite.
- Make sure the pipe is properly connected. Over tightening may damage the bell mouth and under tightening may lead to leakage.

NOTE ON MINIMUM BEND RADIUS

Carefully bend the tubing in the middle according to the diagram below. DO NOT bend the tubing more than 90° or more than 3 times.

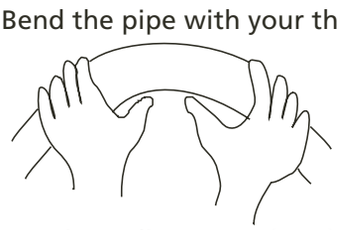


Fig. 7.8

6. After connecting the copper pipes to the indoor unit, wrap the power cable, signal cable, and piping together with binding tape.

NOTE: When bundling these items together, do not intertwine or cross the signal cable with any other wiring.

7. Thread this pipeline through the wall and connect it to the outdoor unit.
8. Insulate all the piping, including the valves of the outdoor unit.
9. Open the stop valves of the outdoor unit to start the flow of the refrigerant between the indoor and outdoor units.

CAUTION

After completing the installation work, make sure there is no refrigerant leak. If there is, ventilate the area immediately and evacuate the system (refer to the Air Evacuation section of this manual).

Wiring

8

Safety Precautions

⚠ WARNING

- Be sure to disconnect the power supply before working on the unit.
- All electrical wiring must be done according to local and national regulations.
- Electrical wiring must be done by a qualified technician. Improper connections may cause electrical malfunction, injury, and fire.
- An independent circuit and single outlet must be used for this unit. DO NOT plug another appliance or charger into the same outlet. If the electrical circuit capacity is not enough or there is a defect in the electrical work, it can lead to shock, fire, and unit and property damage.
- Connect the power cable to the terminals and fasten it with a clamp. An insecure connection may cause a fire.
- Make sure that all wiring is done correctly and the control board cover is properly installed. Failure to do so can cause overheating at the connection points, fire, and electrical shock.
- Ensure that the main supply connection is made through a switch that disconnects all poles, with a contact gap of a least 0.118 in (3 mm).
- DO NOT modify the length of the power cord or use an extension cord.

⚠ CAUTION

- Connect the outdoor wires before connecting the indoor wires.
- Make sure to ground the unit. The grounding wire should be away from gas pipes, water pipes, lightning rods, telephone wires, or other grounding wires. Improper grounding may cause electrical shock.
- DO NOT connect the unit with the power source until all wiring and piping is completed.
- Make sure that you do not cross your electrical wiring with your signal wiring, as this can cause distortion and interference.

Follow these instructions to prevent distortion when the compressor starts:

- The unit must be connected to the main outlet. Normally, the power supply must have a low output impedance of 32 ohms.
- No other equipment should be connected to the same power circuit.
- The unit's power information can be found on the rating sticker on the product.

Outdoor Unit Wiring

⚠ WARNING

Before performing any electrical or wiring work, turn off the main power to the system.

1. Prepare the cable for connection
   A. First choose the right cable size. Be sure to use H07RN-F cables.

Table 8.1: Minimum Cross-Sectional Area of Power and Signal Cables North America

Rated Current of Appliance (A)	AWG
≤ 7	18
7 - 13	16
13 - 18	14
18 - 25	12
25 - 30	10

Table 8.2: Other Regions

Rated Current of Appliance (A)	Nominal Cross-Sectional Area (mm^2)
≤ 6	0.75
6 - 10	1
10 - 16	1.5
16 - 25	2.5
25 - 32	4
32 - 45	6

B. Using wire strippers, strip the rubber jacket from both ends of the signal cable to reveal about 5.9 in (15 cm) of the wires inside.

C. Strip the insulation from the ends of the wires.

D. Using a wire crimper, crimp u-lugs on the ends of the wires.

NOTE: While connecting the wires, please strictly follow the wiring diagram (found inside the electrical box cover).

2. Remove the electric cover of the outdoor unit. If there is no cover on the outdoor unit, disassemble the bolts from the maintenance board and remove the protection board (see Fig. 8.1).

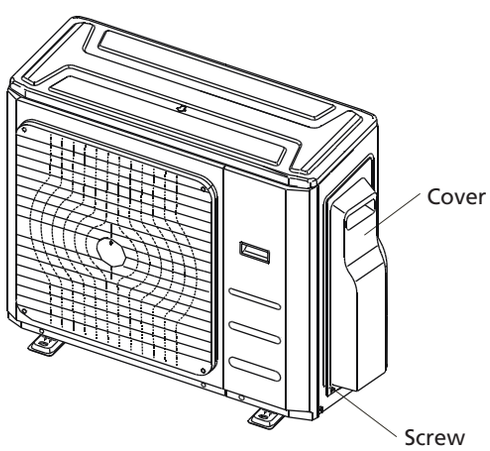
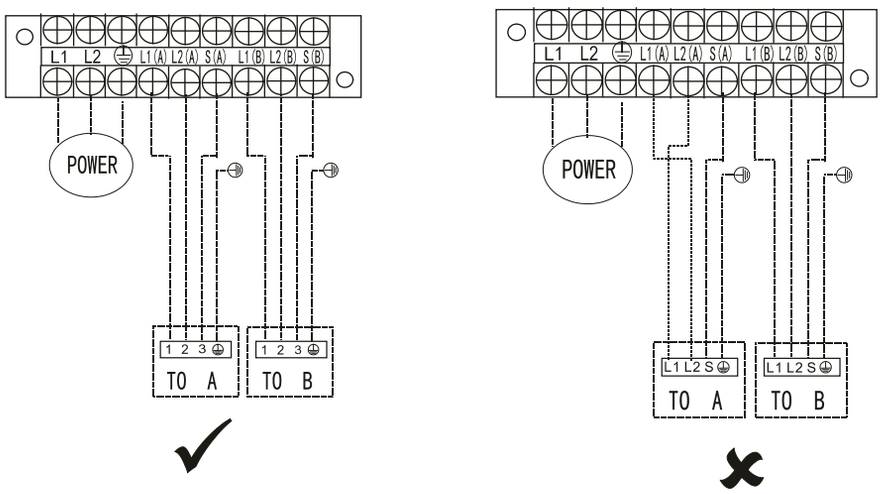


Fig. 8.1

3. Connect the u-lugs to the terminals. Match the wire colors/labels with the labels on the terminal block, then firmly screw the u-lug of each wire to its corresponding terminal.
4. Clamp down the cable with the designated cable clamp.
5. Insulate unused wires with electrical tape. Keep them away from any electrical or metal parts.
6. Reinstall the cover of the electric control box.

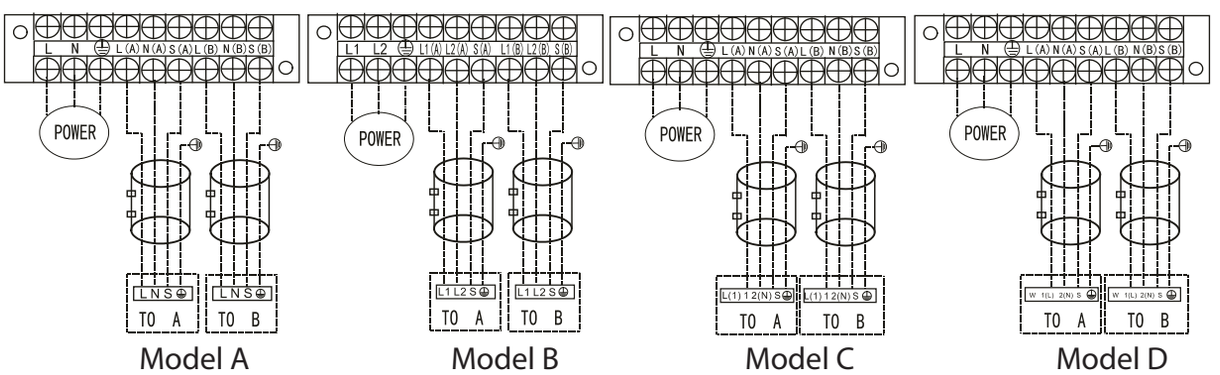
CAUTION

Connect the connective cables to the terminals as identified with their respective matched numbers on the terminal block of the indoor and outdoor units. For example, see the following US models: Terminal L1(A) on the outdoor unit must connect with terminal L1 on the indoor unit.

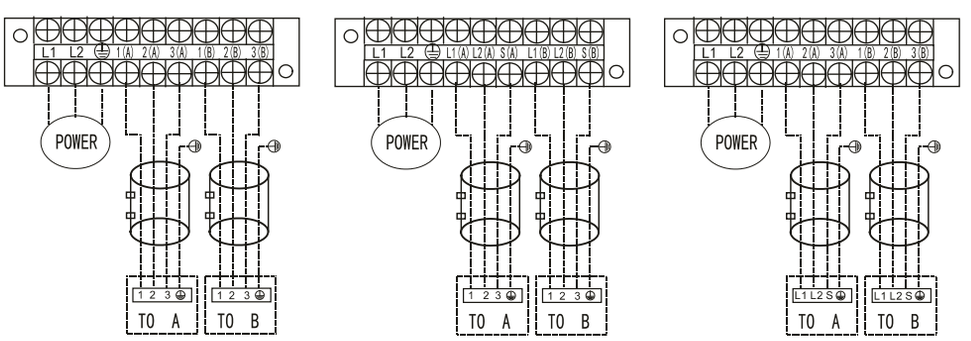


NOTE: If the client wants to perform the wiring himself, refer to the following figures.
Run the main power cord through the lower line-outlet of the cord clamp.

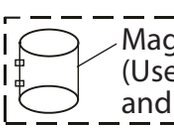
One-two models:



Model A Model B Model C Model D



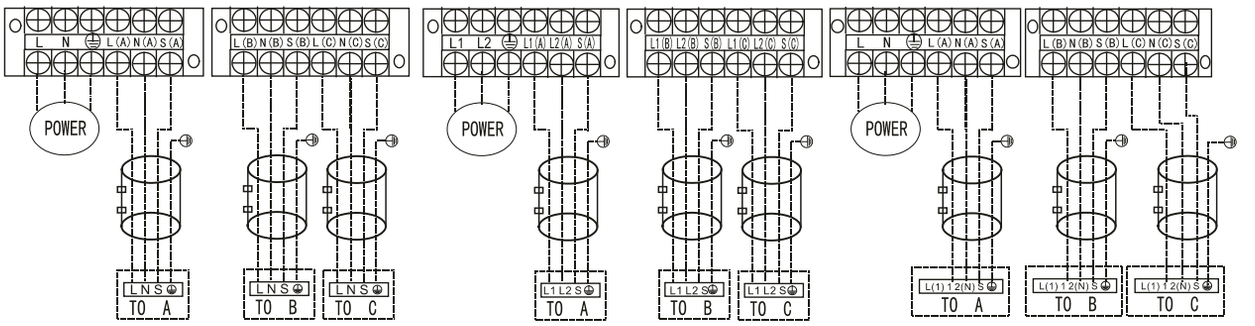
Model E Model F Model G



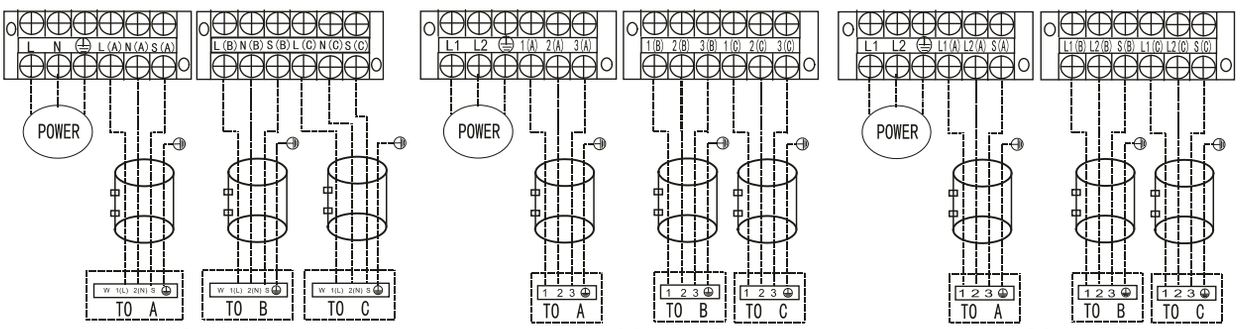
Magnetic ring (not supplied, optional part)
(Used to hitch to the connective cable of the indoor and outdoor units after installation.)

NOTE: If the client wants to perform the wiring himself, refer to the following figures.

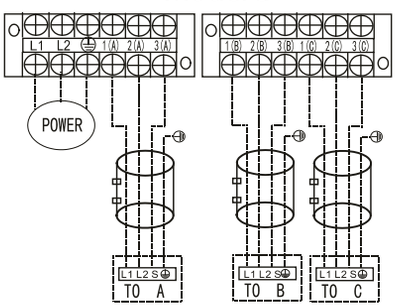
One-three models:



Model A Model B Model C

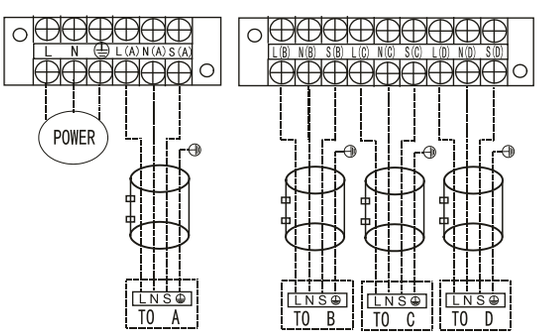


Model D Model E Model F

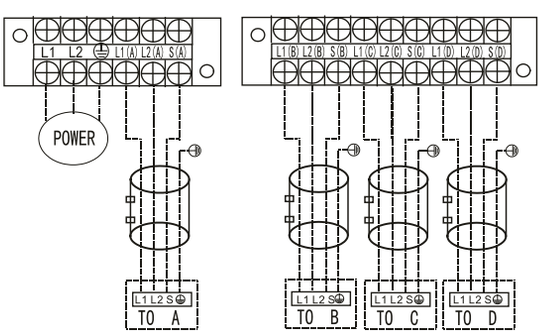


Model G

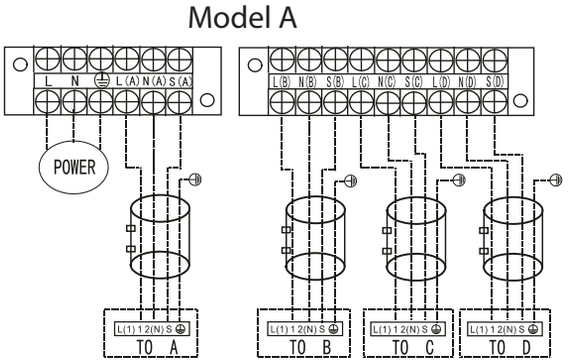
One-four models:



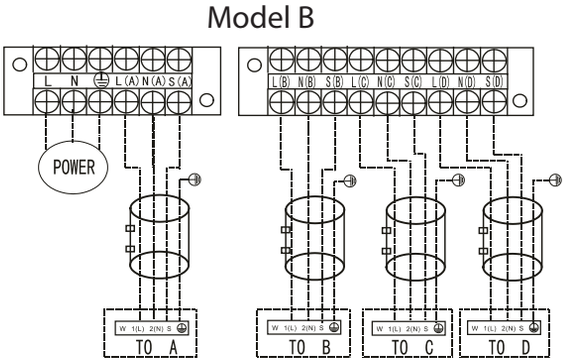
Model A



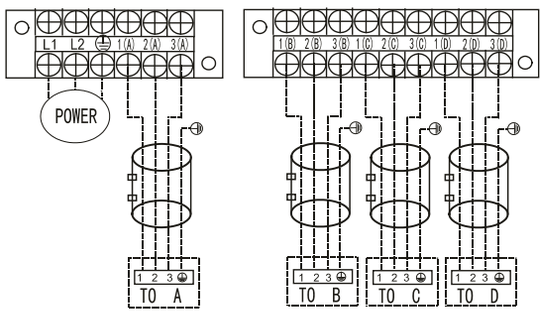
Model B



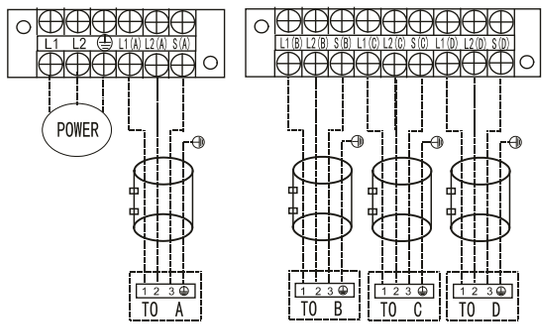
Model C



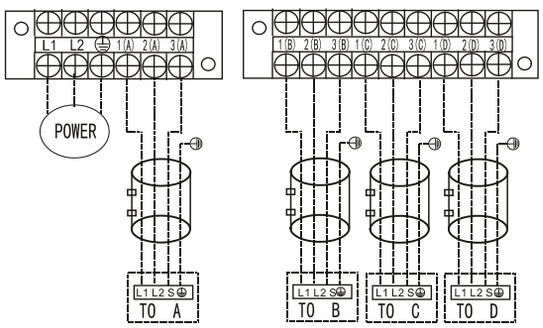
Model D



Model E

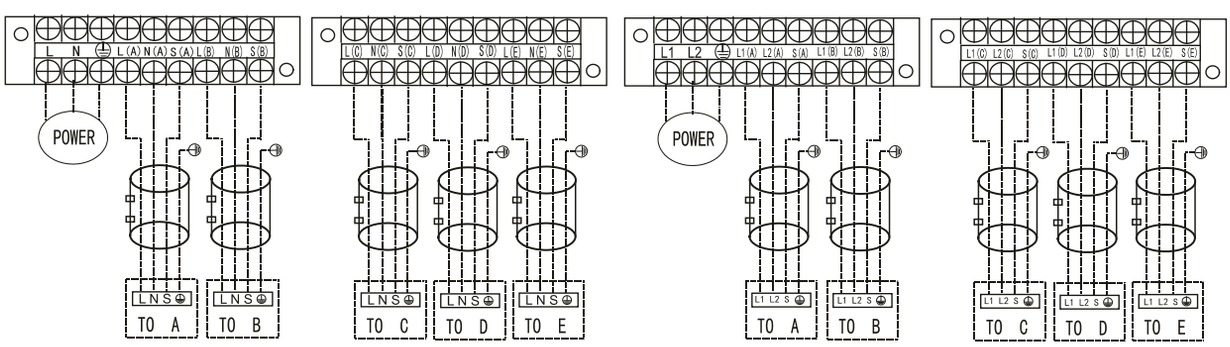


Model F



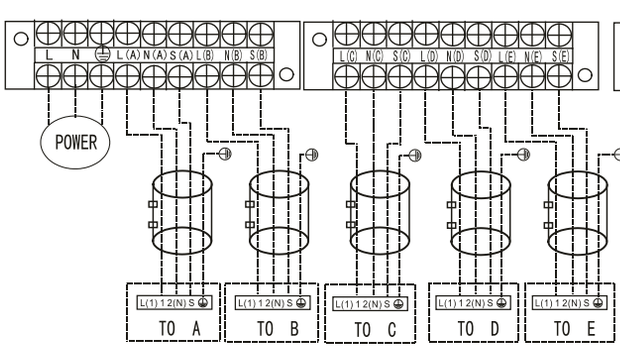
Model G

One-five models:

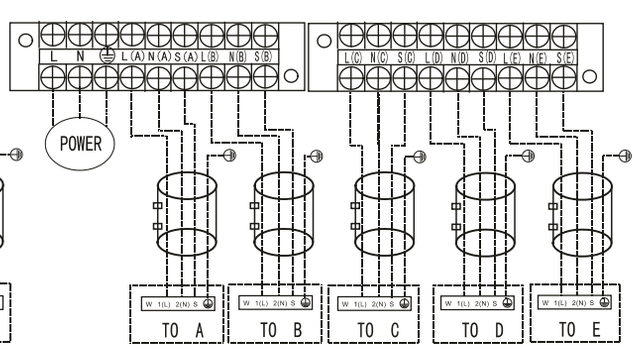


Model A

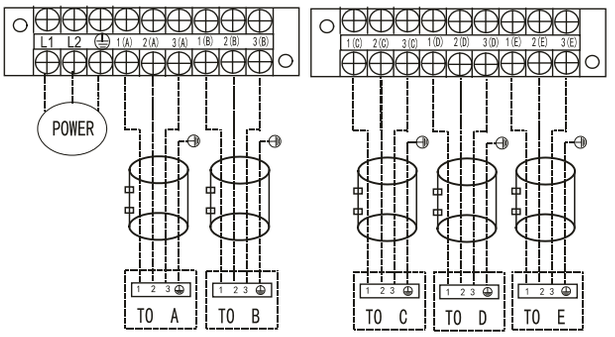
Model B



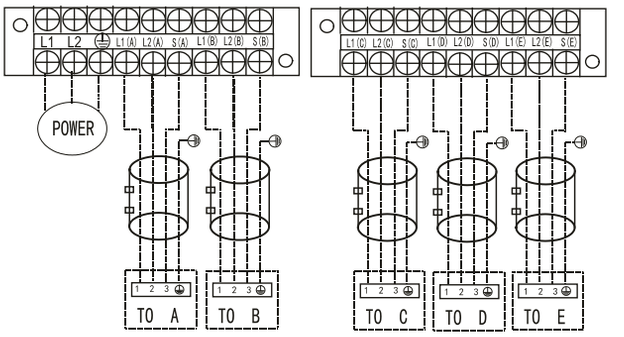
Model C



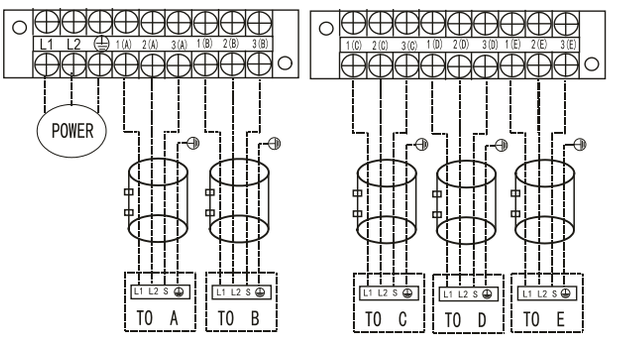
Model D



Model E



Model F



Model G

CAUTION

After the confirmation of the above conditions, prepare the wiring as follows:

- Never fail to delegate an individual power circuit specifically for the air conditioner. For the method of wiring, use the circuit diagram posted on the inside of the control cover as a guide.
- The screws which fastens the wiring in the casing of electrical fittings are liable to come loose from vibrations to which the unit will be subjected during the course of transportation. Check to make sure they are all tightly fastened. (If they are loose, the wires could burn out.)
- Specification of power source.
- Confirm that the electrical capacity is sufficient.
- See that the starting voltage is maintained at more than 90 percent of the rated voltage marked on the name plate.
- Confirm that the cable thickness is as specified in the power source specification.
- Always install an earth leakage circuit breaker in a wet or moist area.
- The following could be caused by a voltage drop: The vibration of a magnetic switch (which will damage the contact point), the breakage of a fuse, or the disturbance of the normal function of the overload.
- The means for disconnection from a power supply must be incorporated in the fixed wiring and have an air gap contact separation of at least 0.12 in (3 mm) in each active (phase) conductor.
- Before terminals are accessed, all supply circuits must be disconnected.

Air Evacuation

9

Safety Precautions

CAUTION

- Use a vacuum pump with a gauge reading lower than -0.1 MPa and an air discharge capacity above 40 L/min.
- The outdoor unit does not need vacuuming. DO NOT open the outdoor unit's gas and liquid stop valves.
- Ensure that the compound meter reads -0.1 MPa or below after 2 hours. If after 3 hours of operation the gauge reading is still above -0.1 MPa, check if there is a gas leak or water inside the pipe. If there is no leakage, perform another evacuation for 1 or 2 hours.
- DO NOT use refrigerant gas to evacuate the system.

Evacuation Instructions

Before using the manifold gauge or vacuum pump, read their operation manuals to familiarize yourself with how to use them properly.

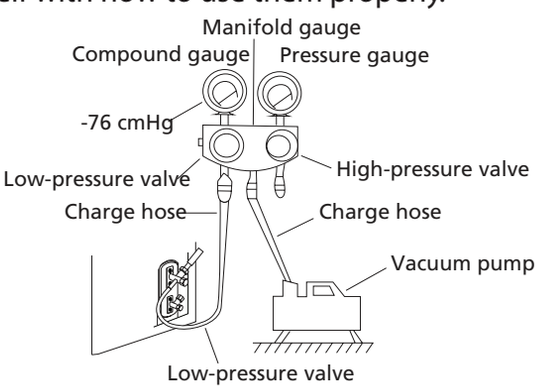


Fig. 9.1

1. Connect the charge hose of the manifold gauge to the service port on the outdoor unit's low-pressure valve.
2. Connect another charge hose from the manifold gauge to the vacuum pump.
3. Open the low-pressure side of the manifold gauge. Keep the low-pressure side closed.
4. Turn on the vacuum pump to evacuate the system.
5. Run the vacuum for at least 15 minutes, or until the compound meter reads -76 cmHG (-1x105 Pa).
6. Close the low-pressure side of the manifold gauge and turn off the vacuum pump.
7. Wait 5 minutes, then check that there has been no change in the system pressure.

NOTE: If there is no change in the system pressure, unscrew the cap from the packed valve (high-pressure valve). If there is a change in the system pressure, there may be a gas leak.

8. Insert a hexagonal wrench into the packed valve (high-pressure valve) and open the valve by turning the wrench counterclockwise a 1/4 turn. Listen for gas to exit the system, then close the valve after 5 seconds.

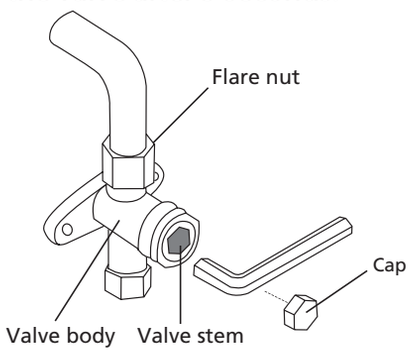


Fig. 9.2

9. Watch the Pressure Gauge for one minute to make sure that there is no change in pressure. The pressure gauge should read slightly higher than atmospheric pressure.
10. Remove the charge hose from the service port.
11. Using a hexagonal wrench, fully open both the high-pressure and high-pressure valves.

OPEN VALVE STEMS GENTLY

When opening valve stems, turn the hexagonal wrench until it hits against the stopper. DO NOT try to force the valve to open further.

12. Tighten the valve caps by hand, then tighten them using the proper tool.
13. If the outdoor unit uses all vacuum valves, and the vacuum position is at the main valve, the system is not connected with the indoor unit and must be tightened with a screw nut. Check the gas leakage before operation to prevent leakage.

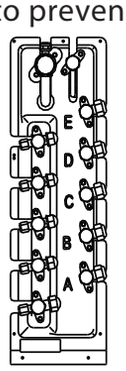


Fig. 9.3

Note on Adding Refrigerant

CAUTION

- Refrigerant charging must be performed after wiring, vacuuming, and the leak test.
- DO NOT exceed the maximum allowable quantity of refrigerant or overcharge the system. Doing so may damage or impact the unit's function.
- Charging with unsuitable substances may cause explosions or accidents. Ensure that the appropriate refrigerant is used.
- Refrigerant containers must be opened slowly. Always use protective gear when charging the system.
- DO NOT mix refrigerant types.

N=2 (one-twin models), N=3 (one-three models), N=4 (one-four models), N=5 (one-five models).
Some systems require additional charging depending on pipe lengths. The standard pipe length varies according to local regulations. For example, in North America, the standard pipe length is 7.5 m (25 ft) In other areas, the standard pipe length is 5 m (16 ft). The additional refrigerant to be charged can be calculated using the following formula:

ADDITIONAL REFRIGERANT PER PIPE LENGTH

Connective Pipe Length	Air Purging Method	Additional Refrigerant (R410A:)	
Pre-charge pipe length (ft/m) (standard pipe length x N)	Vacuum pump	N/A	
More than (standard pipe length x N) ft/m	Vacuum pump	Liquid Side: Ø 6.35 (Ø 1/4") (Total pipe length - standard pipe length x N) x 15 g/m (Total pipe length - standard pipe length x N) x 0.16 oZ/ft	Liquid Side: Ø 9.52 (Ø 3/8") (Total pipe length - standard pipe length x N) x 30 g/m (Total pipe length - standard pipe length x N) x 0.32 oZ/ft

Safety And Leakage Check

Electrical safety check

Perform the electric safety check after completing installation:

1. Insulated resistance
   The insulated resistance must be more than 2 MΩ.
2. Grounding work
   After finishing the grounding work, measure the grounding resistance by visual detection and with a grounding resistance tester. Make sure the grounding resistance is less than 4 Ω.
3. Electrical leakage check (performed during test running)
   During test operation after installation is finished, the service man can use the electroprobe and multimeter to perform the electrical leakage check. Turn off the unit immediately if there is leakage.
   Look for a solution to the problem until the unit operates properly.

Gas leak check

1. Soapy water method:
   To check for leakage in the connecting points of the piping, use a soft brush to apply soapy water or a liquid neutral detergent to the indoor or outdoor unit connections. If bubbles come out, there is leakage.
2. Leak detector
   Use the leak detector to check for leakage.

NOTE: The illustration is for explanation purposes only. The actual order of A, B, C, D and E on the machine may be slightly different from the unit you purchased. The actual shape shape prevails.

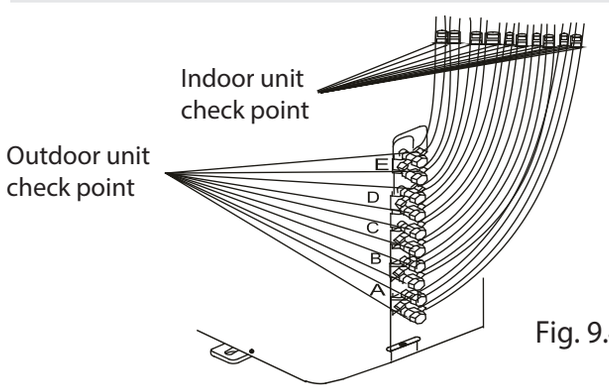


Fig. 9.4

A, B, C, and D are points on a one-four type.
A, B, C, D, and E are points on a one-five type.

Test Run

10

Before Test Run

A test run must be performed after the entire system has been completely installed. Confirm the following points before performing the test:

a) The indoor and outdoor units are properly installed.
b) Piping and wiring are properly connected.
c) No obstacles are near the inlet and outlet of the unit that might cause poor performance or product malfunction.
d) The refrigeration system does not leak.
e) The drainage system is unimpeded and draining to a safe location.
f) The heating insulation is properly installed.
g) The grounding wires are properly connected.
h) The length of the piping and the added refrigerant stow capacity have been recorded.
i) The power voltage is the correct voltage for the air conditioner.

CAUTION

Failure to perform the test run may result in unit damage, property damage, or personal injury.

Test Run Instructions

1. Open both the liquid and gas stop valves.
2. Turn on the main power switch and allow the unit to warm up.
3. Set the air conditioner to COOL mode.
4. For the indoor unit:
   A. Ensure the remote control and its buttons work properly.
   B. Ensure the louvers move properly and can be changed using the remote control.
   C. Double check to see if the room temperature is being registered correctly.
   D. Ensure the indicators on the remote control and the display panel on the indoor unit work properly.
   E. Ensure the manual buttons on the indoor unit works properly.
   F. Check that the drainage system is unimpeded and draining smoothly.
   G. Make sure there is no vibration or abnormal noise during operation.
5. For the outdoor unit:
   A. Check to see if the refrigeration system is leaking.
   B. Make sure there is no vibration or abnormal noise during operation.
   C. Make sure the wind, noise, and water generated by the unit do not disturb your neighbors or pose a safety hazard.

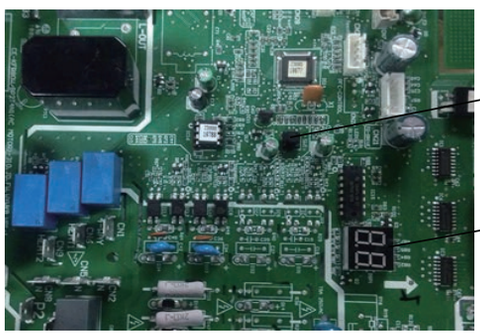
NOTE: If the unit malfunctions or does not operate according to your expectations, please refer to the Troubleshooting section of the User's manual before calling customer service.

Function of Automatic Wiring/Piping Correction

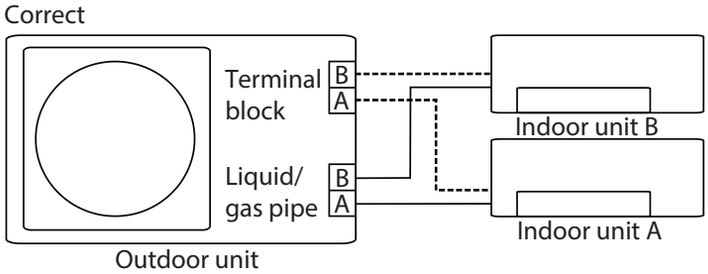
11

Automatic Wiring/Piping Correction Function

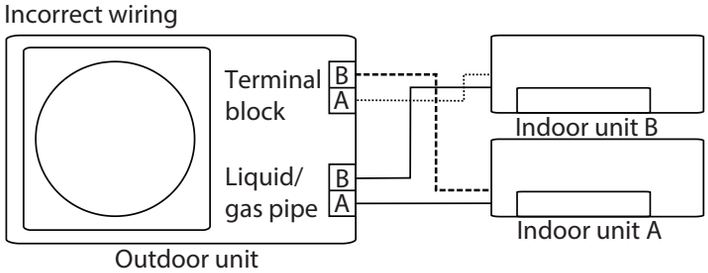
The new product is able to automatically correct a wiring/piping error. Press the "check switch" on the outdoor unit PCB board for 5 seconds until the LED display shows "CE." This means the function is working. Approximately 5-10 minutes after the switch is pressed, "CE" will disappear, the wiring/piping error will be corrected, and the wiring/piping will be properly connected.



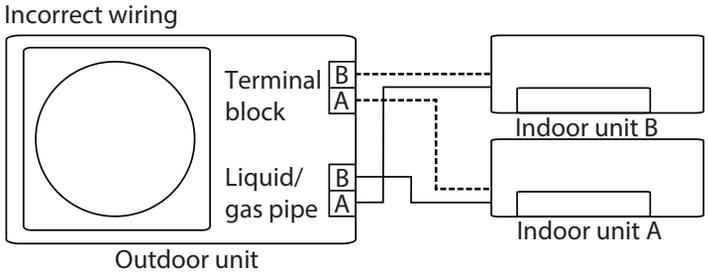
Correct



Incorrect wiring



Incorrect wiring



How to Activate This Function

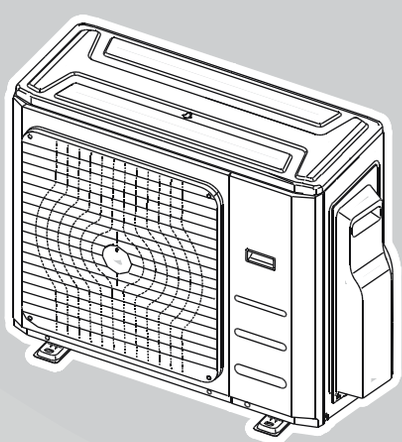
1. Check that the outside temperature is above 41° F (5° C).
   (This fuction does not work when the outside temperature is not above 41° F (5° C))
2. Check that the stop valves on the liquid and gas pipes are open.
3. Turn on the breaker and wait at least 2 minutes.
4. Press the check switch on the outdoor PCB board until the LED display shows "CE."

The design and specifications are subject to change without prior notice for product improvement. Consult with the sales agency or manufacturer for details.

MULTI·ZONE
DUCTLESS INVERTER
SPLIT AIR CONDITIONER
WITH HEAT PUMP

»OWNER'S MANUAL«

OUTDOOR CONDENSER



INVERTER

IMPORTANT NOTE:

- Read this manual carefully before installing or operating your new air conditioning unit. Make sure to save this manual for future reference.
- This manual only describes features of the **OUTDOOR UNIT** in depth. When looking for information on the indoor unit, refer to the indoor unit manuals: (”Installation Manual • Wall Mounted Type” “Owner’s Manual • Wall Mounted Type”)

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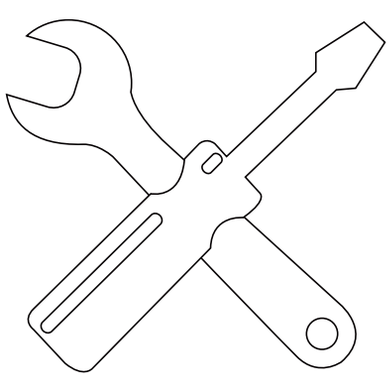

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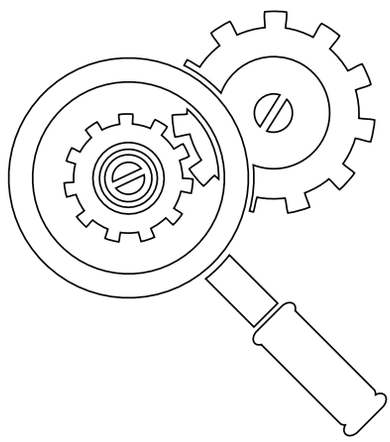
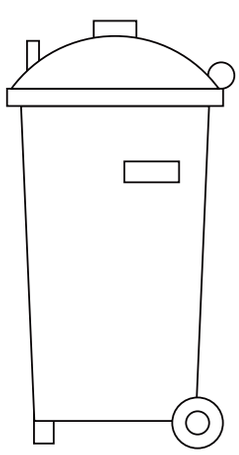




Safety Precautions

1

Thank you for purchasing this air conditioner. This manual will provide you with information on how to operate, maintain, and troubleshoot your air conditioner. Following the instructions will ensure the proper function and extended lifespan of your unit.

Please pay attention to the following signs:

WARNING

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

CAUTION

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

WARNING

- Ask an authorized dealer to install this air conditioner. Inappropriate installation may cause water leakage, electric shock, or fire.
- The warranty will be voided if the unit is not installed by professionals.
- If abnormal situation arises (like burning smell), turn off the power supply and call your dealer for instructions to avoid electric shock, fire or injury.
- DO NOT let the indoor unit or the remote control get wet. It may cause electric shock or fire.
- DO NOT insert fingers, rods or other objects into the air inlet or outlet. This may cause injury, since the fan may be rotating at high speeds.
- DO NOT use a flammable spray such as hair spray, lacquer or paint near the unit. This may cause fire or combustion.

CAUTION

- DO NOT touch the air outlet while the swing flap is in motion. Fingers might get caught or the unit may break down.
- DO NOT inspect the unit by yourself. Ask an authorized dealer to perform the inspection.
- To prevent product deterioration, do not use the air conditioner for preservation purposes (storage of food, plants, animals, works of art, etc.).
- DO NOT touch the evaporator coils inside the indoor unit. The evaporator coils are sharp and may cause injury.
- DO NOT operate the air conditioner with wet hands. It may cause electric shock.
- DO NOT place items that might be affected by moisture damage under the indoor unit. Condensation can occur at a relative humidity of 80%.
- DO NOT expose heat-producing appliances to cold air or place them under the indoor unit. This may cause incomplete combustion or deformation of the unit due to the heat.
- After long periods of usage, check the indoor unit to see if anything is damaged. If the indoor unit is damaged, it may fall and cause injury.
- If the air conditioner is used together with other heating devices, thoroughly ventilate the room to avoid oxygen deficiency.
- DO NOT climb onto or place objects on top of the outdoor unit.
- DO NOT operate the air conditioner when using fumigant insecticides. The chemicals may become layered with the unit and endanger those who are hypersensitive to chemicals.
- DO NOT let children play with the air conditioner.
- The air conditioner can be used by children aged 8 years and older and people with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, if they have been given instruction on how to properly and safely operate the system.
- DO NOT operate the air conditioner in a wet room (e.g. bathroom or laundry room). This can cause electrical shock and cause the product to deteriorate.

Unit Parts And Major Functions

2

Unit Parts

Wall-mounted type

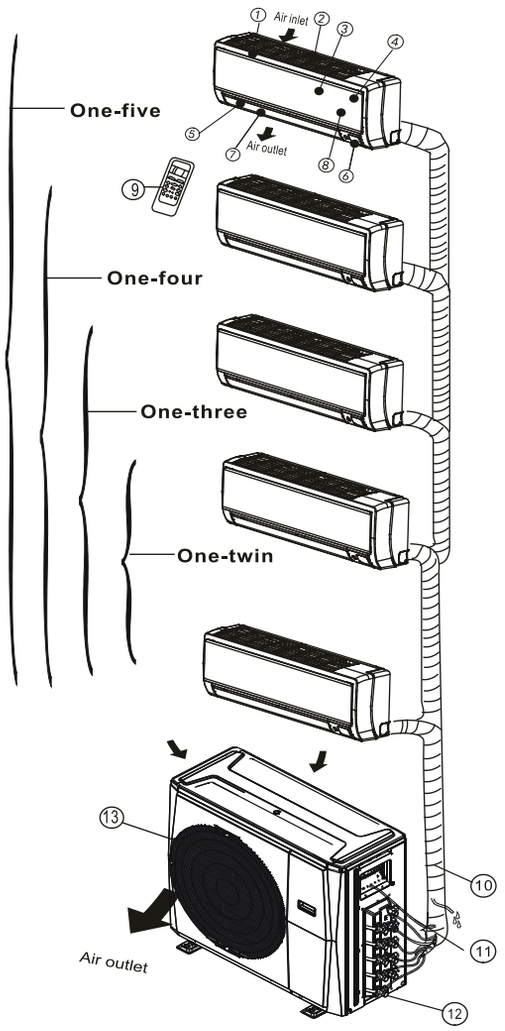


Fig. 2.1

Indoor unit

1. Panel frame
2. Rear air intake grille
3. Front panel
4. Air Purifying filter & Air filter(behind)
5. Horizontal louver
6. LCD display window
7. Vertical louver
8. Manual control button(behind)
9. Remote controller holder

Outdoor unit

10. Drain hose, refrigerant connecting pipe
11. Connective cable
12. Stop valve
13. Fan hood

Duct / Ceiling type

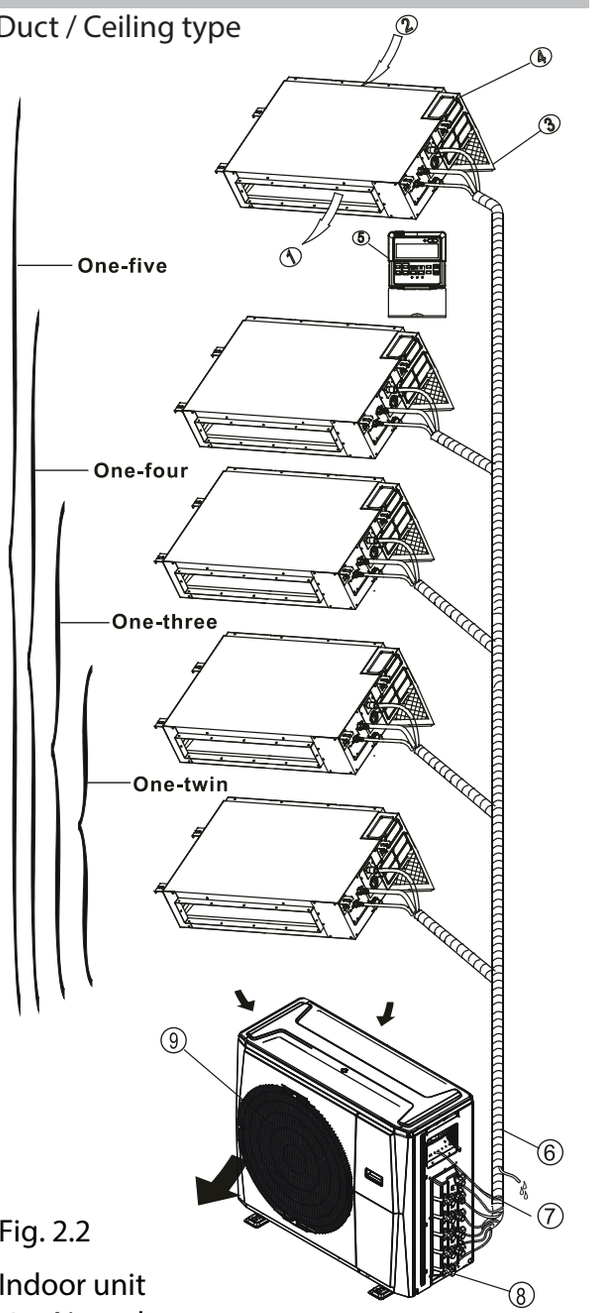


Fig. 2.2

Indoor unit

1. Air outlet
2. Air inlet
3. Air filter
4. Electric control cabinet
5. Wire controller

Outdoor unit

6. Drain hose, refrigerant connecting pipe
7. Connective cable
8. Stop valve
9. Fan hood

Floor and standing type(console)

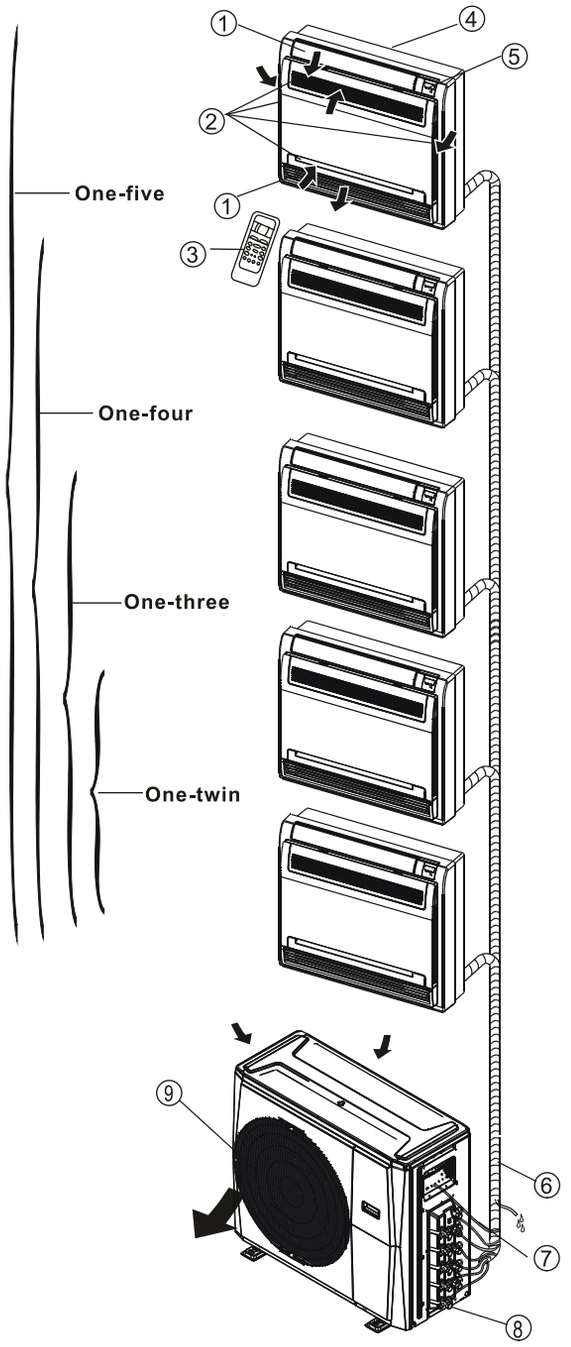


Fig. 2.3

Indoor unit
1. Air flow louver (at air outlet)
2. Air inlet(containing air filter)
3. Remote controller
4. Installation part
5. Display panel

Outdoor unit
6. Drain hose, refrigerant connecting pipe
7. Connective cable
8. Stop valve
9. Fan hood

Compact four-way cassette type

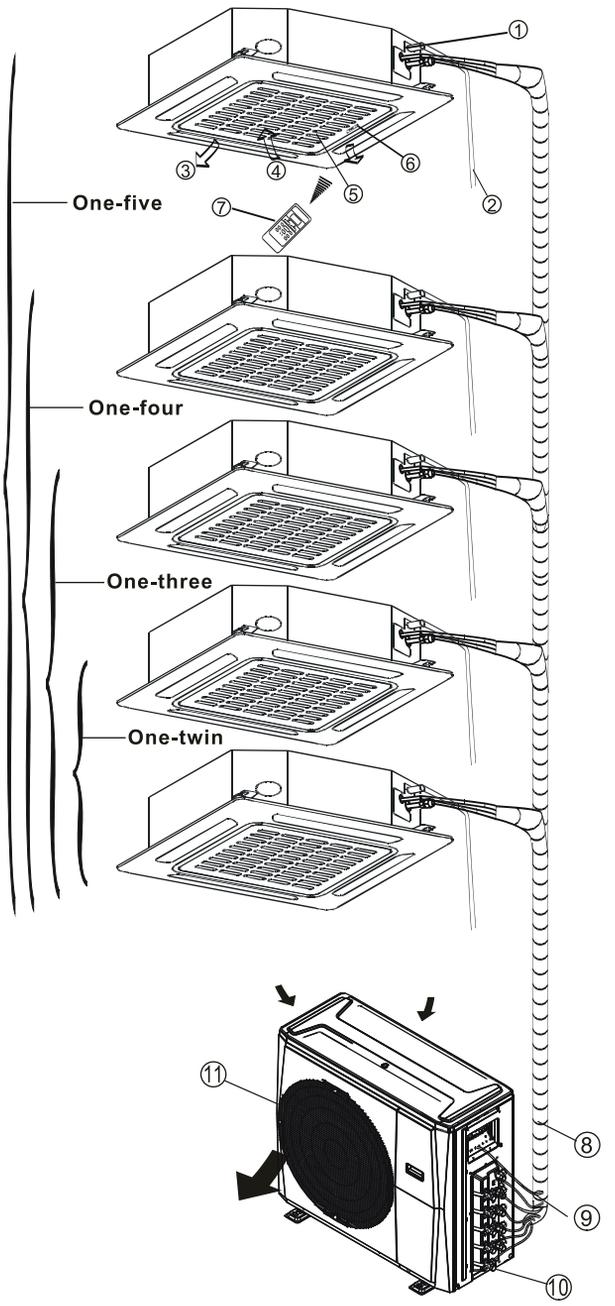


Fig. 2.4

Indoor unit
1. Drain pump(drain water from indoor unit)
2. Drain hose
3. Air outlet
4. Air inlet
5. Air-in grill
6. Display panel
7. Remote controller

Outdoor unit
8. refrigerant connecting pipe
9. Connective cable
10. Stop valve
11. Fan hood

NOTE: For multi-split type air conditioners, one outdoor unit can be matched to different types of indoor units. All of the pictures in this manual are for demonstration purposes only. Your air conditioner may be slightly different, if similar in shape. The following pages introduce several kinds of indoor units that can be matched with the outdoor units.

Operating Conditions

Use the system under the following temperatures for safe and effective operation. If the air conditioner is used under different conditions, it may malfunction or become less efficient.

	COOL Mode	HEAT mode	DRY mode
Indoor Temperature	62-90°F (17-32°C)	32-86°F (0-30°C)	62-90°F (17-32°C)
Outdoor Temperature	32-122°F (0-50°C)	5-76°F (-15-24°C)	32-122°F (0-50°C)
	5-122°F (-15-50°C) (low temperature cooling models)		

Features

Protection of the air conditioner

Compressor protection

- The compressor cannot restart for 3 minutes after it stops.

Anti-cold air (Cooling and heating models only)

- The unit is designed not to blow cold air on HEAT mode, when the indoor heat exchanger is in one of the following three situations and the set temperature has not been reached.
  A) When heating has just started.
  B) During defrosting.
  C) Low temperature heating.
- The indoor or outdoor fan stop running when defrosting (Cooling and heating models only).

Defrosting (Cooling and heating models only)

- Frost may be generated on the outdoor unit during a heat cycle when outdoor temperature is low and humidity is high resulting in lower heating efficiency in the air conditioner.
- Under these conditions, the air conditioner will stop heating operations and start defrosting automatically.
- The time to defrost may vary from 4 to 10 minutes, depending the outdoor temperature and the amount of frost buildup on the outdoor unit.

Auto-Restart (some models)

In case of power failure, the system will immediately stop. When power returns, the Operation light on the indoor unit will flash. To restart the unit, press the ON/OFF button on the remote control. If the system has an auto restart function, the unit will restart with the same settings.

White mist emerging from the indoor unit

- A white mist may be generated due to a large temperature difference between air inlet and air outlet on COOL mode in places with high relative humidity.
- A white mist may be generated due to moisture created in the defrosting process when the air conditioner restarts in HEAT mode operation after defrosting.

Noise coming from the air conditioner

- You may hear a low hissing sound when the compressor is running or has just stopped running. This sound is the sound of the refrigerant flowing or coming to a stop.
- You may also hear a low "squeaking" sound when the compressor is running or has just stopped running. This is caused by tempera heat expansion and cold contraction of the plastic parts in the unit when the temperature is changing.
- A noise may be heard due to the louver restoring itself to its original position when power is first turned on.

Dust blowing out from the indoor unit.

This is happens when the air conditioner has not been used for a long time or during its first use.

Smell emitting from the indoor unit.

This is caused by the indoor unit giving off smells permeated from building materials, furniture,or smoke.

The air conditioner turns to FAN ONLY mode from COOL or HEAT (for cooling and heating models only) mode.

When the indoor temperature reaches the set temperature setting, the compressor will stop automatically, and the air conditioner turns to FAN only mode. The compressor will start again when the indoor temperature rises on COOL mode or falls on HEAT mode to the set point.

Droplets of water may form on the surface of the indoor unit when cooling occurs in relatively high humidity (defined as higher than 80%). Adjust the horizontal louver to the maximum air outlet position and select HIGH fan speed.

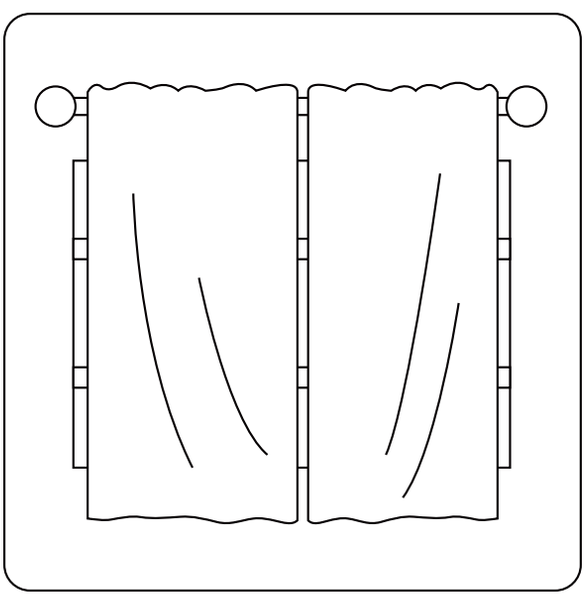
Heating mode (for cooling and heating models only)

The air conditioner draws in heat from the outdoor unit and releases it via the indoor unit during heating. When the outdoor temperature falls, heat drawn in by the air conditioner decreases accordingly. At the same time, heat loading of the air conditioner increases due to larger difference between indoor and outdoor temperature. If a comfortable temperature cannot be achieved with the air conditioner alone, it is recommended that you use a supplementary heating device.

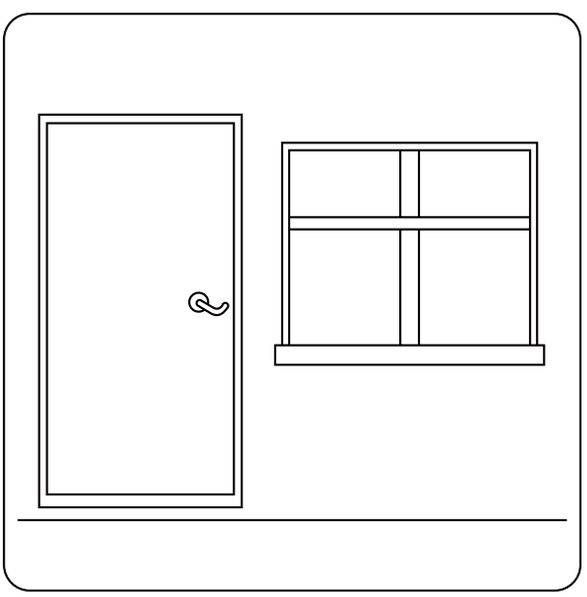
Lightning or a car wireless telephone operating nearby may cause the unit to malfunction. Disconnect the unit from its power source and then re-connect the unit with the power source again. Push the ON/OFF button on the remote controller to restart operations.

Energy Saving Tips

- DO NOT set the unit to excessive temperature levels.
- While cooling, close the curtains to avoid direct sunlight.
- Doors and windows should be kept closed to keep cool or warm air in the room.
- DO NOT place objects near the air inlet and outlet of the unit.
- Set a timer and use the built-in SLEEP/ECONOMY mode if applicable.
- If you don't plan to use the unit for a long time, remove the batteries from the remote control.
- Clean the air filter every two weeks.
- Adjust louvers properly and avoid direct airflow.



Closing curtains during heating also helps keep the heat in



Doors and windows should be kept closed

Manual Operations And Maintenance 3

Operation mode selection

While two or more indoor units are simultaneously operating, make sure the modes do not conflict with each other. The heat mode claims precedence over all other modes. If the unit intially started to operate in HEAT mode, the other units can operate in HEAT mode only. For example: If the unit intially started operates under COOL (or FAN) mode, the other units can operate under any mode except HEAT. If one of the unit selects HEAT mode, the other operating units will stop operation and diplay "--" (for units with display window only) or the auto and operation indication light will flash rapidly, the defrost indication light will turn off, and the timer indication light will remain on (for units without a display window). Alternatively, the defrost and alarm indication light (if applicable) wil light up, or the operation indication light will flash rapidly, and the timer indication light will turn off (for the floor and standing type).

Maintenance

If you plan to leave the unit idle for a long time, perform the following tasks:

1. Clean the indoor unit and air filter.
2. Select FAN ONLY mode and let the indoor fan run for a time to dry the inside of the unit.
3. Disconnect the power supply and remove the battery from the remote control.
4. Check the components of the outdoor unit periodically. Contact a local dealer or a customer service centre if the unit requires servicing.

NOTE: Before you clean the air conditioner, be sure to switch off the unit and disconnect the power supply plug.

Optimal operation

To achieve optimal performance, please note the following:

- Adjust the direction of the air flow so that it is not blowing directly on people.
- Adjust the temperature to achieve the highest possible level of comfort. Do not adjust the unit to excessive temperature levels.
- Close doors and windows in COOL mode or HEAT mode.
- Use the TIMER ON button on the remote controller to select a time you want to start your air conditioner.
- Do not place any object near the air inlet or air outlet, as the efficiency of the air conditioner may be reduced and the air conditioner may stop running.
- Clean the air filter periodically, otherwise cooling or heating per formance may be reduced.
- Do not operate unit with horizontal louvre in closed position.

Suggestion:
For units that feature an electric heater, when the outside ambient temperature is below 0°C (32°F), it is strongly recommended that you to keep the machine plugged in so as to guarantee smooth operation.

When the air conditioner is to be used again:

- Use a dry cloth to wipe off the dust accumulated on the rear air intake grille in order to avoid the dust being dispersed from the indoor unit.
- Check that the wiring is not broken off or disconnected.
- Check that the air filter is installed.
- Check if the air outlet or inlet is blocked after the air conditioner has not been used for a long time.

Troubleshooting 4

CAUTIONS

If one of the following conditions occurs, switch off the power supply immediately and contact your dealer for further assistance.

- The operation light continues to flash rapidly after the unit has been restarted.
- The remote control buttons do not work.
- The unit continually trips fuses or circuit breakers.
- A foreign object or water enters the air conditioner.
- Other abnormal situations.

Common Problems

The following symptoms are not a malfunction and in most situations will not require repairs.

Problem	Possible Causes
Unit does not turn on when pressing ON/ OFF button	The unit has a 3-minute protection feature that prevents the unit from overloading. The unit cannot be restarted within three minutes of being turned off.
	Cooling and Heating Models: If the Operation light and PRE-DEF (Pre-heating/ Defrost) indicators are lit up, the outdoor temperature is too cold and the unit's anti-cold wind is activated in order to defrost the unit.
	In Cooling-only Models: If the "Fan Only" indicator is lit up, the outdoor temperature is too cold and the unit's anti-freeze protection is activated in order to defrost the unit.
The unit changes from COOL mode to FAN mode	The unit changes its setting to prevent frost from forming on the unit. Once the temperature increases, the unit will start operating again.
	The set temperature has been reached, at which point the unit turns off the compressor. The unit will resume operating when the temperature fluctuates again.
The indoor unit emits white mist	In humid regions, a large temperature difference between the room's air and the conditioned air can cause white mist.
Both the indoor and outdoor units emit white mist	When the unit restarts in HEAT mode after defrosting, white mist may be emitted due to moisture generated from the defrosting process.
The indoor unit makes noises	A squeaking sound is heard when the system is OFF or in COOL mode. The noise is also heard when the drain pump (optional) is in operation.
	A squeaking sound may occur after running the unit in HEAT mode due to expansion and contraction of the unit's plastic parts.
Both the indoor unit and outdoor unit make noises	A low hissing sound may occur during operation. This is normal and is caused by refrigerant gas flowing through both the indoor and outdoor units.
	A low hissing sound may be heard when the system starts, has just stopped running or is defrosting. This noise is normal and is caused by the refrigerant gas stopping or changing direction.
The outdoor unit makes noises	The unit will make different sounds based on its current operating mode.

Problem	Possible Causes
Dust is emitted from either the indoor or outdoor unit	The unit may accumulate dust during extended periods of non-use, which will be emitted when the unit is turned on. This can be mitigated by covering the unit during long periods of inactivity.
The unit emits a bad odor	The unit may absorb odors from the environment (such as furniture, cooking, cigarettes, etc.) which will be emitted during operations.
	The unit's filters have become moldy and should be cleaned.
The fan of the outdoor unit does not operate	During operation, the fan speed is controlled to optimize product operation.

Troubleshooting Tips

When troubles occur, please check the following points before contacting a repair company.

Problem	Possible Causes	Solution
The unit is not working	Power failure	Wait for the power to be restored
	The power switch is off	Turn on the power
	The fuse is burned out	Replace the fuse
	Remote control batteries are dead	Replace the remote control batteries
	The unit's 3-minute protection has been activated	Wait three minutes after restarting the unit
Poor cooling performance	Temperature setting may be higher than the ambient room temperature	Lower the temperature setting
	The heat exchanger on the indoor or outdoor unit is dirty	Clean the affected heat exchanger
	The air filter is dirty	Remove the filter and clean it according to instructions
	The air inlet or outlet of either unit is blocked	Turn the unit off, remove the obstruction and turn it back on
	Doors and windows are open	Make sure that all doors and windows are closed while operating the unit
	Excessive heat is generated by sunlight	Close windows and curtains during periods of high heat or bright sunshine
	Low refrigerant due to leak or long-term use	Check for leaks, re-seal if necessary and top off refrigerant
The unit starts and stops frequently	There's too much or too little refrigerant in the system	Check for leaks and recharge the system with refrigerant
	There is air, incompressible gas or foreign material in the refrigeration system.	Evacuate and recharge the system with refrigerant
	System circuit is blocked	Determine which circuit is blocked and replace the malfunctioning piece of equipment
	The compressor is broken	Replace the compressor
	The voltage is too high or too low	Install a manostat to regulate the voltage
Poor heating performance	The outdoor temperature is lower than 7°C (44.5°F)	Check for leaks and recharge the system with refrigerant
	Cold air is entering through doors and windows	Make sure that all doors and windows are closed during use
	Low refrigerant due to leak or long-term use	Check for leaks, re-seal if necessary and top off refrigerant

SYSTEMOPERATION

COOLING OPERATION

How it works:
In cooling mode, your **indoor evaporator** will absorb heat from the room, then the **outdoor condenser** will discharge the heat to the outdoors. The sophia cooling capacity decreases as the outdoor temperature increases. This causes the alice to work harder and longer to hold the selected room temperature.

Indoor Coil Freeze Protection:
Frost may form on the indoor coil during cooling operations when the outdoor temperature below 50°F (10°C). Prolong operation may cause ice to form on the indoor coil and block airflow. If the **indoor evaporator's** microcomputer detects ice on the indoor coil it will stop the compressor to defrost the coil and protect the unit.

HEATING OPERATION

How it works:
In heating mode, your **outdoor condenser** will absorb ambient heat from outdoors, then the **indoor evaporator** will discharge the heat to the room. The heating capacity decreases as the outdoor temperature decreases.

During extreme cold outdoor temperatures, you may need an additional heating source to supplement the heating output.

Defrost Function:
In heating mode, frost may form on the outdoor coil during humid and low outdoor temperature conditions. Prolonged operation may cause ice to form on the outdoor coil and block air□ow. This will reduce the heating capacity.

If the microcomputer detects ice on the outdoor coil, it will switch automatically to defrost mode to melt the ice and clear the coil. During defrost mode, heating will pause and the **indoor evaporator** will □ash the Defrost indicator. The compressor will continue to run while the indoor and outdoor fans will stop. It is normal to see steam or vapor coming from the outdoor unit during defrost. Defrost mode will terminate 12 minutes after it begins the cycle or when the outdoor coil temperature is 50°F (10°C) or greater.

ENERGY SAVING TIPS

1. **Relaxing room temperature at night is OK:** During the nighttime hours you don't require the same level of conscious cooling or heating. Try using Sleep Mode to gradually relax room temperature and allow the unit to run less and save energy.
2. **Curtains and shades:** In the summer, you need to block the effects of the sun. Close window curtains and shades on the south and west side of your home to help block solar heat. In winter, the sun is your friend. Open curtains and shades to allow solar heat into your room.
3. **Close doors:** If you don't need to heat and cool your whole home, confine the heating and cooling to one room by closing doors. Limit the space you're heating and cooling to specified capability of the unit.
4. **Service the unit:** Some basic maintenance might be all you need. The outdoor unit will greatly benefit from a good hosing out, especially in treed areas where seeds and other debris can stick to coil fins and make the unit work up to 15% harder!
5. **Rearrange the room:** Furniture that obstructs airflow means you could be heating and cooling the back of a chair or the front of a sofa instead of the actual living space. Use the Swing Louvers to help direct the air in the right direction for the room; remove or rearrange obstacles blocking airflow.
6. **Lighting:** Turning lights off can help reduce your heat. Each light bulb is a tiny heater. Your air conditioner must waste energy overcoming the heat from your lights to reach and hold your desired room temperature.
7. **Is anyone home?** If possible, while you're away turn your unit to Auto mode and make sure windows and drapes are closed. Although the room temperature will be uncomfortable for a few minutes when you come home, the unit will have the room back to your desired temperature in no time.
8. **Don't forget the fan:** The fan is much like a car. The faster it runs, the more energy is uses. Sometimes we need the car to go fast, but slow is good enough most of the time. Try saving money by using the comfortable quiet low fan speed as much as possible.