

# THERMOCORE SYSTEMS



## MULTI OUTDOOR UNITS

### SERVICE MANUAL

*Multi zone*

## CONDENSING UNITS

Revision V1.0: 20160616



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### WARNING

- Installation MUST conform with local building codes or, in the absence of local codes, with the National Electrical Code NFPA70/ANSI C1-1993 or current edition and Canadian Electrical Code Part1 CSA C.22.1.
- The information contained in the manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments
- Installation or repairs made by unqualified persons can result in hazards to you and others.
- Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury and/or death.



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## 1. Indoor Unit Combination

2zone condenser	
One Unit	Two Unit
9	9+9
12	9+12
	12+12

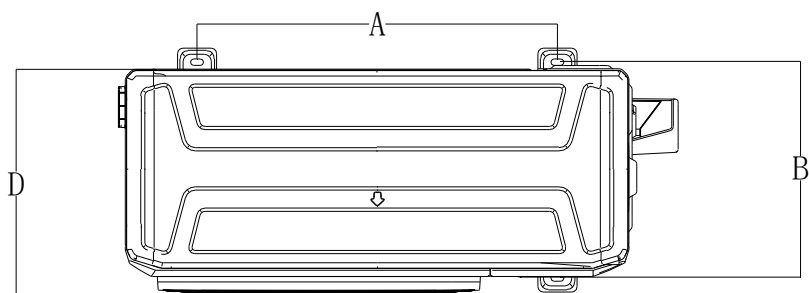
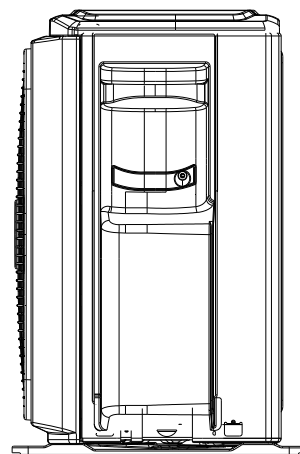
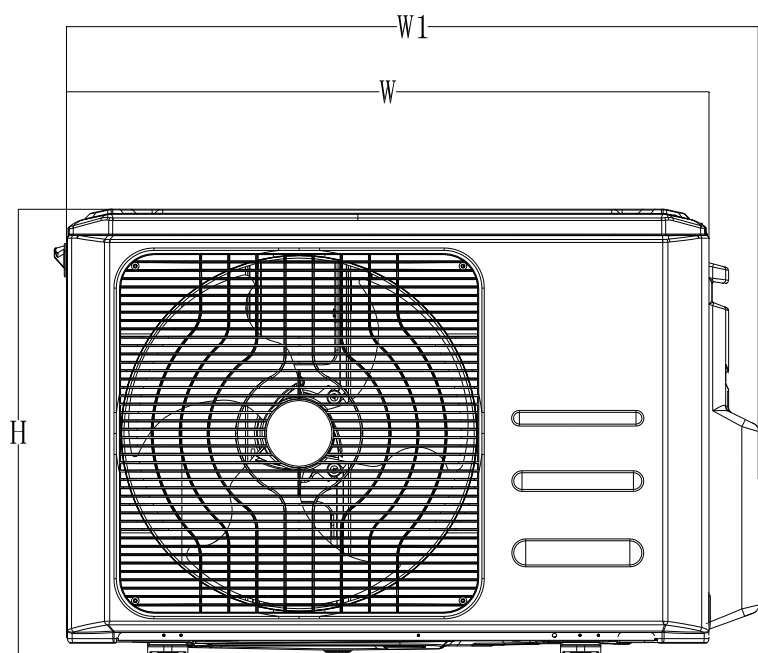
3 zone condenser				
One Unit	Two Unit		Three Unit	
9	9+9	12+12	9+9+9	9+12+12
12	9+12	12+18	9+9+12	12+12+12
18	9+18	18+18	9+9+18	

4 zone condenser							
One Unit	Two Unit		Three Unit			Four Unit	
9	9+9	12+12	9+9+9	9+12+12	12+12+12	9+9+9+9	9+9+12+18
12	9+12	12+18	9+9+12	9+12+18	12+12+18	9+9+9+12	9+12+12+12
18	9+18	12+24	9+9+18	9+12+24	12+12+24	9+9+9+18	12+12+12+12
24	9+24	18+18	9+9+24	9+18+18	12+18+18	9+9+12+12	

5 zone condenser								
One Unit	Two Unit		Three Unit			Four Unit		
	9+9	12+18	9+9+9	9+12+24	12+12+24	9+9+9+9	9+9+12+18	12+12+12+12
9	9+12	12+24	9+9+12	9+18+18	12+18+18	9+9+9+12	9+9+12+24	12+12+12+18
12	9+18	18+18	9+9+18	9+18+24	12+18+24	9+9+9+18	9+12+12+12	12+12+12+24
18	9+24	18+24	9+9+24	9+24+24	12+24+24	9+9+9+24	9+12+12+18	9+9+18+18
24	12+12	24+24	9+12+12	12+12+12	18+18+18	9+9+12+12	9+12+12+24	9+9+18+24
			9+12+18	12+12+18	18+18+24			

5 zone condenser		
One Unit	Five Unit	
	9+9+9+9+9	9+9+9+18+18
9	9+9+9+9+12	9+9+12+12+12
12	9+9+9+9+18	9+9+12+12+18
18	9+9+9+9+24	9+12+12+12+12
24	9+9+9+12+12	9+12+12+12+18
	9+9+9+12+18	12+12+12+12+12

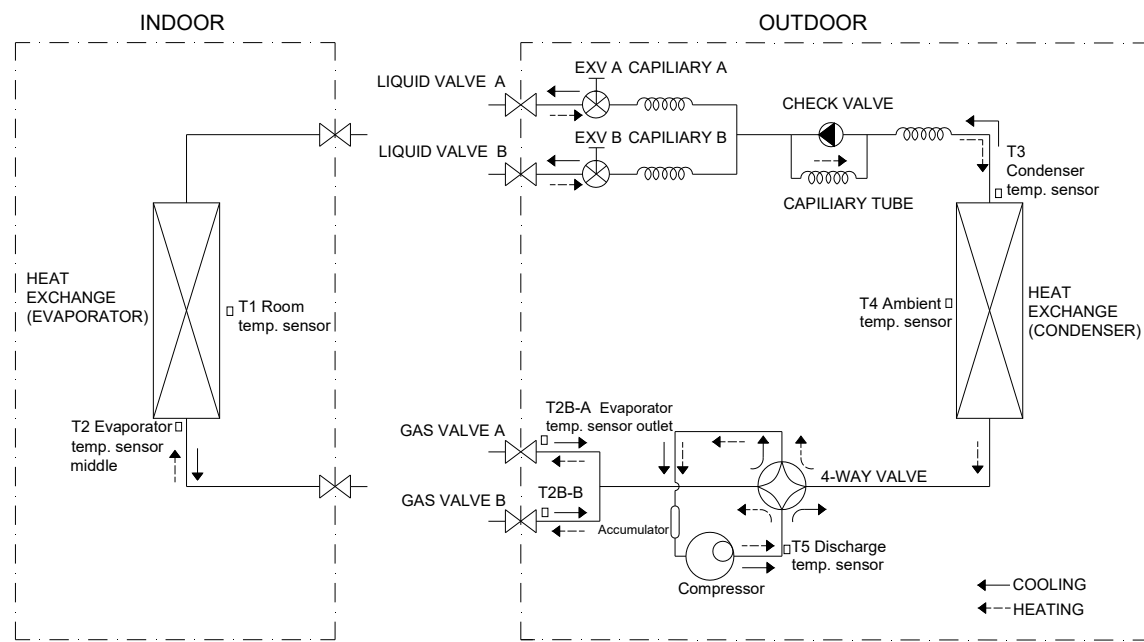
Note, the combination indoor units must more than 2 indoor units. Grey color means only operating 1 indoor unit, but combine more than 2 indoor units.



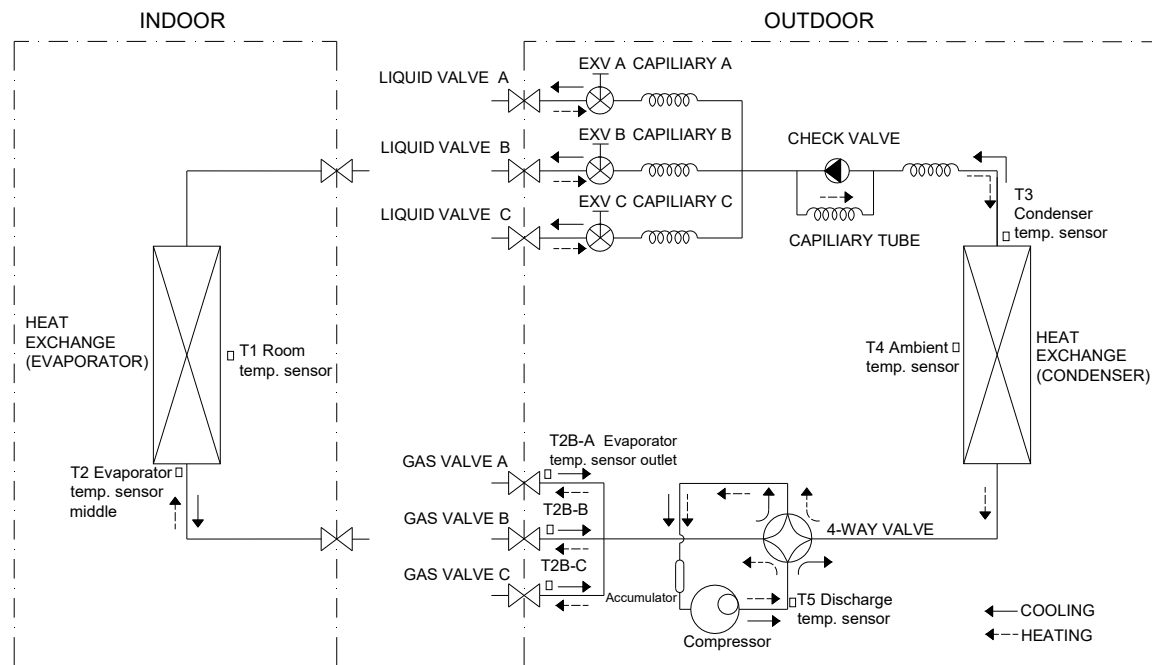
Model	Unit:	W	D	H	W1	A	B
T322D-H224-C	mm	845	363	702	923	540	350
	inch	<b>33.3</b>	<b>14.3</b>	<b>27.6</b>	<b>36.0</b>	<b>21.3</b>	<b>13.8</b>
T323D-H236-C	mm	946	410	810	1034	673	403
	inch	<b>37.2</b>	<b>16.5</b>	<b>31.9</b>	<b>40.6</b>	<b>26.5</b>	<b>15.9</b>
T322D-H248-C	mm	946	410	810	1034	673	403
	inch	<b>37.2</b>	<b>16.5</b>	<b>31.9</b>	<b>40.6</b>	<b>26.5</b>	<b>15.9</b>
T321Q-H263-C	mm	952	415	1333	1045	634	404
	inch	<b>37.5</b>	<b>16.3</b>	<b>52.5</b>	<b>41.1</b>	<b>25.0</b>	<b>15.9</b>

# 4. Refrigerant Cycle Diagram

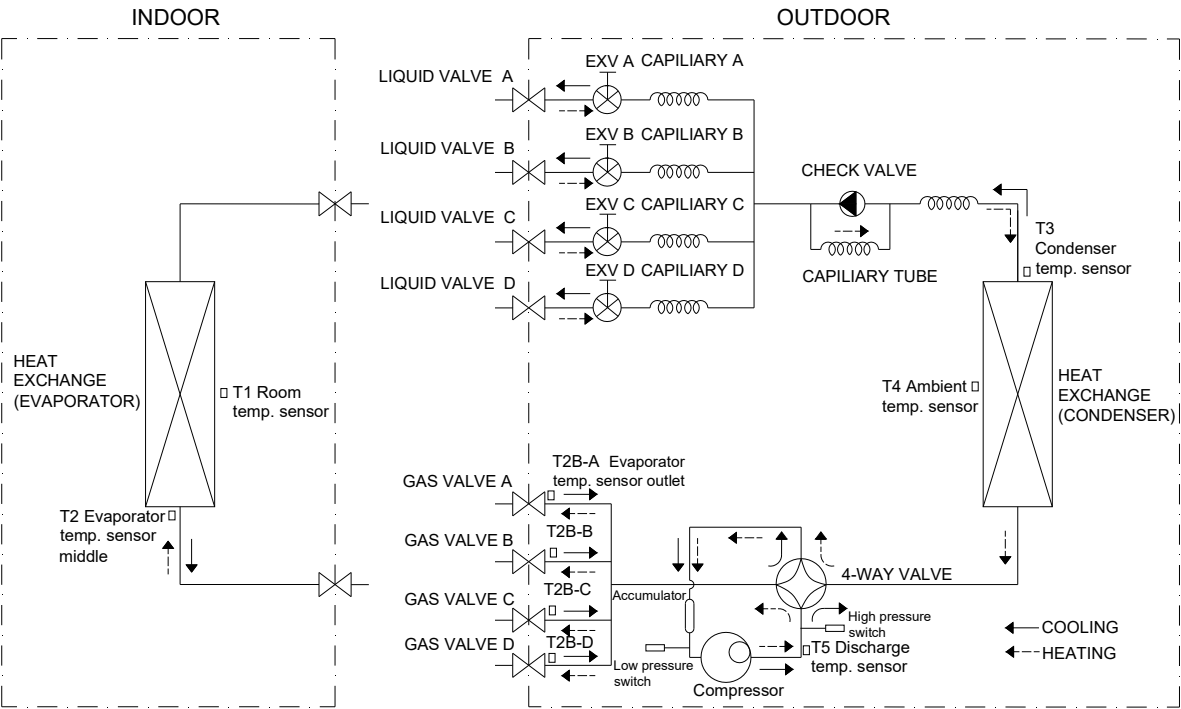
## 4.1 Refrigeration circuit drawing of inverter 1 drive 2 type



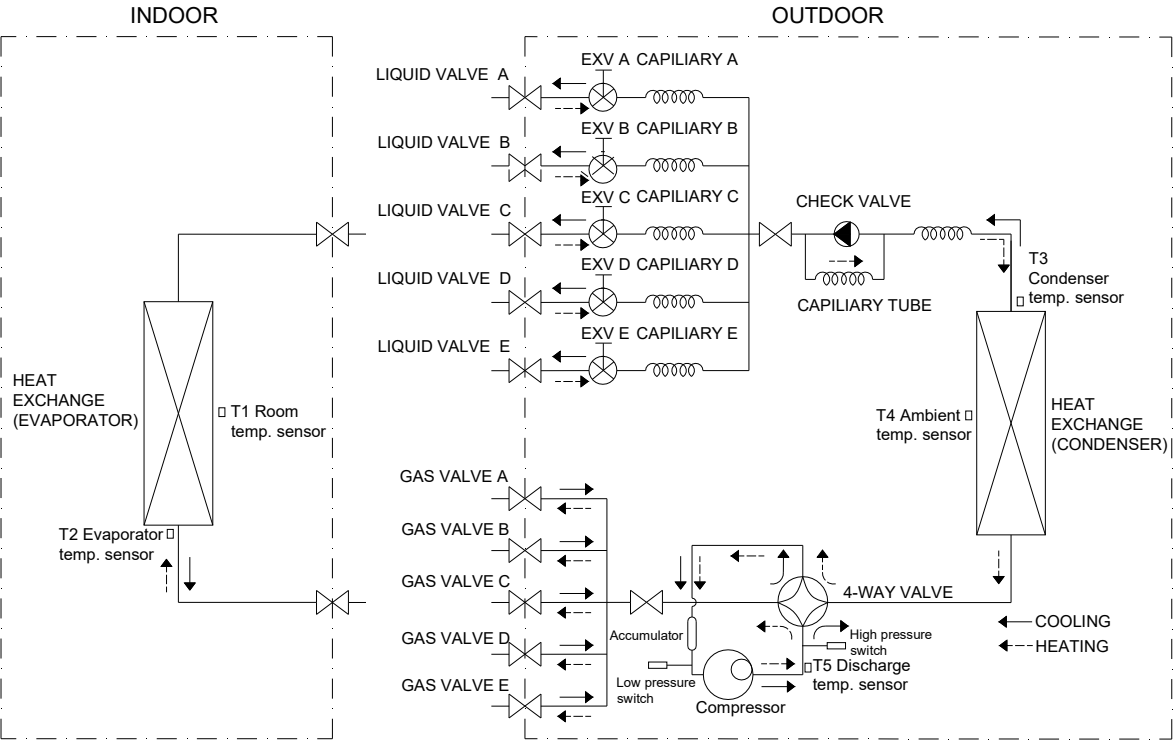
## 4.2 Refrigeration circuit drawing of inverter 1 drive 3 type



4.3 Refrigeration circuit drawing of inverter 1 drive 4 type



4.4 Refrigeration circuit drawing of inverter 1 drive 5 type



## 5. Installation Details

### 5.1 Wrench torque sheet for installation

Outside diameter		Torque	Additional tightening torque
mm	inch	N.cm	N.cm
Φ6.35	1/4	1500(153kgf.cm)	1600(163kgf.cm)
Φ9.52	3/8	2500(255kgf.cm)	2600(265kgf.cm)
Φ12.7	1/2	3500(357kgf.cm)	3600(367kgf.cm)

### 5.2 Connecting the cables

The power cord connection should be selected according to the following specifications sheet.

Unit	AWG
1 drive 2 type (18K outdoor unit)	14
1 drive 3 type (27K outdoor unit).	14
1 drive 4 type (36K outdoor unit)	12
1 drive 5 type (48K outdoor unit)	10

For indoor unit and outdoor unit connection line, 16AWG is ok for all.

### 5.3 Pipe length and the elevation

#### Maximum piping length and height difference

	1 drive 2	1 drive 3	1 drive 4	1 drive 5
Max. length for all rooms (m)	30 (98ft)	45 (150ft)	60 (200ft)	75 (246ft)
Max. length for one IU (m)	20 (65.6ft)	25 (82ft)	30 (98ft)	30 (98ft)
Max. height difference between IU and OU (m)	OU higher than IU	10 (33ft)	10 (33ft)	10 (33ft)
	OU lower than IU	15 (49.2ft)	15 (49.2ft)	15 (49.2ft)
Max. height difference between IUs (m)	10 (33ft)	10 (33ft)	10 (33ft)	10 (33ft)

#### Additional refrigerant charge

		1 drive 2	1 drive 3	1 drive 4	1 drive 5
Precharge pipe length (m)		15 (49.2ft)	22.5 (73.8ft)	30 (98.4ft)	37.5 (123ft)
Additional refrigerant charge	g	15 x (length for all rooms - 15)	15 x (length for all rooms - 22.5)	15 x (length for all rooms - 30)	15 x (length for all rooms - 37.5)
	oz	0.161 x (length for all rooms - 49.2)	0.161 x (length for all rooms - 73.8)	0.161 x (length for all rooms - 98.4)	0.161 x (length for all rooms - 123)

Caution:

- Refrigerant pipe diameter is different according to indoor unit to be connected. When using the extension pipe, refer to the tables below.
- When refrigerant pipe diameter is different from that of the outdoor unit connector (18K indoor unit) an additional adapter is required.

Indoor unit		Extension pipe diameter (mm/inch)	
Model	Pipe diameter (mm/inch)		
9K	Liquid	6.35(1/4)	Liquid 6.35(1/4)
	Gas	9.52(3/8)	Gas 9.52(3/8)
12K 18K	Liquid	6.35(1/4)	Liquid 6.35(1/4)
	Gas	12.7(1/2)	Gas 12.7(1/2)
24K	Liquid	9.52 (3/8)	Liquid 9.52 (3/8)
	Gas	15.9(5/8)	Gas 15.9(5/8)
Outdoor unit union diameter (mm/inch)			
1 drive 2		Liquid	6.35(1/4) *2
		Gas	9.52(3/8) *2
1 drive 3		Liquid	6.35(1/4) *3
		Gas	9.52(3/8) *3
1 drive 4		Liquid	6.35(1/4) *4
		Gas	9.52(3/8) *4
1 drive 5		Liquid	6.35(1/4) *5
		Gas	9.52(3/8) *3 12.7(1/2)*2

### 5.4 Installation for the first time

Air and moisture in the refrigerant system have undesirable effects as below:



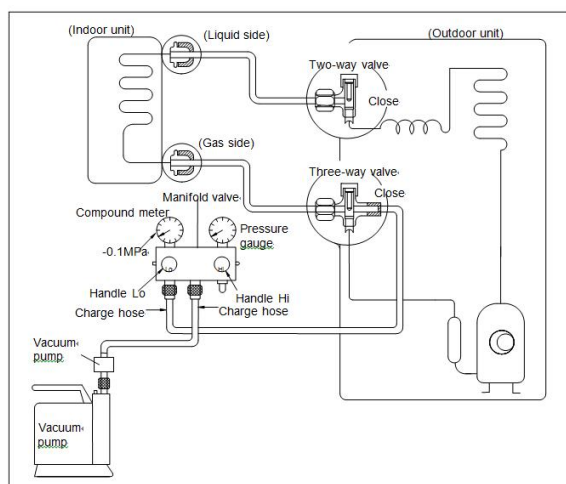
- Pressure in the system rises.
- Operating current rises.
- Cooling or heating efficiency drops.
- Moisture in the refrigerant circuit may freeze and block capillary tubing.
- Water when mixed with the refrigerant and oil will create an acid that will damage the motor windings and components.

Therefore, the indoor units and the pipes between indoor and outdoor units must be leak tested and evacuated to remove gas and moisture from the system.

#### Gas leak check (Soap water method):

Apply soap water or a liquid neutral detergent on the indoor unit connections or outdoor unit connections with a soft brush to check for leakage of the connecting points of the piping. If bubbles come out, the pipes have leakage.

#### 1. Air purging with vacuum pump

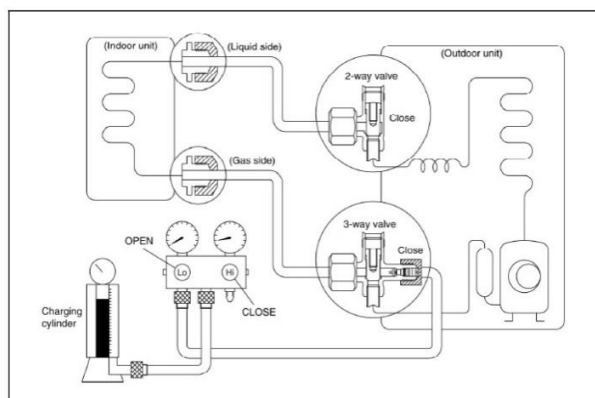


1. Completely tighten the flare nuts of the indoor and outdoor units, confirm that both the 2-way and 3-way valves are set to the front seated.
2. Connect the low pressure gauge to the 3 way service valve access port.
3. Connect the middle hose of the gauge manifold (usually yellow) to the vacuum pump.
4. Fully open the handle for the low pressure gauge.
5. Start the vacuum pump and operate according to manufacture spec's.
6. Perform an evacuation for a minimum of 30 minutes and check that the low pressure

(compound) gauge indicates a vacuum of 29.9 in/hg (500 microns). A vacuum gauge should be used if available. If the proper vacuum cannot be achieved the vacuum pump should be run for an additional 20 minutes. If after the additional 20 minutes the vacuum still cannot be achieved there is a leak in the system and must be located and repaired. Follow the leak checking procedure as mentioned before. If the vacuum is achieved, close the low pressure gauge handle off and shut the vacuum pump off. Recheck the reading after 10 minutes, the vacuum may change slightly, this is normal.

7. The system is now dry and free of contaminates, refrigerant pressure should now be added to the system from a source other than the system before opening the 2 way and 3 way valves for system operation.
8. The 2 way and 3 way valve can now be opened for the system operation.

#### 2. Air purging by refrigerant



#### Procedure:

- 1) Confirm that both the 2-way and 3-way valves are set to the closed position.
- 2) With a container of refrigerant and a gauge manifold set, connect the low pressure gauge hose to the 3 way valve service port.
- 3) Air purging.  
Open the valve on the refrigerant container and the low pressure gauge to allow the refrigerant to enter the system, next loosen the flare connection on the 2 way valve line to purge the air and contaminants from the system for 30 to 50 seconds, then retighten the connection.

4) Check the gas leakage.

Next allow the pressure from the refrigerant to reach 100 psi and then close the low pressure gauge and the refrigerant container and check the 2 way and 3 way valve line connections for leaks with liquid soap or electronic leak detector.

5) Discharge the refrigerant.

After the system has been check for leaks the pressure should be adjusted to about 25 to 50 psi.

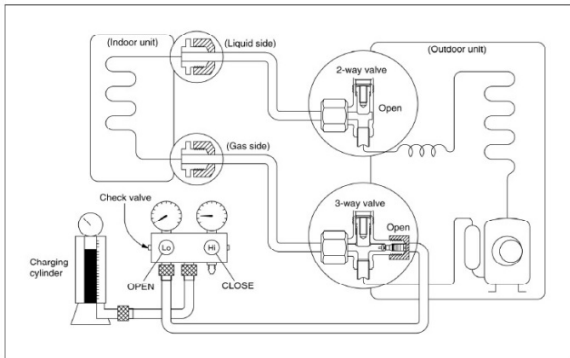
6) You can now disconnect the gauge manifold and refrigerant container from the system and open the 2 way and 3 way valves for system operation.

7). Mount the valve stems nuts and the service port cap.

Be sure to use a torque wrench to tighten the service port cap to a torque 18N·m (13.27 ft·lbs).

Always leak check after servicing the refrigerant system.

### 3. Adding refrigerant if the pipe length exceeds precharge pipe length



#### Procedure:

- 1) Connect the low pressure gauge from the gauge manifold set to the 3 way service valve (this is the blue hose on most sets).
- 2) Connect the middle hose from the manifold set to the refrigerant container (this is the yellow line on most sets). With refrigerant 410A the container must be inverted (upside down) when adding the refrigerant. Note that the 2 way and 3 way valves must be in the open position.
- 3) The air in the gauge hoses needs to be purged out. use the pressure from the system to purge the low side line, loosen the connection on the manifold for a second, next open the to valve on the refrigerant container to pressurize the line,

now loosen that hose at the manifold for a second and purge that line.

4) Set the refrigerant container on an electronic charging scale and record the weight or zero the scale depending on the scale used. Next determine the refrigerant charge to be added.

5) Start the unit in the cooling mode and lower the set point so the unit won't shut off during the charging procedure.

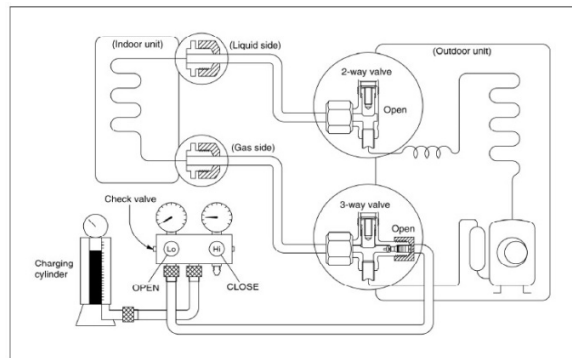
6) Refrigerant can now be added to the system, open the low pressure valve on the gauge manifold set to start charging the unit with liquid refrigerant, keep track of the refrigerant being added to the system (do not overcharge the system).

7) Once the correct charge has been added to the system close the low pressure valve on the gauge manifold set and record the operating pressure. The system is now charged and the unit can be shut off. Close the valve on the refrigerant container and disconnect the hose from the manifold set, also disconnect the hose from the 3 way valve and replace and torque all caps.

Be sure to use a torque wrench to tighten the service port cap to a torque 18N·m (13.27 ft·lbs).

Always leak check after servicing the refrigerant system.

### 5.5 Adding the refrigerant after running the system for many years



#### Procedure

- 1) Connect the low pressure gauge from the gauge manifold set to the 3 way service valve (this is the blue hose on most sets).
- 2) Connect the middle hose from the manifold set to the refrigerant container (this is the yellow line on most sets). With refrigerant 410A the container

must be inverted (upside down) when adding the refrigerant. Note that the 2 way and 3 way valves must be in the open position.

3) The air in the gauge hoses needs to be purged out. use the pressure from the system to purge the low side line, loosen the connection on the manifold for a second, next open the valve on the refrigerant container to pressurize the line, now loosen that hose at the manifold for a second and purge that line.

4) Set the refrigerant container on an electronic charging scale and record the weight or zero the scale depending on the scale used. Next determine the refrigerant charge to be added.

5) Start the unit in the cooling mode and lower the set point so the unit won't shut off during the charging procedure.

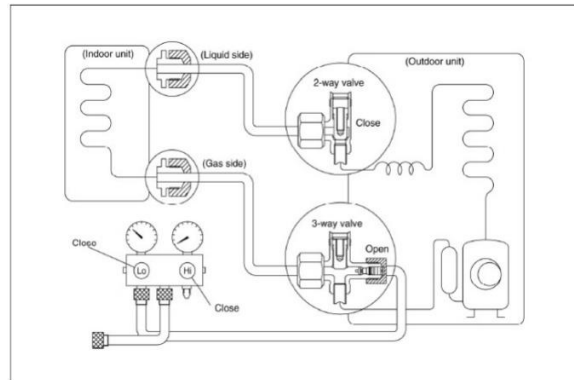
6) Refrigerant can now be added to the system, open the low pressure valve on the gauge manifold set to start charging the unit with liquid refrigerant, keep track of the refrigerant being added to the system (do not overcharge the system).

7) Once the correct charge has been added to the system close the low pressure valve on the gauge manifold set and record the operating pressure. The system is now charged and the unit can be shut off. Close the valve on the refrigerant container and disconnect the hose from the manifold set, also disconnect the hose from the 3 way valve and replace and torque all caps.

Be sure to use a torque wrench to tighten the service port cap to a torque 18N·m (13.27 ft·lbs). Always leak check after servicing the refrigerant system.

## 5.6 Procedure when servicing the indoor unit refrigeration circuit.

### 1. Pumping down the system (isolating the refrigerant charge in the condensing unit)



### Procedure

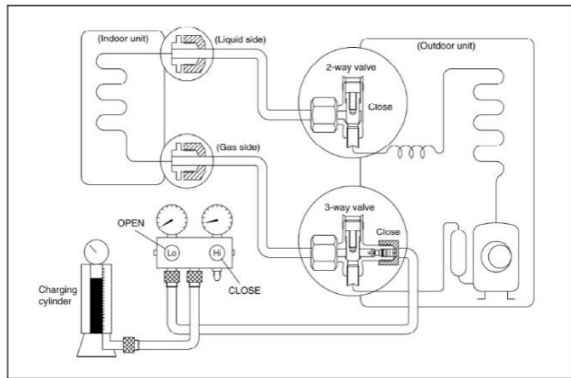
1) With the unit in the cooling mode and a low set point remove all caps from the 3 way and 2 way valves, next attach the low pressure gauge to the 3 way service valve port and purge the air from that hose by loosening the hose at the manifold for a second, be sure the low pressure gauge valve is closed. **Be sure to record the operating pressure**, you will need to know this when you complete the service on the indoor unit and restart the system. Now prepare to close both valves on the unit starting with the 2 way valve (this is called front seating the valve) also prepare to shut the power off to the outdoor unit.

2) Now close the 2 way valve and monitor the low pressure gauge. The pressure will start to drop.

3) Operate the unit in the cooling mode and disconnect the power to the outdoor unit when the low side gauge reads a slight vacuum, running the compressor in a vacuum could damage the motor windings. Note that units with extended lines and additional refrigerant charge may not be able to achieve a vacuum. This is because the outdoor unit can only store a certain amount of refrigerant, this is normal (the amperage of the compressor will have to be monitored in this case). Stop compressor when the amperage approaches the name plate FLA rating.

4) Now close the 3 way valve right away. The pressure will rise during this time, this is normal. There will be some pressure left in the system. This is normal. The indoor unit is now ready to be serviced.

**2. Sweeping (air purging) the system with refrigerant after the service to the refrigerant circuit of the indoor unit is complete.**

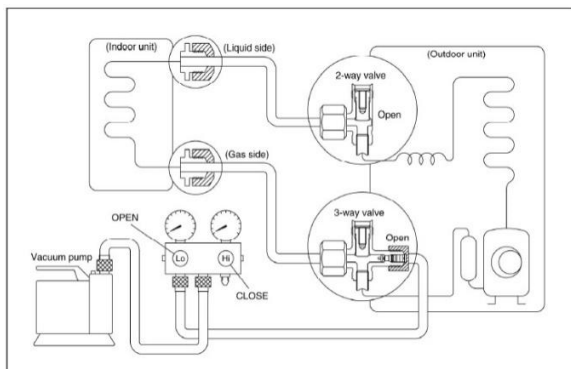


### Procedure:

- 1) Sweeping the system can be used when the unit has been pumped down, this eliminates the need to loosen the flare connection on the 2 way valve (loosening and retightening flare connections could cause a refrigerant leak)
- 2) Sweeping the system with refrigerant from a pump down condition (refrigerant has been isolated in the outdoor unit)
- 3) Open the 2 way valve all the way then the 3 way valve all the way and check for leaks.
- 4) Start the unit in the cooling mode and check the pressure (remember the pressure you recorded?) The unit is going to be low on refrigerant from the sweeping process, add refrigerant as needed from the refrigerant container in the liquid state to achieve the operating pressure that you recorded. The process is now complete.

## 5.7 Evacuation after servicing the outdoor unit refrigeration circuit

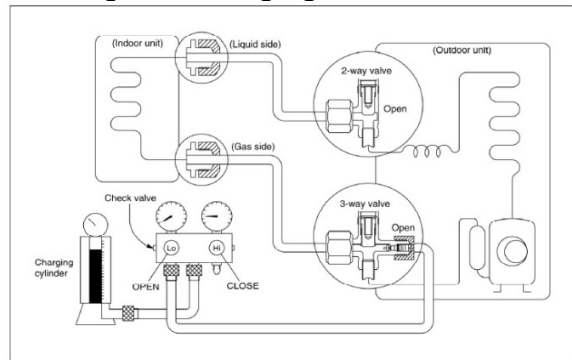
### 1. Evacuation of the complete refrigeration circuit, Indoor and outdoor unit.



### Procedure:

- 1). Confirm that both the 2-way and 3-way valves are set to the opened position.
- 2). Connect the vacuum pump to 3-way valve's service port.
- 3). Evacuation for approximately one hour. Confirm that the compound meter indicates - 0.1Mpa (500 Microns / 29.9 in.hg).
- 4). Close the valve (Low side) on the charge set, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).
- 5). Disconnect the charge hose from the vacuum pump.

## 2. Refrigerant charging



### Procedure:

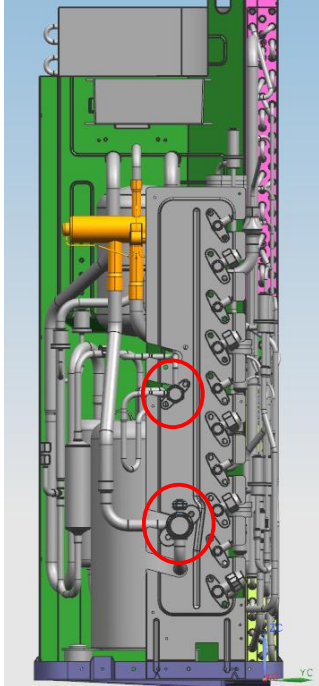
- 1). Connect the charge hose to the charging cylinder, open the 2-way valve and the 3-way valve.  
Connect the charge hose which you disconnected from the vacuum pump to the valve at the bottom of the cylinder. If the refrigerant is R410A, make the cylinder bottom up to ensure liquid charge.
- 2). Purge the air from the charge hose  
Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air (be careful of the liquid refrigerant).
- 3) Put the charging cylinder onto the electronic scale and record the weight.
- 4). Open the valves (Low side) on the charge set and charge the system with liquid refrigerant  
If the system cannot be charge with the specified amount of refrigerant, or can be charged with a little at a time (approximately 150g each time) , operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure.

5).When the electronic scale displays the proper weight, disconnect the charge hose from the 3-way valve's service port immediately  
If the system has been charged with liquid refrigerant while operating the air conditioner, turn off the air conditioner before disconnecting the hose.

6). Mounted the valve stem caps and the service port. Use torque wrench to tighten the service port cap to a torque of 18N·m (13.27 ft·lbs).  
Always leak check after servicing the refrigerant system.

#### For 3, 4,5 zone condenser

*There are one low-pressure centralized valve and one high-pressure centralized valve, it will be more time saving when vacuum and recycle refrigerant. But refer to the previous instruction when vacuum and recycle refrigerant.*



## 6. Electronic Function

### 6.1 Abbreviation

T1: Indoor ambient temperature

T2: Coil temperature of indoor heat exchanger middle.

T2B: Coil temperature of indoor heat exchanger outlet. (This sensor is located in the outdoor unit)

T3: Pipe temperature of outdoor heat exchanger

T4: Outdoor ambient temperature

T5: Compressor discharge temperature

### 6.2 Electric control working environment.

6.2.1 Input voltage: 230V.

6.2.2 Input power frequency: 60Hz.

6.2.3 Indoor fan normal working amp. is less than 1A.

6.2.4 Outdoor fan. Normal working amp. is less than 1.5A.

6.2.5 Four-way valve normal working amp. is less than 1A.

### 6.3 Main Protection

#### 6.3.1 Three Minutes Delay at restart for compressor.

---- 1min delay for the 1<sup>st</sup> time start-up and 3 minutes delay for others.

#### 6.3.2 Temperature protection of compressor discharge.

When the compressor discharge temperature is getting higher, the running frequency will be limited as below rules:

----If  $105^{\circ}\text{C}$  ( $221^{\circ}\text{F}$ )  $\leq T5 < 110^{\circ}\text{C}$  ( $230^{\circ}\text{F}$ ), keep the current frequency.

----If the temperature increase and  $T5 \geq 110^{\circ}\text{C}$  ( $230^{\circ}\text{F}$ ), decrease the frequency to the lower level every 2 minutes till to F1.

---If  $T5 \geq 115^{\circ}\text{C}$  ( $239^{\circ}\text{F}$ ) for 10 seconds, the compressor will stop and restart till  $T5 < 90^{\circ}\text{C}$  ( $194^{\circ}\text{F}$ ).

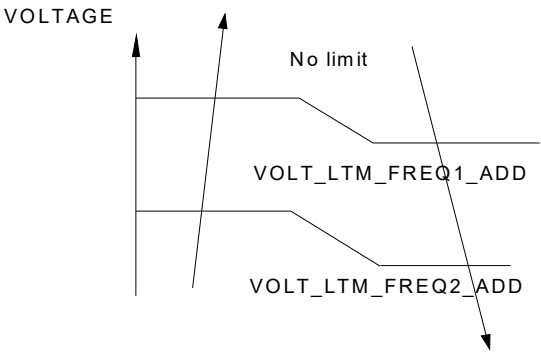
#### 6.3.3 Fan Speed is out of control.

---- When outdoor fan speed is lower than  $100\text{RPM}$  or higher than  $2400\text{RPM}$  for 60 second, the whole unit stops and LED displays  $\text{E8}$  failure.

#### 6.3.4 Inverter module Protection.

----Inverter module protection itself has a protection function against current, voltage and temperature. If these protections happened, the corresponding code will display on indoor unit LED and A/C will stop. The unit will recover 3min delay after the protection disappeared.

**6.3.5 Low voltage protection**

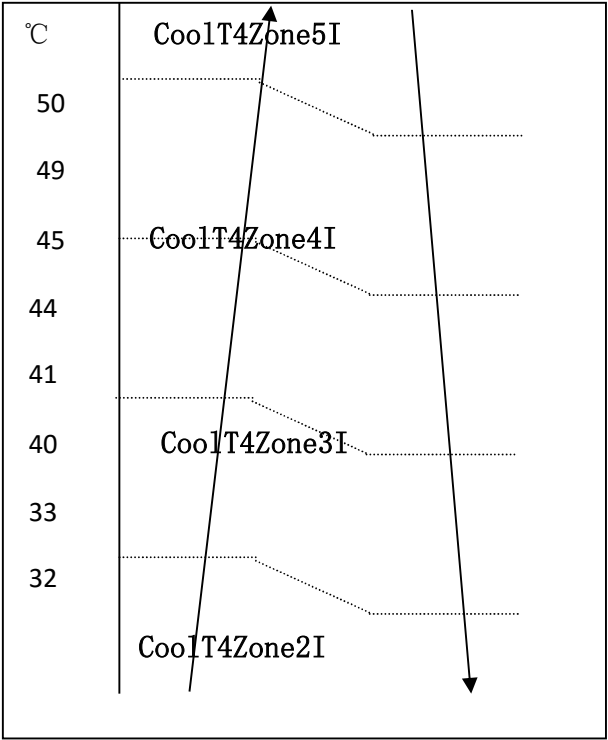


Note: if the low voltage protection occurs and not resumes within 3min, it will keep the protection always after restart the machine.

**6.3.6 Compressor current limit protection**

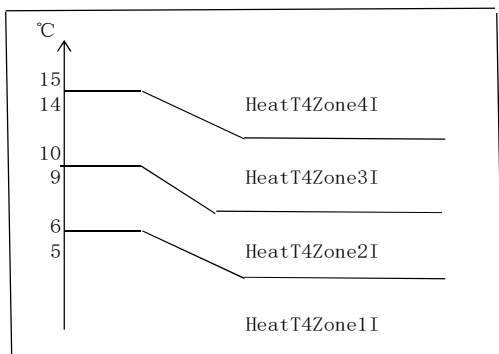
Temperature interval.of current limit is same as range of T4 limited frequency.

**Cooling mode:**



CoolReturnI	The difference between limit current and quit current.
CoolT4Zone5I	Cooling $T4 \geq 50^{\circ}\text{C}$ limit current value
CoolT4Zone4I	Cooling $49 > T4 \geq 45^{\circ}\text{C}$ limit current value
CoolT4Zone3I	Cooling $44 > T4 \geq 41^{\circ}\text{C}$ limit current value
CoolT4Zone2I	Cooling $40 > T4 \geq 33^{\circ}\text{C}$ limit current value
CoolT4Zone1I	Cooling $32 > T4^{\circ}\text{C}$ limit current value
CoolStopI	Cooling stop protection current value

**Heating mode:**

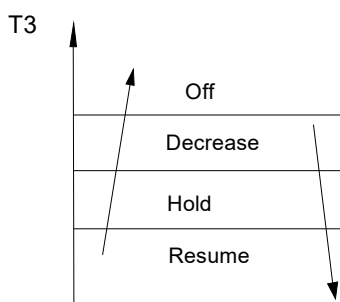


HeatReturnI	The difference between limit current and quit current.
HeatT4Zone4I	Heating $T4 \geq 15^{\circ}\text{C}$ limit current value
HeatT4Zone3I	Heating $14 > T4 \geq 10^{\circ}\text{C}$ limit current value
HeatT4Zone2I	Heating $9 > T4 \geq 6^{\circ}\text{C}$ limit current value
HeatT4Zone1I	Heating $5 > T4$ limit current value
HeatStopI	Heating stop protection current value

### 6.3.7 Indoor / outdoor units communication protection

If the indoor units cannot receive the feedback signal from the outdoor units for 2 minutes, the AC will stop and display the failure.

### 6.3.8 High condenser coil temp. protection.



### 6.3.9 Outdoor unit anti-freezing protection

When  $T2 < 4^{\circ}\text{C}$  for 250 seconds or  $T2 < 0^{\circ}\text{C}$ , the indoor unit capacity demand will be zero and resume to normal when  $T2 > 8^{\circ}\text{C}$  and the time of protection is no less than 3 minutes.

### 6.3.10 Oil return

#### Running rules:

1. If the compressor frequency keeps lower than setting frequency for setting time, the AC will rise the frequency to setting frequency for setting time and then resume to former frequency.
2. The EXV will keep 300p while the indoor units will keep the current running mode.

If the outdoor ambient is higher than setting frequency during the oil return, the AC quit oil return.

### 6.3.11 Low outdoor ambient temperature protection

When compressor is off,  $T4$  is be lower than  $-35^{\circ}\text{C}$ .for 10s, the AC will stop and display “LP” .

When compressor is on,  $T4$  is be lower than  $-40^{\circ}\text{C}$ .for 10s, the AC will stop and display “LP” .

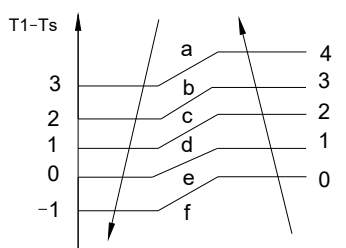
When  $T4$  is no lower than  $-32^{\circ}\text{C}$ .for 10s, the unit will exit protection.

## 6.4 Control and Functions

### 6.4.1 Capacity Request Calculation

Total capacity Request =  $\Sigma(\text{Norm code} \times \text{HP}) / 10 + \text{correction}$

#### Cooling mode:



Capacity area	a	b	c	d	e	f
---------------	---	---	---	---	---	---

Norm code (N)	3	2	1.5	1	0.5	0
---------------	---	---	-----	---	-----	---

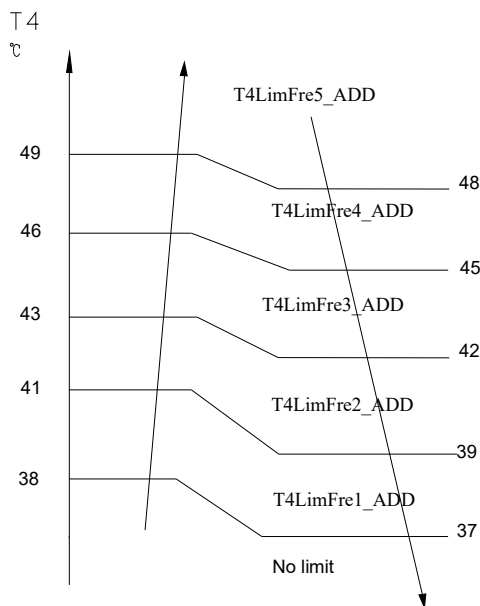
Model	9K	12K	18K	24K
HP	1.0	1.2	1.5	2.5

**Note: The final result is integer.**

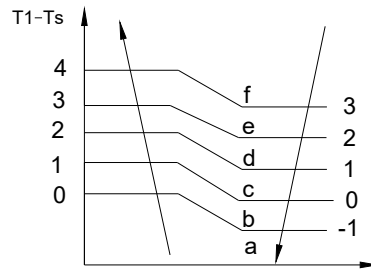
**According to the final capacity request to confirm the operating frequency, as following table.**

Frequency (Hz)	0	COO L_F1	COO L_F2	...	COOL _F24	COO L_F2 5
Amendatory capacity demand.	0	1	2	...	24	25

Meanwhile the maximum running frequency will be adjusted according to the outdoor ambient temp.



**Heating mode**



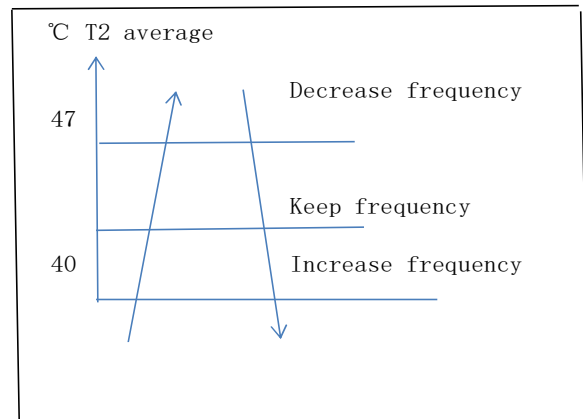
Capacity area	a	b	c	d	e	f
Norm code (N)	3	2	1.5	1	0.5	0

Model	9K	12K	18K	24K
HP	1.0	1.2	1.5	2.5

**Note: The final result is integer.**

**Then modify it according to T2 average (correction):**

Note: Average value of T2: Sum T2 value of all indoor units)/ (indoor units number



**According to the final capacity request to confirm the operating frequency, as following table.**

Frequency (Hz)	0	HEAT _F1	HEAT _F2	...	HEAT _F24	HEAT _F25
Amendatory capacity demand.	0	1	2	...	24	25



## 6.4.2 Defrosting control

### Condition of defrosting:

Condition of defrosting:

If any one of the following items is satisfied, AC will enter the defrosting mode.

After the compressor starts up and keeps running, mark the minimum value of T3 from the 10th minutes to 15th minutes as T30.

1) If the compressor cumulate running time is up to 29 minutes and  $T3 < TCDI1$ ,  $T3 + T30SUBT3ONE \leq T30$ .

2) If the compressor cumulate running time is up to 35 minutes and  $T3 < TCDI2$ ,  $T3 + T30SUBT3TWO \leq T30$ .

3) If the compressor cumulate running time is up to 40 minutes and  $T3 < -24^{\circ}\text{C}$  for 3 minutes.

4) If the compressor cumulate running time is up to 120 minutes and  $T3 < -15^{\circ}\text{C}$ .

Condition of ending defrosting:

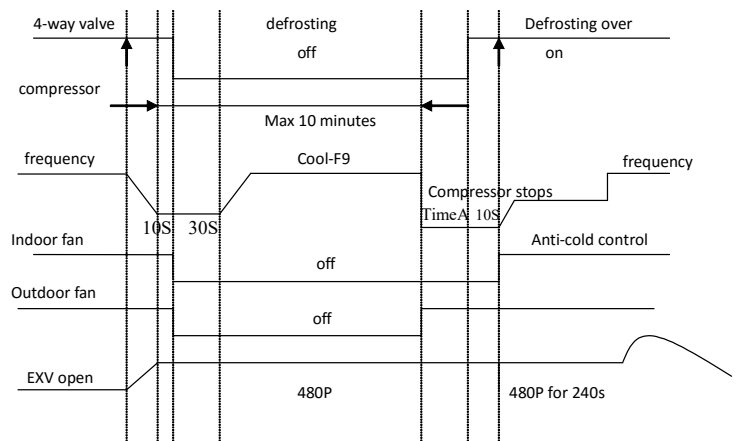
If any one of the following items is satisfied, the defrosting will finish and the machine will turn to normal heating mode.

----T3 rises to be higher than  $TCDE1^{\circ}\text{C}$ .

----T3 keeps to be higher than  $TCDE2^{\circ}\text{C}$  for 80 seconds.

----The machine has run for 10 minutes in defrosting mode.

**Defrosting action:**



### Condition of ending defrosting:

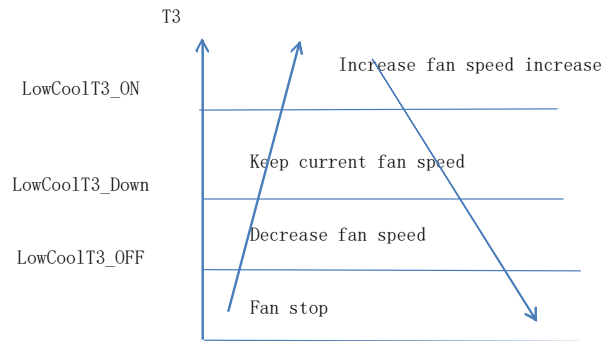
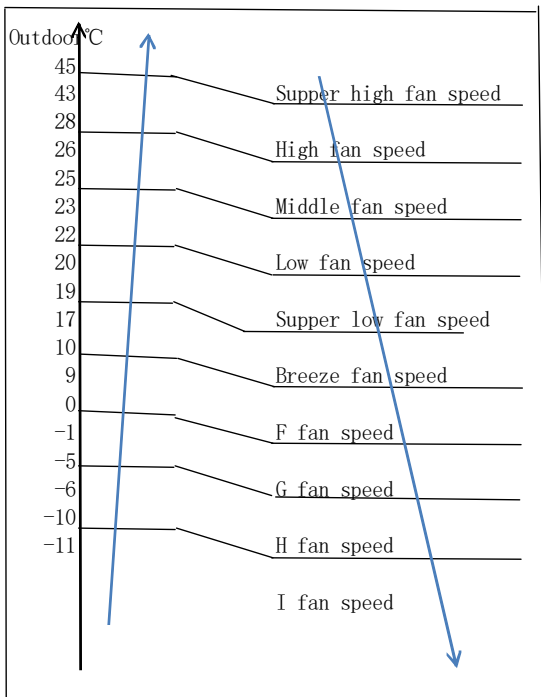
If any one of following items is satisfied, defrosting will stop and the machine will turn to normal heating mode.

- ①  $T3 > \text{TempQuitDefrost\_ADD } ^{\circ}\text{C};$ .
- ② The defrosting time achieves 10min.
- ③ Turn to other modes or off.

## 6.4.3 Outdoor fan control

### 6.4.3.1 Cooling mode

Normally the system will choose the running fan speed according to ambient temperature:



### 6.4.3.2 Heating mode

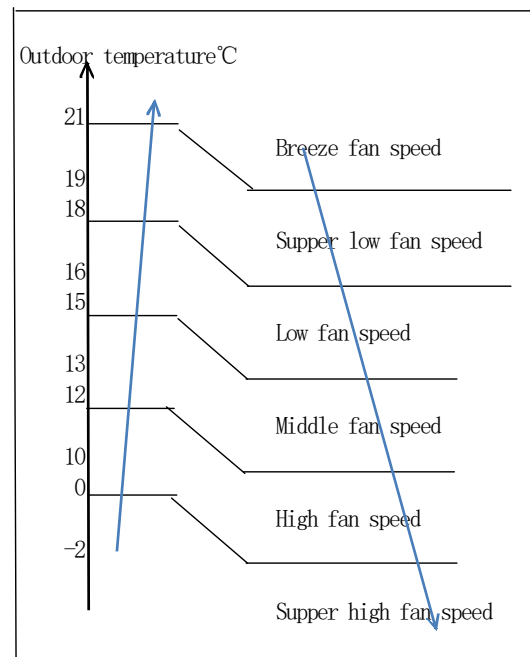
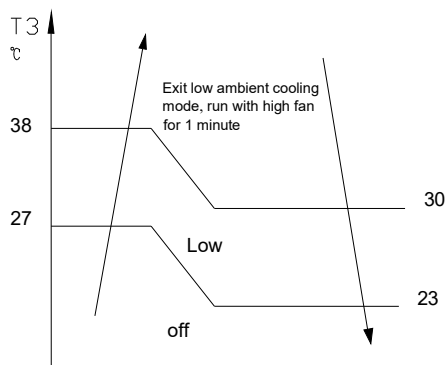
Normally the system will choose the running fan speed according to ambient temperature:

When low ambient cooling is valid:

Outdoor fan speed control logical (low ambient cooling)

When  $T4 < 15\text{ }^{\circ}\text{C}$  ( $59\text{ }^{\circ}\text{F}$ ) and  $T3 < 30\text{ }^{\circ}\text{C}$  ( $86\text{ }^{\circ}\text{F}$ ), the unit will enter into low ambient cooling mode. The outdoor fan will choose speed according to T3.

When  $T3 \geq 38\text{ }^{\circ}\text{C}$  ( $100.4\text{ }^{\circ}\text{F}$ ) or when  $T4 \geq 20\text{ }^{\circ}\text{C}$  ( $68\text{ }^{\circ}\text{F}$ ), the outdoor fan will choose the speed according to T4 again.



### 6.4.4 Electronic Expansion Valve (EXV) Control

1. EXV will be fully closed when turning on the power. Then EXV will be standby with 350P open and will open to target angle after compressor starts.

- 
2. EXV will close with -160P when compressor stops. Then EXV will be standby with 350P open and will open to target angle after compressor starts.
  3. The action priority of the EXVs is A-B-C-D-E.
  4. Compressor and outdoor fan start operation only after EXV is initialized.

modes, the four-way valve is off after compressor is off for 2 minutes. Failure or protection (not including discharge temperature protection, high and low pressure protection), four-way valve immediately shuts down.

#### **6.4.4.1 Cooling mode**

The initial open angle of EXV is depend on indoor model size, adjustment range is 100-400p. When the unit start to work for 3 minutes, the outdoor will receive indoor units( of capacity demand) T2B information and calculate the average of them. After comparing each indoor's T2B with the average, the outdoor gives the following modification commands:

If the  $T2B > \text{average}$ , the relevant valve needs more 16p open;

If the  $T2B = \text{average}$ , the relevant valve's open range remains;

If the  $T2B < \text{average}$ , the relevant valve needs more 16p close.

This modification will be carried out every 2 minutes.

#### **6.4.4.2 Heating mode**

The initial open angle of EXV is depend on indoor model size, adjustment range is 150-350p. When the unit start to work for 3minutes, the outdoor will receive indoor units (of capacity demand) T2 information and calculate the average of them. After comparing each indoor's T2 with the average, the outdoor gives the following modification commands:

If the  $T2 > \text{average} + 2$ , the relevant valve needs more 16p close;

If  $\text{average} + 2 \geq T2 \geq \text{average} - 2$ , the relevant valve's open range remains;

If the  $T2 < \text{average} - 2$ , the relevant valve needs more 16p open.

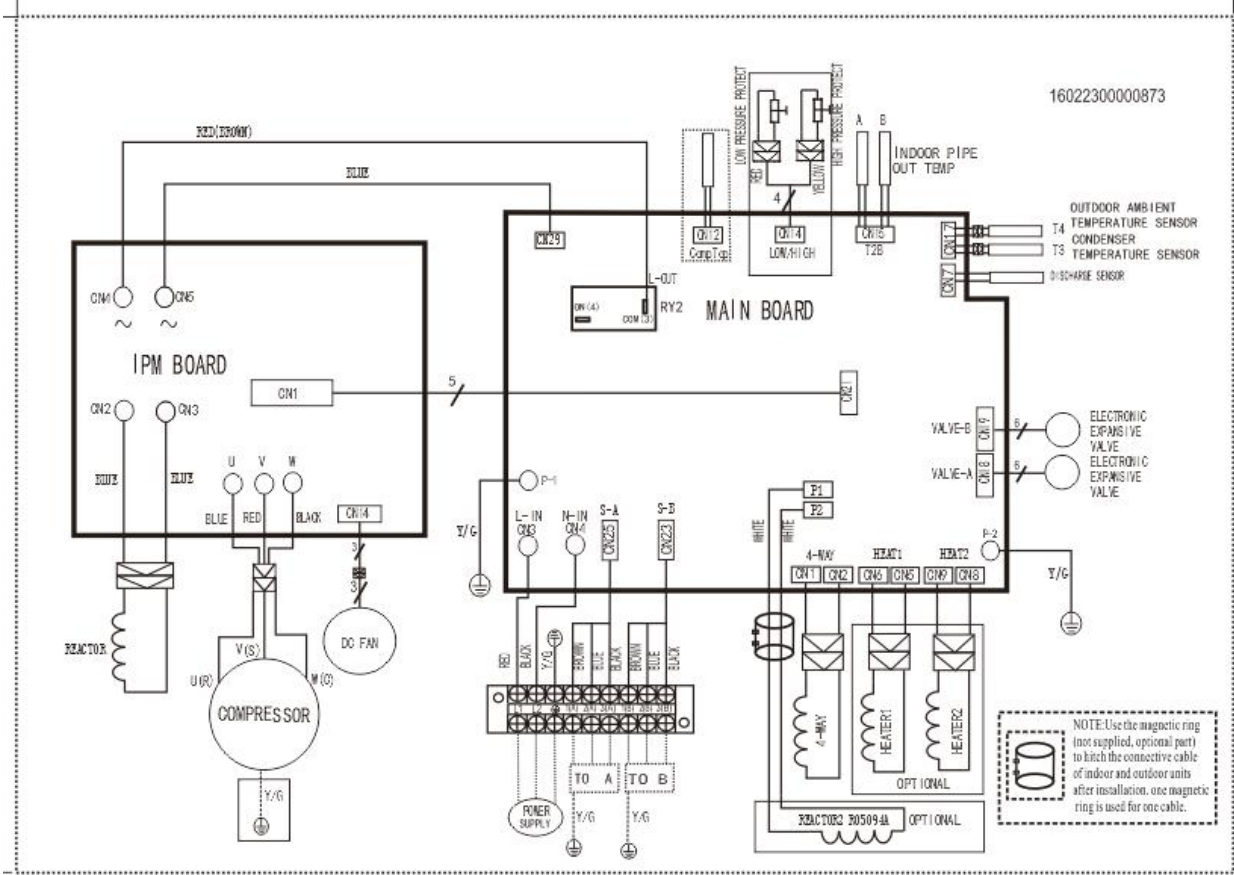
This modification will be carry out every 2 minutes.

#### **6.4.5 Four-way valve control**

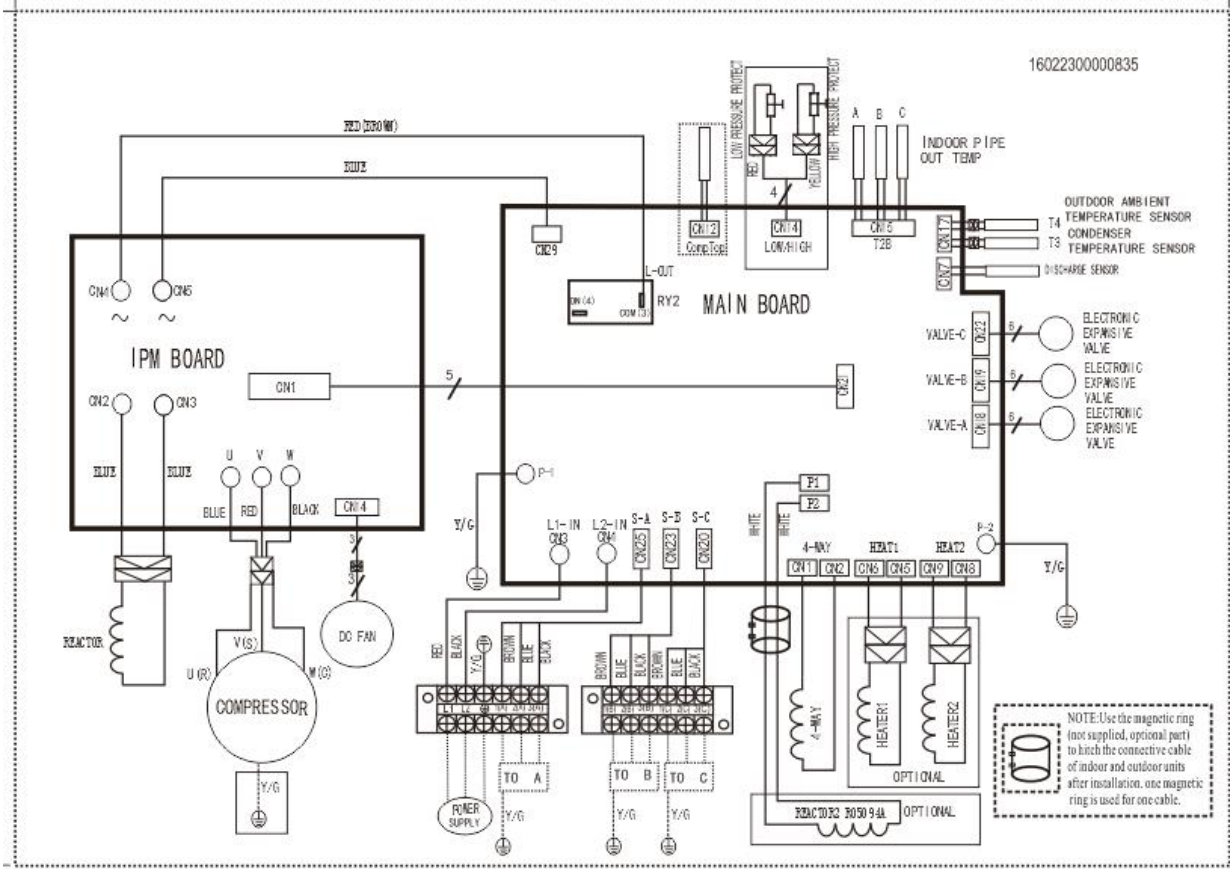
In heating mode, four-way valve is opened. In defrosting, four-way valve operates in according to defrosting action. In other modes, four-way valve is closed. When the heating mode to other

7 Wiring Diagrams

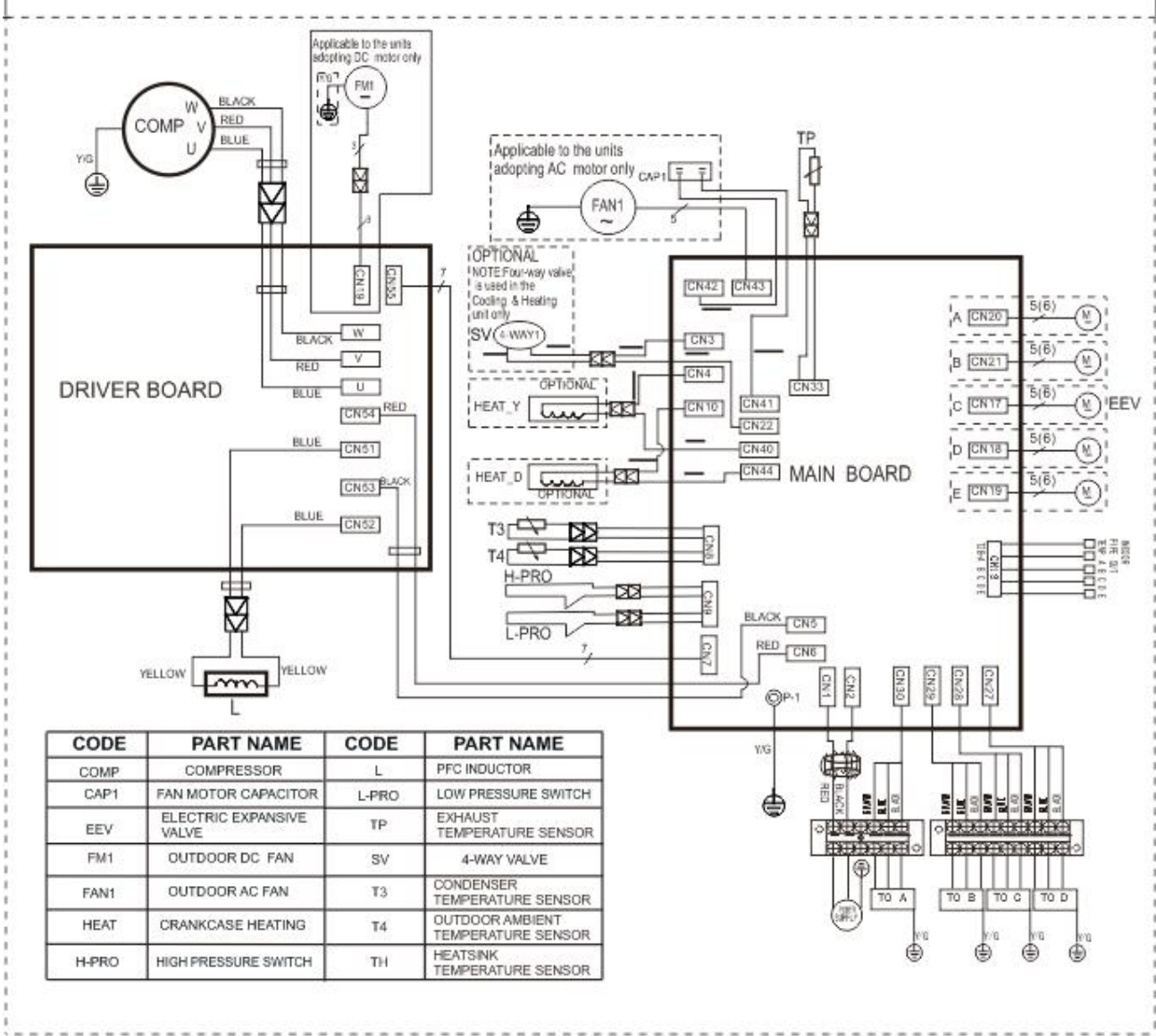
7.1 Wiring diagram of 1 drive 2 outdoor  
CM2-18-2Z



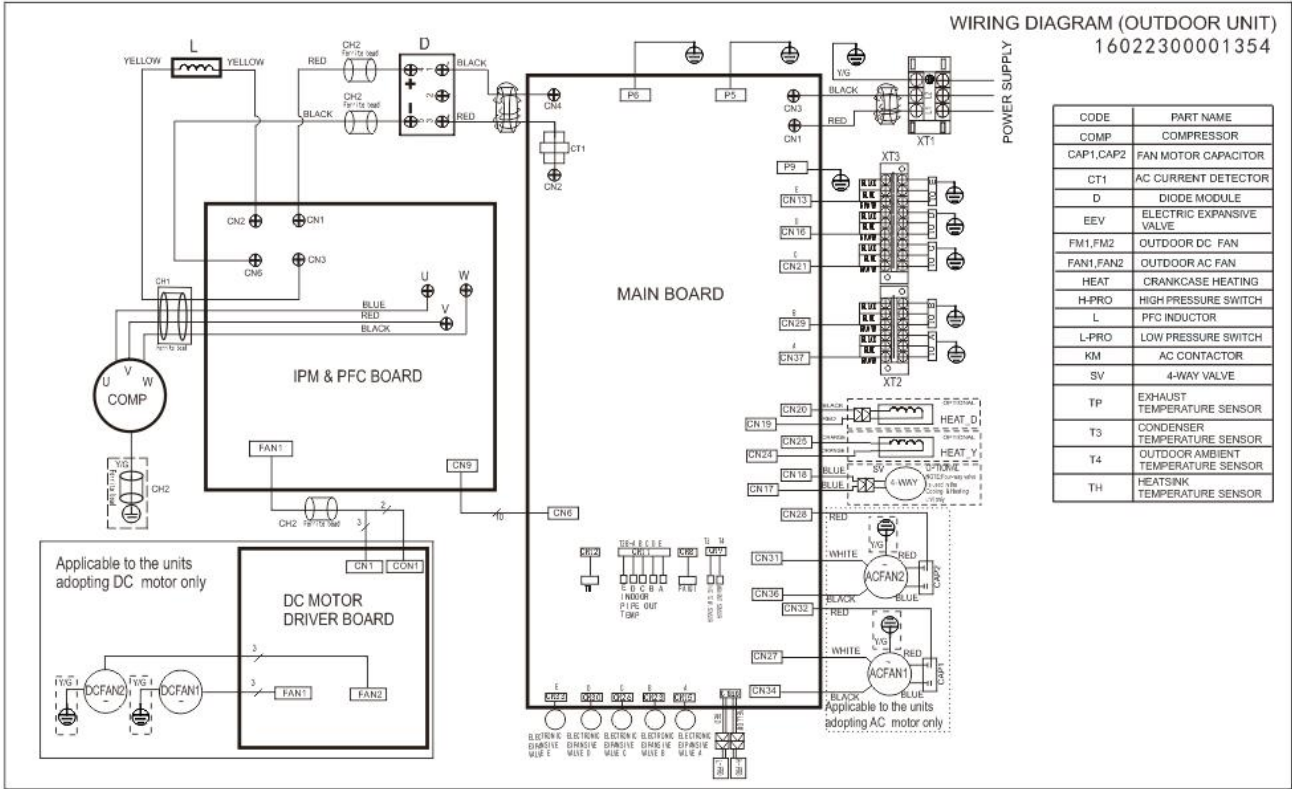
7.2 Wiring diagram of 1 drive 3 outdoor  
CM3-27-3Z



7.3 Wiring diagram of 1 drive 4 outdoor  
CM4-48-4Z



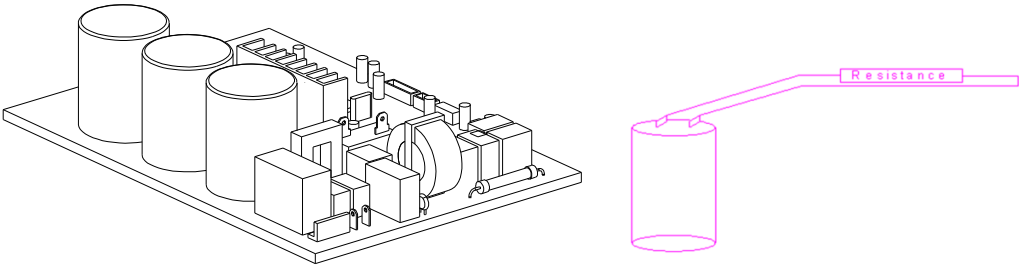
7.4 Wiring diagram of CM5-54-5Z



8. Troubleshooting

8.1 Safety

Because of there are capacitors in PCB and relative circuit in outdoor unit, even shut down the power supply, electricity power still are kept in capacitors, do not forget to discharge the electricity power in capacitor. The value of resistance is about 1500 ohm to 2000 ohm



Electrolytic Capacitors

(HIGH VOLTAGE! CAUTION!) Bulb (25-40W)

The voltage in P3 and P4 in outdoor PCB is high voltage about 310V

The voltage in P5 and P6 in outdoor PCB is high voltage about 310V

## 8.2 Indoor Unit Error Display

Operation lamp	Timer lamp	Display	LED STATUS	Corresponded outdoor error
☆ 1 time	X	E0	Indoor unit EEPROM error	/
☆ 2 times	X	E1	Communication malfunction between indoor and outdoor units.	E2
☆ 4 times	X	E3	Indoor fan speed has been out of control	/
☆ 5 times	X	E4	Indoor room temperature sensor T1 open circuit or short circuit	/
☆ 6 times	X	E5	Evaporator coil temperature sensor T2 open circuit or short circuit	/
☆ 7 times	X	EC	Refrigerant leakage detection	Not available for multizone and heating mode.
☆ 8 times	X	EE	Water-level alarm malfunction	/
☆ 2 times	O	F1	Open circuit or short circuit of outdoor ambient temperature sensor T4	E4
☆ 3 times	O	F2	Open circuit or short circuit of condenser coil temperature sensor T3	E4
☆ 4 times	O	F3	Open circuit or short circuit of Compressor discharge temperature sensor T5	E4
☆ 5 times	O	F4	Outdoor unit EEPROM error	E0
☆ 6 times	O	F5	Outdoor fan speed has been out of control	E8
☆ 7 times	O	F6	Outdoor unit low side value temperature sensor(T2B) open circuit or short circuit.(T2B means indoor unit coil outlet temperature sensor located on the outdoor unit low side value.)	F1,F2,F3,F4,F5,F6
☆ 8 times	O	F7	Lifting-panel communication error	/
☆ 9 times	O	F8	Lifting-panel malfunction	/
☆ 10 times	O	F9	Lifting-panel is not closed	/
☆ 1 times	☆	P0	IPM malfunction	P6



☆ 2 times	☆	P1	Over voltage or over low voltage protection	E5
☆ 3 times	☆	P2	High temperature protection of compressor top High pressure protection. Low pressure protection.	P0, P1, P2
☆ 4 times	☆	P3	Outdoor low temperature protection	/
☆ 5 times	☆	P4	Inverter compressor drive error	P6
☆ 6 times	☆	P5	Mode conflict	/
☆ 8 times	☆	P7	Outdoor IGBT temperature sensor error	/

O (light)      X (off)      ☆ (flash)

## 8.3 Outdoor Unit Display

### 8.3.1 Outdoor unit error display

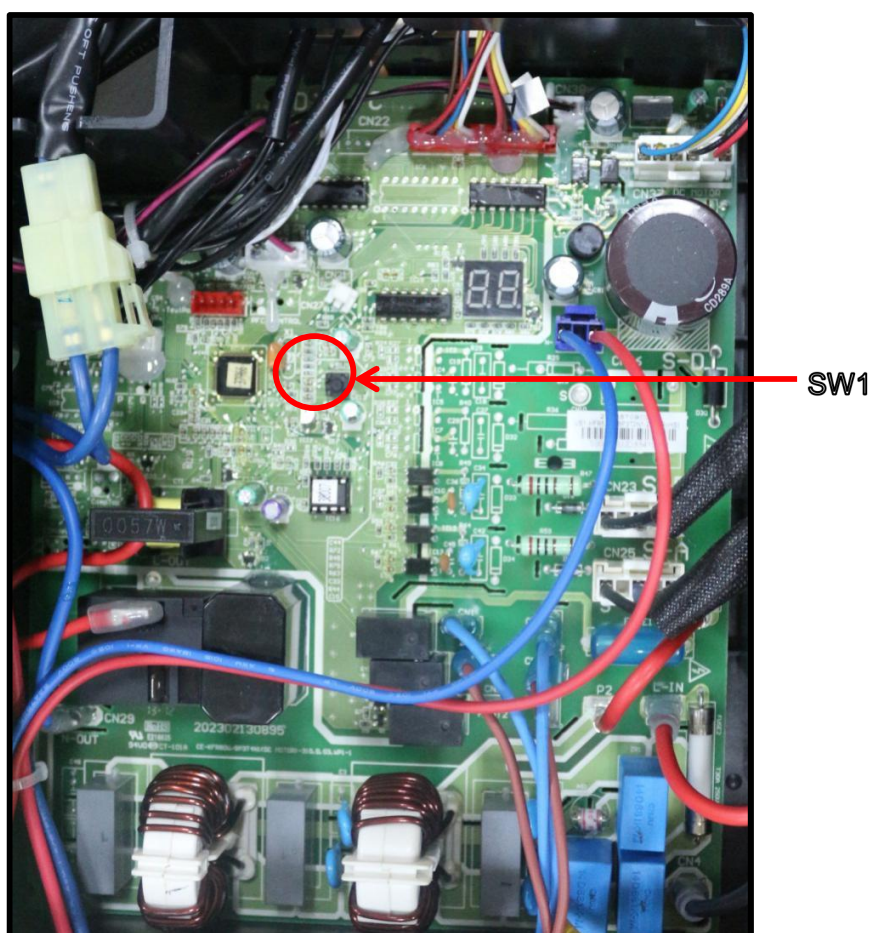
Display	LED STATUS	IDU Error)
E0	Outdoor EEPROM malfunction	F4
E2	Communication malfunction between indoor and outdoor units	E1
E3	Communication malfunction between IPM board and outdoor main board	— —
E4	Open or short circuit of outdoor temperature sensor (T3、T4、T5)	F1,F2,F3
E5	Voltage protection	P1
E6	Active PFC module protection	— —
E8	Outdoor fan speed has been out of control (Only for DC fan motor models)	F5
F1	No A Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit. (T2B means indoor unit coil outlet temperature sensor located on the outdoor unit low side value.)	— —
F2	No B Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit.	— —
F3	No C Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit.	— —
F4	No D Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit.	— —
F5	No E Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit.	— —
F6	No F Indoor unit coil outlet temperature sensor(T2B) open circuit or short circuit.	— —
P0	Temperature protection of compressor top	P2
P1	High pressure protection	P2
P2	Low pressure protection	P2

P3	Current protection of compressor	--
P4	Temperature protection of compressor discharge	--
P5	High temperature protection of condenser	--
P6	IPM module protection	P0

### 8.3.2 Outdoor unit point check function

There is a check switch in outdoor PCB.

Push the switch SW1 to check the states of unit when the unit is running. The digital display tube will display the follow procedure when push SW1 each time.



	Display	Remark
0	Normal display	Display running frequency, running state or malfunction code
1	Quantity of indoor units in good connection	Actual data

			Display	Number of indoor unit
			1	1
			2	2
			3	3
			4	4
2	Outdoor unit running mode code	Off:0,Fan only 1, Cooling:2, Heating:3, Forced cooling:4		
3	A indoor unit capacity	The capacity unit is horse power. If the indoor unit is not connected, the digital display tube will show: "____" (9K:1HP,12K:1.2HP,18K:1.5HP)		
4	B indoor unit capacity			
5	C indoor unit capacity			
6	D indoor unit capacity			
7	E indoor unit capacity			
8	A Indoor unit capacity demand code	Norm code*HP (9K:1HP,12K:1.2HP,18K:1.5HP)		
9	B Indoor unit capacity demand code			
10	C Indoor unit capacity demand code			
11	D Indoor unit capacity demand code			
12	E Indoor unit capacity demand code			
13	Outdoor unit amendatory capacity demand code	Forced cooling:7		
14	The frequency corresponding to the total indoor units amendatory capacity demand			
15	The frequency after the frequency limit			
16	The frequency sending to compressor control chip			
17	A indoor unit evaporator outlet temp.(T <sub>2B</sub> A)	If the temp. is lower than -9 degree, the digital display tube will show "-9".If the temp. is higher than 70 degree, the digital display tube will show "70". If the indoor unit is not connected, the digital display tube will show: "____"		
18	B indoor unit evaporator outlet temp.(T <sub>2B</sub> B)			
19	C indoor unit evaporator outlet temp.(T <sub>2B</sub> C)			
20	D indoor unit evaporator outlet temp.(T <sub>2B</sub> D)			
21	E indoor unit evaporator outlet temp.(T <sub>2B</sub> E)			
22	A indoor unit room temp.(T <sub>1</sub> A)	If the temp. is lower than 0 degree, the digital display tube will show "0".If the temp. is higher than 50 degree, the digital display tube will show "50". If the indoor unit is not connected, the digital display tube will show: "____"		
23	B indoor unit room temp.(T <sub>1</sub> B)			
24	C indoor unit room temp.(T <sub>1</sub> C)			
25	D indoor unit room temp.(T <sub>1</sub> D)			
26	E indoor unit room temp.(T <sub>1</sub> E)			
27	A indoor unit evaporator temp.(T <sub>2</sub> A)	If the temp. is lower than -9 degree, the digital display tube will show "-9".If the temp. is higher than 70 degree, the digital display tube will show "70". If the indoor unit is not connected, the digital display tube will show: "____"		
28	B indoor unit evaporator temp.(T <sub>2</sub> B)			
29	C indoor unit evaporator temp.(T <sub>2</sub> C)			
30	D indoor unit evaporator temp.(T <sub>2</sub> D)			
31	E indoor unit evaporator temp.(T <sub>2</sub> E)			
32	Condenser pipe temp.(T <sub>3</sub> )			
33	Outdoor ambient temp.(T <sub>4</sub> )			
34	Compressor discharge temp.(T <sub>P</sub> )	The display value is between 30~129 degree. If the temp. is lower than 30 degree, the digital display tube will show "30".If the temp. is higher than 99 degree, the digital display tube will show single digit and tens digit. For example, the digital display tube show "0.5",it means the compressor discharge temp. is 105 degree.)		
35	AD value of current	The display value is hex number.		

36	AD value of voltage	For example ,the digital display tube show “Cd”, it means AD value is 205.		
37	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display tube will show single digit and tens digit. For example ,the digital display tube show “2.0”,it means the EXV open angle is 120×4=480p.)		
38	EXV open angle for B indoor unit			
39	EXV open angle for C indoor unit			
40	EXV open angle for D indoor unit			
41	EXV open angle for E indoor unit			
42	Frequency limit symbol	Bit7	Frequency limit caused by IGBT radiator	The display value is hex number. For example, the digital display tube show 2A,then Bit5=1, Bit3=1, Bit1=1. It means frequency limit caused by T4,T3 and current.
		Bit6	Frequency limit caused by PFC	
		Bit5	Frequency limit caused by T4.	
		Bit4	Frequency limit caused by T2.	
		Bit3	Frequency limit caused by T3.	
		Bit2	Frequency limit caused by T5.	
		Bit1	Frequency limit caused by current	
		Bit0	Frequency limit caused by voltage	
43	Average value of T2	(Sum T2 value of all indoor units)/( number of indoor units in good connection)		
44	Outdoor unit fan motor state	Off:0, High speed:1, Med speed:2, Low speed:3 Breeze:4, Super breeze:5		
45	The last error or protection code	00 means no malfunction and protection		
46	F indoor unit capacity			
47	F Indoor unit capacity demand code			
48	F indoor unit evaporator outlet temp.(T <sub>2B</sub> F)			
49	F indoor unit room temp.(T <sub>1</sub> F)			
50	F indoor unit evaporator temp.(T <sub>2</sub> F)			
51	EXV open angle for F indoor unit			

### 8.3.3 Outdoor unit's digital display tube

There is a digital display tube in outdoor PCB.

Digital display tube display function

- In standby , the LED displays “- -”
- In compressor operation, the LED display the running frequency,
- In defrosting mode, The LED displays “dF” or alternative displays between running frequency and “dF”(each displays 0.5s)
- In compressor pre-heating, The LED displays “PH” or alternative displays between running frequency and “PH”(each displays 0.5s)
- During the oil return process, The LED displays “RO” or alternative displays between running frequency and “RO”(each displays 0.5s)
- In low ambient cooling mode, the LED displays “LC” or alternative displays between running frequency and “LC”(each displays 0.5s)
- In forced cooling mode, the LED displays “FC” or alternative displays between running frequency and “FC”(each displays 0.5s)
- When PFC module protection occurs three times within 15 minutes, the LED displays “E6” or alternative displays between running frequency and “E6”(each displays 0.5s)
- In protection or malfunction, the LED displays error code or protection code.

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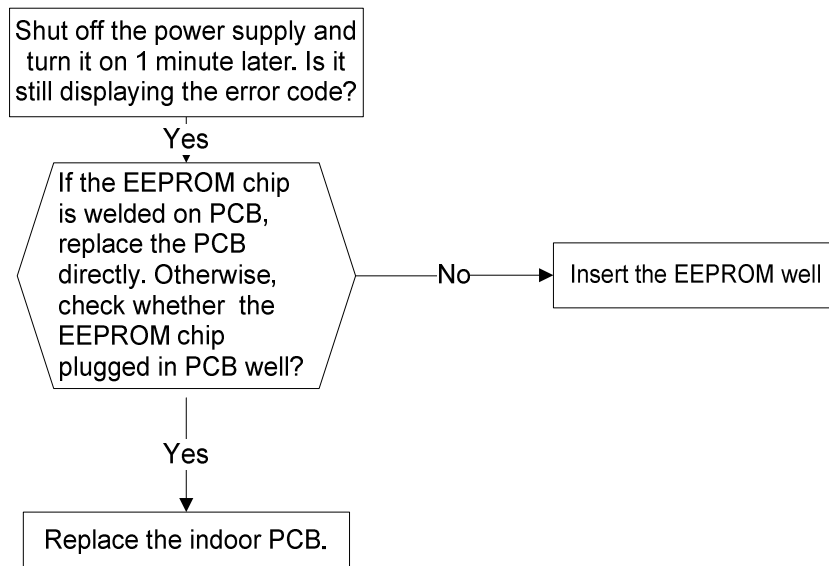
## 8.4 Diagnosis and Solution

### 8.4.1 Indoor unit trouble shooting

#### 8.4.1.1 Indoor EEPROM malfunction diagnosis and solution.

Error code	IDU ERROR E0
Malfunction decision conditions	PCB main chip does not receive feedback from EEPROM chip
	<ul style="list-style-type: none"><li>● Installation mistake</li><li>● PCB faulty</li></ul>

#### Trouble shooting:



#### Supposed causes

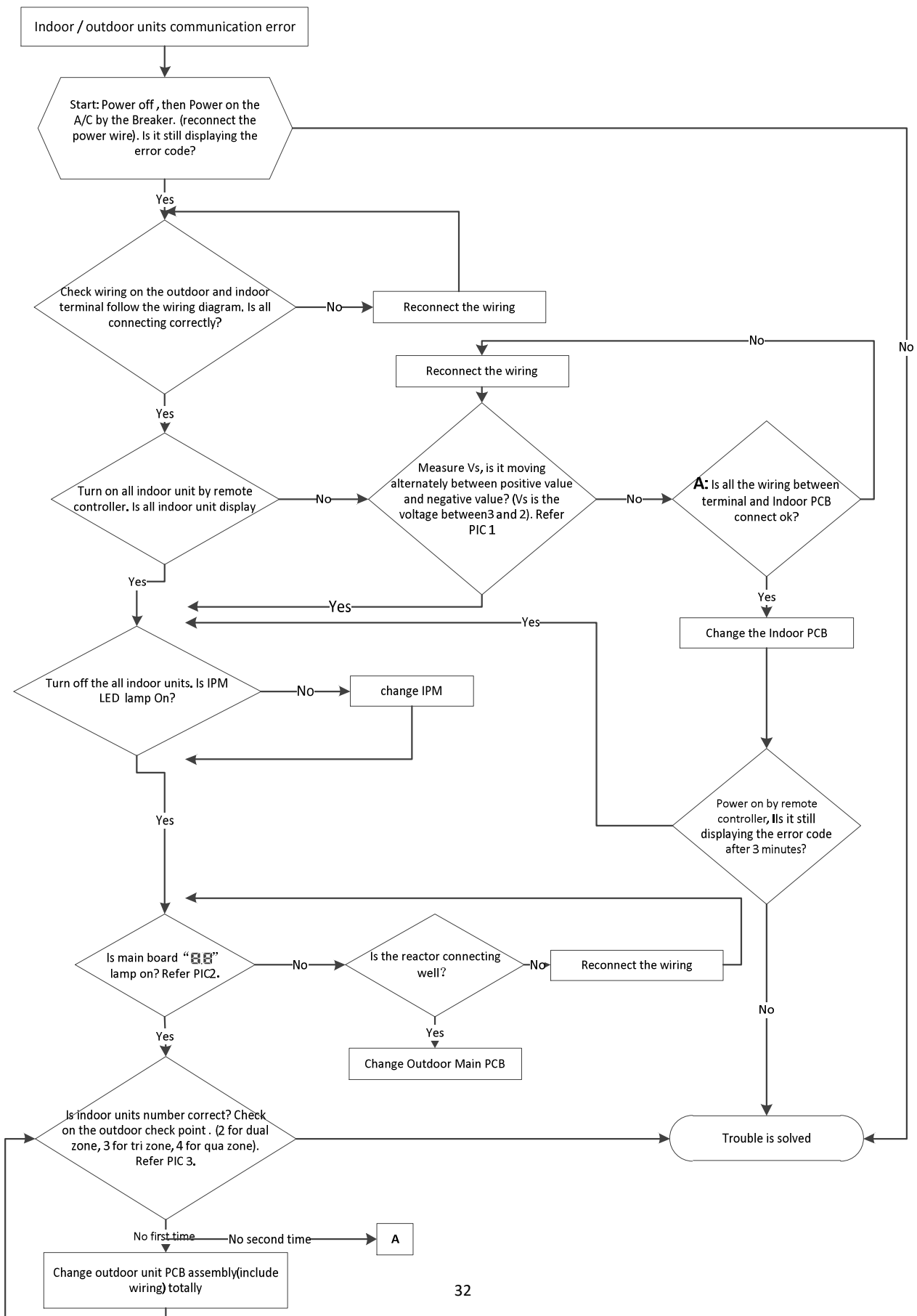
EEPROM: a read-only memory whose contents can be erased and reprogrammed using a pulsed voltage. For the location of EEPROM chip, please refer to the below photos.

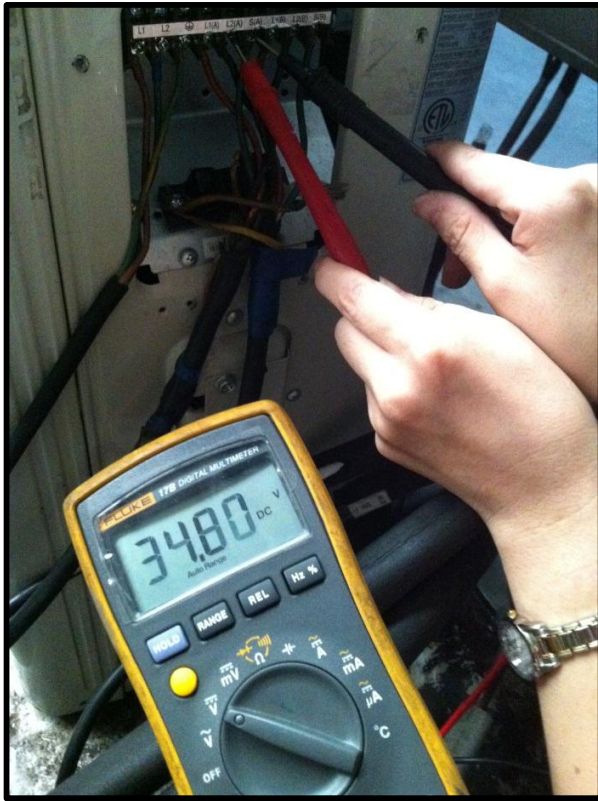
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#### 8.4.1.2 Communication malfunction between indoor and outdoor units diagnosis and solution.

Error code	IDU ERROR E1, ODU ERROR E2
Malfunction decision conditions	Indoor unit does not receive the feedback from outdoor unit during 120 seconds.
Supposed causes	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● Indoor or outdoor PCB faulty</li></ul>

Trouble shooting:





Pic 1: Use a multimeter to test the DC voltage between 2 port and 3 port of outdoor unit. The red pin of multimeter connects with 2 port while the black pin is for 3 port.

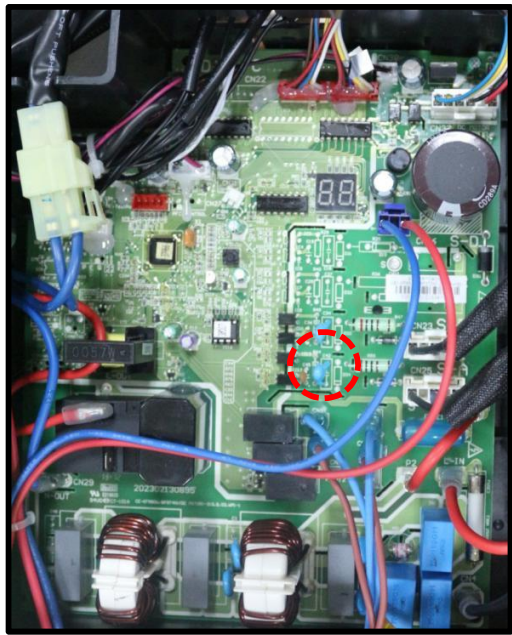
(For previous generation, 2 is same as L2, 3 is same as S)

When AC is normal running, the voltage will move alternately between positive value and negative value.



PIC2: Main board LED when power on and unit standby.





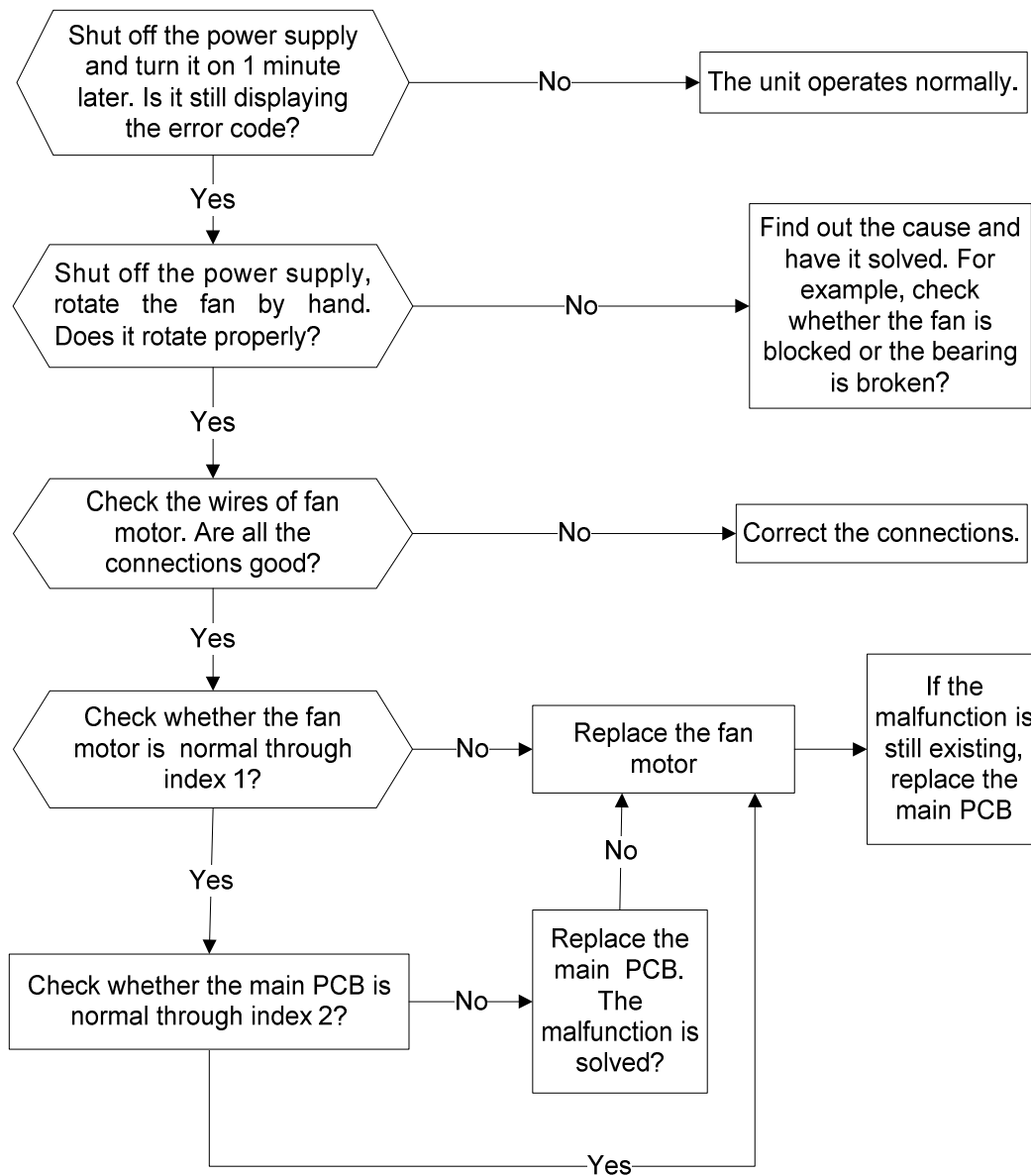
PIC 3: Check point button, press 1 time for check how many indoor units are connected.

#### 8.4.1.3 Reserve

#### 8.4.1.4 Indoor fan speed has been out of control diagnosis and solution.

<b>Error code</b>	<b>IDU ERROR E3</b>
<b>Malfunction decision conditions</b>	When indoor fan speed keeps too low (300RPM) for certain time, the unit will stop and the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Fan ass'y faulty</li> <li>● Fan motor faulty</li> <li>● PCB faulty</li> </ul>

**Trouble shooting:**

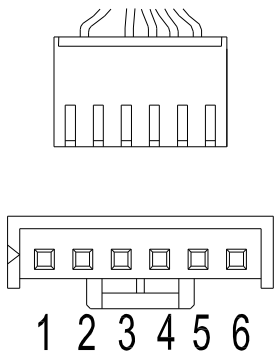


Index 1:

#### 1. Indoor DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must have problems and need to be replaced.

For other models:



DC motor voltage input and output

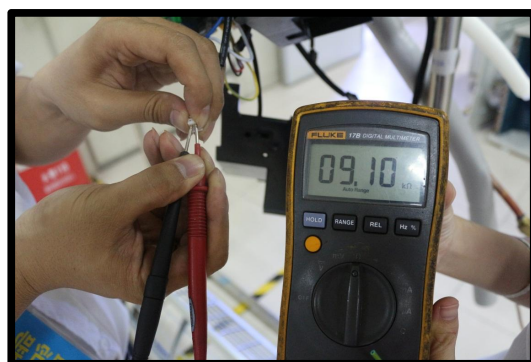
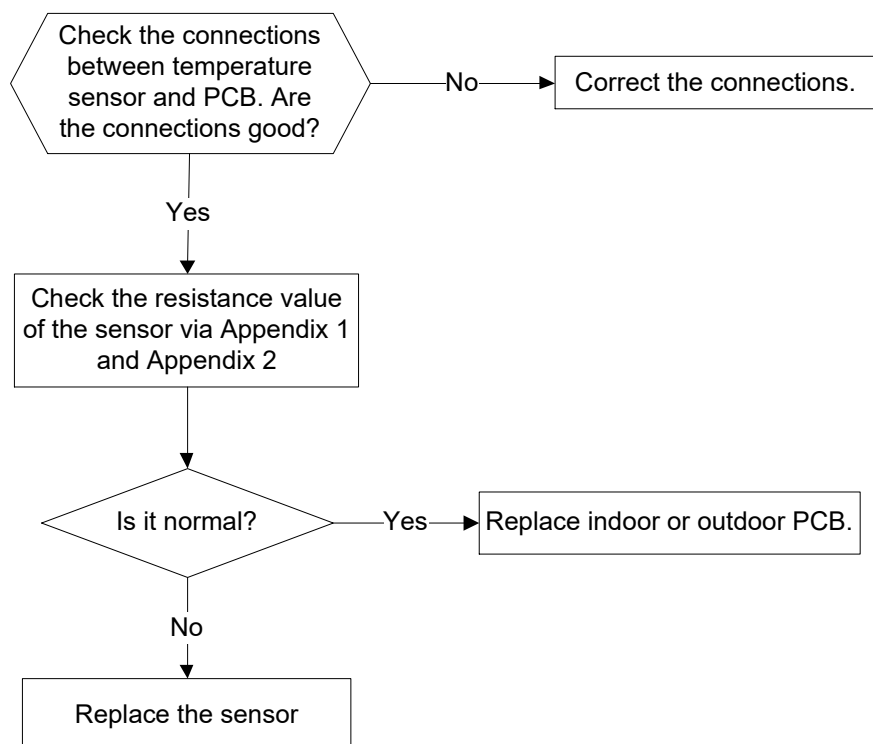
NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	13.5-16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5-16.5V

#### 8.4.1.5 Open or short circuit of temperature sensor diagnosis and solution.

Display	LED STATUS	Corresponded outdoor error
E4	Indoor room temperature sensor T1 open circuit or short circuit	/
E5	Evaporator coil temperature sensor T2 open circuit or short circuit	/
F1	Open circuit or short circuit of outdoor ambient temperature sensor T4	E4
F2	Open circuit or short circuit of condenser coil temperature sensor T3	E4
F3	Open circuit or short circuit of Compressor discharge temperature sensor T5	E4
F6	Outdoor unit low side value temperature sensor(T2B) open circuit or short circuit.(T2B means indoor unit coil outlet temperature sensor located on the outdoor unit low side value.)	F1,F2,F3,F4,F5,F6

<b>Malfunction decision conditions</b>	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Sensor faulty</li> <li>● PCB faulty</li> </ul>

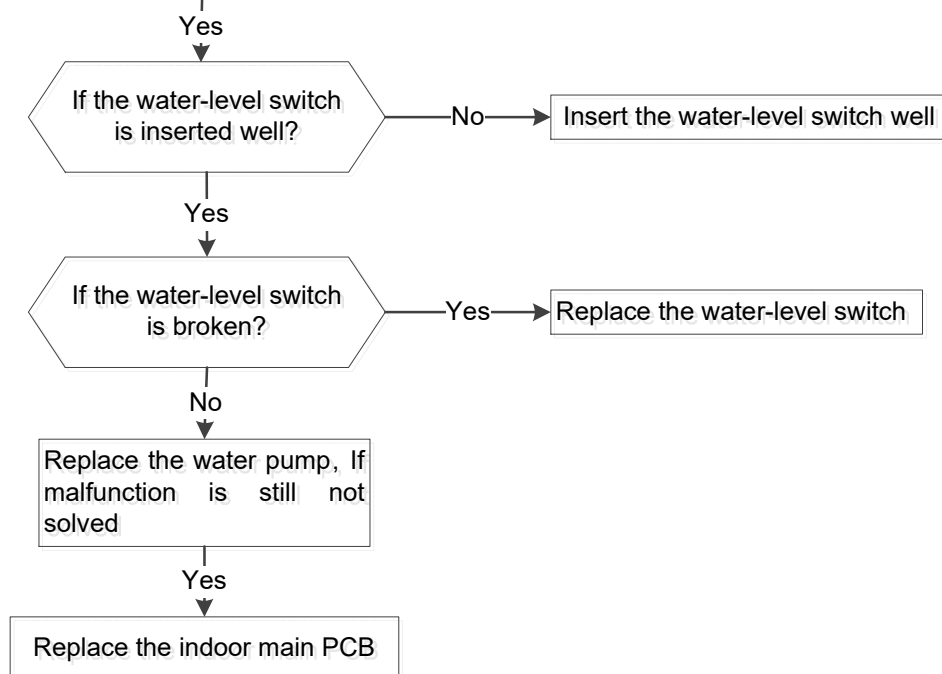
#### Trouble shooting:



#### 8.4.1.6 Water-level alarm malfunction diagnosis and solution (For cassette/A5 duct)

<b>Error code</b>	<b>IDU ERROR EE</b>
<b>Malfunction decision conditions</b>	If the sampling voltage is not 5V, the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Water-level switch faulty</li> <li>● Water pump faulty</li> <li>● Indoor PCB faulty</li> </ul>

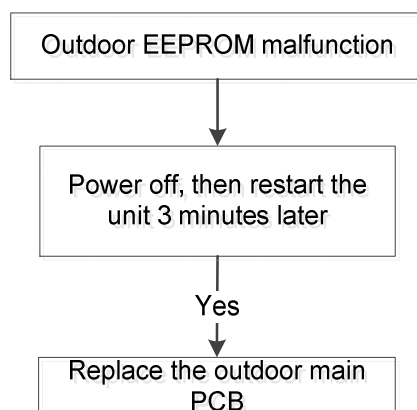
Power off, then restart the unit 3 minutes later. Is it still displaying the error code?



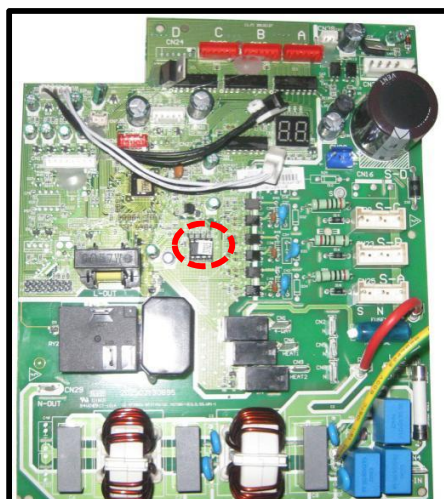
#### 8.4.1.7 Outdoor EEPROM malfunction

Error Code	IDU ERROR F4, ODU ERROR E0
Malfunction decision conditions	PCB main chip does not receive feedback from EEPROM chip
Supposed causes	<ul style="list-style-type: none"><li>● Installation mistake</li><li>● PCB faulty</li></ul>

Trouble shooting:



EEPROM: a read-only memory whose contents can be erased and reprogrammed using a pulsed voltage. For the location of EEPROM chip, please refer to the below photos.

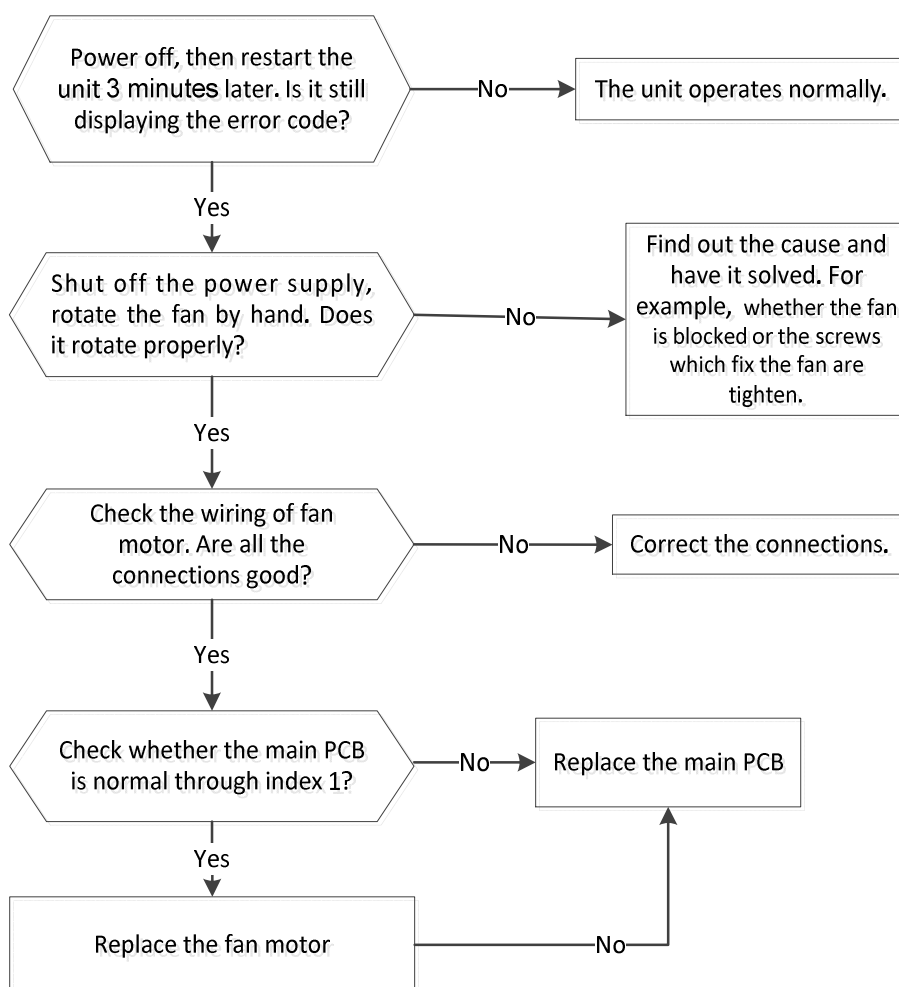


Example of PCB (3zone)

#### 8.4.1.8 Outdoor fan speed has been out of control diagnosis and solution

<b>Error Code</b>	<b>IDU ERROR F5, ODU ERROR E8</b>
<b>Malfunction decision conditions</b>	When outdoor fan speed keeps too low (300RPM) or too high(2400RPM) for certain time, the unit will stop and the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Fan ass'y faulty</li> <li>● Fan motor faulty</li> <li>● PCB faulty</li> </ul>

#### Trouble shooting:



#### Index 1:

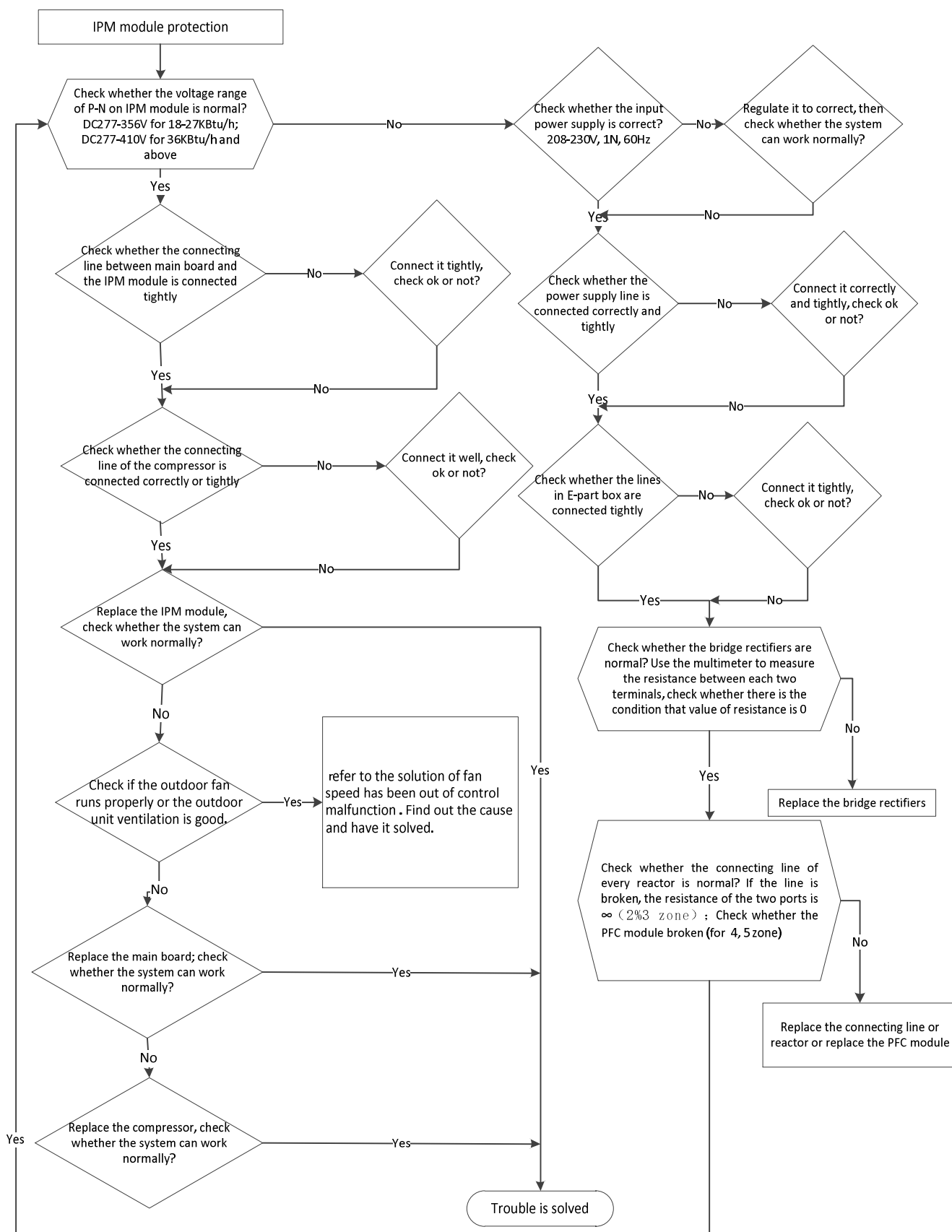
Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor must has problems and need to be replaced.

8.4.1.9 IPM malfunction or Inverter compressor drive error diagnosis and solution.

Error code	IDU ERROR P0, ODU ERROR P6, IPM malfunction IDU ERROR P4, ODU ERROR P6, Inverter compressor drive error
Malfunction decision conditions	When the voltage signal that IPM send to compressor drive chip is abnormal, the ODU display LED will show “P6” and AC will turn off.
Supposed causes	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● IPM malfunction</li><li>● Outdoor fan ass’y faulty</li><li>● Compressor malfunction</li><li>● Outdoor PCB faulty</li></ul>

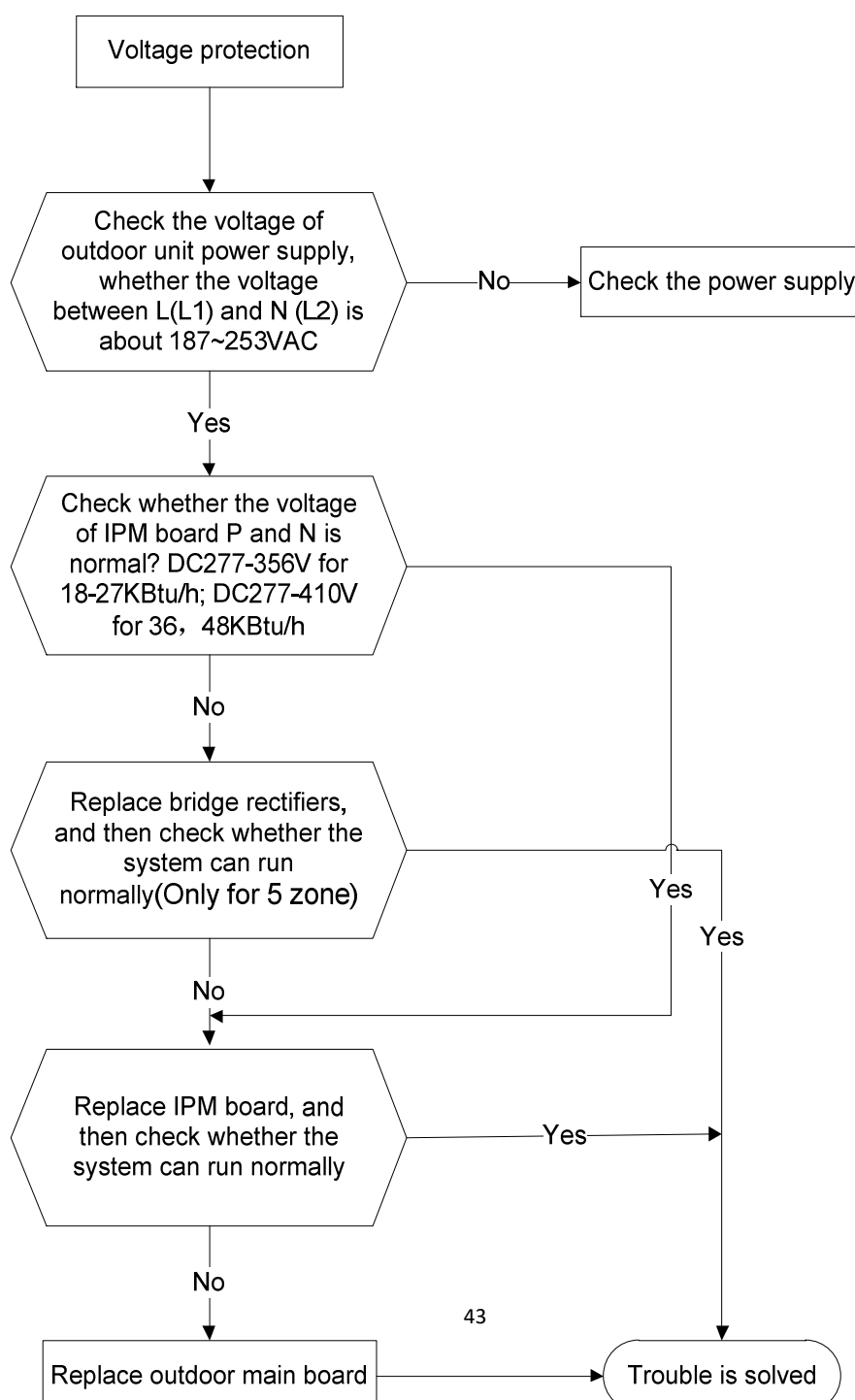
Trouble shooting:





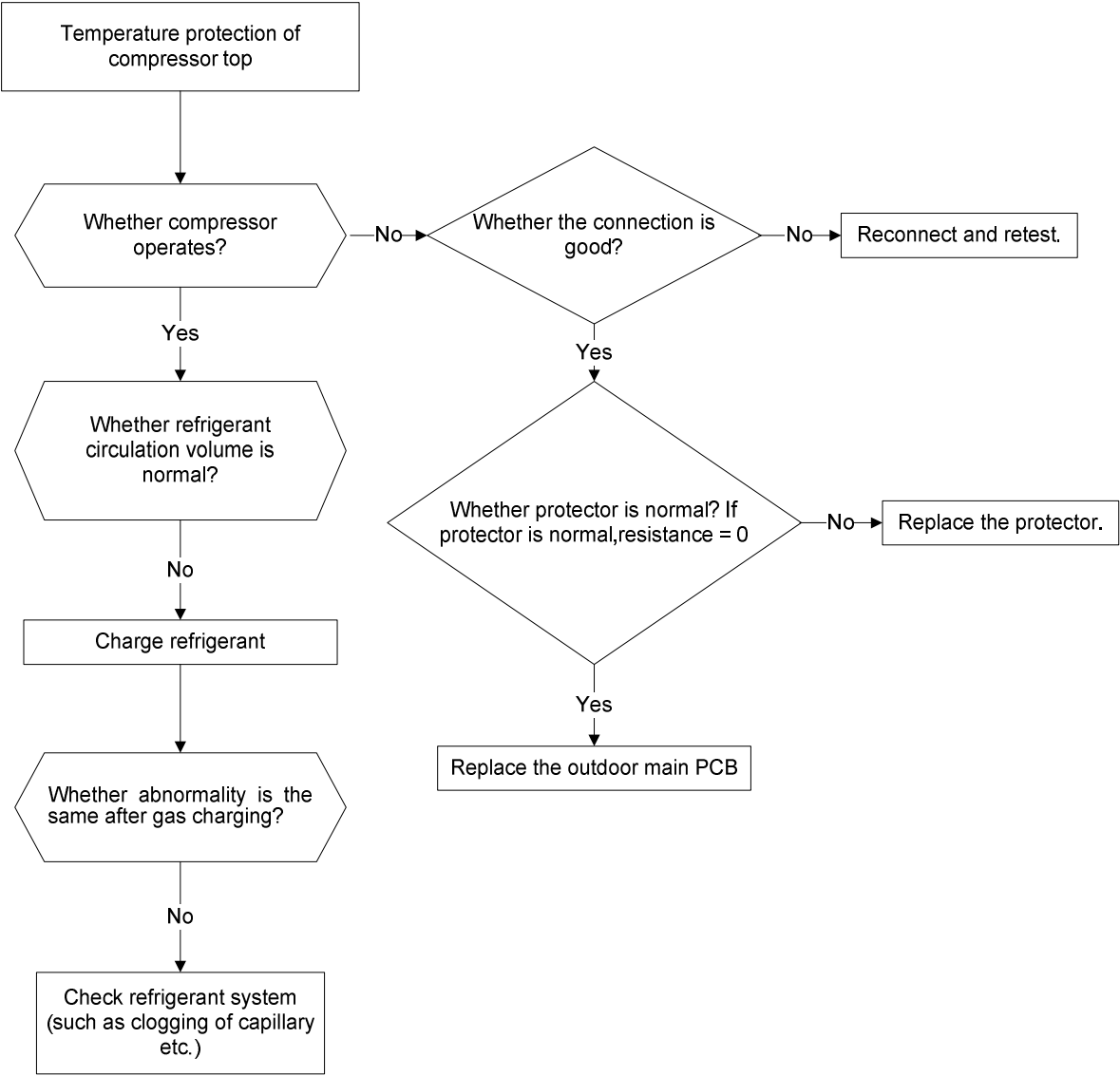
#### 8.4.1.10 Over voltage or too low voltage protection diagnosis and solution.

<b>Error code</b>	<b>IDU ERROR P1, ODU ERROR E5</b>
<b>Malfunction decision conditions</b>	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Power supply abnormal</li> <li>● Wiring mistake</li> <li>● Bridge rectifier faulty</li> <li>● IPM board faulty</li> </ul>



8.4.1.11 Temperature protection of compressor top diagnosis and solution.

Error code	IDU ERROR P2, ODU ERROR P0
Malfunction decision conditions	If the sampling voltage is not 5V, the LED will display the failure.
Supposed causes	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● Over load protector faulty</li><li>● System block</li><li>● Outdoor PCB faulty</li></ul>

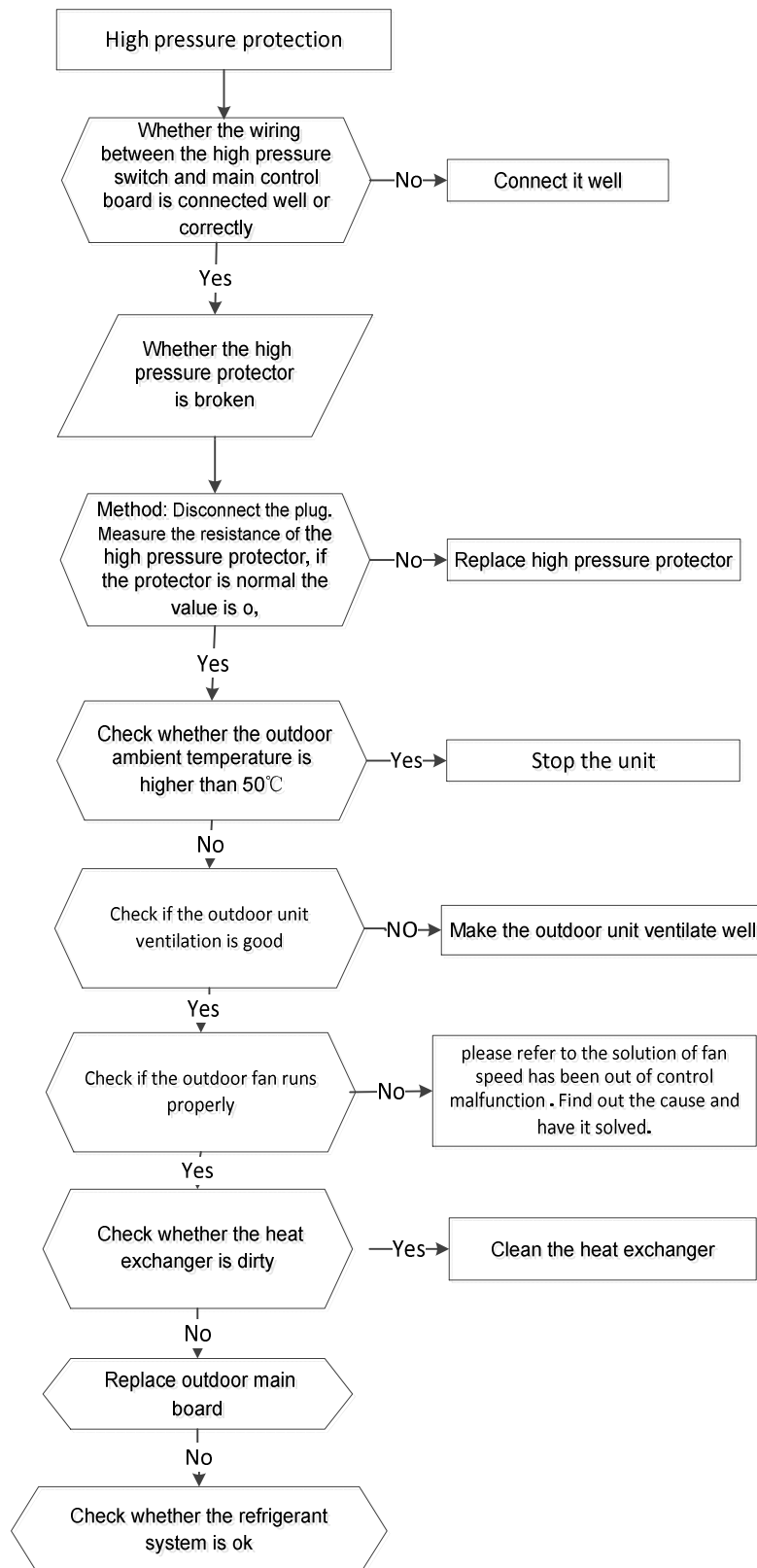


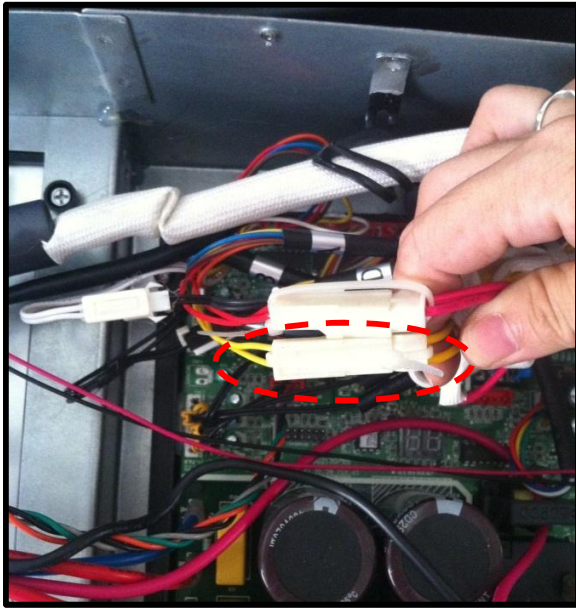
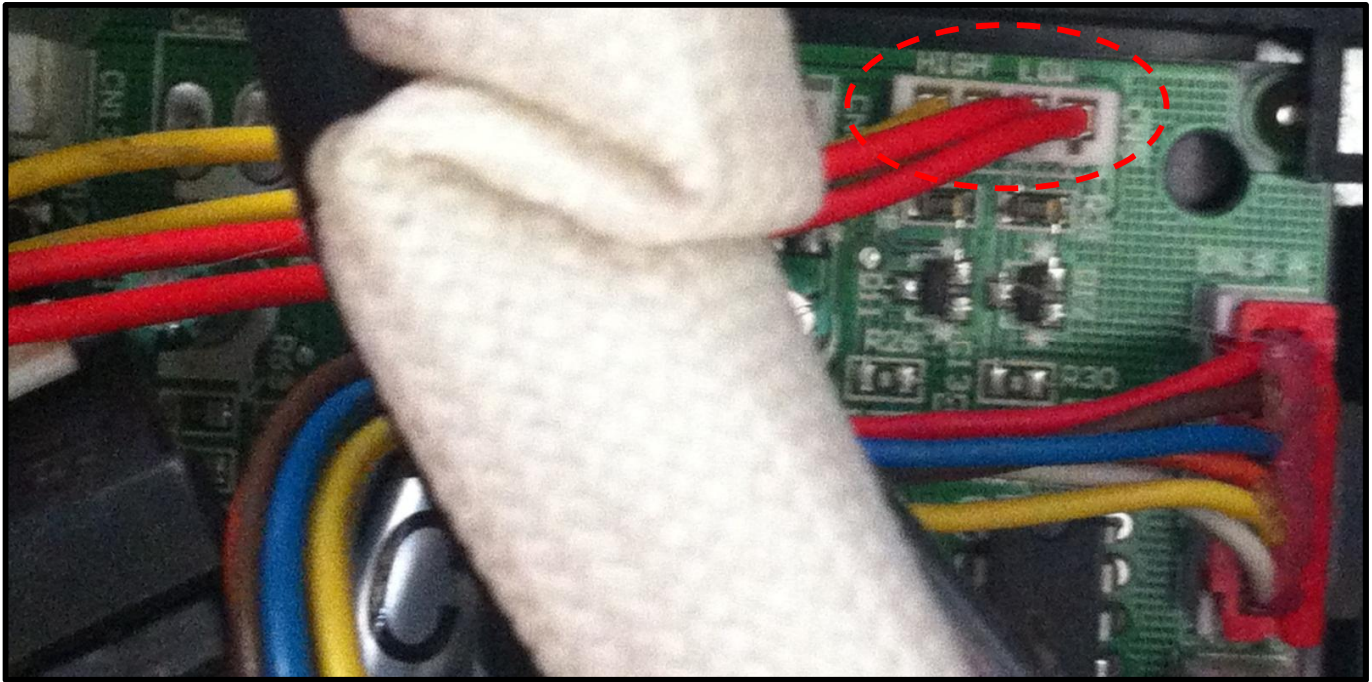
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#### 8.4.1.12 P1 (High pressure protection) error diagnosis and solution.

<b>Error Code</b>	<b>IDU ERROR P2, ODU ERROR P1</b>
<b>Malfunction decision conditions</b>	If the sampling voltage is not 5V, the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● Over load protector faulty</li><li>● System block</li><li>● Outdoor PCB faulty</li></ul>

**Trouble shooting:**



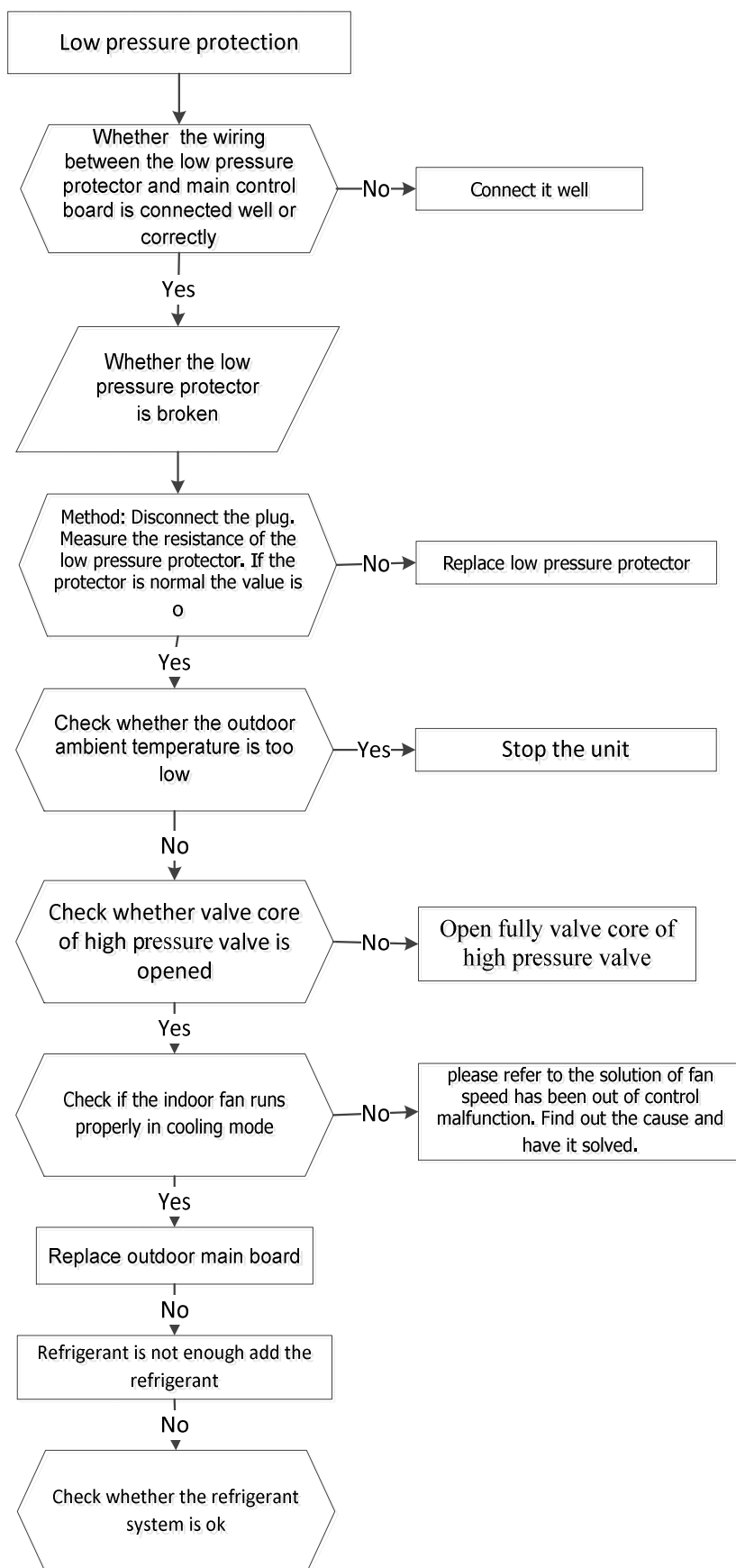


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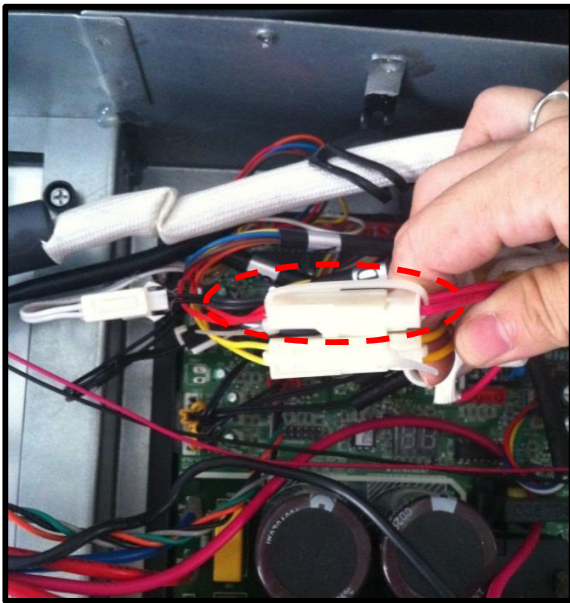
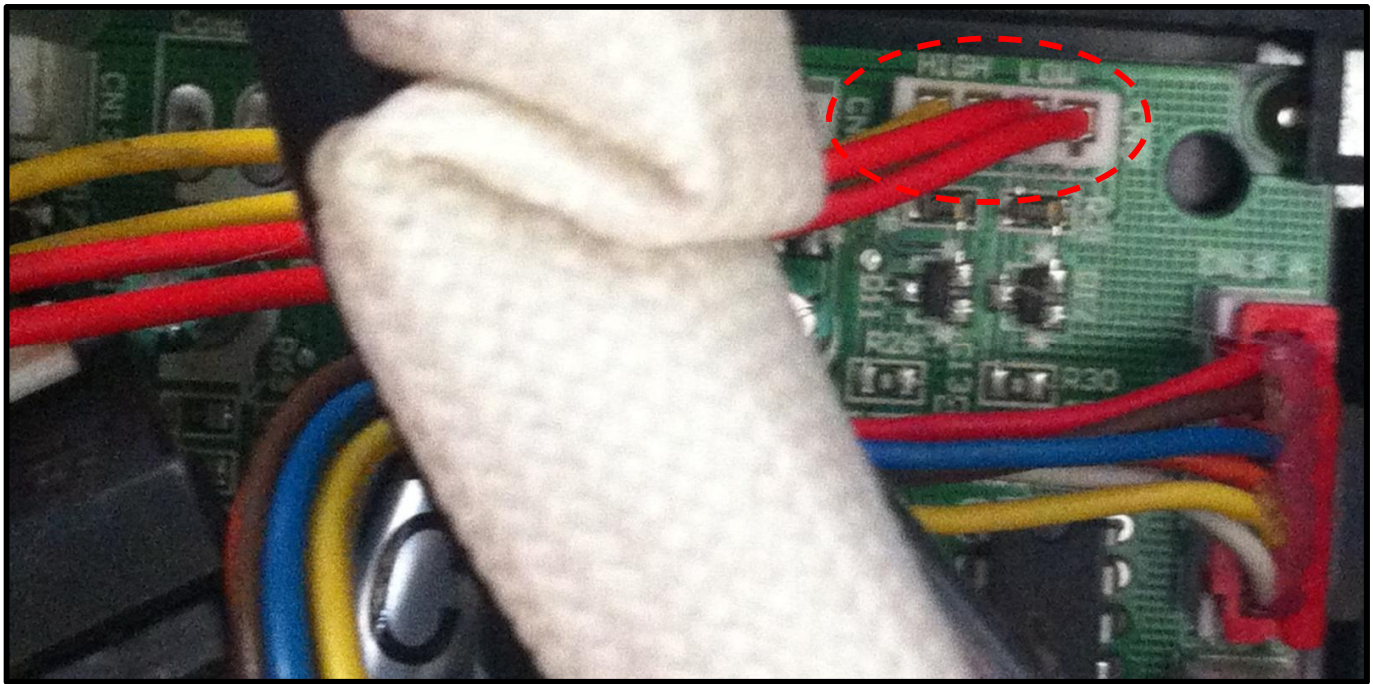
#### 8.4.2.13 Low pressure protection error diagnosis and solution.

<b>Error Code</b>	<b>IDU ERROR P2, ODU ERROR P2</b>
<b>Malfunction decision conditions</b>	If the sampling voltage is not 5V, the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● Over load protector faulty</li><li>● System block</li><li>● Outdoor PCB faulty</li></ul>

**Trouble shooting:**

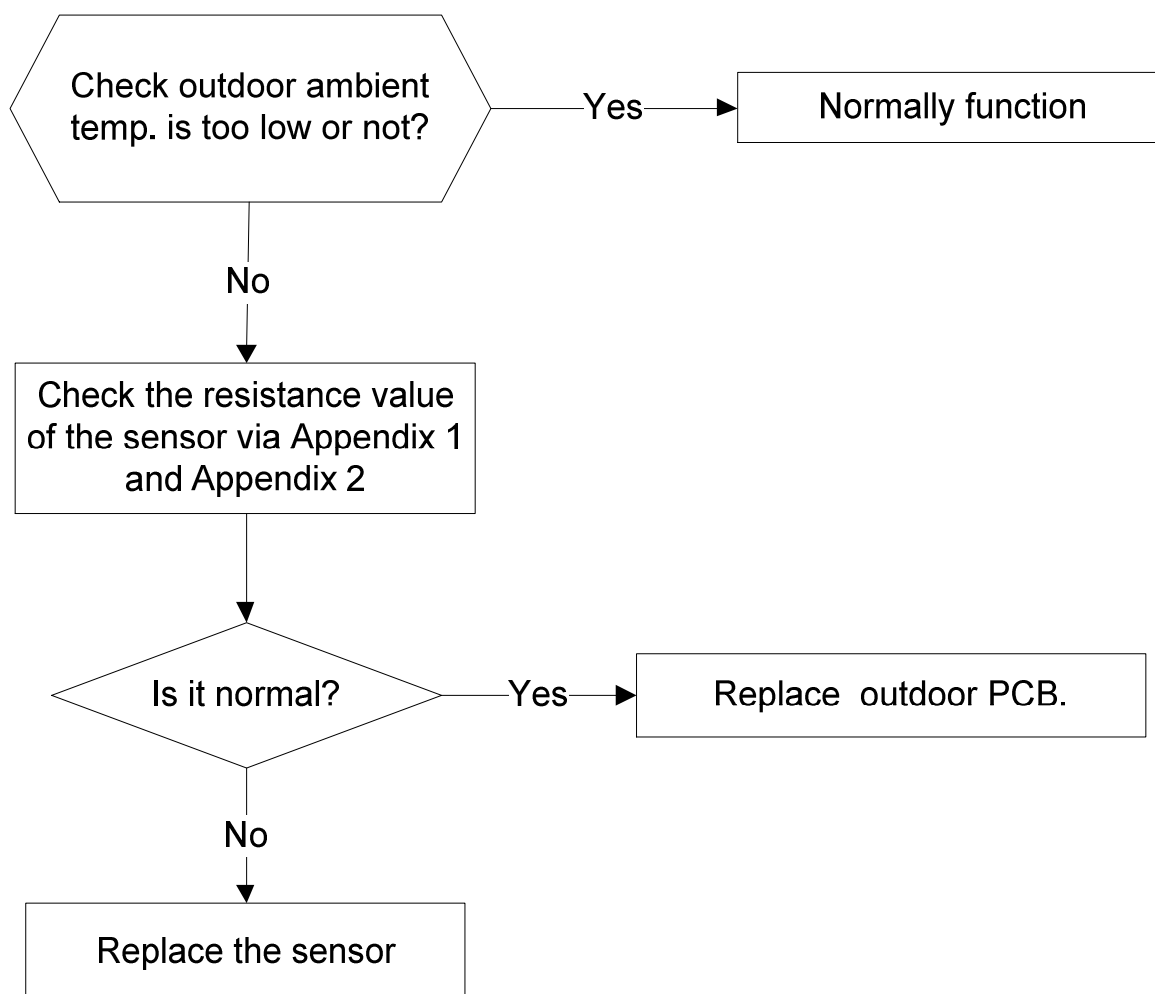






#### 8.4.2.14 Outdoor low temperature protection error diagnosis

Error Code	IDU ERROR P3
Malfunction decision conditions	INDOOR PCB receive outdoor temperature to low (normally - 25C depends on models).
Supposed causes	<ul style="list-style-type: none"><li>● Outdoor ambient temperature too low.</li><li>● Outdoor ambient temperature sensor defective.</li><li>● Outdoor PCB defective.</li></ul>



#### 8.4.1.15 Mode conflict.

<b>Error Code</b>	<b>P5</b>
<b>Malfunction decision conditions</b>	The indoor units cannot work cooling mode and heating at same time. Heating mode has a priority.
<b>Unit action</b>	<ul style="list-style-type: none"> <li>● Suppose Indoor unit A working in cooling mode or fan mode, and indoor unit B is set to heating mode, then A will change to off and B will work in heating mode.</li> <li>● Suppose Indoor unit A working in heating mode, and indoor unit B is set to cooling mode or fan mode, then B will change to stand by and A will be no change.</li> </ul>

	Cooling mode	Heating Mode	Fan	Off
Cooling mode	No	Yes	No	No
Heating Mode	Yes	No	Yes	No
Fan	No	Yes	No	No
Off	No	No	No	No

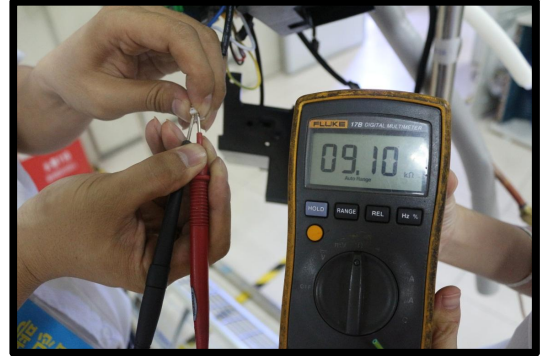
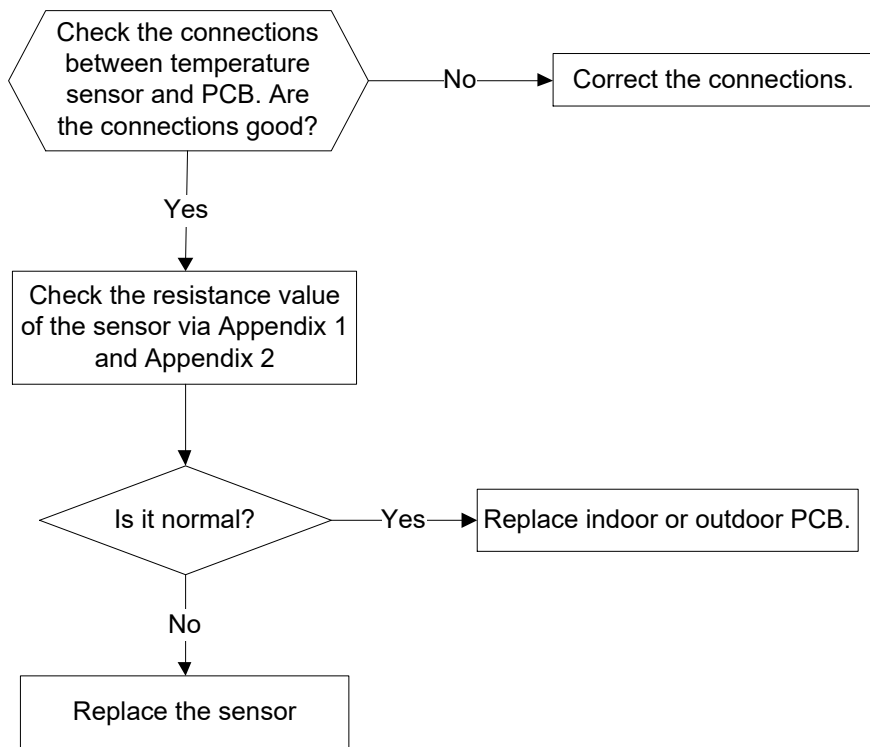
No: No mode conflict;

Yes: Mode conflict

#### 8.4.1.16 Outdoor IGBT temperature sensor error Open or short circuit of temperature sensor diagnosis and solution.

<b>Malfunction decision conditions</b>	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Sensor faulty</li> <li>● PCB faulty</li> </ul>

Trouble shooting:

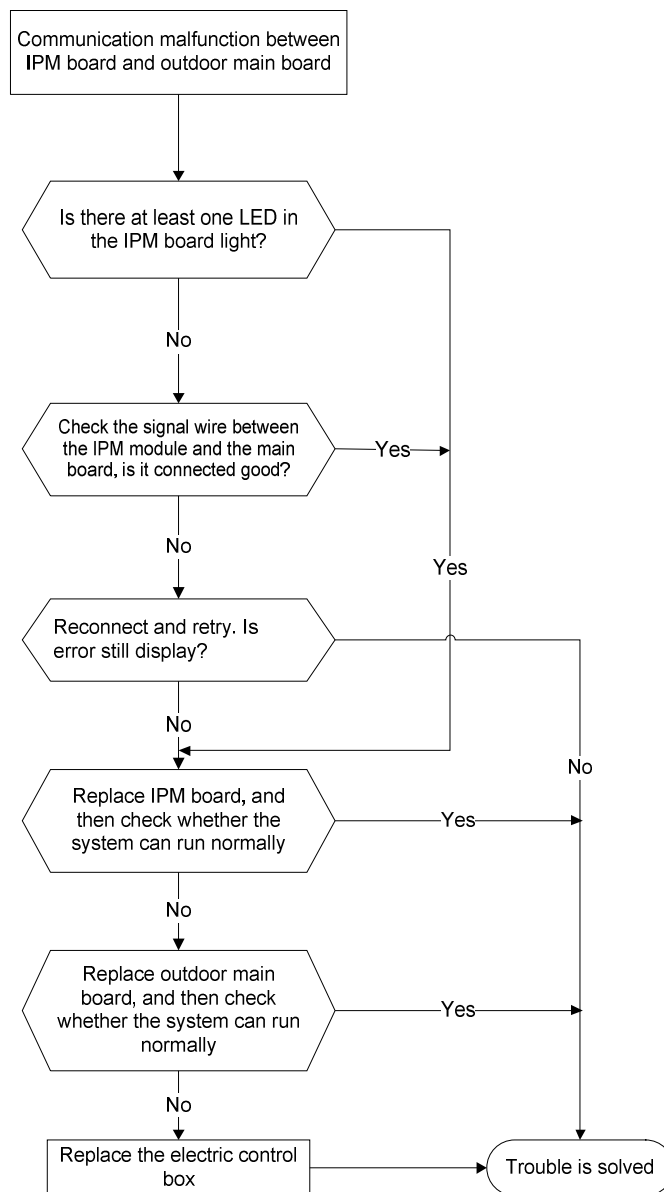


### 8.4.2. Outdoor unit error code (if there is a correspond error code on indoor unit, pls refer indoor unit error code)

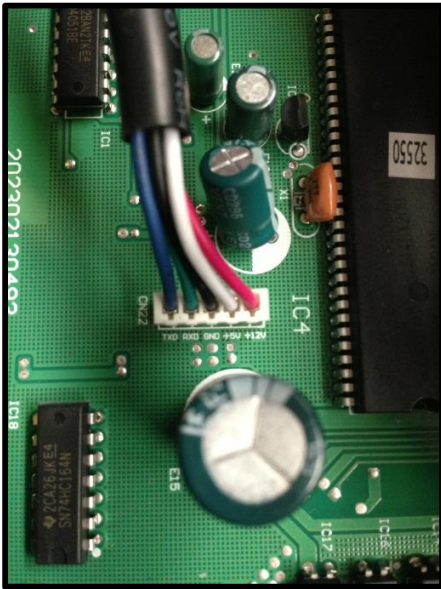
#### 8.4.2.1 Communication malfunction between IPM board and outdoor main board) error diagnosis

<b>Error Code</b>	<b>E3</b>
<b>Malfunction decision conditions</b>	PCB main chip does not receive feedback from IPM module during 60 seconds.
<b>Supposed causes</b>	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● PCB faulty</li> </ul>

#### Trouble shooting:



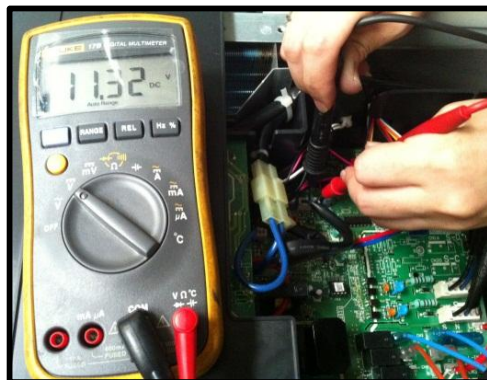
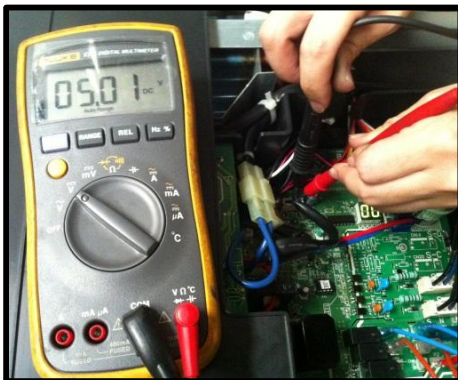




**Remark:**

Use a multimeter to test the DC voltage between black pin and white pin of signal wire. The normal value should be around 5V.

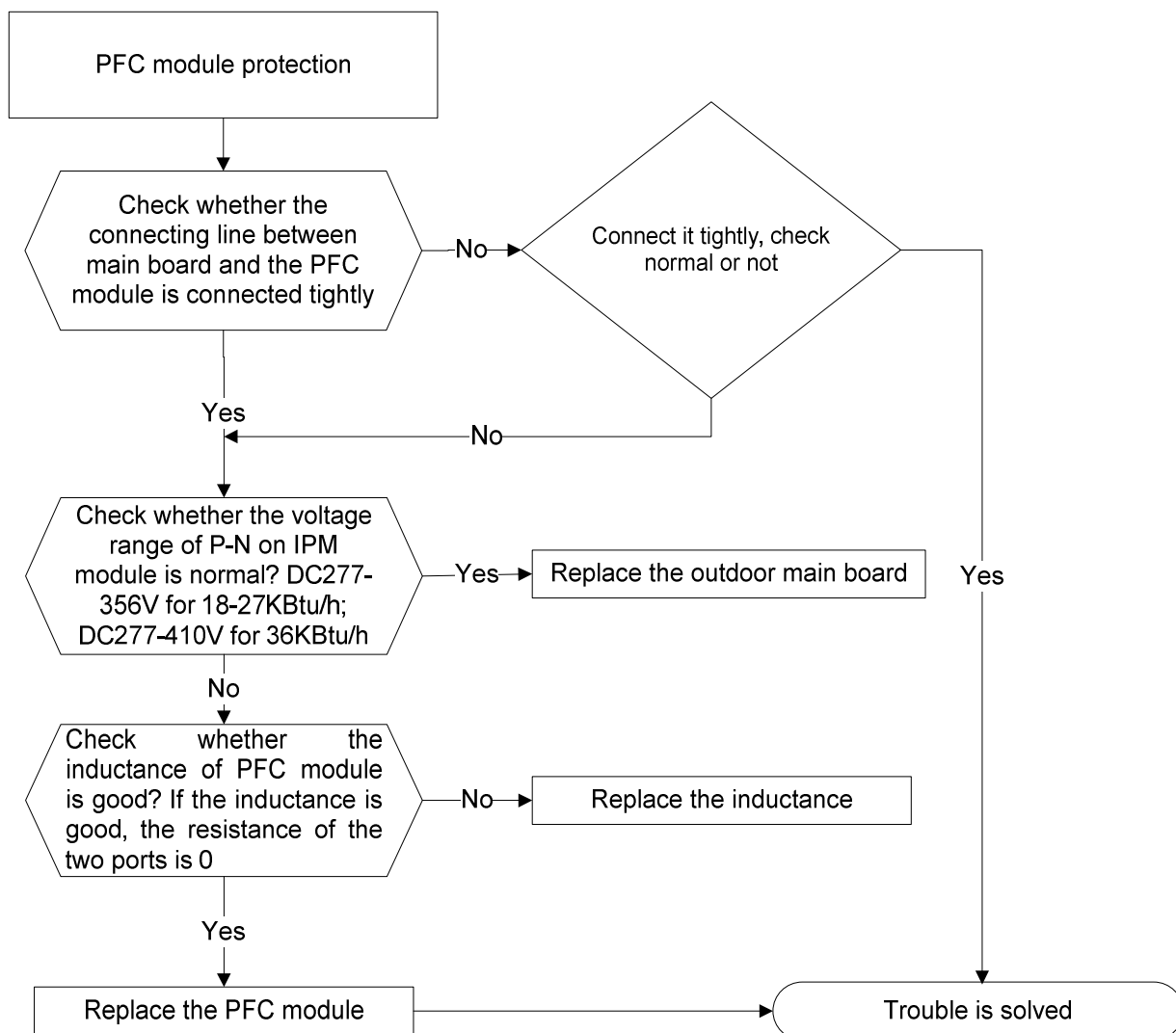
Use a multimeter to test the DC voltage between black pin and red pin of signal wire. The normal value should be around 12V.



#### 8.4.2.2 PFC module protection) error diagnosis and solution. (For 36K and 48k)

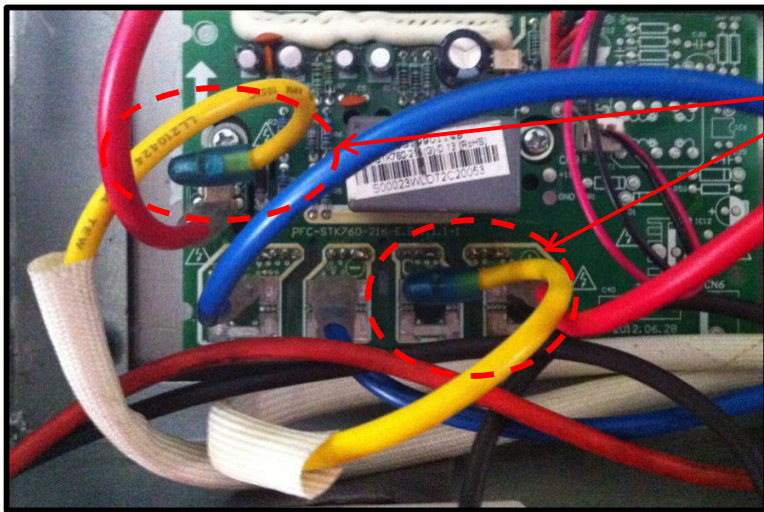
Error Code	ODU ERROR E6
Malfunction decision conditions	When the voltage signal that PFC sends to main control board is abnormal, the display LED will show "E6" and AC will turn off.
Supposed causes	<ul style="list-style-type: none"> <li>● Wiring mistake</li> <li>● Outdoor PCB faulty</li> <li>● Inductance of PFC module faulty</li> <li>● PFC module malfunction</li> </ul>

#### Trouble shooting:





Inductance



Two ports of the inductance



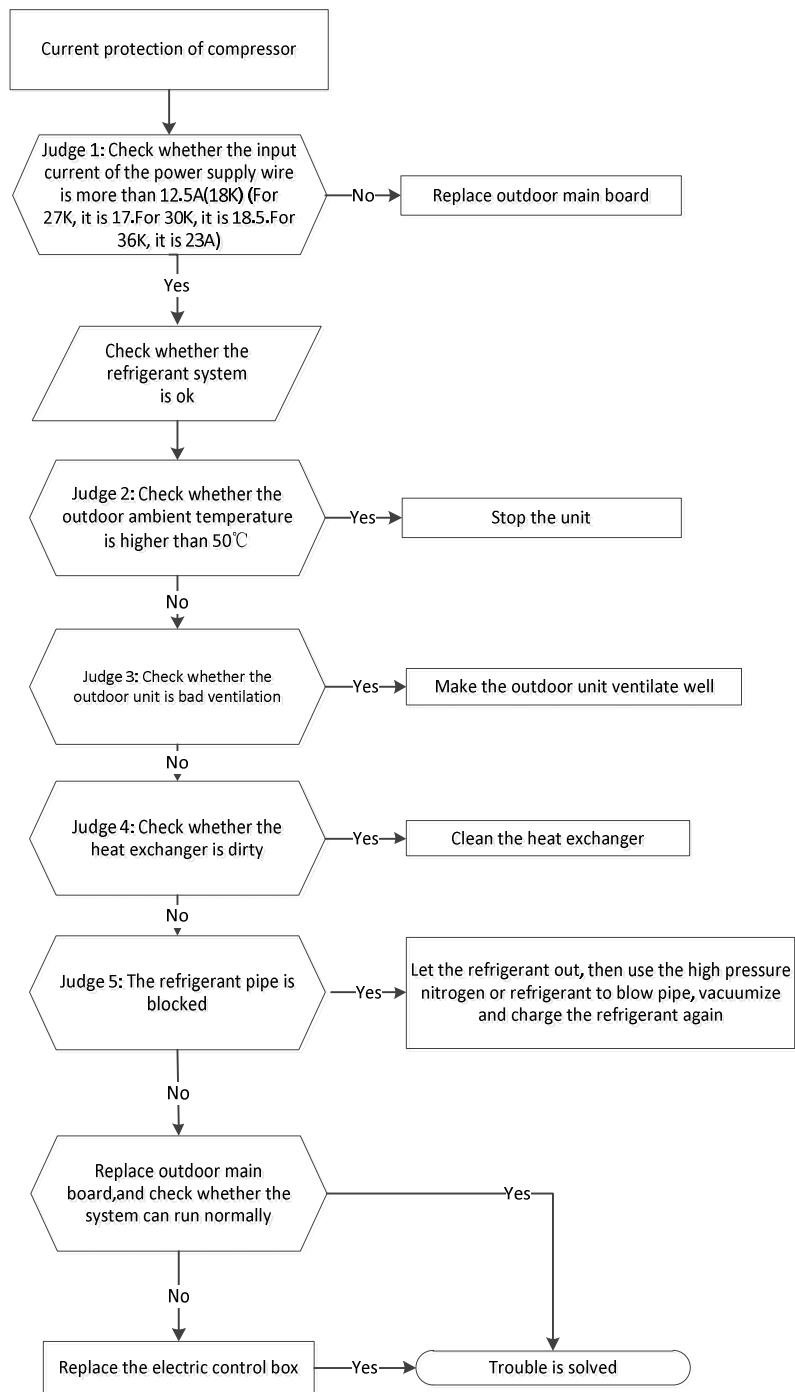


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#### 8.4.2.3 Current protection of compressor error diagnosis and solution.

Error Code	ODU ERROR P3
Malfunction decision conditions	If the outdoor current exceeds the current limit value, the LED will display the failure.
Supposed causes	<ul style="list-style-type: none"><li>● Wiring mistake</li><li>● Over load protector faulty</li><li>● System block</li><li>● Outdoor PCB faulty</li></ul>

**Trouble shooting:**

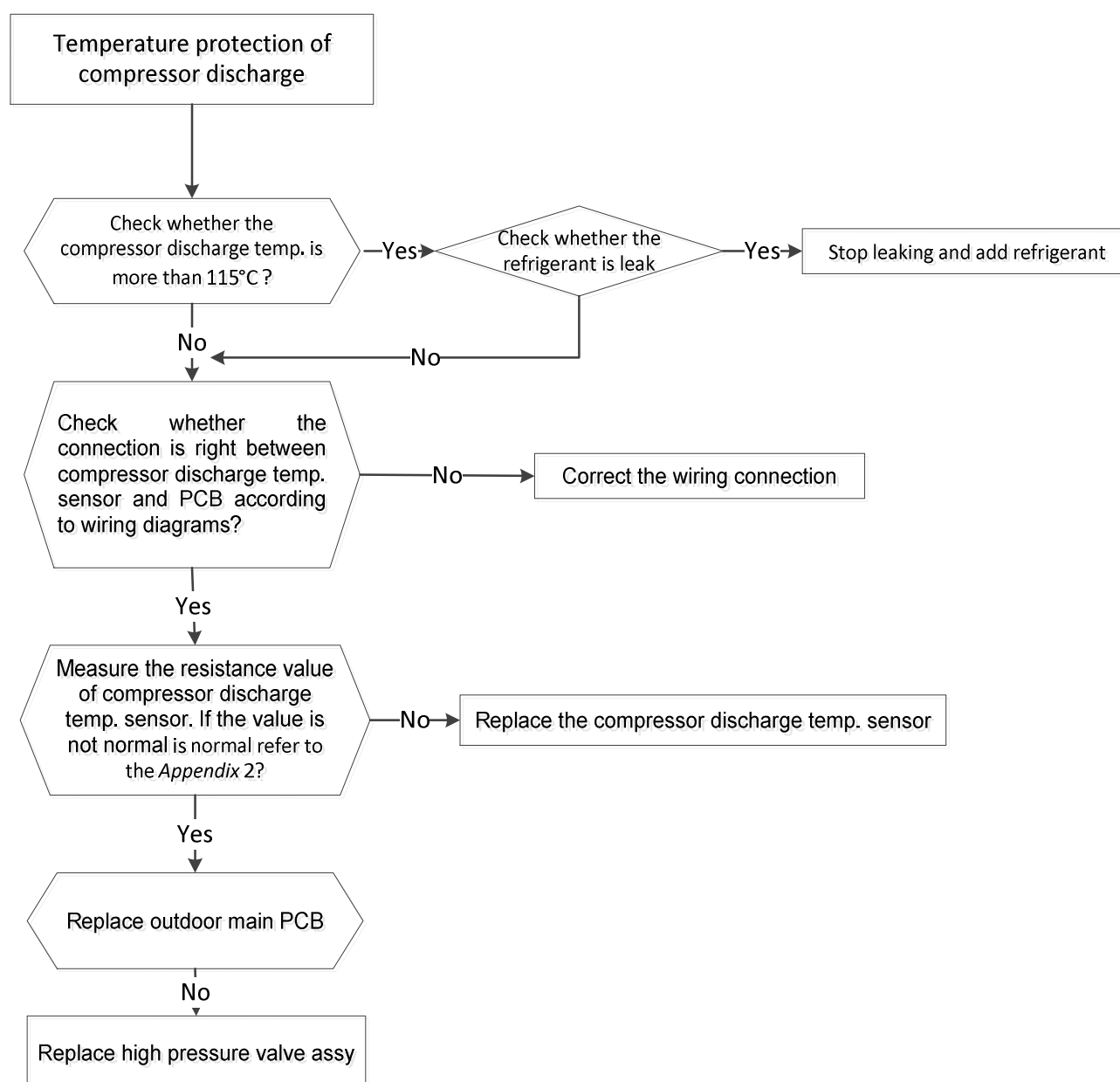




#### 8.4.2.4 Temperature protection of compressor discharge error diagnosis and solution.

Error Code	ODU ERROR P4
Malfunction decision conditions	When the compressor discharge temperature(T5) is more than 115℃ for 10 seconds, the compressor will stop and restart till T5 is less than 90℃.
Supposed causes	<ul style="list-style-type: none"> <li>● Refrigerant leakage</li> <li>● Wiring mistake</li> <li>● The discharge temperature sensor faulty</li> <li>● Outdoor PCB faulty</li> </ul>

#### Trouble shooting:

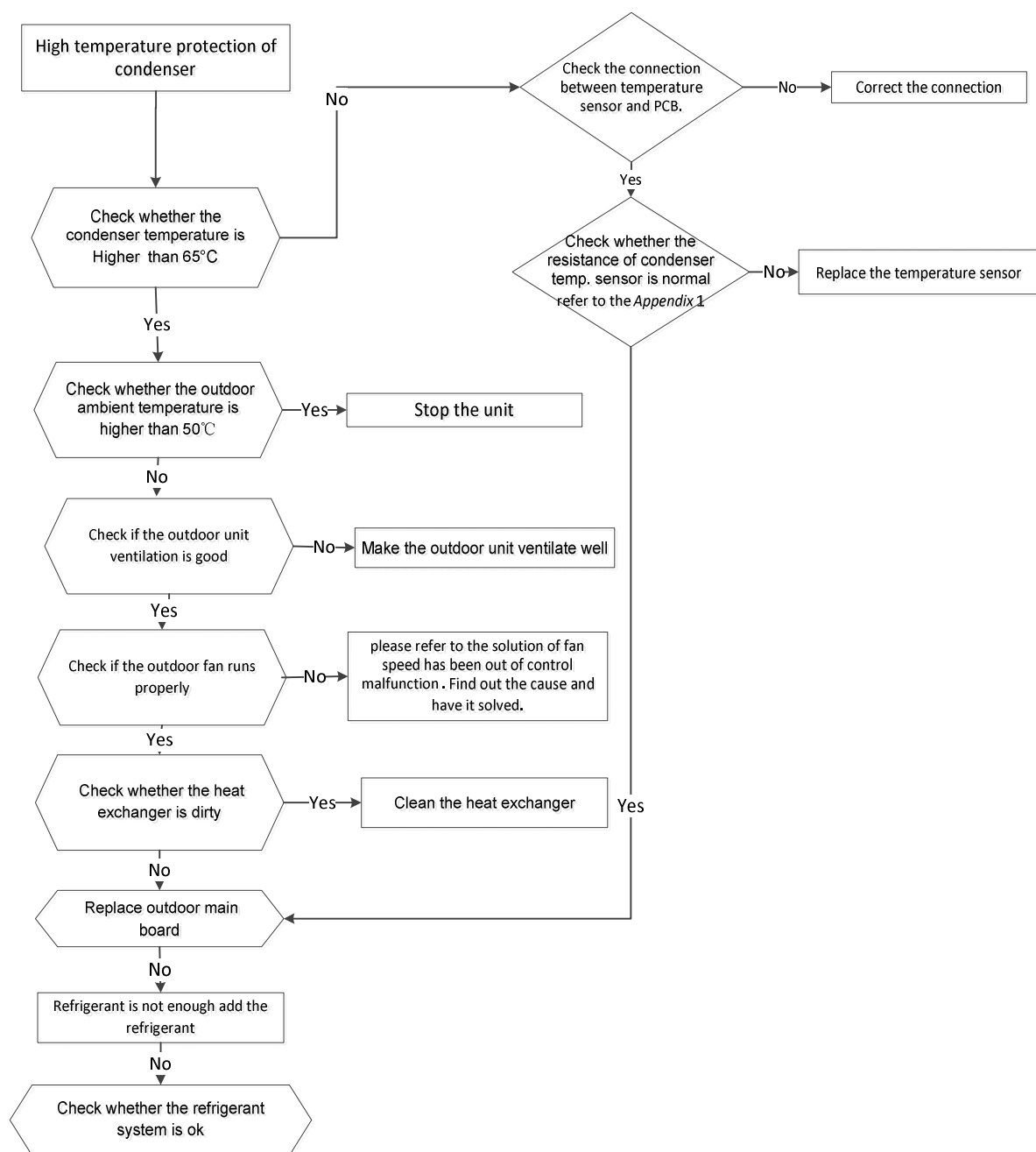


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#### 8.4.2.5 High temperature protection of condenser error diagnosis and solution.

Error Code	ODU ERROR P5
Malfunction decision conditions	When outdoor pipe temperature is more than 65°C, the unit will stop, and unit runs again when outdoor pipe temperature is less than 52°C
Supposed causes	<ul style="list-style-type: none"><li>● The condenser temperature sensor faulty</li><li>● Heat exchanger dirty</li><li>● System block</li></ul>

Trouble shooting:





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#### 8.4.2.6 The cooling operation or heating operation does not operate.

##### Supposed causes

- 4-way valve faulty

Check of 4-way, please refer to part 5 in 9.5 Trouble Criterion Of Main Parts.

#### 8.4.2.7 When cooling, heat exchanger of non-operating indoor unit frosts.

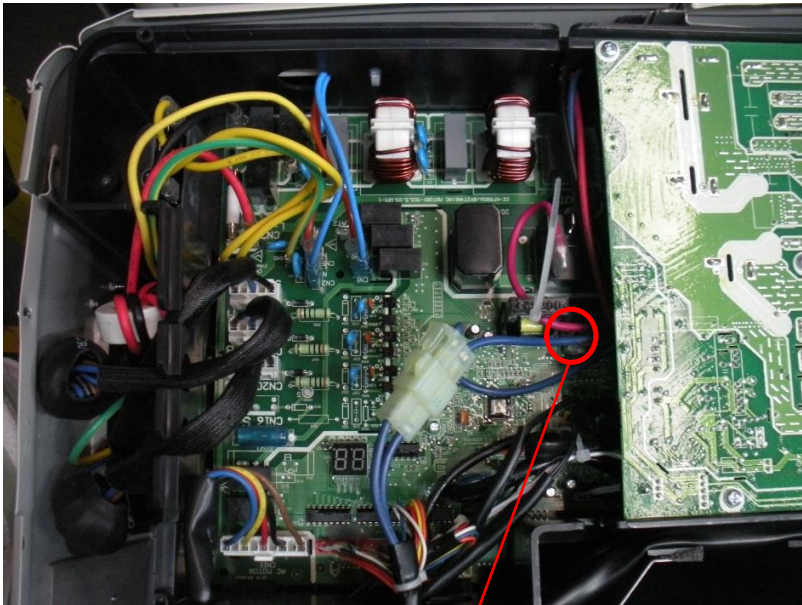
When heating, non-operating indoor unit get warm.

##### Supposed causes

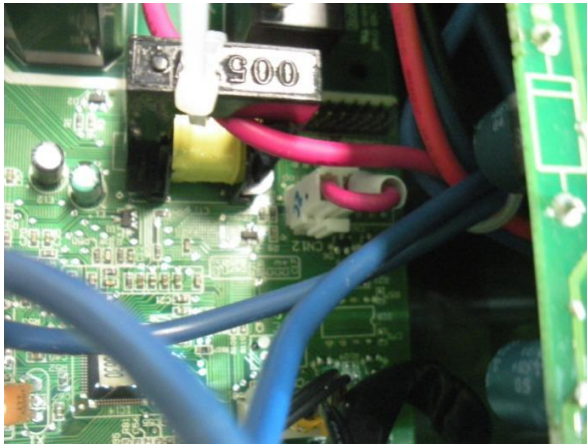
- EXV faulty
- Wire and tubing connected in reverse.

Check of EXV, please refer to part 6 in 9.5 Trouble Criterion Of Main Parts.

**Notice:** If you replace outdoor main PCB of 3 zone condenser unit, you need to check whether the PCB is produced before Apr. 2013. If yes, you need to short connect OLP connector., Otherwise, the outdoor LED will show “P0”.



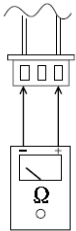




## 8.5 Trouble Criterion Of Main Parts.

### 1. Temperature sensor checking

Disconnect the temperature sensor from PCB, measure the resistance value with a tester.



Tester

Temperature Sensors.

Room temp.(T1) sensor,

Indoor coil temp.(T2) sensor,

Outdoor coil temp.(T3) sensor,

Outdoor ambient temp.(T4) sensor,

Compressor discharge temp.(T5) sensor.

Measure the resistance value of each winding by using the multi-meter.

---

**Appendix 1 Temperature Sensor Resistance Value Table (°C--K)**

°C	K Ohm	°C	K Ohm	°C	K Ohm	°C	K Ohm
-20	115.266	20	12.6431	60	2.35774	100	0.62973
-19	108.146	21	12.0561	61	2.27249	101	0.61148
-18	101.517	22	11.5000	62	2.19073	102	0.59386
-17	96.3423	23	10.9731	63	2.11241	103	0.57683
-16	89.5865	24	10.4736	64	2.03732	104	0.56038
-15	84.2190	25	10.000	65	1.96532	105	0.54448
-14	79.3110	26	9.55074	66	1.89627	106	0.52912
-13	74.5360	27	9.12445	67	1.83003	107	0.51426
-12	70.1698	28	8.71983	68	1.76647	108	0.49989
-11	66.0898	29	8.33566	69	1.70547	109	0.48600
-10	62.2756	30	7.97078	70	1.64691	110	0.47256
-9	58.7079	31	7.62411	71	1.59068	111	0.45957
-8	56.3694	32	7.29464	72	1.53668	112	0.44699
-7	52.2438	33	6.98142	73	1.48481	113	0.43482
-6	49.3161	34	6.68355	74	1.43498	114	0.42304
-5	46.5725	35	6.40021	75	1.38703	115	0.41164
-4	44.0000	36	6.13059	76	1.34105	116	0.40060
-3	41.5878	37	5.87359	77	1.29078	117	0.38991
-2	39.8239	38	5.62961	78	1.25423	118	0.37956
-1	37.1988	39	5.39689	79	1.21330	119	0.36954
0	35.2024	40	5.17519	80	1.17393	120	0.35982
1	33.3269	41	4.96392	81	1.13604	121	0.35042
2	31.5635	42	4.76253	82	1.09958	122	0.3413
3	29.9058	43	4.57050	83	1.06448	123	0.33246
4	28.3459	44	4.38736	84	1.03069	124	0.32390
5	26.8778	45	4.21263	85	0.99815	125	0.31559
6	25.4954	46	4.04589	86	0.96681	126	0.30754
7	24.1932	47	3.88673	87	0.93662	127	0.29974
8	22.5662	48	3.73476	88	0.90753	128	0.29216
9	21.8094	49	3.58962	89	0.87950	129	0.28482
10	20.7184	50	3.45097	90	0.85248	130	0.27770
11	19.6891	51	3.31847	91	0.82643	131	0.27078
12	18.7177	52	3.19183	92	0.80132	132	0.26408
13	17.8005	53	3.07075	93	0.77709	133	0.25757
14	16.9341	54	2.95896	94	0.75373	134	0.25125
15	16.1156	55	2.84421	95	0.73119	135	0.24512
16	15.3418	56	2.73823	96	0.70944	136	0.23916
17	14.6181	57	2.63682	97	0.68844	137	0.23338
18	13.9180	58	2.53973	98	0.66818	138	0.22776
19	13.2631	59	2.44677	99	0.64862	139	0.22231

## Appendix 2

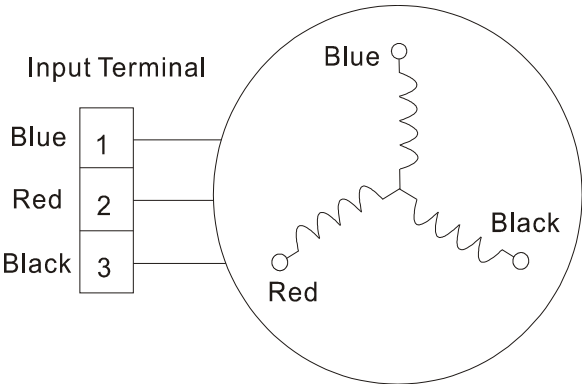
Unit: °C---K		Discharge temp. sensor table					
-20	542.7	20	68.66	60	13.59	100	3.702
-19	511.9	21	65.62	61	13.11	101	3.595
-18	483	22	62.73	62	12.65	102	3.492
-17	455.9	23	59.98	63	12.21	103	3.392
-16	430.5	24	57.37	64	11.79	104	3.296
-15	406.7	25	54.89	65	11.38	105	3.203
-14	384.3	26	52.53	66	10.99	106	3.113
-13	363.3	27	50.28	67	10.61	107	3.025
-12	343.6	28	48.14	68	10.25	108	2.941
-11	325.1	29	46.11	69	9.902	109	2.86
-10	307.7	30	44.17	70	9.569	110	2.781
-9	291.3	31	42.33	71	9.248	111	2.704
-8	275.9	32	40.57	72	8.94	112	2.63
-7	261.4	33	38.89	73	8.643	113	2.559
-6	247.8	34	37.3	74	8.358	114	2.489
-5	234.9	35	35.78	75	8.084	115	2.422
-4	222.8	36	34.32	76	7.82	116	2.357
-3	211.4	37	32.94	77	7.566	117	2.294
-2	200.7	38	31.62	78	7.321	118	2.233
-1	190.5	39	30.36	79	7.086	119	2.174
0	180.9	40	29.15	80	6.859	120	2.117
1	171.9	41	28	81	6.641	121	2.061
2	163.3	42	26.9	82	6.43	122	2.007
3	155.2	43	25.86	83	6.228	123	1.955
4	147.6	44	24.85	84	6.033	124	1.905
5	140.4	45	23.89	85	5.844	125	1.856
6	133.5	46	22.89	86	5.663	126	1.808
7	127.1	47	22.1	87	5.488	127	1.762
8	121	48	21.26	88	5.32	128	1.717
9	115.2	49	20.46	89	5.157	129	1.674
10	109.8	50	19.69	90	5	130	1.632
11	104.6	51	18.96	91	4.849		
12	99.69	52	18.26	92	4.703		
13	95.05	53	17.58	93	4.562		
14	90.66	54	16.94	94	4.426		
15	86.49	55	16.32	95	4.294	B(25/50)=3950K	
16	82.54	56	15.73	96	4.167		
17	78.79	57	15.16	97	4.045	R(90 °C)=5KΩ±3%	
18	75.24	58	14.62	98	3.927		
19	71.86	59	14.09	99	3.812		

Appendix 3:

°C	10	11	12	13	14	15	16	17	18	19	20	21	22
°F	48	50	52	54	56	58	60	62	64	66	68	70	72
°C	23	24	25	26	27	28	29	30	31	32	33	34	35
°F	74	76	78	80	82	84	86	88	90	92	94	96	98

2. Compressor check

Measure the resistance value of each winding by using the tester.



Position	Resistance Value					
	ATM150D23UFZ	ATF235D22UMT	ATF250D22UMT	ATF310D43UMT	ATQ360D1UMU	ATQ420D1UMU
Blue - Red	1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω	0.38 Ω



3. IPM continuity check

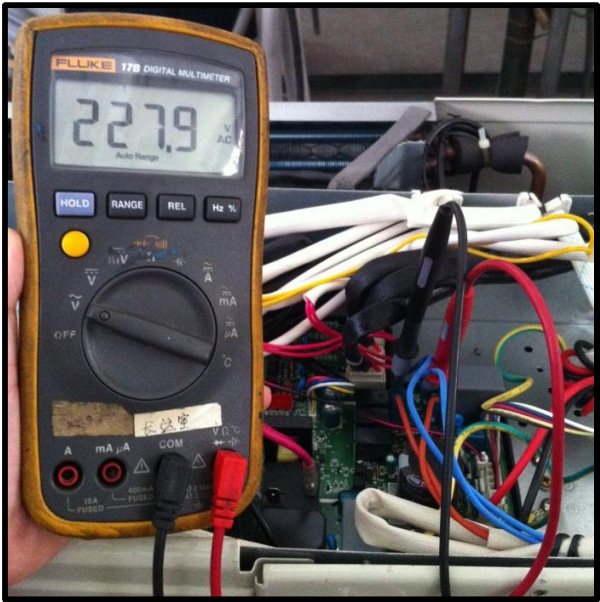
Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

Digital tester		Normal resistance value	Digital tester		Normal resistance value
(+)Red	(-)Black	$\infty$ (Several MΩ)	(+)Red	(-)Black	$\infty$ (Several MΩ)
P	N		U	N	
	U		V		
	V		W		
	W		(+)Red		

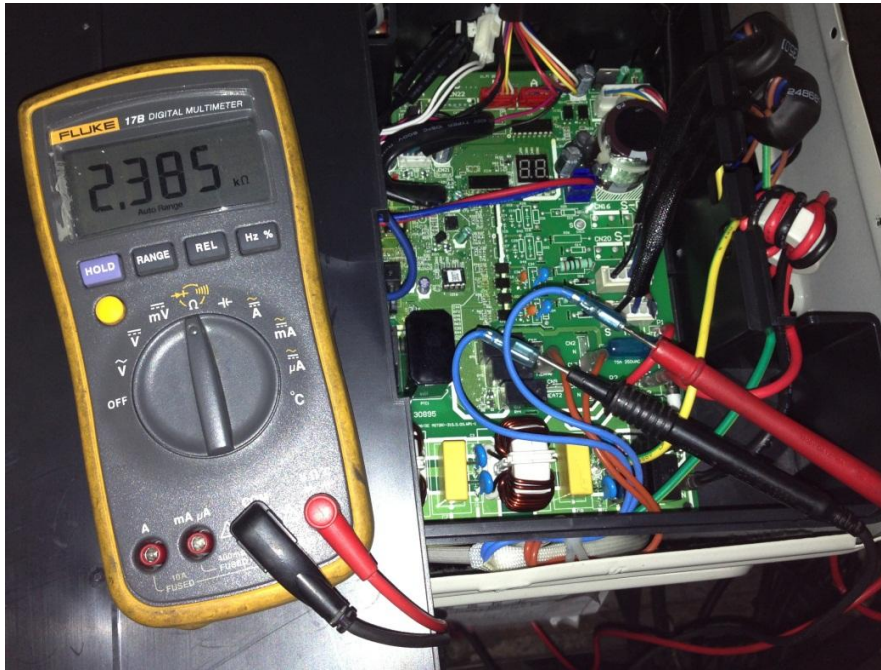
4 .4-way valve

1. Power on, use a digital tester to measure the voltage, when the unit operates in cooling, it is 0V. When the unit operates in heating, it is about 230VAC.

If the value of the voltage is not in the range, the PCB must have problems and need to be replaced.



- 2 Turn off the power, use a digital tester to measure the resistance. The value should be 1.8~2.5 K $\Omega$ .

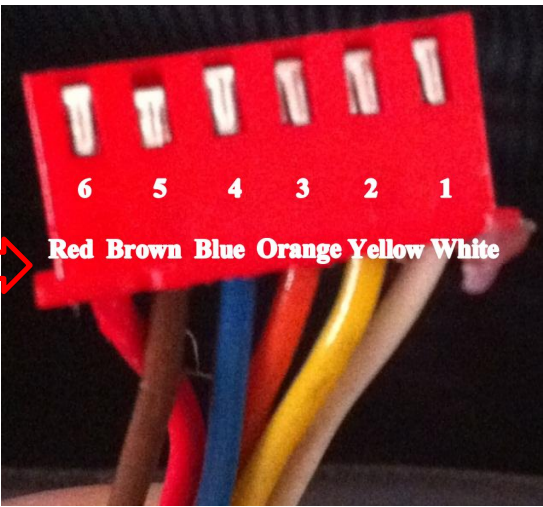
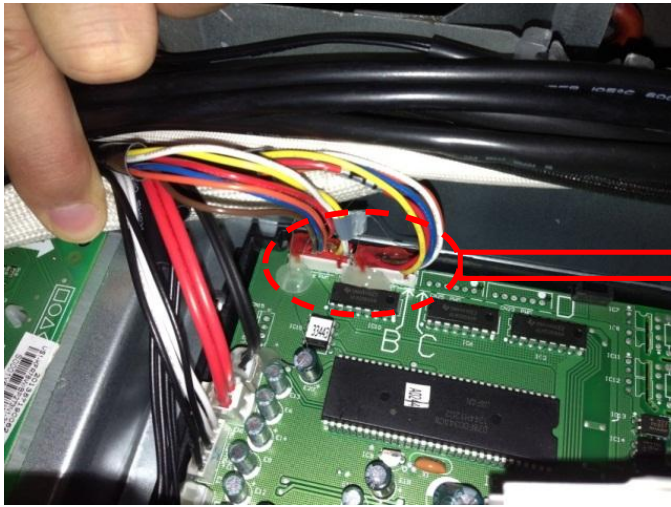


#### 5.EXV check

**Disconnect the connectors.**

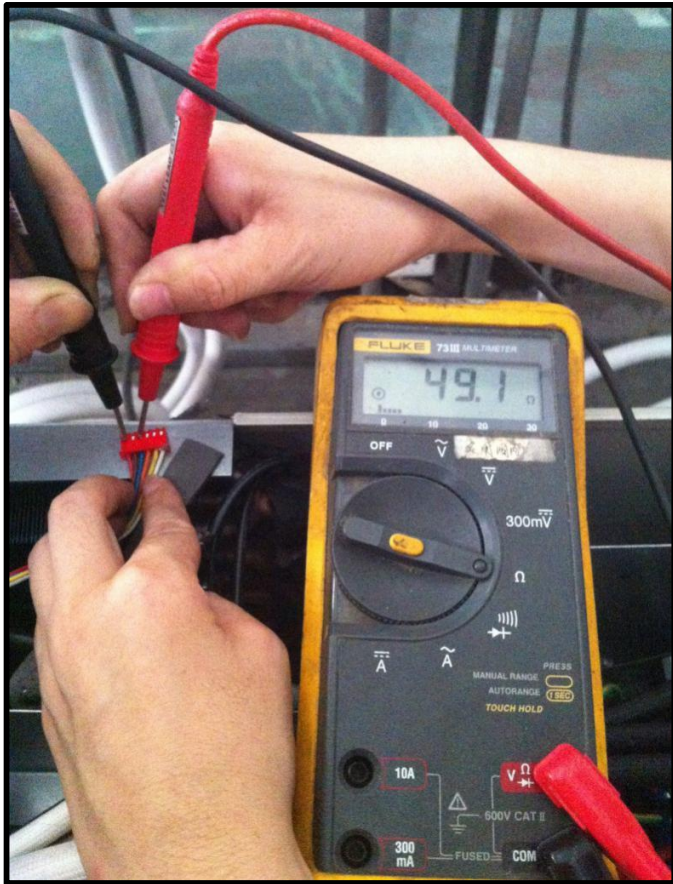






**Resistance to EXV coil**

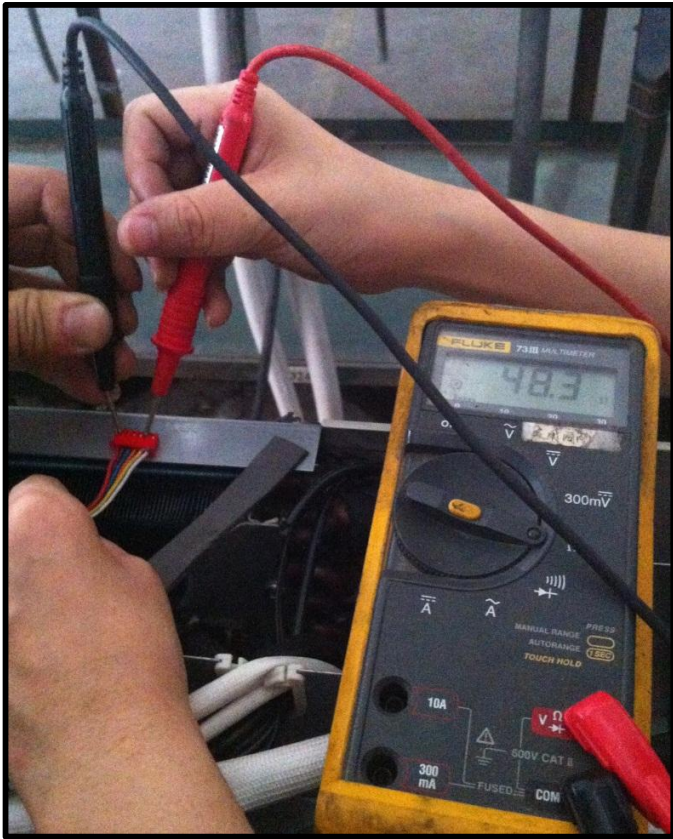
Color of lead wire	Normal Value
Red- Blue	About 50Ω
Red - Yellow	
Brown-Orange	
Brown-White	

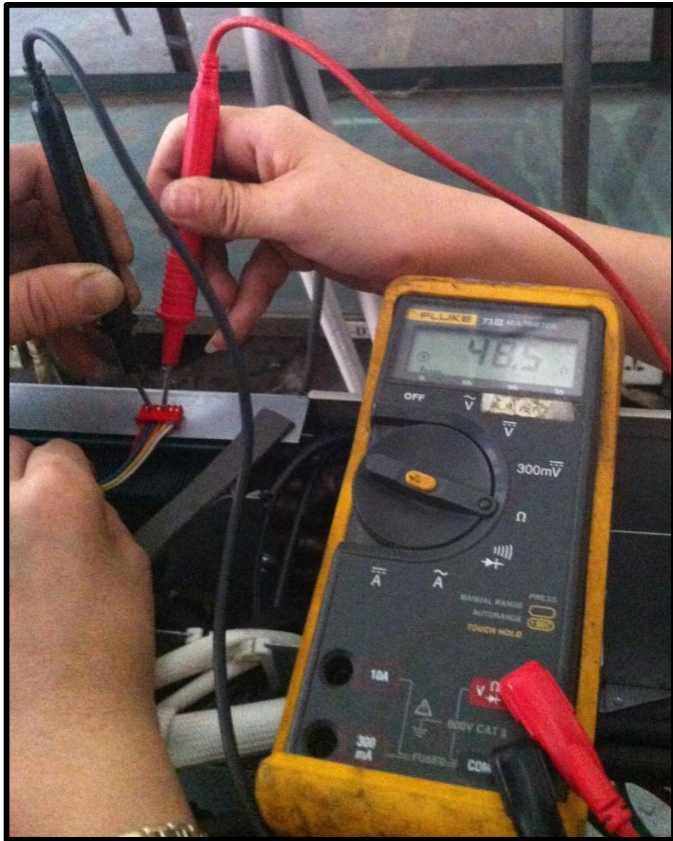


Red- Blue

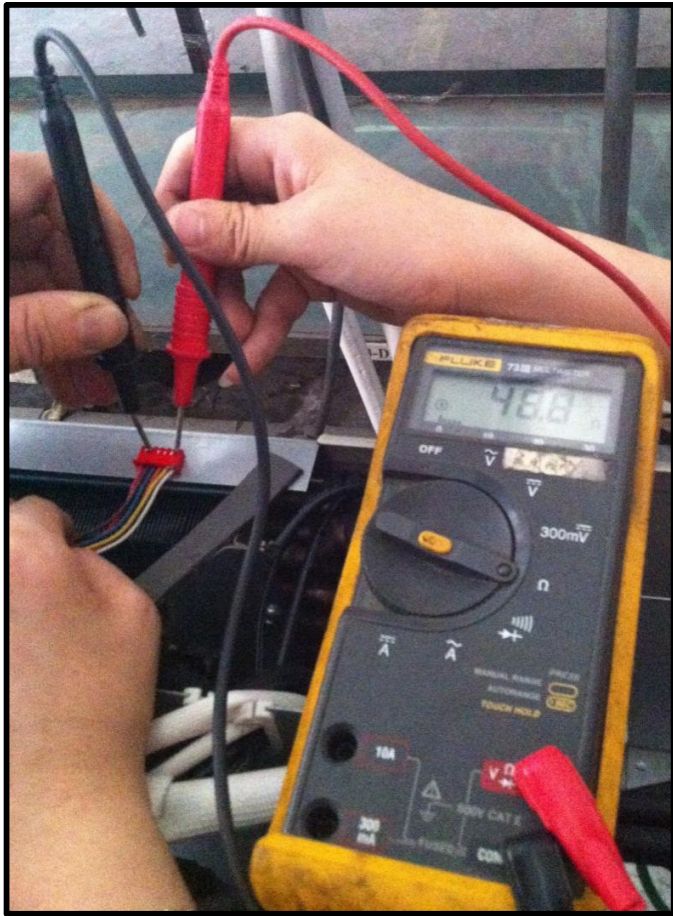
Red - Yellow







Brown-Orange



Brown-White

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