

Room Air Conditioner

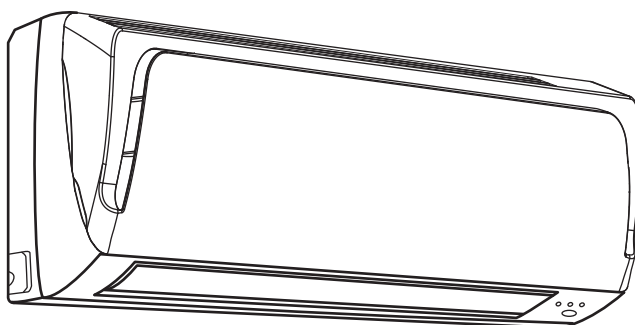
SERVICE MANUAL

SPLIT TYPE ROOM AIR CONDITIONER

CAUTION

- BEFORE SERVICING THE UNIT, READ THE SAFETY PRECAUTIONS IN THIS MANUAL.
- ONLY FOR AUTHORIZED SERVICE PERSONNEL.

MODEL: GWHD18A1NK3EA
(Applied to new Refrigerant R-410A)



Prior to installation, this air-conditioning unit must be submitted for approval by the utility service which provides electricity (EN 61000-3 Norm).

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Safety Precautions



To prevent injury to the user or other people and property damage, the following instructions must be followed.

■ Incorrect operation due to ignoring instruction will cause harm or damage. The seriousness is classified by the following indications.

⚠ WARNING This symbol indicates the possibility of death or serious injury.

⚠ CAUTION This symbol indicates the possibility of injury or damage to properties only.

■ Meanings of symbols used in this manual are as shown below.

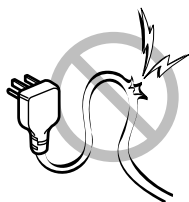
	Be sure not to do.
	Be sure to follow the instruction.

⚠ WARNING

■ Installation

Do not use damaged power cords, plugs, or a loose socket.

- There is risk of fire or electric shock.



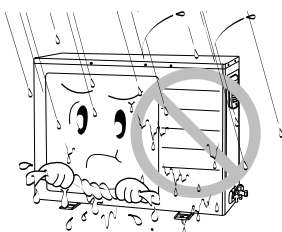
Always use the power plug and socket with the ground terminal.

- There is risk of electric shock.



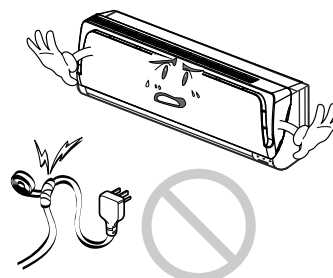
Install the panel and the cover of control box securely.

- There is risk of fire or electric shock.



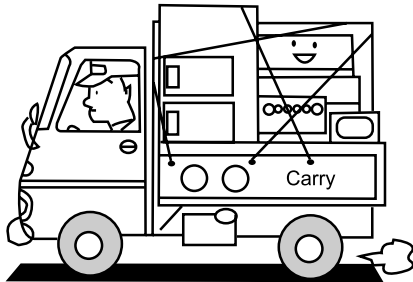
Do not modify or extend the power cord.

- No grounding may cause electric shock.



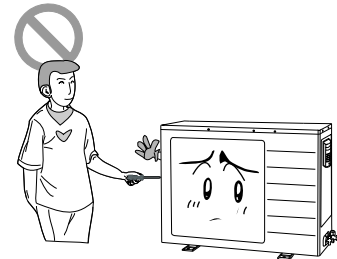
For re-installation of the installed product, always contact a dealer or an authorized service center.

- There is risk of fire, electric shock, explosion, or injury.



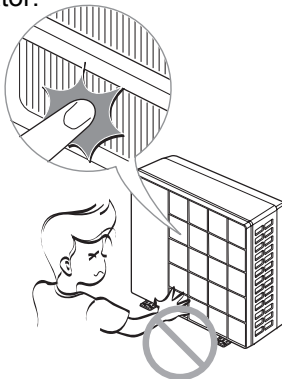
Do not install, remove, or re-install the unit by yourself.

- There is risk of fire, electric shock, explosion, or injury.



Be cautious when unpacking and installing the product.

- Sharp edges could cause injury. Be especially careful of the case edges and the fins on the condenser and evaporator.



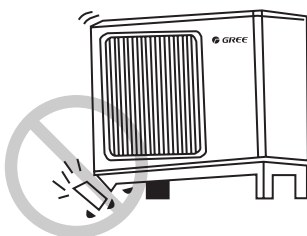
For installation, always contact the dealer or an Authorized service center

- There is risk of fire, electric shock, explosion, or injury.



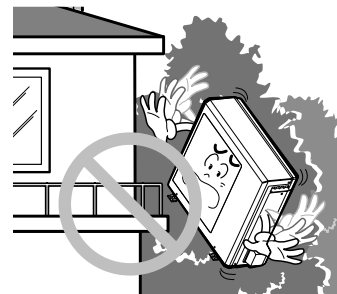
Do not install the product on a defective installation stand.

- It may cause injury, accident, or damage to the product.



Be sure the installation area does not deteriorate with age.

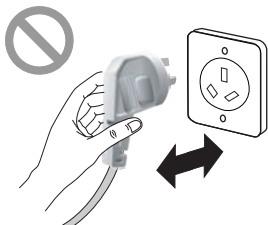
- If the base collapses, the air conditioner could fall with it, causing property damage, product failure, and personal injury.



■ Operation

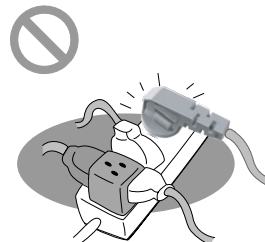
Do not turn the air-conditioner ON or OFF by plugging or unplugging the power plug.

- There is risk of fire or electrical shock.



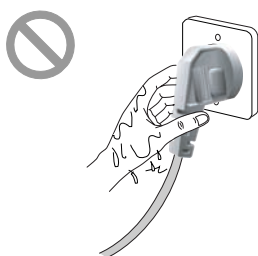
Use a dedicated outlet for this appliance.

- There is risk of fire or electrical shock.



Grasp the plug to remove the cord from the outlet. Do not touch it with wet hands.

- There is risk of fire or electrical shock.



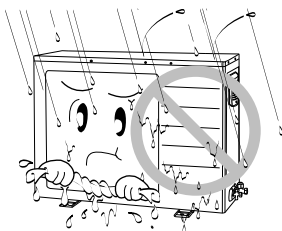
Do not place a heater or other appliances near the power cable.

- There is risk of fire and electric shock.



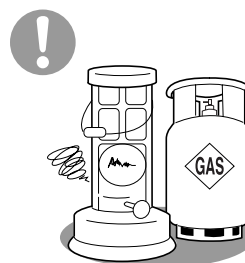
Do not allow water to run into electrical parts.

- There is risk of fire, failure of the product, or electric shock.



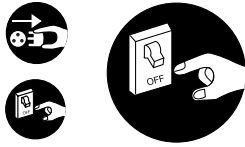
Do not store or use flammable gas or combustibles near the air conditioner.

- There is risk of fire or failure of product.



Unplug the unit if strange sounds, odors, or smoke comes from it.

- There is risk of electric shock or fire.



Be cautious that water could not enter the product.

- There is risk of fire, electric shock, or product damage.

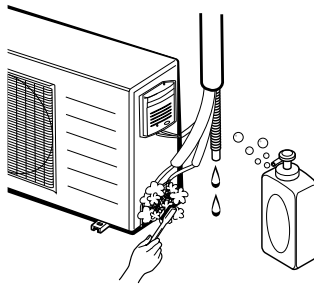


⚠ CAUTION

■ Installation

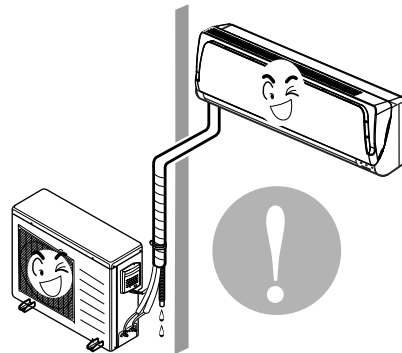
Always check for gas (refrigerant) leakage after installation or repair of product.

- Low refrigerant levels may cause failure of product.



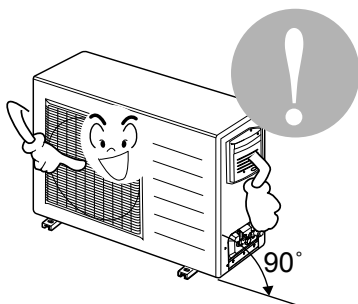
Install the drain hose to ensure that water is drained away properly.

- A bad connection may cause water leakage.



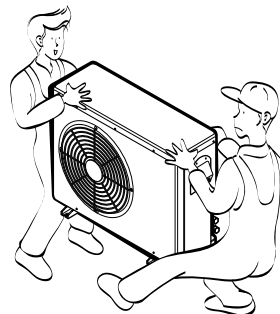
Keep level even when installing the product.

- To avoid vibration or water leakage.



Use two or more people to lift and transport the air conditioner.

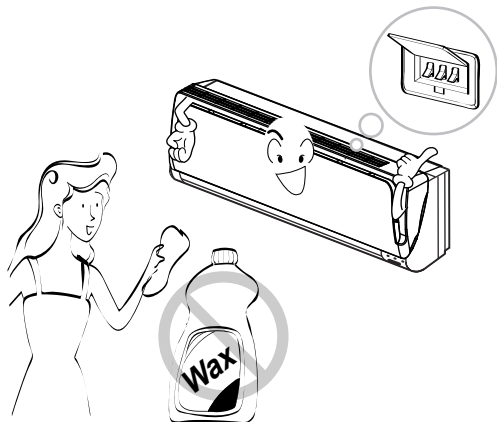
- Avoid personal injury.



■ Operation

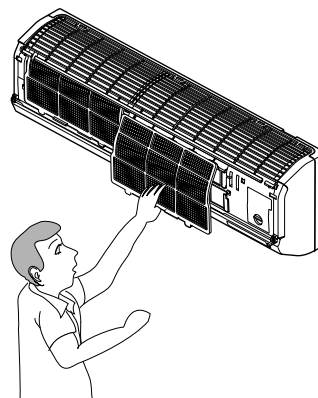
Use a soft cloth to clean. Do not use harsh detergents, solvents, etc.

- There is risk of fire, electric shock, or damage to the plastic parts of the product.



Do not touch the metal parts of the product when removing the air filter. They are very sharp!

- There is risk of personal injury.



Do not step on or put anything on the product. (outdoor units)

- There is risk of personal injury and failure of product.



Do not insert hands or other objects through the air inlet or outlet while the air conditioner is plugged in.

- There are sharp and moving parts that could cause personal injury.



Dimensions

Symbols Used in this Manual



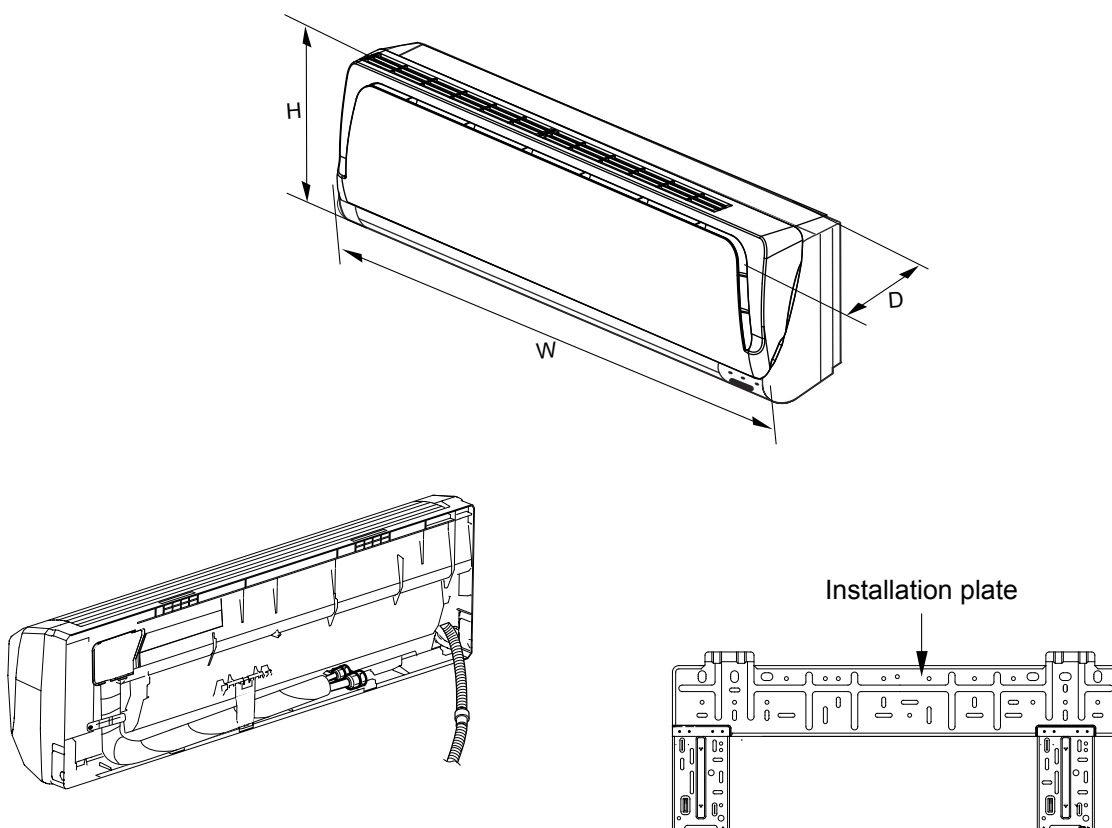
This symbol alerts you to the risk of electric shock.



This symbol alerts you to hazards that could cause harm to the air conditioner.

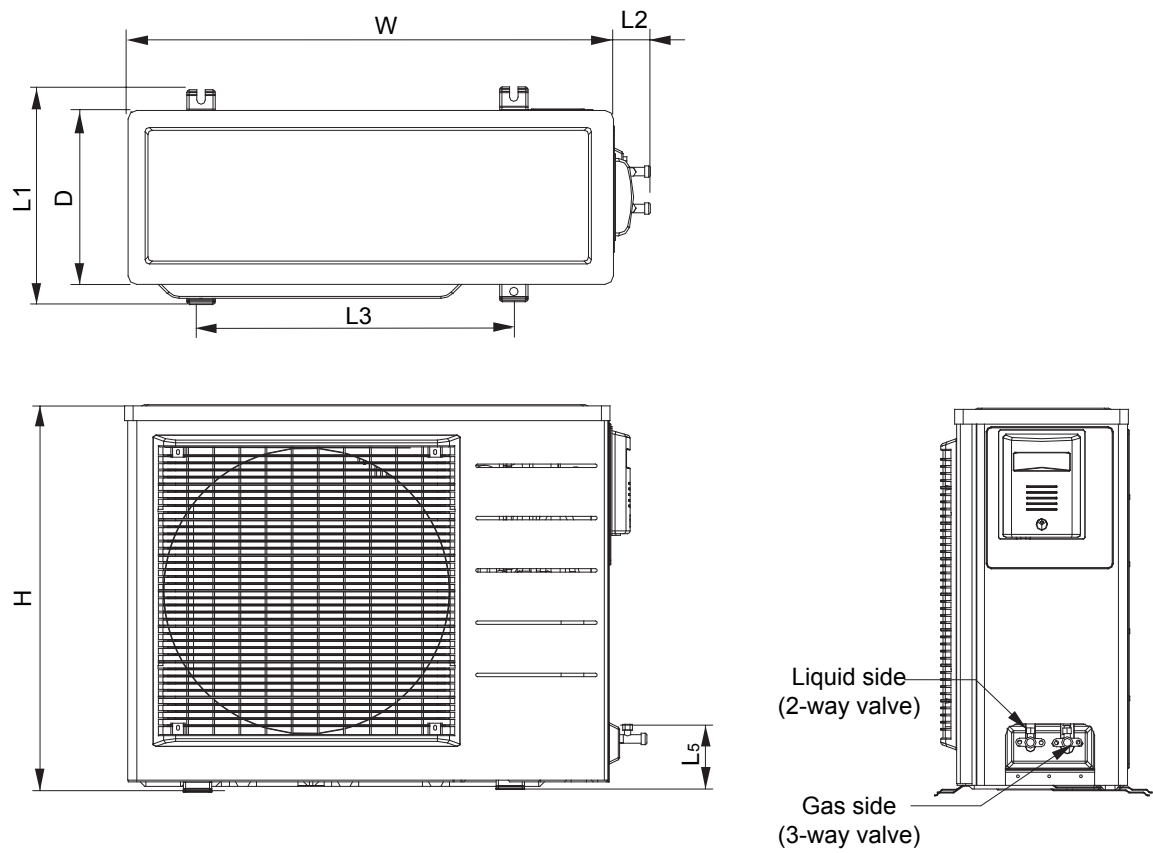
NOTICE This symbol indicates special notes.

Indoor Unit



Model		18k Btu Series
Dimension		
W	mm	907
H	mm	285
D	mm	231

Outdoor Unit



MODEL		18k Btu Series
DIM	unit	
W	mm	845
H	mm	680
D	mm	304
L1	mm	378
L2	mm	68
L3	mm	530
L4	mm	14
L5	mm	100

Product Specifications

Table-1

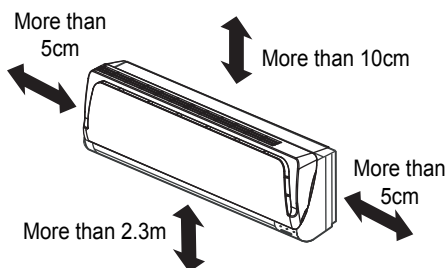
Item		Model Name	Unit	GWHD18A1NK3EA
Cooling Capacity	MIN	W		1314
		kcal/h.(W)		1130
		Btu/h.		4483
	Type	W		4920
		kcal/h.(W)		4232
		Btu/h.		16787
	Max	W		5171
		kcal/h.(W)		4447
		Btu/h.		17643
Heating Capacity	MIN	W		1326
		kcal/h.(W)		1140
		Btu/h.		4526
	Type	W		5740
		kcal/h.(W)		4937
		Btu/h.		19585
	Max	W		6318
		kcal/h.(W)		5434
		Btu/h.		21557
Power Input	IN:20°C,Out: -10°C(Heater ON)		Btu/h.	-
	IN:20°C,Out: -10°C(Heater OFF)		Btu/h.	-
	Cooling	W		1728
	Heating	W		2140
	Heating(-10°C,Heater ON)	W		-
Running Current	Cooling	A		7.53
	Heating	A		9.36
	Heating(-10°C,Heater ON)	A		-
	Heating(-10°C,Heater OFF)	A		-
COP	Cooling	W/W		2.85
	Heating	W/W		2.68
Power Supply		V,Hz		240/50
Power Factor		%		98
Air Circulation	Indoor,Max	m³/min(CFM)		800
	Outdoor,Max	m³/min(CFM)		-
Moisture Removal		l/h.(pts/h.)		2
Noise Level (Sound Pressure,1m)	Indoor,High	dB(A)±3		47
	Med.	dB(A)±3		45
	Low	dB(A)±3		42
	Outdoor,Max	dB(A)±3		57
Refrigerant(R410A)Charge				1600
Power Cord		DXL		1.5mm2
Connecting Cable		DXL		1.5mm2
Connecting Tube (Ø. Socket Flare)	Liquid Side	mm(in)		6.35(1/4)
	Gas Side	mm(in)		12(1/2)
	Length,std	m(in)		5(127)
Drain Hose	(O.D , I.D)	mm(in)		21.5,16.0(0.85,0.63)
Dimension (W*H*D)	Indoor	mm		907X290X231
		inch		35.7X11.4X9.1
	Outdoor	mm		840X675X304
		inch		33.1X26.6X12.0
Net Weight	Indoor	kg(lbs)		13(29)
	Outdoor	kg(lbs)		52(115)

Installation

Selection of the Best Location

Indoor unit

- Do not have any heat or steam near the unit.
- Select a place where there are no obstacles in front of the unit.
- Make sure that condensation drainage can be conveniently routed away.
Do not install near a doorway.
- Ensure that the space around the left and right of the unit is more than "A". The unit should be installed as high on the wall as possible, allowing a minimum of "B" from ceiling.
- Use a stud finder to locate studs to prevent unnecessary damage to the wall.

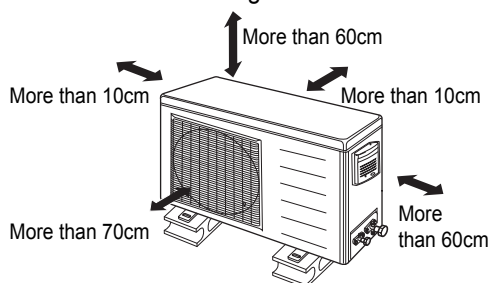


CAUTION

Install the indoor unit on the wall where the height from the floors more than 2.3 meters.

Outdoor unit

- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that heat radiation from the condenser is not restricted.
- Ensure that the space around the back and sides is more than 10cm. The front of the unit should have more than 70cm of space.
- Do not place animals and plants in the path of the warm air.
- Take the air conditioner weight into account and select a place where noise and vibration are minimum.
- Select a place so that the warm air and noise from the air conditioner do not disturb neighbors.

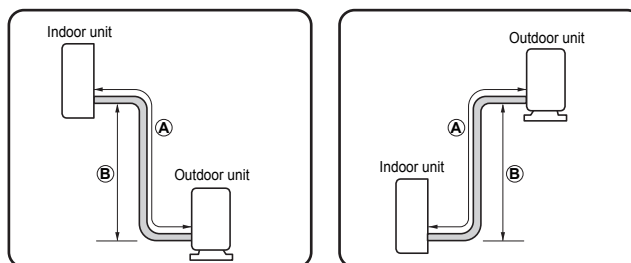


Rooftop Installations:

- If the outdoor unit is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location.
- Consult local codes regarding rooftop mounting.

Piping Length and Elevation

Capacity (Btu/h)	Pipe Size		Standard Length (m)	Max. Elevation B (m)	Max. Length A (m)	Additional Refrigerant (g/m)
	GAS	LIQUID				
18k	1/2"(Ø12.7)	1/4"(Ø6.35)	5	5	15	20



Ⓐ Maximum length of the pipe 15m

Ⓑ Height less than 5m

CAUTION

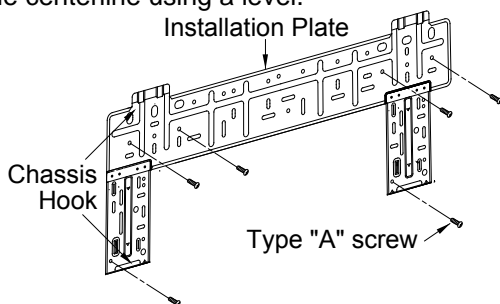
- Capacity is based on standard length and maximum allowance length is on the basis of reliability.

How to Fix Installation Plate

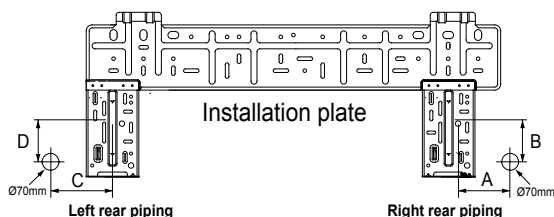
The wall you select should be strong and solid enough to prevent vibration

1. Mount the installation plate on the wall with four type A screws. If mounting the unit on a concrete wall, use anchor bolts.

- Mount the installation plate horizontally by aligning the centerline using a level.



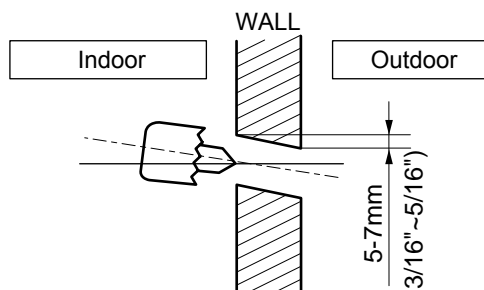
2. Measure the wall and mark the centerline. It is also important to use caution concerning the location of the installation plate—routing of the wiring to power outlets is through the walls typically. Drilling the hole through the wall for piping connections must be done safely.



CHASSIS (Grade)	Distance (mm)			
	A	B	C	D
18k	105	65	260	65

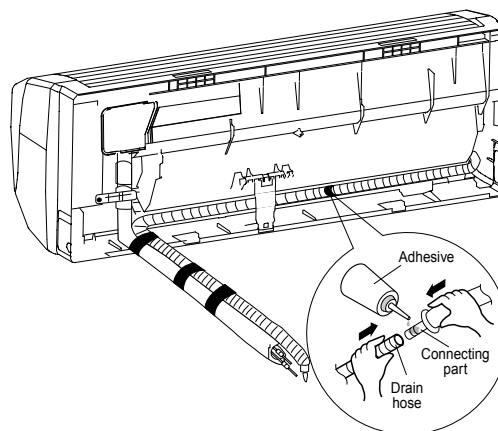
Drill a Hole in the Wall

- Drill the piping hole with a $\varnothing 65\text{mm}$ hole core drill. Drill the piping hole at either the right or the left with the hole slightly slanted to the outdoor side.



Drain hose junction

- Remove the rubber stopple in the desired drain direction.
- Insert drain hose into the handle of drain pan, and join drain hose and connecting hose according to the figure by.



Flaring work and connection of piping

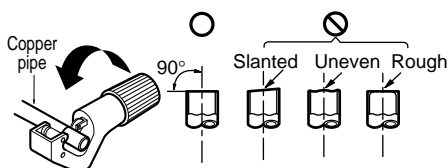
Flaring work

Flaring work

Main cause for refrigerant leakage is due to defect in the flaring work. Carry out correct flaring work using the following procedure.

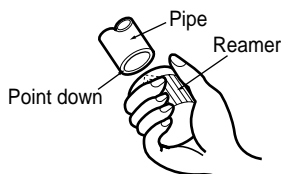
Cut the pipes and the cable.

- Use the piping kit accessory or pipes purchased locally.
- Measure the distance between the indoor and the outdoor unit.
- Cut the pipes a little longer than the measured distance.
- Cut the cable 1.5m longer than the pipe length.



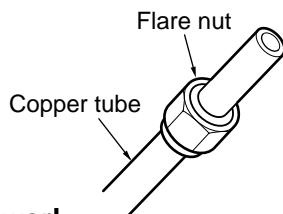
Burr removal

- Completely remove all burrs from the cut cross section of pipe/tube.
- Put the end of the copper tube/pipe in a downward direction as you remove burrs in order to avoid dropping burrs into the tubing.



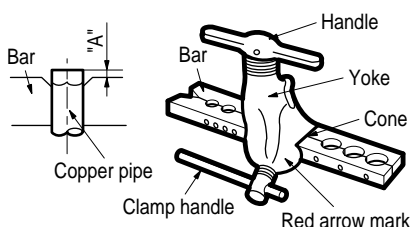
Putting nut on

- Remove flare nuts attached to indoor and outdoor unit, then put them on pipe/tube having completed burr removal. (not possible to put them on after flaring work)



Flaring work

- Firmly hold copper pipe in a die in the dimension shown in the table above.

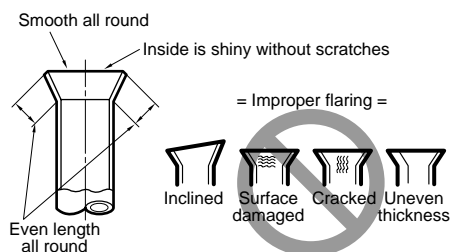


- Carry out flaring work using flaring tool as shown below.

Outside diameter		A
mm	inch	mm
Ø6.35	1/4	0~0.5
Ø12.7	1/2	0~0.5

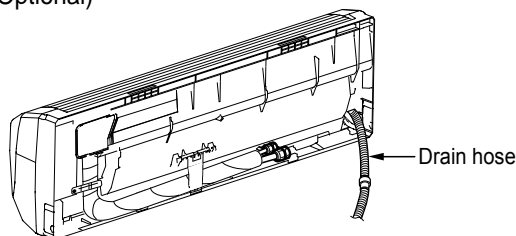
Check

- Compare the flared work with figure below.
- If flare is noted to be defective, cut off the flared section and re-flare it.



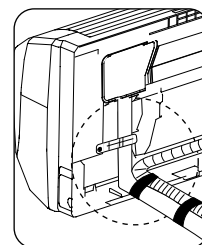
Connection of piping -- Indoor

- Preparing the indoor unit's piping and drain hose for installation through the wall.
- Remove the plastic tubing retainer(see illustration below) and pull the tubing and drain hose away from chassis.
- Replace the plastic tubing holder in the original position.(Optional)



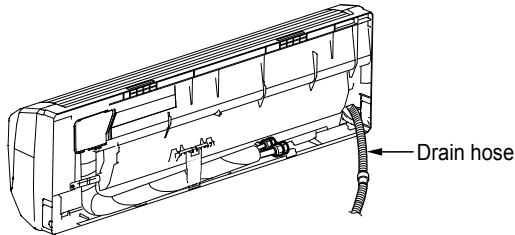
CAUTION

When install, make sure that the remaining parts must be removed clearly so as not to damage the piping and drain hose, especially power cord and connecting cable.



For right rear piping

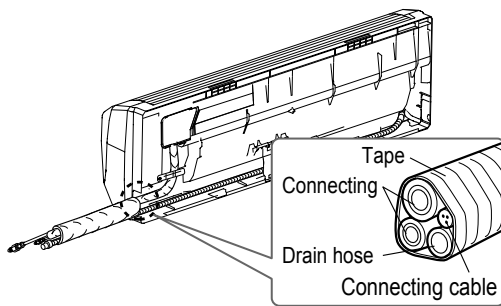
Route the indoor tubing and the drain hose in the direction of rear right.



Insert the connecting cable into the indoor unit from the outdoor unit through the piping hole.

- Do not connect the cable to the indoor unit.
- Make a small loop with the cable for easy connection later.

Tape the tubing, drain hose, and the connecting cable. Be sure that the drain hose is located at the lowest side of the bundle. Locating at the upper side can cause drain pan to overflow inside the unit.

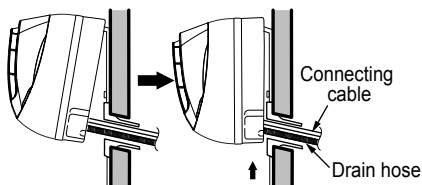


NOTE: If the drain hose is routed inside the room, insulate the hose with an insulation material* so that dripping from "sweating"(condensation) will not damage furniture or floors.

*Foamed polyethylene or equivalent is recommended.

Indoor unit installation

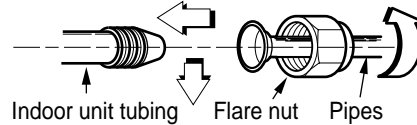
- Hook the indoor unit onto the upper portion of the installation plate.(Engage the two hooks of the rear top of the indoor unit with the upper edge of the installation plate.) Ensure that the hooks are properly seated on the installation plate by moving it left and right.



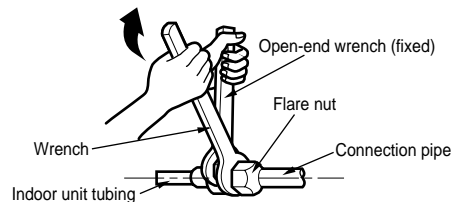
Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots(clicking sound).

Connecting the pipings to the indoor unit and drain hose to drain pipe.

- Align the center of the pipes and sufficiently tighten the flare nut by hand.

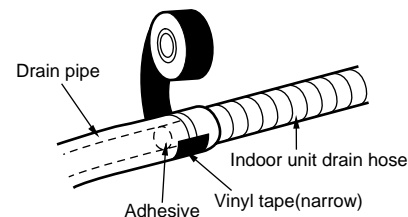


- Tighten the flare nut with a wrench.



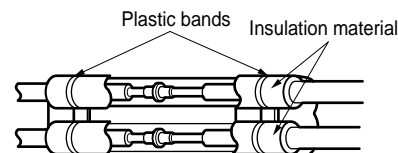
Outside diameter		Torque
mm	inch	kg-m
Ø6.35	1/4	1.8
Ø12.7	1/2	5.5

- When extending the drain hose at the indoor unit, install the drain pipe.

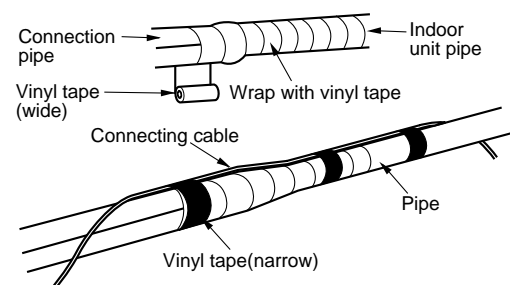


Wrap the insulation material around the connecting portion.

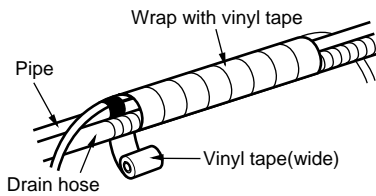
- Overlap the connection pipe insulation material and the indoor unit pipe insulation material. Bind them together with vinyl tape so that there is no gap.



- Wrap the area which accommodates the rear piping housing section with vinyl tape.

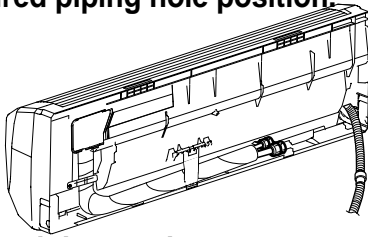


- Bundle the piping and drain hose together by wrapping them with vinyl tape for enough to cover where they fit into the rear piping housing section.

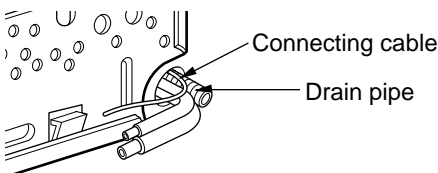


For left rear piping

Route the indoor tubing and the drain hose to the required piping hole position.



Insert the piping, drain hose, and the connecting cable into the piping hole.

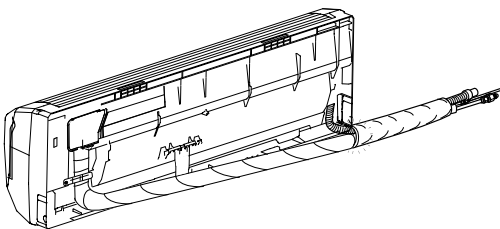


Insert the connecting cable into the indoor unit.

- Don't connect the cable to the indoor unit.
- Make a small loop with the cable for easy connection later.

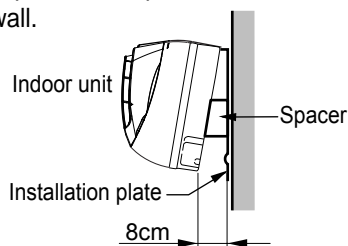
Tape the drain hose and the connecting cable.

- Connecting cable



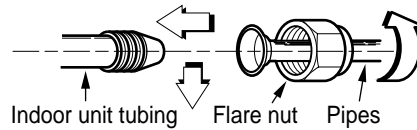
Indoor unit installation

- Hang the indoor unit from the hooks at the top of the installation plate.
- Insert the spacer etc. between the indoor unit and the installation plate and separate the bottom of the indoor unit from the wall.

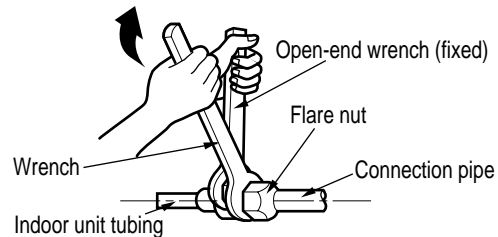


Connecting the pipings to the indoor unit and the drain hose to drain pipe.

- Align the center of the pipes and sufficiently tighten the flare nut by hand.

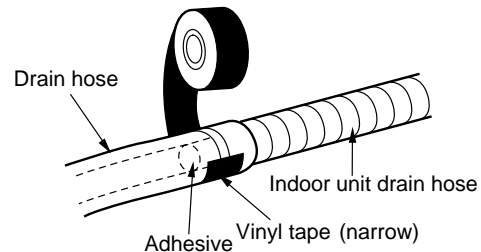


- Tighten the flare nut with a wrench.



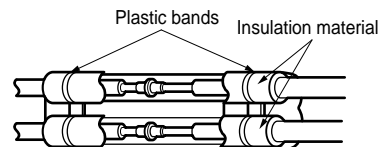
Outside diameter		Torque
mm	inch	kg·m
Ø6.35	1/4	1.8
Ø12.7	1/2	5.5

- When extending the drain hose at the indoor unit, install the drain pipe.

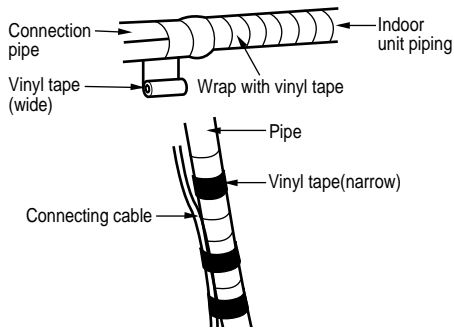


Wrap the insulation material around the connecting portion.

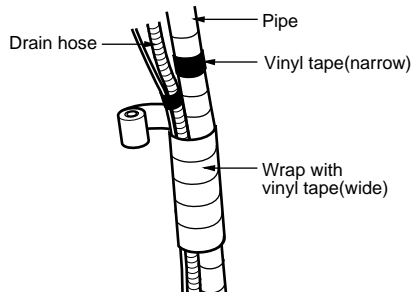
- Overlap the connection pipe heat insulation and the indoor unit pipe heat insulation material. Bind them together with vinyl tape so that there is no gap.



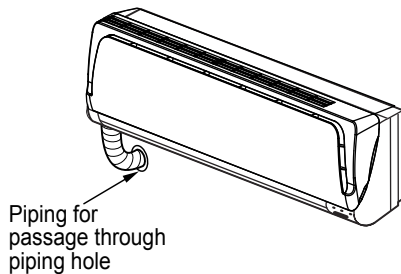
- Wrap the area which accommodates the rear piping housing section with vinyl tape.



- Bundle the piping and drain hose together by wrapping them with cloth tape over the range within which they fit into the rear piping housing section.

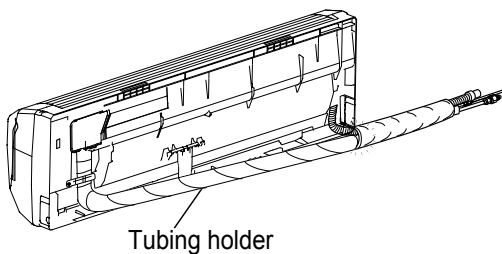


Reroute the pipings and the drain hose across the back of the chassis.



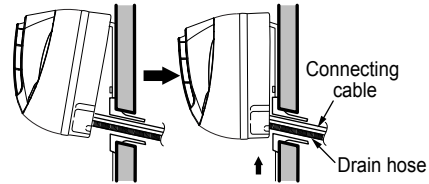
Set the pipings and the drain hose to the back of the chassis with the tubing holder.

- Hook the edge of tubing holder to tap on chassis and push the bottom of tubing holder to be engaged at the bottom of chassis.



Indoor unit installation

- Remove the spacer.
- Ensure that the hooks are properly seated on the installation plate by moving it left and right.

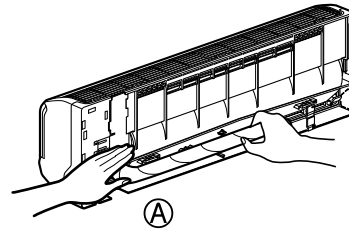


Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots(clicking sound).

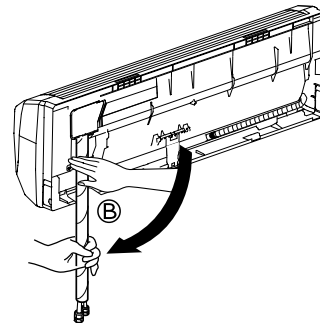
CAUTION

Installation Information (For left piping)

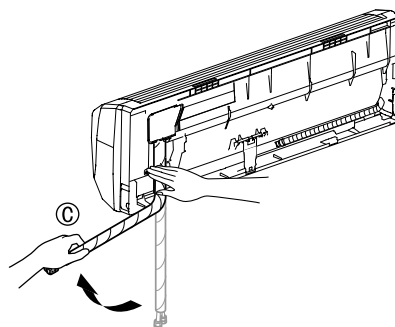
- Good case
For left piping. Follow the instruction below.
- Press on the upper side of clamp. (A)



- Unfold the tubing to downward slowly. (B)

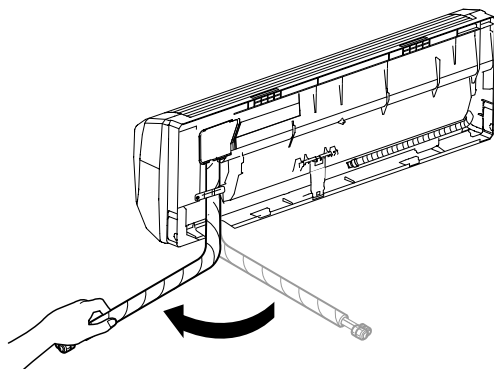
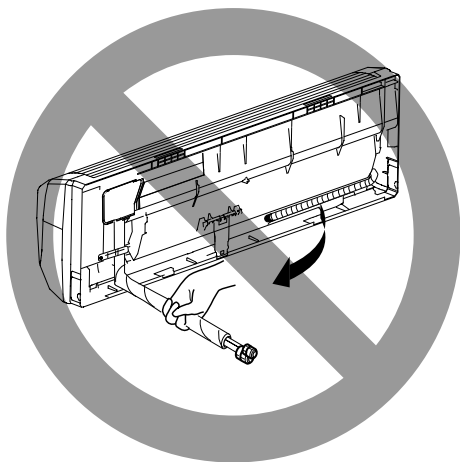
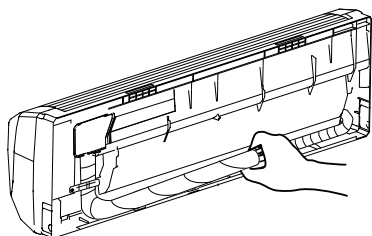


- Bend the tubing to the left side of chassis.(C)



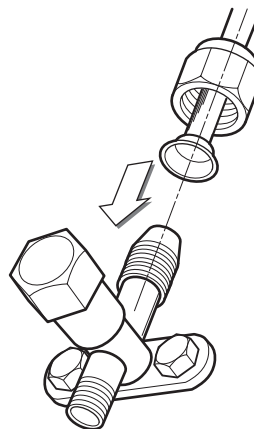
⚠ CAUTION

- Bad case
- Following bending type from right to left could cause problem of pipe damage.



Connection of the pipes-Outdoor

Align the center of the pipings and sufficiently tighten the flare nut by hand.

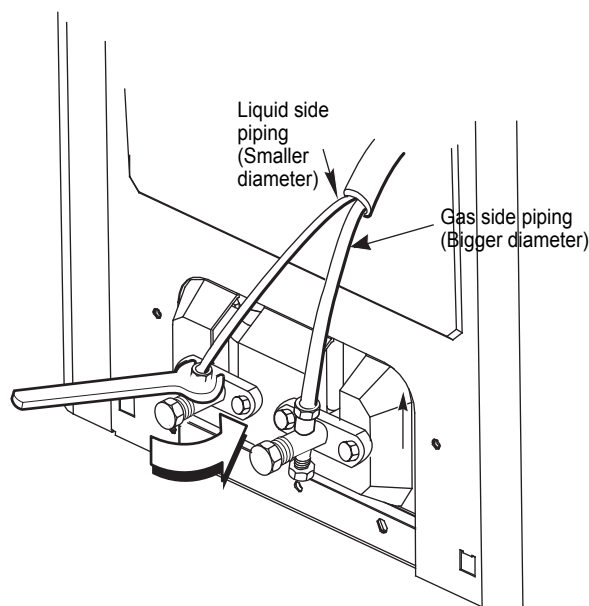


Finally, tighten the flare nut with torque wrench until the wrench clicks.

- When tightening the flare nut with torque wrench, ensure the direction for tightening follows the arrow on the wrench.

Outside diameter		Torque
mm	inch	kg-m
Ø6.35	1/4	1.8
Ø12.7	1/2	5.5

Outdoor unit



Connecting the cable between indoor unit and outdoor unit

Connect the cable to the Indoor unit.

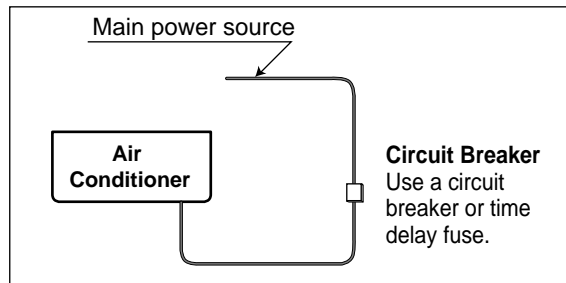
Connect the cable to the indoor unit by connecting the wires to the terminals on the control board individually according to the outdoor unit connection. (Ensure that the color of the wires of the outdoor unit and the terminal No. are the same as those of the indoor unit.)

⚠ CAUTION

- The above circuit diagram is subject to change without notice.
- The earth wire should be longer than the common wires.
- When installing, refer to the circuit diagram behind the panel front of the indoor unit.
- Connect the wires firmly so that they may not be pulled out easily.
- Connect the wires according to color codes, referring to the wiring diagram.

⚠ CAUTION

If a power plug is not used, provide a circuit breaker between power source and the unit as shown by.

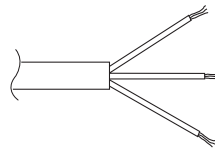


⚠ CAUTION

The power cord connected to the indoor unit and the power connecting cable connecting the indoor and outdoor unit should be selected according to the following specifications (Type "B" approved by HAR or SAA).

(mm²)

Power cord	Connecting cable
1.5	1.5
H05W-F	H07RN-F



Connect the cable to the outdoor unit

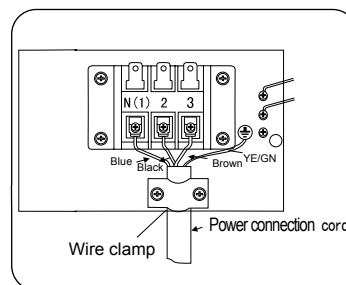
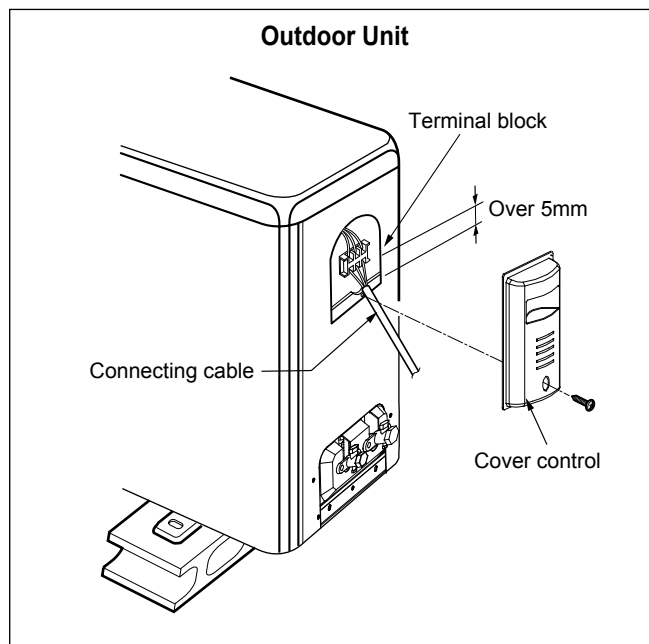
Remove the control cover from the unit by loosening the screw.

Connect the wires to the terminals on the control board individually.

Secure the cable onto the control board with the cord clamp.

Refix the control cover to the original position with the screw.

Use a recognized circuit breaker "A" between the power source and the unit.
A disconnecting device to adequately disconnect all supply lines must be fitted.
This Air-conditioner use 20A.



⚠ CAUTION

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

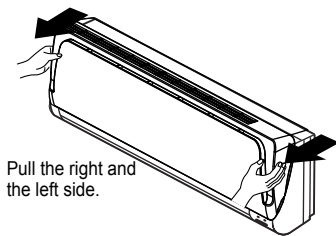
- 1) Never fail to have an individual power circuit specifically for the air conditioner. As for the method of wiring, be guided by the circuit diagram posted on the inside of control cover.
- 2) The screw which fasten the wiring in the casing of electrical fittings are liable to come loose from vibrations to which the unit is subjected during the course of transportation. Check them and make sure that they are all tightly fastened. (If they are loose, it could cause burn-out of the wires.)
- 3) Specification of power source.
- 4) Confirm that electrical capacity is sufficient.
- 5) See to that the starting voltage is maintained at more than 90 percent of the rated voltage marked on the name plate.
- 6) Confirm that the cable thickness is as specified in the power source specification.
(Particularly note the relation between cable length and thickness. (Refer to page 8))
- 7) Always install an earth leakage switch having operating current not exceeding 30mA in a wet or moist area.
- 8) The following would be caused by voltage drop.
 - Vibration of a magnetic switch, which will damage the contact point, fuse breaking, disturbance of the normal function of the overload.
- 9) The means for disconnection from a power supply shall be incorporated in the fixed wiring and have an air gap contact separation of at least 3.5mm in each active(phase) conductors.

Checking the drainage and forming the pipings

Checking the drainage

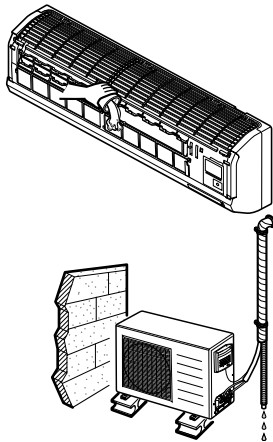
To remove the front panel from the indoor unit.

- Set the air direction louvers up-and-down to the position(horizontally) by hand.
- Remove the securing screws that retain the front panel. Pull the lower left and right sides of the grille toward you and lift it off.



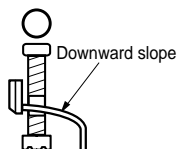
To check the drainage.

- Pour a glass of water on the evaporator.
- Ensure the water flows through the drain hose of the indoor unit without any leakage and goes out the drain exit.

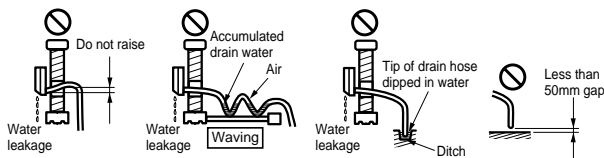


Drain piping

- The drain hose should point downward for easy drain flow.



- Do not make drain piping.



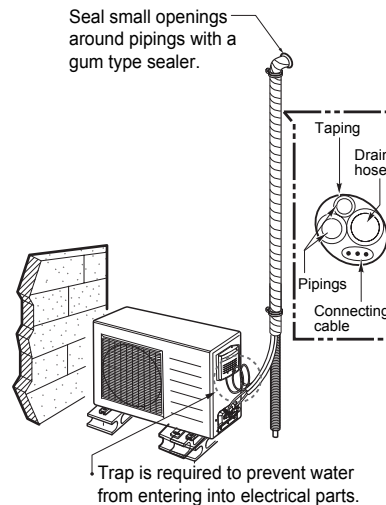
Form the piping

Form the piping by wrapping the connecting portion of the indoor unit with insulation material and secure it with two kinds of vinyl tapes.

- If you want to connect an additional drain hose, the end of the drain outlet should be routed above the ground. Secure the drain hose appropriately.

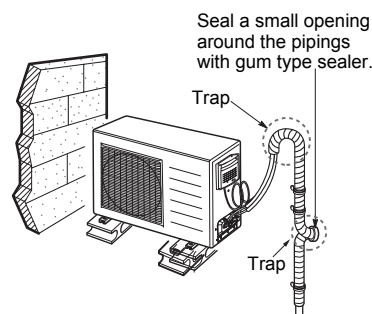
In cases where the outdoor unit is installed below the indoor unit perform the following.

- Tape the piping, drain hose and connecting cable from down to up.
- Secure the tapped piping along the exterior wall using saddle or equivalent.



In cases where the Outdoor unit is installed above the Indoor unit perform the following.

- Tape the piping and connecting cable from down to up.
- Secure the taped piping along the exterior wall. Form a trap to prevent water entering the room.
- Fix the piping onto the wall by saddle or equivalent.



Air Purging

Air purging

Air and moisture remaining in the refrigerant system have undesirable effects as indicated below.

- Pressure in the system rises.
- Operating current rises.
- Cooling(or heating) efficiency drops.
- Moisture in the refrigerant circuit may freeze and block capillary tubing.
- Water may lead to corrosion of parts in the refrigeration system.

Therefore, the indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any noncondensables and moisture from the system.

Air purging with vacuum pump

Preparation

- Check that each tube(both liquid and gas side tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Remove the service valve caps from both the gas and the liquid side on the outdoor unit. Note that both the liquid and the gas side service valves on the outdoor unit are kept closed at this stage.

Leak test

- Connect the manifold valve(with pressure gauges) and dry nitrogen gas cylinder to this service port with charge hoses.

⚠ CAUTION

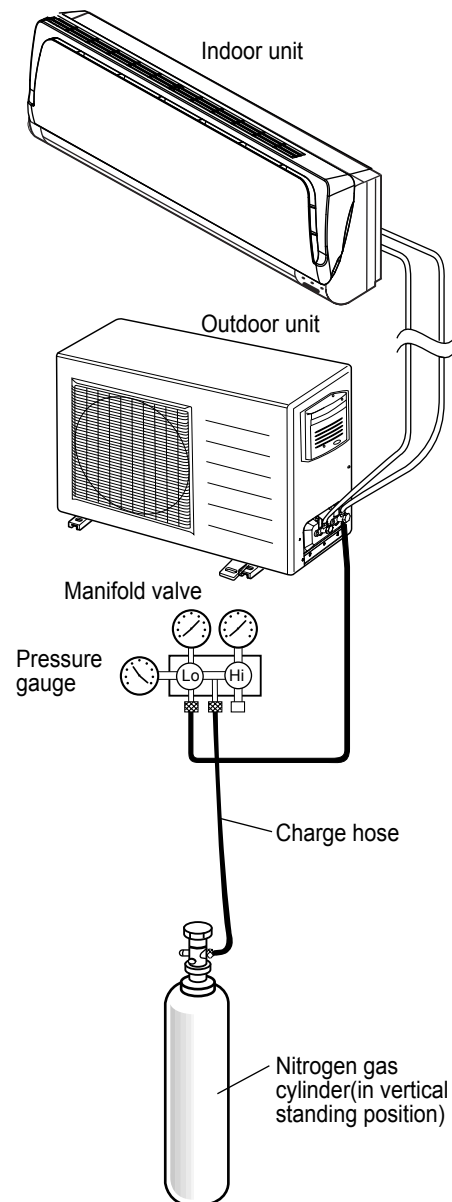
Be sure to use a manifold valve for air purging. If it is not available, use a stop valve for this purpose. The "Hi" knob of the manifold valve must always be kept close.

- Pressurize the system to no more than 150 P.S.I.G. with dry nitrogen gas and close the cylinder valve when the gauge reading reached 150 P.S.I.G. Next, test for leaks with liquid soap.

⚠ CAUTION

To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position.

- Do a leak test of all joints of the tubing(both indoor and outdoor) and both gas and liquid side service valves. Bubbles indicate a leak. Be sure to wipe off the soap with a clean cloth.
- After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.



Soap water method

- (1) Remove the caps from the 2-way and 3-way valves.
- (2) Remove the service-port cap from the 3-way valve.
- (3) To open the 2-way valve turn the valve stem counter-clockwise approximately 90°, wait for about 2~3 sec, and close it.
- (4) Apply a soap water or a liquid neutral detergent on the indoor unit connection or outdoor unit connections by a soft brush to check for leakage of the connecting points of the piping.
- (5) If bubbles come out, the pipes have leakage.

Evacuation

- Connect the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit.

Confirm the "Lo" knob of the manifold valve is open. Then, run the vacuum pump.

The operation time for evacuation varies with tubing length and capacity of the pump. The following table shows the time required for evacuation.

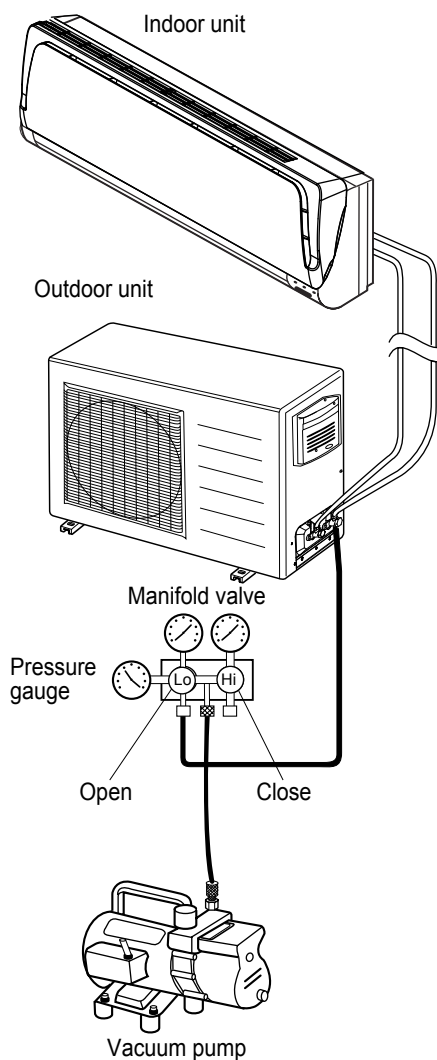
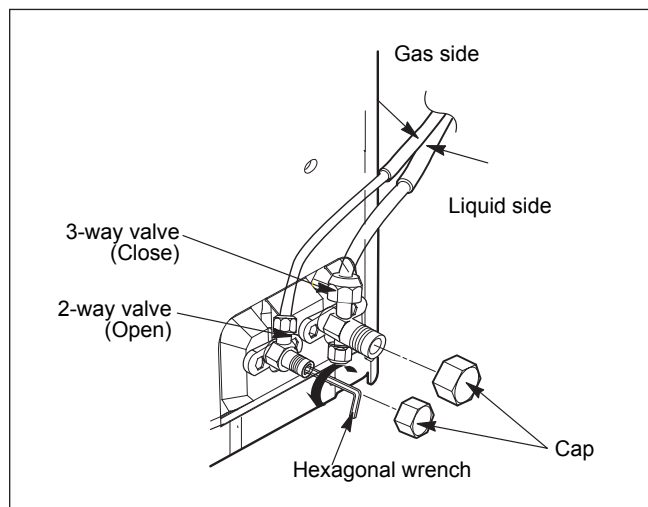
Required time for evacuation when 30 gal/h vacuum pump is used	
If tubing length is less than 10m (33 ft)	if tubing length is longer than 10m (33 ft)
10 min. or more	15 min. or more

- When the desired vacuum is reached, close the "Lo" knob of the manifold valve and stop the vacuum pump.

Finishing the job

- With a service valve wrench, turn the valve stem of liquid side valve counter-clockwise to fully open the valve.
- Turn the valve stem of gas side valve counter-clockwise to fully open the valve.
- Loosen the charge hose connected to the gas side service port slightly to release the pressure, then remove the hose.
- Replace the flare nut and its bonnet on the gas side service port and fasten the flare nut securely with an adjustable wrench. This process is very important to prevent leakage from the system.
- Replace the valve caps at both gas and liquid side service valves and fasten them tight.

This completes air purging with a vacuum pump.
The air conditioner is now ready to test run.

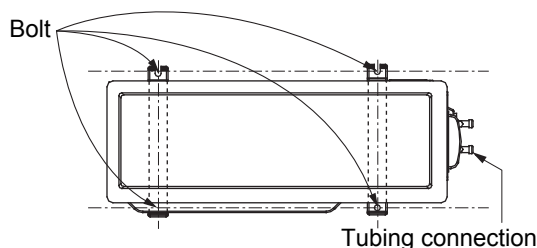


Test Running

1. Check that all tubing and wiring have been properly connected.
2. Check that the gas and liquid side service valves are fully open.

Settlement of outdoor unit

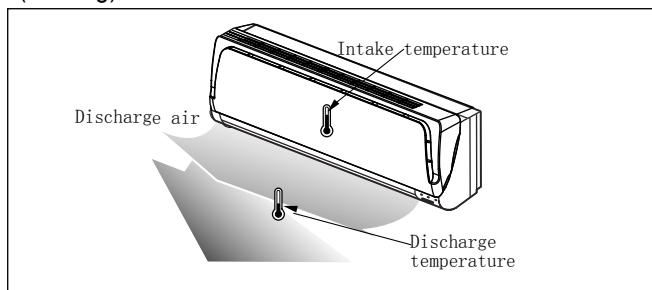
- Anchor the outdoor unit with a bolt and nut($\phi 10\text{mm}$) tightly and horizontally on a concrete or rigid mount.
- When installing on the wall, roof or rooftop, anchor the mounting base securely with a nail or wire assuming the influence of wind and earthquake.
- In the case when the vibration of the unit is conveyed to the hose, secure the unit with an anti-vibration bushing.



Evaluation of the performance

Operate unit for 15~20 minutes, then check the system refrigerant charge:

1. Measure the pressure of the gas side service valve.
2. Measure the temperature of the intake and discharge of air.
3. Ensure the difference between the intake temperature and the discharge is more than $8^{\circ}\text{C}(46^{\circ}\text{F})$ (Cooling) or (Heating).



4. For reference; the gas side pressure of optimum condition is as below.(Cooling)

Refrigerant	Outside ambient TEMP.	The pressure of the gas side service valve.
R-410A	$35^{\circ}\text{C}(95^{\circ}\text{F})$	$8.5\sim 9.5\text{kg}/\text{cm}^2\text{G}(120\sim 135\text{ P.S.I.G.})$

NOTE: If the actual pressure is higher than shown, the system is most likely over-charged, and charge should be removed.
If the actual pressure are lower than shown, the system is most likely undercharged, and charge should be added.

The air conditioner is now ready for use.

PUMP DOWN

This is performed when the unit is to be relocated or the refrigerant circuit is serviced.

Pump Down means collecting all refrigerant in the outdoor unit without loss in refrigerant gas.

CAUTION:

Be sure to perform Pump Down procedure with the unit cooling mode.

Pump Down Procedure

1. Connect a low-pressure gauge manifold hose to the charge port on the gas side service valve.
2. Open the gas side service valve halfway and purge the air from the manifold hose using the refrigerant gas.
3. Close the liquid side service valve(all the way in).
4. Turn on the unit's operating switch and start the cooling operation.
5. When the low-pressure gauge reading becomes 1 to $0.5\text{kg}/\text{cm}^2\text{ G}(14.2\text{ to }7.1\text{ P.S.I.G.})$, fully close the gas side valve stem and then quickly turn off the unit. At that time, Pump Down has been completed and all refrigerant gas will have been collected in the outdoor unit.

Power-Failure Compensation Function User Selection ON/OFF Operation Sequence

- ① Press the forced switch until BUZZER sounds 1 times (beep~beep~).
- ② Release the forced switch if BUZZER sounds.
- ③ Check the function selection ON/OFF with the operation LED.

Functions

Indoor Unit

Cooling Mode Operation

Healty dehumidification Mode Operation

Heating Mode Operation

Operation ON/OFF by Remote controller

Sensing the Room Temperature

Room temperature control

- Maintain the room temperature in accordance with the Setting Temp.

Time Delay Safety Control

- Restarting is for approx. 3 minutes.

Indoor Fan Speed Control

- Super High, High, Med, Low

Operation indication Lamps (LED)

Sleep Mode Auto Control

- The fan is switched to low(Cooling), low(Heating) speed.
- The unit will be stopped after 1, 2, 3, 4, 5, 6, 7 hours.

Natural Air Control by CHAOS Logic

- The fan is switched to intermittent or irregular operation
- The fan speed is automatically switched from high to low speed.

Airflow Direction Control

- The louver can be set at the desired position or swing up and down automatically.

Auto Changeover

Defrost(Deice) Control (Heating)

- Both the indoor and outdoor fan stops during defrosting.

Hot-start Control (Heating)

- The indoor fan stops until the evaporator pipe temperature will be reached at 34°C.

Outdoor Unit

Power Relay Control

- If power is on, it will operate to charge capacitor on controller and power relay will operate after about 2~5sec.

Active Power Filter Control(PSC)

- The active power filter is designed to correct power factor($\cos \theta$) and to regulate DC link voltage.
- It will be operated PFC circuit when the compressor freq. is over 30Hz and wattage is over 450 watt.

Comp. Freq. Control

- The final operating freq. of comp. is set the lowest freq. that limited outdoor temp., discharge pipe temp., heat-sink temp., target freq., owing to CT.

Overheating. Protection(Power Module)

- When the temp. of power module increases to 85°C, controller decreases Freq. of Comp.

Freq. Speed Control(Up/Down Speed)

- It will be changed the drive freq. of comp. according to temp. of indoor and outdoor.

Total Current Control (Over Current Protection)

DC Peak Current Control

4 way Valve Control

- It is only operated in the heating operation mode except defrosting operation.

Outdoor Fan Motor Control

- High speed
 - Although fan motor speed is middle, it will change high speed in case of below AC193V, over 45°C of outdoor temp., and over fc, fh of comp. Freq.
- Low speed
 - Although fan motor speed is middle, it will change Low speed in case of over AC 270V, over 21°C (Heating Mode) of outdoor temp. below 24°C (Cooling Mode) of outdoor temp.

Discharge Pipe Temp. Control

Low Ambient

Comp. Torque Control

Over Heating Protection (Comp.)

Operation

Function of Controls

• DISPLAY

1) C/O Model

Operation Indicator

- ON while in appliance operation, OFF while in appliance pause.
- Flashing while in disconnection or short in Thermistor. (3 sec off / 0.5 sec on)

Timer Indicator

- ON while in timer mode (on/off), OFF when timer mode is completed or canceled.

Comp. Running Indicator

- While in appliance operation, ON while in outdoor unit compressor running, OFF while in compressor off.

2) H/P Model

Operation Indicator

- ON while in appliance operation, OFF while in appliance pause.
- Flashing while in disconnection or short in Thermistor. (3 sec off / 0.5 sec on)

Timer Indicator

- ON while in timer mode (on/off), OFF when timer mode is completed or canceled.

Defrost Indicator

- OFF except when hot start during heating mode operation or while in defrost control.

Protection of the evaporator pipe from frosting

- If the indoor pipe temperature is below -1°C in 3 min. after the compressor operates without pause while in cooling cycle operation mode,
 - compressor, outdoor fan are turned off.
- When indoor pipe temp. is 10°C or higher after 3 min pause of compressor

Cooling mode operation

- Operating frequency of compressor depend on the difference of the temperature.
(= intake air Temp.- Compressor off Temp.)
- Compressor off temp.= setting temp. -0.5°C
on temp. = setting temp. $+0.5^{\circ}\text{C}$
- Condition of compressor turned off
 - When intake air temperature stay at the temperature between setting temp. -0.5°C and setting temp. -1.0°C for 3 minutes continuously.
 - When intake air temperature reaches below the temperature of setting temp. -1.0°C .
- Compressor 3 minutes delay
 - The compressor can restart minimum 3 minutes later after compressor off.

Heating mode operation

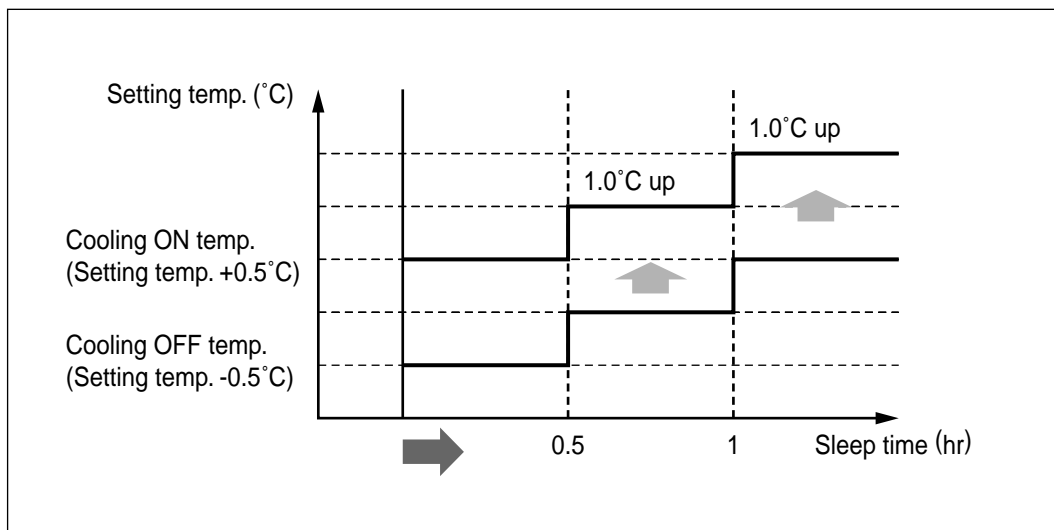
- Operating frequency of compressor depend on the difference of the temperature
(= compressor off temp. - intake air temp.)
- Compressor off temp. = setting temp.+3.0°C
on temp. = setting temp.
- Condition of compressor turned off
 - When intake air temperature reaches +3°C above the setting temperature.
- Condition of indoor fan turned off
 - While in compressor on:indoor pipe temp. < 30°C
- While in defrost control, between the indoor and outdoor fans are turned off.
- Compressor 3 minutes delay
 - After compressor off, the compressor can restart minimum 3 minutes later.

Sleep timer operation

- When the sleep time is reached after [1,2,3,4,5,6,7hr] is input by the remote control during the operation, the operation of the appliance stops.
- When the appliance is on pause, the sleep timer mode cannot be input.

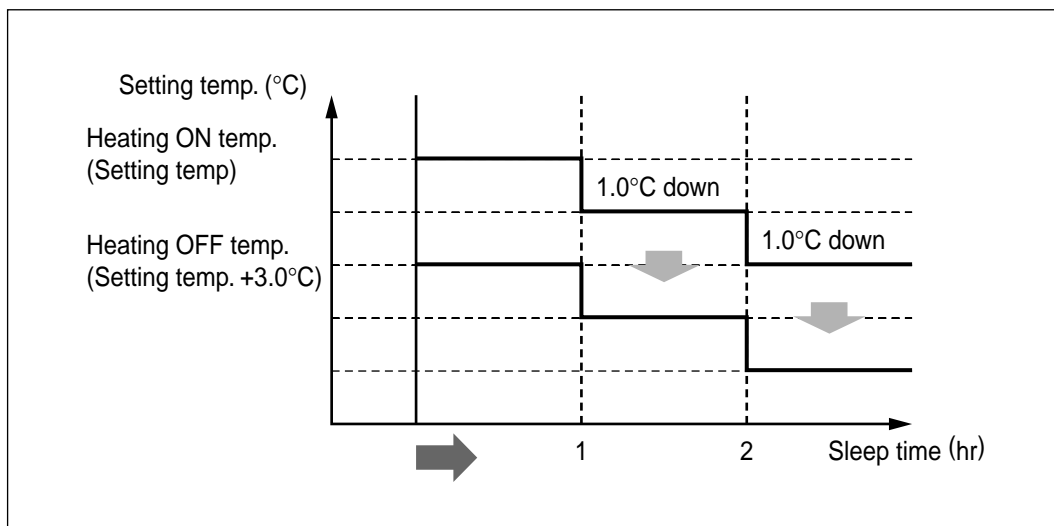
1. Sleep timer operation for cooling cycle

- While in cooling mode operation, 60 min. later since the start of the sleep timer, the setting temperature increase by 1°C. After another 30min. elapse, it increases by 1°C again.



2. Sleep timer operation for heating cycle

- While in heating mode operation, 60 min. later since the start of the sleep timer, the setting temperature decrease by 1°C. After another 60min. elapse, it decreases by 1°C again.



Auto restarting operation

- When the power is restarted after a sudden power failure while in appliance operation, the mode before the power failure is kept on the memory and the appliance automatically operates in the mode on the memory.
- Operation mode that is kept on the memory
 - State of operation ON/OFF
 - Operation mode/setting temp./selected airflow speed
 - Sleep timer mode/remaining time of sleep timer
 - Chaos Swing

Forced operation

- To operate the appliance by force in case that the remote control is lost, the forced operation selection switch is on the main unit of the appliance to operate the appliance in the standard conditions.
- The operation condition is set according to the outdoor temp. and intake air temperature as follows.

Indoor temp.	Operating Mode	Setting temp.	Setting speed of indoor fan
over 24°C	Cooling	25°C	High speed
21~24°C	FAN		
below 21°C	Heating	18°C	

✱ The unit select before operating mode in 3 hours.

Protection from total current control

■ CT1 control

- If the operating current reaches 13A, the operating frequency of the compressor stop insteally.
- After stoping 3min, the compressor will operate again.

■ CT2 control

- If the operating current of the appliance reaches 12A, the compressor will keep the frequency.
- If the operating current of the appliance reaches 12.5A, the compressor's frequency will dearease, until the current less than 12A.

Protection from DC Peak Current

■ DC Peak Current Error by a fault signal of IPM

- If the operating current of IPM reaches 27A, the compressor stop instantly.
- If DC PEAK occurs 5 times within 1 hour, the appliance turns off and display ERROR CODE H5

■ DC Peak Current Error by the compressor lock

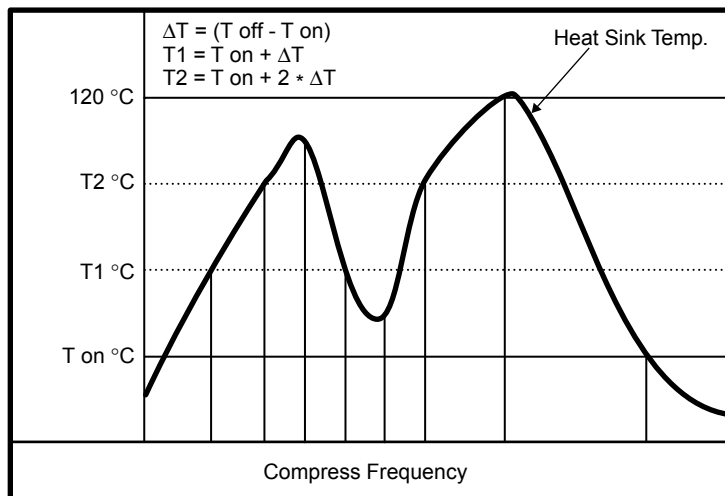
- If the DC LINK voltage below DC 140V occurs 5 times within 1 hour while the compressor is operating, the appliance turns off and display ERROR CODE H5.

■ DC Peak Current Error by the Outdoor Fan Lock

- If it's 5 times within 1 hour in case of the temperature of outdoor pipe TH is over 65°C while the compressor is operating, the appliance turns off and display ERROR CODE E4.

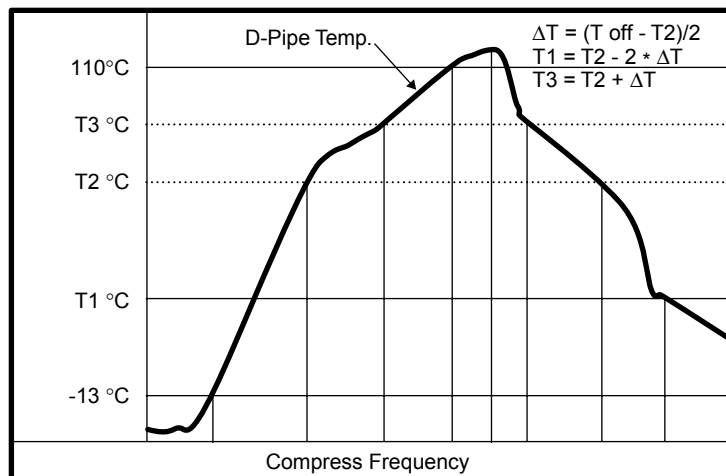
Portection from overheating of power module

- If the temperature of the heat sink TH. reaches over Toff, the Compressor stop instantly.
- It will be limited the compressor operating frequency according to the heat sink TH.(refer to below FIG.)
- It will be blink 4 times, when the thermistor is open or short, also the temperature is over Toff.



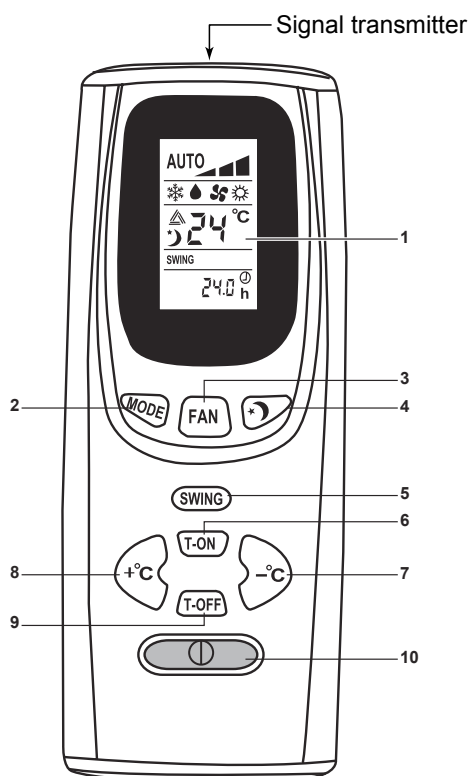
Protection from overheating of compressor

- If the temperature of the discharge pipe of compressor reaches over 130°C or below -30°C the compressor stop instantly.
- It will be limited the compressor operating frequency according to the compressor dome TH.(Refer to below Fig.)
- Temperature range by COMP SPEC varies by 10°C.



Remote Control Operations

The remote control sends signals to the appliance.



1. **Liquid crystal display**
Displays all the operating modes.
2. **MODE button**
Used to select the operating mode.
3. **FAN button**
Used to set the fan speed, in sequence, to automatic, low, medium, high.
4. **SLEEP button**
Used to set or cancel SLEEP mode.
5. **SWING button**
Used to start or stop the movement of the vertical louvers.
6. **TIMER ON button**
When the appliance is off, this button is used to switch the air-conditioner on automatically.
- 7-8. **ROOM TEMPERATURE SETTING buttons**
Used to set the room temperature.
9. **TIMER OFF button**
When the appliance is on, this button is used to switch the air-conditioner off automatically.
10. **⏻ button**
Used to switch appliance on or off.

Meaning of the symbols shown on the liquid crystal display:

- AUTO Automatic fan speed
- ▮ Low fan speed
 - ▮▮ Medium fan speed
 - ▮▮▮ High fan speed
 - ❄ Cooling indicator
 - 💧 Dehumidification indicator
 - 🌀 Fan only operation indicator
 - ☀ Heating indicator
 - ⚙ Automatic mode indicator
 - 🌙 SLEEP indicator
- SWING Louver swing indicator

Disassembly

Indoor Unit

▲ WARNING

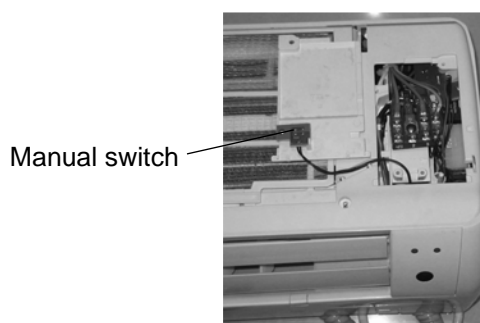
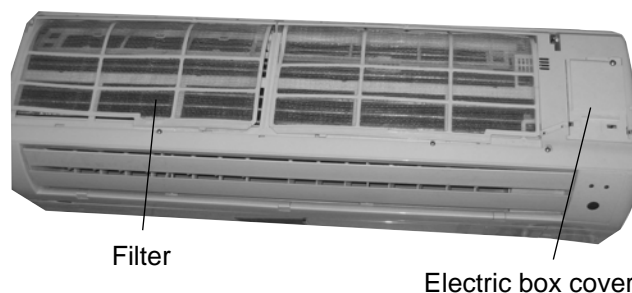
Disconnect the unit from power supply before making any checks.
Be sure the power switch is set to "OFF".

1. Disassemble the front panel

- Open the front panel, loosen the clasp which fix on the front panel, then lift it up can disassemble the front panel.

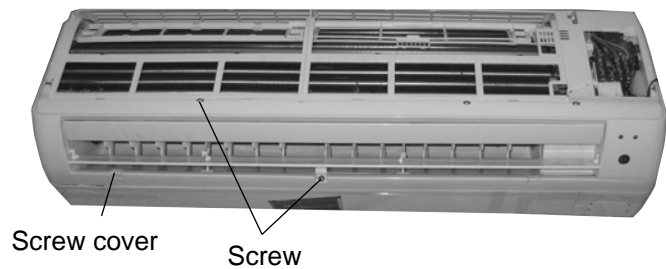
2. Disassemble the filter and electric box cover

- Push up the filter, to loosen the clasp, then two filters could be taken out.
- Screw off the screws which fix on the top cover of electric box, to open the electric box cover, loosen the screw on the top cover which fix the manual switch, then disassemble the electric box cover.



3. Disassemble the guide louver and body case

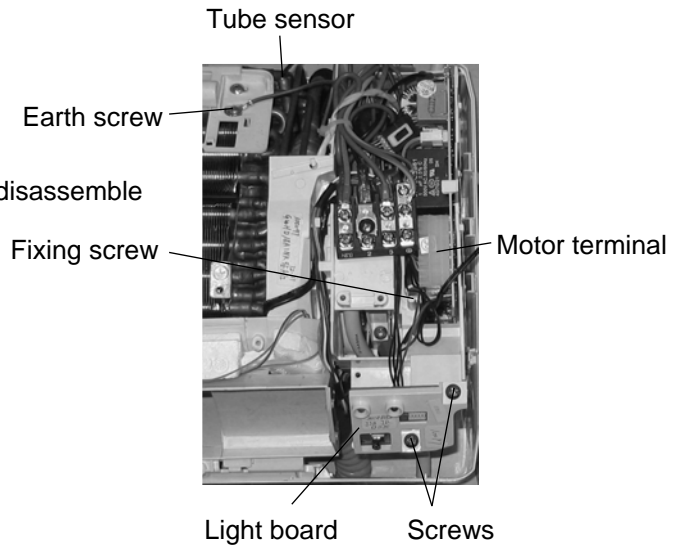
- To bend the guide louver, to make the rotating shaft slide from the groove, then can take down the guide louver.
- Open 3pcs screw cover, and screw off 6pcs screw which fix the body case, then lift it up loosen the clasp, then can take down the body case.



4. Disassemble the electric box

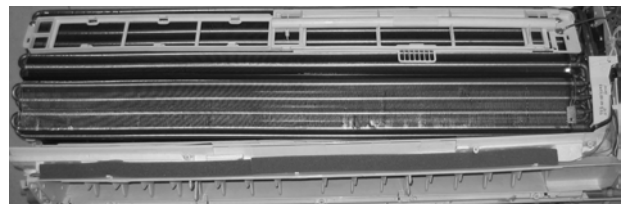
- Screw off 2pcs screw which fix the light board, then disassemble the light board.

Disassemble the motor terminal, screw off the earth screw and screw of fixing the electric box by screw driver, then loosen the upper clasp of electric box the electric box could be taken down.



5. Disassemble the water tray

- Loosen the clasp under the water tray, then rotate the water tray, to make it release from the clasp, then disassemble the water tray.

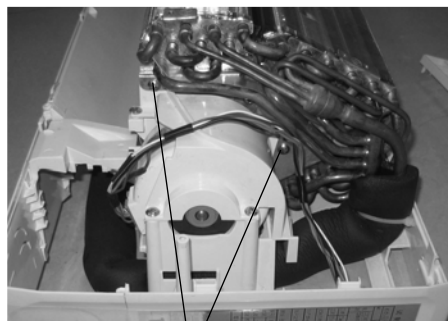


6. Disassemble the evaporator

- Screw off the fixing screws of evaporator left side and right side (2 pcs for each side), then lift the evaporator left side up, and remove it backward, can take down the evaporator.

⚠ CAUTION

- When repair, do not damage the Caution label.



Screws

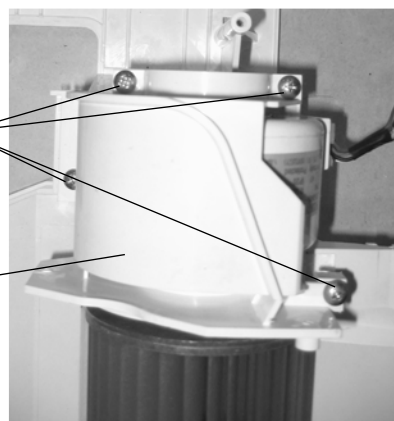


7. Disassemble the motor and cross flow fan

- Screw off 4pcs screw from the motor clamp, then take down the motor clamp.

Screws

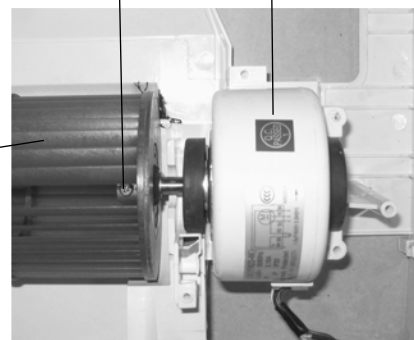
Motor clamp



Screw

Motor

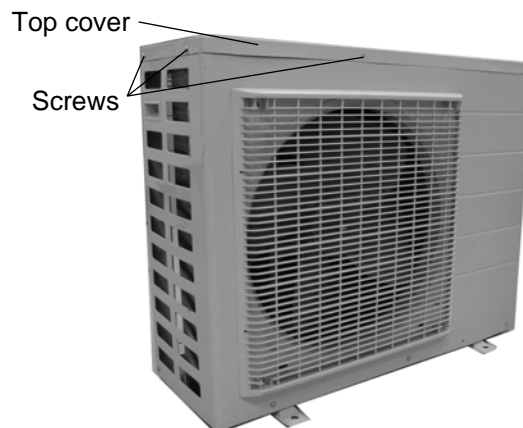
Cross flow fan



outdoor Unit

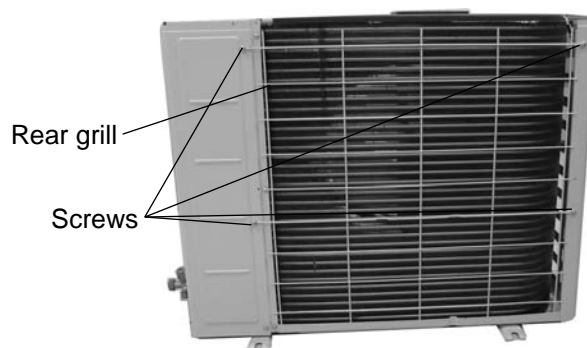
1. Take down the top cover

- Screw off the 6pcs screw around the top cover, lift the unit up can take down the top cover.



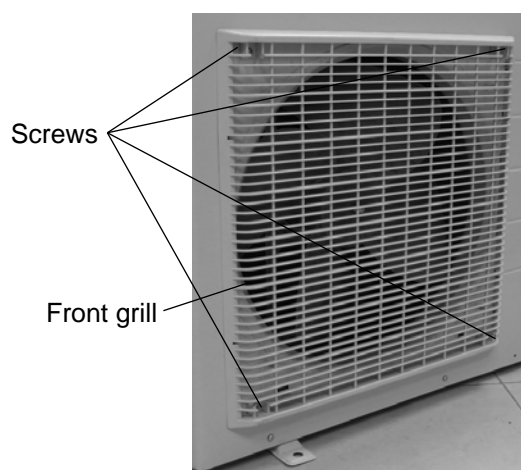
2. Disassemble the rear grill

- Screw off 4pcs tapping screw of rear grill, then take down the rear grill.



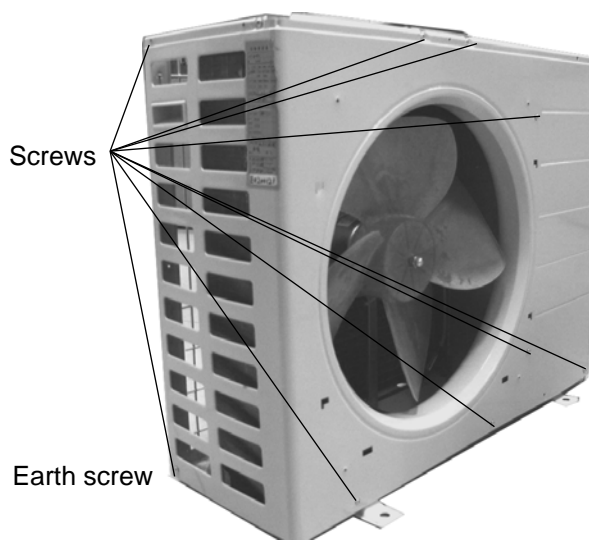
3. Disassemble the front grill

- Screw off 4pcs tapping screw on the front grill, then take down the front grill.



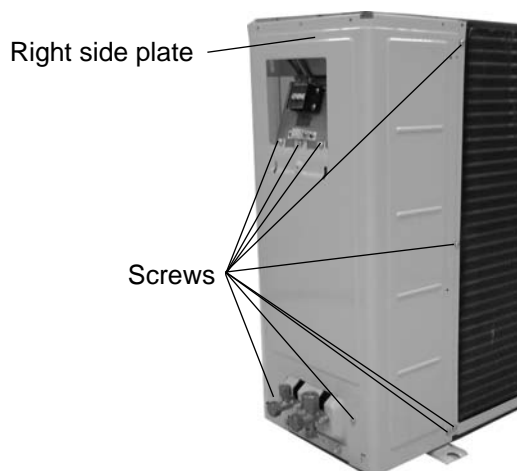
4. Disassemble the front panel

- Screw off the tapping screws of front panel, motor supporter, chassis condenser side plate, then can take down the front panel.



5. Disassemble the right side plate

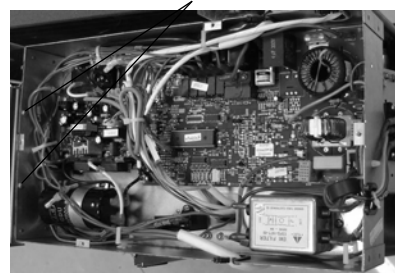
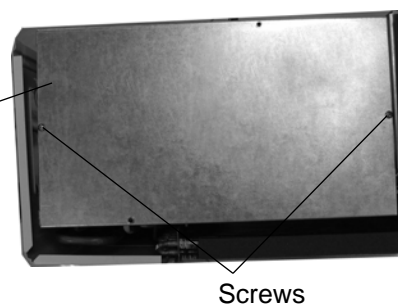
- Screw off 9pcs screw of the right side plate, then take down the right side plate.



6. Disassemble the electric box

- Screw off 2pcs screw of electric box cover, then take down the electric box cover.
- Screw off 2pcs screw of electric box cover, pull out the lead out insert of compressor, reactor, four-way reactor, four-way valve and fan motor, then take down the electric box.

Electric box cover

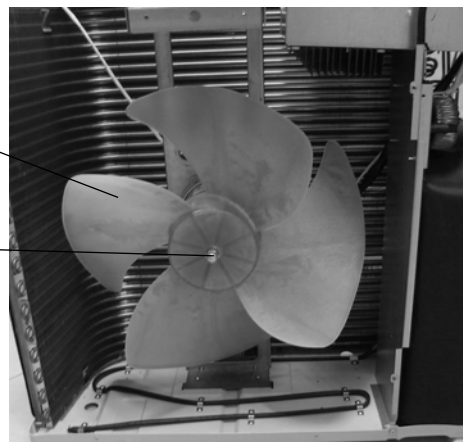


7. Disassemble the axial flow fan

- Screw off the nut which fixing the axial flow fan by the spanner, then take out the nut, spring washer, flat washer in turn.

Axial flow fan

Nut



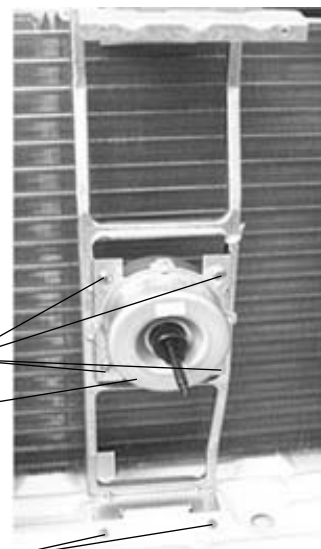
8. Disassemble the motor and motor supporter

- Screw off 4pcs screw which fixing the motor, then take down the motor.
- Screw off 2pcs screw which fixing the motor supporter, then can take down the motor supporter.

Screws

Motor

Screws



8. Disassemble the four-way valve

- Screw off the nut which fixing the four-way valve loop, take down the loop, then use the wet gauze to wrap the four-way valve, and unsolder four pcs soldered point on the four-way valve, then can disassemble it.

⚠ CAUTION

- Before disassembly, please discharge the refrigerant, the soldering procedure should be as quickly as possible, and please keep the gauze wet all the time, do not burn out the lead wire of compressor by the flame.



Four-way valve

Soldered point



9. Disassemble the capillaries and valves

- Unsolder each soldered point of main capillary and auxiliary, then take down the capillary.
- To screw off the screws which fixing the gas valve and liquid valve (2pcs for each), unsolder the connection pipe and take down the valves.

Capillary

Bolt

Valves



10. Disassemble the compressor

- Loosen the 3pcs bottom nut of compressor, unsolder the air in pipe, and carefully remove the pipelines, take out the compressor.

Compressor

Bottom nut

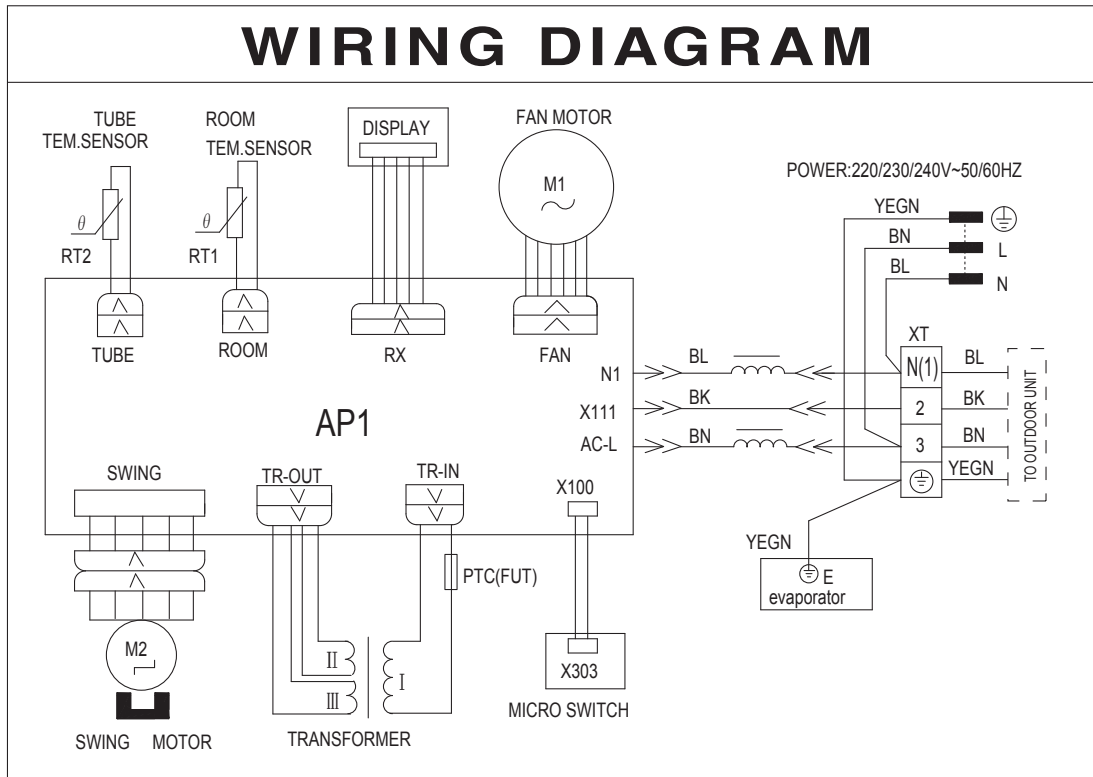


Schematic Diagram

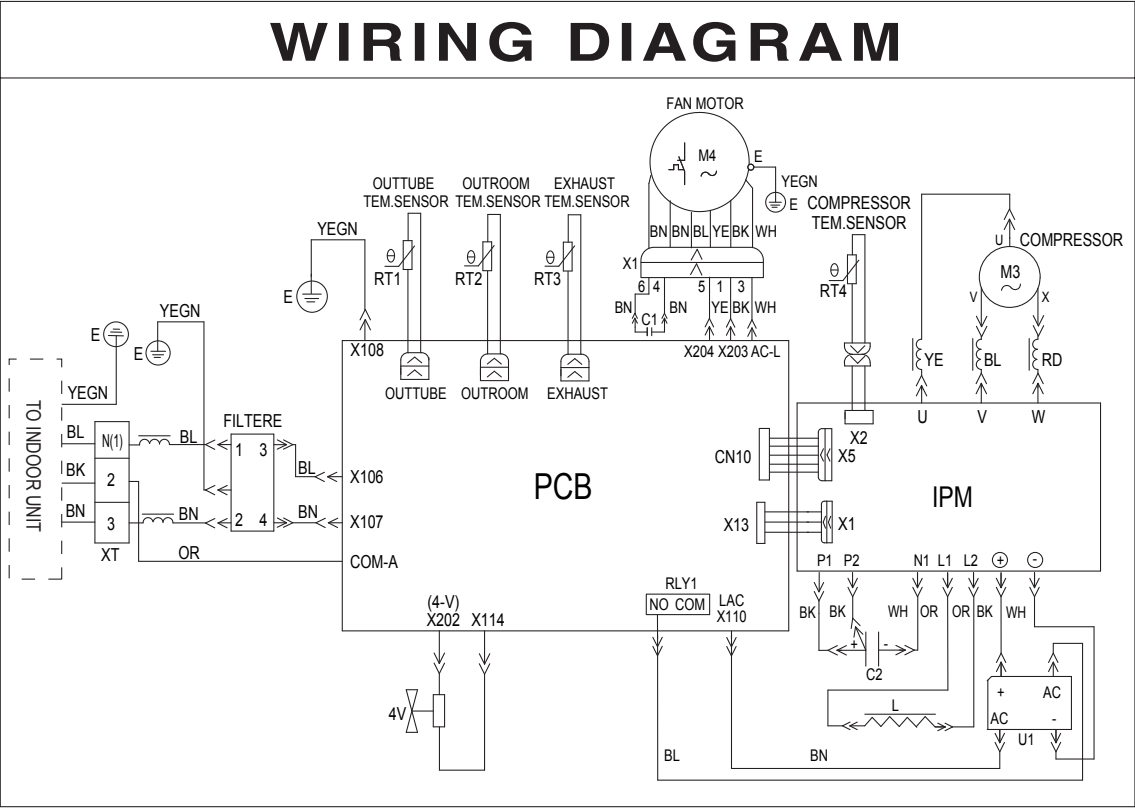
Wiring Diagram

Indoor Unit

Models:

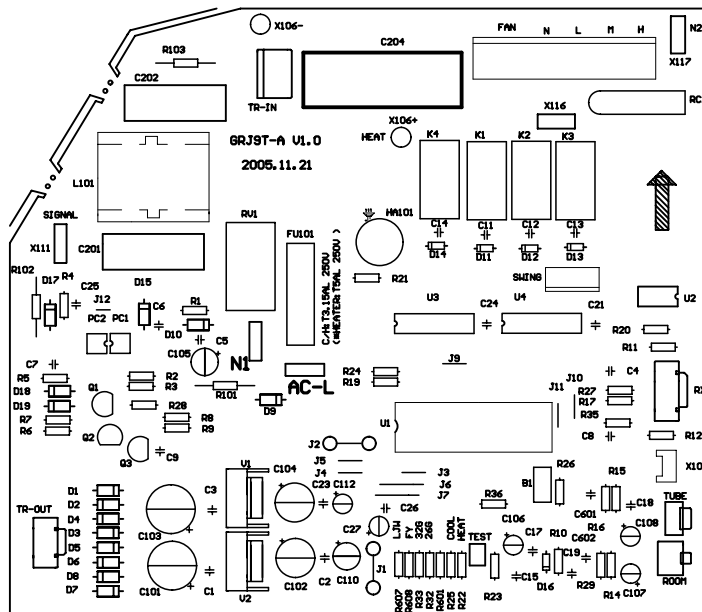


Outdoor Unit
Models:

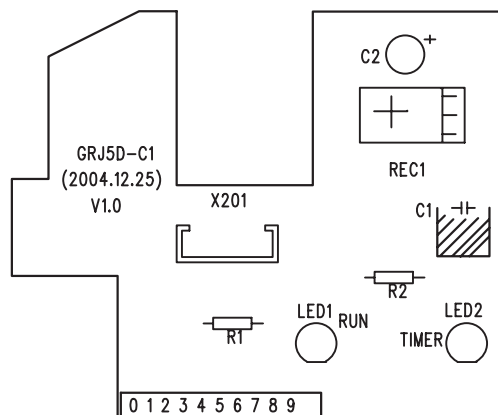


Models:

• TOP VIEW



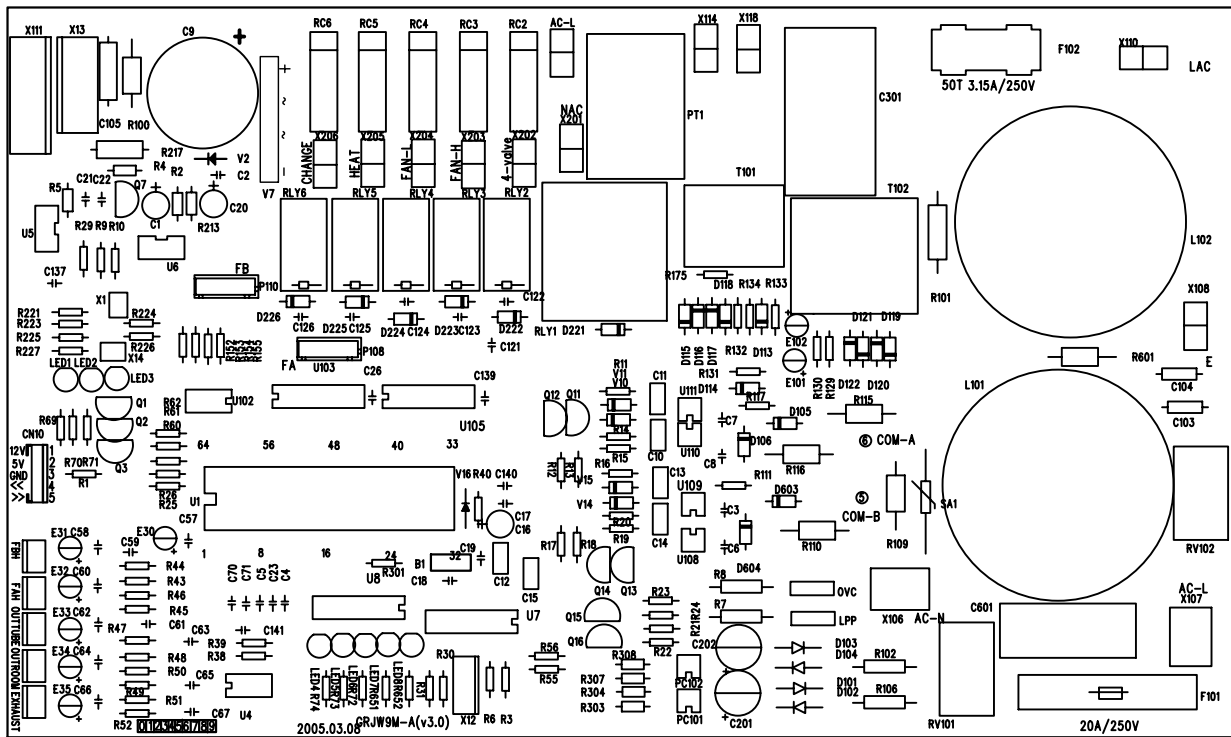
• TOP VIEW



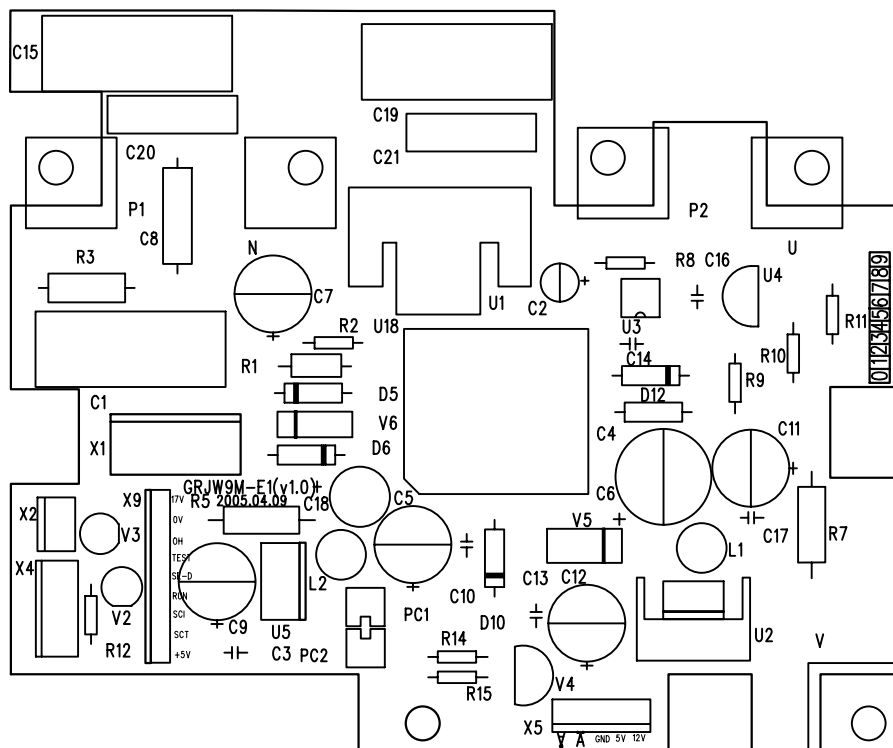
Outdoor Unit

Models:

• TOP VIEW



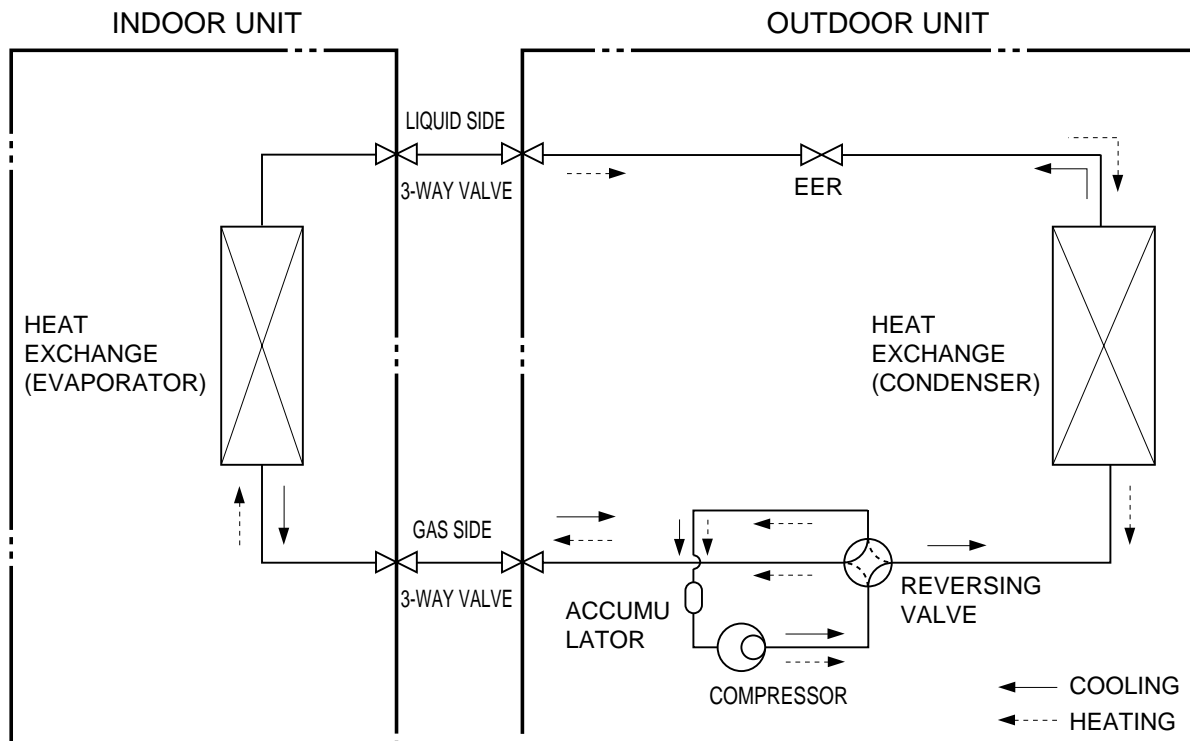
• BOTTOM VIEW



Troubleshooting Guide

Refrigeration Cycle Diagram

Cooling & Heating Models



2-way, 3-way Valve

		2-way Valve (Liquid Side)	3-way Valve (Gas Side)	
Works		Shaft position	Shaft position	Service port
Shipping		Closed (with valve cap)	Closed (with valve cap)	Closed (with cap)
1.	Air purging (Installation)	Open (counter-clockwise)	Closed (clockwise)	Open (push-pin or with vacuum pump)
Operation		Open (with valve cap)	Open (with valve cap)	Closed (with cap)
2.	Pumping down (Transferring)	Closed (clockwise)	Open (counter-clockwise)	Open (connected manifold gauge)
3.	Evacuation (Servicing)	Open	Open	Open (with charging cylinder)
4.	Gas charging (Servicing)	Open	Open	Open (with charging cylinder)
5.	Pressure check (Servicing)	Open	Open	Open (with charging cylinder)
6.	Gas releasing (Servicing)	Open	Open	Open (with charging cylinder)

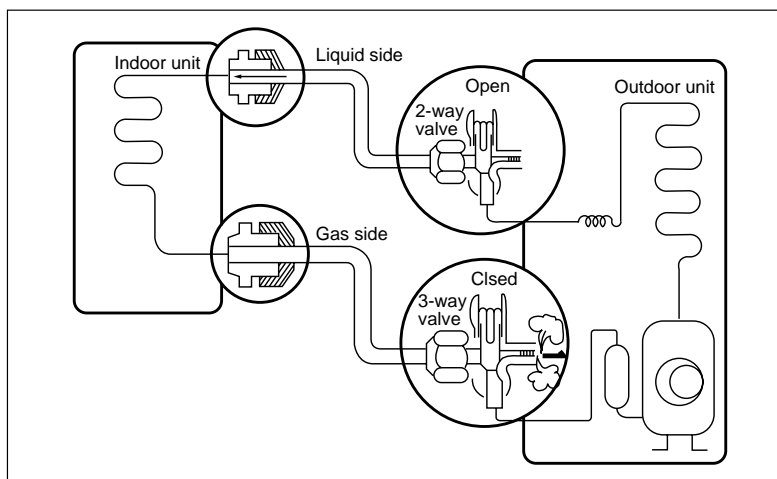
Air purging

Required tools : hexagonal wrench, adjustable wrench, torque wrenches, wrench to hold the joints, and gas leak detector.

The additional gas for air purging has been charged in the outdoor unit.

However, if the flare connections have not be done correctly and there gas leaks, a gas cylinder and the charge set will be needed.

The air in the indoor unit and in the piping must be purged. If air remains in the refrigeration pipes, it will affect the compressor, reduce to cooling capacity, and could lead to a malfunction.



Service port nut:

Be sure, using a torque wrench to tighten the service port nut (after using the service port), so that it prevents the gas leakage from the refrigeration cycle.



CAUTION: Do not leak the gas in the air during Air purging.

• Procedure

- (1) Recheck the piping connections.
- (2) Open the valve stem of the 2-way valve counterclockwise approximately 90°, wait 10 seconds, and then set it to closed position.
 - Be sure to use a hexagonal wrench to operate the valve stem.
- (3) Check for gas leakage.
 - Check the flare connections for gas leakage.
- (4) Purge the air from the system.
 - Set the 2-way valve to the open position and remove the cap from the 3-way valve's service port.
 - Using the hexagonal wrench to press the valve core pin, discharge for three seconds and then wait for one minute. Repeat this three times.
- (5) Use torque wrench to tighten the service port nut to a torque of 1.8kg.cm.

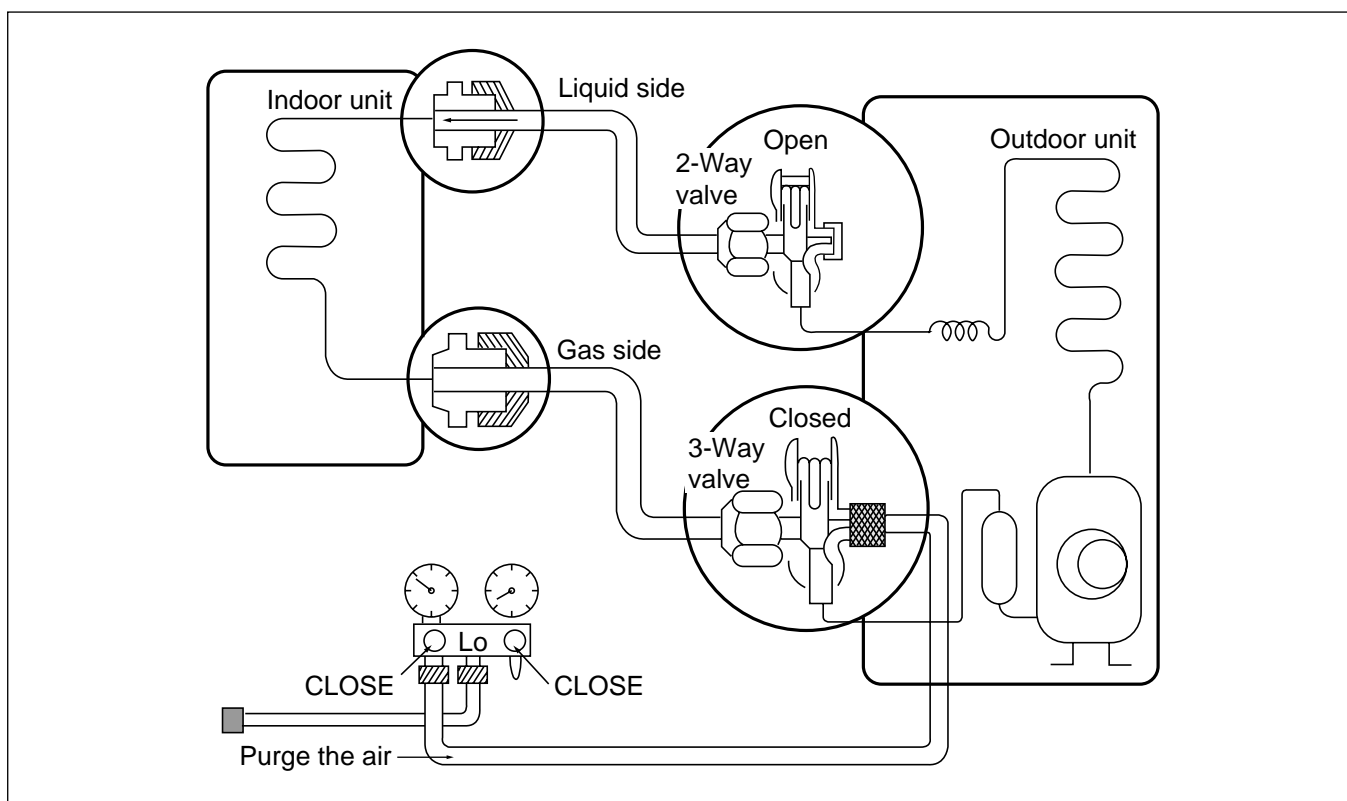
- (6) Set the 3-way valve to the back seat.
- (7) Mount the valve stem nuts to the 2-way and 3-way valves.
- (8) Check for gas leakage.
 - At this time, especially check for gas leakage from the 2-way and 3-way valve's stem nuts, and from the service port nut.



CAUTION: If gas leakage are discovered in step (3) above, take the following mesures :

If the gas leaks stop when the piping connections are tightened further, continue working from step (4). If the gas leaks do not stop when the connections are retightened, repair the location of the leak, discharge all of the gas through the service port, and then recharge with the specified amount of gas from a gas cylinder.

Pumping Down

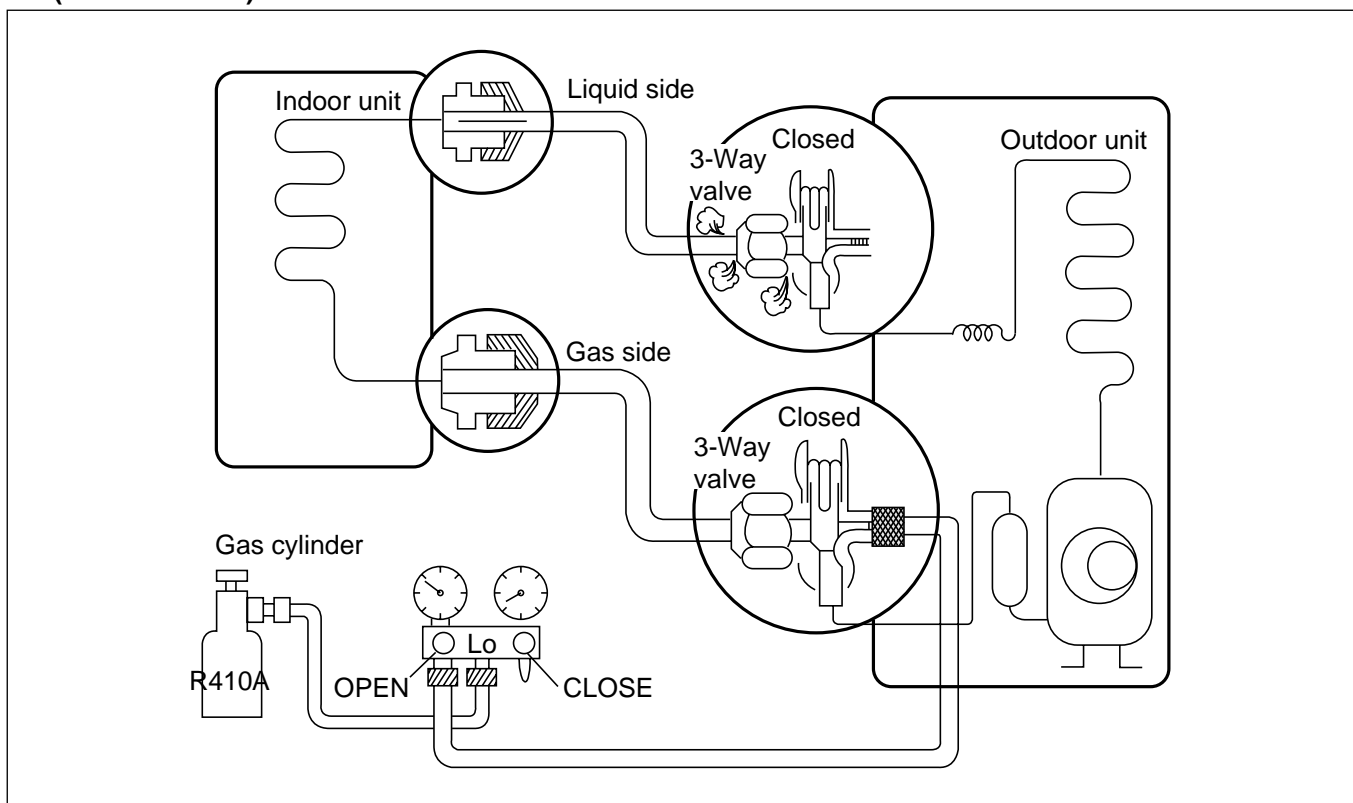


• Procedure

- (1) **Confirm that both the 2-way and 3-way valves are set to the open position.**
 - Remove the valve stem caps and confirm that the valve stems are in the raised position.
 - Be sure to use a hexagonal wrench to operate the valve stems.
- (2) **Operate the unit for 10 to 15 minutes.**
- (3) **Stop operation and wait for 3 minutes, then connect the charge set to the service port of the 3-way valve.**
 - Connect the charge hose with the push pin to the service port.
- (4) **Air purging of the charge hose.**
 - Open the low-pressure valve on the charge set slightly to air purge from the charge hose.
- (5) **Set the 2-way valve to the closed position.**
- (6) **Operate the air conditioner at the cooling cycle and stop it when the gauge indicates $1\text{kg/cm}^2\text{g}$.**
- (7) **Immediately set the 3-way valve to the closed position.**
 - Do this quickly so that the gauge ends up indicating 3 to $5\text{kg/cm}^2\text{g}$.
- (8) **Disconnect the charge set, and mount the 2-way and 3-way valve's stem nuts and the service port nut.**
 - Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m .
 - Be sure to check for gas leakage.

Re-air Purging

(Re-installation)



• Procedure

(1) Confirm that both the liquid side valve and the gas side valve are set to the closed position.

(2) Connect the charge set and a gas cylinder to the service port of the Gas side valve.

- Leave the valve on the gas cylinder closed.

(3) Air purging.

- Open the valves on the gas cylinder and the charge set. Purge the air by loosening the flare nut on the liquid side valve approximately 45° for 3 seconds then closing it for 1 minute; repeat 3 times.
- After purging the air, use a torque wrench to tighten the flare nut on liquid side valve.

(4) Check for gas leakage.

- Check the flare connections for gas leakage.

(5) Discharge the refrigerant.

- Close the valve on the gas cylinder and discharge the refrigerant until the gauge indicates 3 to 5 kg/cm²g.

(6) Disconnect the charge set and the gas cylinder, and set the Liquid side and Gas side valves to the open position.

- Be sure to use a hexagonal wrench to operate the valve stems.

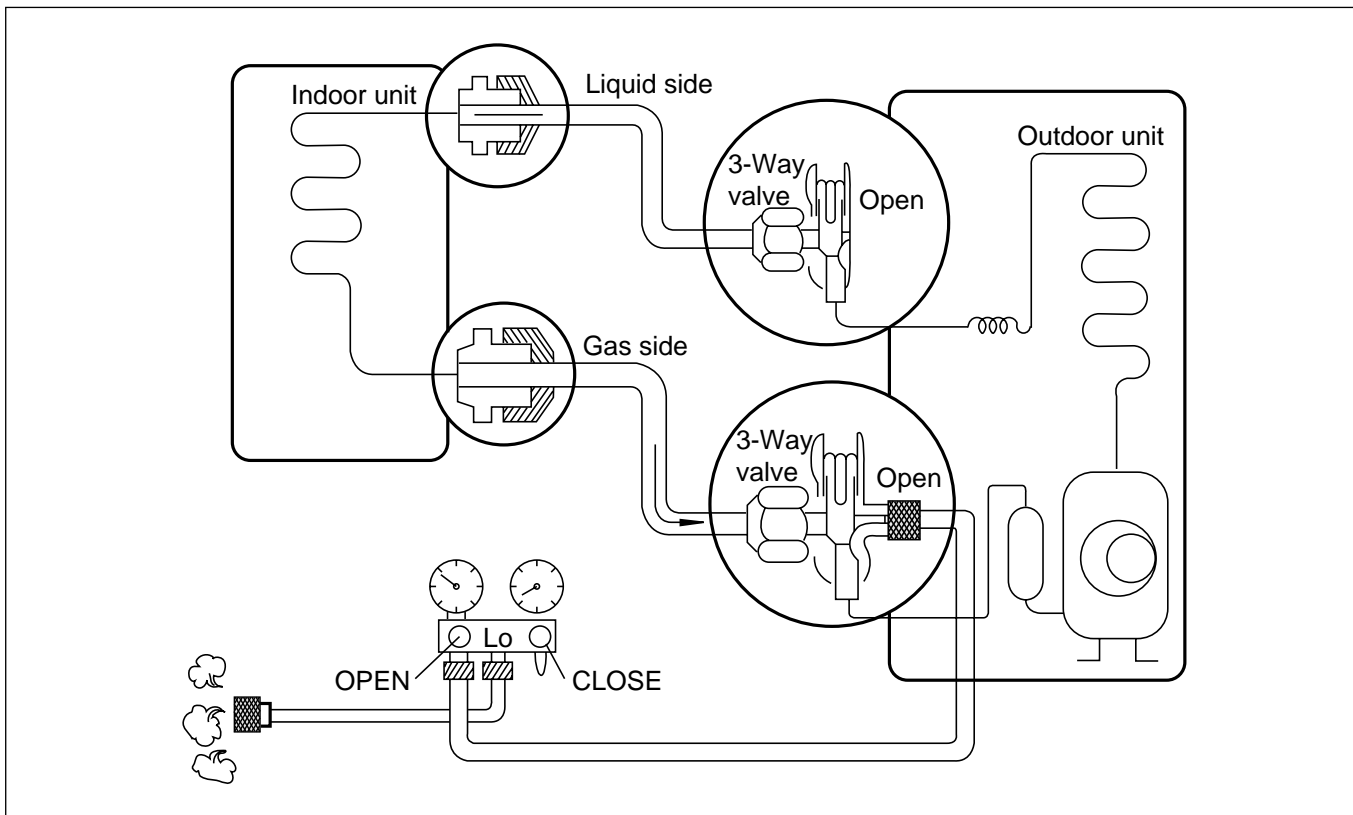
(7) Mount the valve stem nuts and the service port nut.

- Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m.
- Be sure to check for gas leakage.



CAUTION: Do not leak the gas in the air during Air Purging.

Balance Refrigerant of the 3-way Valve (Gas leakage)

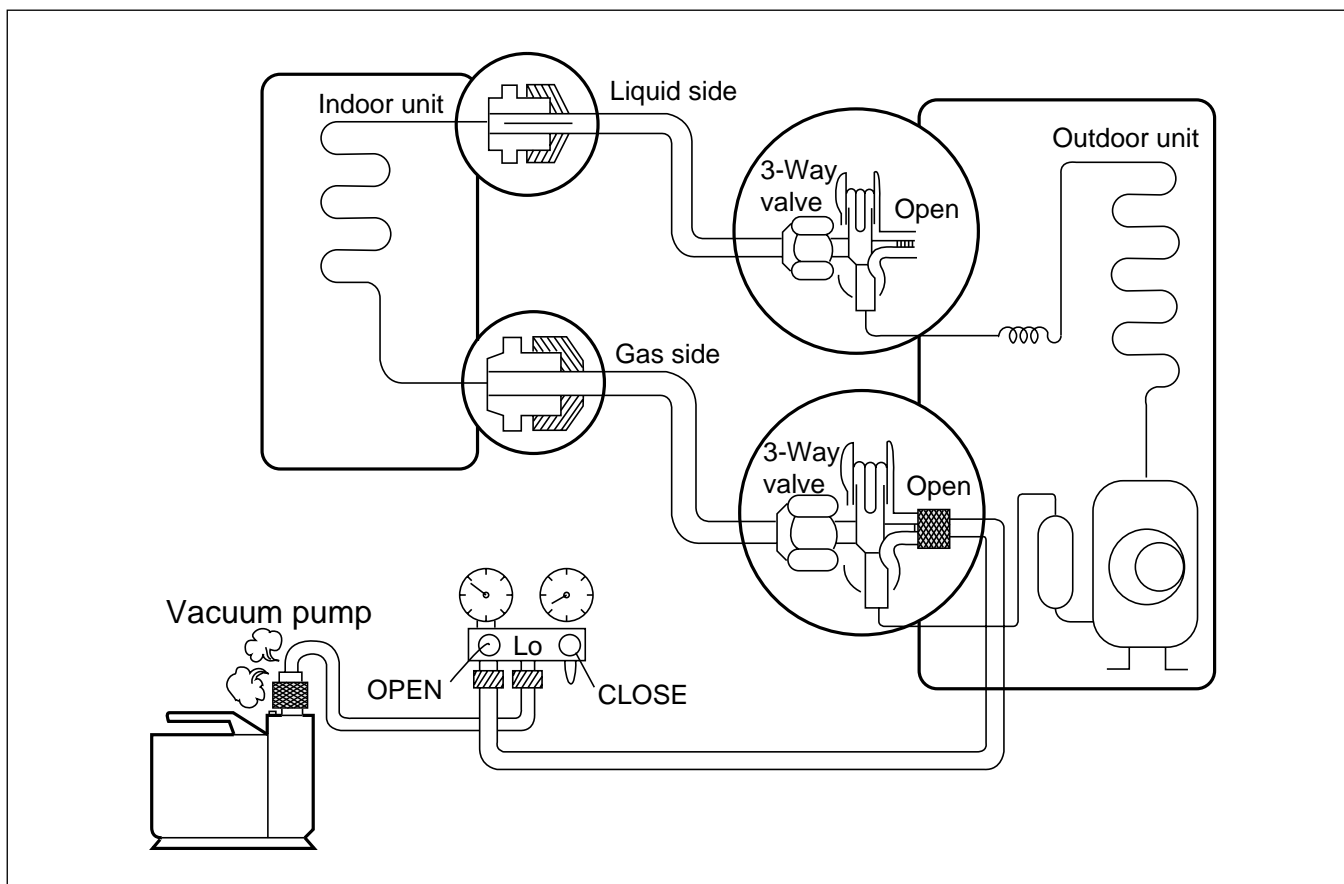


• Procedure

- (1) Confirm that both the 2-way and 3-way valves are set to the back seat.
- (2) Connect the charge set to the 3-way valve's port.
 - Leave the valve on the charge set closed.
 - Connect the charge hose to the service port.
- (3) Open the valve (Lo side) on the charge set and discharge the refrigerant until the gauge indicates 0 kg/cm²G.
 - If there is no air in the refrigerant cycle (the pressure when the air conditioner is not running is higher than 1 kg/cm²G), discharge the refrigerant until the gauge indicates 0.5 to 1 kg/cm²G. If this is the case, it will not be necessary to apply a vacuum.
 - Discharge the refrigerant gradually; if it is discharged too suddenly, the refrigeration oil will also be discharged.

Evacuation

(All amount of refrigerant leaked)

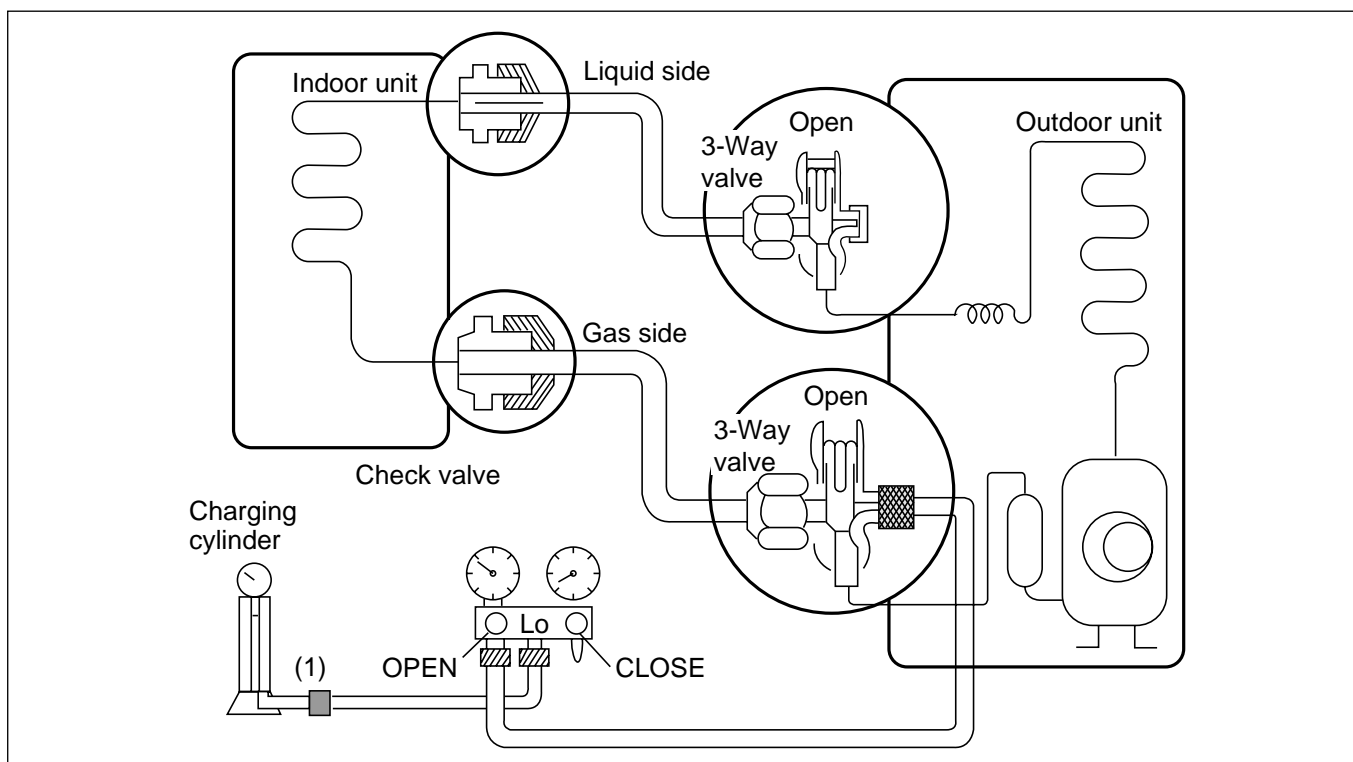


• Procedure

- (1) Connect the vacuum pump to the center hose of charge set center hose
- (2) Evacuation for approximately one hour.
 - Confirm that the gauge needle has moved toward -76 cmHg (vacuum of 4 mmHg or less).
- (3) Close the valve (Lo side) on the charge set, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).
- (4) Disconnect the charge hose from the vacuum pump.
 - Vacuum pump oil.
If the vacuum pump oil becomes dirty or depleted, replenish as needed.

Gas Charging

(After Evacuation)



• Procedure

(1) Connect the charge hose to the charging cylinder.

- Connect the charge hose which you dis-connected from the vacuum pump to the valve at the bottom of the cylinder.
- If you are using a gas cylinder, also use a scale and reverse the cylinder so that the system can be charged with liquid.

(2) Purge the air from the charge hose.

- Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air. (Be careful of the liquid refrigerant). The procedure is the same if using a gas cylinder.

(3) Open the valve (Lo side on the charge set and charge the system with liquid refrigerant.

- If the system can not be charged with the specified amount of refrigerant, it can be charged with a little at a time (approximately 150g each time) while operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure (pumping down-pin).

This is different from previous procedures.

Because you are charging with liquid refrigerant from the gas side, absolutely do not attempt to charge with larger amounts of liquid refrigerant while operating the air conditioner.

(4) Immediately disconnect the charge hose from the 3-way valve's service port.

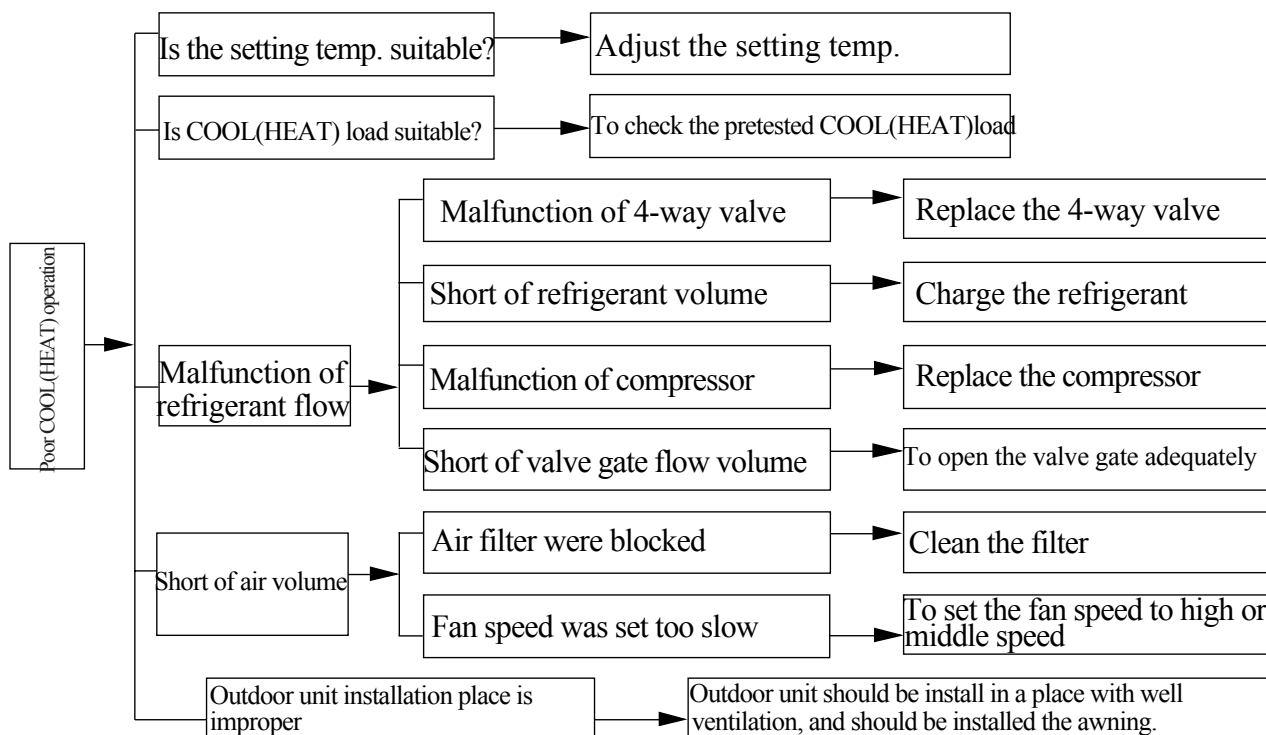
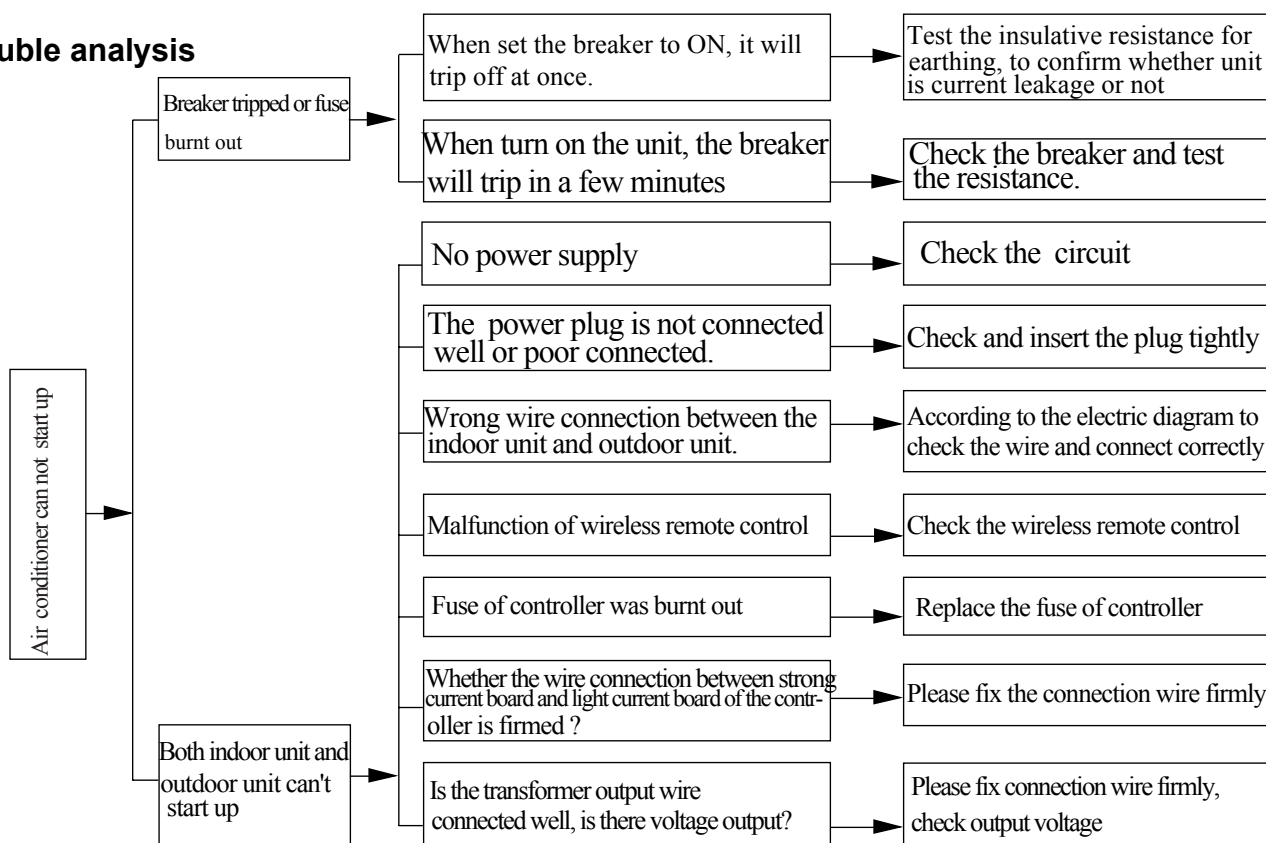
- Stopping partway will allow the gas to be discharged.
- If the system has been charged with liquid refrigerant while operating the air conditioner turn off the air conditioner before disconnecting the hose.

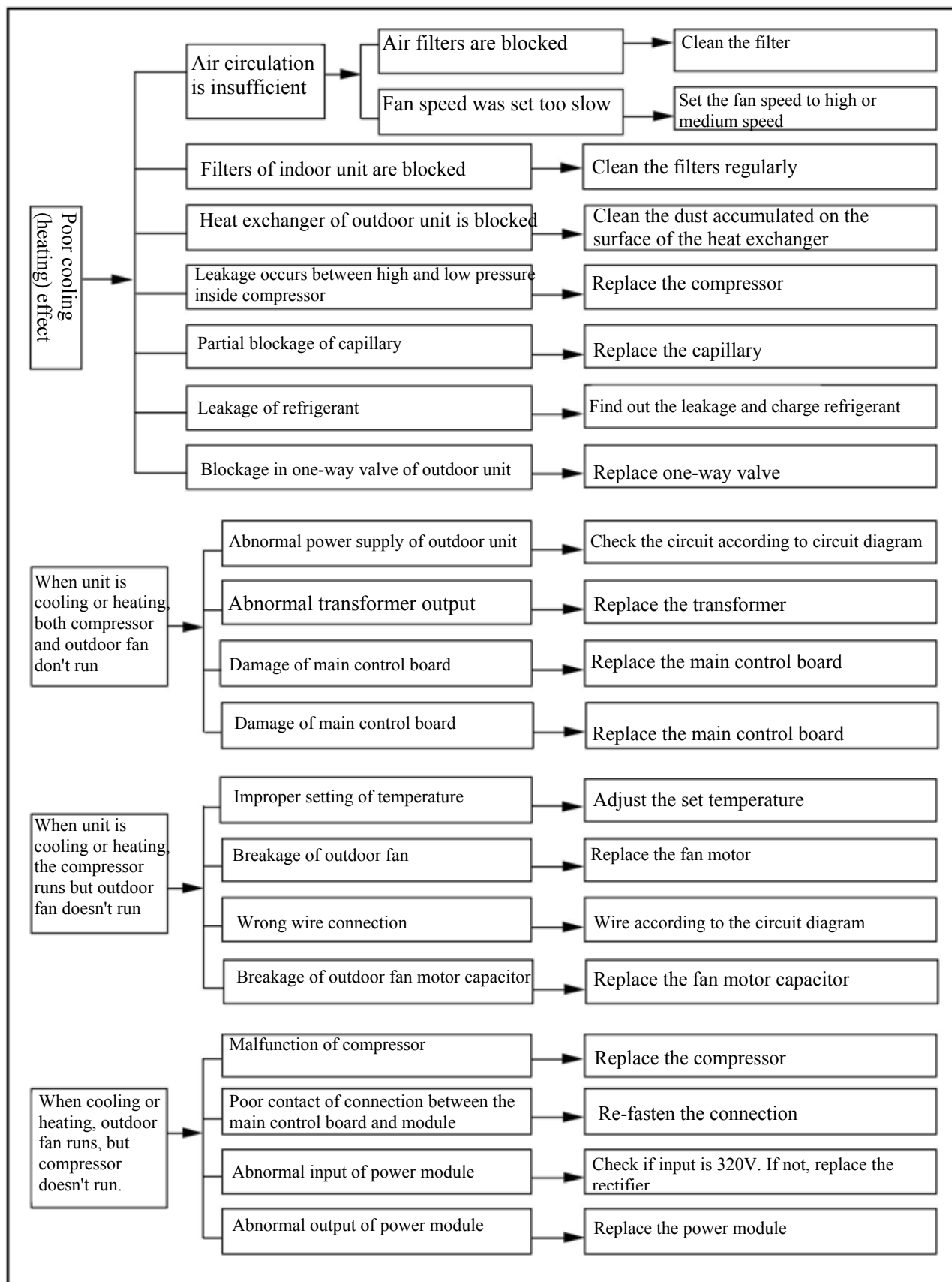
(5) Mount the valve stem nuts and the service port nut.

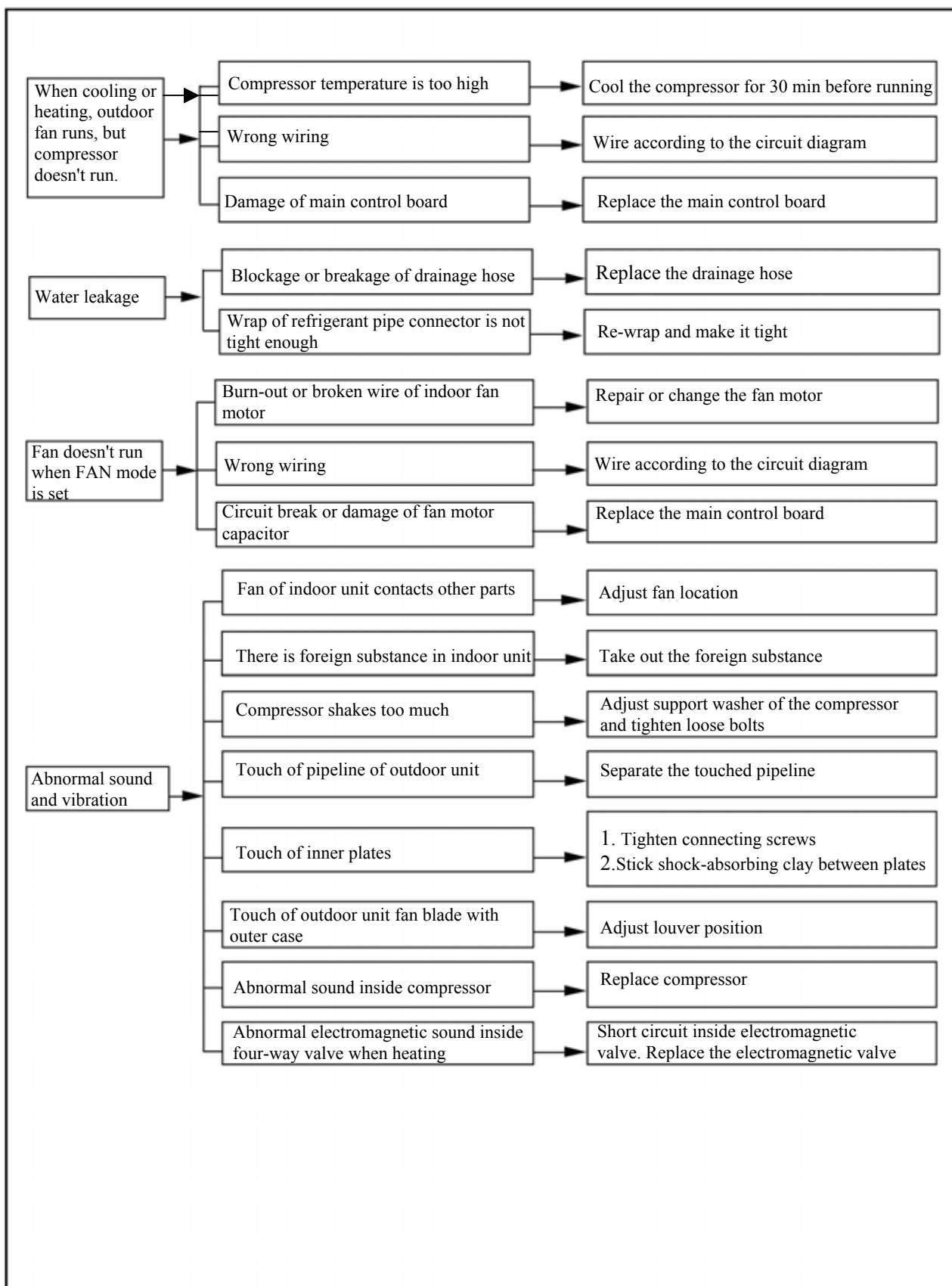
- Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m.
- Be sure to check for gas leakage.

Cycle Parts

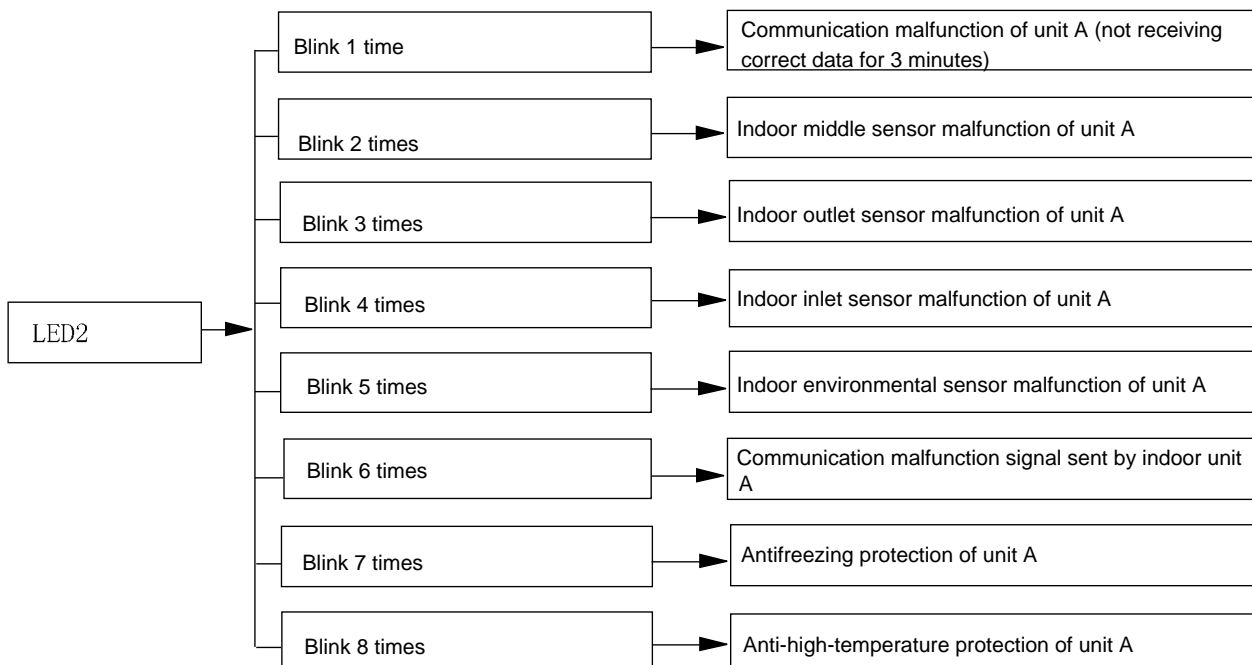
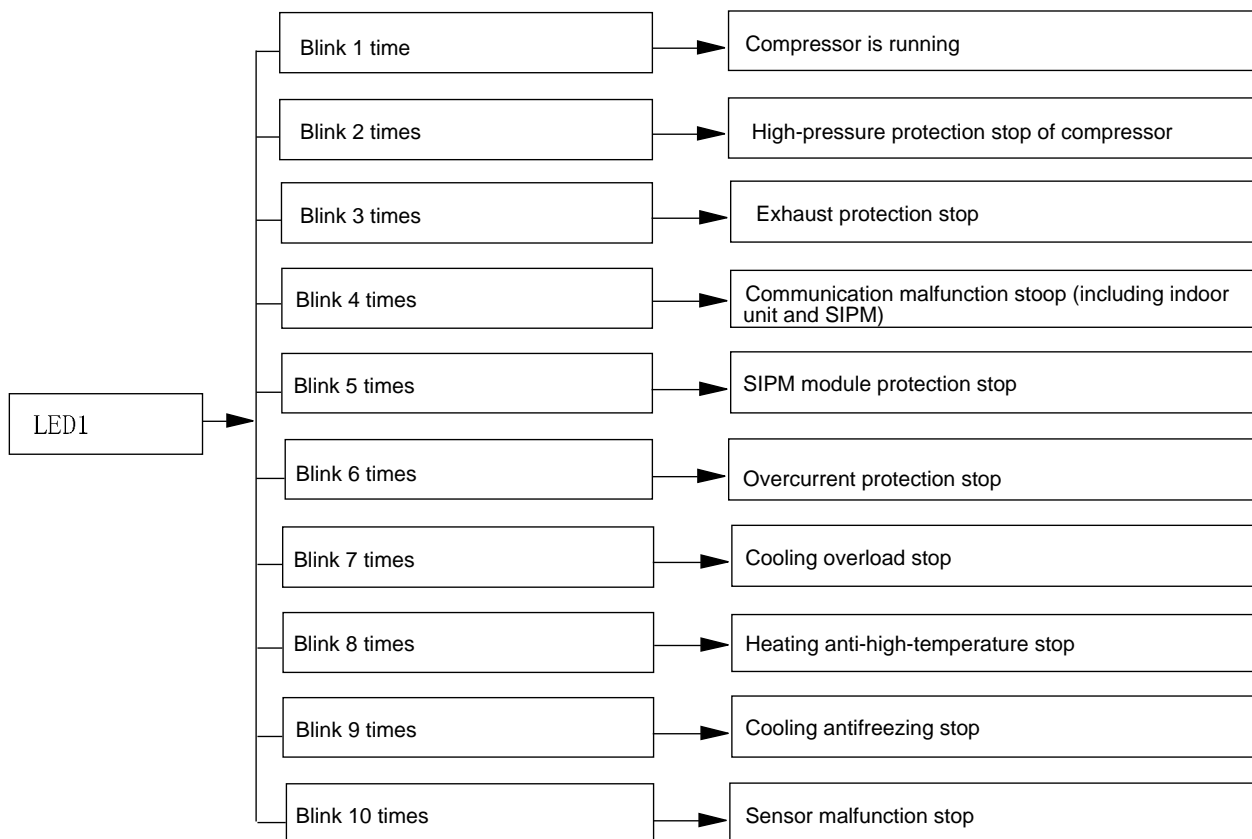
Trouble analysis

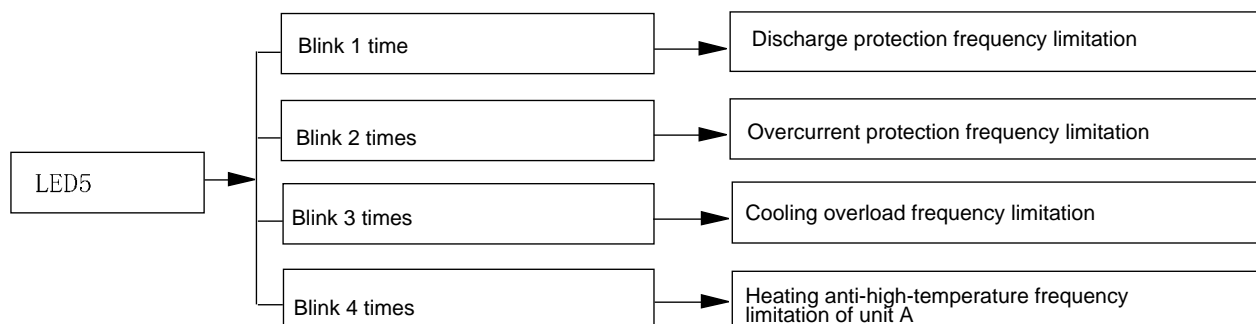
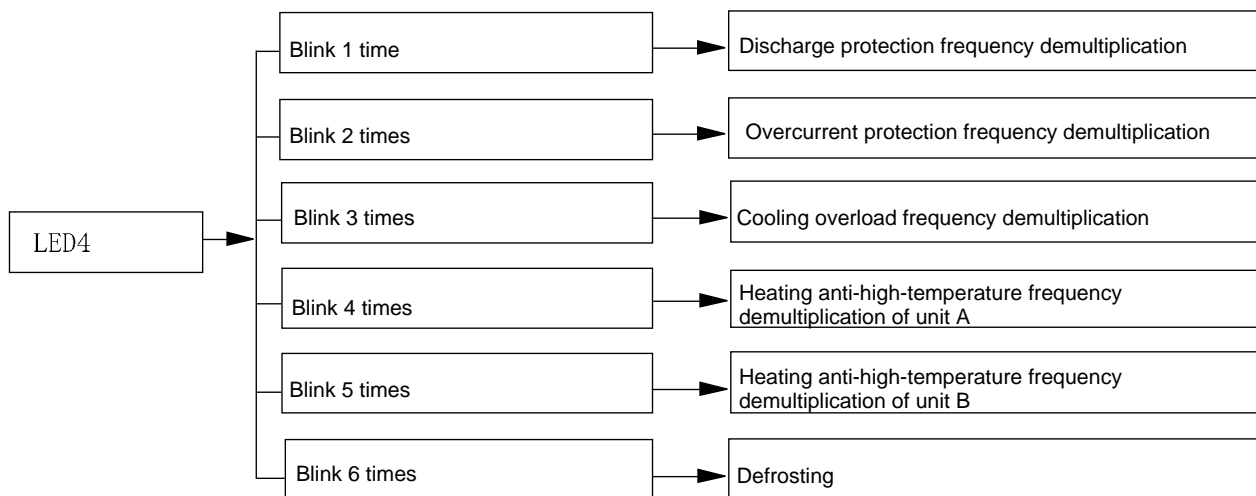
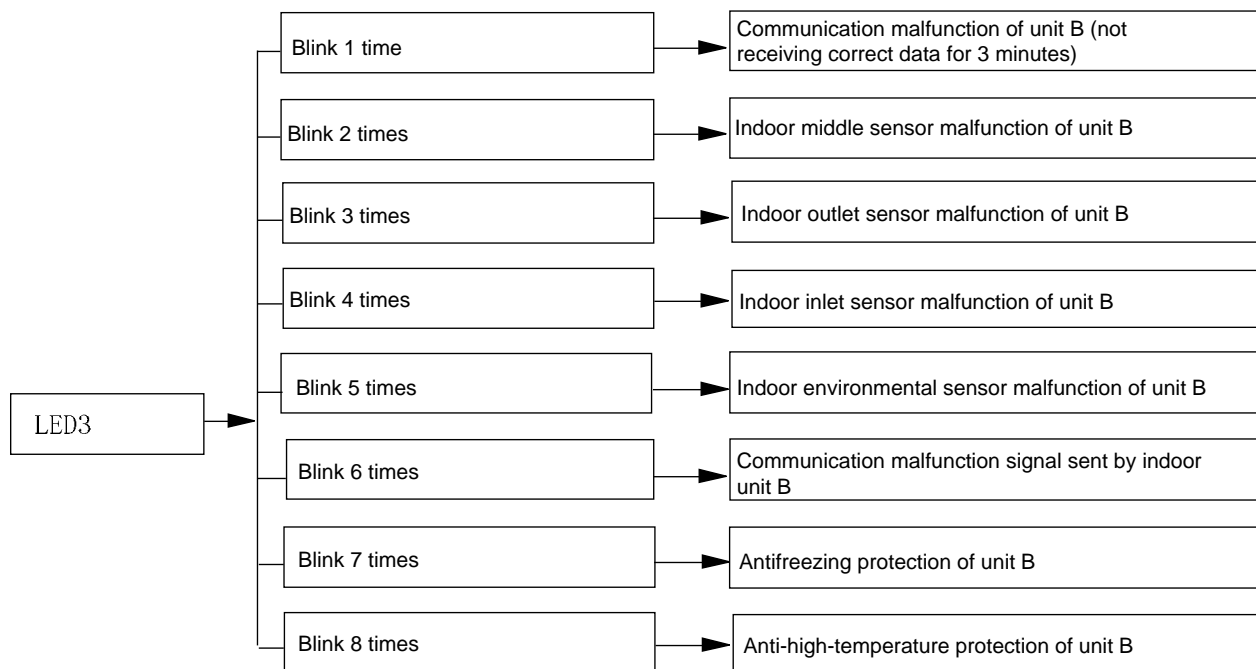


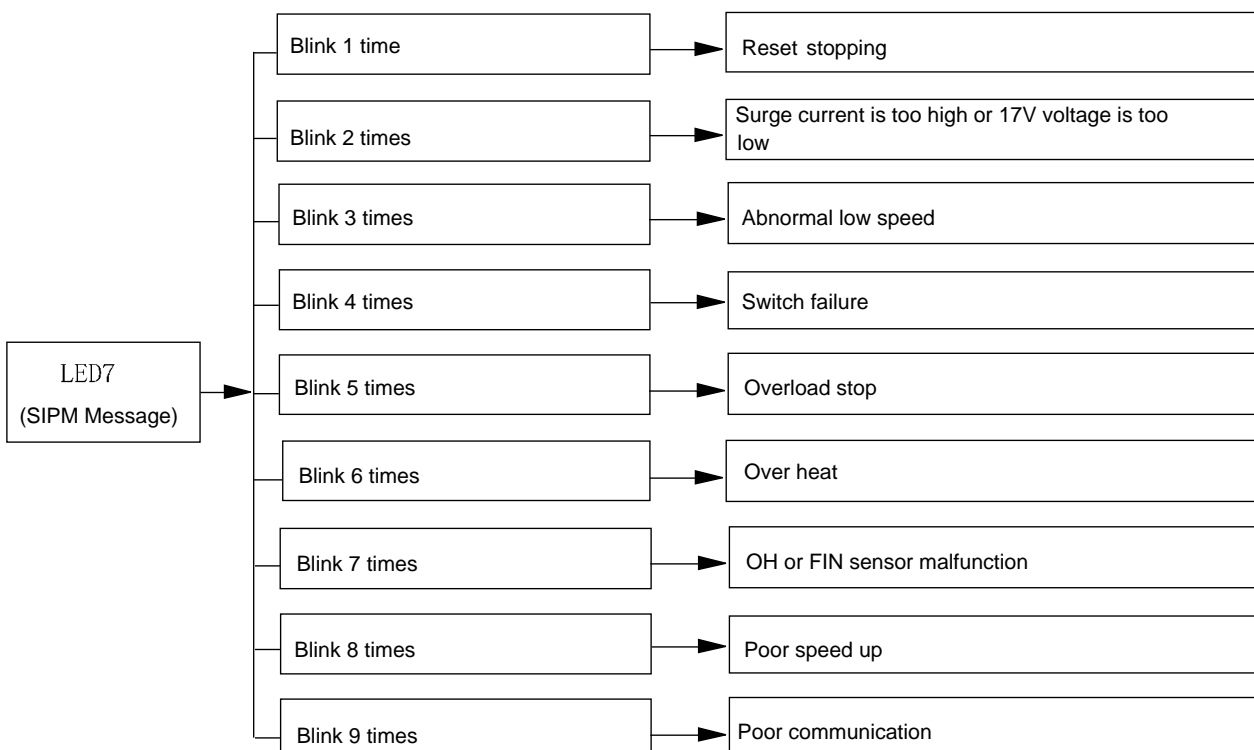
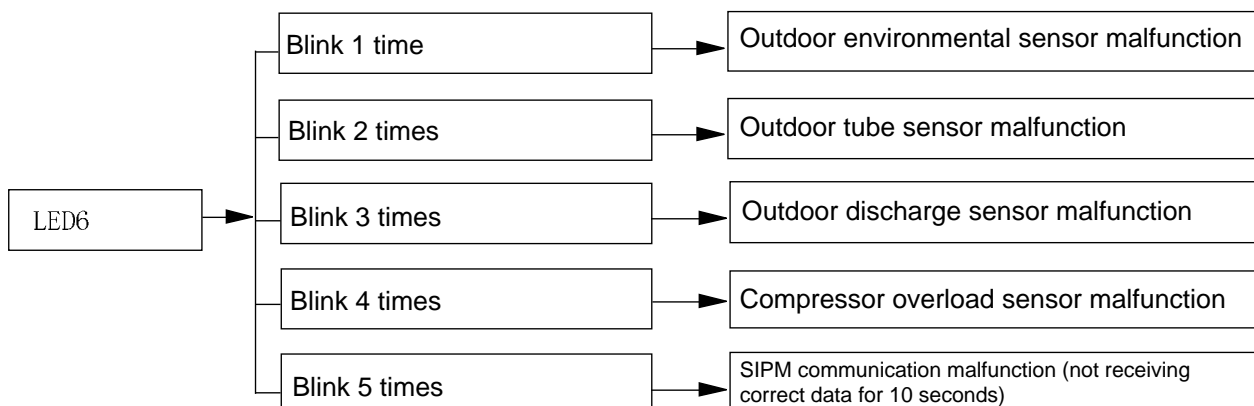
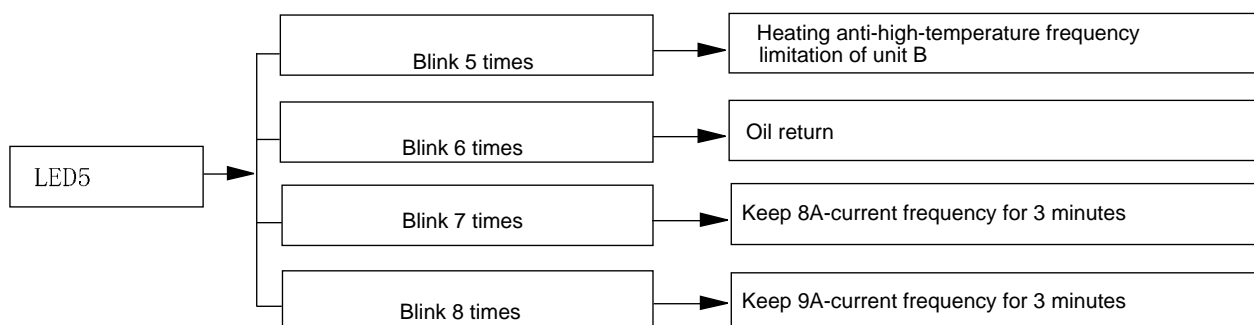


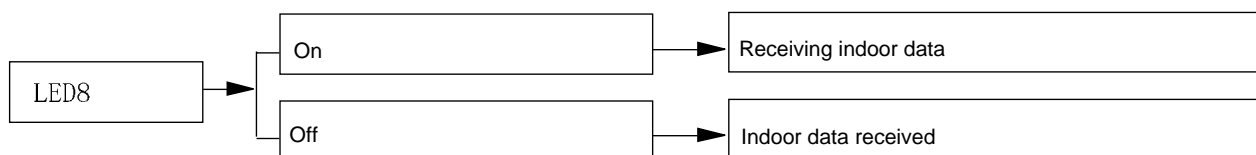
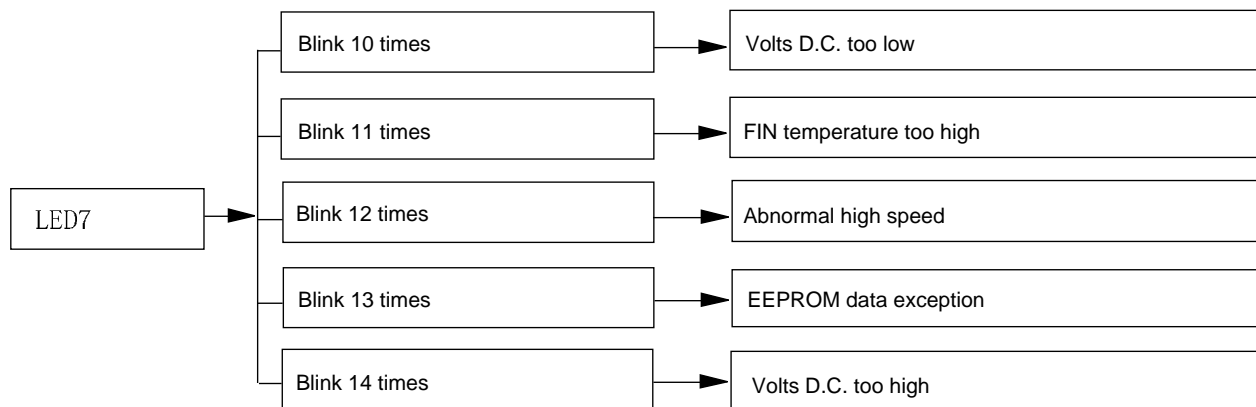


Malfunction display









Voltage table of 15K sensor resistance value

Temp. (°C)	Value of resistance (K Ω)	Voltage (V) *15K	Voltage (V) *8.1K	Temp. (°C)	Value of resistance (K Ω)	Voltage (V) *15K	Voltage (V) *8.1K	Temp. resistance (°C)	Value of (K Ω)	Voltage (V) *15K	Voltage (V) *8.1K
-20	147.69	0.46	0.26	32	11.0917	2.87	2.11	84	1.6417	4.51	4.16
-19	139.298	0.49	0.27	33	10.6341	2.93	2.16	85	1.5904	4.52	4.18
-18	131.436	0.51	0.29	34	10.1979	2.98	2.21	86	1.541	4.53	4.2
-17	124.067	0.54	0.31	35	9.7819	3.03	2.26	87	1.4933	4.55	4.22
-16	117.158	0.57	0.32	36	9.3851	3.08	2.32	88	1.4474	4.56	4.24
-15	110.677	0.6	0.34	37	9.0066	3.12	2.37	89	1.403	4.57	4.26
-14	104.594	0.63	0.36	38	8.6453	3.17	2.42	90	1.3603	4.58	4.28
-13	98.8834	0.66	0.38	39	8.3004	3.22	2.47	91	1.3191	4.6	4.3
-12	93.5199	0.69	0.4	40	7.9711	3.26	2.52	92	1.2793	4.61	4.32
-11	88.4804	0.72	0.42	41	7.6565	3.31	2.57	93	1.2409	4.62	4.34
-10	83.7433	0.76	0.44	42	7.3561	3.35	2.62	94	1.2038	4.63	4.35
-9	79.2888	0.8	0.46	43	7.069	3.4	2.67	95	1.1681	4.64	4.37
-8	75.0984	0.83	0.49	44	6.7946	3.44	2.72	96	1.1335	4.65	4.39
-7	71.1548	0.87	0.51	45	6.5323	3.48	2.77	97	1.1002	4.66	4.4
-6	67.4422	0.91	0.54	46	6.2815	3.52	2.82	98	1.068	4.67	4.42
-5	63.9457	0.95	0.56	47	6.0416	3.56	2.86	99	1.0369	4.68	4.43
-4	60.6514	0.99	0.59	48	5.8121	3.6	2.91	100	1.0068	4.69	4.45
-3	57.5465	1.03	0.62	49	5.5925	3.64	2.96	101	0.9778	4.69	4.46
-2	54.6191	1.08	0.65	50	5.3823	3.68	3	102	0.9497	4.7	4.48
-1	51.858	1.12	0.68	51	5.1804	3.72	3.05	103	0.9225	4.71	4.49
0	49.2528	1.17	0.71	52	4.9872	3.75	3.09	104	0.8963	4.72	4.5
1	46.7926	1.21	0.74	53	4.8023	3.79	3.14	105	0.871	4.73	4.51
2	44.47	1.26	0.77	54	4.6252	3.82	3.18	106	0.848	4.73	4.53
3	42.2765	1.31	0.8	55	4.4556	3.85	3.23	107	0.825	4.74	4.54
4	40.2043	1.36	0.84	56	4.2931	3.89	3.27	108	0.802	4.75	4.55
5	38.246	1.41	0.87	57	4.1374	3.92	3.31	109	0.779	4.75	4.56
6	36.3946	1.46	0.91	58	3.9882	3.95	3.35	110	0.758	4.76	4.57
7	34.6438	1.51	0.95	59	3.8452	3.98	3.39	111	0.737	4.77	4.58
8	32.9875	1.56	0.99	60	3.708	4.01	3.43	112	0.717	4.77	4.59
9	31.42	1.62	1.02	61	3.5765	4.04	3.47	113	0.697	4.78	4.6
10	29.9362	1.67	1.06	62	3.4503	4.06	3.51	114	0.678	4.78	4.61
11	28.531	1.72	1.11	63	3.3293	4.09	3.54	115	0.66	4.79	4.62
12	27.2	1.78	1.15	64	3.2131	4.12	3.58	116	0.642	4.79	4.63
13	25.9387	1.83	1.19	65	3.1016	4.14	3.62	117	0.625	4.8	4.64
14	24.7432	1.89	1.23	66	2.9945	4.17	3.65	118	0.608	4.81	4.65
15	23.6097	1.94	1.28	67	2.8917	4.19	3.68	119	0.592	4.81	4.66
16	22.5345	2	1.32	68	2.7929	4.22	3.72	120	0.577	4.81	4.67
17	21.5144	2.05	1.37	69	2.698	4.24	3.75	121	0.561	4.82	4.68
18	20.5463	2.11	1.41	70	2.6069	4.26	3.78	122	0.547	4.82	4.68
19	19.6272	2.17	1.46	71	2.5193	4.28	3.81	123	0.532	4.83	4.69
20	18.7545	2.22	1.51	72	2.435	4.3	3.84	124	0.519	4.83	4.7
21	17.9254	2.28	1.56	73	2.3541	4.32	3.87	125	0.505	4.84	4.71
22	17.1376	2.33	1.6	74	2.2762	4.34	3.9	126	0.492	4.84	4.71
23	16.3889	2.39	1.65	75	2.2013	4.36	3.93	127	0.48	4.85	4.72
24	15.677	2.44	1.7	76	2.1292	4.38	3.96	128	0.467	4.85	4.73
25	15	2.5	1.75	77	2.0599	4.4	3.99	129	0.456	4.85	4.73
26	14.356	2.55	1.8	78	1.9932	4.41	4.01	130	0.444	4.86	4.74
27	13.7431	2.61	1.85	79	1.9289	4.43	4.04	131	0.433	4.86	4.75
28	13.1598	2.66	1.91	80	1.8671	4.45	4.06	132	0.422	4.86	4.75
29	12.6045	2.72	1.96	81	1.8076	4.46	4.09	133	0.412	4.87	4.76
30	12.0756	2.77	2.01	82	1.7502	4.48	4.11	134	0.401	4.87	4.76
31	11.5718	2.82	2.06	83	1.6949	4.49	4.13	135	0.391	4.87	4.77

Remark: The above voltage value is the power supply voltage 5V, the divider resistance are 15K and 8.1K.

Voltage table of 20K sensor resistance value

Temp. (℃)	Value of resistance (KΩ)	Voltage (V) *15K	Temp. (℃)	Value of resistance (KΩ)	Voltage (V) *8.1K	Temp. (℃)	Value of resistance (KΩ)	Voltage (V) *8.1K
-20	192	0.47	32	14.79	2.87	84	2.194	4.51
-19	181.4	0.5	33	14.18	2.93	85	2.125	4.52
-18	171.4	0.52	34	13.59	2.98	86	2.059	4.53
-17	162.1	0.55	35	13.04	3.03	87	1.996	4.55
-16	153.3	0.58	36	12.51	3.08	88	1.934	4.56
-15	145	0.61	37	12	3.13	89	1.875	4.57
-14	137.2	0.64	38	11.52	3.17	90	1.818	4.58
-13	129.9	0.67	39	11.06	3.22	91	1.736	4.6
-12	123	0.7	40	10.62	3.27	92	1.71	4.61
-11	116.5	0.73	41	10.2	3.31	93	1.658	4.62
-10	110.3	0.77	42	9.803	3.36	94	1.609	4.63
-9	104.6	0.8	43	9.42	3.4	95	1.561	4.64
-8	99.13	0.84	44	9.054	3.44	96	1.515	4.65
-7	94	0.88	45	8.705	3.48	97	1.47	4.66
-6	89.17	0.92	46	8.37	3.52	98	1.427	4.67
-5	84.61	0.96	47	8.051	3.56	99	1.386	4.68
-4	80.31	1	48	7.745	3.6	100	1.346	4.68
-3	76.24	1.04	49	7.453	3.64	101	1.307	4.69
-2	72.41	1.08	50	7.173	3.68	102	1.269	4.7
-1	68.79	1.13	51	6.905	3.72	103	1.233	4.71
0	65.37	1.17	52	6.648	3.75	104	1.198	4.72
1	62.13	1.22	53	6.403	3.79	105	1.164	4.73
2	59.08	1.26	54	6.167	3.82	106	1.131	4.73
3	56.19	1.31	55	5.942	3.85	107	1.099	4.74
4	53.46	1.36	56	5.726	3.89	108	1.069	4.75
5	50.87	1.41	57	5.519	3.92	109	1.039	4.75
6	48.42	1.46	58	5.32	3.95	110	1.01	4.76
7	46.11	1.51	59	5.13	3.98	111	0.9825	4.77
8	43.92	1.56	60	4.948	4.01	112	0.9556	4.77
9	41.84	1.62	61	4.773	4.04	113	0.9295	4.78
10	39.87	1.67	62	4.605	4.06	114	0.9043	4.78
11	38.01	1.72	63	4.443	4.09	115	0.8799	4.79
12	36.24	1.78	64	4.289	4.12	116	0.8562	4.79
13	34.57	1.83	65	4.14	4.14	117	0.8333	4.8
14	32.98	1.89	66	3.998	4.17	118	0.8111	4.81
15	31.47	1.94	67	3.861	4.19	119	0.7695	4.81
16	30.04	2	68	3.729	4.21	120	0.7687	4.81
17	28.68	2.05	69	3.603	4.24	121	0.7455	4.82
18	27.39	2.11	70	3.481	4.26	122	0.7289	4.82
19	26.17	2.17	71	3.364	4.28	123	0.7099	4.83
20	25.01	2.22	72	3.252	4.3	124	0.6915	4.83
21	23.9	2.28	73	3.144	4.32	125	0.6738	4.84
22	22.85	2.33	74	3.04	4.34	126	0.6583	4.84
23	21.85	2.39	75	2.94	4.36	127	0.6395	4.85
24	20.9	2.44	76	2.844	4.38	128	0.6232	4.85
25	20	2.5	77	2.752	4.4	129	0.6074	4.85
26	19.14	2.55	78	2.663	4.41	130	0.5921	4.86
27	18.13	2.62	79	2.577	4.43	131	0.5772	4.86
28	17.55	2.66	80	2.495	4.45	132	0.5627	4.86
29	16.8	2.72	81	2.415	4.46	133	0.5487	4.87
30	16.1	2.77	82	2.339	4.48	134	0.5351	4.87
31	15.43	2.82	83	2.265	4.49	135	0.5212	4.87

Remark: The above voltage value is the power supply voltage 5V, the divider resistance are 20K.

Voltage table of 50K sensor resistance value

Temp. (°C)	Value of resistance (KΩ)	Voltage (V) *15K	Temp. (°C)	Value of resistance (KΩ)	Voltage (V) *8.1K	Temp. (°C)	Value of resistance (KΩ)	Voltage (V) *8.1K
-20	484.5536	0.04	32	36.9866	0.52	84	5.4621	2.2
-19	457.3636	0.05	33	35.4618	0.54	85	5.2908	2.24
-18	431.8647	0.05	34	34.0079	0.56	86	5.1257	2.28
-17	407.9418	0.05	35	32.6212	0.58	87	4.9665	2.32
-16	385.4885	0.06	36	31.2983	0.6	88	4.8131	2.36
-15	364.4061	0.06	37	30.0359	0.63	89	4.6651	2.4
-14	344.6029	0.06	38	28.8309	0.65	90	4.5224	2.44
-13	325.9941	0.07	39	27.6805	0.67	91	4.3847	2.48
-12	308.5007	0.07	40	26.582	0.7	92	4.2518	2.51
-11	292.0497	0.07	41	25.5326	0.72	93	4.1236	2.55
-10	276.573	0.08	42	24.5301	0.75	94	3.9999	2.59
-9	262.0074	0.08	43	23.572	0.77	95	3.8805	2.63
-8	248.2941	0.09	44	22.6562	0.8	96	3.7652	2.67
-7	235.3787	0.09	45	21.7806	0.82	97	3.6538	2.7
-6	223.2101	0.09	46	20.9433	0.85	98	3.5463	2.74
-5	211.741	0.1	47	20.1424	0.88	99	3.4424	2.78
-4	200.9274	0.1	48	19.3761	0.91	100	3.3421	2.81
-3	190.7282	0.11	49	18.6428	0.94	101	3.2451	2.85
-2	181.1052	0.12	50	17.9409	0.97	102	3.1513	2.89
-1	172.0225	0.12	51	17.2683	1	103	3.0607	2.92
0	163.447	0.13	52	16.6244	1.03	104	2.9731	2.96
1	155.3267	0.13	53	16.008	1.06	105	2.8884	2.99
2	147.6573	0.14	54	15.4177	1.09	106	2.8065	3.03
3	140.4114	0.15	55	14.8522	1.12	107	2.7273	3.06
4	133.5631	0.16	56	14.3105	1.16	108	2.6507	3.09
5	127.0885	0.16	57	13.7913	1.19	109	2.5766	3.13
6	120.9652	0.17	58	13.2937	1.22	110	2.5049	3.16
7	115.172	0.18	59	12.8167	1.26	111	2.4355	3.19
8	109.6896	0.19	60	12.3592	1.29	112	2.3683	3.22
9	104.4994	0.2	61	11.9204	1.33	113	2.3033	3.26
10	99.5843	0.21	62	11.4994	1.36	114	2.2403	3.29
11	94.9283	0.22	63	11.0955	1.4	115	2.1794	3.32
12	90.5162	0.23	64	10.7078	1.43	116	2.1203	3.35
13	86.3341	0.24	65	10.3357	1.47	117	2.0632	3.38
14	82.3687	0.25	66	9.9784	1.51	118	2.0078	3.41
15	78.6076	0.26	67	9.6352	1.54	119	1.9541	3.44
16	75.0392	0.27	68	9.3056	1.58	120	1.9021	3.47
17	71.6526	0.28	69	8.9889	1.62	121	1.8518	3.49
18	68.4376	0.3	70	8.6846	1.66	122	1.8029	3.52
19	65.3846	0.31	71	8.3921	1.69	123	1.7556	3.55
20	62.4845	0.32	72	8.111	1.73	124	1.7097	3.58
21	59.729	0.34	73	7.8406	1.77	125	1.6653	3.6
22	57.11	0.35	74	7.5807	1.81	126	1.6221	3.63
23	54.6202	0.36	75	7.3306	1.85	127	1.5803	3.66
24	52.2524	0.38	76	7.09	1.89	128	1.5397	3.68
25	50	0.4	77	6.8585	1.93	129	1.5003	3.71
26	47.8569	0.41	78	6.6357	1.97	130	1.4621	3.73
27	45.8171	0.43	79	6.4212	2.01	131	1.4251	3.76
28	43.8752	0.45	80	6.2147	2.04	132	1.3891	3.78
29	42.0259	0.46	81	6.0159	2.08	133	1.3542	3.8
30	40.2644	0.48	82	5.8243	2.12	134	1.3203	3.83
31	38.5861	0.5	83	5.6398	2.16	135	1.2874	3.85

Remark: The above voltage value is the power supply voltage 5V, the divider resistance are 4.3K.

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TELEFONO 0422 4131 - TELEFAX 0422 413659

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