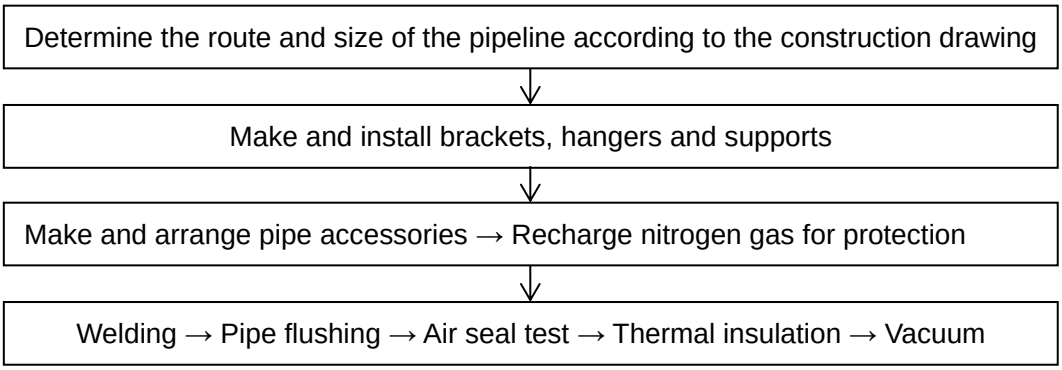
4. Refrigerant pipe installation

4.1 Basic requirements

4.1.1 Operation procedure



4.1.2 Three principles for refrigerant piping

Principle	Reasons	Countermeasure
Dry	Rainwater/Engineered water / Condensation may enter the piping system	The process of tubing must follow standard procedures → Blow cleanly → Vacuum
Clean	Oxidation produced by welding/Outside dust /Sundries	Charge nitrogen gas to prevent oxidation when welding/Attention the cleanness during the piping process → Blow clean
Air seal	Imprecision welding/Unqualified airproof to bell-mouth/Leakage of the fringe	Use suitable welding rod to weld/Comply with welding operation criteria/Comply with bell-mouth connecting operation criteria/Comply with the interface operation criteria →Air seal test

Caution: Removing oil from copper pipe of a system that uses R410A

For the system that uses R410A, oil-free copper pipes should be selected (they can also be customized). If ordinary (oily) copper pipes are used, it must be cleaned with gauze that is dipped into tetrachloroethylene solution.

Purpose of cleaning copper pipe: Remove the lubrication (industrial oil used during the processing of the copper pipe) attached to the inner wall of the copper pipe. The ingredients of such lubricants are different from those of the lubricants used by the R410A refrigerant, and will leave deposits in the system, which may cause complex system errors.

Special Note: Never use CCl4 for pipe cleansing and flushing, or the system will be seriously damaged.

4.1.3 Support for refrigerant pipe

1. Fixing horizontal pipe

When the air conditioner is running, the refrigerant pipe will deform (for example, shrunk/expanded or droop). To avoid pipe damage, use hangers or supports (see the table below for the criteria).

Pipe Diameter (mm)	Less than Φ20	Φ20-40	Larger than Φ40
Interval between support points (m)	1	1.5	2

In general, gas pipe and liquid pipe should be suspended in parallel, and the interval between support points should be selected according to the diameter of the gas pipe. The temperature of the flowing refrigerant will change according to operation and working conditions, which will result in expansion and shrinkage of the refrigerant piping, therefore piping with thermal insulation should not be clamped tightly, in order to avoid any rupturing of the copper piping as a result of unnecessary stress.

2. Fixing vertical piping

Fix the pipe along the wall according to the pipeline route. Round log should be used at the pipe clip to replace thermal insulation material, “U”-shape pipe should be fixed outside the round log, and the round log should be provided with anticorrosion treatment.

Pipe Diameter (mm)	Less than Φ20	Φ20-40	Larger than Φ40
Interval between support points (m)	1.5	2	8.2(2. 5)

3. Local fixing

To avoid stress resulting from pipe expansion and shrinkage, it is usually required to conduct local fixing beside the wall through-holes of the branch pipe and end pipe.

4.1.4 Requirements for installing branch pipe subassembly

When laying the branch pipe subassembly, pay attention to the following:

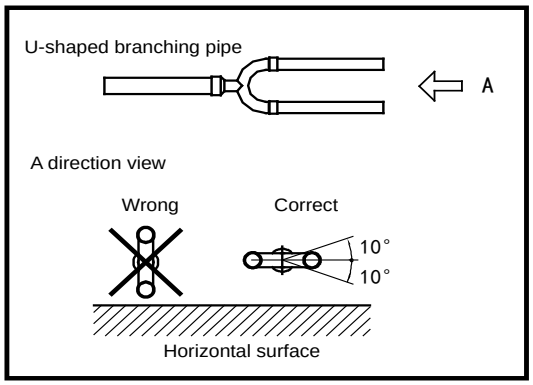
1) Do not replace branch pipe with tee pipe.

2) Follow the construction drawing and installation instructions to confirm the branch pipe models as well as the main pipe and branch pipe.

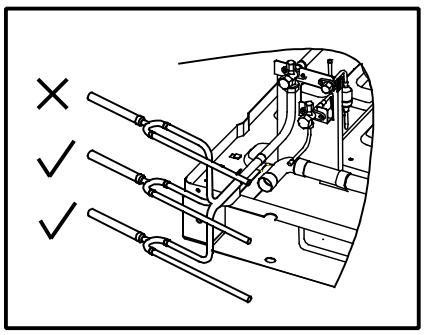
3) Sharp bends (an angle of 90°) and connection to other branch pipe subassembly are not allowed within 500mm of the branch pipe subassembly.

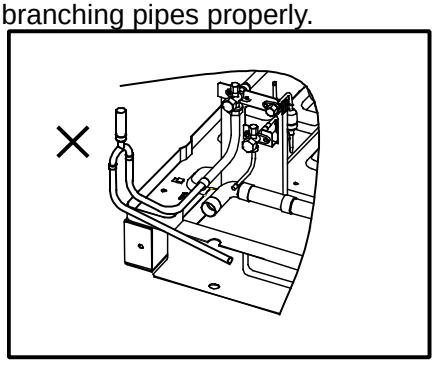
4) It is best to install the branch pipe subassembly at a place that facilitates welding (if doing so is impossible, it is recommended to prefabricate the subassembly).

5) Install vertical or horizontal branch joints, and ensure that the horizontal angle is within 10°. Refer to the right side picture:



6) To avoid oil accumulation in the outdoor unit, please install the branching pipes properly.



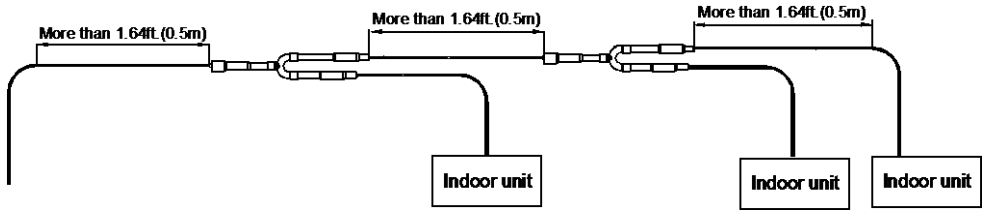


7) To ensure even distribution of refrigerant, pay attention to the distance between the branch pipe subassembly and the horizontal straight pipe.

a. Ensure that the distance between the bending point of copper pipe and the horizontal straight pipe section of the adjacent branch pipe is larger than or equal to 0.5m.

b. Ensure that the distance between the horizontal straight pipe sections of the two adjacent branch pipes is larger than or equal to 0.5m.

c. Ensure that the distance between the branch pipe and the horizontal straight pipe section used to connect the indoor unit is larger than or equal to 0.5m.



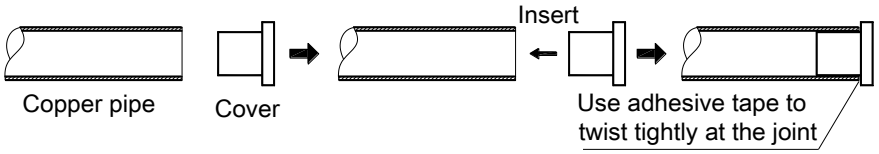
4.2 Storage and maintenance of copper pipe

4.2.1 Pipe delivery and storage

1. Prevent bending or deforming during the delivery.
2. Seal the openings of the copper pipe with a plug or adhesive tape during the storage.
3. Place the coil upright to avoid compressing deformation due to self-weight.
4. Use wooden support to ensure that the copper pipe is higher than the ground, so as to make the pipe dust-proof and water-proof.
5. Take dust-proof and water-proof measures at both ends of the pipe.
6. Store piping at a specified place on the construction site.

4.2.2 Correct to seal the opening

1. There are two ways for opening sealing:
1) Sealing with cover or adhesive tape (suitable for short-term storage)
2) Wielding seal (suitable for long-term storage)
Caution: The openings of the copper pipe must be sealed at all times during construction.
● Method of sealing with cover or adhesive tape



It is recommended to seal the openings of the pipe with both cover and adhesive tape.
● Wielding seal method
2. Attention:
1) When putting the copper pipe through the hole in the wall, dirt can easily enter into the pipe, the pipe orifice should be sealed.
2) When the copper pipe is placed outside a wall, ensure that no rain water can enter the pipe, particularly when the pipe is placed upright.
3) Before completing the pipe connection, seal the openings of the pipe with covers.
4) Place the openings of the pipe vertically or horizontally.
5) Before putting the pipe outside the wall, seal the opening of the pipe with a cover.
6) Do not place the pipe directly on the ground, or keep it away from ground friction.
7) If piping on a raining day, remember to seal the openings of the pipe first.

4.3 Processing of copper pipe

4.3.1 Pipe cutting

1. Tool
Use a pipe cutter instead of a saw or cutting machine to cut the pipe.
2. Correct operation procedure:
Rotate the pipe evenly and slowly, and apply even force to it. Cut the pipe off while ensuring that it does not become deformed.
3. Risks if a saw or cutting machine is used to cut pipe:
Copper shavings will enter the pipe; these particles are difficult to remove and pose a serious risk to the system if they enter the compressor or block the throttling unit.

4.3.2 Rectify opening of copper pipe

1. Purpose
To shave away any burrs at the opening of the copper pipe, clean the inside of the pipe, and rectify the opening of the pipe, so as to avoid scratches at the opening to be sealed during flaring.
2. Operation procedure
1) Use a scraper to remove the inner spurs. When doing so, keep the opening of the pipe downwards to avoid

copper shavings from entering the pipe.

2) After the chamfering is completed, use veiling to remove the copper chip out of the pipe.

3) Ensure piping is not scarred, so as to avoid any breaches during flaring.

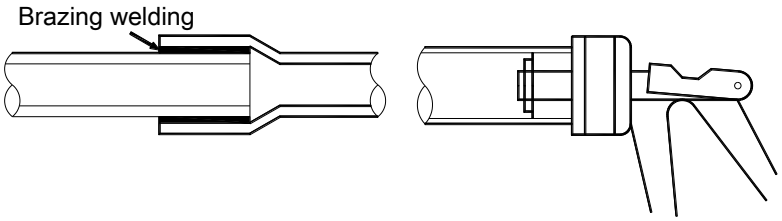
4) If the pipe end is deformed, cut the end off and then cut the pipe again.

4.3.3 Pipe expansion

1. Purpose: Expand the opening of the pipe so that another copper pipe can be inserted, serves as an alternative to direct connections and reduces welding spots.

2. Attention: Ensure that the connection part is smooth and even; after cutting the pipe off, remove the inner spurs.

3. Operation method: Insert the expanding head of the pipe expander into the pipe. After completing pipe expansion, rotate the copper pipe a few degrees to rectify the straight line mark embedded by the expanding head.



4.3.4 Bell-mouthed opening

1. Purpose: Flaring bell-mouthed opening is used for screw thread connection.

2. Attention::

1) Before performing the bell-mouthed opening operation, perform fire annealing for the hard pipe.

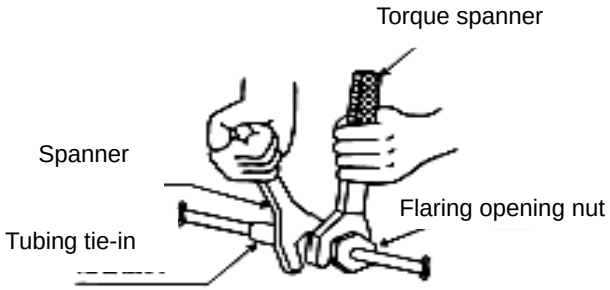
2) Use a pipe cutter to cut pipe ensuring even cross sections and avoid refrigerant leakage; do not use a steel saw or metal cutting device to cut pipe, in order to avoid deformation and prevent shavings from entering the pipe.

3) Remove burrs carefully to avoid scars on the bell-mouthed opening, which may lead to refrigerant leakage.

4) When connecting pipes, use two spanners (one torque wrench and one non-adjustable spanner).

5) Before conducting opening bell-mouthed, install pipe onto the flaring nut.

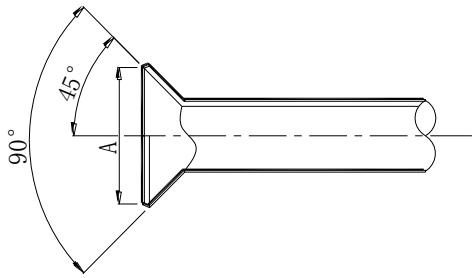
6) Use proper torque to tighten the flaring nut..

Pipe Diameter (mm)	Torque		Legend
	(kgf-cm)	(N-cm)	
6. 35	144~176	1420~1720	
9. 53	333~407	3270~3990	
12. 7	504~616	4950~6030	
15. 9	630~770	6180~7540	
19. 1	990~1210	9270~11860	

Caution: When you are tightening the flaring nut with a spanner, the tightening torque will be suddenly increased at a certain point. From this point, further tighten the flaring nut to the angles shown below.

Pipe Diameter (mm)	Angle of further tightening	Recommended length of tool lever (mm)
9. 53	60°~90°	About 200
12. 7	30°~60°	About 250
15. 9	30°~60°	About 300

7) Check whether the surface of the flaring opening is damaged. The size of the flaring opening is as shown below.

Pipe Diameter (mm)	R410A Size of Flaring Opening (A)	Legend
6. 35	8. 7~9. 1	
9. 53	12. 8~13. 2	
12. 7	16. 2~16. 6	
15. 9	19. 3~19. 7	
19. 1	23. 6~24. 0	

Cautions:

a. Apply some refrigeration oil onto the inner surface and outer surface of the flared opening, to facilitate the connection or rotation of the flaring nut, ensure firm connection between the sealing surface and the bearing surface, and avoid pipe bending.

b. Ensure that the flared opening is not cracked or deformed, otherwise it cannot be sealed or, after the system runs for some time, refrigerant leakage will occur.

4.3.5 Pipe bending

1. Method

1) Manual bending: Suitable for thin copper pipes Φ6.35mm - Φ12.7mm.

2) Mechanical bending: Suitable in a wide range of copper pipes (Φ6.35mm-Φ67mm). Spring bender, manual bender or electric bender is used.

Purpose: Reduce welding joints and required elbows, and improve engineering quality; save material, no joint is needed.

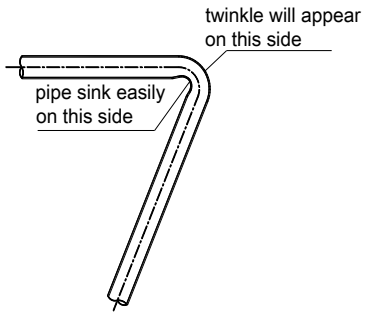
2. Caution

1) When bending a copper pipe, ensure that there are no wrinkles or deformation on the inner side of the pipe.

2) When using a spring bender, ensure that the bender is clean before inserting it in the copper pipe.

3) When using a spring bender, ensure that the bending angle does not exceed 90°, otherwise wrinkles will appear on the inner side of the pipe, and the pipe may crack.

4) Ensure that the pipe does not sink during the bending process; ensure that the cross section of the bending pipe is larger than 2/3 of the original area, otherwise it cannot be used.



4.4 Brazing

4.4.1 Selecting refrigerant pipe

1. All pipe used shall comply with national or local standards (for example, pipe diameter, material, thickness, etc.)

2. Specifications: Seamless phosphorus to oxygenate copper pipe

3. It is best to use straight pipe or coil and avoid excessive brazing.

Note: Select the pipes according to the pipe diameters shown below (O—coil, 1/2H—straight pipe)

Outer Diameter (mm)	Material	Minimum Thickness (mm)	Outer Diameter (mm)	Material	Minimum Thickness (mm)	Outer Diameter (mm)	Material	Minimum Thickness (mm)
Φ6. 35	O	0. 8	Φ19. 1	O	1. 0	Φ38. 1	1/2H	1. 5
Φ9. 53	O	0. 8	Φ22. 2	1/2H	1. 2	Φ44.5	1/2H	1. 5
Φ12. 7	O	0. 8	Φ25. 4	1/2H	1. 2	Φ54. 0	1/2H	1. 8
Φ15. 9	O	1. 0	Φ28. 6	1/2H	1. 3	Φ67. 0	1/2H	1. 8

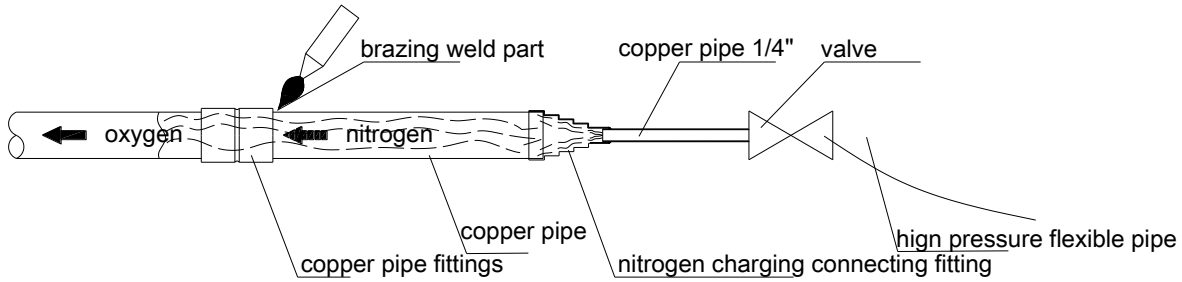
4.4.2 Nitrogen filling to protect copper pipe during brazing

1. Purpose: Avoid oxide scale formation on the inner wall of the copper pipe caused by high temperature

2. Risks of non-protective welding:

If insufficient nitrogen is charged during brazing, oxides will form on the inner wall of the copper pipe. These oxides will block the refrigerant system, which will lead to various malfunctions such as compressor burnout, poor cooling efficiency.

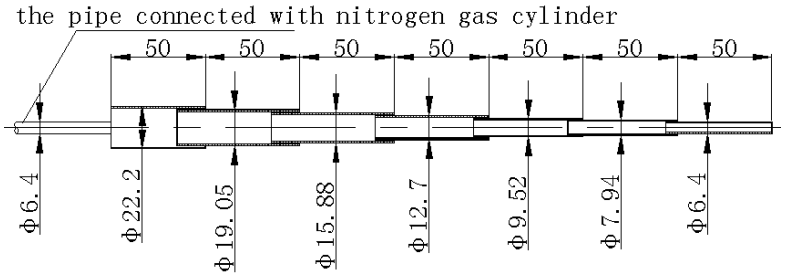
To avoid these problems, charge nitrogen continuously into the refrigerant pipe during brazing, and ensure that the nitrogen continuously passes through the operating point until the welding is completed and the copper pipe cools down completely. The diagram for nitrogen charging is shown below.



3. Making nitrogen-charging pipe joint

When welding the pipe joint, connect the nitrogen-charging joint to the pipe fittings to be welded.

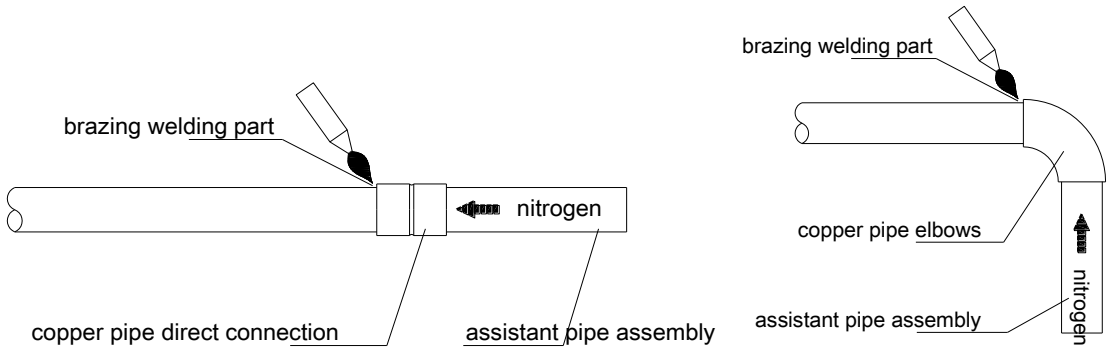
The nitrogen-charging joint is shown below:



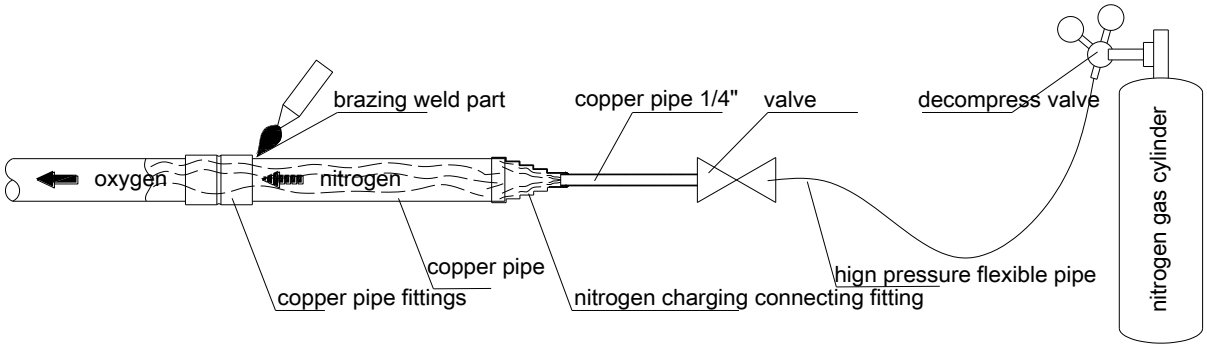
4. Cautions for welding pipe fittings

1) Adopt transition pipe.

2) Charge nitrogen from the side of the short pipe, because short distance may result in perfectible nitrogen replacement effect.

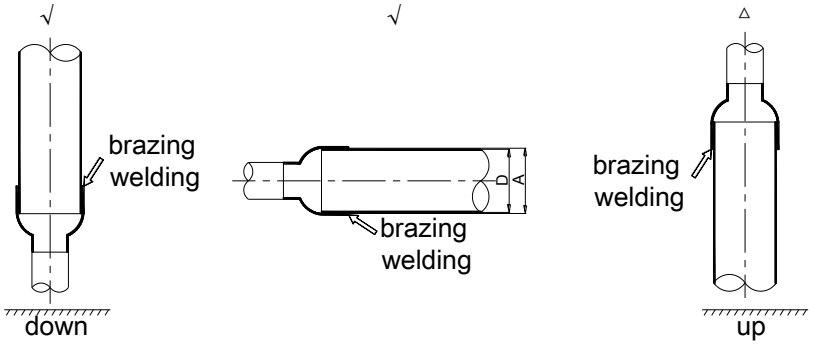


5. Standard brazing operation



Attention:

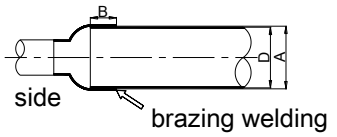
1) Maintain the nitrogen pressure at around 0.2-0.3kgf/cm² during the welding.
2) Ensure the gas is nitrogen other than oxygen, oxygen will easily leads explosion, so it is forbidden.
3) Use a pressure reducing valve, and maintain the nitrogen pressure at around 0.2kg/ cm².
4) Select a proper position for charging nitrogen.
5) Ensure that the nitrogen passes through the welding spots.
6) If the pipe between the position for charging nitrogen and the welding spot is long, ensure that the nitrogen is charged for sufficient time so as to discharge all the air from the welding area.
7) After completing the welding, charge the nitrogen continuously until the pipe cools down completely.
8) Try best to conduct welding downwards or horizontally and avoid face-down welding.



6. Cautions

1) Take fire-prevention measures when conducting welding (ensure that a fire extinguisher is available near the operating area).
2) Avoid getting burnt.
3) Pay attention to the fit gap of the position where the pipe is inserted.

Note: The following table shows the relation between the minimum embedded depth and gap at the copper pipe joint.

Type	Outer diameter of pipe (D) (mm)	Minimum inlaid depth (B) (mm)	Gap A—D (mm)
	5<D<8	6	0. 05-0. 21
	8<D<12	7	
	12<D<16	8	0. 05-0. 27
	16<D<25	10	
	25<D<35	12	0. 05–0. 35
	35<D<45	14	

4.5 Pipe cleaning

4.5.1 Flushing copper pipe

1. Function: use pressurized gas to flush pipeline (raw material or welded assembly) to remove dust and moisture. Removing solid foreign material is difficult therefore steps should be taken to protect it during construction.

2. Purpose

1) Eliminate oxide powder or part oxide layer in copper pipe.

2) Help to clear dirt and humidity out of piping.

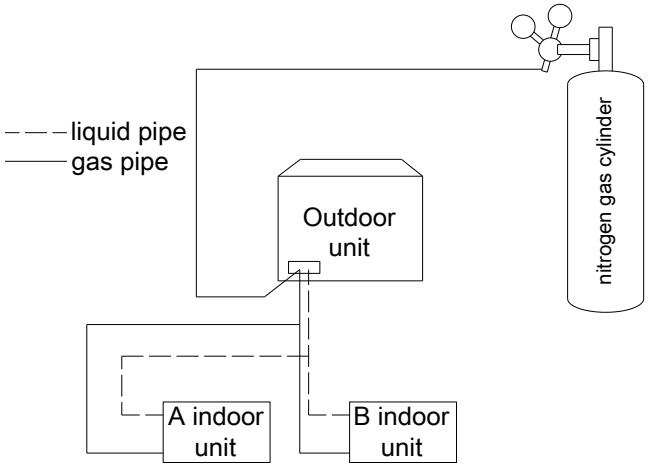
3. Risks of not flushing:

If solids or moisture remain in the system serious malfunctions will occur, such as ice blockage, dirt blockage and compressor jamming.

4.5.2 Flushing procedure

1. Mounting pressure adjusting valve on nitrogen gas cylinder. The applied gas must be nitrogen. If polytetrafluoro ethylene or carbon dioxide is used, there is risk of condensation. If using oxygen, there is risk of explosion.

2. Use inflation tube to connect the pressure adjusting valve outlet to the inlet on the liquid pipe side of the outdoor unit.



3. Use blind plug to block all liquid side copper line connectors (including unit B) soundly, excluding indoor unit A.

4. Turn on nitrogen gas cylinder valve, and then using the valve gradually pressurize to 5kgf/cm2.

5. Check to ensure nitrogen has passed through the liquid pipe of indoor unit A. Ensure the connector on the side of indoor unit body has been covered by tape to prevent dirt from entering.

4.5.3 Detailed steps for flushing

1. Use suitable material, such as a bag or cloth, and press it firmly against the main opening on the gas side of the indoor unit.

2. When pressure increases and hands cannot be held against the opening, suddenly release allowing gas to

rush out. (flushing for first time).

Repeat above step1 and step 2 to re-flush dirt (flushing multiple times)

3. When flushing, place a piece of white cotton at the pipe opening to check if there is any moisture.

Method of thoroughly drying pipeline is as follows:

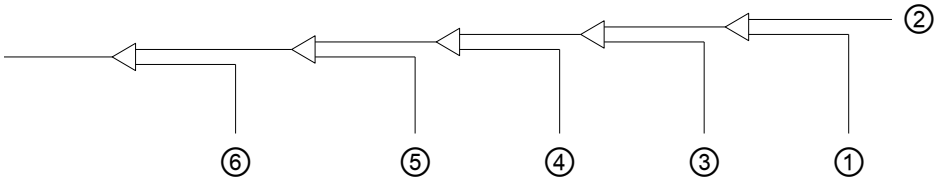
1) Use of nitrogen gas to flush the piping until no dirt and moisture remain.

2) Perform vacuum drying operation (see vacuum drying of MDV refrigerant piping for details).

3) Shut down nitrogen main valve.

4) Repeat the above operations to the connected copper pipe of all indoor units.

5) Flushing sequence: when pipeline has been connected to system, flushing sequence is from farthest to nearest, relative to the main unit, beginning from the farthest pipe opening to the main unit in turn (i.e. 1)-2)-3)-4)-5)-6)).



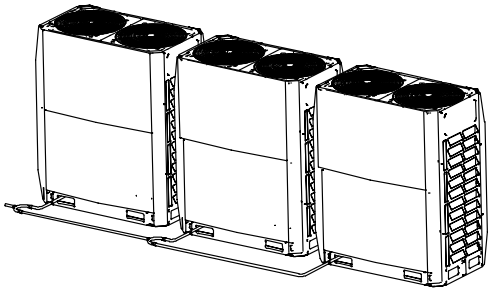
Caution: When flushing one pipe opening, block all other pipe openings which are connected in the same system.

6) After finishing flushing, seal all openings to prevent dust and moisture from entering.

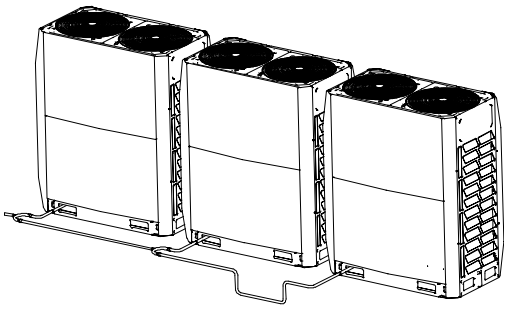
4.6 Piping connection between outdoor units

All connection pipes between outdoor units should be horizontal, it is not allowed the concave at junction site.

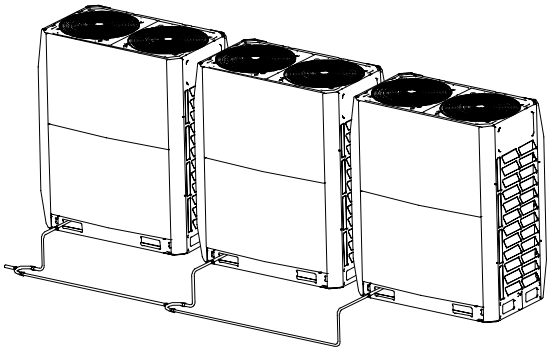
The height of each connection pipe between outdoor units cannot be higher than the refrigerant outlet.



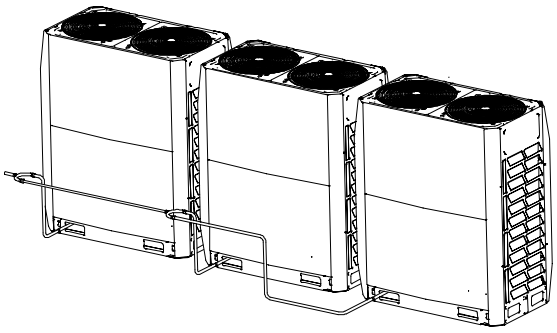
√ Correct way



× Wrong way



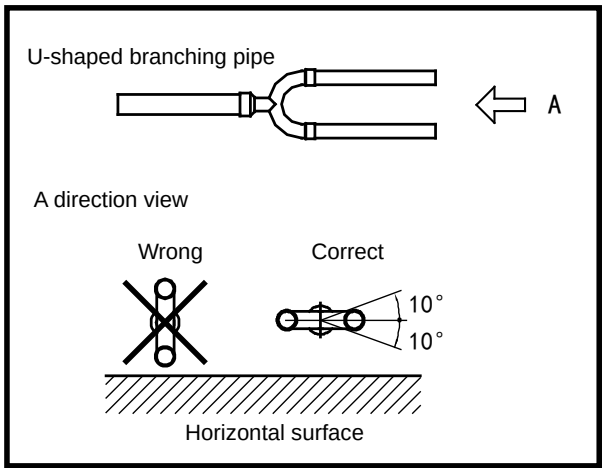
√ Correct way



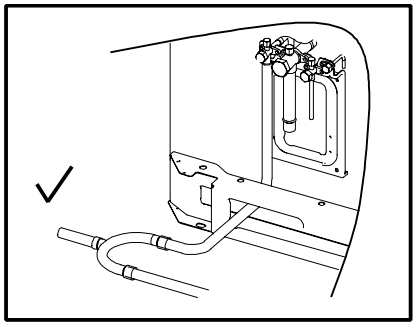
× Wrong way

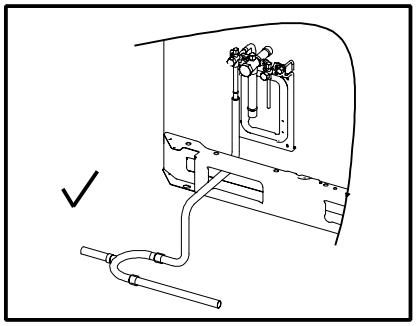
4.7 Branch pipe installation

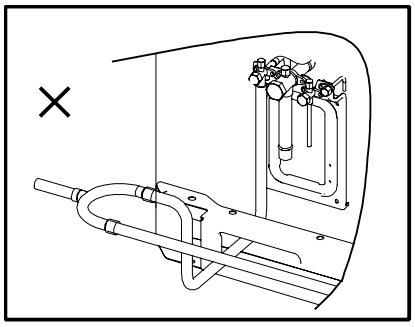
The branching pipe must be installed horizontally and cannot be at an angle greater than 10 degrees.. Otherwise, refrigerant assignment will be uneven and malfunction will occur.

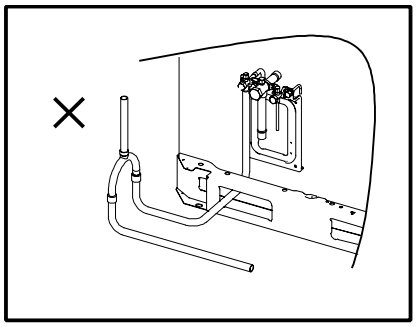


To avoid oil accumulation in the outdoor unit, please install the branching pipes properly.









5. Drainage pipe engineering

5.1 Installation essentials

5.1.1 Installation principles

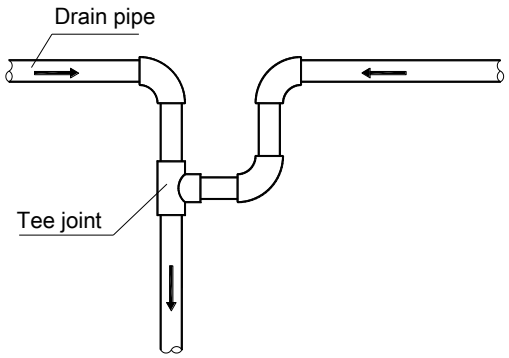
1) Slope; 2) reasonable pipe diameter; 3) nearby discharge

5.1.2 Installation requirements

1. Before installing condensation piping, determine its route and elevation to avoid interference with other pipes and ensure a smooth slope.

2. Make sure two horizontal condensation pipes not encounter to avoid back flow or other complications.

a. Correct connection:



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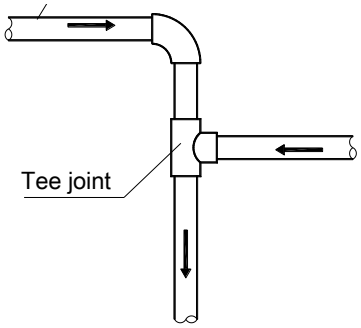

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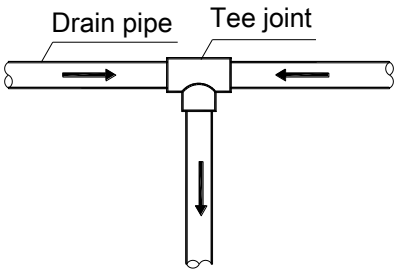
b. Incorrect connection:



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Advantages of correct connection:

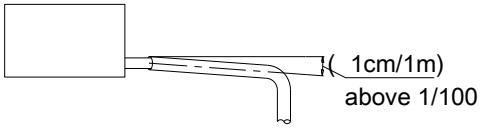
1. No back flow.
2. The slope of two pipes can be regulated separately.

Disadvantages of incorrect connection:

1. Drainage interference.
2. If the fluid volume of one side is greater it will flow to areas with less volume, thus creating back flow into areas of the system with less drainage.
3. Suspender spacing:

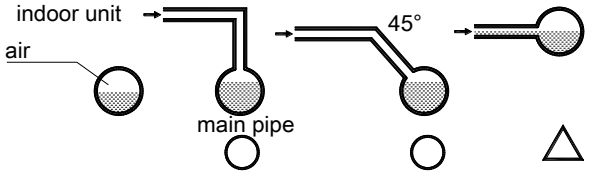
In general, horizontal spacing is 0.8m-1m and vertical spacing is 1.5m-2.0m. Each vertical pipe shall be equipped with not less than two suspenders. Over spacing of suspenders on horizontal piping leads to sagging, and creates to air resistance.

4. The highest point of drainage piping shall be designed with air hole to ensure that condensation can be discharged smoothly. The outlet air hole shall face down to prevent dirt entering piping.
5. After finishing connection, conduct water passing test and overflowing water test to check the smoothness of drainage and ensure there is no leakage.
6. Use appropriate adhesive for thermal insulation materials seam, and then bind with rubber or plastic adhesive tape. The width of the adhesive tape shall not be less than 50mm to ensure firm hold and prevent condensation.
7. The air conditioner drainage pipe shall be installed separately with other waste, rainwater and other drainage piping.
8. The slope of drainage pipe shall be kept above 1/100.



9. In case 1/100 slope cannot be met, consider using a larger-sized pipe and its diameter to create slope.

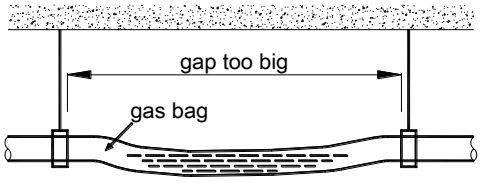
10. Merging pipe shall be done from above to the extent possible in order to avoid back flow to the system.
11. The end of drainage pipe shall not directly contact ground.



Caution

1. The drainage pipe diameter shall meet the draining requirement of indoor unit.
2. The outlet air vent cannot be installed near the lifting pump of the indoor unit.
3. Ensure condensation pump can start up and shut down normally by infusing water into the drainage pan of indoor unit and powering on.
4. All joints shall be firm (particularly PVC pipe).
5. The drainage pipe is not to be set horizontally or at an incline towards the unit, and suspenders shall be used to avoid sagging.
6. Dimension of drainage pipe shall be not less than the connecting mouth size of the indoor units' drainage piping.
7. Work out thermal insulation for drainage pipe to avoid condensation.. Thermal insulation processing shall be continued to the connecting part of indoor unit.
8. Indoor units with different draining pattern shall not share the same concentrated drainage pipe.
9. Discharge of condensation cannot interfere with the normal activities occupants..
10. As for long drainage piping, suspenders shall be used to ensure 1/100 slope without any sagging in the PVC pipe.

※ The support spacing for horizontal piping is 0.8-1.0mm. If the spacing is too large, it shall produce sagging and air resistance, while air resistance could seriously influence the smoothness of water flow and cause abnormal water levels. As shown in following figure:



5.2 Water storing elbow of drainage pipe

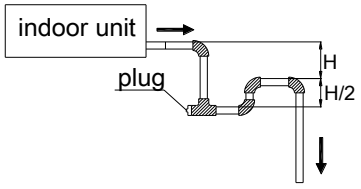
For indoor units with high negative pressure at the outlet of drainage pan, the drainage pipe must be equipped with water storing elbow.

Function of water storing elbow:

When indoor unit is operating, prevents generating negative pressure from causing drainage difficulty or blow water from air outlet.

Installation of water storing elbow:

1. Install water storing elbow as shown in following figure: H shall be more than 50mm.
2. Install one water storing elbow for each unit.
3. When installing ensure future cleaning is convenient.



5.3 Concentrated drainage pipe

5.3.1 Concentrated drainage piping diameter

Select drainage pipe diameter according to indoor unit's combined flow volume.

E.g. If one 1HP unit with 2L/h condensation discharge, the calculation of the combined flow volume of three 2HP units and two 1.5HP units is: 2HPx2L/hx3+1.5HPx2L/hx2 =18L

5.3.2 Relation between horizontal piping diameter and permitted displacement of condensation

PVC piping	Inner diameter of piping(reference value: (mm))	Inner diameter of piping (mm))	Permitted displacement(1/h)		Remark
			Slope 1:50	Slope 1:100	
PVC25	19	20	39	27	(Reference value)could not be used for confluence pipe
PVC32	27	25	70	50	
PVC40	34	31	125	88	Could be used for confluence pipe
PVC50	44	40	247	175	
PVC63	56	51	473	334	

Attention: joints require PVC40 or larger piping.

5.3.3 Relation between vertical piping diameter and displacement of condensation.

PVC piping	Inner diameter of piping(reference value: (mm))	Inner diameter of piping (mm)	Permitted displacement(1/h)	Remark
PVC25	19	20	220	(Reference value)could not be used for confluence pipe
PVC32	27	25	410	
PVC40	34	31	730	Could be used for confluence pipe
PVC50	44	40	1440	
PVC63	56	51	2760	
PVC75	66	67	5710	
PVC90	79	77	8280	

Attention: joints require PVC40 or larger piping.

5.3.4 Operation process of concentrated drainage

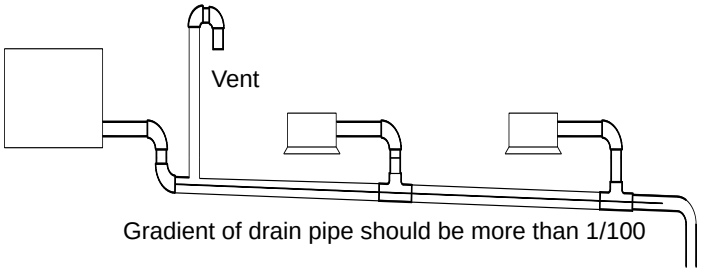
Install indoor unit → connect drainage pipe → water pass test and overflow water test → thermal insulation of drainage pipe

Caution:

1) Increase drainage point as much as possible and reduce quantity of connected indoor units, to ensure horizontal main drainage pipe is not too long.

2) Units with drainage pump and natural drainage shall have separate drainage systems..

3) Add two elbows at air outlet, and make sure its mouth faces down to prevent dirt from entering and creating blockages.



5.4 Lifting of drainage pipe (for the unit with lift pump)

Installation of lift pipe

1. When connecting drainage pipe with indoor unit, use pipe clamp shipped with unit to fix. Glue splicing is not permitted for ensuring convenience in repairing.

2. To ensure 1/100 slope, total lift height of drainage pipe (H) shall depend on indoor unit's pump, and do not set vent pipe on the lifting pipe section. After lifting vertically, immediately place down inclined, otherwise it will cause error operation of switch at water pump. The connecting method is shown as follows:

Note: Air outlet could not be installed on the lifting part; otherwise water shall be discharged to ceiling or could not be discharged.

5.5 Overflow water test and water pass test

5.5.1 Overflow water test

After finishing the construction of drainage pipe system, fill the pipe with water for 24 hours to check for leakage at joints.

5.5.2 Water pass test

1. Natural drainage mode

Fill condensation pan with above 600ml of water slowly through check port, check drainage outlet for water discharge.

2. Pump drainage mode

1) Remove water level switch plug, remove water-finding cover and slowly fill condensation pan with about 2000ml of water through water-finding port to avoid touching the drainage pump motor.

2) Power on and let the air conditioner operate in cooling mode. Check operation status of drainage pump, and then turn on water level switch, check operation sound of pump and transparent hard pipe at drainage outlet to confirm water is being discharged. (Depending on the length of drainage pipe, water shall be discharged after about a 1 minute delay.)

3) Stop the operation of air conditioner and return water-finding cover to its original place.

a. After shutting down the air conditioner, wait for three minutes and check for abnormalities. If drainage pipe was not installed properly, back-flow water will trigger the alarm on the remote control receiver board and water will return to the condensation pan.

b. Add water until reaching alarm water level, ensure the drainage pump can discharge water in a timely fashion. If water level does not decline within 3 minutes of reaching the warning level, it will cause shutdown of unit. When this situation occurs, normal startup shall be carried out after turning off power supply and removing the accumulated water.

Note: Drain plug at the main condensation pan is used for removing accumulated water when maintaining air conditioner. During normal operation, the drain should be plugged to prevent leakage.

6. Duct engineering

6.1 Duct selection

1. The material, specifications, performance and thickness of metal duct should be in accordance with the relevant local regulations and standards. Sheet metal thickness should not be less than the regulations in the table below:

Thickness of steel sheet duct

Diameter(D) or edge length (b) of duct (mm)	Circular duct (mm)	Rectangle duct (mm)	
		Middle/low pressure system	High pressure system
D(b)≤320	0.5	0.5	0.75
320 < D(b)≤450	0.6	0.6	0.75
450 < D(b)≤630	0.75	0.6	0.75
630 < D(b)≤1000	0.75	0.75	1
1000 < D(b)≤1250	1	1	1

2. The material, specifications, performance and thickness of non-metal duct should be in compliance with design and local regulations.

3. The body, frame, fixing material and sealed cushion of fire-proof air duct should be made of non-combustible materials. Its fire resistance rating should be in accordance with the design requirement.

4. The sheathing of composite duct should be made of non-combustible materials. Inner insulation material should be fireproof or fire retardant with a B1 rating.

5. The permitted deviation to outer diameter or long edge of duct: when less than 300mm, it is 2mm; when

more than 300mm, it is 3mm. The permitted deviation of pipe end flatness is 2mm.

Discrepancy between two diagonal lines of rectangle duct shall not be more than 3mm. Discrepancy between two diameters of any cross-cut circular flange shall not be more than 2mm.

6.2 Duct connection

1. Duct connection

1) The seam of duct board splice should be stagger and cross-seam is not allowed.

2) Specifications of metal duct flanges shall not be less than the data as shown in the table below.

Specification to flange and bolt of circular metal duct

Diameter of duct(D) (mm)	Specification of flange (mm)		Specification of bolt
	Flat steel	Angle steel	
D≤140	20×4	-	M6
140 < D≤280	25×4	-	
280 < D≤630	-	25×3	
630 < D≤1250	-	30×4	M8
1250 < D≤2000	-	40×4	

Specifications to flanges and bolts of rectangle metal duct (mm)

Dimension of long edge of duct(b) (mm)	Specification of flange(angle steel) (mm)	Specification of bolt
b≤630	25×3	M6
630 < b≤1500	30×3	M8
1500 < b≤2500	40×4	
2500 < b≤4000	50×5	M10

3) Diameter of bolt and rivet to duct flange for middle/low pressure system should be no more than 150mm. High pressure system ducts should be no more than 100mm.

4) Four sides of rectangle duct flanges should be designed with screw hole.

5) If using reinforcement methods for duct flanges the corresponding specifications may be extended.

2. Connection of nonmetallic duct

Specifications of flanges should be in accordance with standard, gap of bolt hole should be no more than 120m. Four sides of rectangle duct flanges should be designed with screw hole.

3. Strengthening of metal duct

When edge length of rectangle duct is more than 630mm, edge length of insulation duct is more than 800mm and length of pipe section is more than 1250mm, or single-edge level area of low pressure duct is more than 1.2 square meters and single-edge level area of high/middle pressure duct is more than 1.0 square meter, strengthening measures should be taken.

4. Strengthening of nonmetallic duct

When diameter or edge length of HPVC duct is more than 500mm, the joint section of duct and flange should be equipped with strengthening board and the gap should not be more than 450mm.

6.3 Main points for duct connections

1. Supporting, hanging and mounting brackets should be made of angle iron. Position of expansion bolt should be correct, firm and reliable. The buried part could not be painted. Spacing should be in accordance with regulations below:

1) If duct is installed horizontally, spacing should be no more than 4m when diameter or edge length is less than or equal to 400mm, while spacing should be no more than 3m when diameter or edge length is more than 400mm.

2) If duct is installed vertically, spacing should be no more than 4m and ensure there is at least 2 fixed points on each straight pipe.

2. Supporting, hanging and mounting brackets cannot be installed at air vent, valves, checking door and automatically controlled device, and distance to air opening or plugged tube shall not be less than 200mm.

3. Hanging brackets should not be hung above flanges.

4. Thickness of flange gasket should be 3-5mm. Gasket should set flat against flange and inserting to pipe is not allowed. Set up fixed points in suitable areas for hanging pipe to prevent vibration.

5. Vertical splice seam of duct should be stagger. Make sure there is no vertical seam at the bottom of duct installed horizontally. As for the installation of flexible short duct, keep proper tightness and no distortion.

6. All metal parts (including supporting, hanging and mounting brackets) in piping system should be given anti-corrosion treatment.

6.4 Installation of Assembly

1. Air flow regulators should be installed in easily accessible areas..

2. The air vent should be installed firmly and duct should be connected tightly. Duct construction should blend with building design. The appearance should be smooth and level, and regulation is flexible.

3. If air vent is installed horizontally, level deviation should be no more than 3/1000. If air vent is installed vertically, deviation from perpendicular should be no more than 2/1000.

4. Air vent in same room should be installed at the same height, and put in order.

7. Heat Insulation Engineering

The insulation of refrigerating equipment and piping follows general insulation methods. Insulating shall be carried out in a manner best suited for selected insulation material.

7.1 Insulation of Refrigerant Piping

7.1.1 Operational procedure of refrigerant piping insulation

Construction of refrigerant pipe → insulation (excluding joints) →air tightness test → joint insulation

Joints: Insulation of welded joints or flanges should be carried out after air tightness is confirmed.

7.1.2 Purpose of refrigerant piping insulation

1. During operation, temperature of gas pipe and liquid pipe will be heated or cooled excessively. Therefore, is necessary to insulate in order to guarantee unit performance and compressor life span.

2. Gas pipe temperature is very low during cooling. If insulation is insufficient, condensation will form and cause leakage.

3. Temperature of gas pipe is very high (generally 50-100°C) during heating. Insulation serves as a necessary protection from burning.

7.1.3 Selection of insulation materials for refrigerant piping

Adopt closed-cell foam insulation materials with a B1 fire resistant rating and over 120°C of constant burning performance.

7.1.4 Thickness of insulation layer

1. When outer diameter of copper pipe (d) is less than or equal to 12.7mm, the thickness of insulation layer (δ) shall be above 15mm.

When outer diameter of copper pipe (d) is more than or equal to 15.88mm, the thickness of insulation layer (δ) shall be above 20mm.

2. In hot and wet environments, the above recommended value shall be doubled.

Note: The outdoor piping shall be protected by metal casing to protect against sunlight, rain, air erosion and any other potential causes of damage.

7.1.5 Installation and main points of insulation construction

1. Example of incorrect insulation: Gas and liquid piping are insulated together reducing air conditioner efficiency and effectiveness.

2. Example of correct installation:

a. Gas and liquid piping are insulated separately..

Note: After gas pipe and liquid pipe are insulated separately, Do not bind to tightly as the spliced insulation joint will be damaged.

b. All pipe joints shall be insulated.

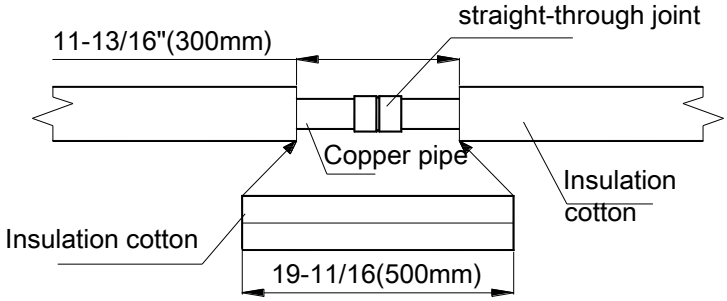
Cautions:

1. Ensure no gaps exist in insulation material joints.

2. Any tape must be applied with appropriate pressure. If applied too tightly insulation may shrink and lose its insulating properties leading to condensation and loss of efficiency.

3. In indoor shield space, it is no necessary to bind belting, so as to avoid influencing insulation effect.

Correct repairing method for insulation cotton: (see the figure below)



Firstly cut out the material longer than gap, expend the two ends and embed the insulated cotton, at last, paste joint with glue.

Main points of insulation repairing:

1. Repaired length of insulation (insulation tube with filled gap) shall be 50~100mm longer than the exposed area.

2. Sliver the cut of insulation to be repaired and cross-section shall be even.

3. Insert gap with insulation for repairing and cross-section shall be pressed tightly.

4. All cross-section and cut need to be pasted with glue.

5. Finally, bind the seam with rubber/plastic tape.

6. Prohibit conducting insulation by using binder fabric in concealed section, so as to avoid influencing insulation effect.

7.2 Insulation of Condensation Pipe

1. Select rubber/plastic tube with a fire retardant of B1 rating.

2. Thickness of insulation layer is usually above 10mm.

3. The insulation material at water outlet should be fixed with glue to the unit body, so as to avoid condensation and dripping.

4. No insulation will be implied if installed in a wall.

5. Use specified glue to seal the seam of insulation material, and then bind with cloth tape. The width of tape shall not be less than 50mm. Ensure tape is fixed firmly to avoid condensation.

7.3 Duct insulation

1. Duct insulation

1) Insulation of duct parts and equipment should be conducted after confirming that the leakage test has been completed and quality of duct is confirmed.

2) Common insulation materials include centrifugal glass cotton, rubber/plastic materials etc..

2. Insulation layer should be even and tight. Cracks, gaps and other defects are not allowed.

3. The supporting, hanging and mounting brackets of duct should be fixed on the outside of the insulation layer, and insert bed timber between bracket and duct.

4. Thickness of insulation layer

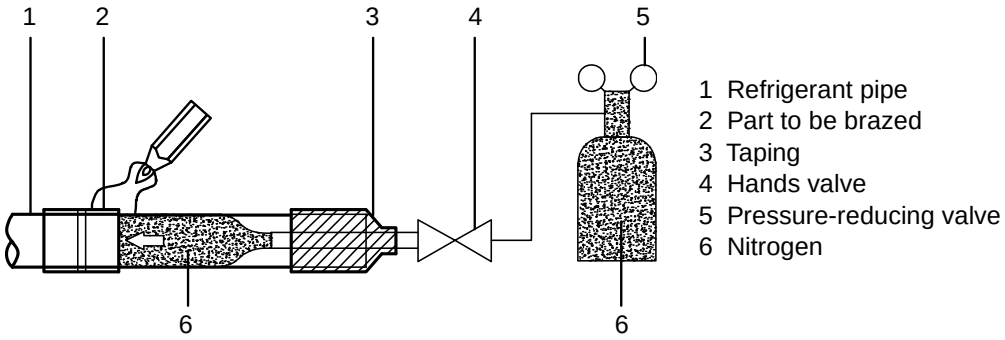
1) When inlet and outlet duct are installed in rooms with no air-conditioning, the insulation thickness should be above 40mm when adopting centrifugal glass cotton for insulation.

2) When inlet and outlet duct are installed in a room with air conditioning, insulation thickness should be above 25mm when adopting centrifugal glass cotton for insulation.

3) When adopting rubber/plastic or other materials, insulation thickness shall meet design requirements according to relevant calculations.

8. Brazing cautions

- Ensure system is purged with sufficient nitrogen throughout all brazing operations. Correct use of nitrogen during the brazing process prevents the formation of oxidation on the inside in copper piping. An oxidized film adversely affects valves and compressors in the refrigerating system and prevents proper operation.
- The nitrogen pressure should be set to 0.02MPa with a pressure-reducing valve.



- Do not use anti-oxidants when brazing the pipe joints. Residue can clog pipes and damage equipment.
- Do not use flux when brazing copper-to-copper refrigerant piping. Use phosphor copper brazing alloy (BCuP) which does not require flux.
- Flux has an extremely harmfully influence on refrigerant pipe systems. For instance, if chlorine based flux is used, it will cause pipe corrosion, if the flux contains fluorine, and it will deteriorate the lubrication properties of refrigerant oil.

9. Remove dirt or water in the piping

- Make sure there is no dirt or water in the piping system before connecting the piping to the outdoor units.
- Flush the system with high pressure nitrogen, never use the outdoor units' refrigerant for this purpose.

10. Gas tightness test

10.1 Purpose and operation procedure of air tightness test

10.1.1 Purpose

Identify the source of leaks, make sure there is no leakage in system to prevent system fault due to leakage of refrigerant.

10.1.2 Operation tips

Subsection detection, overall pressure-keeping, grading pressurization.

10.1.3 Operation procedure

1. After piping of indoor unit has been connected, weld port of high-pressure side piping.
2. Weld low-pressure side piping with connector for pressure gauge together.
3. Charge nitrogen slowly into pressure gauge connector to conduct air tightness test.

10.2 Operation of air tightness test

10.2.1 Operation procedure

1. When conducting air tightness test, make sure that gas and liquid piping are fully closed to prevent nitrogen from entering the system. Both gas and liquid valve need to be strengthened before pressurization.
2. Each refrigerant system shall be slowly pressurized from both sides of gas and liquid pipe.
3. Use dry nitrogen to conduct air tightness test. Phase-in control diagram of pressurization is as follows:

No.	Phase (phase-in pressurization)	Criteria
1	Phase 1: large leakage after over three minutes of pressurization with 3.0kgf/cm^2.	No pressure drop after modification
2	Phase 2: major leakage after over three minutes of pressurization with 15. 0kgf/cm^2.	
3	Phase 3: small leakage after over 24 hours of pressurization with R410A: 40.0kgf/cm^2.	

10.2.2 Pressure observation

1. System pressure should be maintained for 24 hours. When pressure change is related to temperature change according to below calculation, it means there are on leakage. If pressure falls, identify and address the leakage source.

2. Modification method

When ambient temperature difference is ±1°C, the pressure difference shall be ±0.1kgf/cm^2.

Modification formula: Real value = pressure of pressurization + (temperature of pressurization – temperature during observation)x0.1kgf/cm^2

A pressure drop can be identified by comparing the modification value with pressurization value.

3. General method for identifying the source of a leak

Detection process involves three general steps.

1) Audio detection for identifying large leaks.

2) Touch detection -----place hand at the joint to feel the leakage

3) Soap water detection is used to identify small leaks. Escaping gas will create bubbles at the leak point after soapy water is applied.

4) Detection by use of halogen leak detector

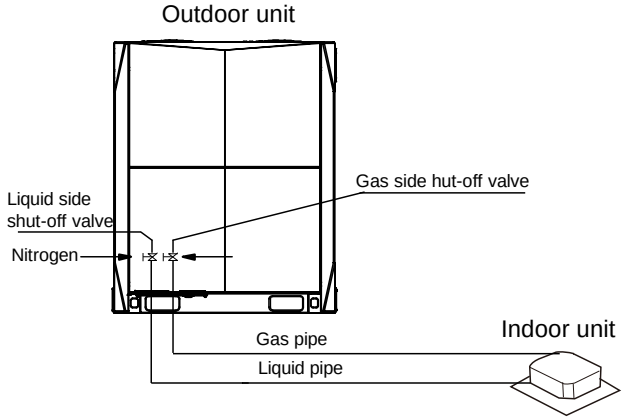
Use a halogen leak detector when finding the source of difficult to detect leakages.

a. Keep nitrogen at 3.0kgf/cm^2.

b. Supplement refrigerant to 5.0kgf/cm^2.

c. Use halogen leak detector, methane leak detector and electric leak detector for detection.

d. If the leak source cannot be found, continuously pressurize to 40.0kgf/cm^2 (R410A) and then detect again.



4. Caution

1) The air tightness test is conducted by pressurized nitrogen (R410A system: 40.0kgf/cm^2).

2) Oxygen, flammable gas and toxic gas shall not be used to conduct air tightness test.

3) Before pressure reading, let the system rest for several minutes till pressure is stable.

4) After test is complete, reduce system pressure to 5~8kgf/cm^2 and then conduct pressure-keeping and storage.

5) If pipeline is too long, conduct phase-in detection.

a. Inner side of pipeline

b. Inner side of pipeline + upright

c. Inner side of pipeline + upright+ outer side of pipeline

11. Vacuum Drying

11.1 Purpose and main points of vacuum drying

11.1.1 Purpose of vacuum drying

1. Remove moisture from the system to prevent ice-blockage and copperizing. Ice-blockage will cause abnormal operation, while copperizing may damage compressor.

2. Eliminating the non-condensable gas of system prevents oxidizing of internal components, system pressure fluctuation, and low heat exchange performance.

3. Detect leak source from reverse rotate.

11.1.2 Selection of vacuum pump

1. Vacuuming suction must be less than -756mmHg.

2. The discharge of vacuum pump is over 4L/s.

3. The precision of vacuum pump is over 0. 02mmHg.

R410A system caution:

After the vacuuming process of R410A refrigerant circulation system is complete, vacuum pump will stop running. As a result of suction in the in the air conditioning system, vacuum pump lubricant will seep back into the system. This, same situation will also occur if vacuum pump suddenly stops during operation. This will cause different oils mix, leading to system malfunction, it is therefore recommended to use one-way valve to prevent reverse flow of oil in vacuum pump.

11.1.3 Vacuum drying for piping

Vacuum drying: Use of vacuum pump effectively transfers moisture in lines from liquid to gas state. Typical boiling point for water is 100^{o}C the vacuum pump reduces the internal pressure of the piping system thus reducing the boiling point of water to room temperature. This process evaporates all moisture in the piping system.

Boiling Point of Water (°C)	Air Pressure (mmHg)	Vacuum Degree (mmHg)	Boiling Point of Water (°C)	Air Pressure (mmHg)	Vacuum Degree (mmHg)
40	55	-705	17. 8	15	-745
30	36	-724	15	13	-747
26. 7	25	--735	11. 7	10	-750
24. 4	23	-737	7. 2	8	-752
22. 2	20	-740	0	5	-755
20. 6	18	-742			

11.2 Operation procedure

There are two vacuum drying methods: common and special.

11.2.1 Ordinary vacuum drying

1) Connect the pressure gauge to the infusing mouth of gas and liquid pipe, keep vacuum pump running for at least 2 hours, ensures vacuum degree o is below -755mmHg.

2) If the vacuum degree is not below -755mmHg after 2 hours of drying, system will continue drying for one hour.

3) If the vacuum degree is not be below -755mmHg after 3 hours of drying, check the system for leaks.

4) Vacuum placement test: when the vacuum degree reaches -755mmHg, keep for 1 hour. If the vacuum gauge indicator does not increase, the process is complete. If the vacuum gauge increases, it indicates of moisture or a leak.

5) Vacuum drying shall be conducted from liquid and gas pipe simultaneously. There are a lot of functional parts like valves, which could shut down the gas flow midway.

11.2. 2 Special vacuum drying

Special vacuum drying method shall be adopted when:

1) Discovery of moisture during refrigerant piping flush.

2) Conducting construction on rainy day, because rain water might penetrated into pipeline.

3) Construction period is long, and rain water might penetrated into pipeline.

4) Rain water might penetrate into pipeline during construction.

Procedures of special vacuum drying are as follows:

a. First stage vacuum drying 2 hours.

b. The second vacuum damage, charging nitrogen to 0.5kgf/cm^2.

Because nitrogen is dry, vacuum damage could achieve the effect of vacuum drying, but this method cannot sufficiently dry the system when there is too much moisture. Therefore, it is crucial to ensure that moisture does not enter the system and condensation does not form.

c. Second stage vacuum drying 1 hour.

Vacuum drying is confirmed complete when vacuum degree is under -755mmHg; if the vacuum degree is still above -755mmHg within 2 hours drying, please repeat the procedures of “vacuum damage---vacuum drying”.

d. Vacuum placement test: when the vacuum degree reaches -755mmHg, keep for 1 hour. If the vacuum gauge indicator does not increase, the process is complete. If the vacuum gauge increases, it indicates of moisture or a leak.

12. Additional refrigerant charge

12.1 Operation procedure for recharging refrigerant

12.1.1 Operation procedure

Calculate the required refrigerant volume by the length of liquid pipe → recharge refrigerant.

※The refrigerant volume from factory does not take into consideration actual installation piping length.

12.1.2 Steps for recharging refrigerant

1. Make sure vacuum drying is qualified before recharging refrigerant.

2. Calculate the required refrigerant volume by the diameter and the length of liquid pipe.

3. Use electronic scale or fluid infusion apparatus to weigh the recharged refrigerant volume.

4. Use soft pipe to connect refrigerant cylinder, pressure gauge, and examine valve of outdoor unit. And recharge in liquid mode. Before recharging, clear the air in the soft pipe and pressure gauge’s pipe.

5. After recharge is finished, using gas leak detector or soap water, inspect for refrigerant leakage in expansion part of indoor and outdoor units.

6. Write the recharged refrigerant volume in the indicating plate of outdoor unit.

Caution

1) The recharged refrigerant volume must be calculated according to the formula in the outdoor technical reference manual. Calculation cannot be made according to running current, pressure and temperature as current and pressure will change depending on the difference of temperature and length of pipeline.

2) In cold temperature, use warm water and hot air to warm up refrigerant storage cylinder.

12.1.3 Recharging R410A refrigerant

If R410A refrigerant is adopted, confirm the following items before recharging:

1) R410A refrigerant compatible vacuum pump with one-way valve.

2) R410A refrigerant compatible pressure gauge.

3) R410A refrigerant compatible recharging soft pipe and connector.

4) Charging method: Recharge in liquid phase.

5) The different leak detector.

12.2 Calculating the refrigerant recharge volume

Calculate the additional refrigerant charge according to the diameter and the length of the liquid side pipe of the outdoor/indoor unit connection. The refrigerant is R410A.

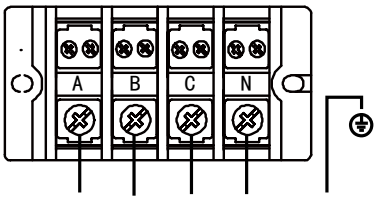
Note: Assume equivalent pipe length of the branch joint is 0.5m (for calculation purposes).

Pipe size of liquid side (mm)	Additional refrigerant charge per meter (kg)
Φ6.35	0.022
Φ9.53	0.057
Φ12.7	0.110
Φ15.9	0.170
Φ19.1	0.260
Φ22.2	0.360
Φ25.4	0.520
Φ28.6	0.680

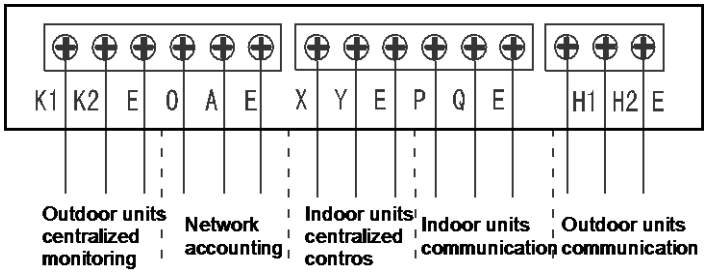
- Charge the additional refrigerant from the gas pipe or liquid pipe. After the system is running, if it is needed to charge refrigerant during maintenance, charge at the gauge point.
- **Calculating formula (R410A):**
- The recharged volume: R (kg) = (L1×0.022 kg/m) + (L2×0.057 kg/m) + (L3×0.110 kg/m) + (L4×0.170 kg/m) + (L5×0.260 kg/m) + (L6×0.360 kg/m) + (L7×0.520kg/m) + (L8×0.680kg/m)
- L1: Actual total length of Φ6.35 liquid pipe (m); L2: Actual total length of Φ9.53 liquid pipe (m);
- L3: Actual total length of Φ12.7 liquid pipe (m); L4: Actual total length of Φ15.9 liquid pipe (m);
- L5: Actual total length of Φ19.1 liquid pipe (m); L6: Actual total length of Φ22.2 liquid pipe (m);
- L7: Actual total length of Φ25.4 liquid pipe (m); L8: Actual total length of Φ28.6 liquid pipe

13. Electrical wiring installation

13.1 Wiring terminal instruction



Three-phase power supply



13.2 Electric characteristics

Model	Units				Power supply			Compressor		OFM	
	Hz	Voltage (V)	Min. (V)	Max. (V)	MCA (A)	TOCA (A)	MFA (A)	MSC (A)	RLA (A)	kW	FLA (A)
8HP	50	380~415	342	456	20.0	25.6	25	-	8.2	0.48	4.6
10HP					21.0	25.6	25	-	9.8	0.48	4.6
12HP					23.0	27.6	25	-	11	0.48	4.6
14HP					27.3	37.4	30	-	7.2×2	0.4+0.28	3.9+3.5
16HP					29.9	37.5	35	-	7.3×2	0.425+0.335	4.0+3.5
18HP					34.4	45.5	40	-	11.3+7.4	0.425+0.335	4.0+3.5

Notes:

1. The current value of combination unit is the total value of each basic model:
2. RLA is based on the following conditions, Indoor temp. 27°C DB/19°C WB, Outdoor temp. 35°C DB
3. TOCA means the total value of each OC set.
4. MSC means the Max. current during the starting of compressor.
5. Voltage range units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed range limits.
6. Maximum allowable voltage variation between phase is 2%

7. Selection wire size based on the value of MCA

8. MFA is used to select the circuit breaker and the ground fault circuit interrupter (earth circuit breaker).

MCA: Min. Circuit Amps. (A); **TOCA:** Total Over-current Amps. (A); **MFA:** Max. Fuse Amps. (A); **MSC:** Max. Starting Amps. (A)

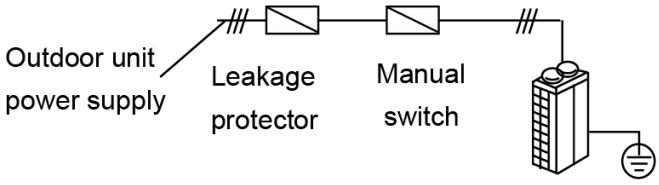
RLA: Rated Load Amps. (A); **OFM:** Outdoor Fan Motor; **FLA:** Full Load Amps. (A); **KW:** Rated Motor Output (KW)

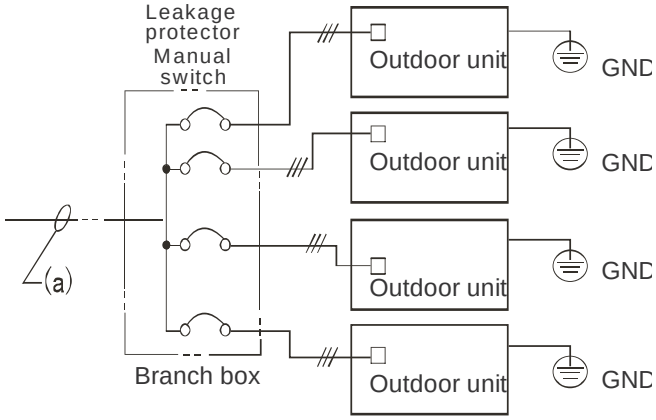
13.3 Electrical wiring installation

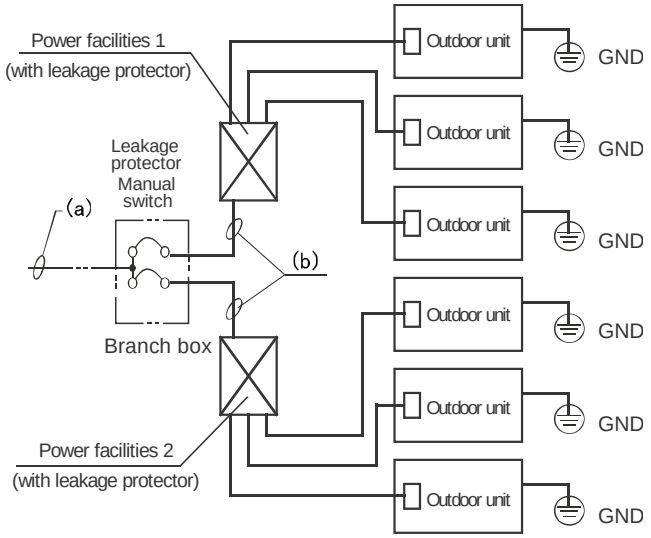
Note:

- Separate power supply for indoor unit and outdoor unit.
- The power supply should have specified branch circuit with leakage protector and manual switch.
- The power supply, leakage protector and manual switch of all the indoor units connected to the same outdoor unit should be universal. (All indoor unit power supplies should be tied into the same circuit. Powering on and shutting down all indoor units connected to the same outdoor unit should be done simultaneously in order to ensure system life span)
- Please put the connective wiring system between indoor unit and outdoor unit with refrigerant piping system together.
- Use 3-core shielded wire as signal wire between indoor and outdoor units, multi-core wire is unavailable.
- Please comply with relevant local codes and standards..
- Power wiring should be done by professional electrician.

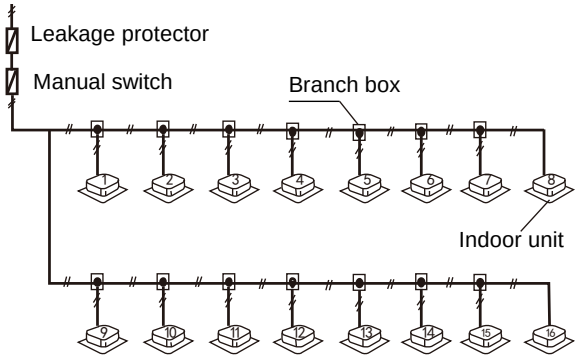
13.3.1 Outdoor unit power supply wiring







13.3.2 Indoor unit power supply wiring



Note:

- Refrigerant piping system, signal wires between indoor units and outdoor units should be run together.
- Power supply for all indoor units must be unified.
- Do not put the signal wires and power wires in the same conduit; if power supply is less than 10A than a distance of over 300mm between conduits should be maintained, if power supply is between 10A to 50A than the separation distance should be increased to 500mm.

13.4 Control system installation

The control line should be shielded wire. Using other wiring shall create signal interference, leading to malfunction.

The shielded nets at the two sides of shielded wires are either grounded, or connected with each other and jointed to the sheet metal along to the earth.

Control wire could not be bound together with refrigerant pipeline and power wire. When power wire and control wire are run parallel to each other they should be spaced a minimum of 300mm so as to prevent signal interference.

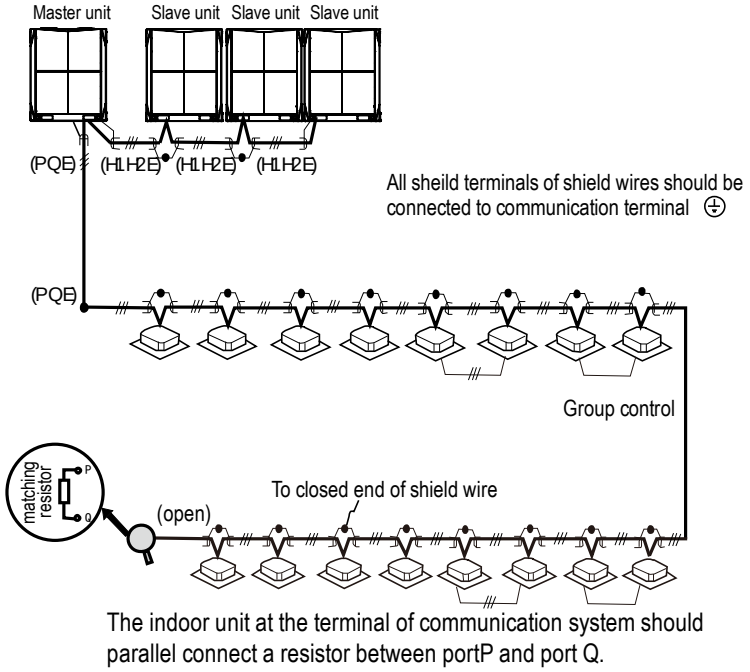
Control wire shall not form a closed loop.

Control wire has polarity, so be careful when connecting.

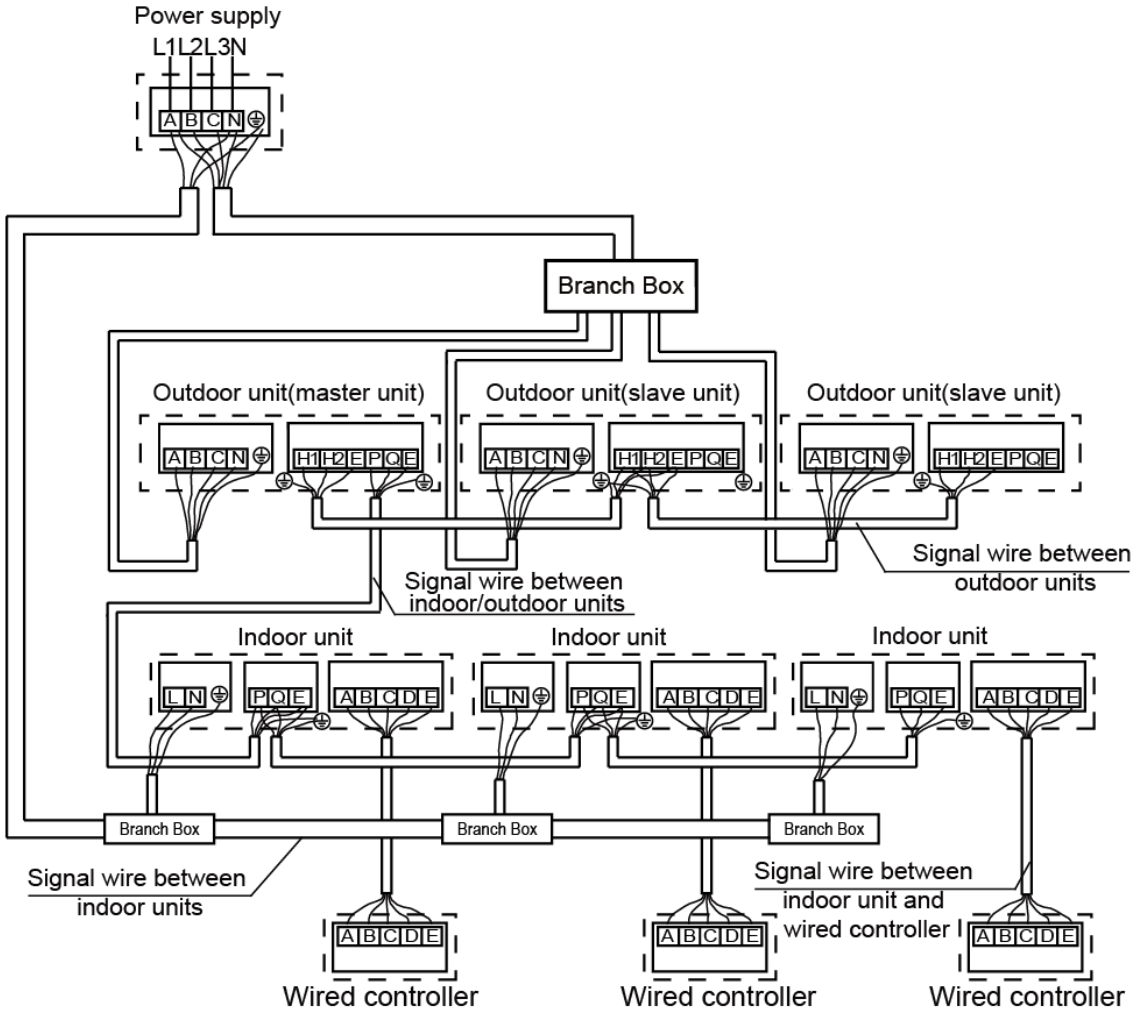
The shield net should be grounded at the outdoor unit wiring terminal. The inlet and outlet wire net of indoor communication wire should be connected directly and cannot be grounded, and form open circuit at the shield net of final indoor unit.

13.4.1 Signal wire between outdoor unit and indoor unit

Signal wire of indoor/outdoor unit adopts 3-core shielded wire (≥0.75mm^2, The signal wire is polarized and must be connected correctly.



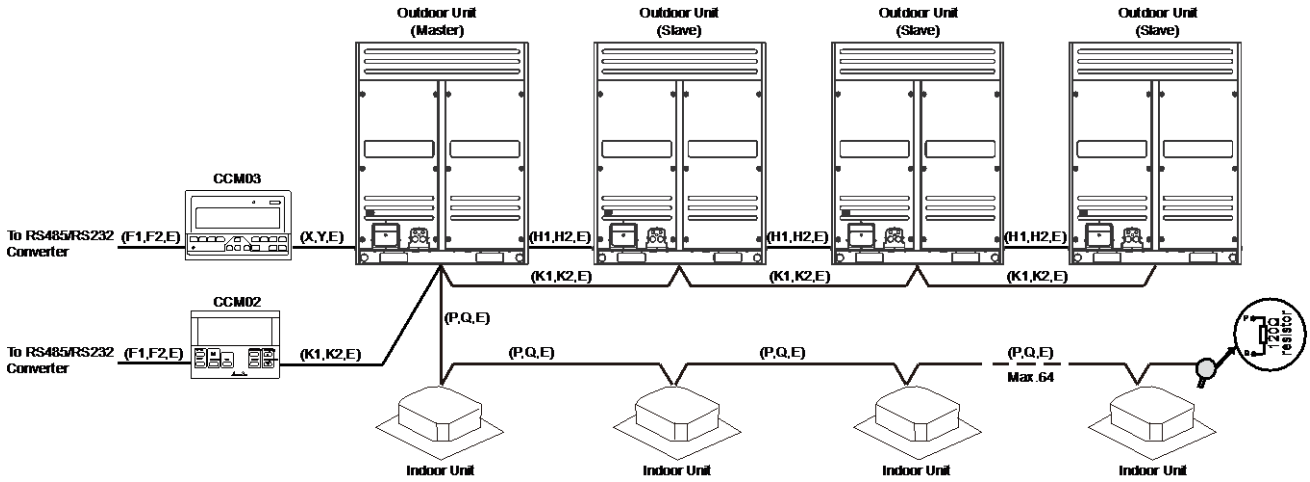
13.4.2 Wiring example



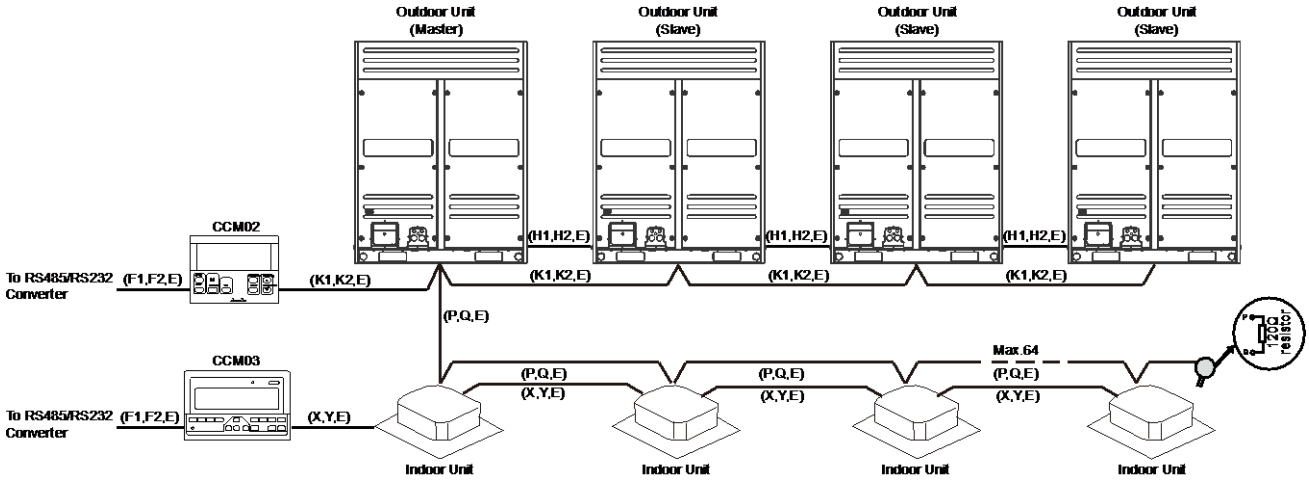
13.4.3 Signal wire of centralized control

When centralized control is needed, one CCM03 (indoor unit central controller) can only control the indoor units of the same refrigerant system **via the X Y E port of the outdoor unit.** Outdoor unit will automatically distribute addresses to the indoor units. Remote controller can query and modify indoor unit addresses.

The diagram below is an example wiring:



CCM03 can also connect indoor units **via the X Y E port of indoor unit**. This method requires another set of X Y E cable between indoor units and is therefore more complex and not the first recommendation. The diagram below is an example wiring:



14. Running test

14.1 Inspection and confirmation before commissioning

- Confirm that refrigeration piping and communication wire of indoor and outdoor units have been connected to the same refrigeration system in order avoid unnecessary malfunctions..
- Confirm power voltage is within ±10% rated voltage.
- Confirm that the power wire and control wire are correctly connected.
- Confirm wire controller is properly connected.
- Before powering on, confirm there is no short circuiting.
- Confirm all units have passed nitrogen pressure-keeping test for 24 hours with R410A: 40kg/cm^2.
- Confirm the system has been carried out vacuum drying and charged with refrigeration as required.

14.2 Preparation before debugging

- Calculate the additional refrigerant quantity for each set of unit according to the actual length of liquid pipe.
- Keep required refrigerant ready.
- Keep system scheme, system piping diagram and control wiring diagram ready.
- Record the setting address code on the system scheme.
- Turn on power switches of outdoor unit in advance, and keep connected for a minimum of 12 hours to ensure refrigerant oil is sufficiently heated.
- Turn on all valves. If valves are not fully open unit may be damaged.
- Confirm the power phase sequence of outdoor unit is correct.
- All dial switches of indoor and outdoor units have been set according to the products technical requirements.

Note: The outdoor unit dial switch setting should be conducted before unit is powered up, otherwise the unit cannot be identified. The following table shows the address and power of outdoor master and slave unit:

ADDRESS dial switch		POWER dial switch	
0	Master unit	0	8HP
1	Salve unit 1	1	10HP
2	Salve unit 2	2	12HP
3	Salve unit 3	3	14HP
⩾4	Invalid address, system error	4	16HP
/		5	18HP
/		⩾6	Invalid dial switch

14.3 Commissioning of Trial Run

14.3.1 Commissioning for trial run of single outdoor unit.

1. Each independent refrigeration system (i.e. each outdoor unit) should be given a trial run..

2. Inspection list of trial run:

1) Confirm the fan impeller is rotating according to its intended route and turns smoothly. No abnormal vibration and noise.

2) Check for abnormal noise during operation of refrigerant system and compressor.

3) Confirm outdoor unit can detect each indoor unit.

4) Confirm drainage is smooth and its lift pump is operational.

5) Confirm microcomputer controller is operating normally and no warning indicators have been activated.

6) Confirm operating current is within the allowed range.

7) Confirm each operating parameter is within the range permitted by the equipment.

Note: When conducting trial run, separately test cooling mode and heating mode to judge the stability and reliability of system.

14.3.2 Commissioning for the trial run of multiple outdoor units

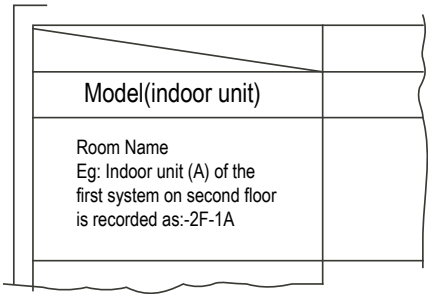
1. Confirm operation of single unit is normal through trial operation. After confirming it is normal, conduct operation of the whole system.

2. Commissioning is carried out according to the Technical Requirement of Product. When Commissioning, analyze and record operation status so as to understand the operation status of the whole system for convenient maintenance and inspection.

3. After finishing Commissioning, fill out Commissioning report in detail.

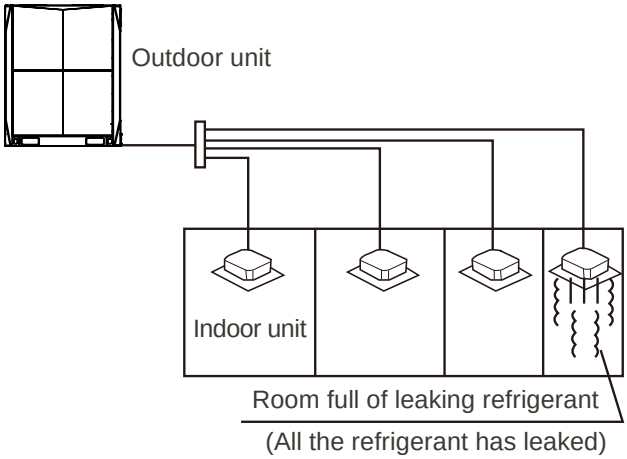
14.4 Fill the name of connected system

To clearly identify the connected systems among two or more indoor units and outdoor units, select names for every system and record them on the nameplate on the outdoor electric control box cover.



14.5 Refrigerant leakage caution

- This air conditioner adopts R410A as refrigerant, which is safe and noncombustible.
- Air conditioned rooms should be large enough that if leakage occurs critical levels will not be reached, and time for protective measure can be ensured.
- R410A critical thickness: 0.3 kg/m^3, (Critical thickness: the max thickness of Freon without any harm to person)



- Calculate the critical thickness through following steps, and take necessary actions.

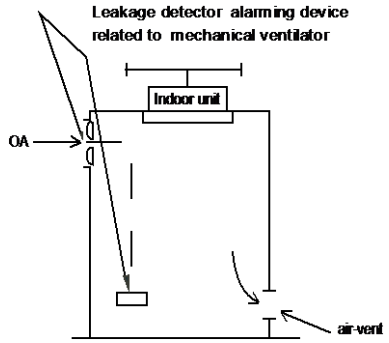
1. Calculate the refrigerant charge A

2. Total refrigerant charge = delivered refrigerant charge (nameplate) + supplemental refrigerant charge
3. Calculate the indoor volume (B) (as the minimum volume)
4. Calculate the refrigerant thickness.

   A/B ≤ critical thickness 0.3kg/m^3

- Countermeasures for high refrigerant thickness

1. Install mechanical ventilator to reduce the refrigerant thickness under critical levels. (Ventilate regularly)
2. Install leakage detector alarming device related to mechanical ventilator if you cannot regularly ventilate.



The commissioning report form is shown as follows:

Commissioning Report for Midea MDV Pro System

Date:_____dd_____mm_____yy

Item name:	
Address:	**Tel:**
Supplier:	**Delivery date: dd mm yy**
Installation section:	**Principal:**
Commissioning section:	**Principal:**
Remark: recharged refrigeration quantity to system: _____kg **Name of refrigerant:_____ (R22, R407C, R410A)**	

Installing section:_____

(seal)

Signature:_____

Date: _____dd____mm____yy

Commissioning name:_____

(seal)

Signature:_____

Date: _____dd____mm____yy

Test Data for Test Run of _____System

Model of outdoor unit	Production series no.

Operation data of outdoor unit (Cooling)

Unit	No.1	No.2	No.3
Run Voltage V			
Total current of run A			
Operation current of compressor A			
High-pressure pressure Kg/cm^2			
Low-pressure pressure Kg/cm^2			
Inlet air temperature °C			
Outlet air temperature °C			

Operation data of indoor unit

No.	Position	Model	Bar code of indoor unit	Inlet air temperature °C	Outlet air temperature °C
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

System check (SW2)

SW2: (CHECK)——Used to query outdoor unit data. Check point sequence and corresponding actuality is as follows:

No.	Content (present frequency)	Note
1	Outdoor unit address	Master unit: 0; slave unit: 1, 2, 3.
2	Outdoor unit capacity	Refer to note 1
3	Outdoor unit quantity	Available for master unit
4	Setting quantity of indoor unit	Available for master unit
5	Total capacity of outdoor units	Available for master unit
6	Total capacity requirement of indoor units	Capacity requirements
7	Total correct capacity requirement of master unit	Capacity requirements
8	Running mode	Refer to note 2
9	Actual running capacity of this outdoor unit	Capacity requirement
10	Fan A speed	Refer to note 3
11	Fan B speed	Refer to note 3
12	Temperature of evaporator pipe (T2B/T2)	Actual value=display value
13	Temperature of condenser pipe (T3)	Actual value=display value
14	Temperature of outdoor ambient (T4)	Actual value=display value
15	Discharge temperature of inverter compressor A	Actual value=display value
16	Discharge temperature of inverter compressor B	Actual value=display value
17	Main inverter module temperature	Actual value=display value
18	Saturation temperature corresponding to the discharge pressure	Actual value=display value+30
19	Current of inverter compressor A	Actual value=display value
20	Current of inverter compressor B	Actual value=display value
21	Opening degree of EXVA	Pulse value=display value×8
22	Opening degree of EXVB	Pulse value=display value×8
23	High pressure	Actual value=display value×0.1MPa
24	Low pressure (Reserved)	/
25	Quantity of indoor units which are communicated with master unit	Actual value=display value
26	Quantity of working indoor units	Actual value=display value
27	Priority mode	Refer to note 4
28	Silent mode	Refer to note 5
29	Static pressure mode	Refer to note 6
30	DC voltage A	Actual value=display value×10
31	DC voltage B	Actual value=display value×10
32	Reserved	/
33	The last error or protection code	Display 000 if it has no error or protection
34	Error clearance time	Actual value=display value
35	----	End

Note:

1. Outdoor unit capacity setting: 0—8HP; 1—10HP; 2—12HP; 3—14HP; 4—16HP; 5—18HP.
2. Running mode: 0—OFF; 2—cooling mode; 3—heating mode; 4—forced cooling mode.
3. Fan speed: 0—stop; 1~15—fan speed sequentially increased.
4. Priority mode: 0—heating priority mode; 1—cooling priority mode; 2—VIP (address no. 63) priority mode or voting priority mode; 3—heating only priority mode; 4—cooling only priority mode.
5. Silent mode: 0—night silent mode; 1—silent mode; 2—super silent mode; 3—no silent mode.
6. Static pressure mode: 0—none static pressure; 1—low static pressure; 2—medium static pressure; 3—high static pressure.

Normal display: When the outdoor unit is on standby, the first two numbers on LED digital tube will display the address of the outdoor unit, and the last two numbers display the indoor unit's quantity which can communicate with outdoor unit. When the outdoor unit is operating, it will display the rotation frequency of the compressor.

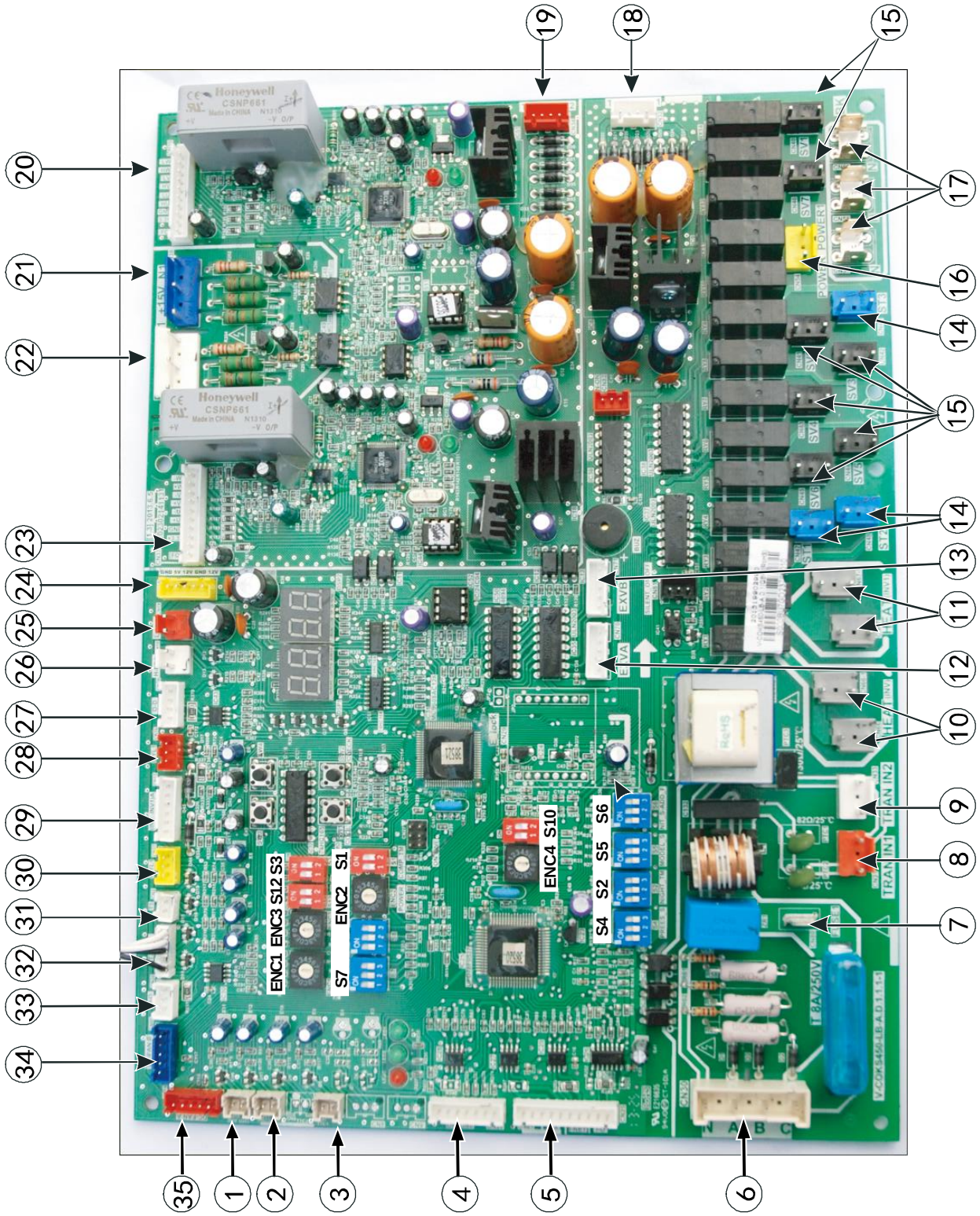
System check steps:

1. Ensure the system operates steadily for more than 1 hour;
2. Press the check button (SW2) on main PCB of outdoor master unit;
3. Check the parameters one by one and fill out the commissioning tables.

Part 5 Troubleshooting

1. Outdoor main control board instructions

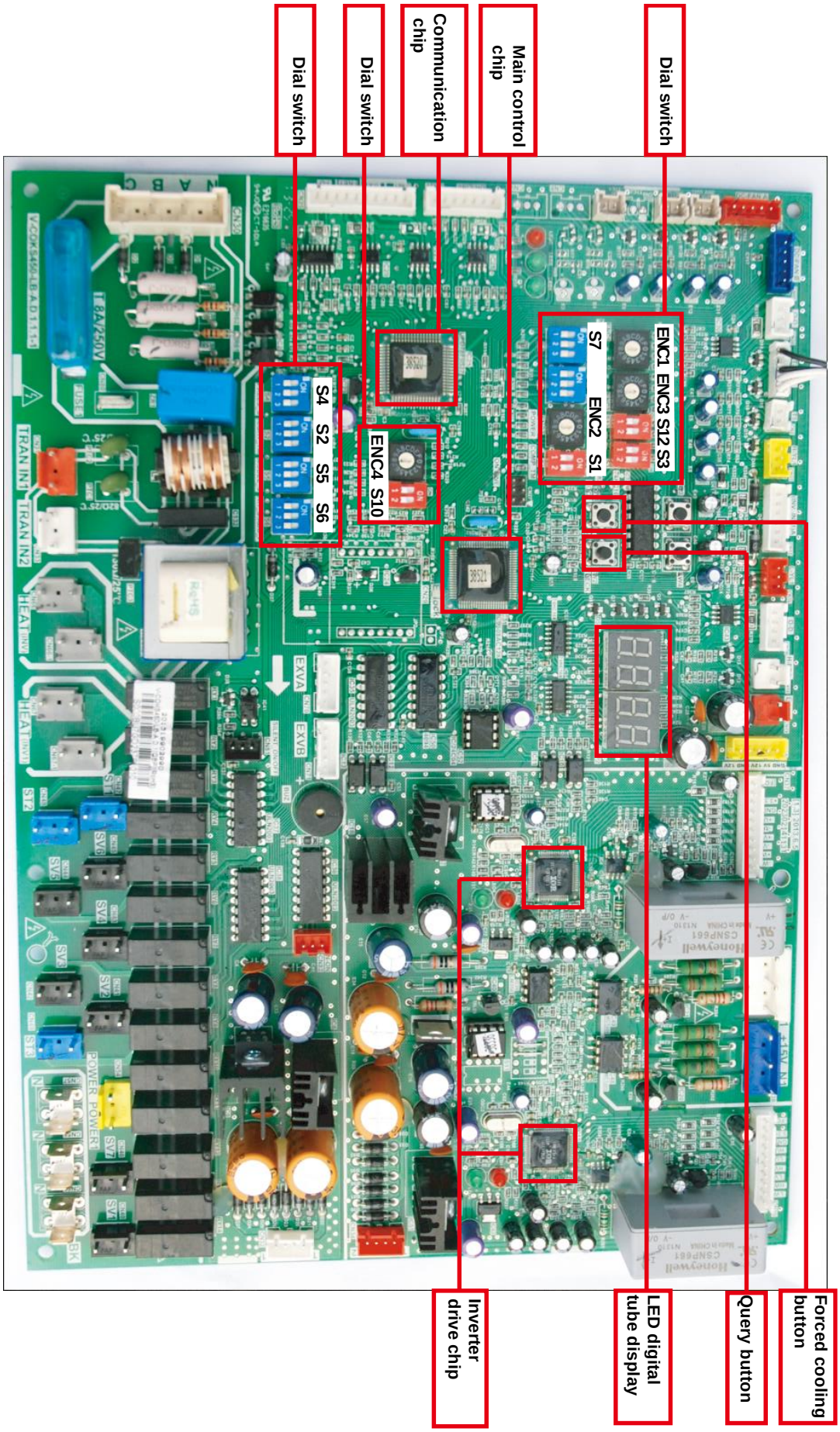
1.1 Main PCB ports instructions



Outdoor main PCB ports instructions

No.	Content	Port voltage
1	Discharge temperature detection port of inverter compressor A	DC 0~5V (in dynamic change)
2	Discharge temperature detection port of inverter compressor A or B	DC 0~5V (in dynamic change)
3	Temperature detection port of inverter module	DC 0~5V (in dynamic change)
4	Reserved	/
5	Wiring port for communication between indoor and outdoor units, indoor unit network, outdoor unit network and network accounting	DC 2.5~2.7V
6	Three-phase detection port	380V
7	Reserved	/
8	Power input of No.1 transformer	220V
9	Power input of No.2 transformer	220V
10	Heat output of inverter compressor A electrical heater	220V
11	Heat output of inverter compressor B electrical heater	220V
12	Drive port of EXV A	The first pin on left: DC 12V The other four pins: in dynamic change
13	Drive port of EXV B	
14	Four-way valve output port	220V
15	One-way valve output port	220V
16	Power output port	220V
17	Null line terminal	0
18	Power output of No.1 transformer	The voltage between upper tow pins: AC 13.5V; The voltage between under tow pins: AC 9V
19	Power output of No.2 transformer	The voltage between upper tow pins: AC 14.5V; The voltage between under tow pins: AC 14.5V
20	Activation port of inverter module B	The third pin on the left: DC3.3V
21	Voltage detection port of inverter module B	DC 540V, +15V, N
22	Voltage detection port of inverter module A	DC 540V, +15V, N
23	Activation port of inverter module A	The third pin on the left: DC3.3V
24	Power supply port of main PCB	GND, +5V, +12V, GND, 12V
25	ON/OFF signal input port for system low pressure detection	0 or 5V
26	ON/OFF signal input port for system high pressure detection	0 or 5V
27	Reserved	/
28	Reserved	/
29	Current detection port of inverter compressor A and B	AC 0~7.8V (in dynamic change)
30	Input port for system high pressure detection	DC 0~5V (in dynamic change)
31	Reserved	/
32	Outdoor ambient temperature and condenser temperature detection port	DC 0~5V (in dynamic change)
33	Outdoor units communication port	DC 2.5~2.7V
34	Control port of DC fan B	The first pin on left: DC 12V The other four pins: in dynamic change
35	Control port of DC fan A	

1.2 Main PCB parts instructions



2.2.1 Query content instructions

No.	Content (present frequency)	Note
1	Outdoor unit address	Master unit: 0; slave unit: 1, 2, 3.
2	Outdoor unit capacity	Refer to note 1
3	Outdoor unit quantity	Available for master unit
4	Setting quantity of indoor unit	Available for master unit
5	Total capacity of outdoor units	Available for master unit
6	Total capacity requirement of indoor units	Capacity requirements
7	Total correct capacity requirement of master unit	Capacity requirements
8	Running mode	Refer to note 2
9	Actual running capacity of this outdoor unit	Capacity requirement
10	Fan A speed	Refer to note 3
11	Fan B speed	Refer to note 3
12	Temperature of evaporator pipe (T2B/T2)	Actual value=display value
13	Temperature of condenser pipe (T3)	Actual value=display value
14	Temperature of outdoor ambient (T4)	Actual value=display value
15	Discharge temperature of inverter compressor A	Actual value=display value
16	Discharge temperature of inverter compressor B	Actual value=display value
17	Main inverter module temperature	Actual value=display value
18	Saturation temperature corresponding to the discharge pressure	Actual value=display value+30
19	Current of inverter compressor A	Actual value=display value
20	Current of inverter compressor B	Actual value=display value
21	Opening degree of EXVA	Pulse value=display value×8
22	Opening degree of EXVB	Pulse value=display value×8
23	High pressure	Actual value=display value×0.1MPa
24	Low pressure (Reserved)	/
25	Quantity of indoor units which are communicated with master unit	Actual value=display value
26	Quantity of working indoor units	Actual value=display value
27	Priority mode	Refer to note 4
28	Silent mode	Refer to note 5
29	Static pressure mode	Refer to note 6
30	DC voltage A	Actual value=display value×10
31	DC voltage B	Actual value=display value×10
32	Reserved	/
33	The last error or protection code	Display 000 if it has no error or protection
34	Error clearance time	Actual value=display value
35	----	End

Note:

When the outdoor unit is on standby, the first two numbers on LED digital tube will display the address of the outdoor unit, and the last two numbers display the indoor unit's quantity which can communicate with outdoor unit. When the outdoor unit is operating, it will display the rotation frequency of the compressor.

1. Outdoor unit capacity setting: 0—8HP; 1—10HP; 2—12HP; 3—14HP; 4—16HP; 5—18HP.
2. Running mode: 0—OFF; 2—cooling mode; 3—heating mode; 4—forced cooling mode.
3. Fan speed: 0—stop; 1~15—fan speed sequentially increased.
4. Priority mode: 0—heating priority mode; 1—cooling priority mode; 2—VIP (address no. 63) priority mode or voting priority mode; 3—heating only priority mode; 4—cooling only priority mode.
5. Silent mode: 0—night silent mode; 1—silent mode; 2—super silent mode; 3—no silent mode.
6. Static pressure mode: 0—none static pressure; 1—low static pressure; 2—medium static pressure; 3—high static pressure.

2.2.2 Dial switch setting

S1: Starting time setting

	Starting time is 10 minutes
	Starting time is 12 minutes (default)

S2: Night silent time setting

	Night silent time is 6h/10h (default)
	Night silent time is 6h/12h
	Night silent time is 8h/10h
	Night silent time is 8h/12h

S3: Silent mode selection

	Night silent mode (default)
	Silent mode
	Super silent mode.
	None silent mode.

S4: Static pressure mode selection

	No static pressure(default)
	Low static pressure mode (reserved, can be customized)
	Medium static pressure mode (reserved, can be customized)
	High static pressure mode (reserved, can be customized)

S5: Priority mode selection

	Heating priority mode (default)
	Cooling priority mode
	VIP (address no. 63) priority mode or voting priority mode
	Heating only priority mode
	Cooling only priority mode

S6: Auto addressing mode selection

	Auto addressing
	No auto addressing (default)
	Clear the indoor unit address

S7: Set the indoor units' numbers selection

	No need to set the numbers of indoor units (default)
	Need to set the numbers of indoor units

S8: Reserved

S10: Reserved

ENC3+S12: Indoor unit quantity setting

		The quantity of indoor unit is 0-15 0~9 on ENC3 refer to 0~9 indoor units; A~F on ENC3 refer to 10~15 indoor units.
		The quantity of indoor unit is 16-31 0~9 on ENC3 refer to 16~25 indoor units; A~F on ENC3 refer to 26~31 indoor units.
		The quantity of indoor unit is 32-47 0~9 on ENC3 refer to 32~41 indoor units; A~F on ENC3 refer to 42~47 indoor units.
		The quantity of indoor unit is 48-63 0~9 on ENC3 refer to 48~57 indoor units; A~F on ENC3 refer to 58~63 indoor units.

ENC1: Outdoor unit address setting

ENC1	Only 0, 1, 2, 3 are available. 0 is for master unit; 1, 2, 3 are for slave units

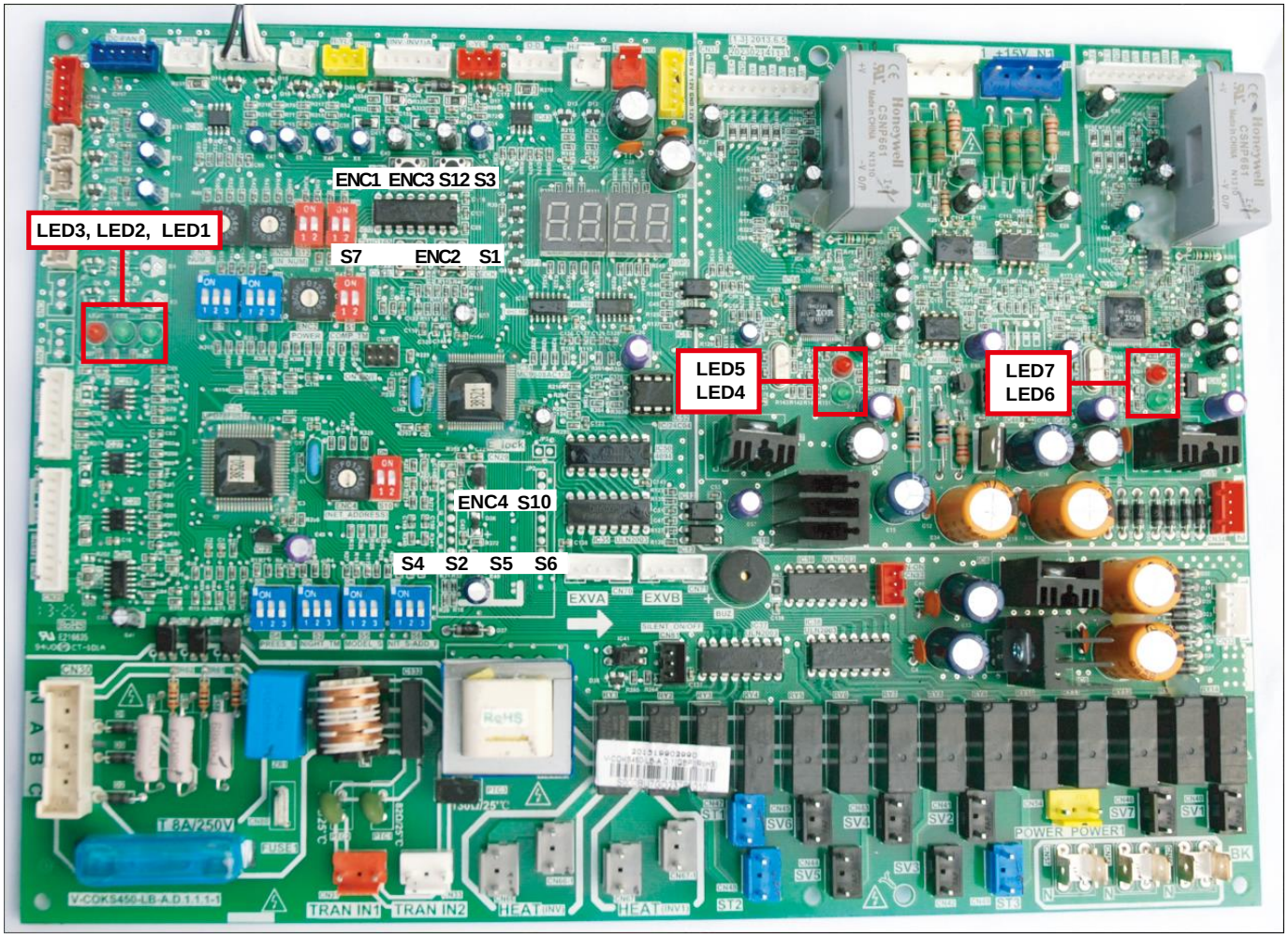
ENC2: Outdoor unit capacity setting

ENC2	Only 0, 1, 2, 3, 4, 5 are available. 0: 8HP; 1: 10HP; 2: 12HP; 3: 14HP; 4: 16HP; 5: 18HP

ENC4: Network address setting

ENC4	Only 0, 1, 2, 3, 4, 5, 6, 7 are available.

2.3 LED on main control board instructions



LED1: Power supply indicator. The lamp will keep on if the power supply is normal.

LED2: Running indicator. The lamp will keep on if the system running is normal, the lamp will flash if the system has problem.

LED3: Malfunction indicator of network centralized control chip. The lamp will flash if three-phase sequence protection or communication errors (communication between indoor units and outdoor units, communication among indoor units, communication among chips).

LED4: Running indicator of inverter module. The lamp will keep on if the compressor is running.

LED5: Malfunction indicator of inverter module. LED5 will keep on and the LED4 will flash if the inverter module is faulty and the error code will be displayed on digital tube by pressing the query button.

LED6: Running indicator of inverter module. The lamp will keep on if the compressor is running.

LED7: Malfunction indicator of inverter module. LED7 will keep on and the LED6 will flash if the inverter module is faulty and the error code will be displayed on digital tube by pressing the query button.

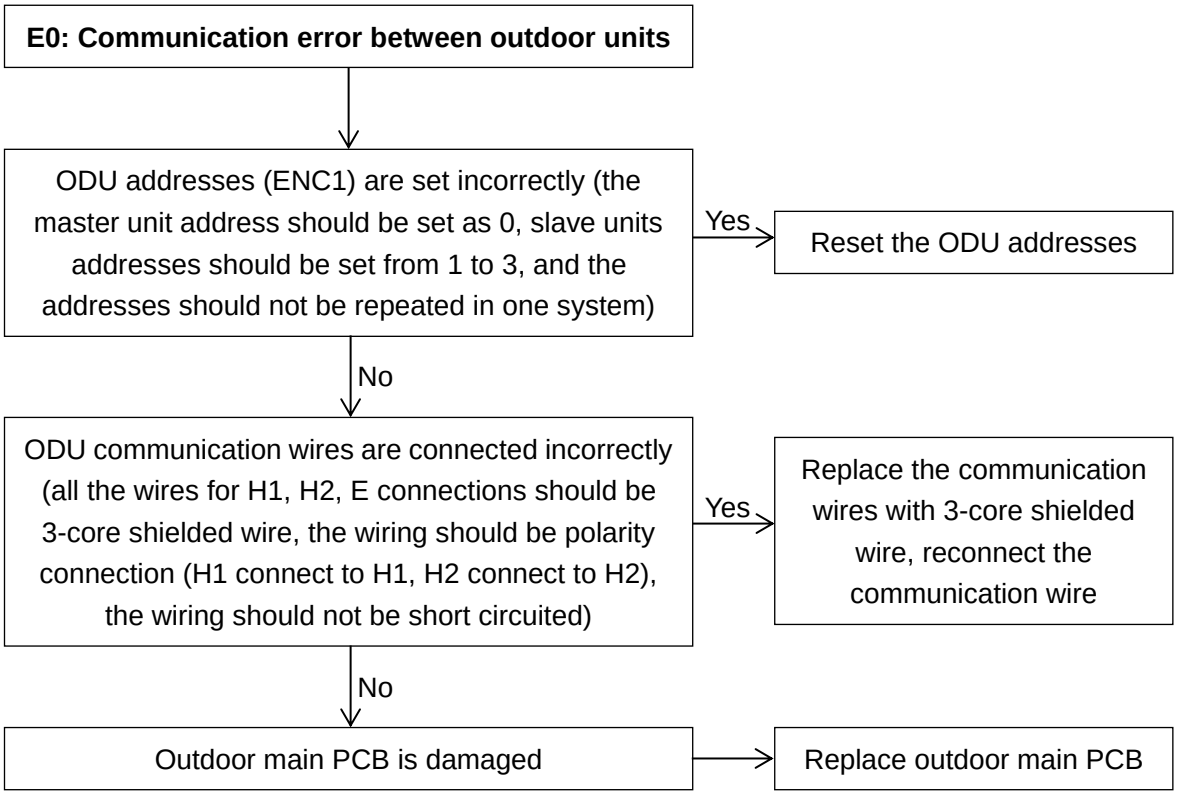
2. Error code table

Error code	Content	Note
E0	Communication error between outdoor units	Only display on the faulty slave unit
E1	Phase sequence error	Display on the faulty unit
E2	Communication error between indoor units and the master unit.	Only display on the master unit
E3	Reserved	/
E4	Malfunction of outdoor ambient temperature sensor (T4)	Display on the faulty unit
E5	Malfunction of power supply voltage	Display on the faulty unit
E6	Reserved	/
E7	Malfunction of discharge temperature sensor	Display on the faulty unit
E8	Faulty outdoor unit address	Display on the faulty unit
xE9	Driver model is mismatched	When x is 1, it means A system; 2 means B system
xH0	Malfunction of communication between main control chip and inverter driver chip	Display on the faulty unit
H1	Malfunction of communication between main control chip and communication chip	Display on the faulty unit
H2	Outdoor unit quantity is decreased	Only display on the master unit
H3	Outdoor unit quantity is increased	Only display on the master unit
xH4	Inverter module protection	Display on the faulty unit Cannot be recovered until re-power on
H5	P2 protection appears three times in 60 minutes	Display on the faulty unit Cannot be recovered until re-power on
H6	P4 protection appears three times in 100 minutes	Display on the faulty unit Cannot be recovered until re-power on
H7	Faulty indoor units quantity	Display on the master unit Cannot be recovered until unit quantity recover
H8	Malfunction of pressure sensor for discharge pipe	The discharge pressure Pc≤0.3MPa
H9	P9 protection appears three times in 60 minutes	Display on the faulty unit Cannot be recovered until re-power on
Hc	Reserved	/
F0	PP protection appears three times in 150 minutes	Display on the faulty unit Cannot be recovered until re-power on
C7	PL protection appears three times in 100 minutes	Display on the faulty unit Cannot be recovered until re-power on
yHd	Slave units malfunction	Y stands for corresponding slave unit, y=1, 2, 3.
P0	Temperature protection of inverter compressor	Display on the faulty unit
P1	High pressure protection	Display on the faulty unit
P2	Low pressure protection	Display on the faulty unit
xP3	Over current protection of compressor	Display on the faulty unit
P4	Discharge temperature protection	Display on the faulty unit
P5	Condenser high temperature protection	Display on the faulty unit
P9	Fan module protection	Display on the faulty unit
PL	Temperature protection of inverter module	Display on the faulty unit
PP	Insufficient overheat degree protection of compressor discharge	Display on the faulty unit
xL0	Inverter module error	/
xL1	DC generatrix low voltage error	/
xL2	DC generatrix high voltage error	/
xL3	Reserved	/
xL4	MCE error/ synchronization/ closed loop	/
xL5	Zero speed protection	/
xL6	Reserved	/
xL7	Phase sequence error	/
xL8	Frequency difference in one second more than 15Hz protection	/
xL9	Frequency difference between the real and the setting frequency more than 15Hz protection	/
r1	Refrigerant amount is slightly insufficient	/
r2	Refrigerant amount is significantly insufficient	/
r3	Refrigerant amount is critically insufficient	/
R1	Refrigerant amount is slightly excessive	/
R2	Refrigerant amount is critically excessive	/

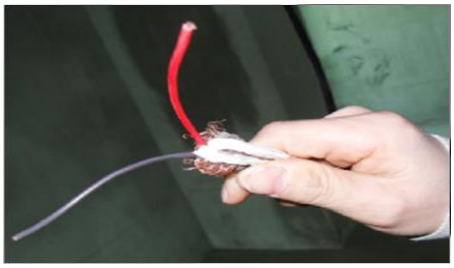
3. Troubleshooting

4.1 E0: Communication error between outdoor units

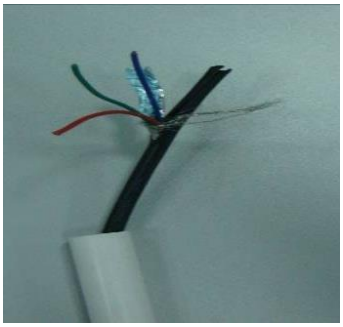
The error will only display on faulty slave unit, all the ODUs will be on standby.



2-core shielded wire (×)

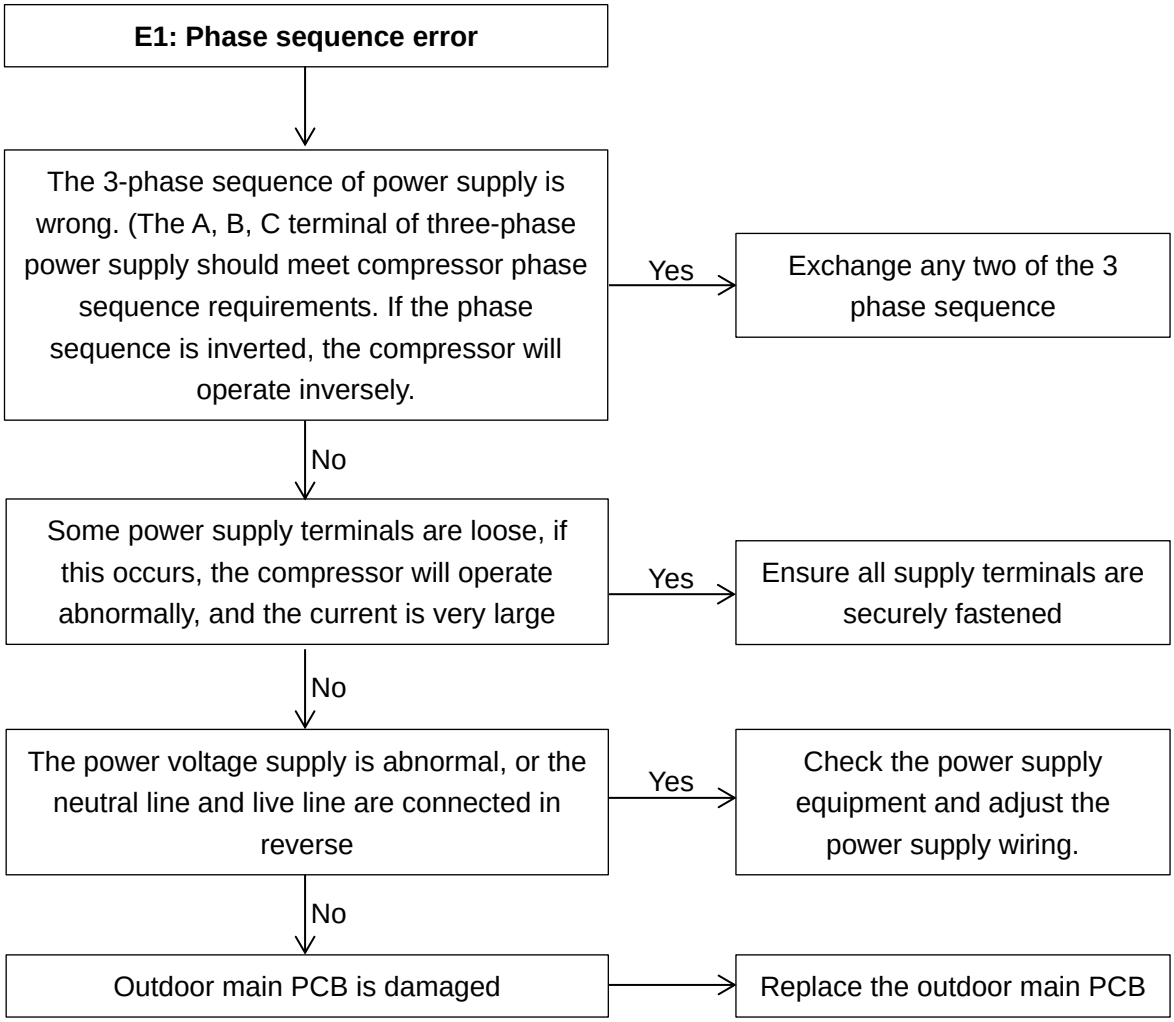


3-core shielded wire (√)



4.2 E1: Phase sequence error

The error will only display on the faulty unit, all the ODUs will be on standby.

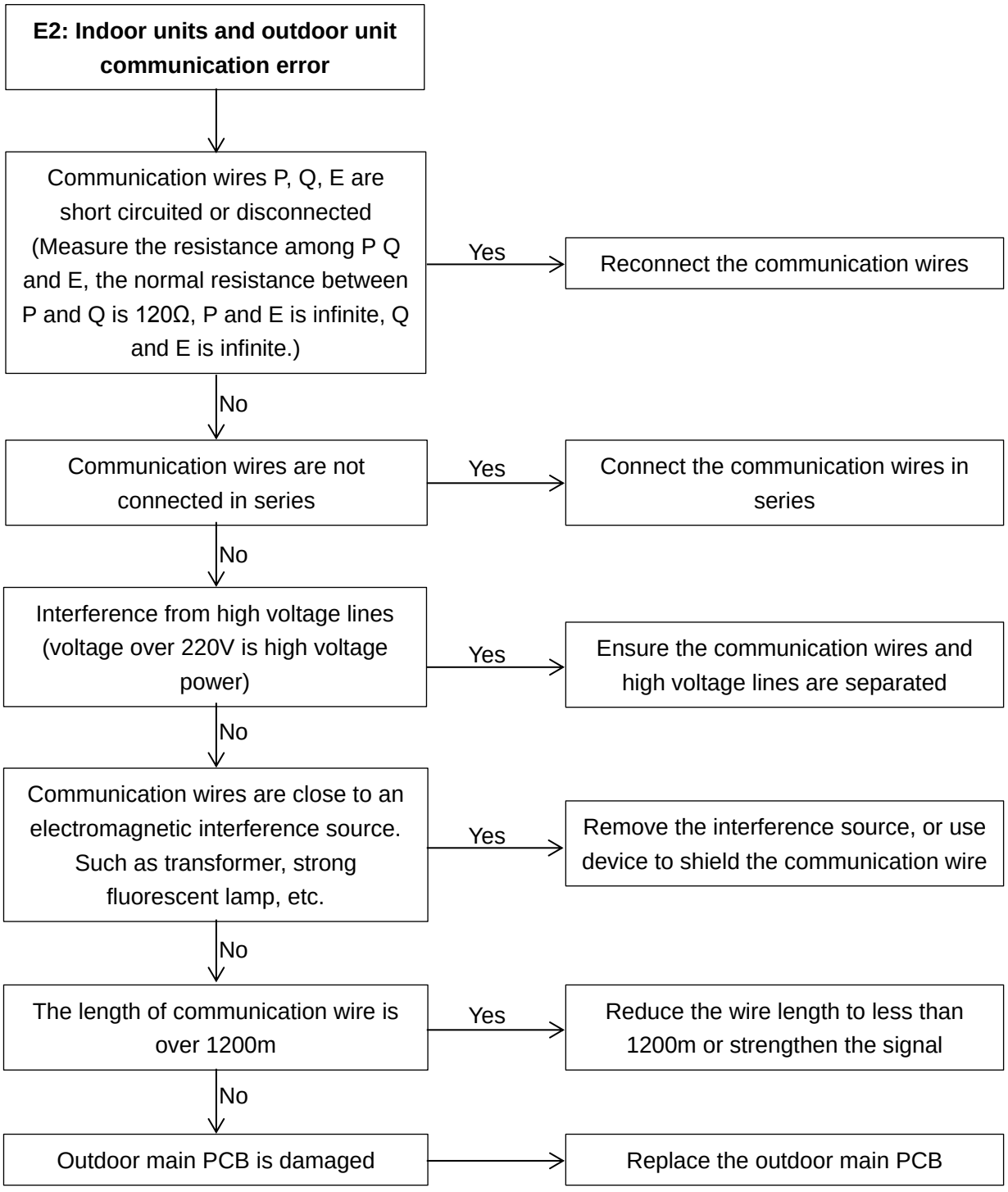


Note:

If the wiring connection of each outdoor unit is in A, B, C phase sequence, and multiple units are connected, the current difference between C phase and A, B phase will be very large as the power supply load of each outdoor unit is on C phase, this can easily lead to tripped breakers and terminal wiring burnout. Therefore if multiple units are to be used, the phase sequence should be staggered, so that the current can be distributed among the three phases equally.

4.3 E2: Communication error between indoor units and the master unit

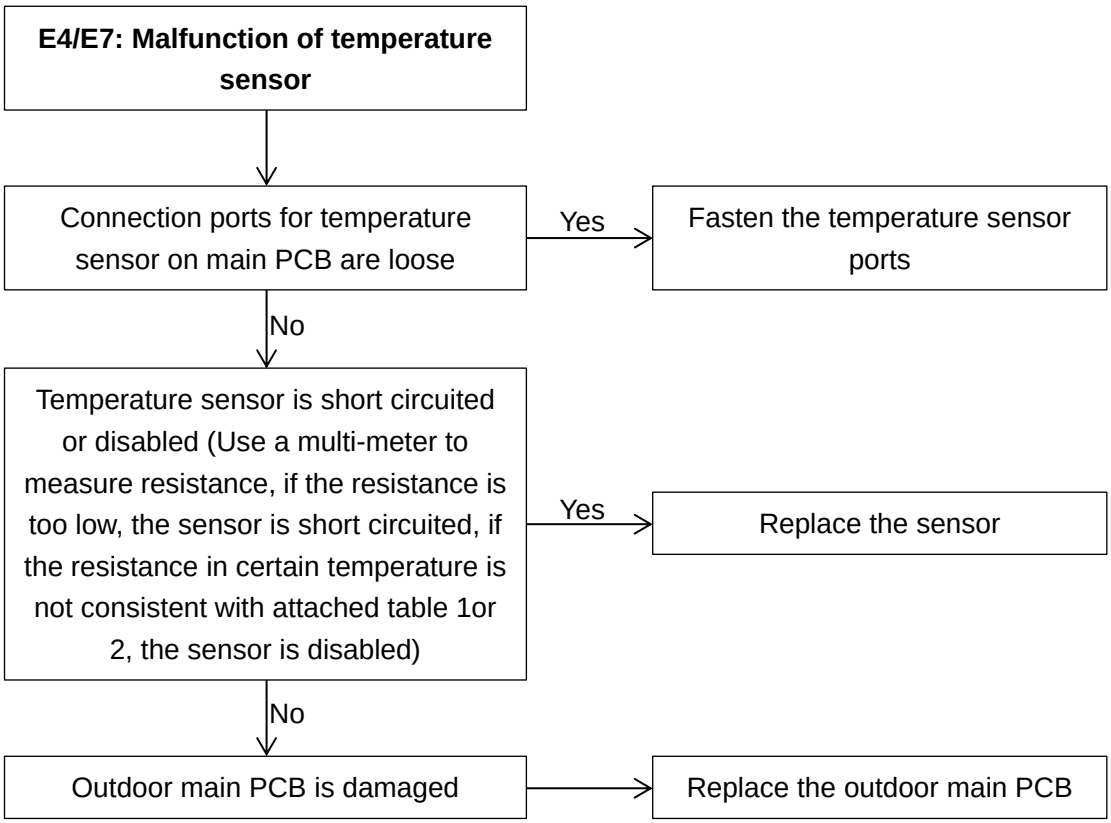
The error will only display on faulty slave unit, all the ODUs will be on standby.



4.4 E4: Malfunction of outdoor ambient temperature sensor (T4)

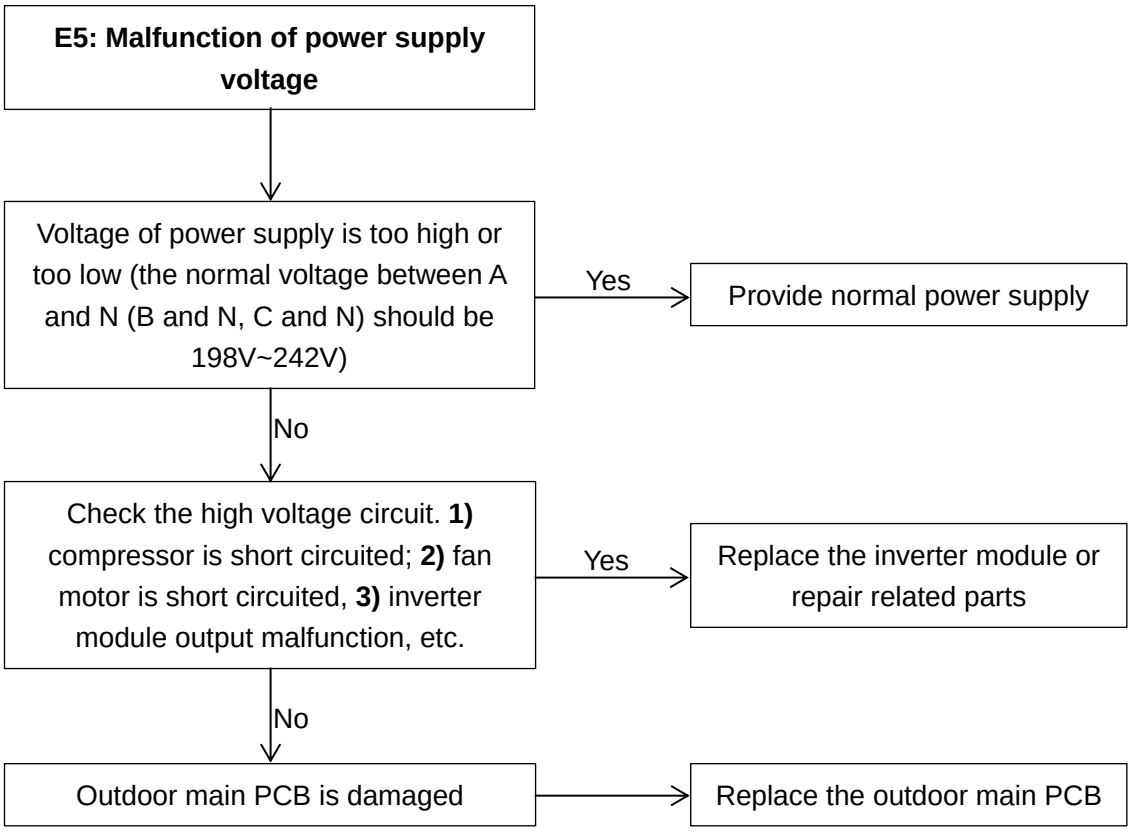
4.5 E7: Malfunction of discharge temperature sensor

The error will only display on faulty unit, all the ODUs will be on standby.



4.6 E5: Malfunction of power supply voltage

The error will only display on faulty unit, all the ODUs will be on standby.



Note:

1) How to check for compressor

The normal resistance value of inverter compressor among U V W is 0.7~1.5Ω, and infinite to ground. If the resistance value is out of the range, the compressor has malfunctioned.

2) How to check for fan motor

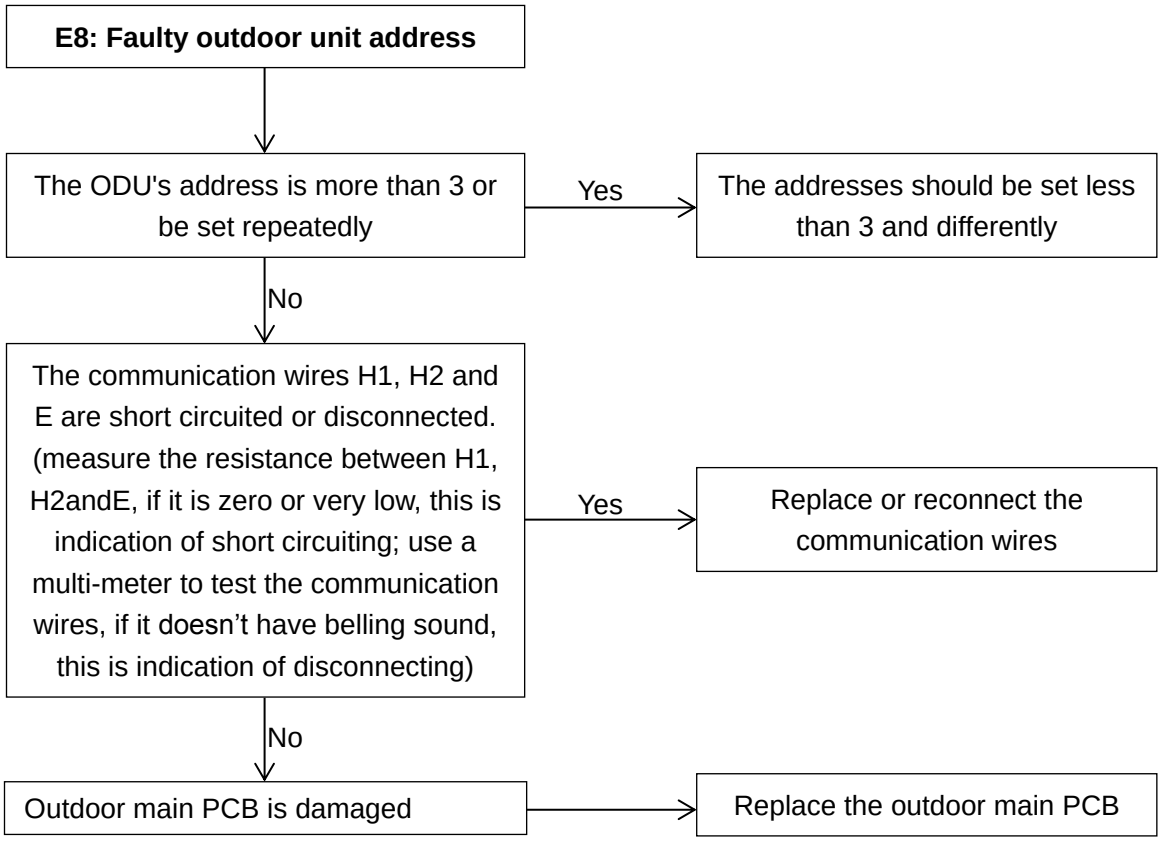
The normal value of DC fan motor coil among U V W is less than 10Ω. If the measured value is 0Ω, the fan motor is short circuited.

3) How to check for inverter module output

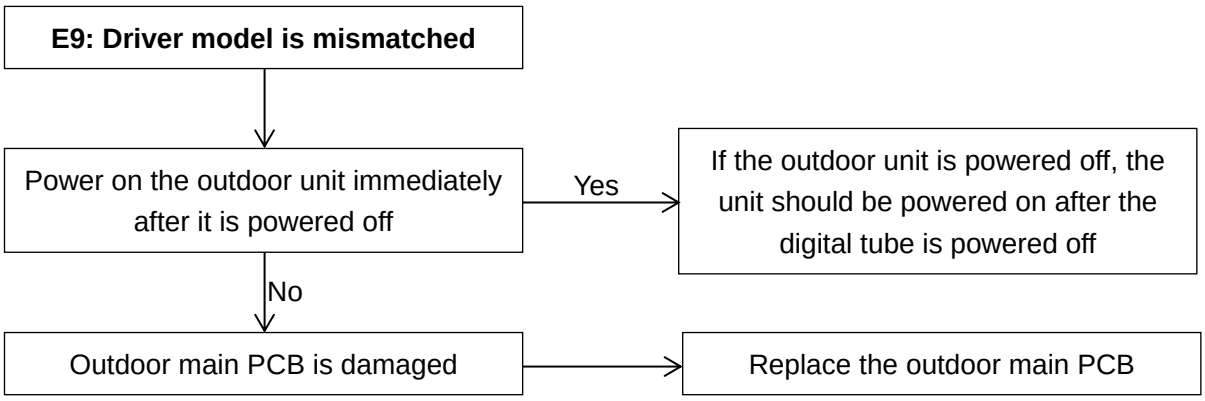
Dial multi-meter to buzzer gear, measure any two terminals of P N and U V W of inverter module, if the multi-meter is ring, means the inverter module is short circuited.

4.7 E8: Faulty outdoor unit address

The error will only display on faulty slave unit, all the ODUs will be on standby.



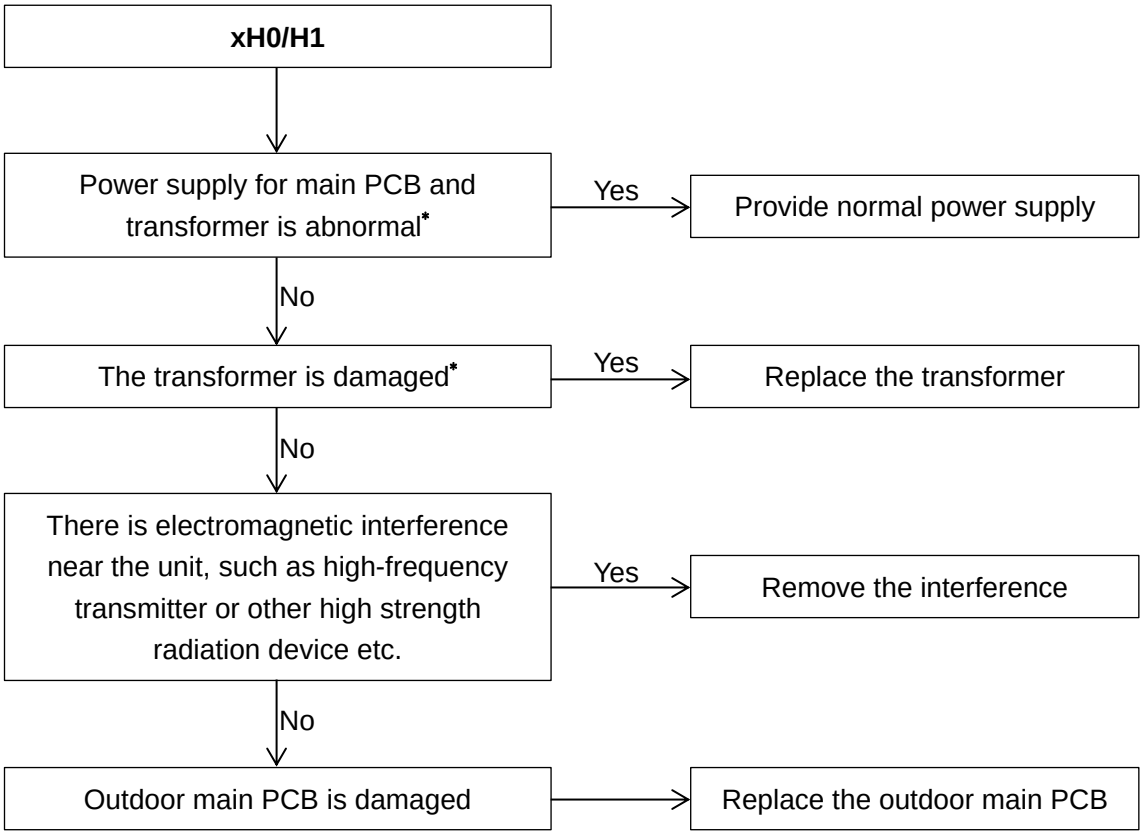
4.8 xE9: Driver model is mismatched (when X is 1, it refers to A system; 2 refers to B system)



4.9 xH0: Communication malfunction between main control chip and inverter driver chip

4.10 H1: Communication malfunction between main control chip and communication chip

The error will only display on faulty unit, all the ODUs will be on standby.



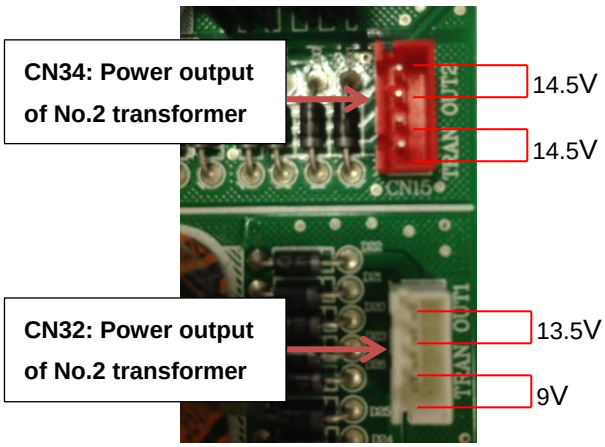
Note:

*** How to check for transformer power supply**

Check the voltage of 8(CN31), 9(CN33) and 24(CN35) terminals. The normal voltage of 8(CN31) and 9(CN33) terminals should be 220V, the voltage between “GND” and “5V” of 24(CN35) terminal should be 5V, the voltage between “GND” and “12V of 24(CN35) terminal should be 12V. If the voltage is out of the range, the power supply for main PCB and transformer is abnormal.

*** How to check for transformer**

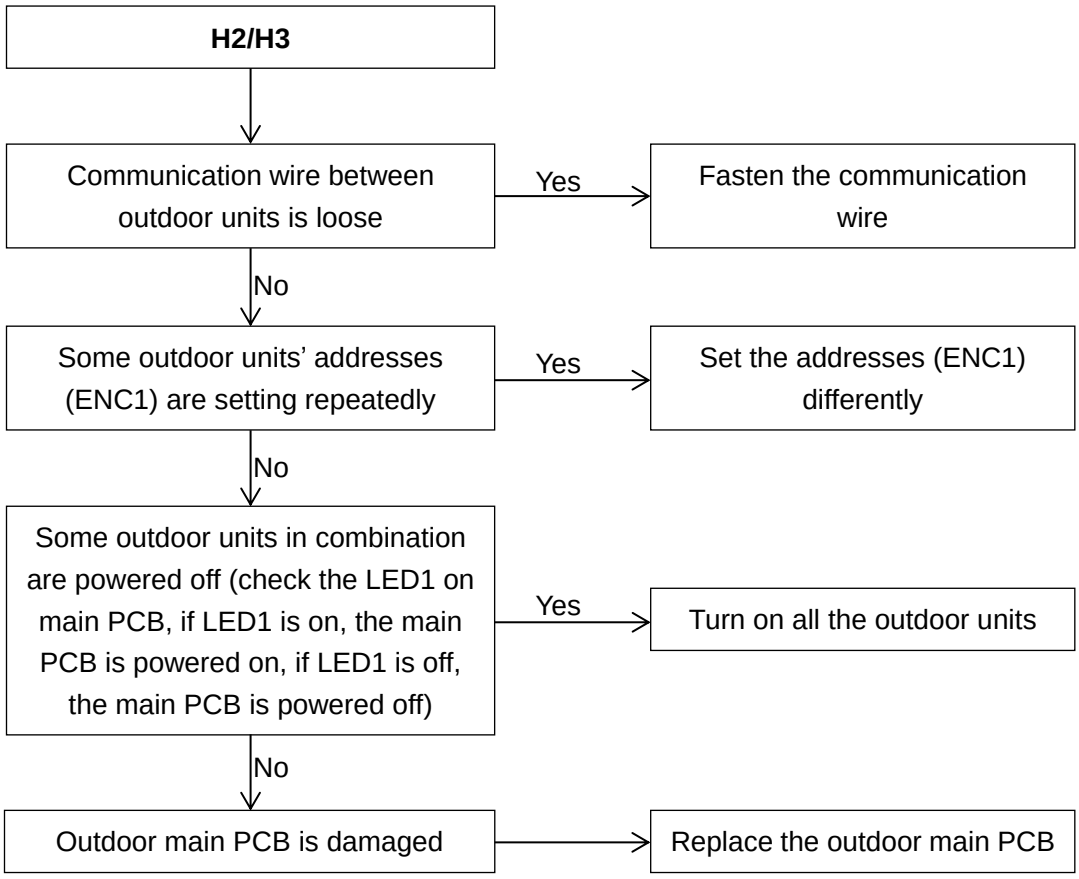
The voltage between upper tow pins of 18(CN32) terminal is AC 13.5V; the voltage between under tow pins of 18(CN32) terminal is AC 9V. The voltage between upper tow pins of 19(CN34) terminal is AC 14.5V; the voltage between under tow pins of 19(CN34) terminal is AC 14.5V



4.11 H2: Outdoor unit quantity is decreased

4.12 H3: Outdoor unit quantity is increased

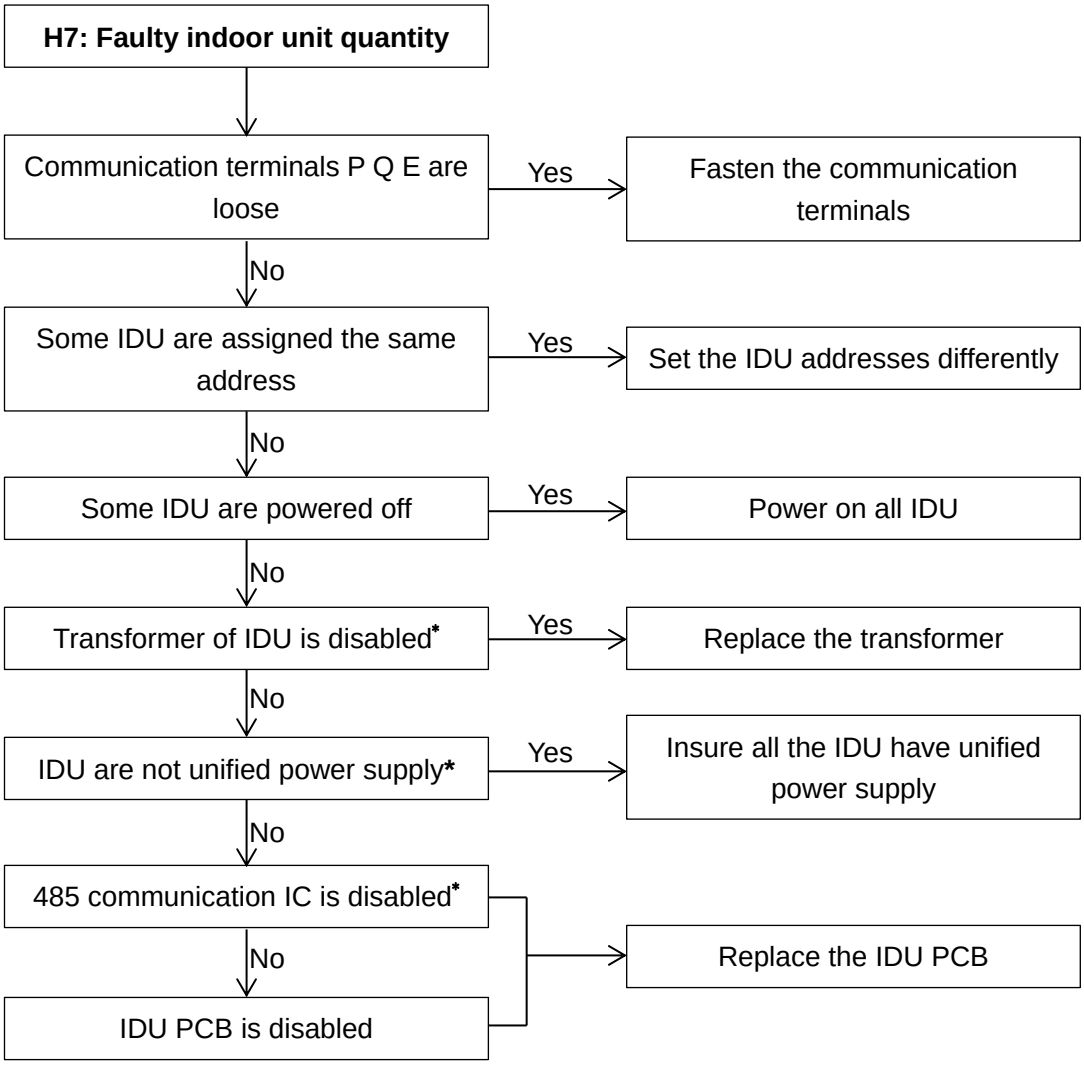
The error will only display on master unit, all the ODUs will be on standby.



Note: All the outdoor units should have unified power supply. If the outdoor units do not unified power supply, units may be powered off individually leading imbalances in the system and damage.

4.13 H7: Faulty indoor unit quantity

The error will only display on the master unit, all the ODUs will be on standby. It will display when the quantity of indoor units decrease above 3 minutes.



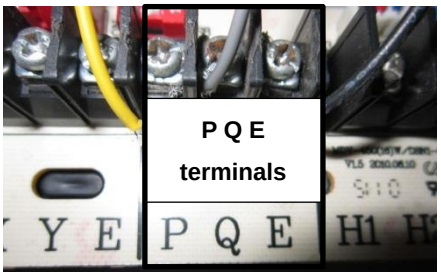
Note:

*** How to check for IDU transformer**

The voltage input of IDU transformer is 220V, the voltage output is AC9V (yellow-yellow) and AC13.5V (brown-brown).

*** How to check for 485 communication IC**

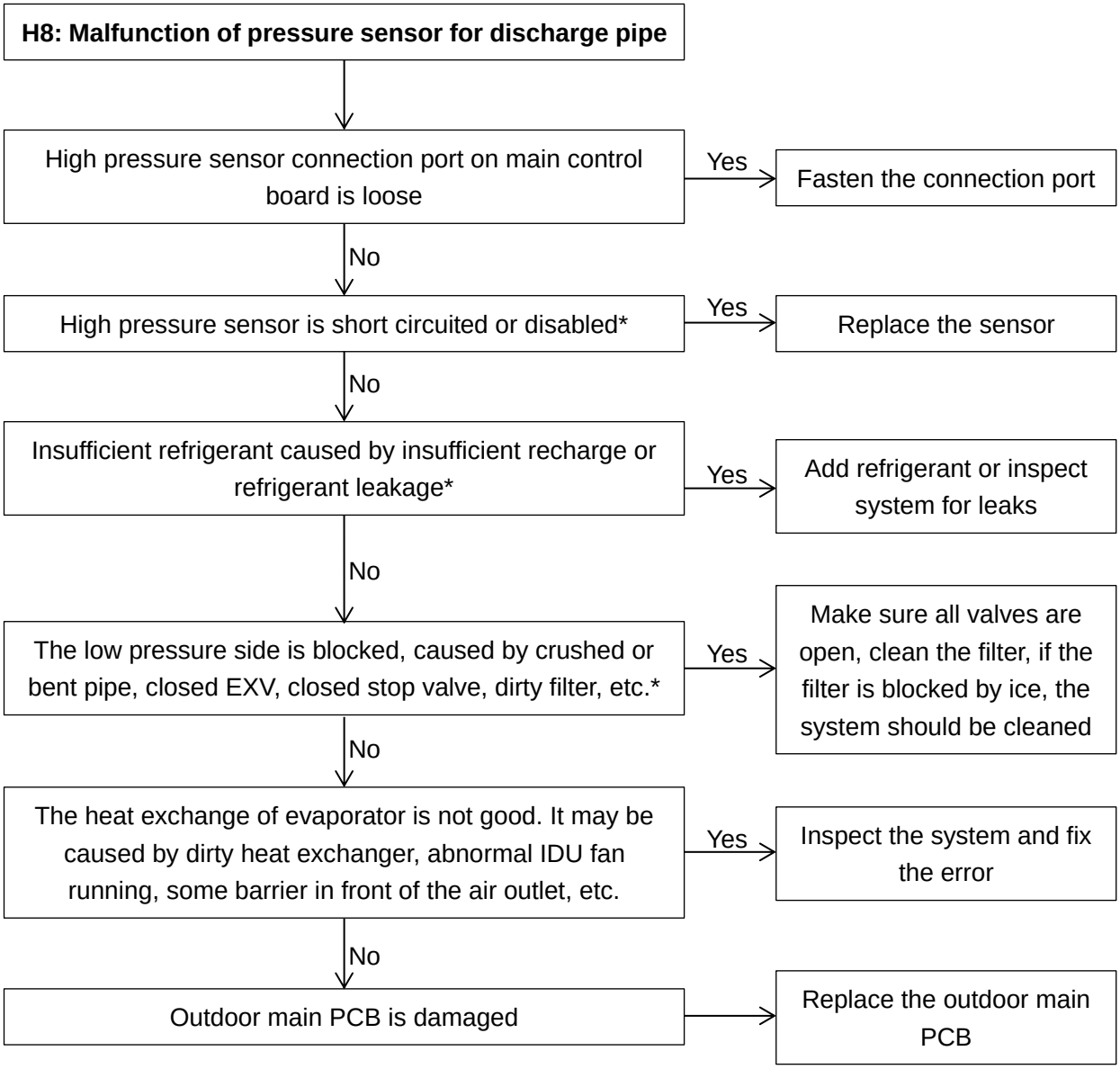
The normal voltage between “P” and “GND” is DC2.5~2.7V, between “Q” and “GND” is DC2.5~2.7V. If the voltage is out of the normal range, the 485 communication IC is disabled.



* Indoor units should have unified power supply, which can protect the compressor from liquid hammering caused by dropped indoor units with unclosed EXV.

4.14 H8: Malfunction of pressure sensor for discharge pipe

When the discharge pressure is lower than 0.3MPa, the system will display error H8, the ODUs will be on standby. When the discharge pressure is back to normal, H8 is removed and normal operation resumes.



Note:

*** How to check for high pressure sensor**

Measure the resistance among the three terminals of the pressure sensor, if the resistance value is megohm or infinite, the pressure sensor is disabled.

*** The phenomenon of insufficient refrigerant**

Top temperature and discharge temperature of all compressors are higher than normal value, discharge pressure and suction pressure are both lower than normal value, current is lower than normal value, suction pipe may be frosting. All the phenomenon will disappear after recharging refrigerant.

*** The phenomenon of low pressure side blockage**

The discharge temperature is higher than normal value*, low pressure is lower than normal value*, current is lower than normal value* and suction pipe may be frosting.

*For normal system running parameters please refer to attached table 3.

4.15 yHd: Slave unit malfunction (y refers to corresponding slave unit)

yHd is only displayed on the master unit. y stands for corresponding slave unit. If y is 1, it refers No.1 slave unit which has malfunctioned.

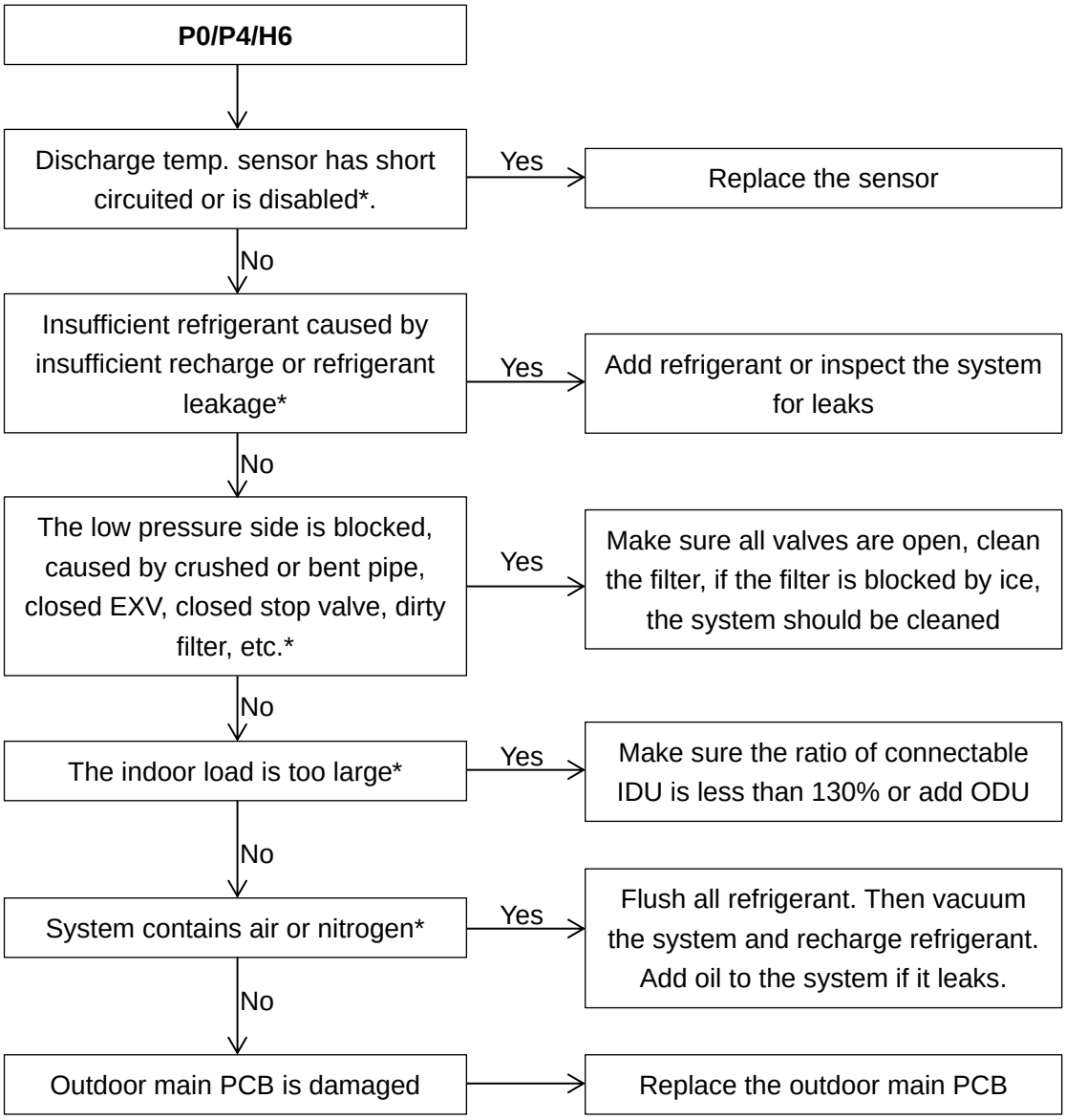
4.16 P0: Temperature protection of inverter compressor

4.17 P4: Discharge temperature protection;

4.18 H6: P4 protection appears three times in 100 minutes

The error will only display on the faulty unit, all the ODUs will be on standby.

If H6 error occurs system must be restarted as it cannot automatically resume.



Note:

*** How to check for the discharge temperature sensor**

Using a multi meter to measure resistance, if the resistance is too low, the sensor has short circuited, if the resistance at certain temperature is not consistent with attached table 2, the sensor is disabled

*** The phenomenon of insufficient refrigerant**

Top temperature and discharge temperature of all compressors are higher than normal value, discharge pressure and suction pressure are both lower than normal value, current is lower than normal value, suction pipe may be frosting. All the phenomenon will disappear after recharging refrigerant.

*** The phenomenon of low pressure side blockage**

The discharge temperature is higher than normal value*, low pressure is lower than normal value*, current is lower than normal value* and suction pipe may be frosting.

4. The phenomenon of too large indoor load

The suction temperature and discharge temperature are both higher than normal value.

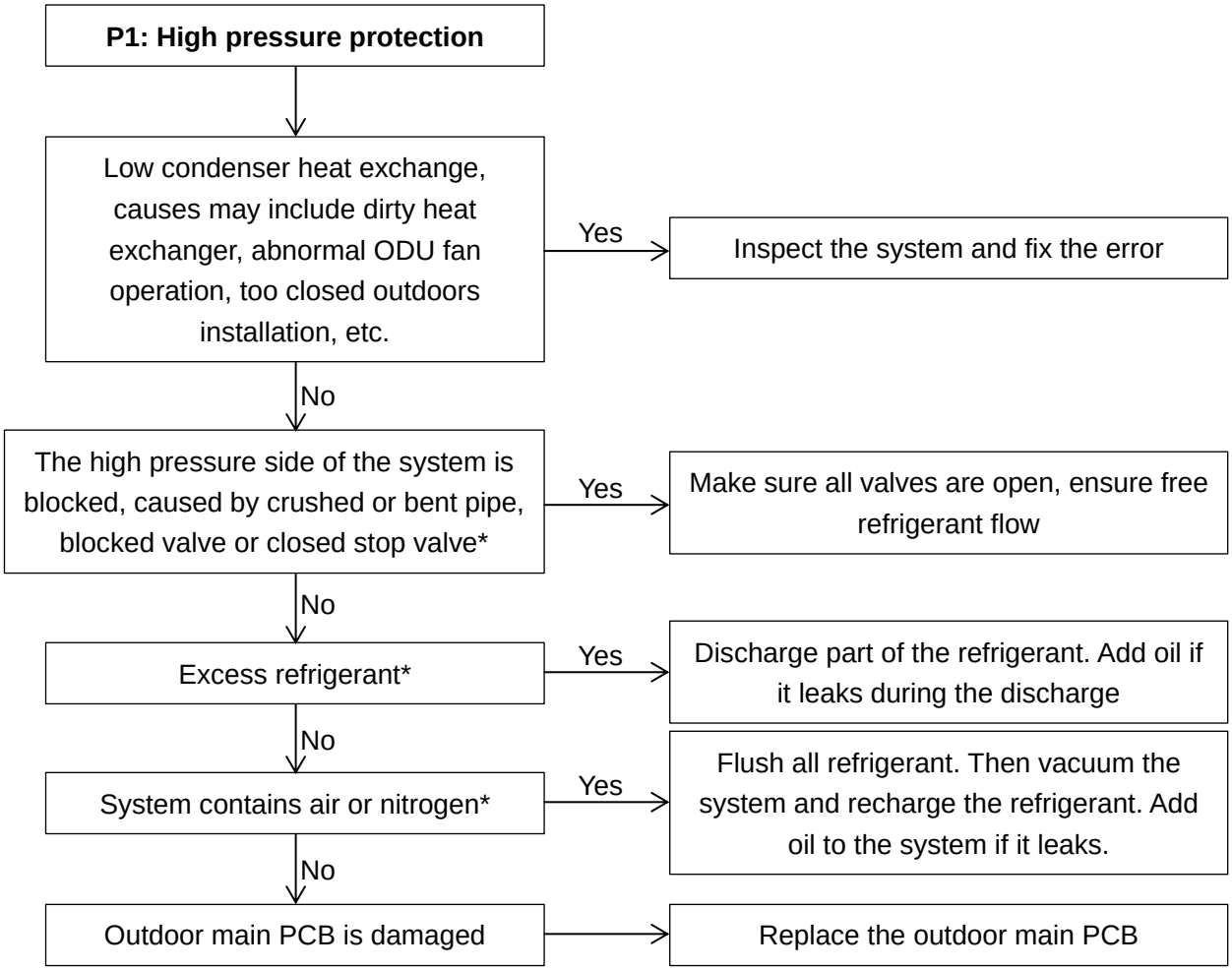
5. The phenomenon of air or nitrogen in the system

The high pressure is higher than normal value, current is larger than normal value, discharge temperature is higher than normal value, abnormal compressor noise, pressure meter is not steady.

*For normal system running parameters please refer to attached table 3.

4.19 P1: High pressure protection

When the pressure is over 4.4MPa, the system will display P1 protection, the ODUs will be on standby. When the pressure is lower than 3.2MPa, P1 protection is finished and normal operation resumes.



Note:

*** The phenomenon of high pressure side blockage**

The high pressure is higher than normal value, the low pressure is lower than normal value, and the discharge temperature is higher than normal value.

*** The phenomenon of excess refrigerant is**

The high pressure is higher than normal value, the low pressure is higher than normal value, and the discharge temperature is lower than normal value.

*** The phenomenon of air or nitrogen in the system**

The high pressure is higher than normal value, current is larger than normal value, discharge temperature is higher than normal

value, abnormal compressor noise, pressure meter is not steady.

* For normal system running parameters please refer to attached table 3.

* If the system has a three-phase protector, and the three-phase protector is connected with the high pressure switch in series, the system will display P1 protection when initially powered on, and P1 protection will disappear after system is steady.

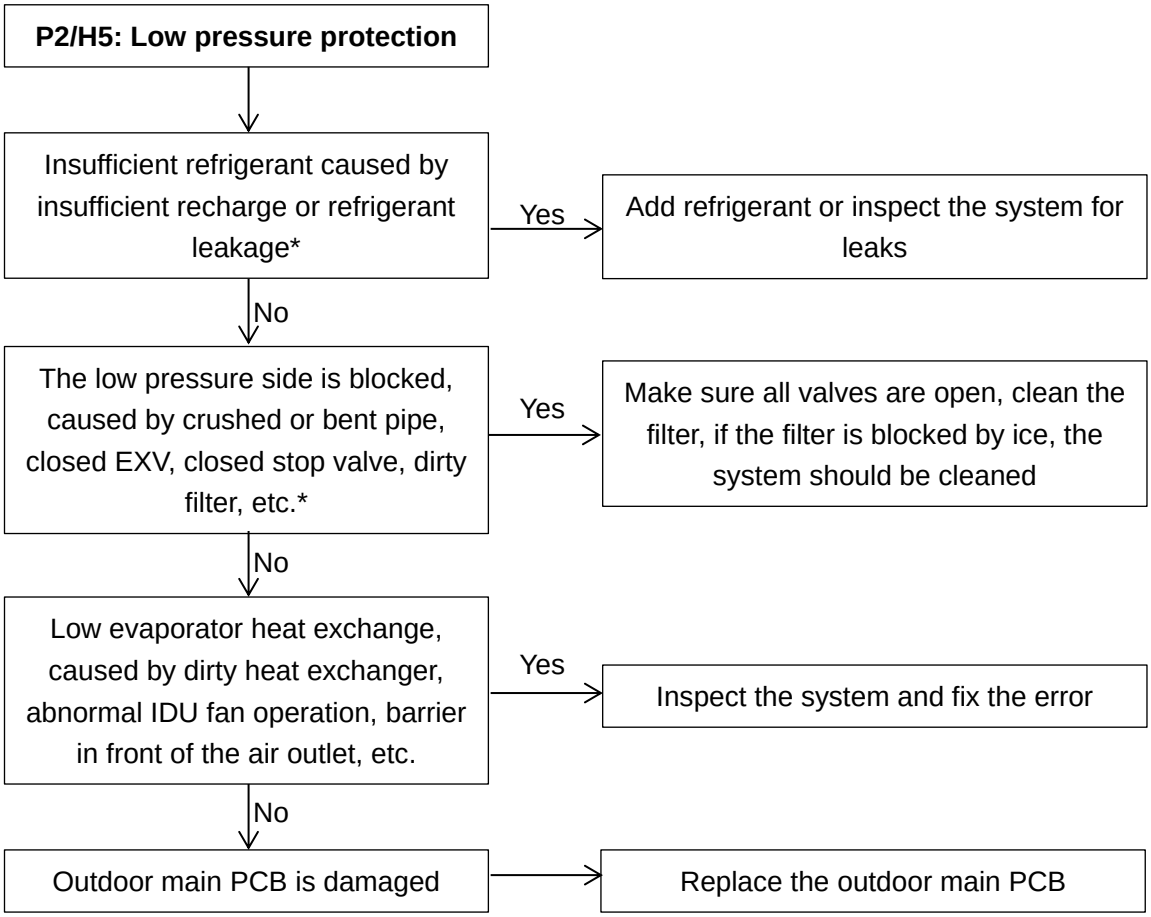
* If the system has a three-phase protector, and the three-phase protector is connected with the low pressure switch in series, the system will display P2 protection when initially powered on, and P2 protection will disappear after system is steady.

4.20 P2: Low pressure protection

4.21 H5: P2 protection appears three times in 60 minutes

When the pressure is lower than 0.05MPa, the system will display P2 protection, the ODUs will be on standby. When the pressure is higher than 0.15MPa, P2 protection finished and normal operation resumes.

H5 error will display when P2 protection appears 3 times in 60 minutes. In this case the system cannot automatically reset and must be manually restarted.



Note:

*** The phenomenon of insufficient refrigerant**

Top temperature and discharge temperature of all compressors are higher than normal value, discharge pressure and suction pressure are both lower than normal value, current is lower than normal value, suction pipe may be frosting. All the phenomenon will disappear after recharging refrigerant.

*** The phenomenon of low pressure side blockage**

The discharge temperature is higher than normal value*, low pressure is lower than normal value*, current is lower than normal value* and suction pipe may be frosting.

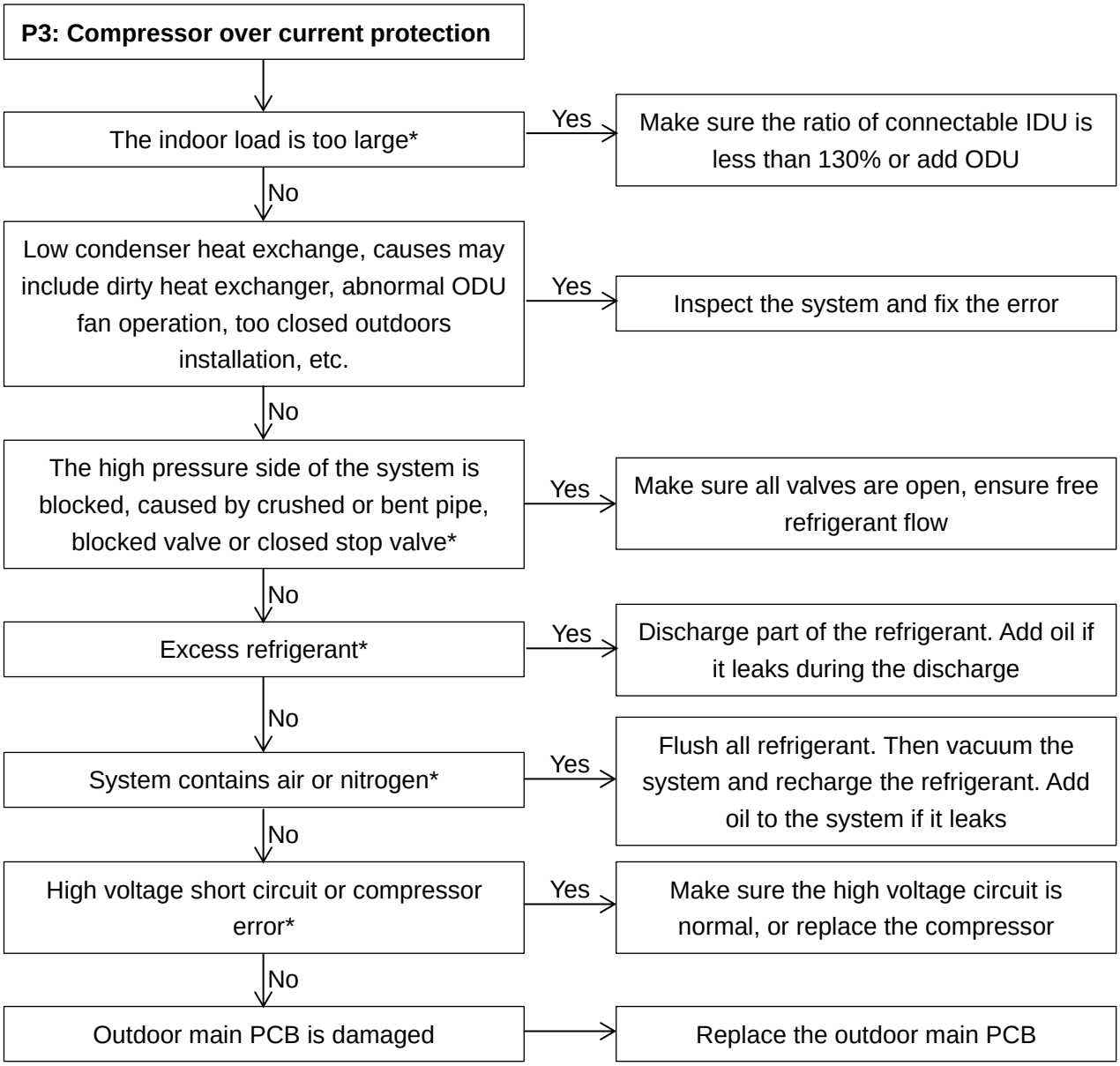
* For normal system running parameters please refer to attached table 3.

* If the system has a three-phase protector, and the three-phase protector is connected with high pressure switch in series, the system will display P1 protection when initially powered on, and P1 protection will disappear after system is steady.

* If the system has a three-phase protector, and the three-phase protector is connected with low pressure switch in series, the system will display P2 protection when initially powered on, and P2 protection will disappear after system is steady.

4.22 xP3: Over current protection of compressor (When x is 1, it refers to A compressor; 2 refers to B compressor)

When inverter compressor current is over 12A*, the system will display P3 protection, the ODU in standby. When the current goes back to normal range, P3 disappears and normal operation resumes.



Note:

*** The phenomenon of too large indoor load is**

The suction temperature and discharge temperature are both higher than normal value.

*** The phenomenon of high pressure side blockage**

The high pressure is higher than normal value, the low pressure is lower than normal value, and the discharge temperature is higher than normal value.

*** The phenomenon of excess refrigerant is**

The high pressure is higher than normal value, the low pressure is higher than normal value, and the discharge temperature is lower than normal value.

*** The phenomenon of air or nitrogen in the system**

The high pressure is higher than normal value, current is larger than normal value, discharge temperature is higher than normal value, abnormal compressor noise, pressure meter is not steady.

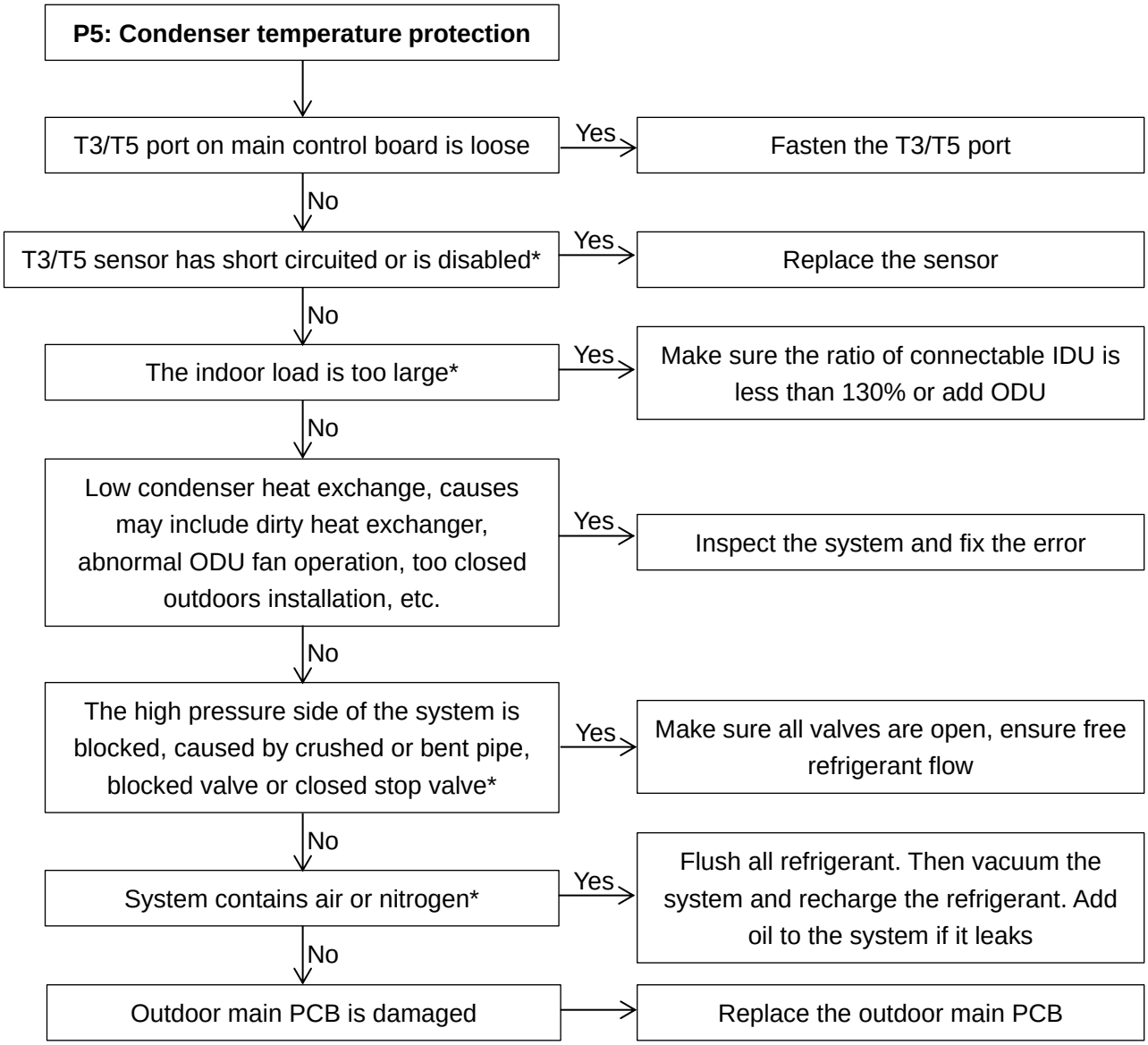
*** How to check for compressor**

Measure the resistance between two of the three compressor terminals. The resistance between two terminals is 2-5Ω, the resistance between each terminal and ground is infinite, if the resistance is out of the normal range, the compressor has malfunctioned.

*The protection current of different compressors are as followed: E405DHD-36D2YG, 12A; E405DHD-42D2YG, 15A; E655DHD-65D2YG, 21A; E705DHD-72D2YG, 23A.

4.23 P5: Condenser temperature protection

When condenser temperature is over 65^{o}C (149^{o}F), the system will display P5 protection, the ODUs will go on standby. When the temperature goes back to normal range, P5 protection finishes and normal operation resumes.



Note:

T3/T5: Sensor for condenser pipe;

*** How to check for T3/T5 sensor**

Using a multi meter to measure resistance, if the resistance is too small, the sensor is short circuit, if the resistance in certain temperature is not consistent with attached table 1, the sensor is disabled

*** The phenomenon of large indoor load**

The suction temperature and discharge temperature are both higher than normal value.

*** The phenomenon of high pressure side blockage**

The high pressure is higher than normal value, the low pressure is lower than normal value, and the discharge temperature is higher than normal value.

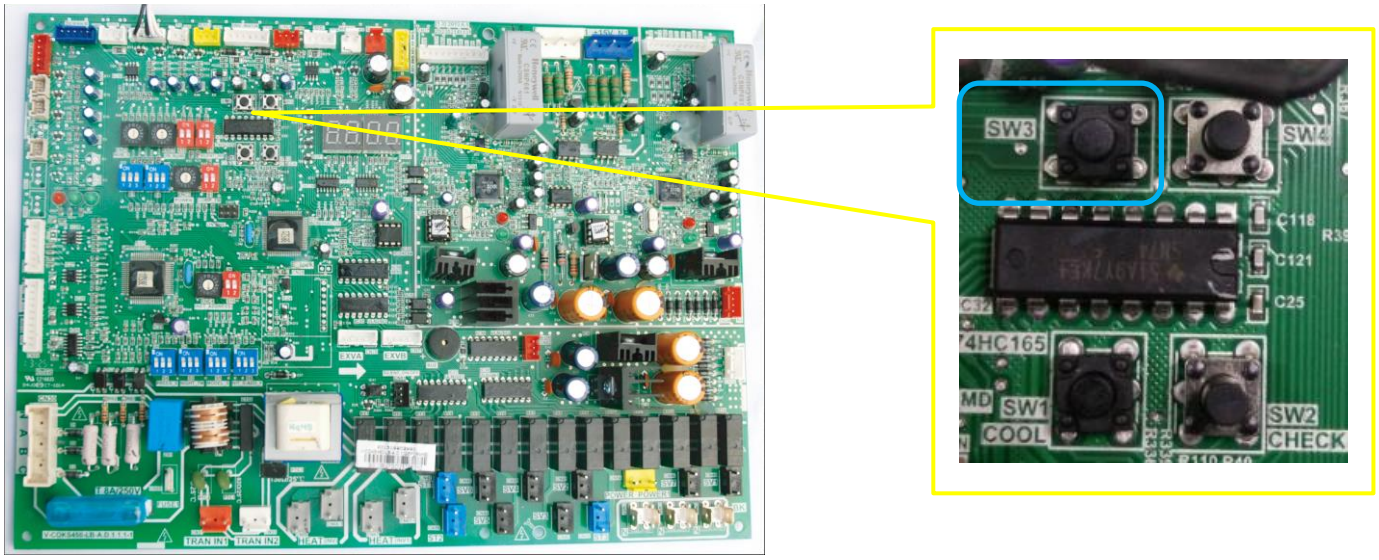
*** The phenomenon air or nitrogen in the system**

The high pressure is higher than normal value, current is larger than normal value, discharge temperature is higher than normal value, abnormal compressor noise, pressure meter is not steady.

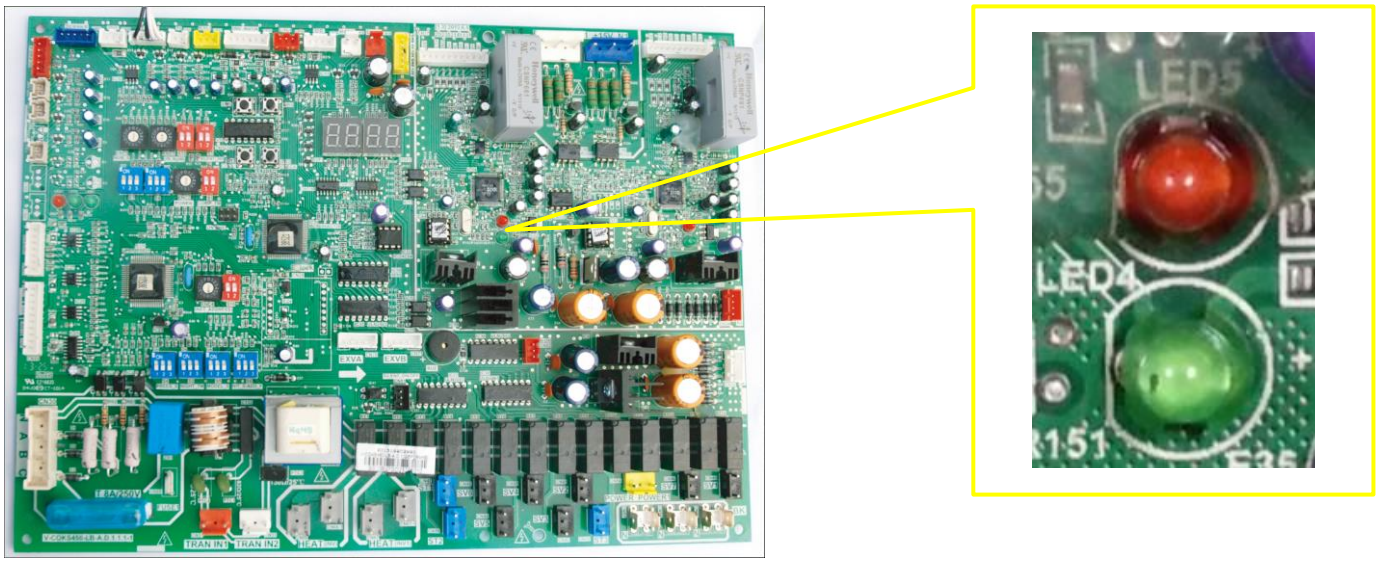
4.24 xH4: Inverter module protection

When the system displays H4 error code, the system can resume only by restarting the machine. In the event of H4, the cause for error should be addressed promptly to avoid system damage.

1) When H4 error code occurs, press SW3 button every two seconds until error code (L0/L1/L2/L4/L5/L7/L8/L9) displayed on digital tube to find the specific error code.



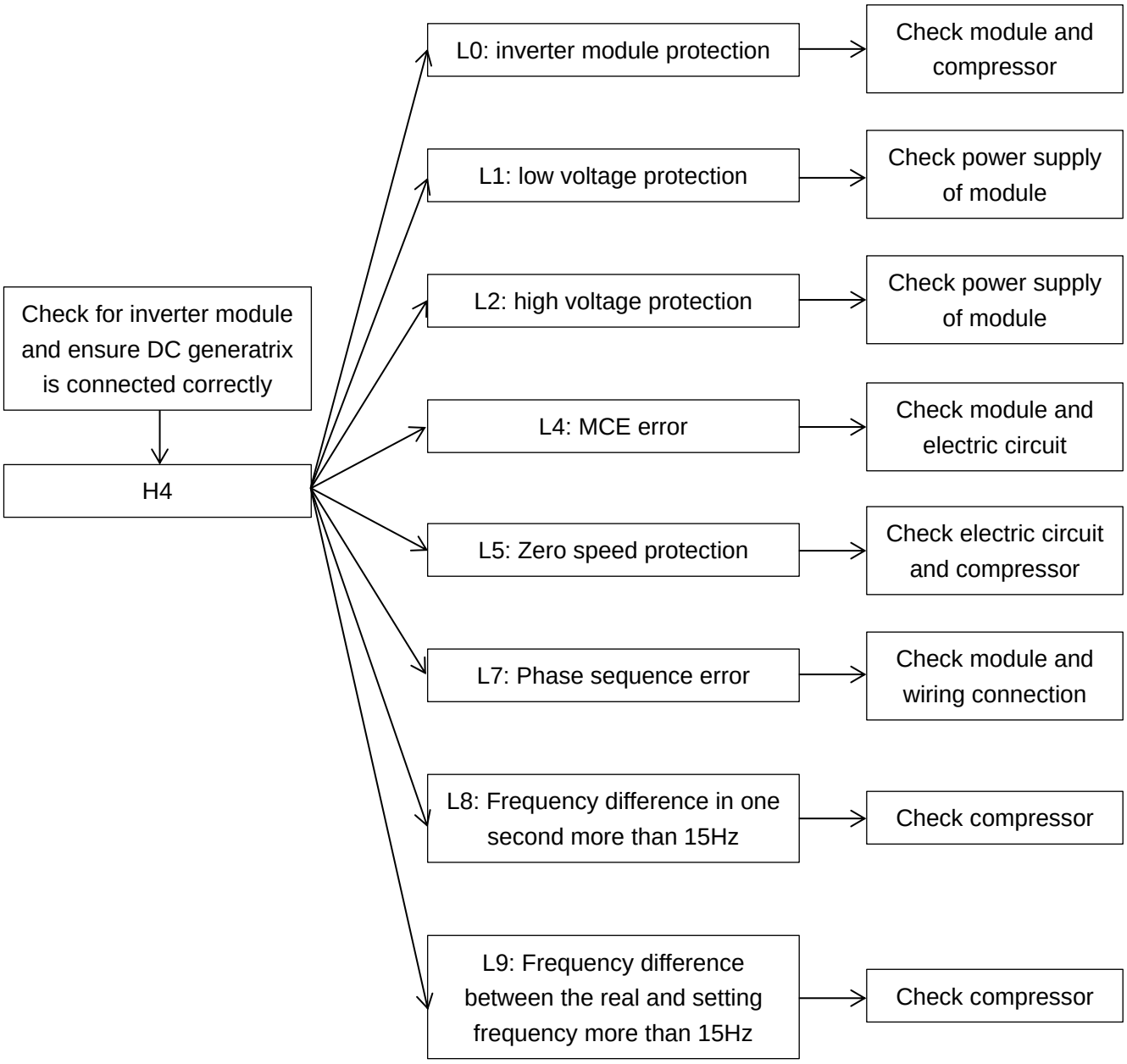
2) When H4 error code occurs, it is also can check the inverter module LED indicators to get the specific error code (L0/L1/L2/L4/L5/L7/L8/L9).



If inverter module has malfunctioned, the LED5(LED7) will keep on and the LED4(LED6) will flash.

LED4(LED6) flashes frequency	Corresponding error
Flashes 8 times and stops 1 second, then repeat	L0- Inverter module protection
Flashes 9 times and stops 1 second, then repeat	L1- DC generatrix low voltage protection
Flashes 10 times and stops 1 second, then repeat	L2- DC generatrix high voltage protection
Flashes 12 times and stops 1 second, then repeat	L4- MCE error

Specific error code for inverter module



1) L0 troubleshooting

Step 1: Compressor check

Measure the resistance between each two of U, V, W terminals of the compressor, all resistance levels should be the same and equal to 0.9~5 Ohms. (Fig. A and Fig. B)

Measure the resistance between each of U, V, W terminals of the compressor and ground (Fig. C), all the resistance should be infinite (Fig. D), otherwise the compressor has malfunctioned and needs to be replaced.

Fig. A

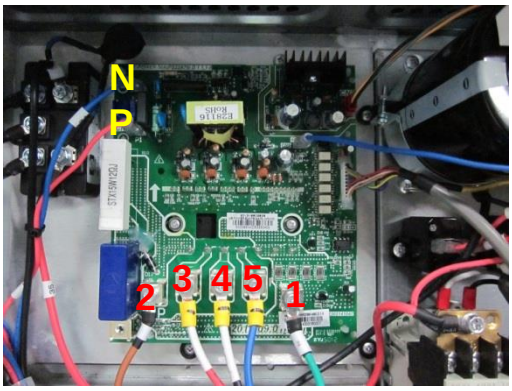
Fig.B

Fig.C

Fig.D

If the resistance values are normal, then go to step 2.

Step 2: Module check

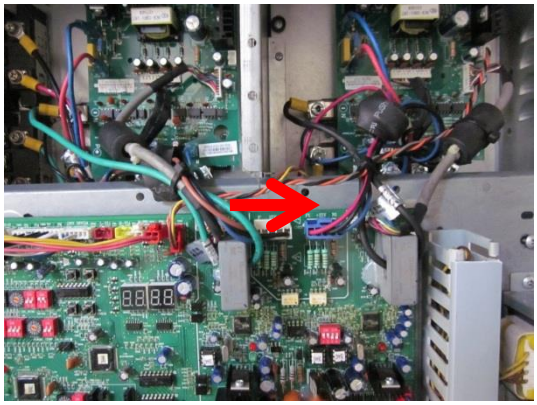


1) DC voltage between terminal P and terminal N should be 1.41 times the local power supply voltage.
2) DC voltage between terminal 1 and 2 should be 510V～580V.
3) Disconnect the terminal 3, 4, and 5 from inverter compressor. Measure the resistance between any two terminals among terminal 1, 2, 3, 4, 5. All the values should be infinite. If any of the value approximates to 0, the inverter module is damaged and should be replaced.

After replacing the inverter module, if the system is still abnormal, then go to step 3.

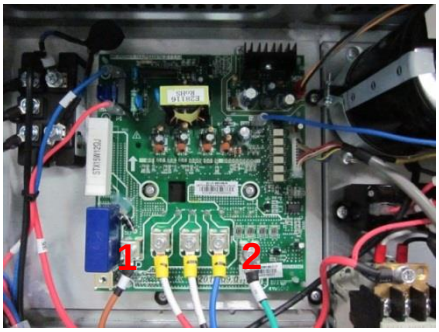
Step 3: DC generatrix check

Direction of the current in DC supply wire which is running through the inductor should be the same as the direction of arrow marked on the inductor.

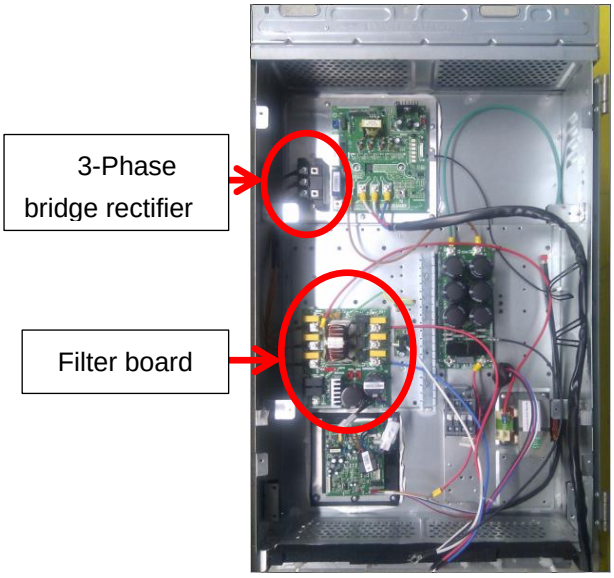


2) L1/L4 troubleshooting

Step 1: Check the DC voltage between terminal 1 and 2, the normal value should be 510V~580V, if the voltage is lower than 510V, go to step 2.

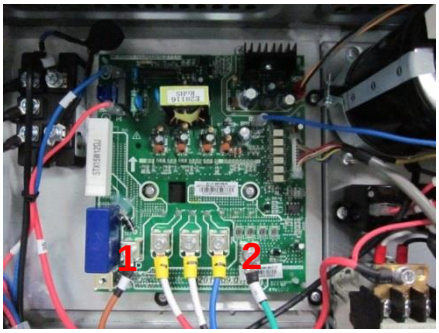


Step 2: Check for rectifier wiring circuit. If wires are loose, fasten the wires. If wires are OK, replace the main PCB.



3) L2 troubleshooting

Step 1: Check the DC voltage between terminal 1 and 2, the normal value should be 510V~580V, if the voltage is higher than 580V, go to step 2.



Step 2: Check the voltage between P and N on capacitor board, the normal value should be 510V~580V.

If the value is not in the range, this indicates a problem with the electrolytic capacitor power supply, check the power supply for high or unstable voltage.

If the voltage value is normal, then the main PCB has malfunctioned, it needs to be replaced.

4) L8/L9 troubleshooting

Step 1: Compressor check

Measure the resistance between each two of U, V, W terminals of the compressor, all the resistance should be the same and equal to 0.9~5 Ohms. (Fig. A and Fig. B)

Measure the resistance between each U, V, W terminal of the compressor and ground (Fig. C), all the resistance should be infinite (Fig. D), if not the compressor has malfunctioned and needs to be replaced.

Fig. A

Fig.B

Fig.C

Fig.D

If the resistance values are normal, then go to step 2.

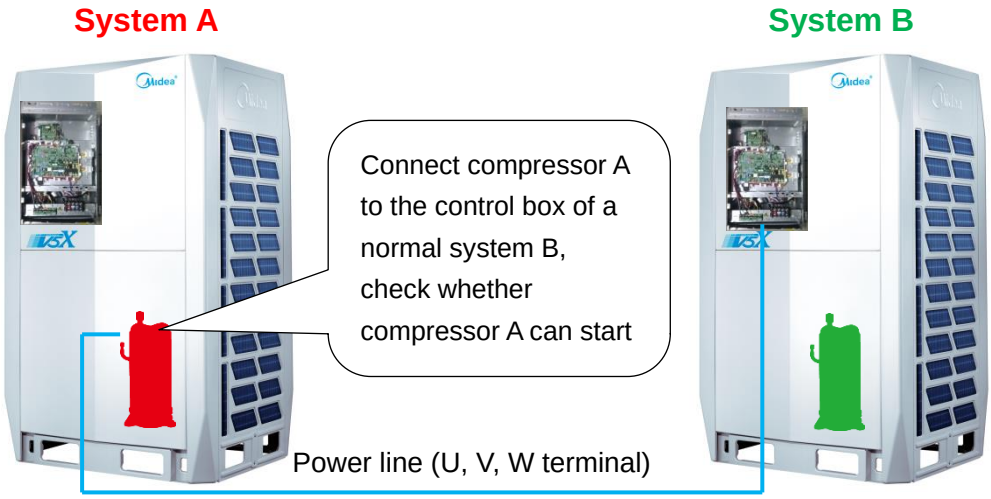
Step 2: Disconncet the power wiring from the compressor(named compressor A) of the faulted system(named system A).

If there is a system running normally nearby (named system B):

Extend the power line of the inverter compressor of system B, connect compressor A to the control box of system B, make sure that the U, V, W terminals are connected in right order, then start system B.

If compressor A can start normally, that means compressor is OK, the control box of system A has malfunctioned, then replace the main PCB of system A and ensure correct wiring.

If compressor A can not start normally, that means compressor A is damaged and needs to be replaced.



If there is no normal system nearby:

Replace the main PCB of system A and ensure correct wiring, if compressor A can start normally, it means the main PCB which was replaced was damaged. If compressor A still can't start normally, replace the compressor.

Guide for compressor replacement

Step 1: Remove the compressor from the faulty outdoor unit, pour out the oil from the compressor according to the method illustrated. Normally the oil will flow out from the discharge pipe of the compressor.

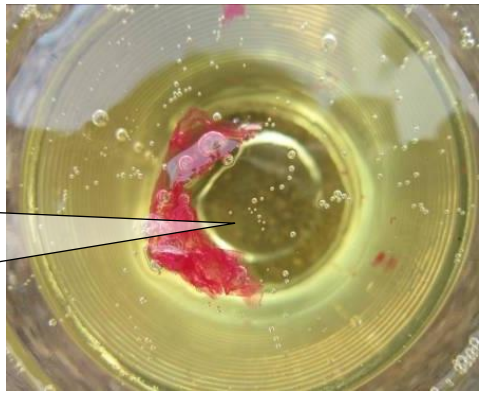
Step 2: Inspect system oil

Normally the oil should be clear and transparent, slightly yellow is also not an indication on any problems. However, if the oil is dark, black or contains impurities, the system has problems and the oil needs to be changed.

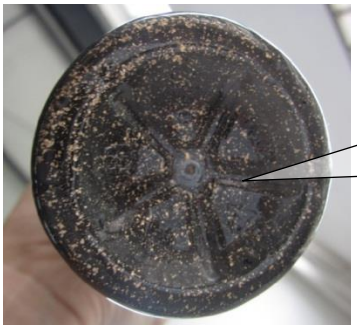
The oil is black, it has been carbonized

The oil is a little yellow, but it is clear and transparent, the quality is acceptable

The oil is still transparent, but there is impunity in the oil, the impunity may clog the filter



Cloudy or gray oil indicates abnormal system operation



This sample contains copper bits

If the oil has been spoiled

The compressor can't be lubricated effectively.

↓

The scroll plate, the crankshaft and the compressor bearings will wear

↓

Abrasion leads to larger load, higher current

↓

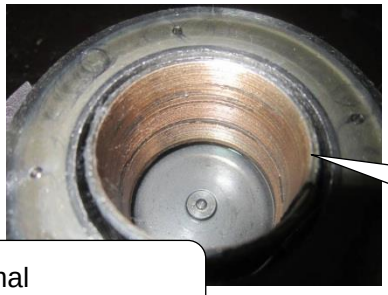
The electric heat will rise and the temperature of the motor becomes increasingly high

↓

Leads finally to compressor burnout an damage

Worn crankshaft

Worn crankshaft

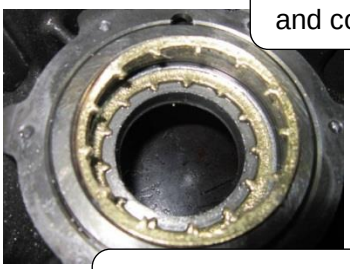


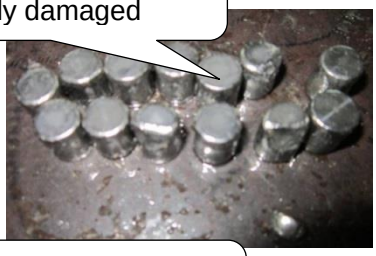
Worn scroll plate

Worn scroll plate

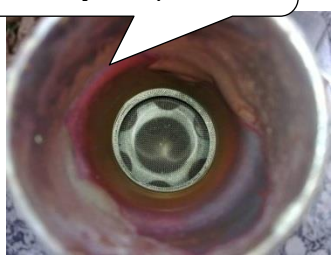
A normal compressor bearing

The bearing is seriously worn, and completely damaged

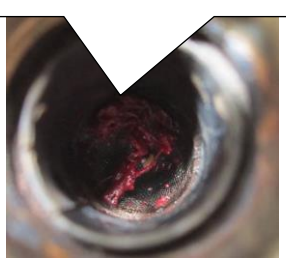




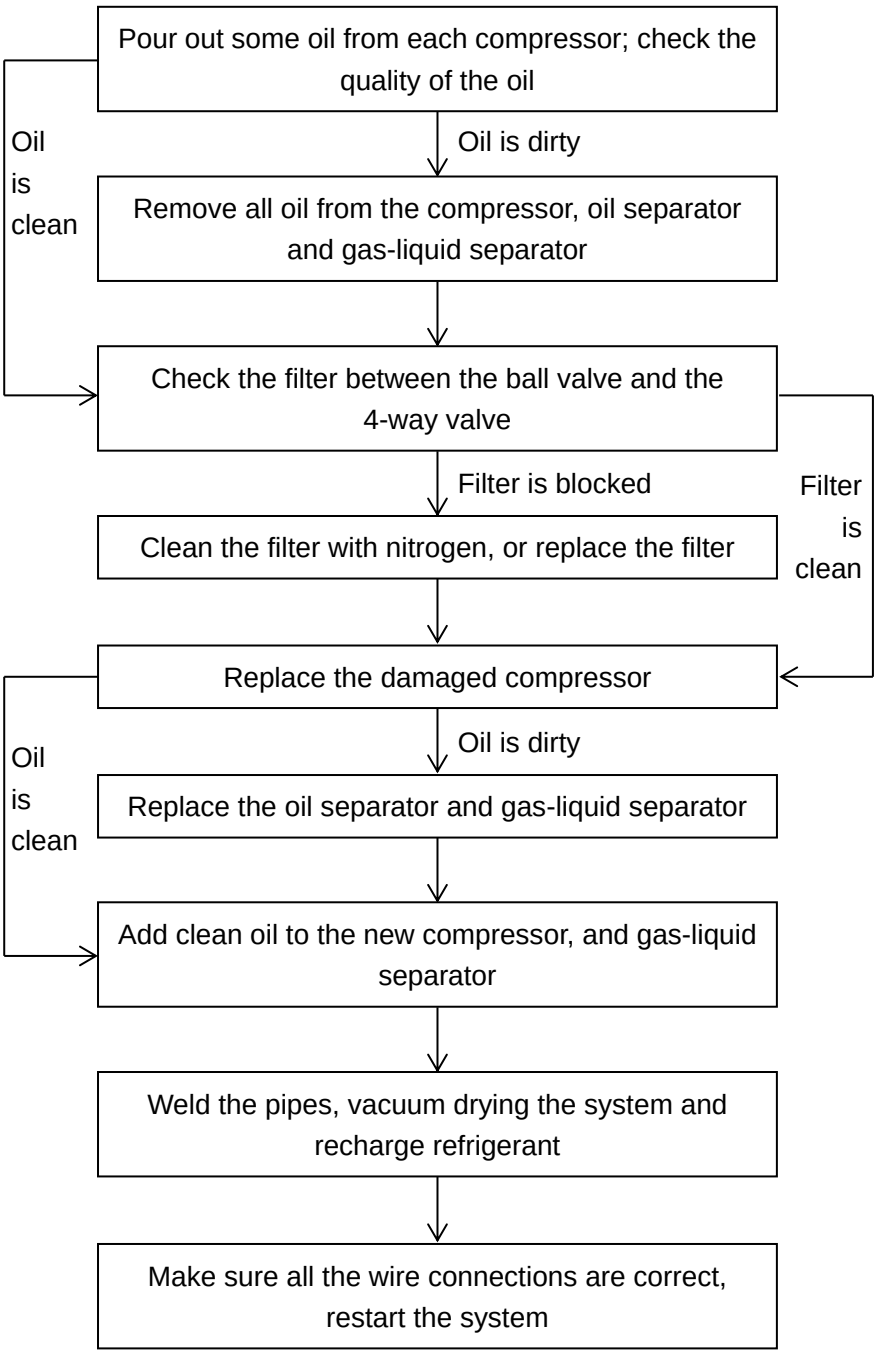
A clean filter (on the suction pipe of the system)



The filter is blocked by impurity; the compressor suction will be abnormal

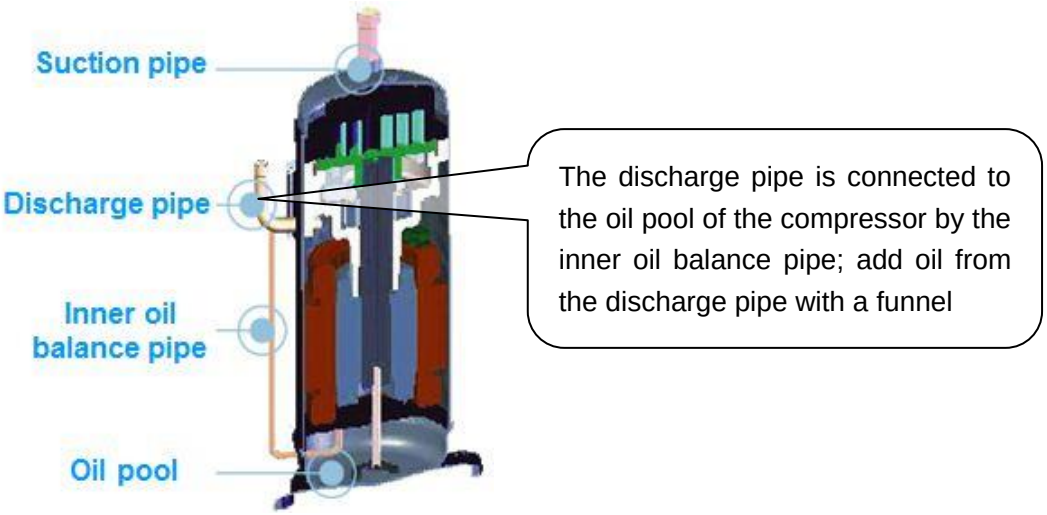


Step 3: Replace the compressor



Note:

1. Before removing the oil, shake the compressor, oil separator and gas-liquid separator first, so as to not allow impurities to settle at the bottom of the tank.
2. If the oil of one compressor is clean, there's no need to check the oil of the other compressor. If the oil of one compressor has gone bad, it is necessary to check the oil of the other compressor. If all the oil of an outdoor unit needs to be replaced, after adding oil to the compressors, the rest oil should be charged to the gas-liquid separator.
3. Add oil to the compressor from the discharge pipe.

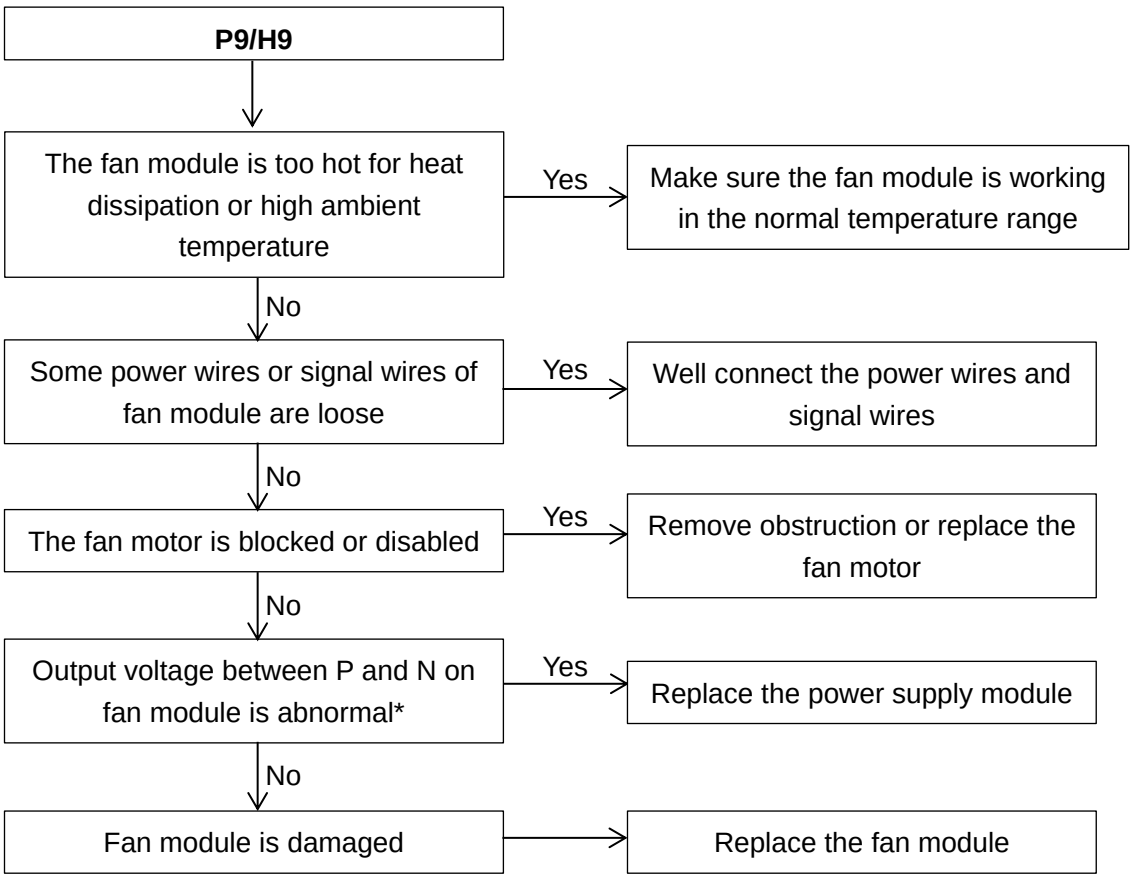


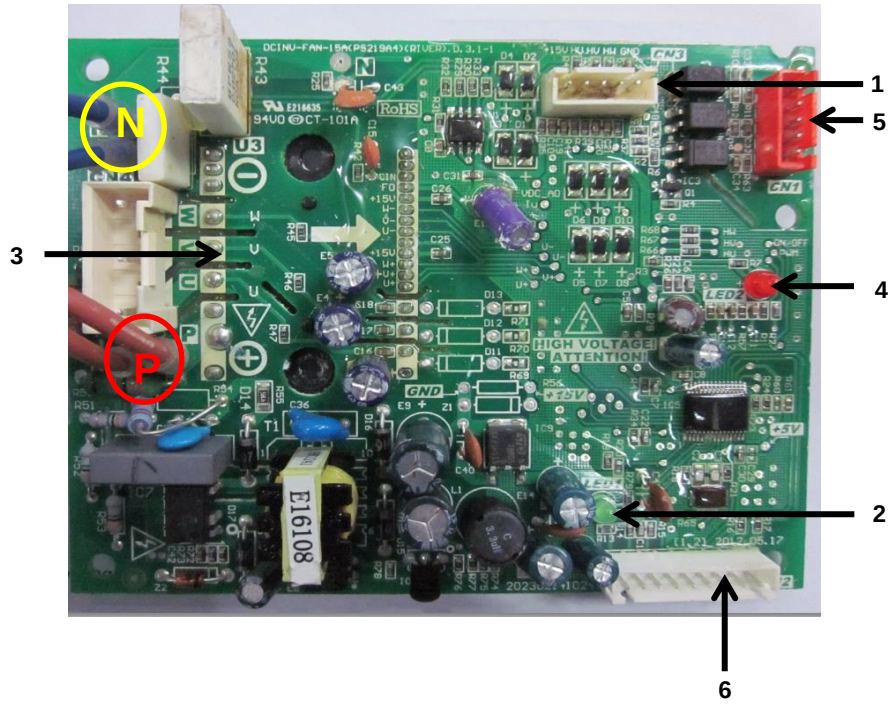
4. The type of the oil is FVC-68D, make sure the type of the oil is right because different compressors require different oil type, incorrect oil leads to various problems.

4.25 P9: Fan module protection

4.26 H9: P9 protection appears three times in 60 minutes

If the system displays P9 protection three times in 60 minutes, the system will stop and display H9 error code. When the system displays H9 error code, the system can resume only by restarting the machine. In the event of H9 error code the cause should be promptly identified and addressed in order to avoid excessive damage.





1 Program input port
2 Power supply indicator lamp
3 Fan motor U, V, W output port
4 Fault indicator lamp
5 PCB control signal input port
6 Signal feedback port

*The normal value of output voltage between P and N on fan module is DC 310V

P9 protection analysis

Conditions	Fault indicator lamp of fan module	Power supply indicator lamp of fan module	Digital tube display	Malfunction analysis
Power on	Off	Off	Quantity of IDU or “0”	Check the fan module power supply circuit. Check power supply for lightning protection plate, ensure the protective tube is not broken, the voltage after rectification is normal, the bridge rectifier is not broken.
Power on	Off	Flash	Quantity of IDU or “0”	Power supply of fan module has problem, fan module needs to be replaced.
Fan motor start up	At first the lamp is on then the lamp is off	On	P9/H9	Check the drive port and signal feedback ports for loose connection, ensure the fan module and fan motor are installed firmly. If above conditions are all confirmed, the fan module needs to be replaced.
Fan motor start up	At first the lamp is on then flashes	On	P9/H9	Check the transformer in lightning protection plate for open circuit, or broken relay. If occurs above problem, it needs to replace the lightning protection plate.
Fan motor running several minutes	On	On	P9/H9	Ensure the capacity setting on dial switch matches with actual ODU capacity, and the capacity checked from query button matches with actual ODU capacity. If there is a discrepancy the settings need to be adjusted. If the above settings match then the main control board needs to be replaced.

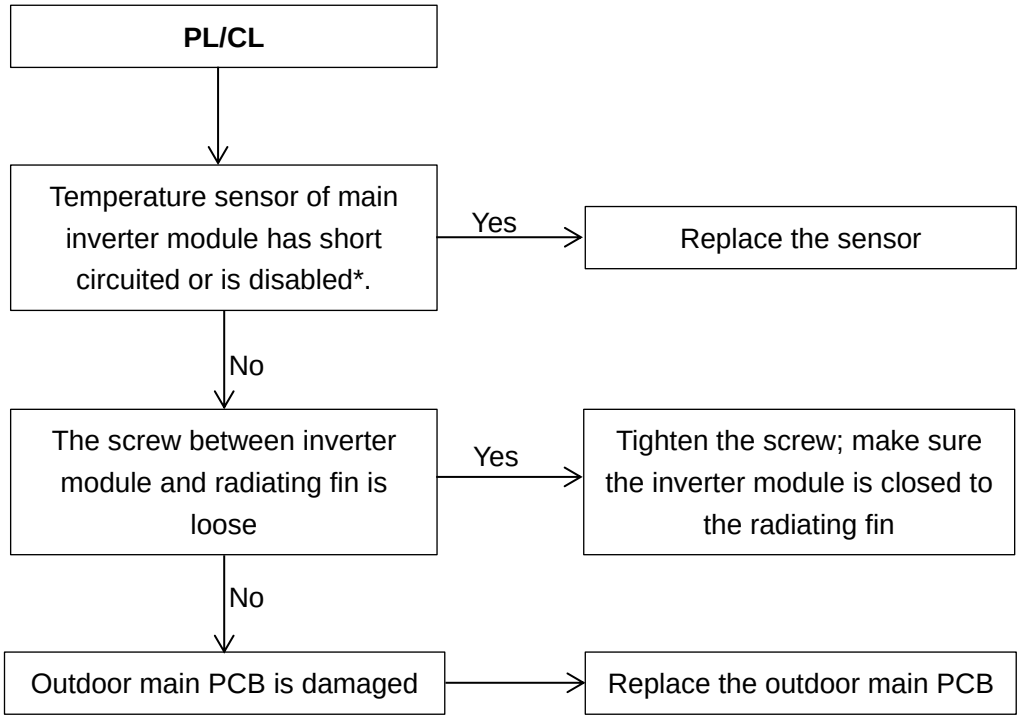
4.27 PL: Temperature protection of main inverter module

4.28 C7: PL protection appears three times in 100 minutes

When the temperature of inverter module is over 80^{o}C, it will display PL protection.

If the system displays PL protection three times in 100 minutes, the system will stop and display C7 error code.

When the system displays C7 error code, the system can resume only by restarting the machine.



*** How to check for the temperature sensor**

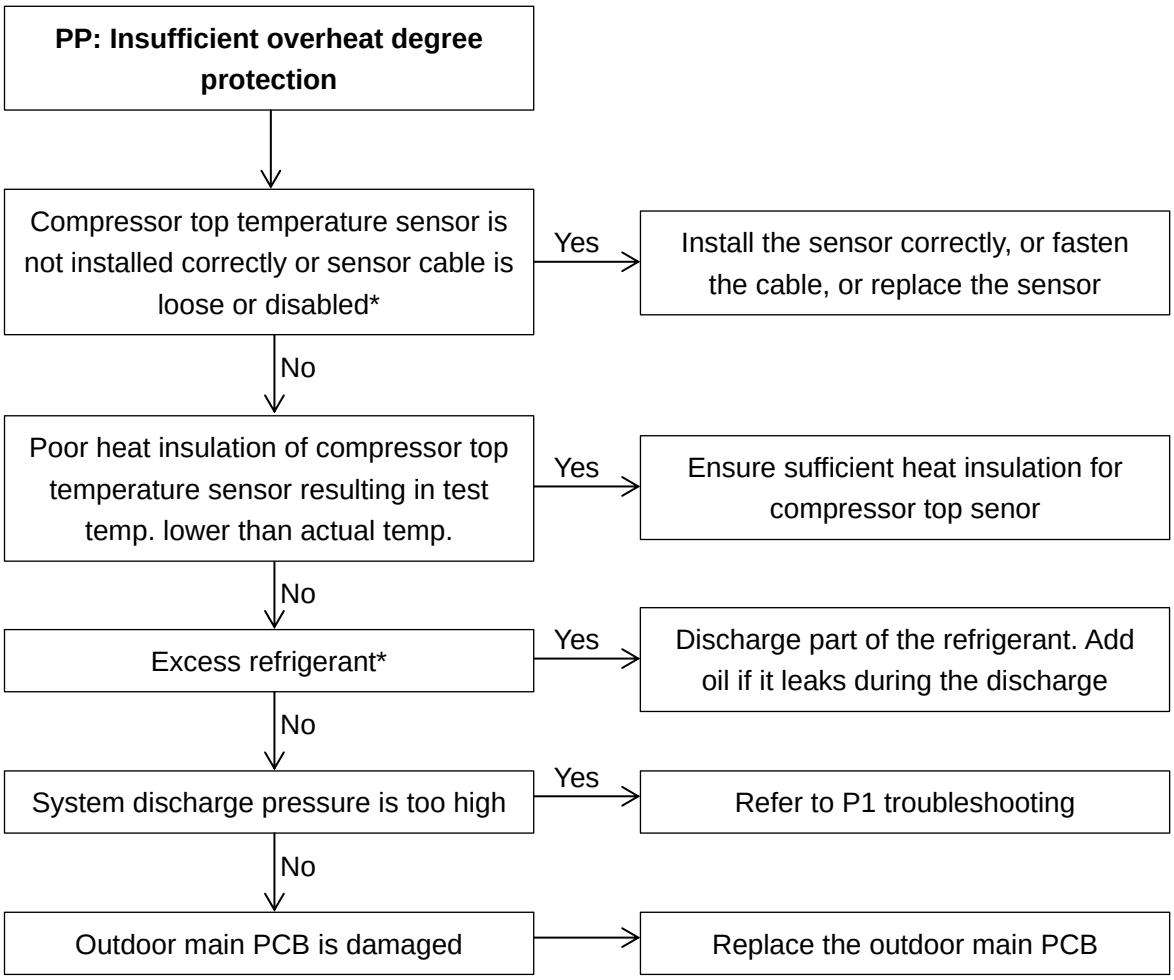
Using a multi-meter to measure resistance, if the resistance is too low, the sensor is short circuit, if the resistance at certain temperature is not consistent with attached table 2, the sensor is disabled

4.29 PP: Insufficient overheat degree protection of compressor discharge temperature

4.30 F0: PP protection appears three times in 150 minutes

When the discharge temperature overheat degree is≤0^{o}C for 20min; or the overheat degree is≤5^{o}C for 60min, it will display PP protection.

If the system displays PP protection three times in 150 minutes, the system will stop and display F0 error code. When the system displays F0 error code, the system can resume only by restarting the machine.



Note:

*** How to check for the temperature sensor**

Using a multi-meter to measure resistance, if the resistance is too small, the sensor is short circuit, if the resistance in certain temperature is not consistent with attached table 2, the sensor is disabled.

*** The phenomenon of excess refrigerant is**

The high pressure is higher than normal value, the low pressure is higher than normal value, and the discharge temperature is lower than normal value.

Attached table 1: Resistance characteristics of ambient temperature and pipe temperature sensor

Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)
-20(-4)	115.266	**20(68)**	12.6431	**60(140)**	2.35774	**100(212)**	0.62973
-19(-2.2)	108.146	**21(69.8)**	12.0561	**61(141.8)**	2.27249	**101(213.8)**	0.61148
-18(-0.4)	101.517	**22(71.6)**	11.5	**62(143.6)**	2.19073	**102(215.6)**	0.59386
-17(1.4)	96.3423	**23(73.4)**	10.9731	**63(145.4)**	2.11241	**103(217.4)**	0.57683
-16(3.2)	89.5865	**24(75.2)**	10.4736	**64(147.2)**	2.03732	**104(219.2)**	0.56038
-15(5)	84.219	**25(77)**	10	**65(149)**	1.96532	**105(221)**	0.54448
-14(6.8)	79.311	**26(78.8)**	9.55074	**66(150.8)**	1.89627	**106(222.8)**	0.52912
-13(8.6)	74.536	**27(80.6)**	9.12445	**67(152.6)**	1.83003	**107(224.6)**	0.51426
-12(10.4)	70.1698	**28(82.4)**	8.71983	**68(154.4)**	1.76647	**108(226.4)**	0.49989
-11(12.2)	66.0898	**29(84.2)**	8.33566	**69(156.2)**	1.70547	**109(228.2)**	0.486
-10(14)	62.2756	**30(86)**	7.97078	**70(158)**	1.64691	**110(230)**	0.47256
-9(15.8)	58.7079	**31(87.8)**	7.62411	**71(159.8)**	1.59068	**111(231.8)**	0.45957
-8(17.6)	56.3694	**32(89.6)**	7.29464	**72(161.6)**	1.53668	**112(233.6)**	0.44699
-7(19.4)	52.2438	**33(91.4)**	6.98142	**73(163.4)**	1.48481	**113(235.4)**	0.43482
-6(21.2)	49.3161	**34(93.2)**	6.68355	**74(165.2)**	1.43498	**114(237.2)**	0.42304
-5(23)	46.5725	**35(95)**	6.40021	**75(167)**	1.38703	**115(239)**	0.41164
-4(24.8)	44	**36(96.8)**	6.13059	**76(168.8)**	1.34105	**116(240.8)**	0.4006
-3(26.6)	41.5878	**37(98.6)**	5.87359	**77(170.6)**	1.29078	**117(242.6)**	0.38991
-2(28.4)	39.8239	**38(100.4)**	5.62961	**78(172.4)**	1.25423	**118(244.4)**	0.37956
-1(30.2)	37.1988	**39(102.2)**	5.39689	**79(174.2)**	1.2133	**119(246.2)**	0.36954
0(32)	35.2024	**40(104)**	5.17519	**80(176)**	1.17393	**120(248)**	0.35982
1(33.8)	33.3269	**41(105.8)**	4.96392	**81(177.8)**	1.13604	**121(249.8)**	0.35042
2(35.6)	31.5635	**42(107.6)**	4.76253	**82(179.6)**	1.09958	**122(251.6)**	0.3413
3(37.4)	29.9058	**43(109.4)**	4.5705	**83(181.4)**	1.06448	**123(253.4)**	0.33246
4(39.2)	28.3459	**44(111.2)**	4.38736	**84(183.2)**	1.03069	**124(255.2)**	0.3239
5(41)	26.8778	**45(113)**	4.21263	**85(185)**	0.99815	**125(257)**	0.31559
6(42.8)	25.4954	**46(114.8)**	4.04589	**86(186.8)**	0.96681	**126(258.8)**	0.30754
7(44.6)	24.1932	**47(116.6)**	3.88673	**87(188.6)**	0.93662	**127(260.6)**	0.29974
8(46.4)	22.5662	**48(118.4)**	3.73476	**88(190.4)**	0.90753	**128(262.4)**	0.29216
9(48.2)	21.8094	**49(120.2)**	3.58962	**89(192.2)**	0.8795	**129(264.2)**	0.28482
10(50)	20.7184	**50(122)**	3.45097	**90(194)**	0.85248	**130(266)**	0.2777
11(51.8)	19.6891	**51(123.8)**	3.31847	**91(195.8)**	0.82643	**131(267.8)**	0.27078
12(53.6)	18.7177	**52(125.6)**	3.19183	**92(197.6)**	0.80132	**132(269.6)**	0.26408
13(55.4)	17.8005	**53(127.4)**	3.07075	**93(199.4)**	0.77709	**133(271.4)**	0.25757
14(57.2)	16.9341	**54(129.2)**	2.95896	**94(201.2)**	0.75373	**134(273.2)**	0.25125
15(59)	16.1156	**55(131)**	2.84421	**95(203)**	0.73119	**135(275)**	0.24512
16(60.8)	15.3418	**56(132.8)**	2.73823	**96(204.8)**	0.70944	**136(276.8)**	0.23916
17(62.6)	14.6181	**57(134.6)**	2.63682	**97(206.6)**	0.68844	**137(278.6)**	0.23338
18(64.4)	13.918	**58(136.4)**	2.53973	**98(208.4)**	0.66818	**138(280.4)**	0.22776
19(66.2)	13.2631	**59(138.2)**	2.44677	**99(210.2)**	0.64862	**139(282.2)**	0.22231

Attached table 2: Resistance characteristics of compressor discharge temperature sensor

Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)	Temperature °C (°F)	Resistance value (kΩ)
-20(-4)	542.7	**20(68)**	68.66	**60(140)**	13.59	**100(212)**	3.702
-19(-2.2)	511.9	**21(69.8)**	65.62	**61(141.8)**	13.11	**101(213.8)**	3.595
-18(-0.4)	483	**22(71.6)**	62.73	**62(143.6)**	12.65	**102(215.6)**	3.492
-17(1.4)	455.9	**23(73.4)**	59.98	**63(145.4)**	12.21	**103(217.4)**	3.392
-16(3.2)	430.5	**24(75.2)**	57.37	**64(147.2)**	11.79	**104(219.2)**	3.296
-15(5)	406.7	**25(77)**	54.89	**65(149)**	11.38	**105(221)**	3.203
-14(6.8)	384.3	**26(78.8)**	52.53	**66(150.8)**	10.99	**106(222.8)**	3.113
-13(8.6)	363.3	**27(80.6)**	50.28	**67(152.6)**	10.61	**107(224.6)**	3.025
-12(10.4)	343.6	**28(82.4)**	48.14	**68(154.4)**	10.25	**108(226.4)**	2.941
-11(12.2)	325.1	**29(84.2)**	46.11	**69(156.2)**	9.902	**109(228.2)**	2.86
-10(14)	307.7	**30(86)**	44.17	**70(158)**	9.569	**110(230)**	2.781
-9(15.8)	291.3	**31(87.8)**	42.33	**71(159.8)**	9.248	**111(231.8)**	2.704
-8(17.6)	275.9	**32(89.6)**	40.57	**72(161.6)**	8.94	**112(233.6)**	2.63
-7(19.4)	261.4	**33(91.4)**	38.89	**73(163.4)**	8.643	**113(235.4)**	2.559
-6(21.2)	247.8	**34(93.2)**	37.3	**74(165.2)**	8.358	**114(237.2)**	2.489
-5(23)	234.9	**35(95)**	35.78	**75(167)**	8.084	**115(239)**	2.422
-4(24.8)	222.8	**36(96.8)**	34.32	**76(168.8)**	7.82	**116(240.8)**	2.357
-3(26.6)	211.4	**37(98.6)**	32.94	**77(170.6)**	7.566	**117(242.6)**	2.294
-2(28.4)	200.7	**38(100.4)**	31.62	**78(172.4)**	7.321	**118(244.4)**	2.233
-1(30.2)	190.5	**39(102.2)**	30.36	**79(174.2)**	7.086	**119(246.2)**	2.174
0(32)	180.9	**40(104)**	29.15	**80(176)**	6.859	**120(248)**	2.117
1(33.8)	171.9	**41(105.8)**	28	**81(177.8)**	6.641	**121(249.8)**	2.061
2(35.6)	163.3	**42(107.6)**	26.9	**82(179.6)**	6.43	**122(251.6)**	2.007
3(37.4)	155.2	**43(109.4)**	25.86	**83(181.4)**	6.228	**123(253.4)**	1.955
4(39.2)	147.6	**44(111.2)**	24.85	**84(183.2)**	6.033	**124(255.2)**	1.905
5(41)	140.4	**45(113)**	23.89	**85(185)**	5.844	**125(257)**	1.856
6(42.8)	133.5	**46(114.8)**	22.89	**86(186.8)**	5.663	**126(258.8)**	1.808
7(44.6)	127.1	**47(116.6)**	22.1	**87(188.6)**	5.488	**127(260.6)**	1.762
8(46.4)	121	**48(118.4)**	21.26	**88(190.4)**	5.32	**128(262.4)**	1.717
9(48.2)	115.2	**49(120.2)**	20.46	**89(192.2)**	5.157	**129(264.2)**	1.674
10(50)	109.8	**50(122)**	19.69	**90(194)**	5	**130(266)**	1.632
11(51.8)	104.6	**51(123.8)**	18.96	**91(195.8)**	4.849		
12(53.6)	99.69	**52(125.6)**	18.26	**92(197.6)**	4.703		
13(55.4)	95.05	**53(127.4)**	17.58	**93(199.4)**	4.562		
14(57.2)	90.66	**54(129.2)**	16.94	**94(201.2)**	4.426		
15(59)	86.49	**55(131)**	16.32	**95(203)**	4.294	B(25/50)=3950K	
16(60.8)	82.54	**56(132.8)**	15.73	**96(204.8)**	4.167		
17(62.6)	78.79	**57(134.6)**	15.16	**97(206.6)**	4.045	R(90℃)=5KΩ+-3%	
18(64.4)	75.24	**58(136.4)**	14.62	**98(208.4)**	3.927		
19(66.2)	71.86	**59(138.2)**	14.09	**99(210.2)**	3.812		

Attached table 3: Commissioning and operating parameters of refrigerant system

Condition 1: Make sure outdoor unit can detect all indoor units, the quantity of indoor units is displayed steadily and is equal to actual quantity of installed indoor units.

Condition 2: Make sure all the valves in outdoor units are open, indoor units EXVs are connected to indoor PCB.

Condition 3: The ratio of connectable indoor units is 100%. When ambient temperature is high, operate the system in cooling mode and set the temperature 17°C(62.6°F). When ambient temperature is low, operate the system in heating mode and set the temperature 30 °C(86°F). Then check the parameters after system has been running normally more than 30 minutes.

Outdoor unit cooling parameters table

Ambient temperature (T4)	°C	20-27	27-33	33-38	38-45
Discharge pressure (spot check)	MPa	2.1-2.3	2.8-3.2	3.3-3.5	3.7-3.9
Pressure of high pressure valve	MPa	1.8-2.0	2.4-2.7	2.8-3.1	3.2-3.5
Pressure of low pressure valve	MPa	0.7-0.9	0.8-1.0	1.0-1.2	1.2-1.4
Discharge temperature (spot check)	°C	50-65	70-85	75-90	80-90
DC inverter compressor current (BP1/BP2)* (spot check)	A	8-13/5-11	14-17/7-11	15-18/7-12	9-11/5-7
Average temperature of evaporator outlet T2B	°C	8-9	12-15	16-17	20

Outdoor unit heating parameters table

Ambient temperature (T4)	°C	-15--5	-5-5	5-12	12-18
Discharge pressure (spot check)	MPa	2.0-2.2	2.2-2.7	3.0-3.1	2.6-2.7
Pressure of high pressure valve	MPa	1.7-1.8	1.8-2.4	2.6-2.8	2.2-2.4
Pressure of low pressure valve	MPa	2.0-2.2	2.2-2.6	3.0-3.1	2.6-2.7
Discharge temperature (spot check)	°C	50-70	60-70	60-85	60-70
DC inverter compressor current (BP1/BP2)* (spot check)	A	9-12/5-7	10-12/5-8	6-8/9-10	11-15/6-9
Average temperature of condenser outlet T2	°C	33	33-40	46-50	39-41

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