

Owner & Installation Manual



MRCOOL®

COMFORT MADE SIMPLE

PRODIRECT™ SERIES

Split System Heat Pump & Air Conditioner
13 -14 SEER 1.5-5 Tons Model: HHP140*

Please read the installation manual carefully before installation and keep for future reference.

Please note: The design and specifications of this product and/or manual are subject to change without prior notice. Visit www.mrcool.com for the latest documentation.

**RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION****! WARNING**

These instructions are intended as an aid for qualified licensed service personnel for proper installation, adjustment and operation of this unit. Read these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, property damage, personal injury or death.

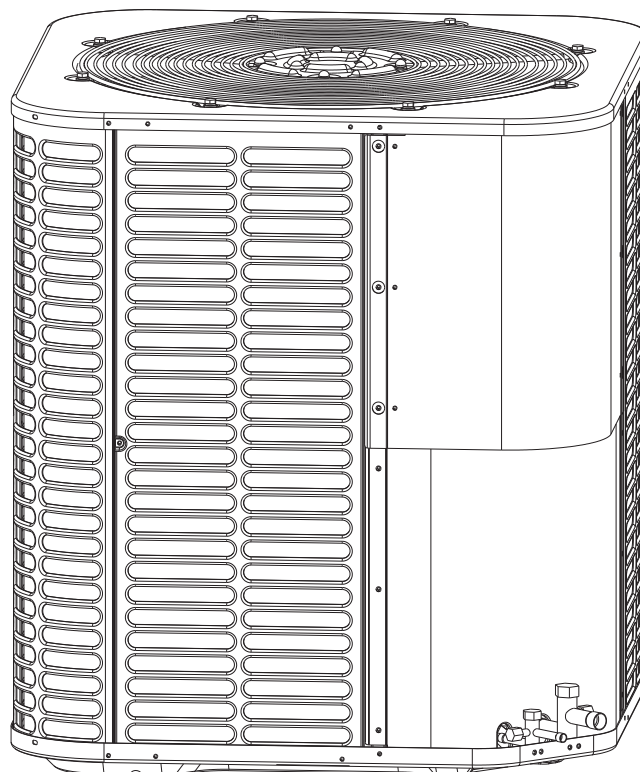
**DO NOT DESTROY THIS MANUAL****Please read carefully and keep in a safe place for future reference by a serviceman.**

INSTALLATION AND OWNER'S MANUAL

OUTDOOR UNIT MODELS

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1. Dimensions

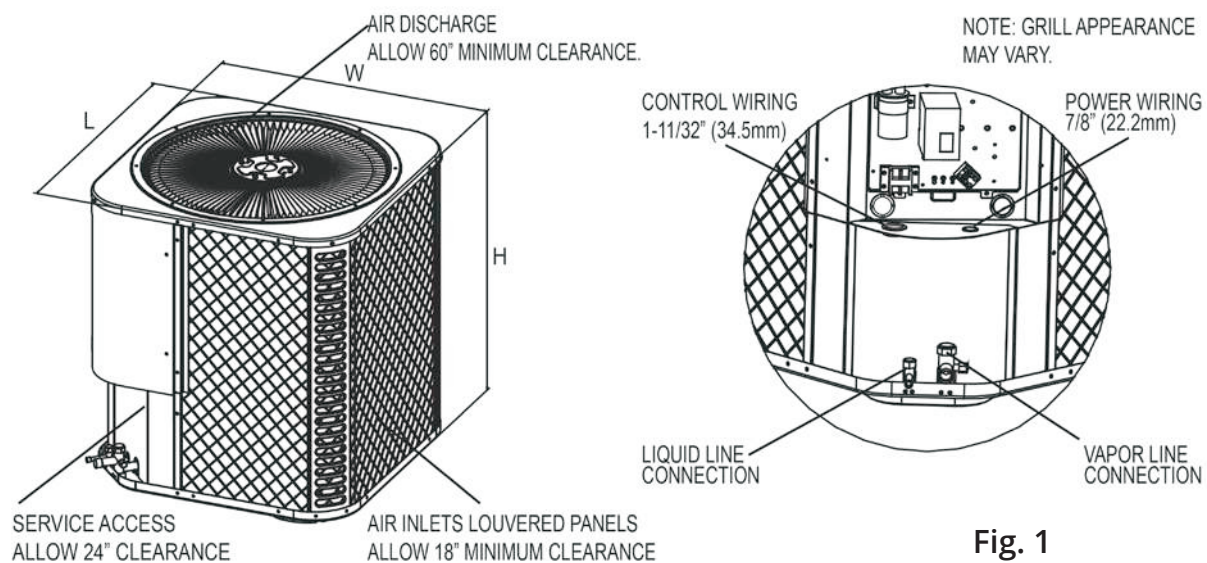


Fig. 1

Unit Model	Dimensions (Inches)			Refrigerant Connection Service Valve Size	
	"H" in [mm]	"W" in [mm]	"L" in [mm]	Liquid in	Vapor in
18K	25 [633]	21-3/4 [554]	21-3/4 [554]	3/8	3/4
24K	25 [633]	21-3/4 [554]	21-3/4 [554]	3/8	3/4
30K	25 [633]	21-3/4 [554]	21-3/4 [554]	3/8	3/4
36K	25 [633]	29-1/7 [740]	29-1/7 [740]	3/8	3/4
42K	32-7/8 [835]	29-1/7 [740]	29-1/7 [740]	3/8	3/4
48K	32-7/8 [835]	29-1/7 [740]	29-1/7 [740]	3/8	7/8
60K	32-7/8 [835]	29-1/7 [740]	29-1/7 [740]	3/8	7/8

Table - 1

2. Service Space

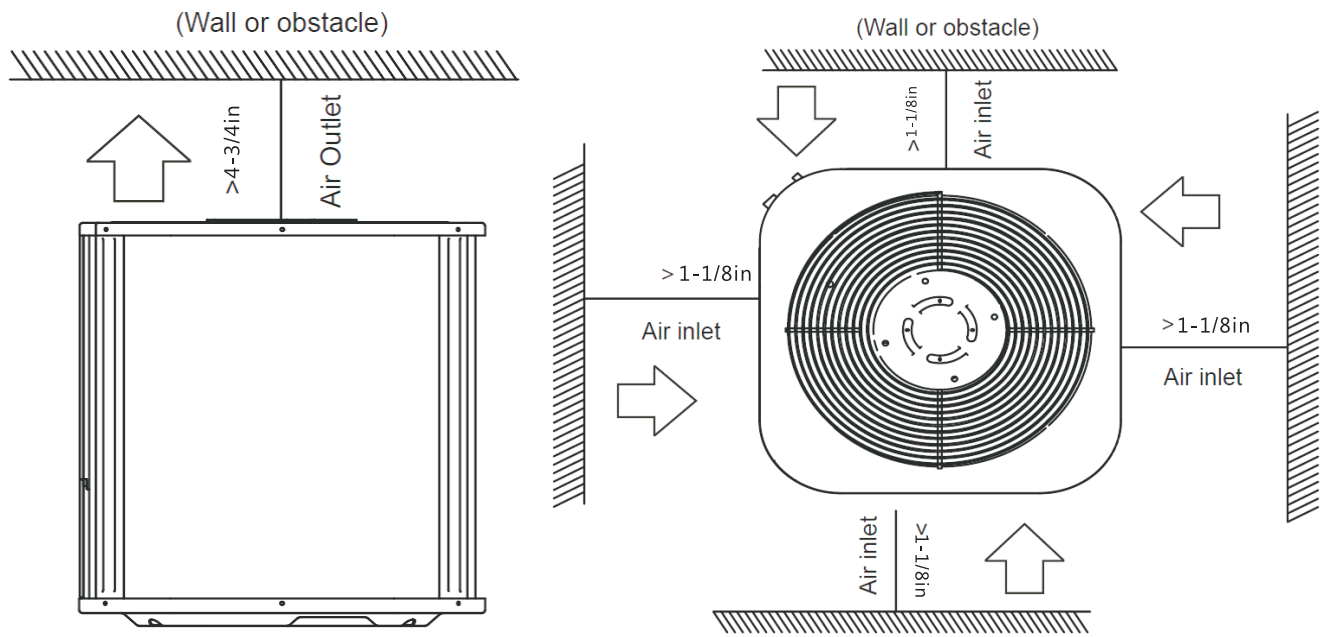


Fig. 2

3. Piping Diagrams

Applicable for 18k, 24k, 30k, 36k cooling only type

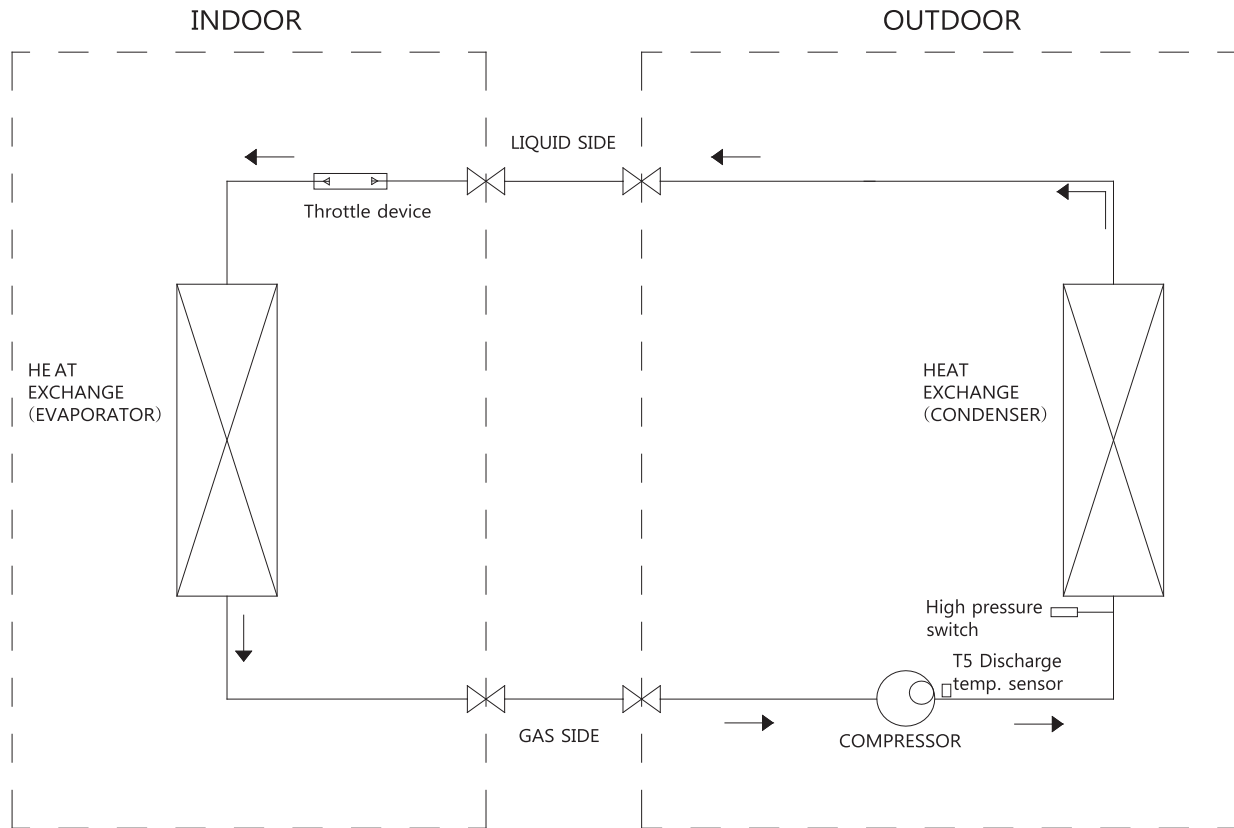


Fig. 3-1

Applicable for 18k, 24k, 30k, 36k cooling & heating type

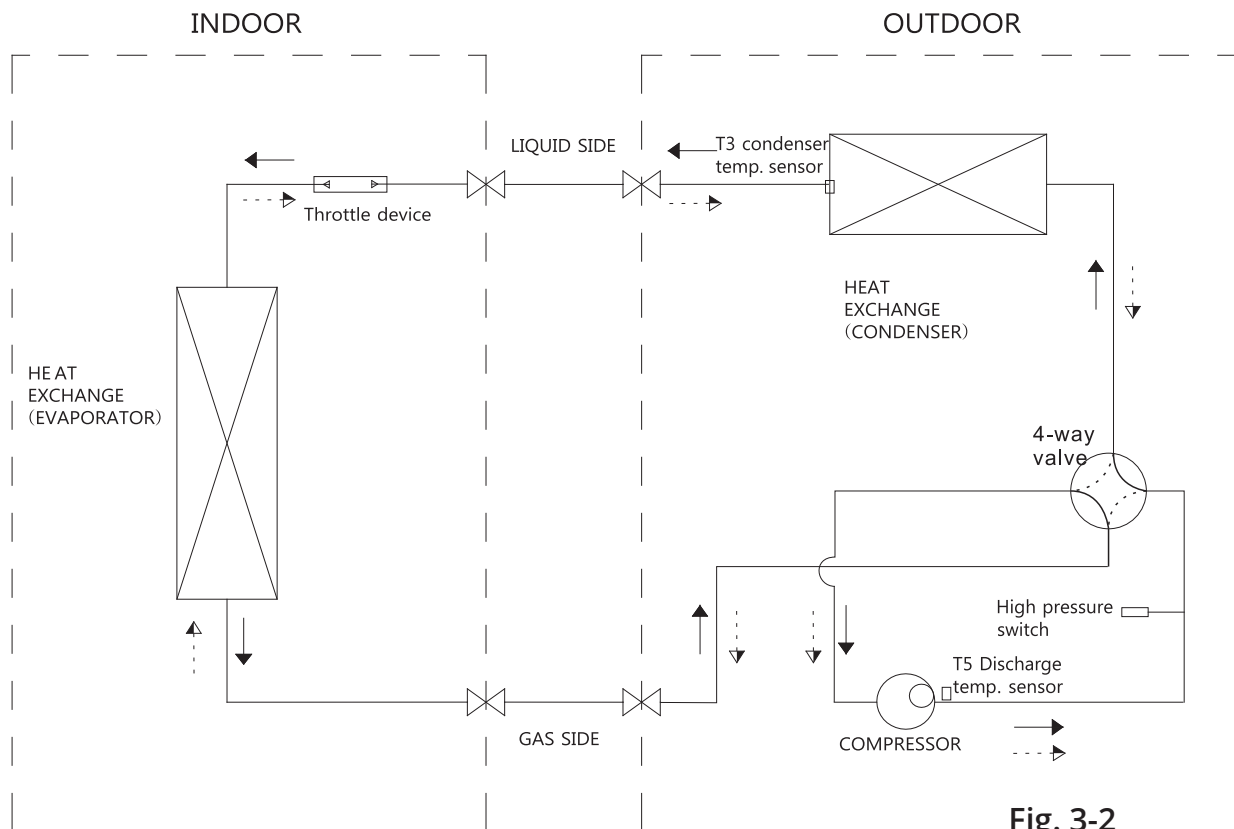


Fig. 3-2

Applicable for 42k, 48k, 60k cooling only type

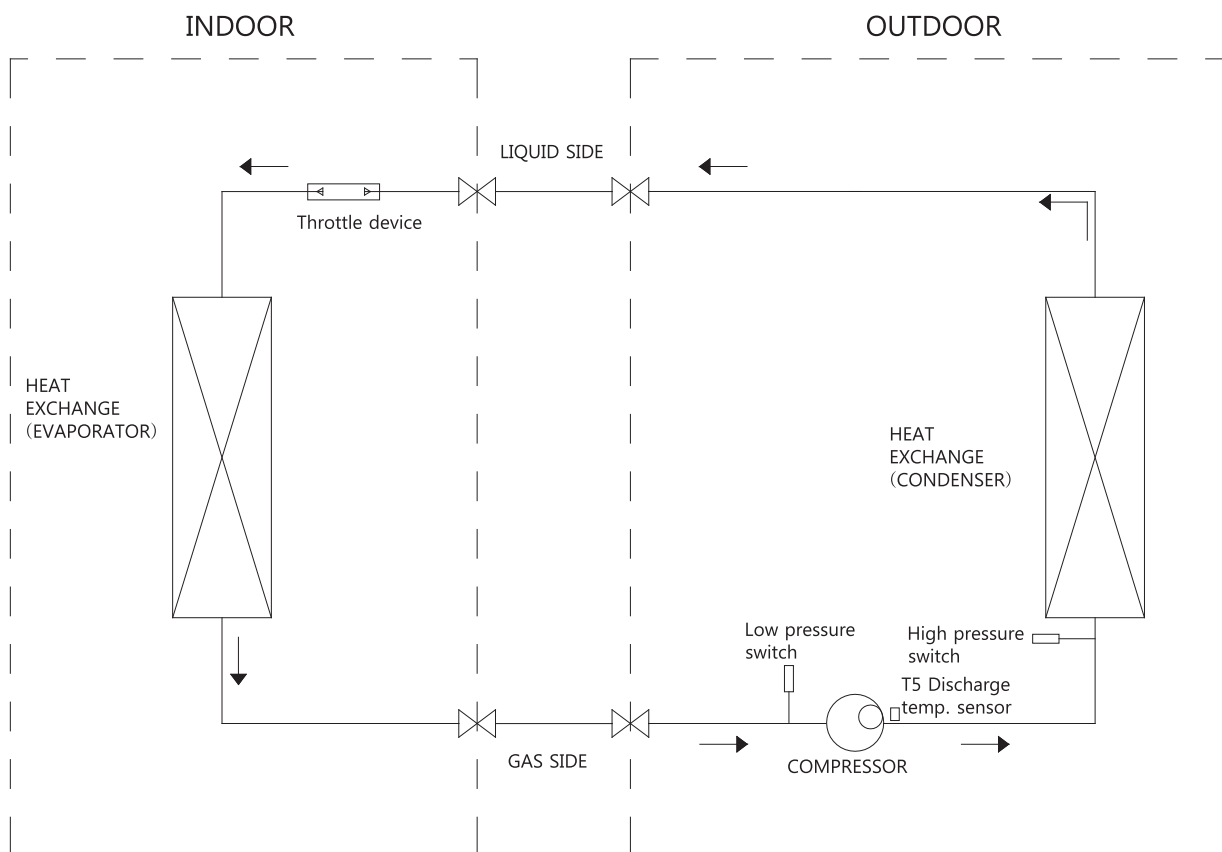


Fig. 3-3

Applicable for 42k, 48k, 60k cooling & heating type

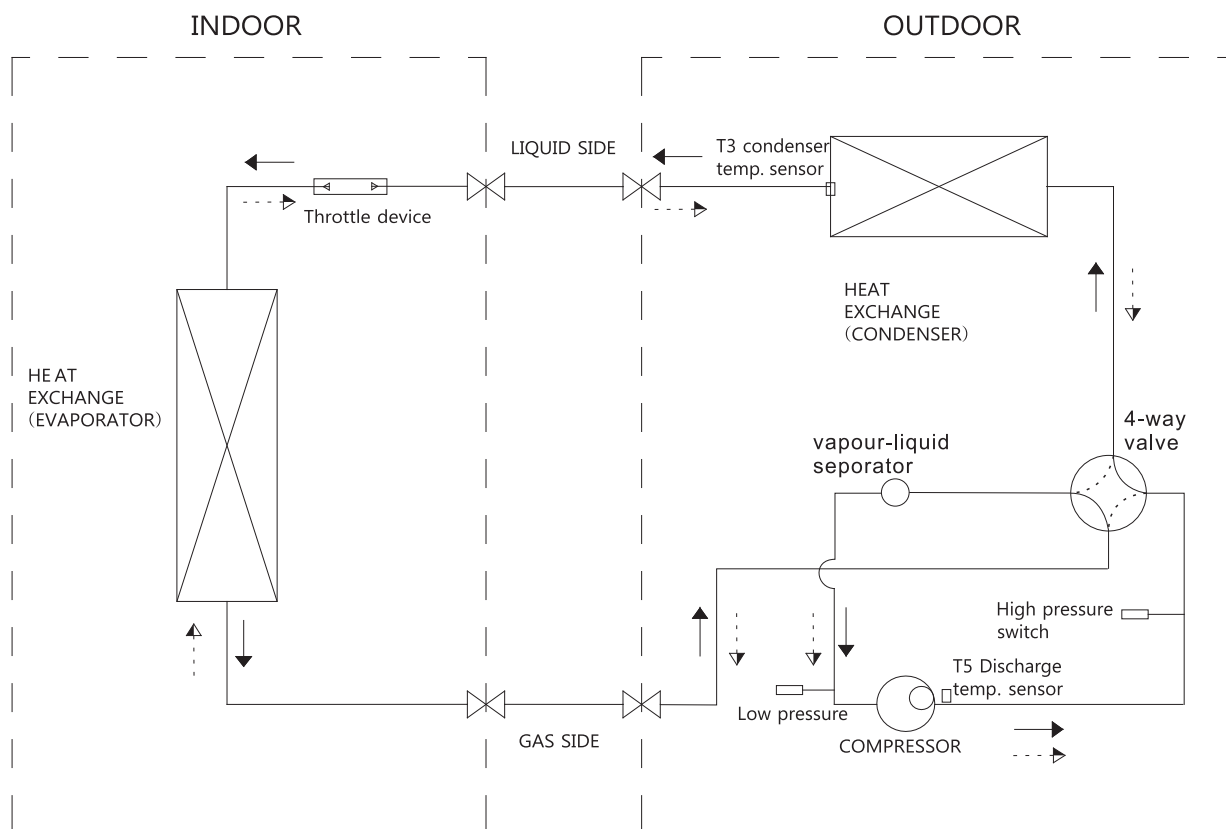
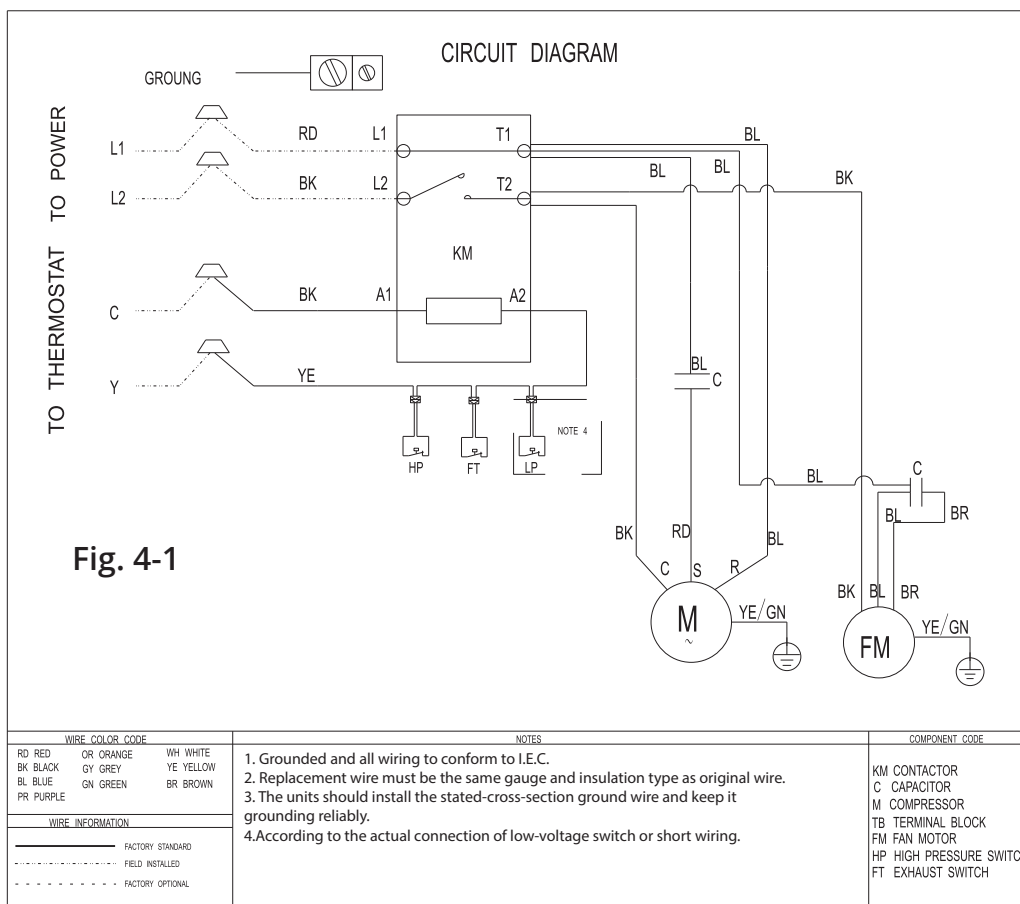


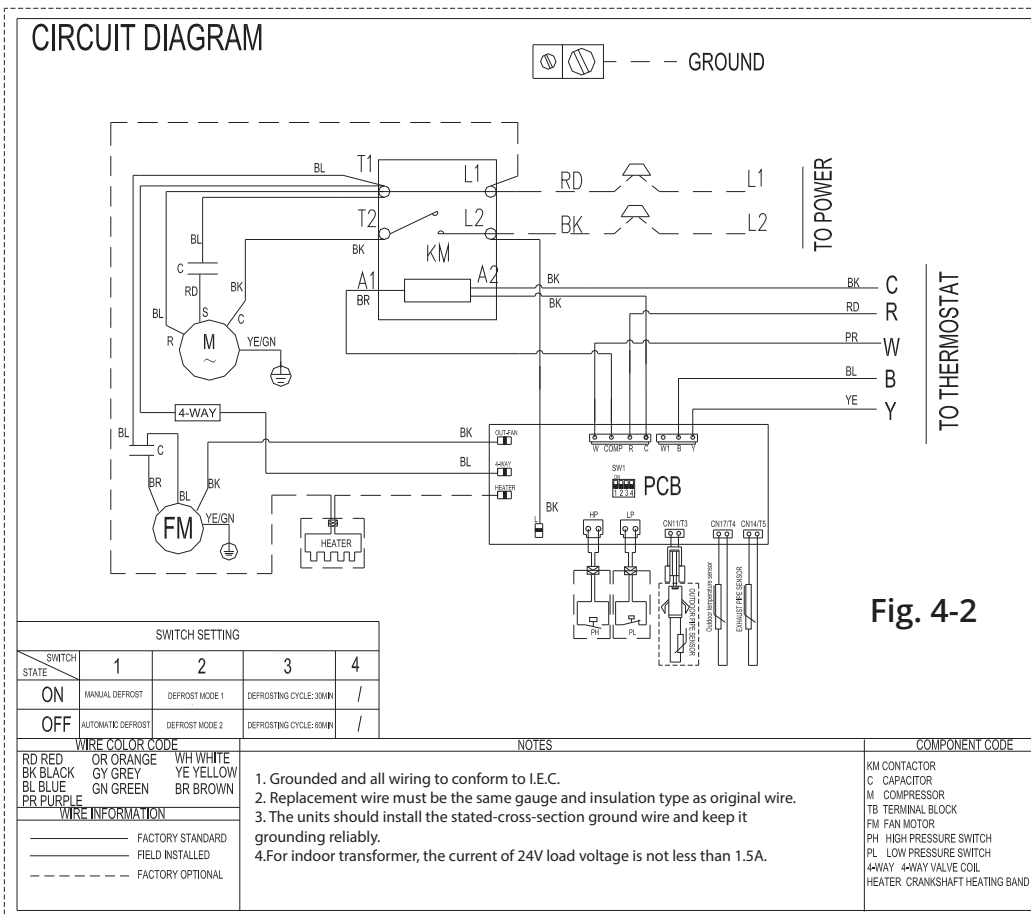
Fig. 3-4

4. Wiring Diagrams

Applicable for 18k, 24k, 30k, 36k, 42k, 48k, 60k cooling only type



Applicable for 18k, 24k, 30k, 36k, 42k, 48k, 60k cooling & heating type



5. Electric Characteristics

Model	Power Supply				
	Hz	Phase	Voltage	Min.	Max.
18K	60	1	220-230V	198V	242V
24K	60	1	220-230V	198V	242V
30K	60	1	220-230V	198V	242V
36K	60	1	220-230V	198V	242V
42K	60	1	220-230V	198V	242V
48K	60	1	220-230V	198V	242V
60K	60	1	220-230V	198V	242V

Table - 2

6. Operation Limits

Table - 3

Mode \ Temperature	Cooling operation	Heating operation
Room temperature	63°F~86°F	63°F~86°F
Outdoor temperature	64°F~109°F	19°F~75°F

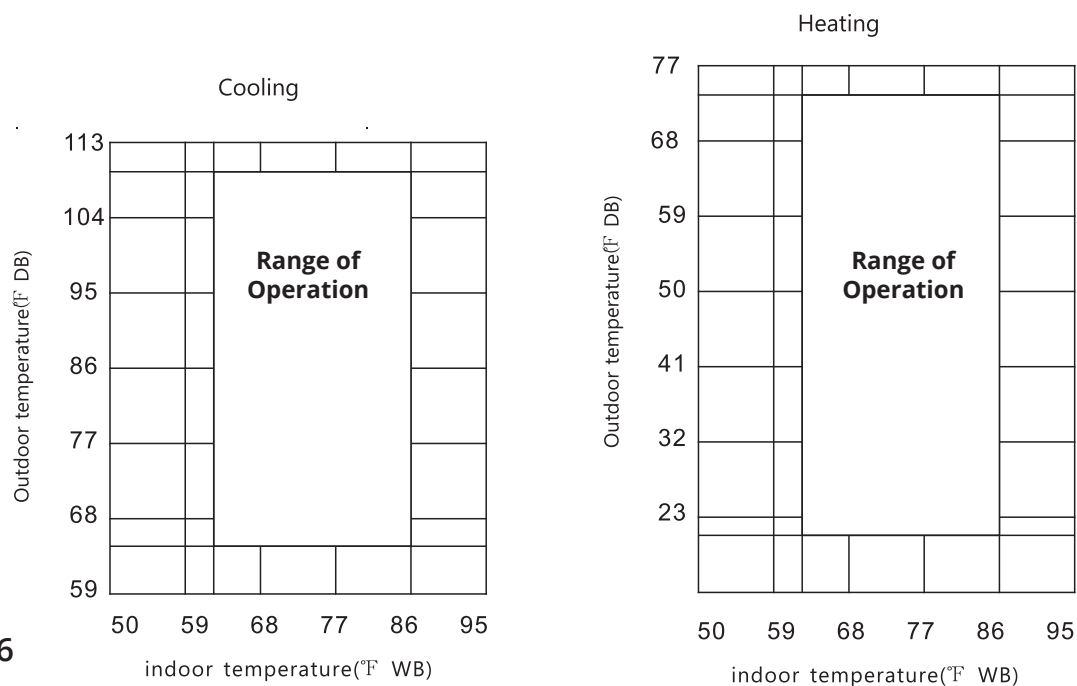
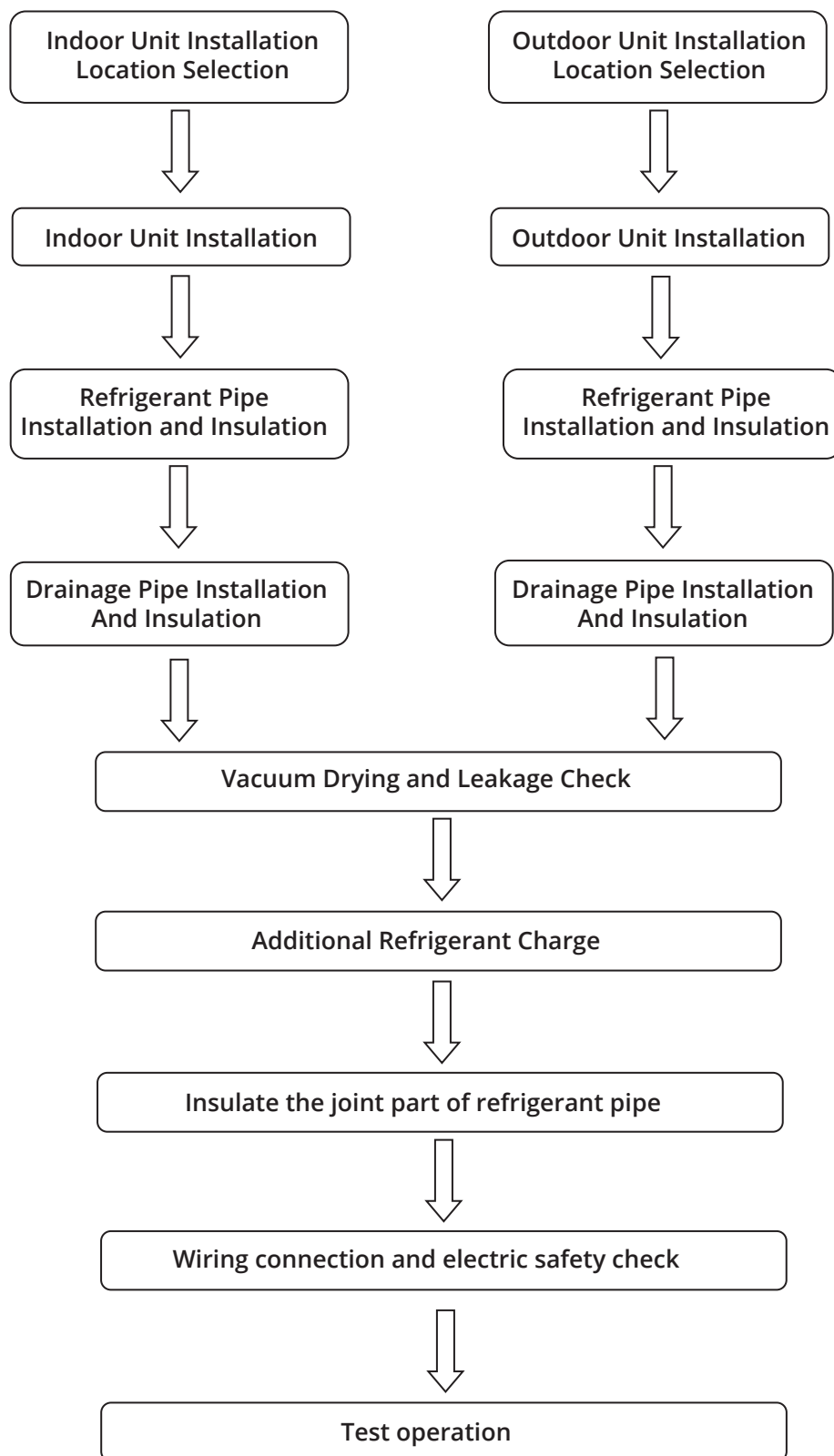


Fig. 6

⚠ WARNING

When the ambient temperature is more than 109°, the restart time may take 15-20 minutes. It is suggested to install a booster in the outdoor unit (18K, 24K, 30K, and 36K units only) to shorten the restart time. In the case of high and low pressure imbalance, a booster can increase the starting torque of the compressor allowing it to start normally.

7. Installation Procedure



8. Location Selection

8.1 Indoor unit location selection

- The place should easily support the indoor unit's weight.
- The place is easily accessible for indoor unit installation and inspection.
- The place can accommodate horizontal indoor unit installation.
- The place allows easy water drainage.
- The place can easily connect with the outdoor unit.
- The place offers sufficient air circulation in the room.
- There should not be any heat source or steam near the unit.
- There should not be any oil or gas near the unit.
- There should not be any corrosive materials near the unit.
- There should not be any salty air near the unit.
- There should not be strong electromagnetic waves near the unit.
- There should not be inflammable materials near the unit.
- There should not be any strong voltage vibration.

8.2 Outdoor unit location selection

- The place should easily support the outdoor unit's weight.
- Locate the outdoor unit as close to indoor unit as possible.
- The piping length and height drop can not exceed the allowable value (**Reference Table 4**).
- Select a place where any noise, vibration or outlet air will not disturb the residents of surrounding homes.
- There is enough room for installation and maintenance.
- The air outlet and the air inlet are not impeded, and do not face any sort of strong wind.
- Select a location where pipes and cables will be easy to install.
- There is no danger of fire from potential leakage of inflammable gas.
- The location should be a dry and well ventilated space.
- The support should be flat and horizontal.
- Do not install the outdoor unit in a dirty or severely polluted place to avoid any blockage of the heat exchanger contained within the outdoor unit.
- If a protective structure is built over the unit to prevent direct sunlight, rain exposure, direct strong wind, snow or accumulation of other types of debris, make sure that the heat that radiates from the condenser is not restricted.

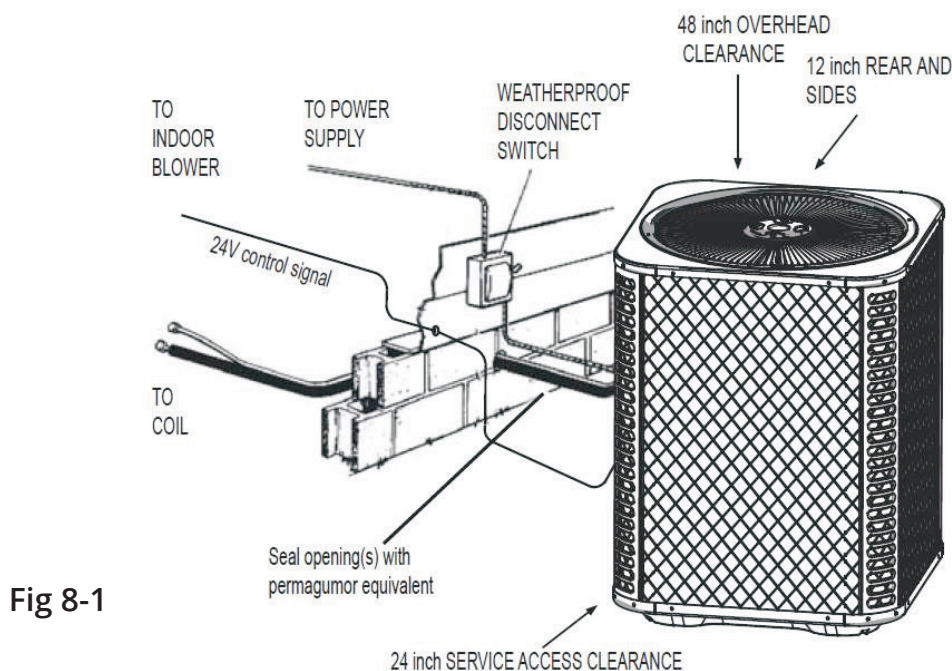


Fig 8-1

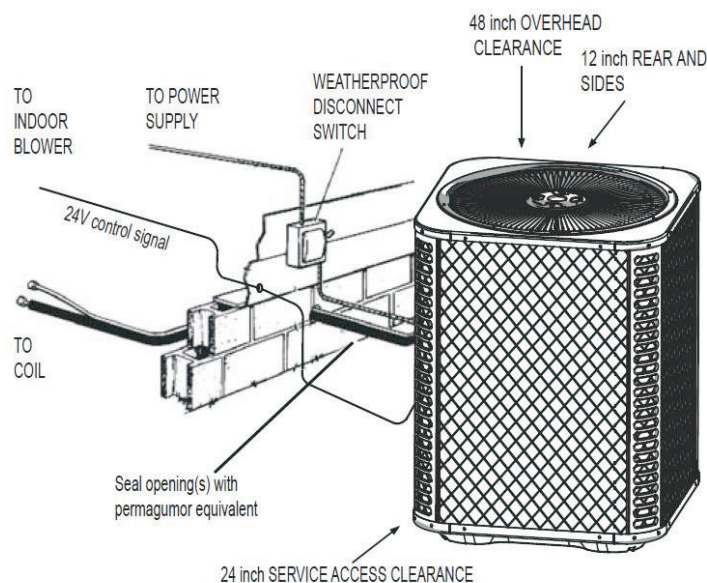
NOTE: All outdoor wiring must be weatherproof

9. Outdoor Unit Installation (Top Discharge Unit)

Location selection

Before starting the installation, find and select a suitable location for both the indoor and outdoor unit using the guidelines listed previously. Observe all limitations and clearance requirements. The outdoor unit must have sufficient clearance for air entrance to the condenser coil, for air discharge, and for service access.

Fig 9-1



NOTE: All outdoor wiring must be weatherproof

Note: For multiple unit installations, units must be spaced a minimum of 18 inches apart. (Coil face to coil face.) If the unit is to be installed on a roof or a black-topped ground area where it will be exposed to the heat of the sun, the unit should be raised sufficiently above the roof or ground to avoid the unit from taking in the accumulated heat of those surfaces. Provide adequate structural support.

Service space for outdoor unit

(Wall or obstacle)

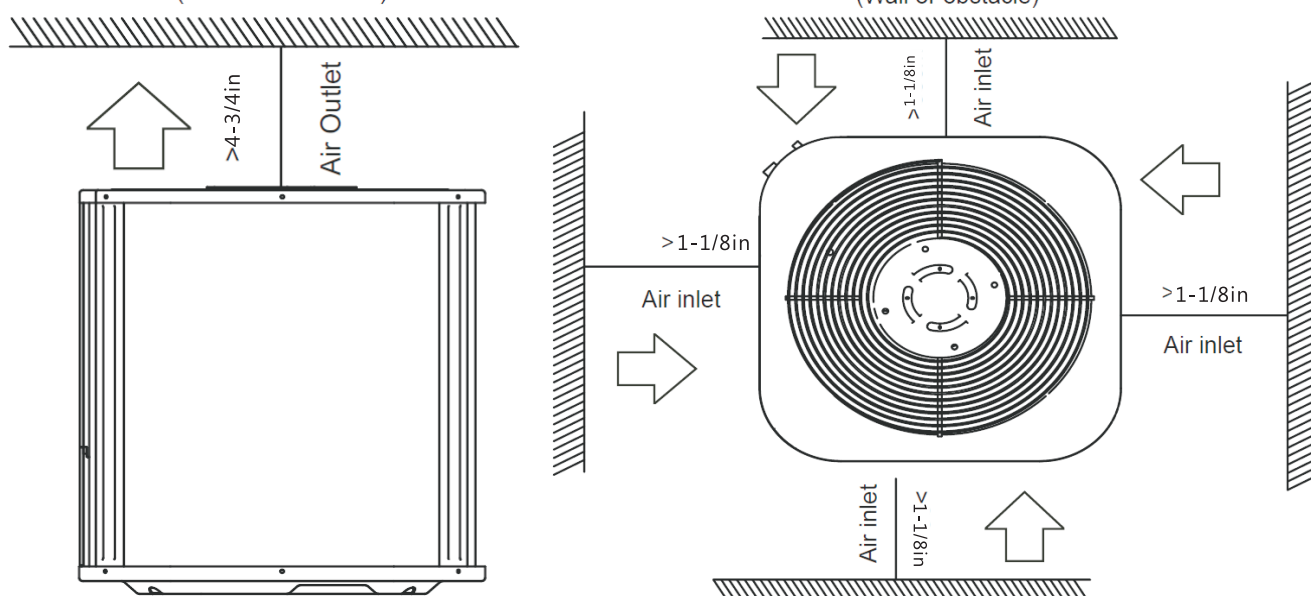


Fig 9-2

Install the Unit

The unit may be installed at ground level on a solid base that will not shift or settle, as unnecessary movement could cause strain on the refrigerant lines and possible leaks to occur. Maintain the clearances shown in Fig.9-2 and install the unit in a level position. Normal operating sound levels may be undesirable if the unit is placed directly under windows of certain rooms (bedrooms, study, etc.). The top of unit discharge area must be unrestricted for a minimum 6 feet above the unit.

Warning: The outdoor unit should not be installed in an area where excessive mud or ice could cause personal injury. Elevate the unit sufficiently to prevent any blockage to the air entrances from excessive snow or precipitation. Check the local weather bureau for average snow accumulation in the area. Be sure to isolate the unit from rain gutters to avoid any possible foundation wash out.

Roof installation

When installing units on a roof, the structure must be capable of supporting the total weight of the unit. This also includes any framing of the unit, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

10. Refrigerant Pipe Installation

Maximum pipe length and height drop

Consider the allowable pipe length and height drop when deciding the installation position. Make sure the distance and height drop between the indoor and outdoor units do not exceed the data in the following table.

Model	Max. Length Ft. (M)	Max. Elevation Ft. (M)	Max elbow(pcs)
≤36,000Btu/h	50[15]	26[8]	5
>36,000Btu/h	66[20]	33[10]	5

The procedure of connecting pipes

1. Choose the pipe size according to **Table 4** above.
2. Confirm the cross way of the pipes.
3. Measure the necessary pipe length.
4. Cut the selected pipe with pipe cutter making the section flat and smooth. Refer to **Fig. 10-1**
5. Insulate the copper pipe.
6. Before test operation, the joint parts should not be heat insulated.
7. Drill holes if the pipes need to pass through the wall.
8. Bend the pipes if necessary to pass through the wall smoothly.
9. Bind and wrap the wires together with insulated pipe if necessary.
10. Set the wall conduit.
11. Set the support for the pipe.
12. Locate the pipe and secure to support bracket.
 - For horizontal refrigerant pipe, the distance between supports should not be exceed 3.28 ft (1m).
 - For vertical refrigerant pipe, the distance between supports should not exceed 4.92 ft (1.5m).
13. Connect the pipe to indoor unit and outdoor unit by brazing (Top discharge outdoor unit and Air Handler indoor units).
 - Top discharge outdoor unit and air handler indoor units connections are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos -5 or equivalent. **DO NOT** use soft solder. The outdoor units have reusable service valves on both the liquid and vapor connections. The total system refrigerant charge is retained within the outdoor unit during shipping and installation. The reusable service valves are provided to evacuate and charge per this instruction.
 - Serious service problems can be avoided by taking adequate precautions to ensure an internally clean and dry system.

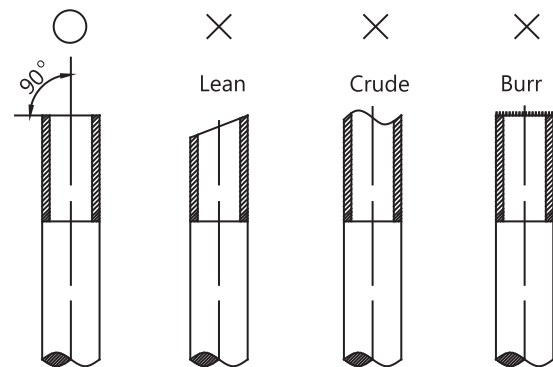


Fig.10-1

Table - 4

CAUTION: Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provided. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to ensure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

- Precautions should be taken to prevent heat damage to service valve by wrapping a wet rag around it, as shown in the image below. Also, protect all painted surfaces and insulation during brazing. After brazing, cool joint with a wet rag.

- Valve can be opened by removing the plunger cap, and then fully insert a hex wrench into the stem turning counter-clockwise until the valve stem just touches the chamfered retaining wall.

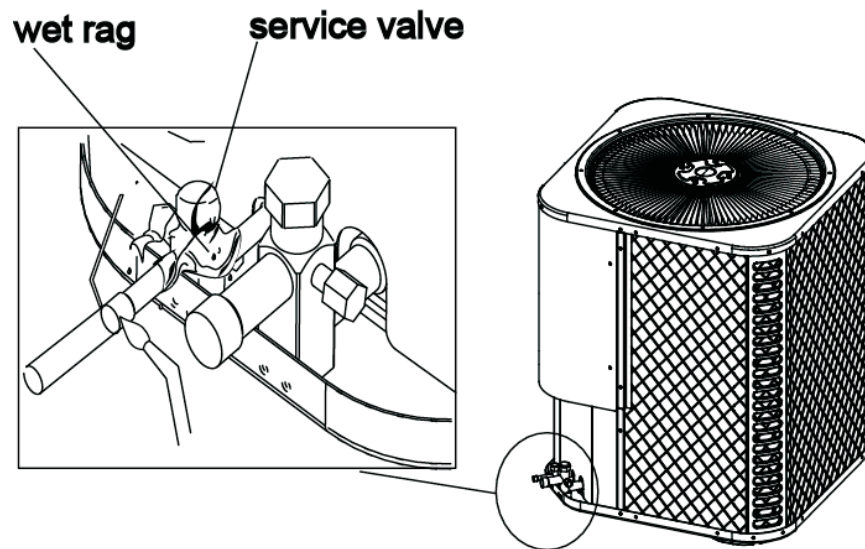


Fig. 10-2

11. Vacuum Drying and Leakage Checking

Purpose of vacuum drying

- Eliminating moisture in system to prevent the phenomena of ice-blockage and copper oxidation. Ice-blockage can cause abnormal operation of system, while copper oxide can damage the compressor.
- Eliminating the non-condensable gas (air) in the system to prevent the components from oxidizing, pressure fluctuation, or bad heat exchange during the operation of system.

Selection of vacuum pump

- The vacuuming capability of the vacuum pump should be 756 mmHg or above.
- Precision of vacuum pump should reach 0.02 mmHg or above.

Operation procedure for vacuum drying

There are two kinds of vacuum drying that can be used depending on the environment, when the unit is installed. These are ordinary vacuum drying and special vacuum drying. These consist of the following:

Ordinary vacuum drying

1. When conducting the first vacuum drying, connect pressure gauge to the infusing mouth of the gas pipe and liquid pipe, and keep vacuum pump running for an hour (vacuum degree of vacuum pump shall be reached -755mmHg).
2. If the vacuum degree of vacuum pump can not reach -755 mmHg after 1 hour of drying, it indicates that there is moisture or leakage in the pipeline system and will need to continue drying for half an hour.
3. If the vacuum degree of vacuum pump still can not reach -755 mmHg after 1.5 hours of drying, check for leaks.
4. Leakage test : After the vacuum degree reaches -755 mmHg, stop vacuum drying and keep the pressure for 1 hour. If the indicator of the vacuum gauge increases, that indicates that there is still moisture or a leak present.

Special vacuum drying

The special vacuum drying method should be used when:

1. Finding moisture during flushing the refrigerant pipe.
2. Conducting installation on a rainy day, because rain water could penetrate into the pipeline.
3. Install period takes an extended amount of time, rain water might penetrate into the pipeline.
4. Be sure to use a micron gauge during vacuuming that can hold under 800 microns. Pull down to 500 microns.

12. Additional Refrigerant Charge

After the vacuum drying process is carried out, the additional refrigerant charge process needs to be performed. The outdoor unit is factory charged with refrigerant. The additional refrigerant charge volume is decided by the diameter and length of the liquid pipe between the indoor and outdoor unit. Refer to the following formula to calculate the charge volume.

Diameter of liquid pipe (IN [mm])	1/4 [6.35]	3/8[9.52]	1/2[12.7]
Formula	$V=0.22 \text{ oz} \times (L-16)$	$V=0.43 \text{ oz} \times (L-16)$	$V=0.64 \text{ oz} \times (L-16)$

V: Additional refrigerant charge volume (oz).

Table - 5

L : The length of the liquid pipe (ft).

- Refrigerant may only be charged after the vacuum drying process is performed.
- Always use gloves and glasses to protect your hands and eyes during the charging process.
- Use an electronic scale or fluid infusion apparatus to weigh refrigerant to be recharged. Be sure to avoid extra refrigerant being charged, as it may cause damage to the compressor, cause a leak, or could result in personal injury.
- Use supplementing flexible pipe to connect refrigerant cylinder, pressure gauge and outdoor unit. The refrigerant should be charged in liquid state.
- After the refrigerant recharge process, check for refrigerant leakage at the connection joint. (Using a gas leakage detector or soapy water to detect).

Note: There are two ways to verify the correct refrigerant charge. The most commonly used method is to adjust the refrigerant charge based on the subcooling range. The second method is rarely used, but it is included for reference only. Multiply the length of the liquid pipe and the empirical coefficient (the coefficient is determined by the pipe diameter) to verify the correct charge. This method is rarely used.

13. Engineering of Insulation

Insulation of refrigerant pipe

Operational procedure of refrigerant pipe insulation

1. Cut the suitable pipe
2. Insulation (except joint section)
3. Flare the pipe
4. Piping layout and connection
5. Vacuum drying
6. Insulate the joint parts

Purpose of refrigerant pipe insulation

- During operation, temperature of gas pipe and liquid pipe could be extremely hot or cold. Therefore, it is necessary to insulate them; otherwise it can affect the performance of the unit and damage the compressor.
- Gas pipe temperature is very low during cooling. If insulation is insufficient, it can form condensation and cause leakage.
- Temperature of gas pipe is very high, generally 122°F-212°F (50-100°C) during heating. Insulation must be used to prevent injury.

Insulation material selection for refrigerant pipe

- Should be able to withstand temperatures of above 248° F (120°C)
- Insulation should be made of a material that meets the standards of local laws and regulations
- The thickness of insulation layer should be above 10mm. If in a hot or wet environment, the layer of insulation should be thicker.

Installation of insulation

Note - Gas pipe and liquid pipe should be insulated separately. If the gas pipe and liquid pipe are insulated together, it will decrease the performance of air conditioner.

- The insulation material at the joint pipe should be 5-10 cm longer than the gap of the insulation material.
- The insulation material at the pipe joint should be inserted into the gap of the insulation material.
- The insulation material at the pipe joint should be wrapped to the gas pipe and liquid pipe tightly.
- The linking part should use glue to paste together
- Be sure to not wrap the insulation material too tightly, as it may force out air in the material and cause the insulation to be less effective, and lessen its durability.

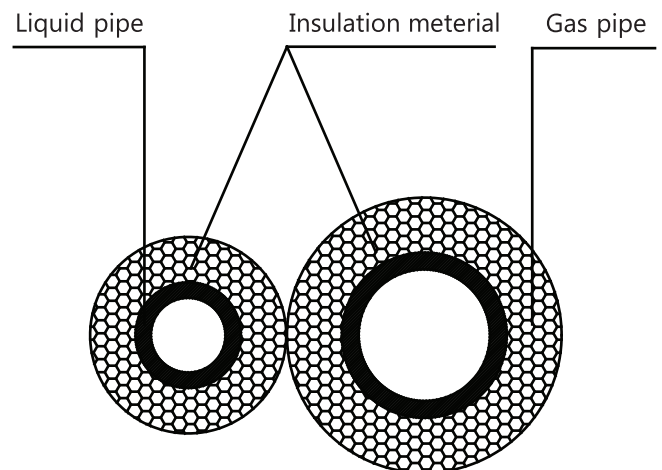


Fig. 13

Insulation of drainage pipe

Operational procedure of refrigerant pipe insulation

- Select the suitable pipe
- Insulation (except joint section)
- Piping layout and connection
- Drainage test
- Insulate the joint parts

Purpose of drainage pipe insulation

The temperature of condensate drainage water is very low. However, if insulation is insufficient, it could cause condensate to form and cause leakage which could lead to property damage.

Insulation material selection for drainage pipe

- The insulation material should be a flame retardant material, and the material should be in accordance to the guidelines of local law.
- Thickness of insulation layer is usually above 10mm.
- Use specific glue to paste the seam of insulation material, and then bind with adhesive tape. The width of tape should not be less than 5cm. Make sure it is firm and avoid condensation.

Installation of insulation

The single pipe should be insulated before connecting to another pipe, the joint should be insulated after the drainage test.

There should be no insulation gap between the insulation material.

Engineering of electrical wiring

Highlights of electrical wiring installation

- All field wiring construction should be performed by a qualified electrician.
- Air conditioning equipment should be grounded according to the local electrical regulations.
- Current leakage protection switch should be installed.
- Do not connect the power wire to the terminal of signal wire.
- When power wire is parallel with signal wire, put wires to their own wire tube and remain at least 300mm gap.
- Using the following tables to select the proper wire guage.
- Select different colors for different wire according to relevant regulations.
- Do not use metal wire tube where it could be exposed to acid or alkali corrosion. Use plastic wire tube to replace it.
- There must be not wire connect joint in the wire tube If joint is a must, set a connection box at the place.
- Wiring of varying voltage should not be in one wire tube.
- Ensure that the color of the wires of the outdoor unit and the terminal No. are same as those of indoor unit respectively.

Electric Wiring Guage

Model (cooling only type)			18K	24K	30K	36K	42K	48K	60K
Line Gauge	Indoor Unit Power Line	Line Quantity	3	3	3	3	3	3	3
		Line Diameter(AWG)	16	16	16	16	16	16	16
	Outdoor Unit Power Line	Line Quantity	3	3	3	3	3	3	3
		Line Diameter(AWG)	14	14	12	12	10	10	10
	Outdoor-Indoor Singal Line	Line Quantity	2	2	2	2	2	2	2
		Line Diameter(AWG)	18	18	18	18	18	18	18
	Thermostat Singal Line	Line Quantity	4	4	4	4	4	4	4
		Line Diameter(AWG)	18	18	18	18	18	18	18

Table - 6

Model (cooling & heating type)			18K	24K	30K	36K	42K	48K	60K
Line Gauge	Indoor Unit Power Line	Line Quantity	3	3	3	3	3	3	3
		Line Diameter(AWG)	16	16	16	16	16	16	16
	Outdoor Unit Power Line	Line Quantity	3	3	3	3	3	3	3
		Line Diameter(AWG)	14	14	12	12	10	10	10
	Outdoor-Indoor Singal Line	Line Quantity	2	2	2	2	2	2	2
		Line Diameter(AWG)	18	18	18	18	18	18	18
	Thermostat Singal Line	Line Quantity	6	6	6	6	6	6	6
		Line Diameter(AWG)	18	18	18	18	18	18	18

Table - 7

15. Test Operation

The test operation must be carried out after the entire installation has been completed.

Check off the following before testing the operation:

- ☐ Are both the indoor unit and outdoor unit installations completed?
- ☐ Is tubing and wiring completed?
- ☐ Have you checked the refrigerant pipe system for leaks?
- ☐ Is drainage unimpeded?
- ☐ Is the ground wiring connected correctly?
- ☐ Has the length of the tubing and added stow capacity of the refrigerant been recorded?
- ☐ Does the power voltage fit the rated voltage of the air conditioner?
- ☐ Are there any obstacles blocking the outlet or inlet of the outdoor and indoor units?
- ☐ Are both the gas -side and liquid-side valves fully opened?

Note - the air conditioner is pre-heated by turning on the power.

To test the operation, set the air conditioner under the mode of "COOLING" by remote controller, and check the following points.

Indoor Unit:

- ☐ Does the switch on the controller work well?
- ☐ Do the buttons on the remote controller work well?
- ☐ Do the air flow louvers move normally?
- ☐ Has the room temperature adjusted well?
- ☐ Do the indicator lights work normally?
- ☐ Do the temporary buttons work well?
- ☐ Is the drainage normal?
- ☐ Is there vibration or abnormal noise during operation?

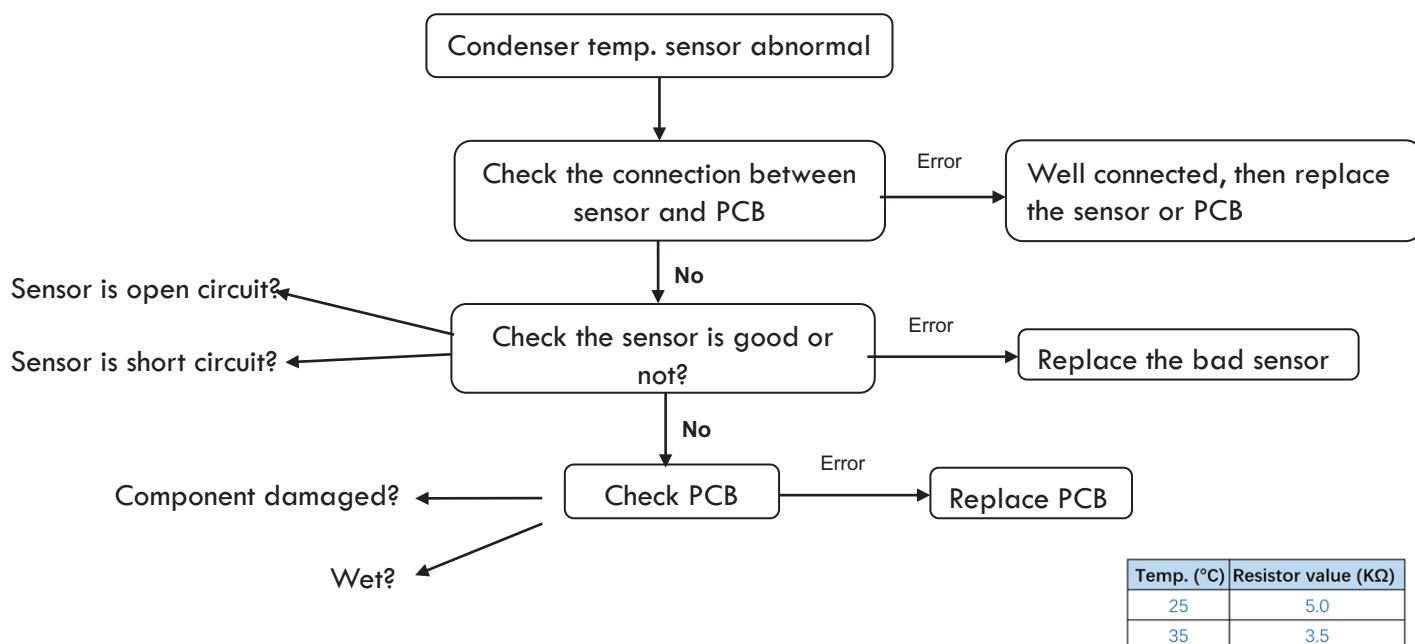
Outdoor Unit:

- ☐ Is there any vibration or abnormal noise during operation?
- ☐ Does the generated wind, noise, or condensation created by the air conditioner have any negative influence on the surrounding area?
- ☐ Has any of the refrigerant leaked?

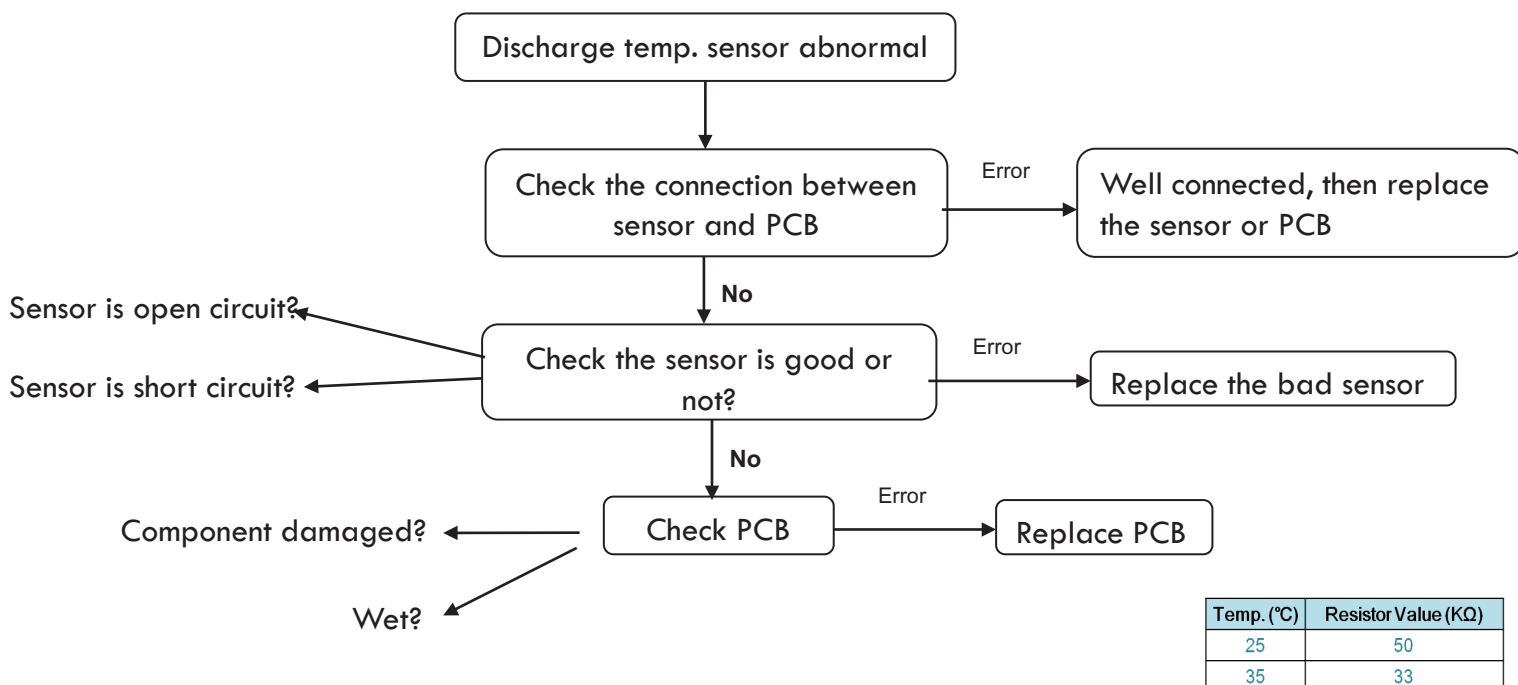
16. Troubleshooting

Display content		State description
No alarm: green light flashes Yellow lights	Green light slow flash	Normal standby
	Green light normally on	Normal operation
System Alarm: Green light or Yellow light slowly flashes	(T3)Temperature sensor fault	Yellow light flashes 2 times every 8 seconds
	(T5)Temperature sensor fault	Yellow light flashes 8 times every 8 seconds
	Low air pressure alarm	Yellow light flashes 6 times every 8 seconds
	High pressure alarm	Yellow light flashes 1 times every 8 seconds
	(T3)High temperature protection	Yellow light flashes 9 times every 8 seconds
	High exhaust temperature protection	Yellow light flashes 5 times every 8 seconds
System lock: Green light goes out and Yellow light is on	3 high/low voltage protection in 20 minutes	Turn off power for 10-15 minutes and then restart.
	Exhaust temperature is too high for 3 times within 20 minutes	
	T3 high temperature protection 3 times within 20 minutes	

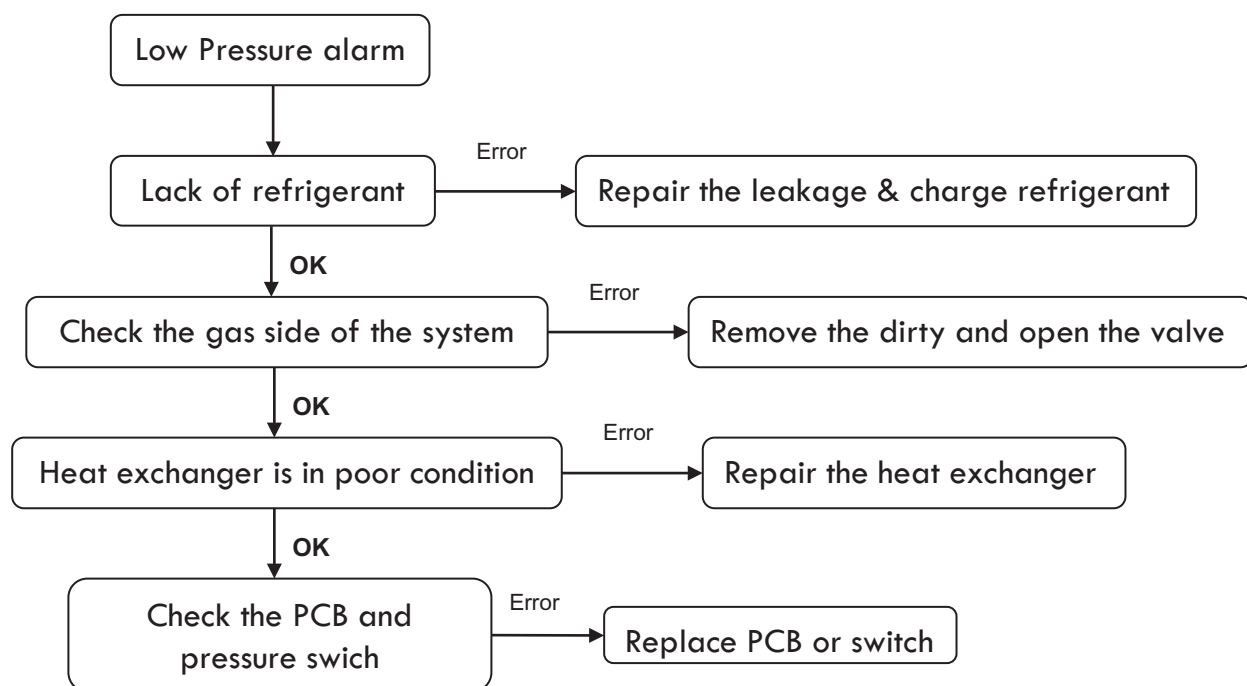
T3 Condenser Temperature sensor fault



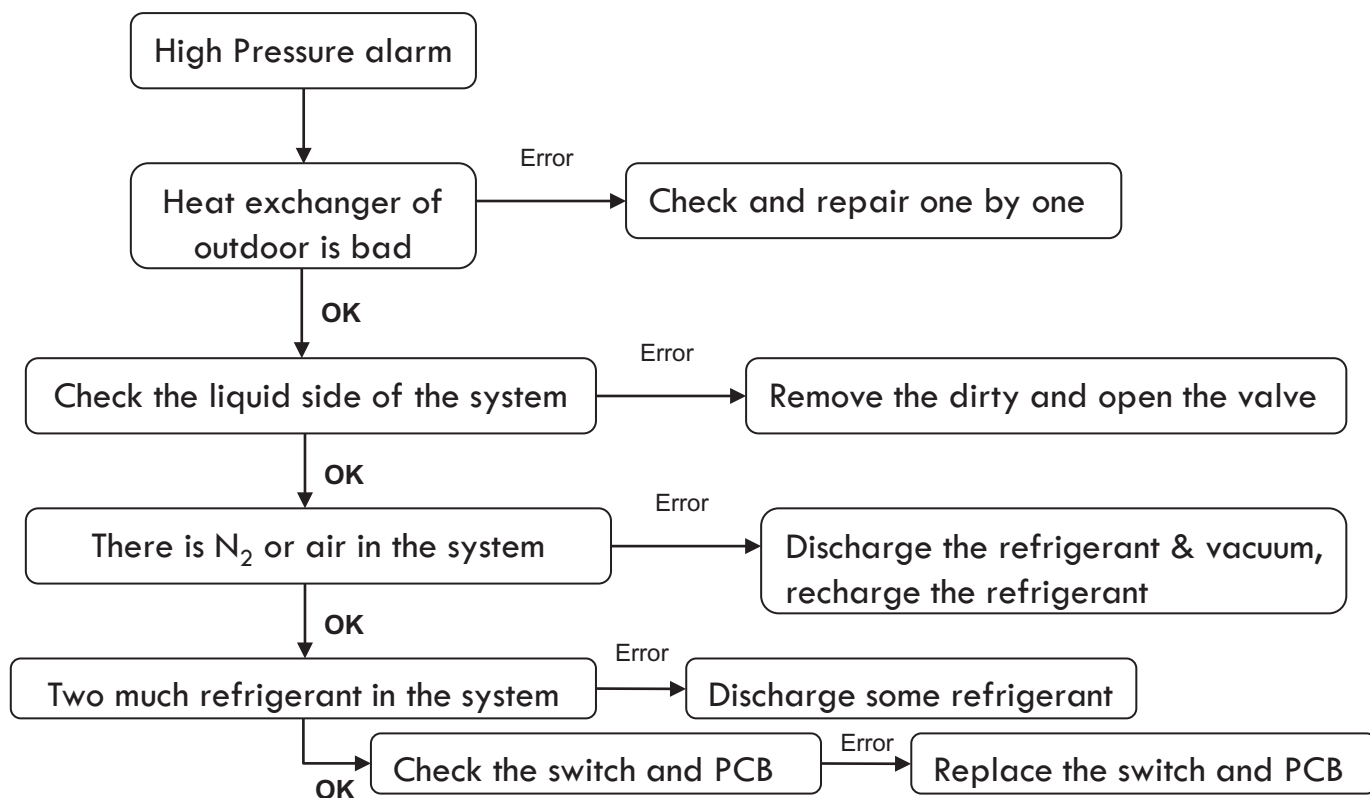
T5 discharge Temperature sensor fault



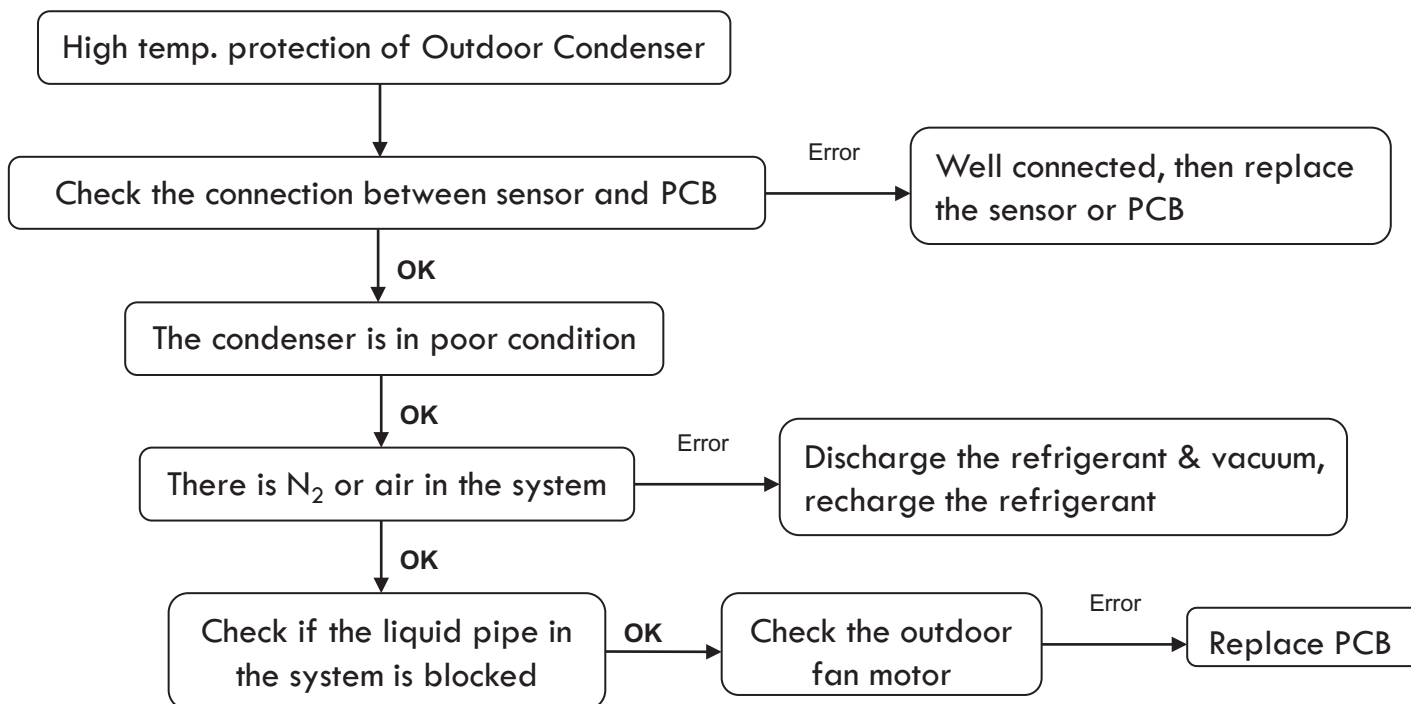
Low pressure alarm



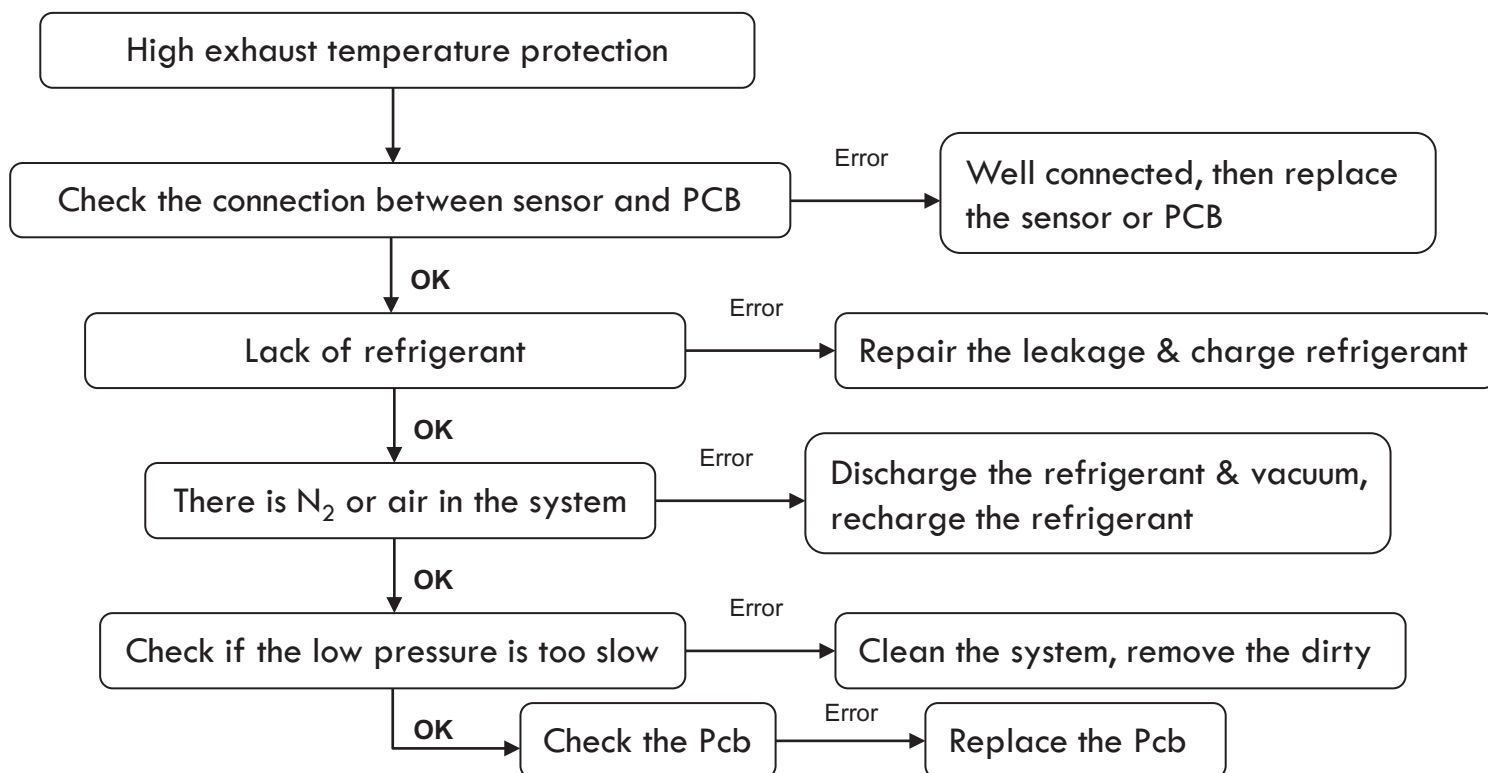
High pressure alarm



(T3)High temperature protection



High exhaust temperature protection





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Consult with the sales agency or manufacturer for details.