ComfortStar®

MULTI OUTDOOR UNITS

SERVICE MANUAL

Multi zone

CONDENSING UNITS

Revision V2.0: 201812

R-410A DC Inverter

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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

1.1 Regular Models.

Outdoor Units	Available Indoor Units	Combination			
		Two units	Three units	Four units	Five units
CM2-18-2Z	Wall mounted(CXH/CP P)：9K/12k；Cassette/Duct：9K/12k；	9+9			
		9+12			
		12+12			
CM3-27-3Z	Wall mounted(CXH/CP P)：9K/12k/18K；Cassette/Duct&Floor Ceiling：9K/12k/18K；	9+9	9+9+9		
		9+12	9+9+12		
		9+18	9+9+18		
		12+12	9+12+12		
		12+18	12+12+12		
		18+18			
CM4-48-4Z	Wall mounted(CXH/CP P)：9K/12k/18K/24K；Cassette/Duct/&Floor Ceiling：9K/12k/18K/24K；	9+9	9+9+9	9+9+9+9	
		9+12	9+9+12	9+9+9+12	
		9+18	9+9+18	9+9+9+18	
		9+24	9+9+24	9+9+12+12	
		12+12	9+12+12	9+9+12+18	
		12+18	9+12+18	9+12+12+12	
		12+24	9+12+24	12+12+12+12	
		18+18	9+18+18		
			12+12+12		
			12+12+18		

			12+18+18		
			12+12+24		
CM5-54-5Z	Wall mounted(CXH/CPP)：9K/12k/18K/24K；Cassette/Duct&Floor Ceiling：9K/12k/18K/24K；	9+18	9+9+9	9+9+9+9	9+9+9+9+9
		9+24	9+9+12	9+9+9+12	9+9+9+9+12
		12+12	9+9+18	9+9+9+18	9+9+9+9+18
		12+18	9+9+24	9+9+9+24	9+9+9+9+24
		12+24	9+12+12	9+9+12+12	9+9+9+12+12
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		18+24	9+12+24	9+9+12+24	9+9+9+18+18
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			9+18+24	9+9+18+24	9+9+12+12+18
			9+24+24	9+12+12+12	9+12+12+12+12
			12+12+12	9+12+12+18	9+12+12+12+18
			12+12+18	9+12+12+24	12+12+12+12+12
			12+12+24	9+12+18+18	
			12+18+18	9+18+18+18	
			12+18+24	12+12+12+12	
			12+24+24	12+12+12+18	
			18+18+18	12+12+12+24	
			18+18+24	12+12+18+18	

If total indoor units load exceeds nominal capacity of outdoor unit, the practical output capacity of every indoor unit will be correspondingly attenuated. This situation is very evidently during heating mode.

Rules: Outdoor unit Capacity*0.66<= Indoor unit total capacity <= Outdoor unit Capacity 1.33

Outdoor Units	Available Indoor Unit	Combination			
		Two units	Three units	Four units	Four units
CM2-18-2ZX	Wall mounted(CXH/CPP)：9K/12k/18K； Cassette/Duct：9K/12k/18K；	9+9			
		9+12			
		9+18			
		12+12			
CM3-27-3ZX	Wall mounted(CXH/CPP)：9K/12k/18K/24K； Cassette/Duct&Floor Ceiling：9K/12k/18K/24K；	9+9	9+9+9		
		9+12	9+9+12		
		9+18	9+9+18		
		9+24	9+12+12		
		12+12	9+12+18		
		12+18	12+12+12		
		12+24			
		18+18			
CM4-36-4ZX	Wall mounted(CXH/CPP)：9K/12k/18K/24K； Cassette/Duct&Floor Ceiling：9K/12k/18K/24K；	9+9	9+9+9	9+9+9+9	
		9+12	9+9+12	9+9+9+12	
		9+18	9+9+18	9+9+9+18	
		9+24	9+9+24	9+9+9+24	
		12+12	9+12+12	9+9+12+12	
		12+18	9+12+18	9+9+12+18	
		12+24	9+12+24	9+9+12+24	
		18+18	9+18+18	9+9+18+18	
		18+24	9+18+24	9+12+12+12	
		24+24	12+12+12	9+12+12+18	

			12+12+18	12+12+12+12	
			12+12+24	12+12+12+18	
			12+18+18		
			12+18+24		

1.2 Hi Heat Models

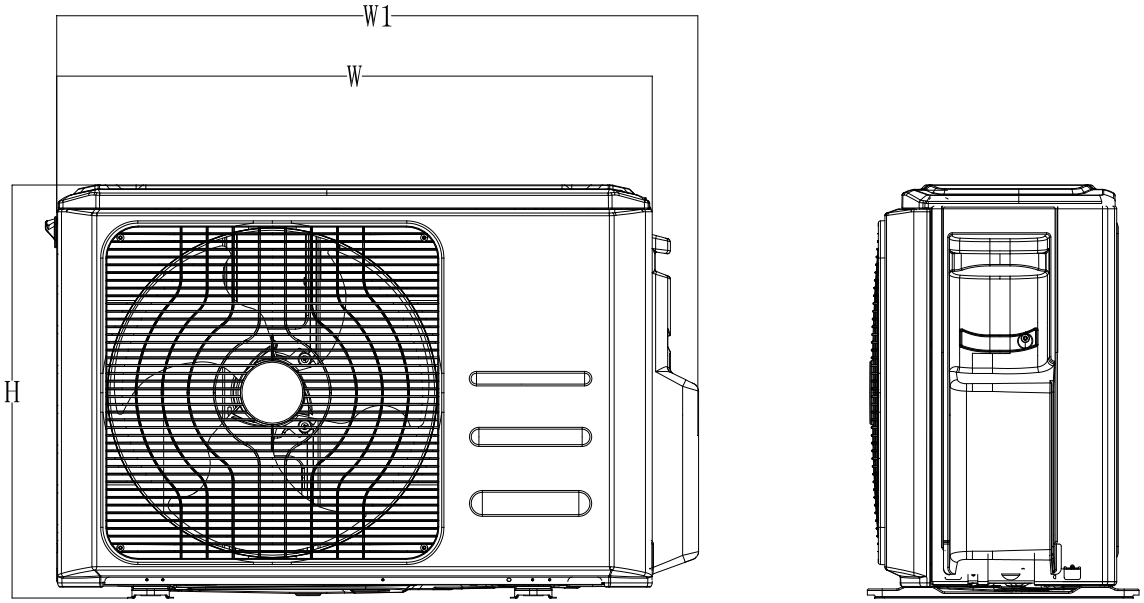
If total indoor units load exceeds nominal capacity of outdoor unit, the practical output capacity of every indoor unit will be correspondingly attenuated. This situation is very evidently during heating mode.

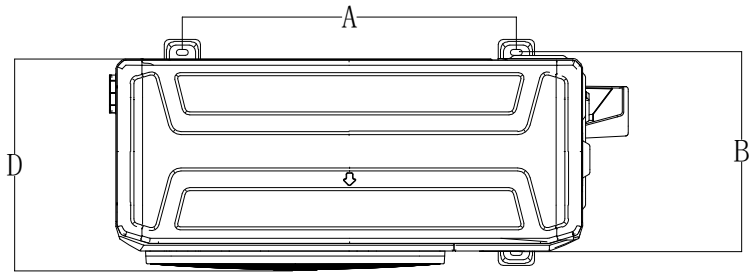
Rules: Outdoor unit Capacity*0.5<= Indoor unit total capacity <= Outdoor unit Capacity *1.5

2. Suggested Indoor Unit Model Numbers

Ducted CPA*， Floor ceiling FPA*， Cassette， TPA*， wallmounted CPP*, CXH*

3. Dimension Of Outdoor Unit

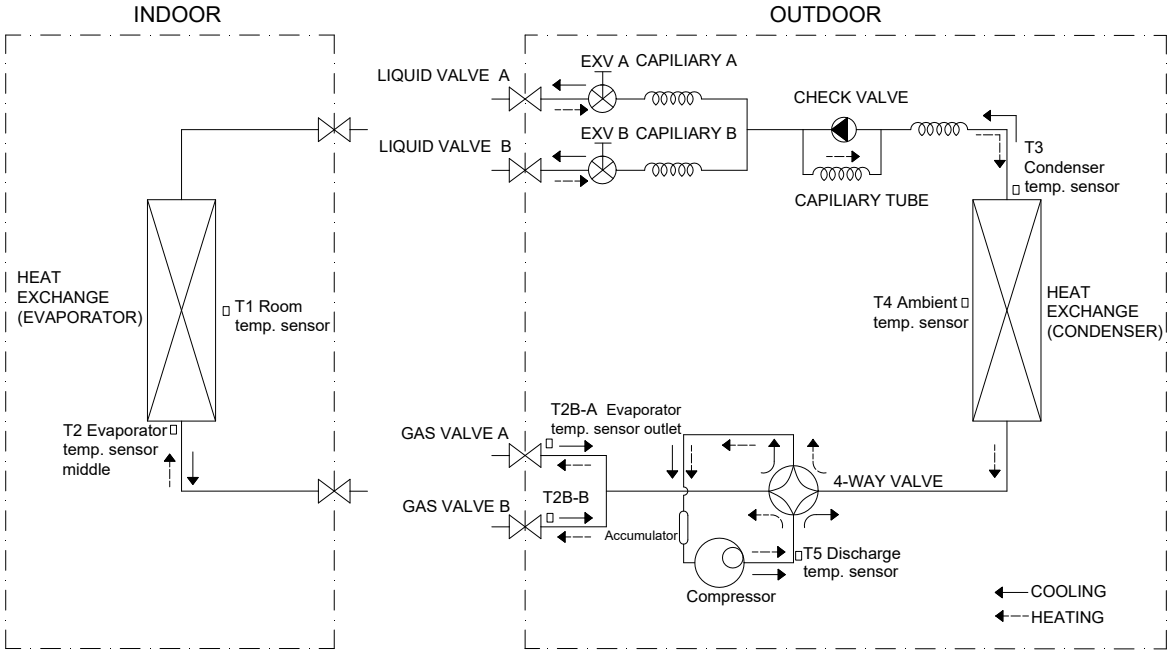




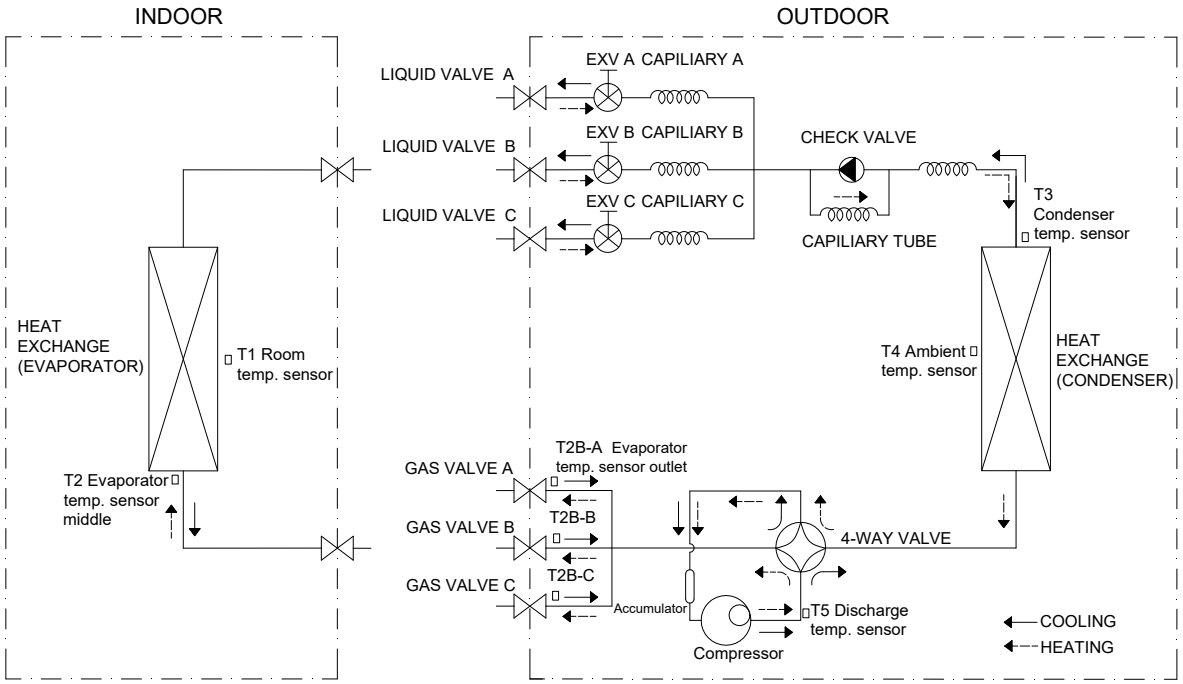
Model	Unit：	W	D	H	W1	A	B
CM2-18-2Z	mm	845	363	702	923	540	350
	inch	**33.3**	**14.3**	**27.6**	**36.0**	**21.3**	**13.8**
CM3-27-3Z	mm	946	410	810	1034	673	403
CM2-18-2ZX	inch	**37.2**	**16.5**	**31.9**	**40.6**	**26.5**	**15.9**
CM4-48-4Z	mm	946	410	810	1034	673	403
CM3-27-3ZX	inch	**37.2**	**16.5**	**31.9**	**40.6**	**26.5**	**15.9**
CM5-54-5Z	mm	952	415	1333	1045	634	404
CM4-36-4ZX	inch	**37.5**	**16.3**	**52.5**	**41.1**	**25.0**	**15.9**

4. Refrigerant Cycle Diagram

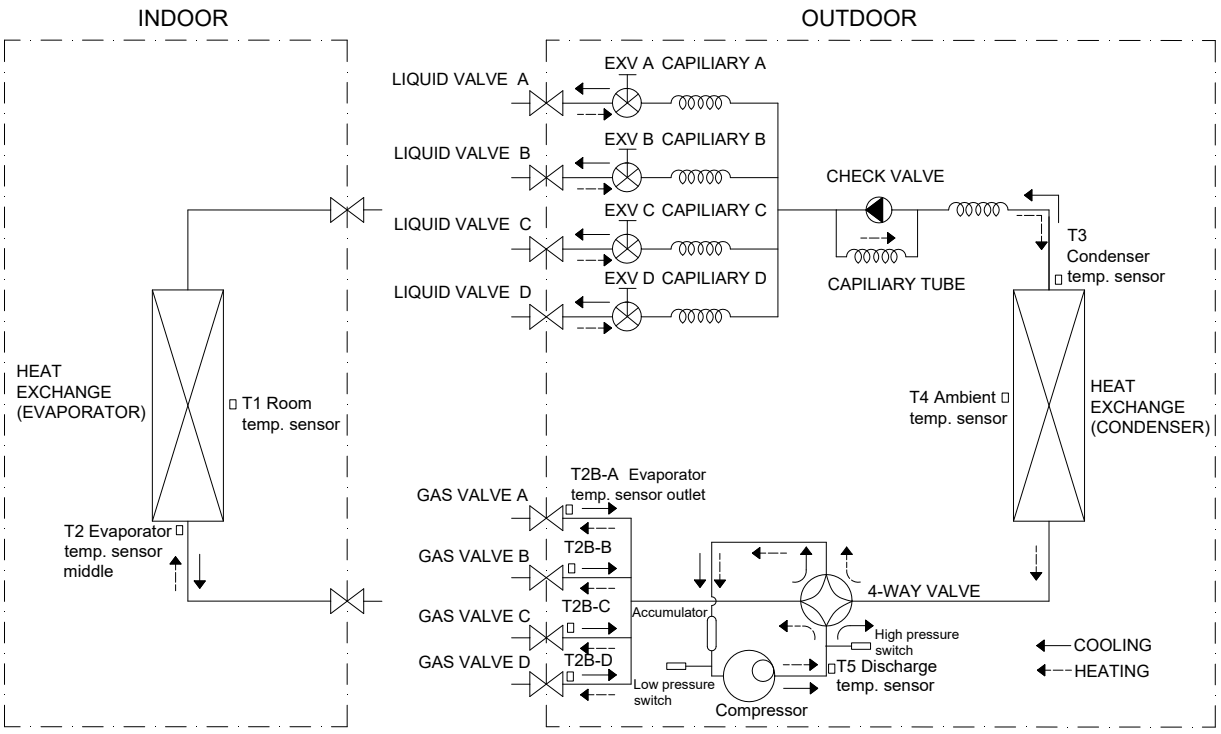
4.1 Refrigeration circuit drawing of inverter 1 drive 2 type



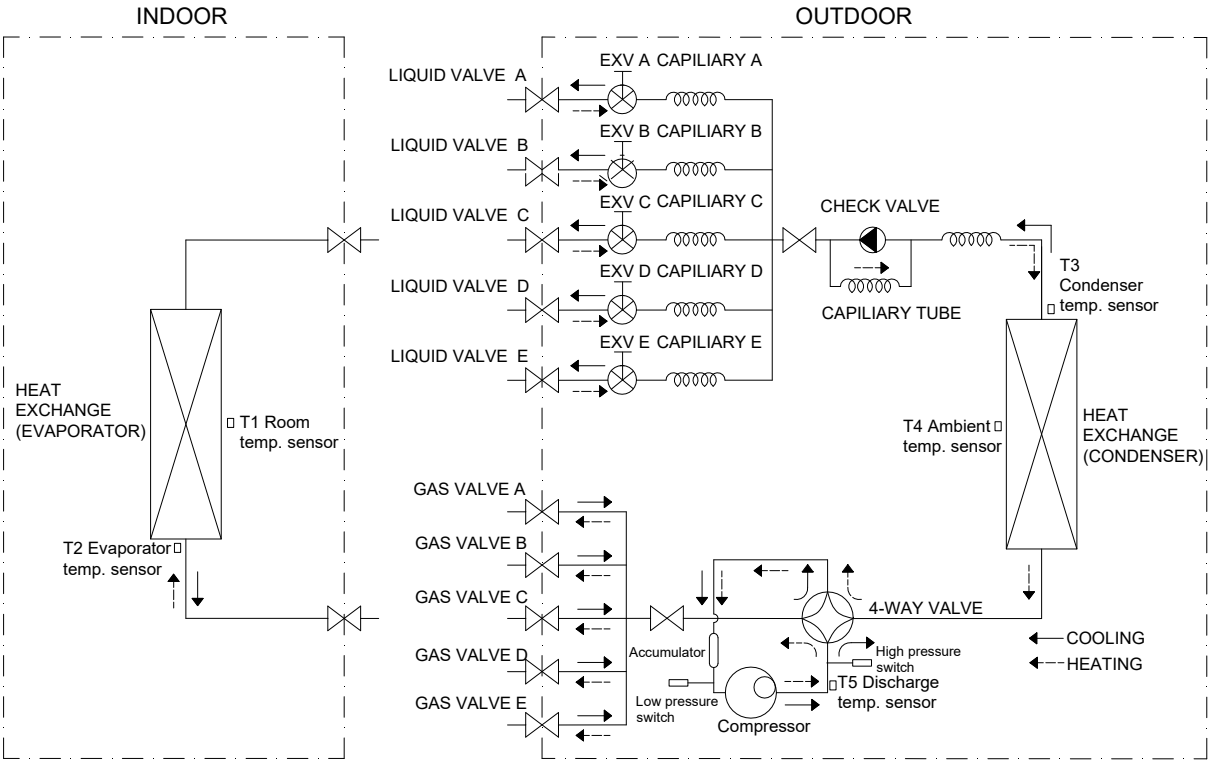
4.2 Refrigeration circuit drawing of inverter 1 drive 3 type



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 specifications.

For indoor unit and outdoor unit connection line, 16AWG.

5.3 Pipe length and the elevation

Maximum piping length and height difference

Outdoor unit model			**CM2-18-2Z**	**CM3-27-3Z**	**CM4-48-4Z**	**CM5-54-5Z**
MINIMUM CIRCUIT AMPACITY		A	18.0	25.0	30.0	35.0
MAX.FUSE		A	25.0	35.0	45.0	50.0
Refrigerant type		oz	R410A/70.5	R410A/98.8	R410A/105.8	R410A/162.3
Refrigerant precharge(Total pipe length)		ft	25	25	25	25
Additional charge for each ft		oz	0.161	0.161	0.161	0.32
Design pressure		PSIG	550/340	550/340	550/340	550/340
Refrigerant piping	Liquid side/ Gas side	inch	(1/4", 3/8") *2	(1/4", 3/8") *3	(1/4",3/8")*3 +(1/4",1/2")*1	(1/4",3/8")*3 +(1/4",1/2")*2
	Max. length for all rooms	ft	131	197	262	262
	Max. length for one indoor unit	ft	82	98	115	115
	Max. height difference between indoor and outdoor unit	ft	49	49	49	49
	Max. height difference between indoor units	ft	33	33	33	33

Outdoor unit model			CM2-18-2ZX	CM3-27-3ZX	CM4-36-4ZX
Refrigerant type		oz	R410A/98.8	R410A/105.8	R410A/162.3
Refrigerant precharge(Total pipe length)		ft	25	25	25
Additional charge for each ft		oz	0.161	0.161	0.32
Design pressure		PSIG	550/340	550/340	550/340
Refrigerant piping	Liquid side/ Gas side	inch	(1/4", 3/8") *2	(1/4", 3/8") *3	(1/4",3/8")*3+(1/4",1/2")*1
	Max. length for all rooms	ft	197	262	262
	Max. length for one indoor unit	ft	98	115	115
	Max. height difference between indoor and outdoor unit	ft	49	49	49
	Max. height difference between indoor units	ft	33	33	33

Additional refrigerant charge

		CM2-18-2Z CM2-18-2ZX	CM3-27-3Z CM3-27-3ZX	CM4-48-4Z CM4-48-4ZX	CM5-54-5Z
Pre-charge 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)	0.161x(length for all rooms – 98.4)	0.161x(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)

5.4 Installation for the first time

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

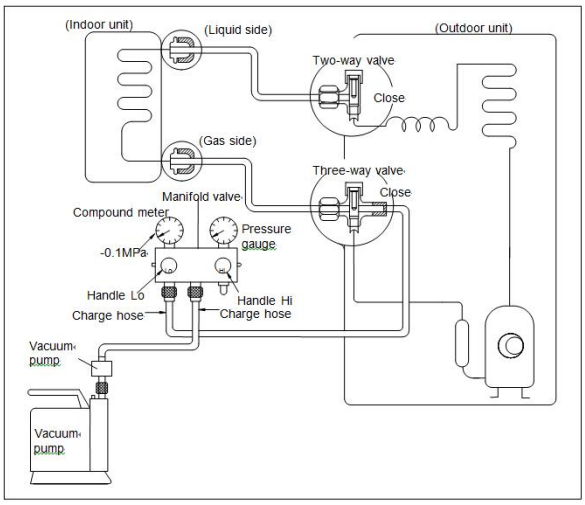
- Pressure in the system rises.
- Operating current rises.
- Cooling or heating efficiency drops.
- Moisture in the refrigerant circuit may freeze and block capillary tubing.
- Water when mixed with the refrigerant and oil will create an acid that will damage the motor winding and components.

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):

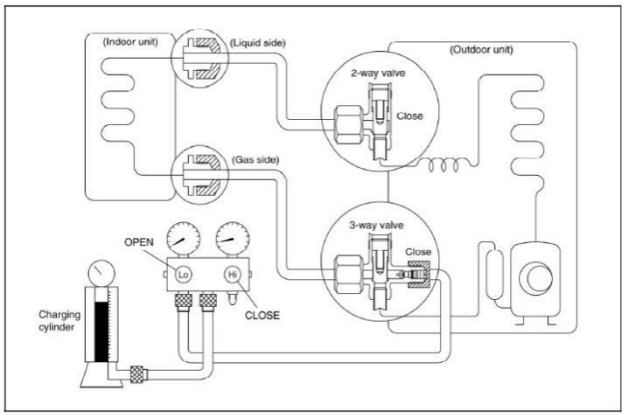
Apply soap water or a liquid neutral detergent on the indoor unit connections or outdoor unit connections with a soft brush to check for leakage of the connecting points of the piping. If bubbles come out, the pipes have leakage.

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.

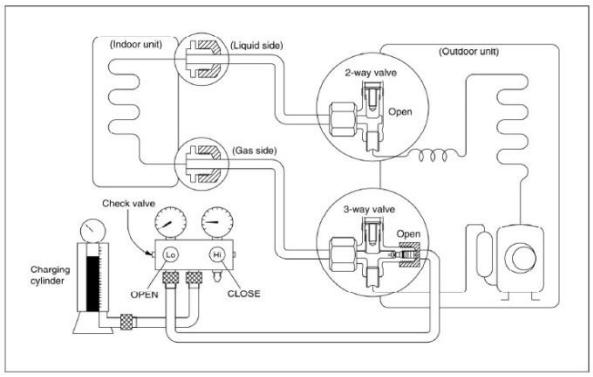
2. Air purging by refrigerant



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

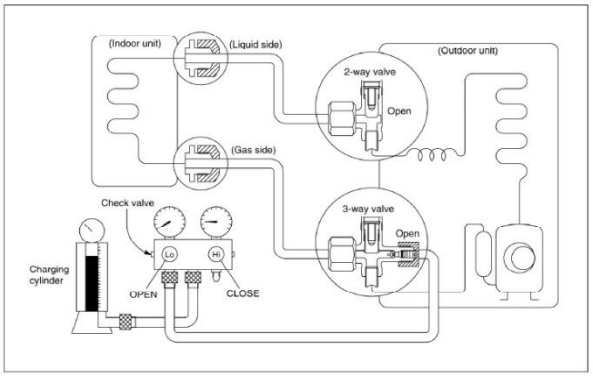


Procedure:

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).
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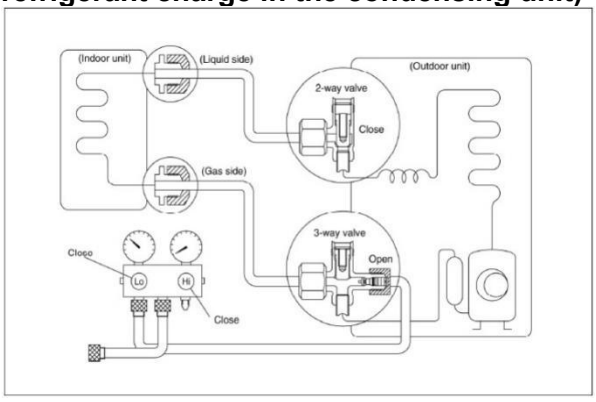
6) Refrigerant can now be added to the system, open the low pressure valve on the gauge manifold set to start charging the unit with liquid

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.

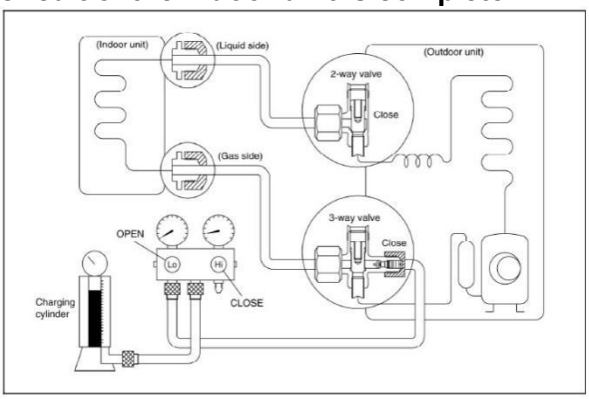
1. Pumping down the system (isolating the refrigerant charge in the condensing unit)



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.

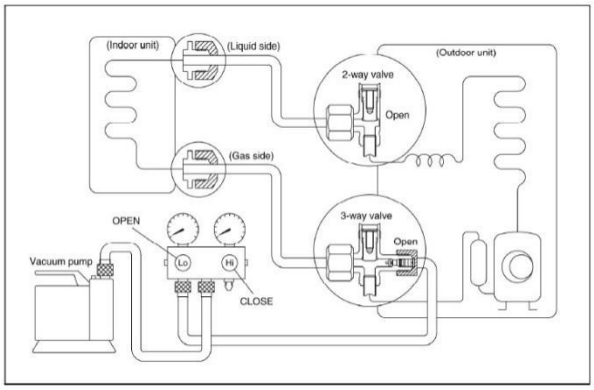


Procedure:

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.

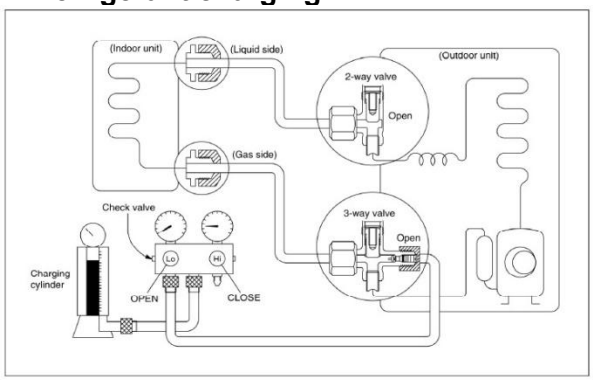


Procedure:

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:

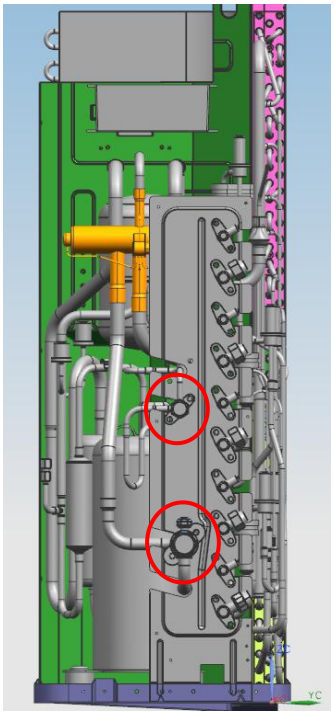
1). Connect the charge hose to the charging cylinder, open the 2-way valve and the 3-way valve.

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 1st 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℃ (221 ℉) ≦ T5<110℃ (230 ℉), keep the current frequency.

----If the temperature increase and T5 ≧ 110℃ (230 ℉), decrease the frequency to the lower level every 2 minutes till to F1.

---If T5 ≧ 115℃ (239 ℉) for 10 seconds, the compressor will stop and restart till T5<90℃ (194 ℉).

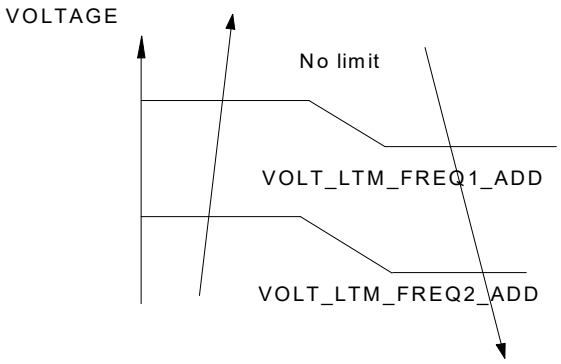
6.3.3 Fan Speed is out of control.

---- When outdoor fan speed is lower than 100RPM or higher than 2400RPM for 60 second, the whole unit stops and LED displays 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

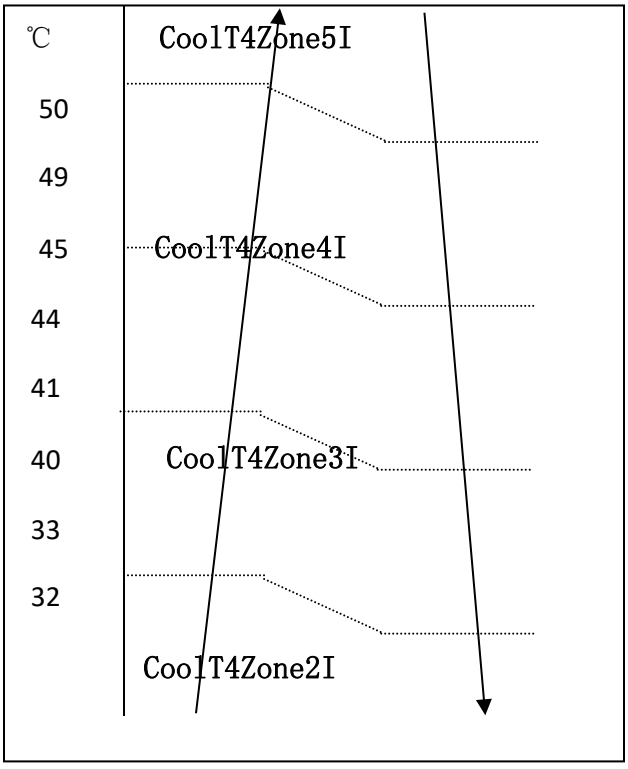


Note: if the low voltage protection occurs and not resumes within 3min, it will keep the protection always after restart the machine.

6.3.6 Compressor current limit protection

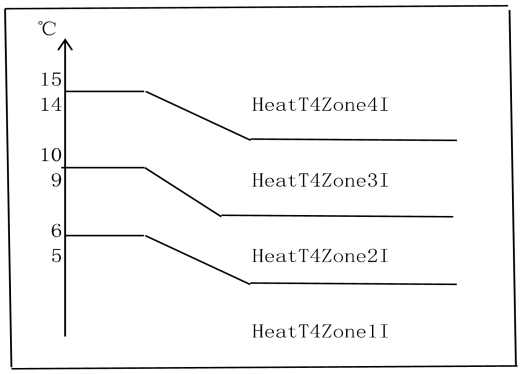
Temperature interval.of current limit is same as range of T4 limited frequency.

Cooling mode:



CoolReturnI	The difference between limit current and quit current.
CoolT4Zone5I	Cooling T4≥50℃ limit current value
CoolT4Zone4I	Cooling 49＞T4≥45℃ limit current value
CoolT4Zone3I	Cooling 44＞T4≥41℃ limit current value
CoolT4Zone2I	Cooling 40 ﹥T4≥33℃ limit current value
CoolT4Zone1I	Cooling 32＞T4℃ limit current value
CoolStopI	Cooling stop protection current value

Heating mode:

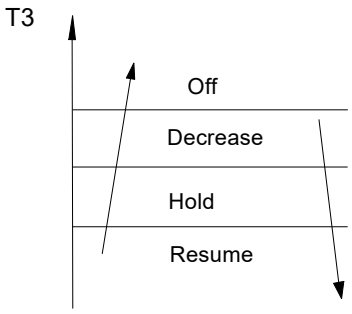


HeatReturnI	The difference between limit current and quit current.
HeatT4Zone4I	Heating T4≥15℃limit current value
HeatT4Zone3I	Heating 14＞T4≥10℃ limit current value
HeatT4Zone2I	Heating 9＞T4≥6℃ limit current value
HeatT4Zone1I	Heating 5＞T4 limit current value
HeatStopI	Heating stop protection current 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℃ for 250 seconds or T2<0℃, the indoor unit capacity demand will be zero and resume to normal when T2>8℃ 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℃.for 10s, the AC will stop and display “LP”.

When compressor is on, T4 is be lower than -40℃.for 10s, the AC will stop and display “LP”.

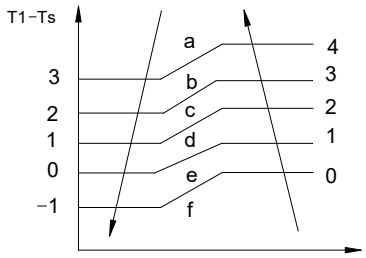
When T4 is no lower than -32℃.for 10s, the unit will exit protection.

6.4 Control and Functions

6.4.1 Capacity Request Calculation

Total capacity Request=Σ(Norm code × HP) /10 + correction

Cooling mode:



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

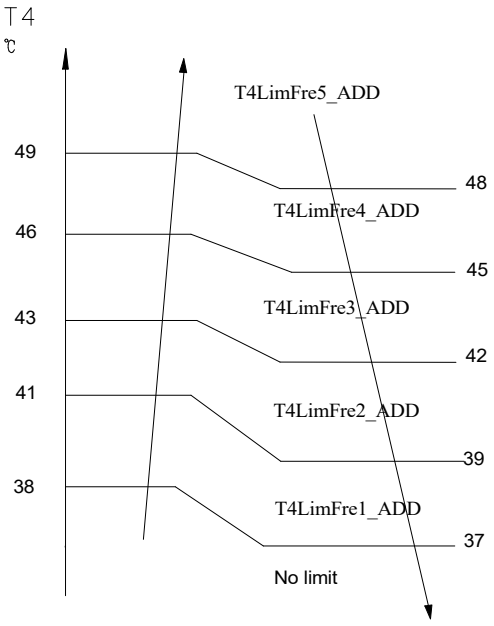
Model	9K	12K	18K	24K
HP	1.0	1.2	1.5	2.5

Note: The final result is integer.

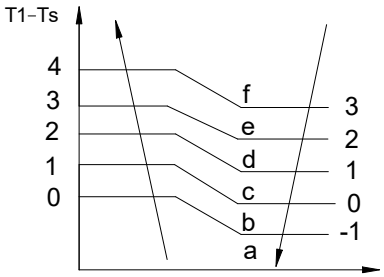
According to the final capacity request to confirm the operating frequency, as following table.

Frequency (Hz)	0	COOL_F1	COOL_F2	… …	COOL_F24	COOL_F25
Amendatory capacity demand.	0	1	2	… …	24	25

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



Heating mode



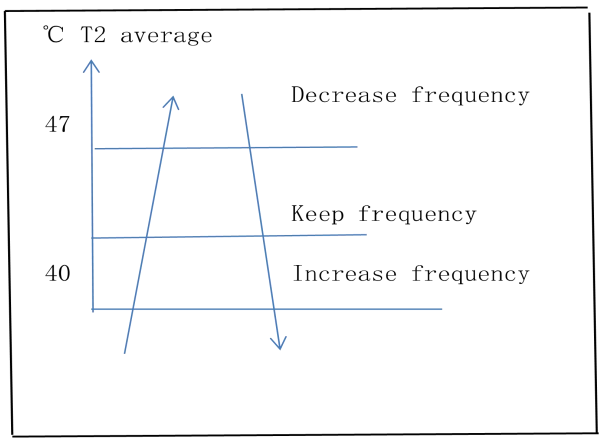
Capacity area	a	b	c	d	e	f
Norm code (N)	3	2	1.5	1	0.5	0

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≦T30.

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

3)If the compressor cumulate running time is up to 40 minutes and T3< -24C for 3 minutes.

4)If the compressor cumulate running time is up to 120 minutes and T3<-15℃.

Condition of ending defrosting:

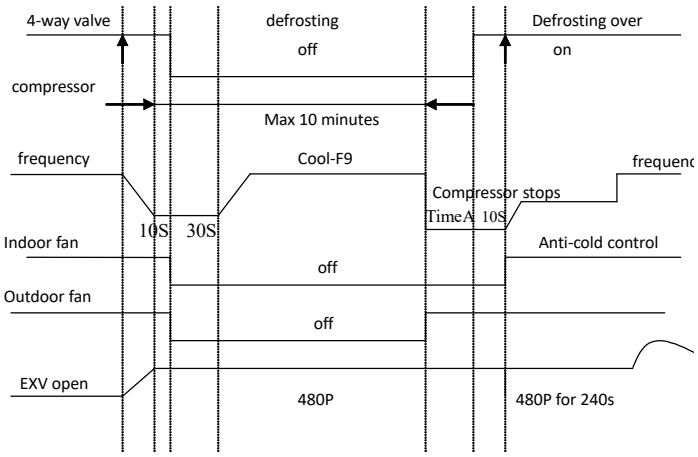
If any one of the following items is satisfied, the defrosting will finish and the machine will turn to normal heating mode.

----T3 rises to be higher than TCDE1℃.

----T3 keeps to be higher than TCDE2℃ 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 > TempQuitDefrost_ADD ℃;.

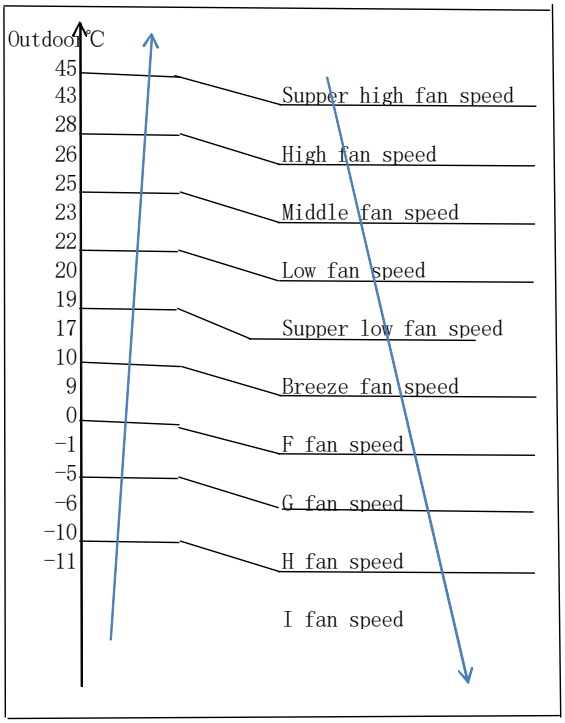
② The defrosting time achieves 10min.

③ Turn to other modes or off.

6.4.3 Outdoor fan control

6.4.3.1 Cooling mode

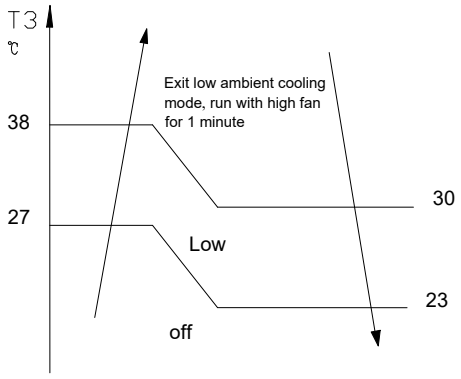
Normally the system will choose the running fan speed according to ambient temperature:

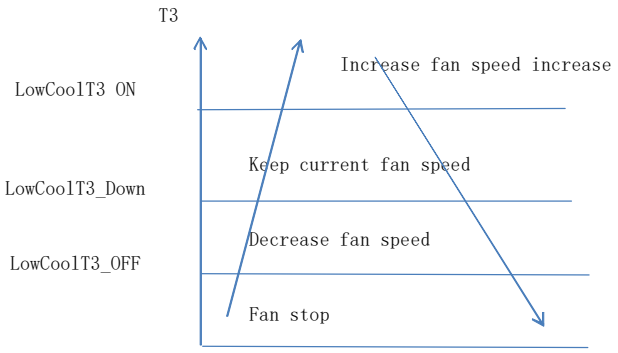


When low ambient cooling is valid:

Outdoor fan speed control logical (low ambient cooling)

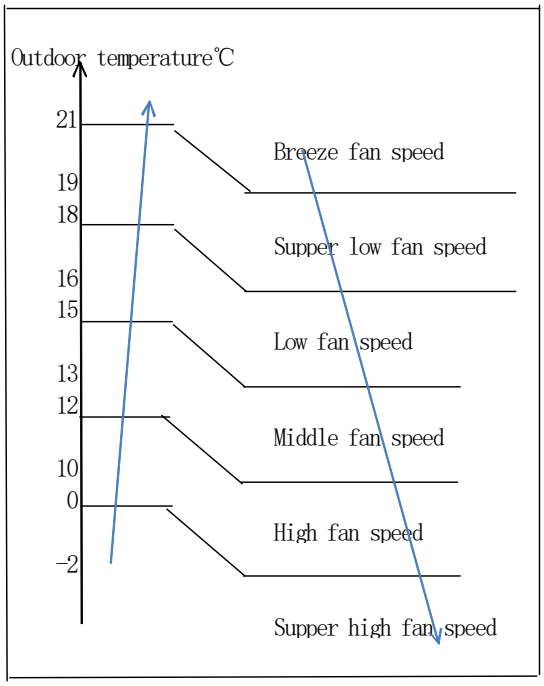
When T4 <15 ℃ (59 ℉) and T3 < 30 ℃ (86 ℉), the unit will enter into low ambient cooling mode. The outdoor fan will choose speed according to T3.
When T3≥38 ℃ (100.4 ℉) or when T4≥20 ℃ (68 ℉), the outdoor fan will choose the speed according to T4 again.





6.4.3.2 Heating mode

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



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.

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 ＞ average, the relevant valve needs more 16p open;
If the T2B= average, the relevant valve's open range remains;
If the T2B ＜ 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 ＞ average+2, the relevant valve needs more 16p close;
If average+2≥the T2≥ average-2, the relevant valve's open range remains;
If the T2 ＜ average-2, the relevant valve needs more 16p open.
This modification will be carry out every 2 minutes.

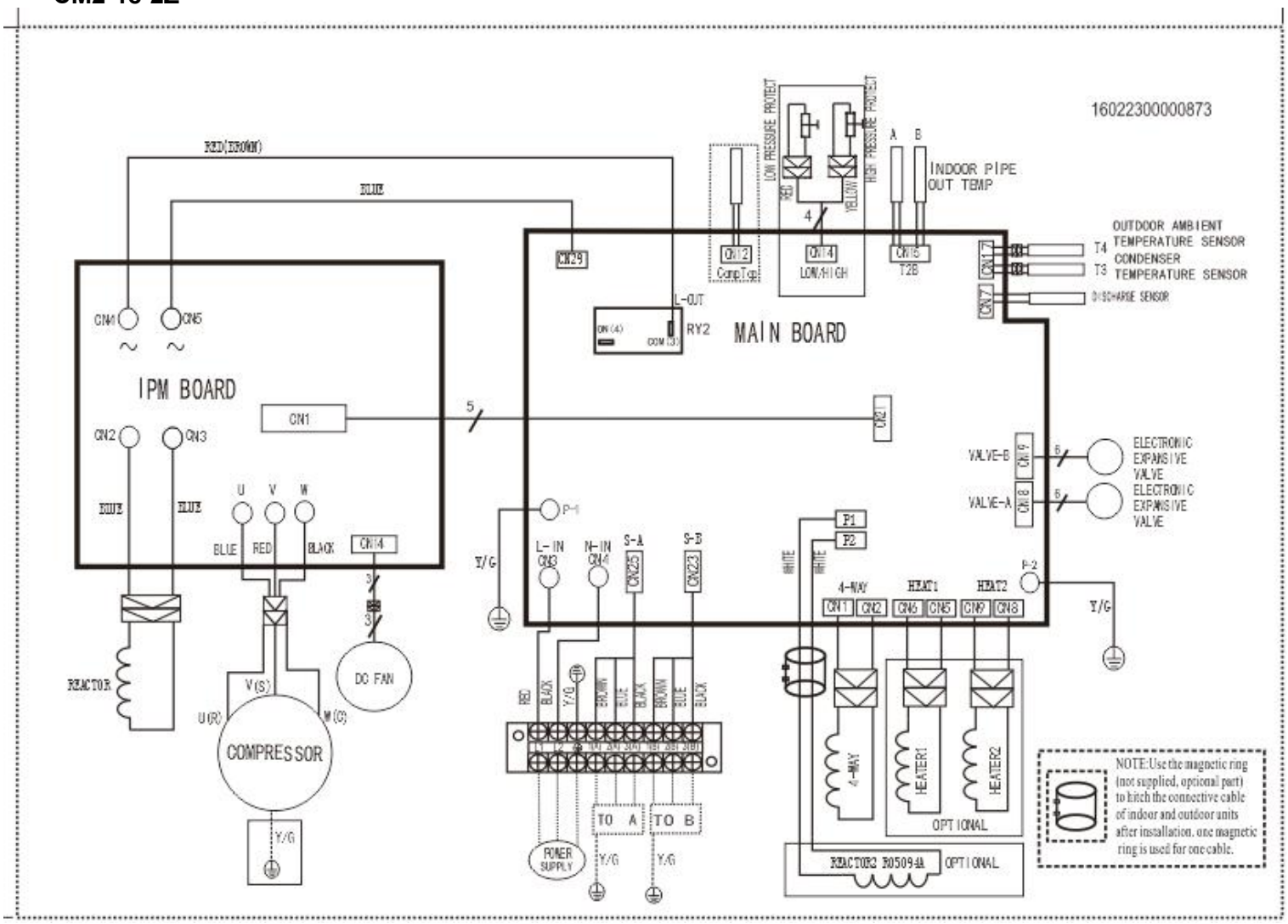
6.4.5 Four-way valve control

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

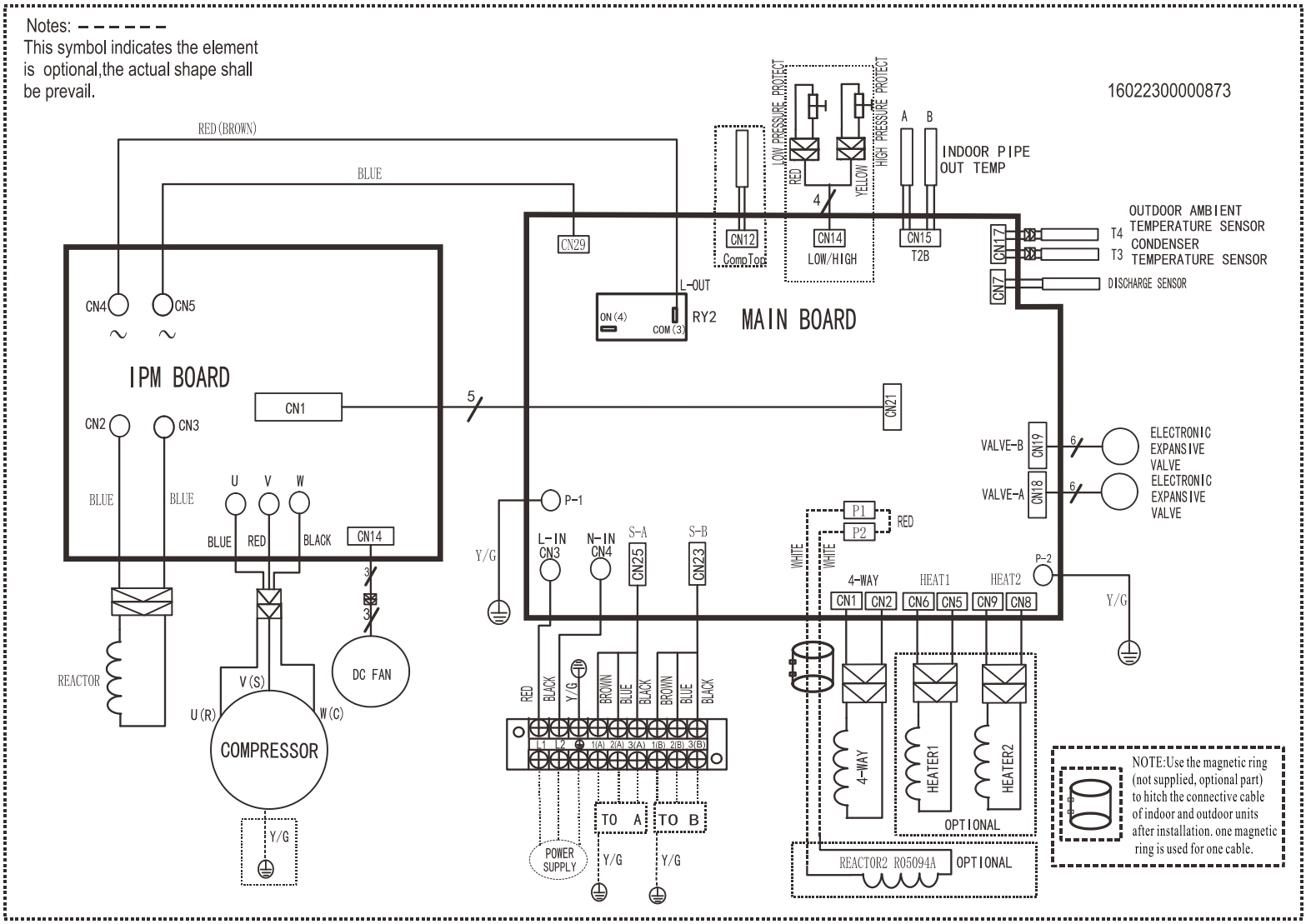
modes, the four-way valve is off after compressor is off for 2 minutes. Failure or protection (not including discharge temperature protection, high and low pressure protection), four-way valve immediately shuts down.

7 Wiring Diagrams

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

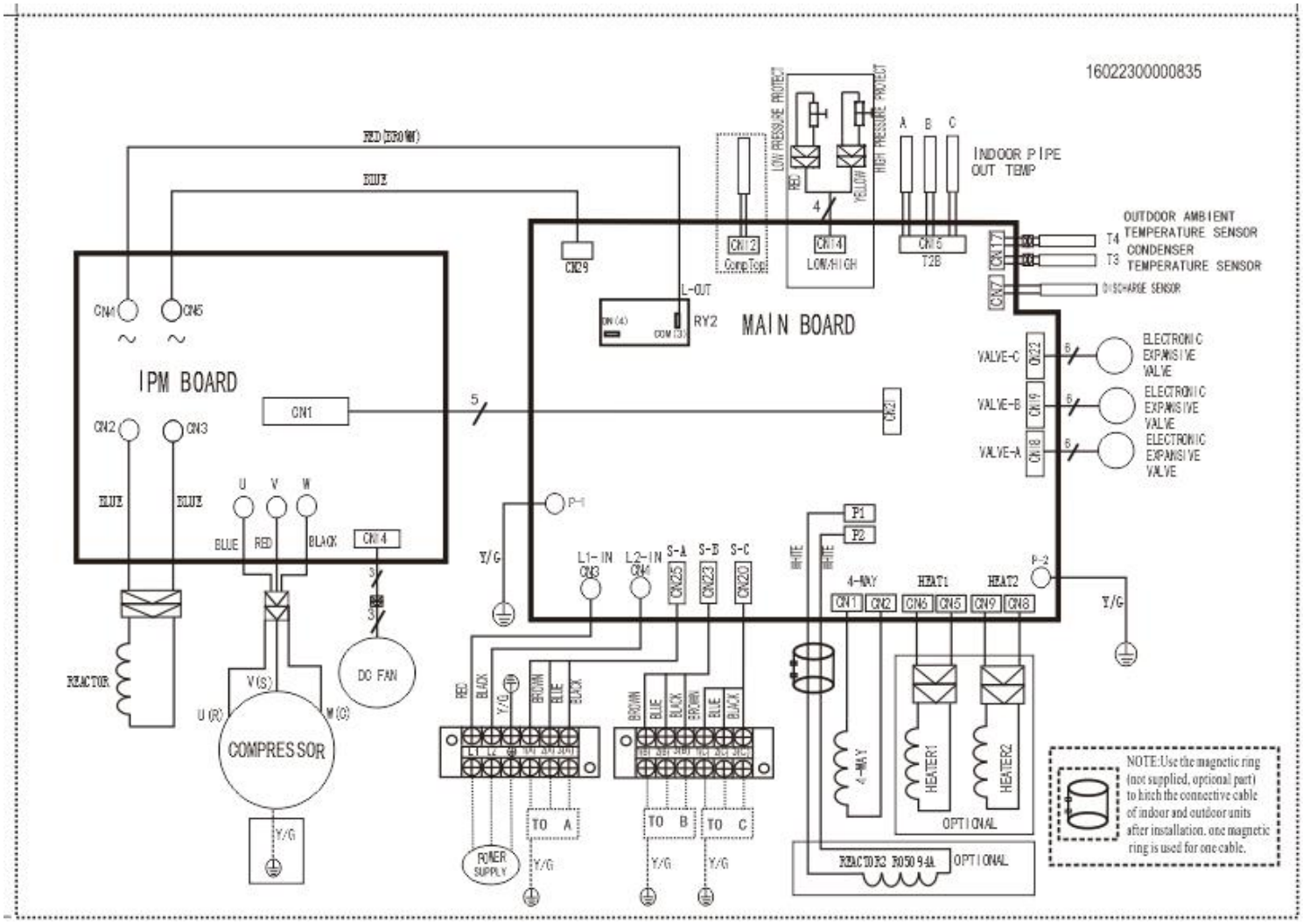


CM2-18-2ZX

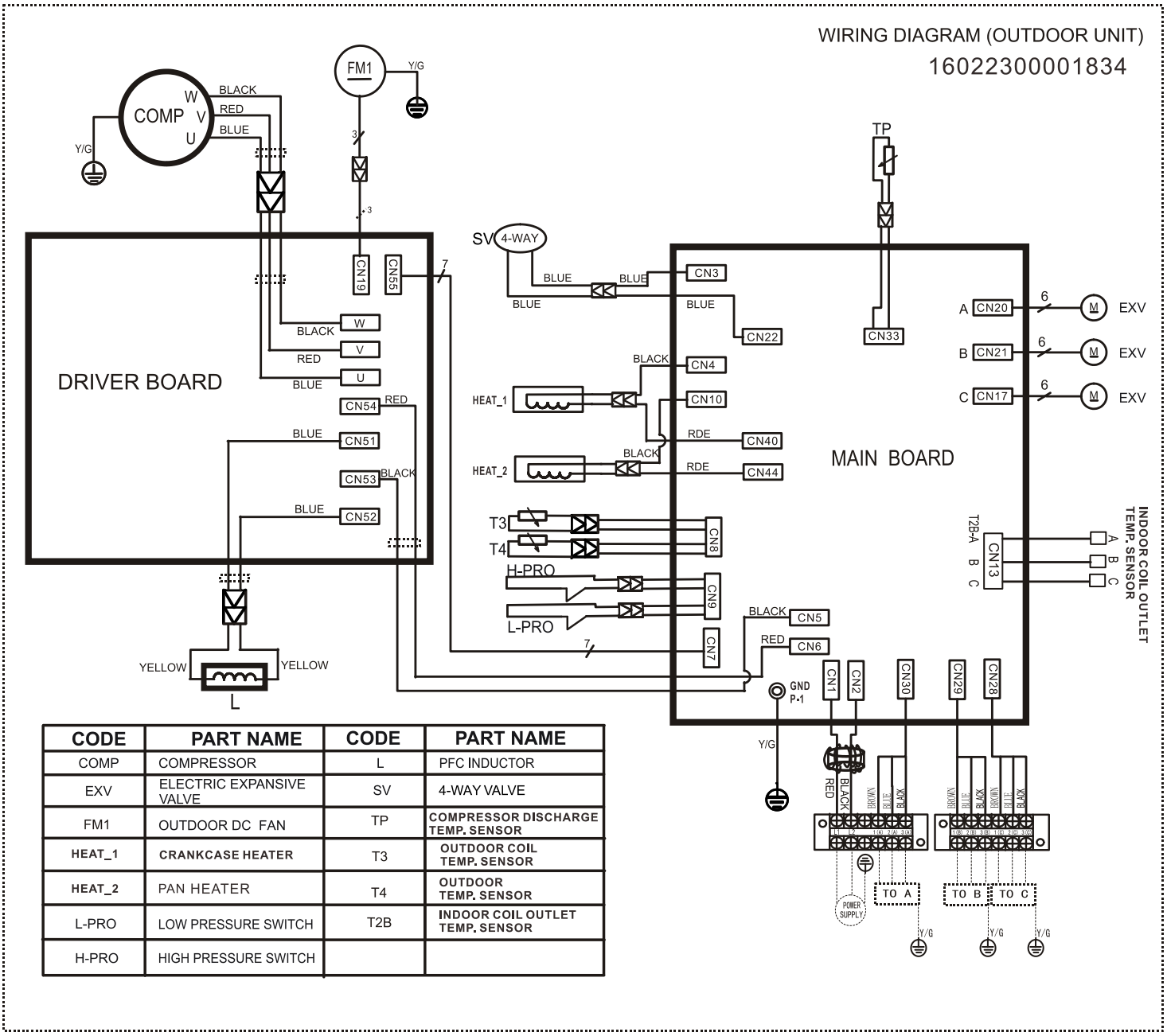

Notes: – – – – – –
This symbol indicates the element is optional,the actual shape shall be prevail.
16022300000873
RED (BROWN)
BLUE
CN4
CN5
IPM BOARD
CN2
CN3
CN1
BLUE
BLUE
U
V
W
BLUE
RED
BLACK
CN14
REACTOR
V(S)
U(R)
W(C)
COMPRESSOR
Y/G
DC FAN
CN29
CN12
CompTop
LOW PRESSURE PROTECT
RED
CN14
LOW/HIGH
YELLOW
HIGH PRESSURE PROTECT
A
B
INDOOR PIPE
OUT TEMP
CN15
T2B
CN17
T4
OUTDOOR AMBIENT
TEMPERATURE SENSOR
T3
CONDENSER
TEMPERATURE SENSOR
CN7
DISCHARGE SENSOR
L-OUT
ON (4)
COM (3)
RY2
MAIN BOARD
CN21
P-1
L-IN
CN3
N-IN
CN4
S-A
CN25
S-B
CN23
Y/G
RED
BLACK
Y/G
BROWN
BLUE
BLACK
BROWN
BLUE
BLACK
L1 L2 1(A) 2(A) 3(A) 1(B) 2(B) 3(B)
TO A
TO B
POWER SUPPLY
Y/G
Y/G
VALVE-B
CN19
ELECTRONIC EXPANSIVE VALVE
VALVE-A
CN18
ELECTRONIC EXPANSIVE VALVE
P1
P2
RED
WHITE
WHITE
P-2
4-WAY
HEAT1
HEAT2
CN1
CN2
CN6
CN5
CN9
CN8
Y/G
4-WAY
HEATER1
HEATER2
OPTIONAL
REACTOR2 R05094A
OPTIONAL
NOTE:Use the magnetic ring (not supplied, optional part) to hitch the connective cable of indoor and outdoor units after installation. one magnetic ring is used for one cable.

7.2 Wiring diagram of 1 drive 3 outdoor

CM3-27-3Z



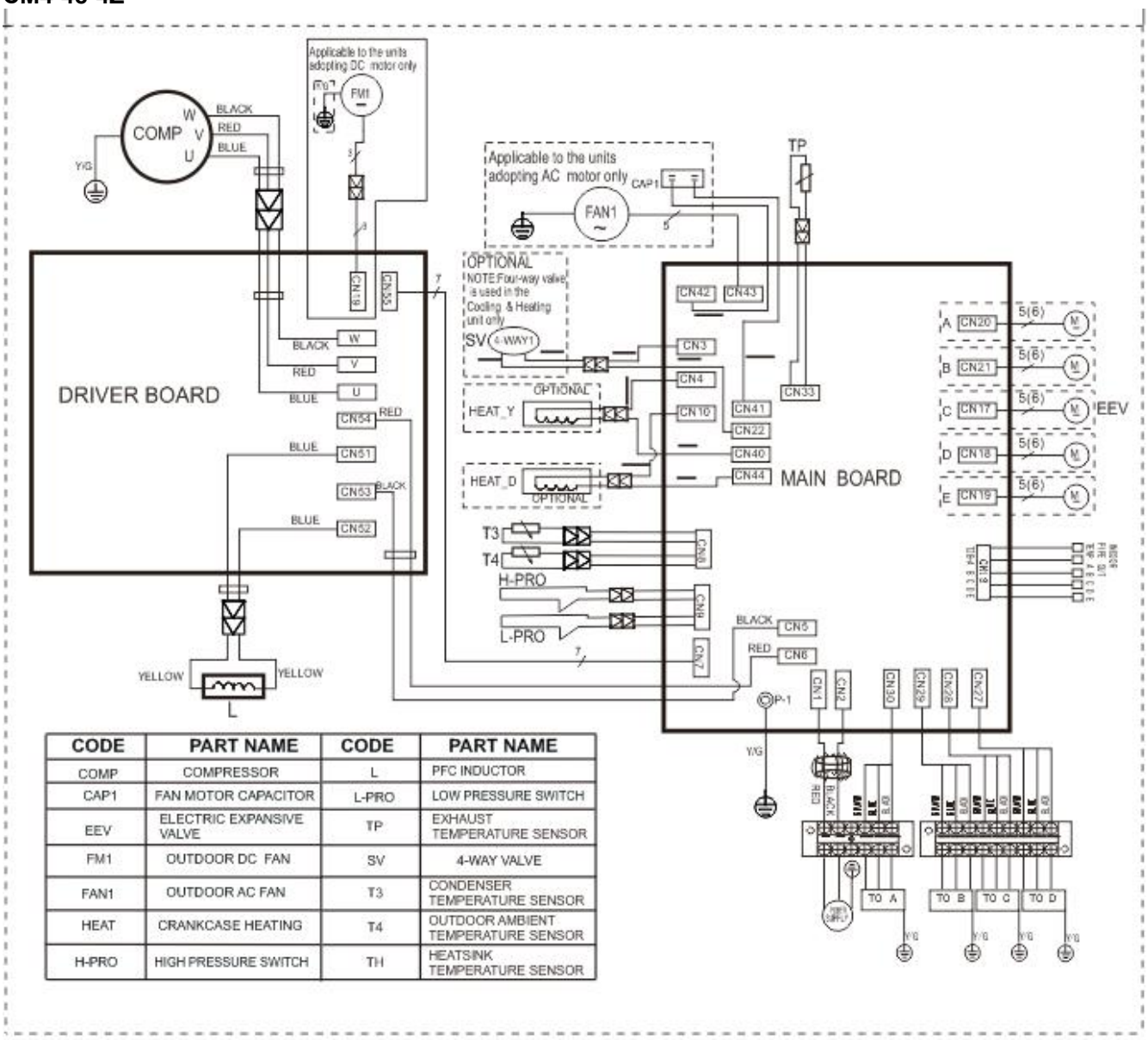
CM3-27-3ZX



CODE	PART NAME	CODE	PART NAME
COMP	COMPRESSOR	L	PFC INDUCTOR
EXV	ELECTRIC EXPANSIVE VALVE	SV	4-WAY VALVE
FM1	OUTDOOR DC FAN	TP	COMPRESSOR DISCHARGE TEMP. SENSOR
HEAT_1	CRANKCASE HEATER	T3	OUTDOOR COIL TEMP. SENSOR
HEAT_2	PAN HEATER	T4	OUTDOOR TEMP. SENSOR
L-PRO	LOW PRESSURE SWITCH	T2B	INDOOR COIL OUTLET TEMP. SENSOR
H-PRO	HIGH PRESSURE SWITCH		

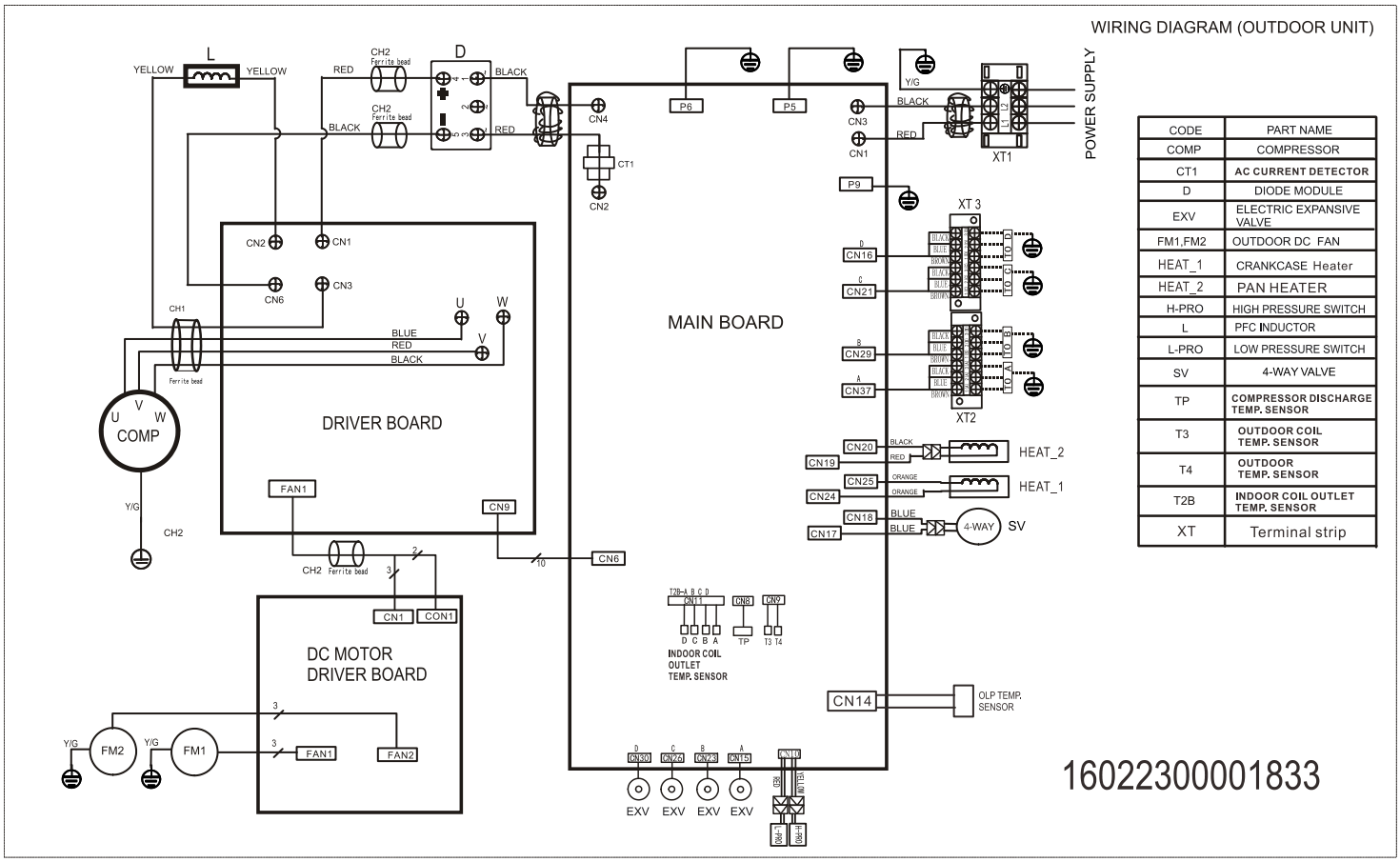
7.3 Wiring diagram of 1 drive 4 outdoor

CM4-48-4Z



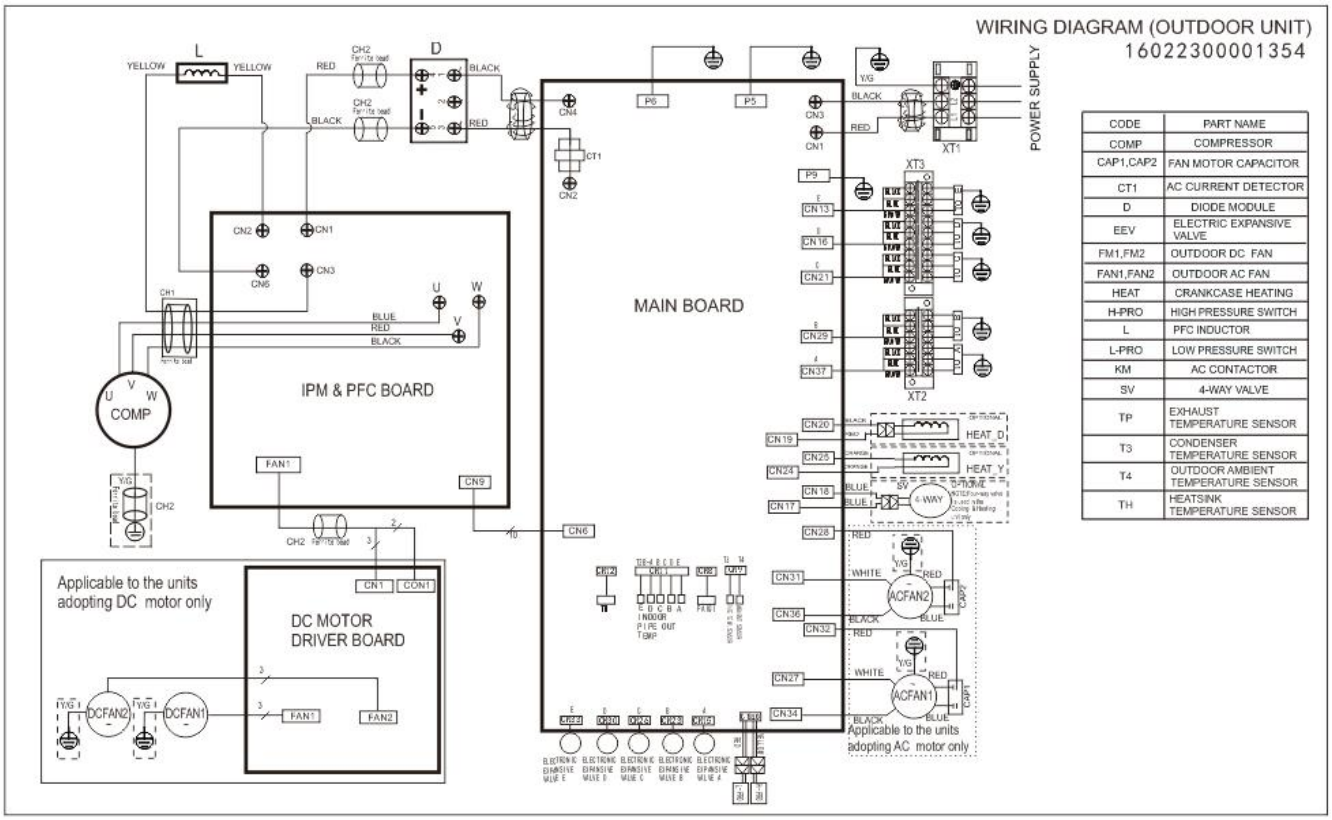
CODE	PART NAME	CODE	PART NAME
COMP	COMPRESSOR	L	PFC INDUCTOR
CAP1	FAN MOTOR CAPACITOR	L-PRO	LOW PRESSURE SWITCH
EEV	ELECTRIC EXPANSIVE VALVE	TP	EXHAUST TEMPERATURE SENSOR
FM1	OUTDOOR DC FAN	SV	4-WAY VALVE
FAN1	OUTDOOR AC FAN	T3	CONDENSER TEMPERATURE SENSOR
HEAT	CRANKCASE HEATING	T4	OUTDOOR AMBIENT TEMPERATURE SENSOR
H-PRO	HIGH PRESSURE SWITCH	TH	HEATSINK TEMPERATURE SENSOR

CM4-48-4ZX



CODE	PART NAME
COMP	COMPRESSOR
CT1	AC CURRENT DETECTOR
D	DIODE MODULE
EXV	ELECTRIC EXPANSIVE VALVE
FM1,FM2	OUTDOOR DC FAN
HEAT_1	CRANKCASE Heater
HEAT_2	PAN HEATER
H-PRO	HIGH PRESSURE SWITCH
L	PFC INDUCTOR
L-PRO	LOW PRESSURE SWITCH
SV	4-WAY VALVE
TP	COMPRESSOR DISCHARGE TEMP. SENSOR
T3	OUTDOOR COIL TEMP. SENSOR
T4	OUTDOOR TEMP. SENSOR
T2B	INDOOR COIL OUTLET TEMP. SENSOR
XT	Terminal strip

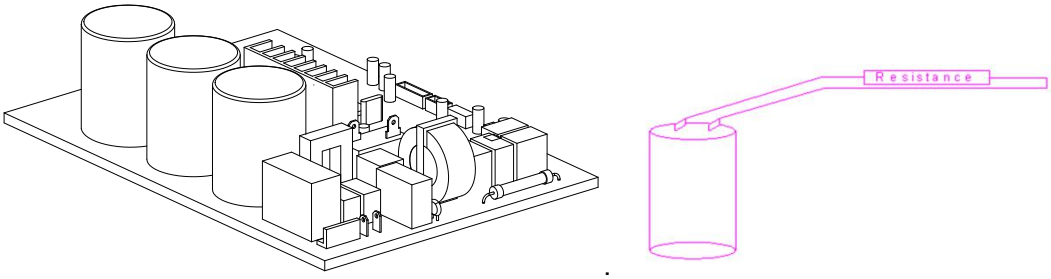
7.4 Wiring diagram of CM5-54-5Z



8. Troubleshooting

8.1Safety

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

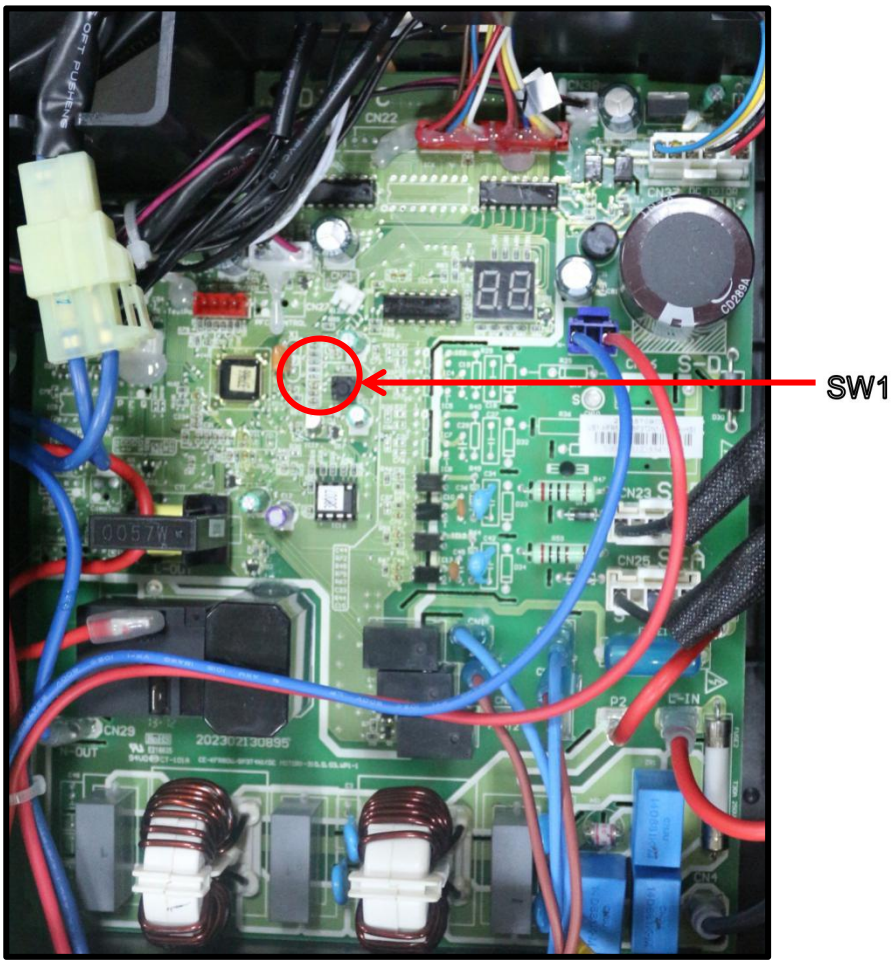
Display	LED STATUS	IDU Error)
E0	Outdoor EEPROM malfunction	F4
E2	Communication malfunction between indoor and outdoor units	E1
E3	Communication malfunction between IPM board and outdoor main board	——
E4	Open or short circuit of outdoor temperature sensor (T3、T4、T5)	F1,F2,F3
E5	Voltage protection	P1
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

<table>
<tr><td></td><td></td><td><table><tr><th>Display</th><th>Number of indoor unit</th></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>2</td></tr><tr><td>3</td><td>3</td></tr><tr><td>4</td><td>4</td></tr></table></td></tr>
<tr><td>2</td><td>Outdoor unit running mode code</td><td>Off:0,Fan only 1, Cooling:2, Heating:3, Forced cooling:4</td></tr>
<tr><td>3</td><td>A indoor unit capacity</td><td rowspan="5">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)</td></tr>
<tr><td>4</td><td>B indoor unit capacity</td></tr>
<tr><td>5</td><td>C indoor unit capacity</td></tr>
<tr><td>6</td><td>D indoor unit capacity</td></tr>
<tr><td>7</td><td>E indoor unit capacity</td></tr>
<tr><td>8</td><td>A Indoor unit capacity demand code</td><td rowspan="5">Norm code*HP
(9K:1HP,12K:1.2HP,18K:1.5HP)</td></tr>
<tr><td>9</td><td>B Indoor unit capacity demand code</td></tr>
<tr><td>10</td><td>C Indoor unit capacity demand code</td></tr>
<tr><td>11</td><td>D Indoor unit capacity demand code</td></tr>
<tr><td>12</td><td>E Indoor unit capacity demand code</td></tr>
<tr><td>13</td><td>Outdoor unit amendatory capacity demand code</td><td>Forced cooling:7</td></tr>
<tr><td>14</td><td>The frequency corresponding to the total indoor units amendatory capacity demand</td><td></td></tr>
<tr><td>15</td><td>The frequency after the frequency limit</td><td></td></tr>
<tr><td>16</td><td>The frequency sending to compressor control chip</td><td></td></tr>
<tr><td>17</td><td>A indoor unit evaporator outlet temp.(T_{2B}A)</td><td rowspan="5">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: “——”</td></tr>
<tr><td>18</td><td>B indoor unit evaporator outlet temp.(T_{2B}B)</td></tr>
<tr><td>19</td><td>C indoor unit evaporator outlet temp.(T_{2B}C)</td></tr>
<tr><td>20</td><td>D indoor unit evaporator outlet temp.(T_{2B}D)</td></tr>
<tr><td>21</td><td>E indoor unit evaporator outlet temp.(T_{2B}E)</td></tr>
<tr><td>22</td><td>A indoor unit room temp.(T_1A)</td><td rowspan="5">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: “——”</td></tr>
<tr><td>23</td><td>B indoor unit room temp.(T_1B)</td></tr>
<tr><td>24</td><td>C indoor unit room temp.(T_1C)</td></tr>
<tr><td>25</td><td>D indoor unit room temp.(T_1D)</td></tr>
<tr><td>26</td><td>E indoor unit room temp.(T_1E)</td></tr>
<tr><td>27</td><td>A indoor unit evaporator temp.(T_2A)</td><td rowspan="7">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: “——”</td></tr>
<tr><td>28</td><td>B indoor unit evaporator temp.(T_2B)</td></tr>
<tr><td>29</td><td>C indoor unit evaporator temp.(T_2C)</td></tr>
<tr><td>30</td><td>D indoor unit evaporator temp.(T_2D)</td></tr>
<tr><td>31</td><td>E indoor unit evaporator temp.(T_2E)</td></tr>
<tr><td>32</td><td>Condenser pipe temp.(T3)</td></tr>
<tr><td>33</td><td>Outdoor ambient temp.(T4)</td></tr>
<tr><td>34</td><td>Compressor discharge temp.(TP)</td><td>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.)</td></tr>
<tr><td>35</td><td>AD value of current</td><td>The display value is hex number.</td></tr>
</table>

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.($T_{2B}F$)			
49	F indoor unit room temp.(T_1F)			
50	F indoor unit evaporator temp.(T_2F)			
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.

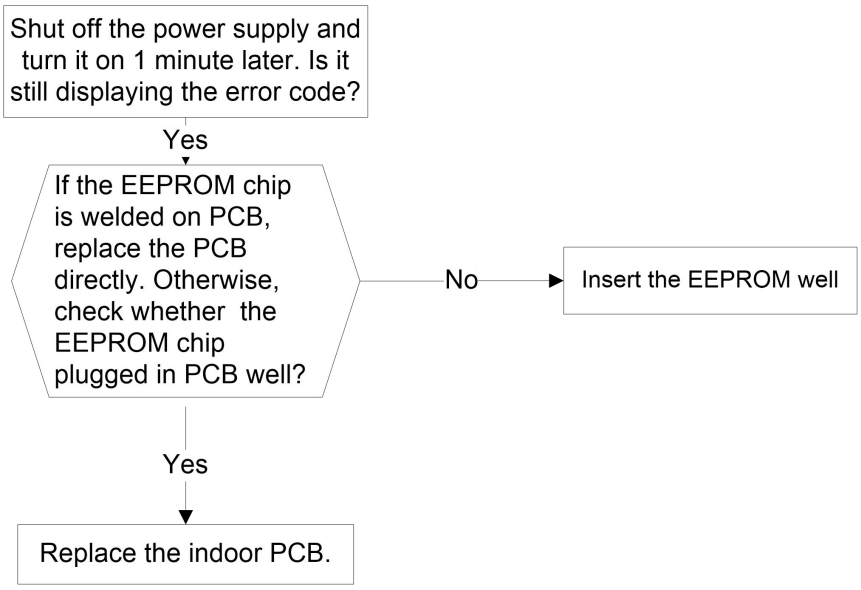
8.4 Diagnosis and Solution

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
	● Installation mistake ● PCB faulty

Trouble shooting:



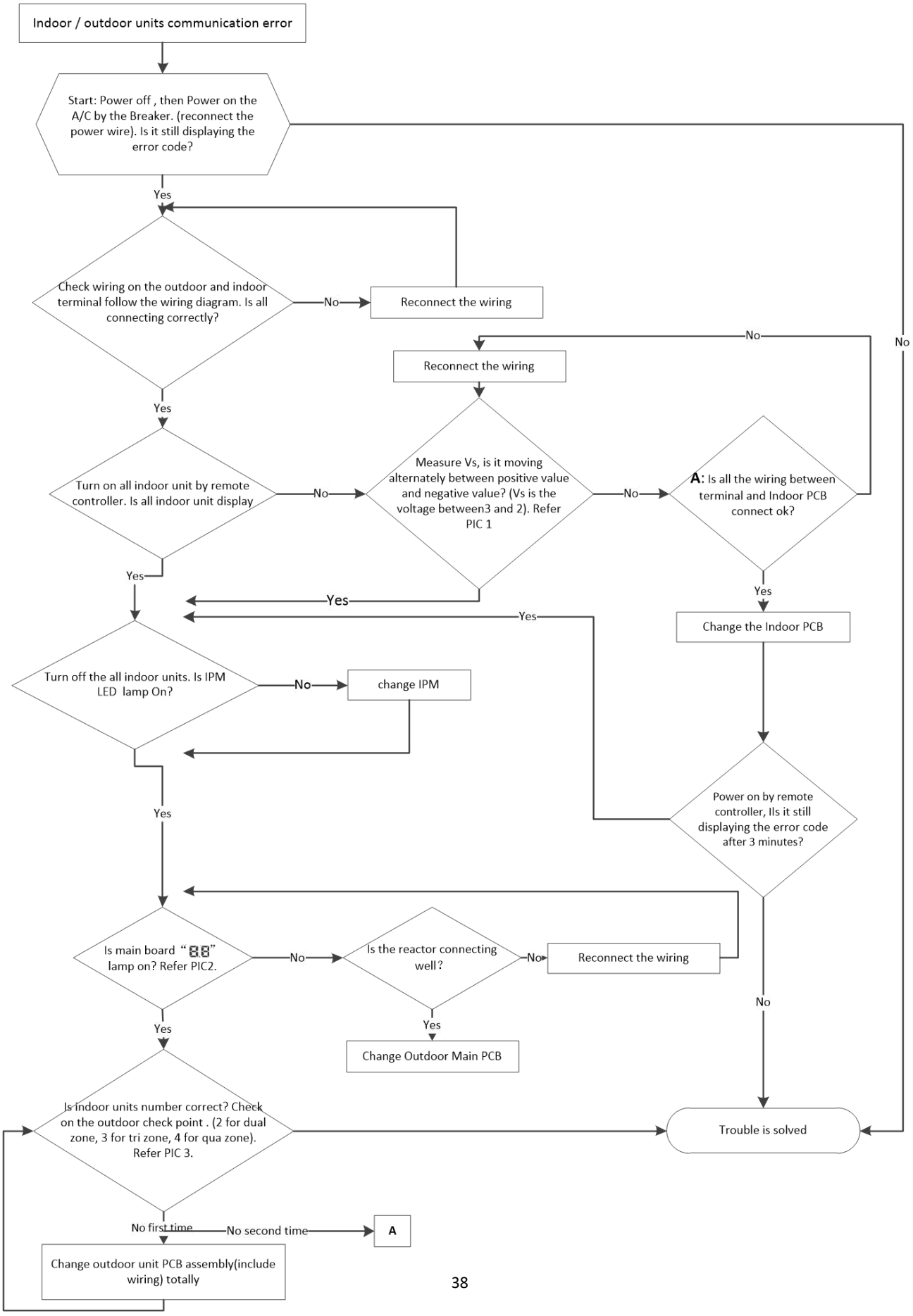
Supposed causes

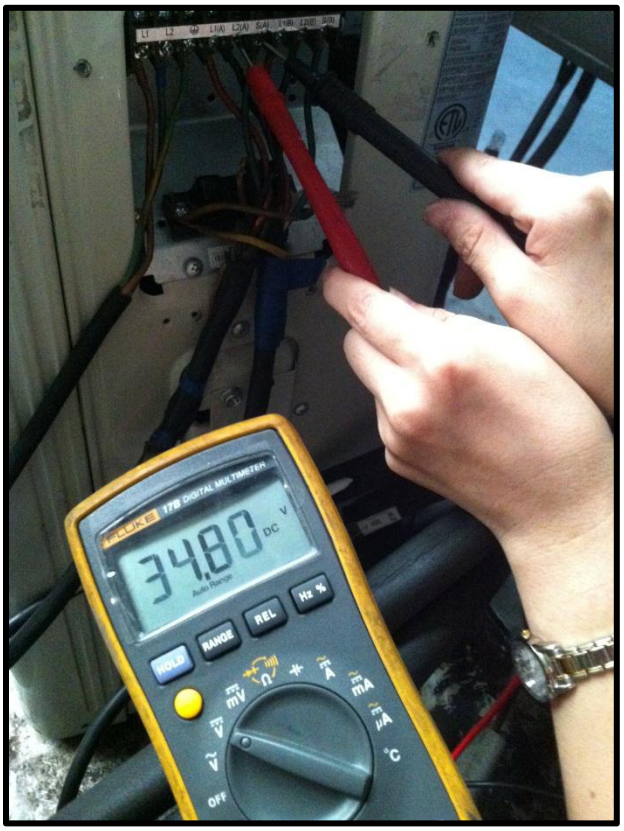
EEPROM: a read-only memory whose contents can be erased and reprogrammed using a pulsed voltage. For the location of EEPROM chip, please refer to the below photos.

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	● Wiring mistake ● Indoor or outdoor PCB faulty

Trouble shooting:

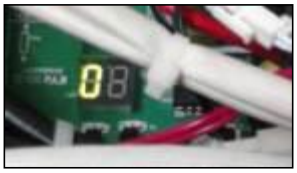

Indoor / outdoor units communication error
Start: Power off , then Power on the A/C by the Breaker. (reconnect the power wire). Is it still displaying the error code?
Yes
No
Check wiring on the outdoor and indoor terminal follow the wiring diagram. Is all connecting correctly?
No
Reconnect the wiring
Yes
Reconnect the wiring
No
No
Turn on all indoor unit by remote controller. Is all indoor unit display
No
Measure Vs, is it moving alternately between positive value and negative value? (Vs is the voltage between3 and 2). Refer PIC 1
No
A: Is all the wiring between terminal and Indoor PCB connect ok?
Yes
Yes
Yes
Yes
Change the Indoor PCB
Turn off the all indoor units. Is IPM LED lamp On?
No
change IPM
Yes
Power on by remote controller, Ils it still displaying the error code after 3 minutes?
Is main board "88" lamp on? Refer PIC2.
No
Is the reactor connecting well?
No
Reconnect the wiring
No
Yes
Yes
Change Outdoor Main PCB
Is indoor units number correct? Check on the outdoor check point . (2 for dual zone, 3 for tri zone, 4 for qua zone). Refer PIC 3.
Trouble is solved
No first time
No second time
A
Change outdoor unit PCB assembly(include wiring) totally

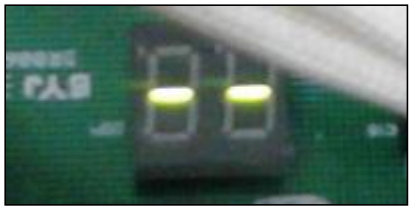


Pic 1: Use a multimeter to test the DC voltage between 2 port and 3 port of outdoor unit. The red pin of multimeter connects with 2 port while the black pin is for 3 port.

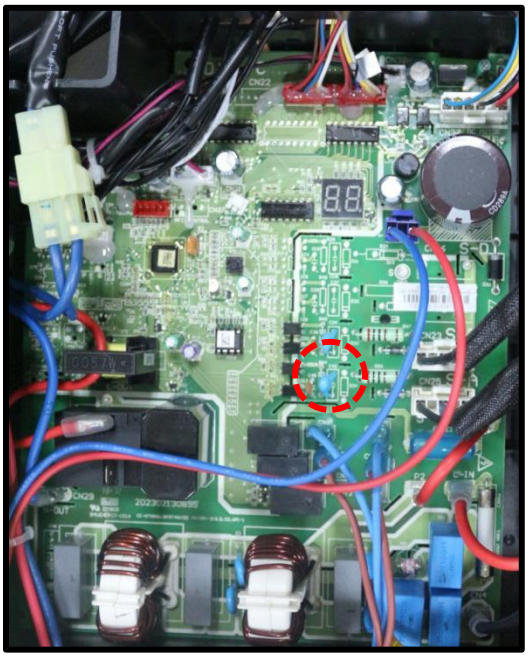
(For previous generation, 2 is same as L2, 3 is same as S)

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.



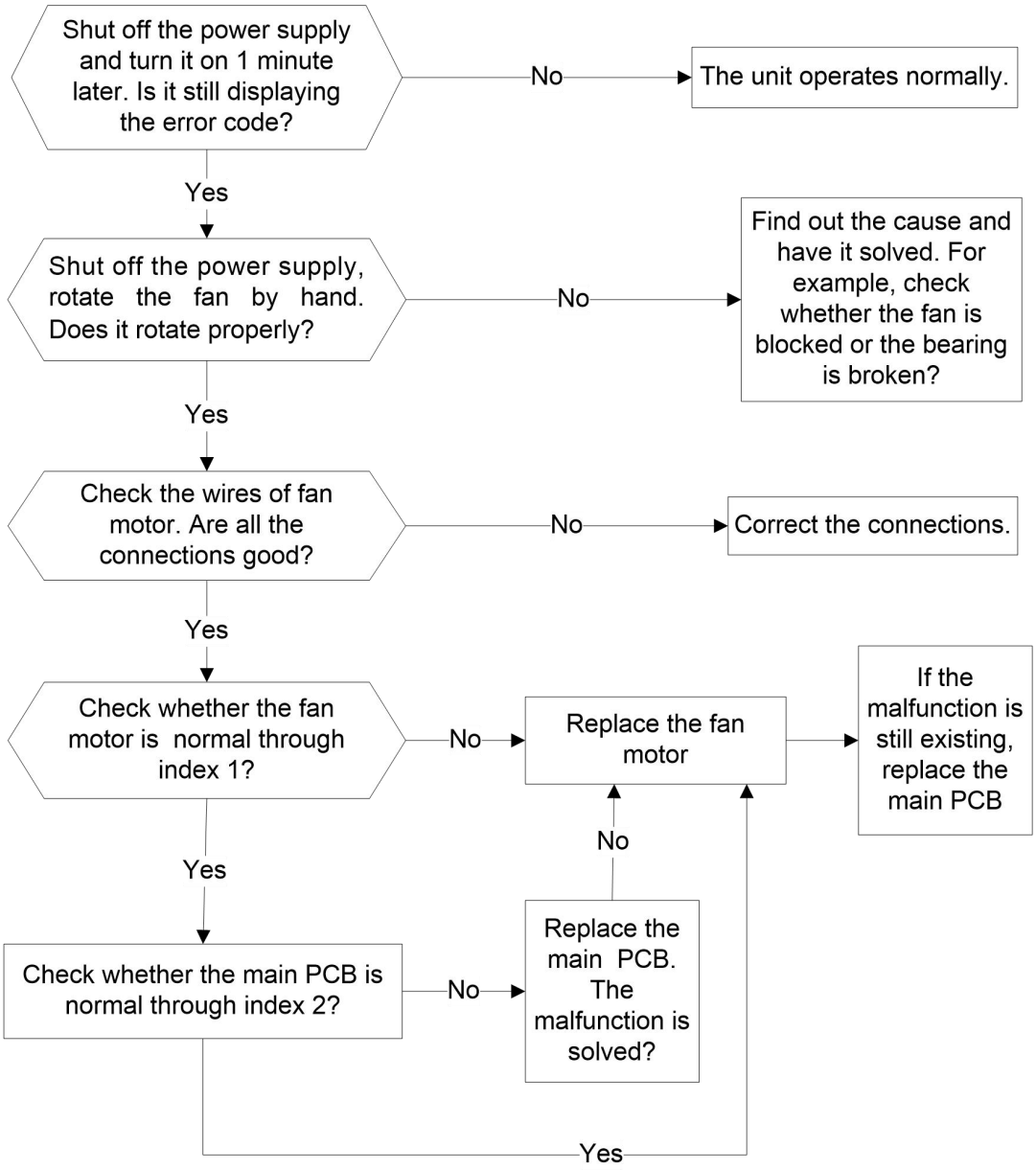
PIC 3: Check point button, press 1 time for check how many indoor units are connected.

8.4.1.3 Reserve

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

Error code	**IDU ERROR E3**
Malfunction decision conditions	When indoor fan speed keeps too low (300RPM) for certain time, the unit will stop and the LED will display the failure.
Supposed causes	● Wiring mistake ● Fan ass'y faulty ● Fan motor faulty ● PCB faulty

Trouble shooting:

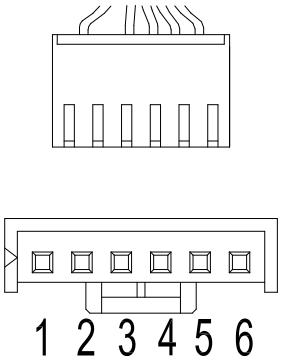


Index 1:

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

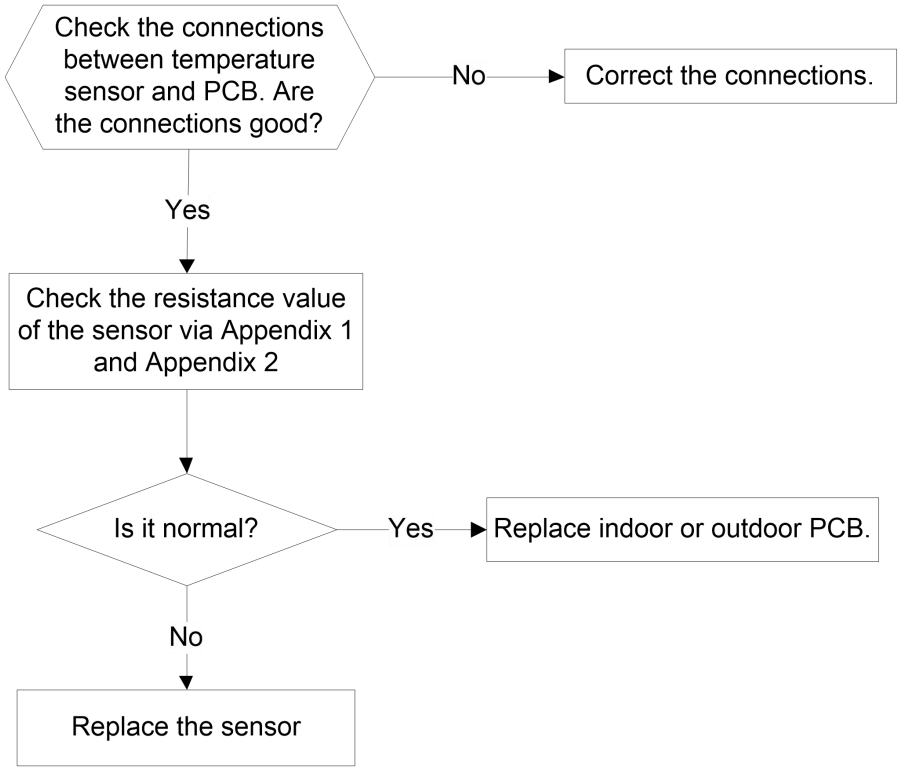
NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	13.5-16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5-16.5V

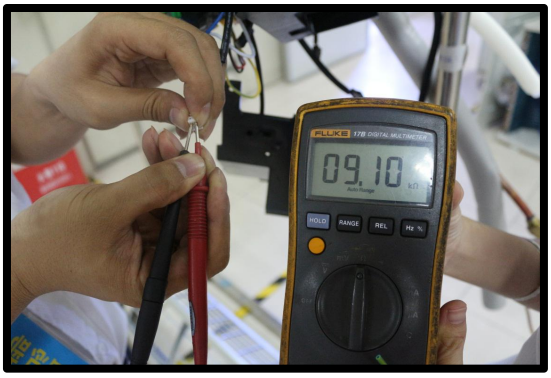
8.4.1.5 Open or short circuit of temperature sensor diagnosis and solution.

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

Malfunction decision conditions	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Sensor faulty ● PCB faulty

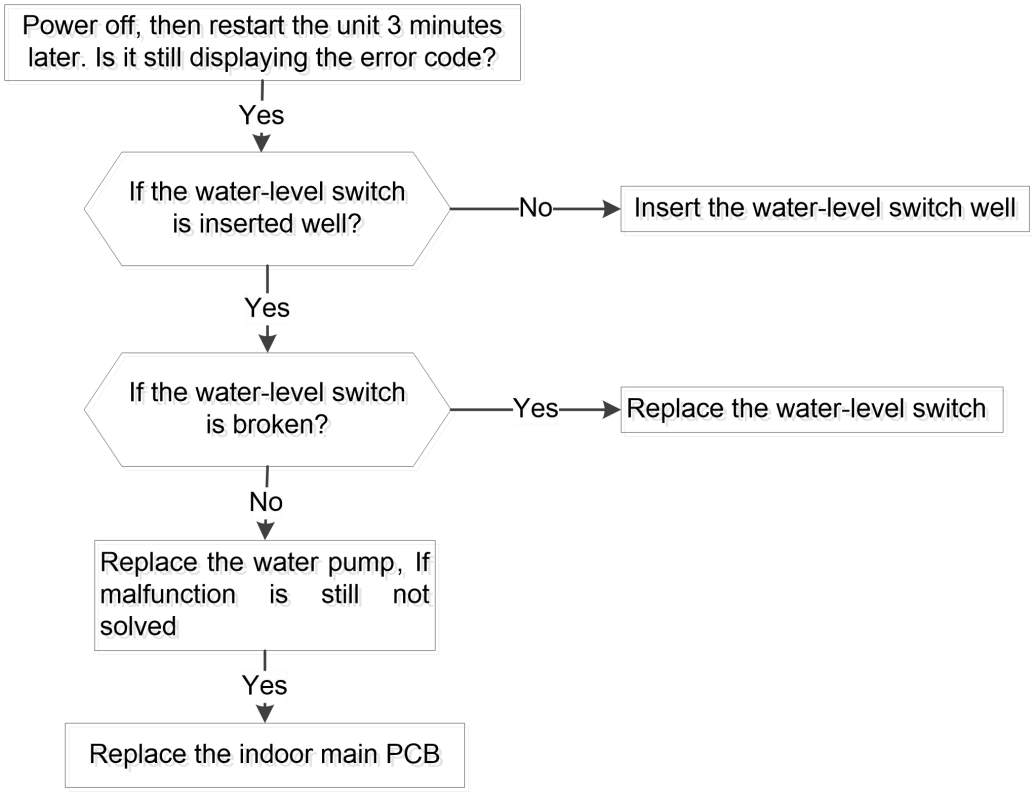
Trouble shooting:





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

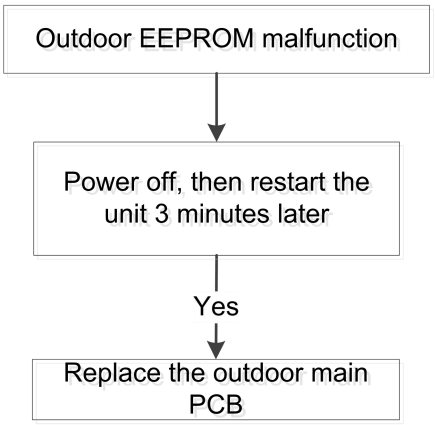
Error code	IDU ERROR EE
Malfunction decision conditions	If the sampling voltage is not 5V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Water-level switch faulty ● Water pump faulty ● Indoor PCB faulty



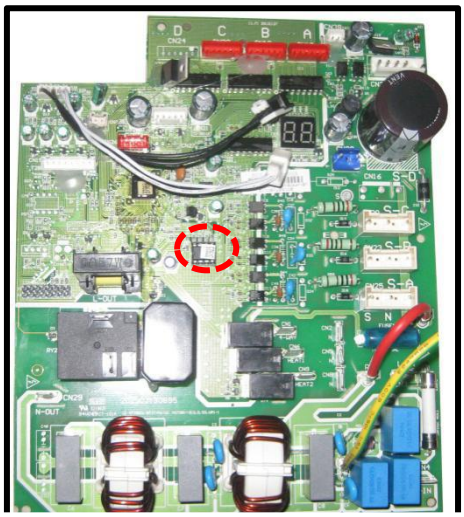
8.4.1.7 Outdoor EEPROM malfunction

Error Code	IDU ERROR F4, ODU ERROR E0
Malfunction decision conditions	PCB main chip does not receive feedback from EEPROM chip
Supposed causes	● Installation mistake ● PCB faulty

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.

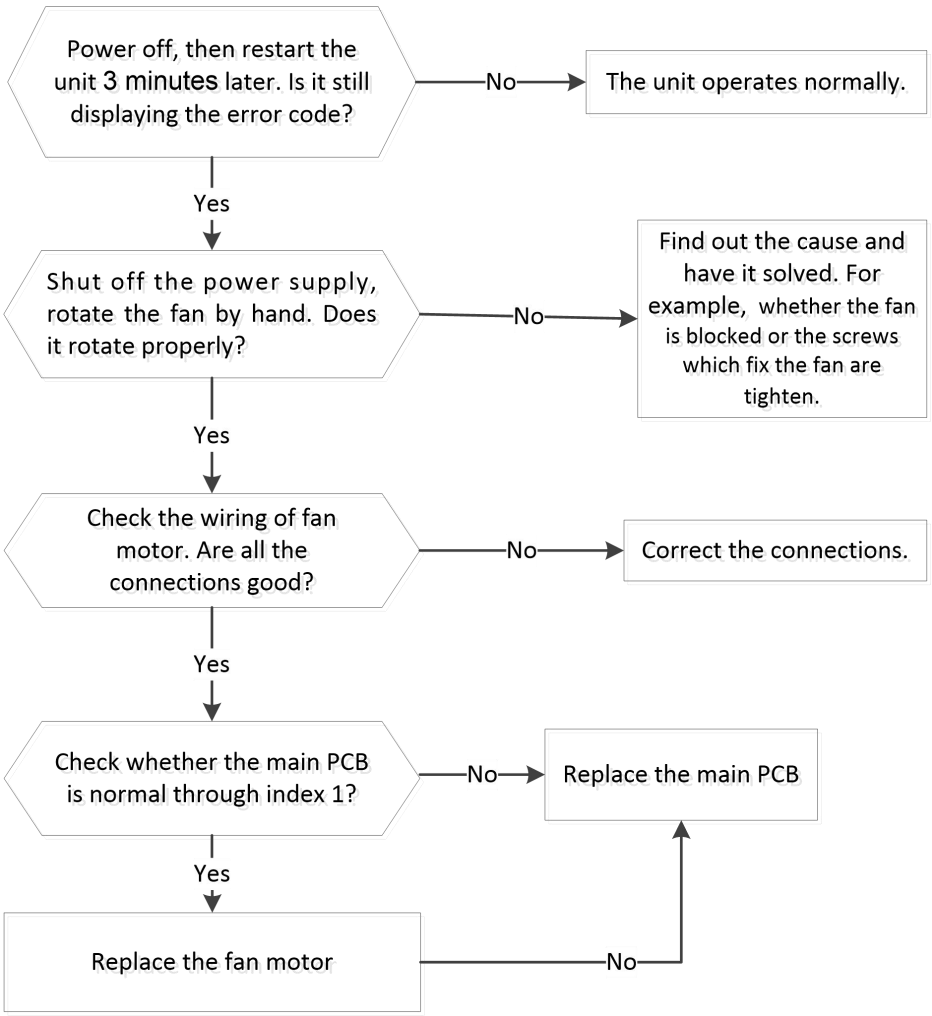


Example of PCB (3zone)

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

Error Code	IDU ERROR F5, ODU ERROR E8
Malfunction decision conditions	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.
Supposed causes	● Wiring mistake ● Fan ass'y faulty ● Fan motor faulty ● PCB faulty

Trouble shooting:



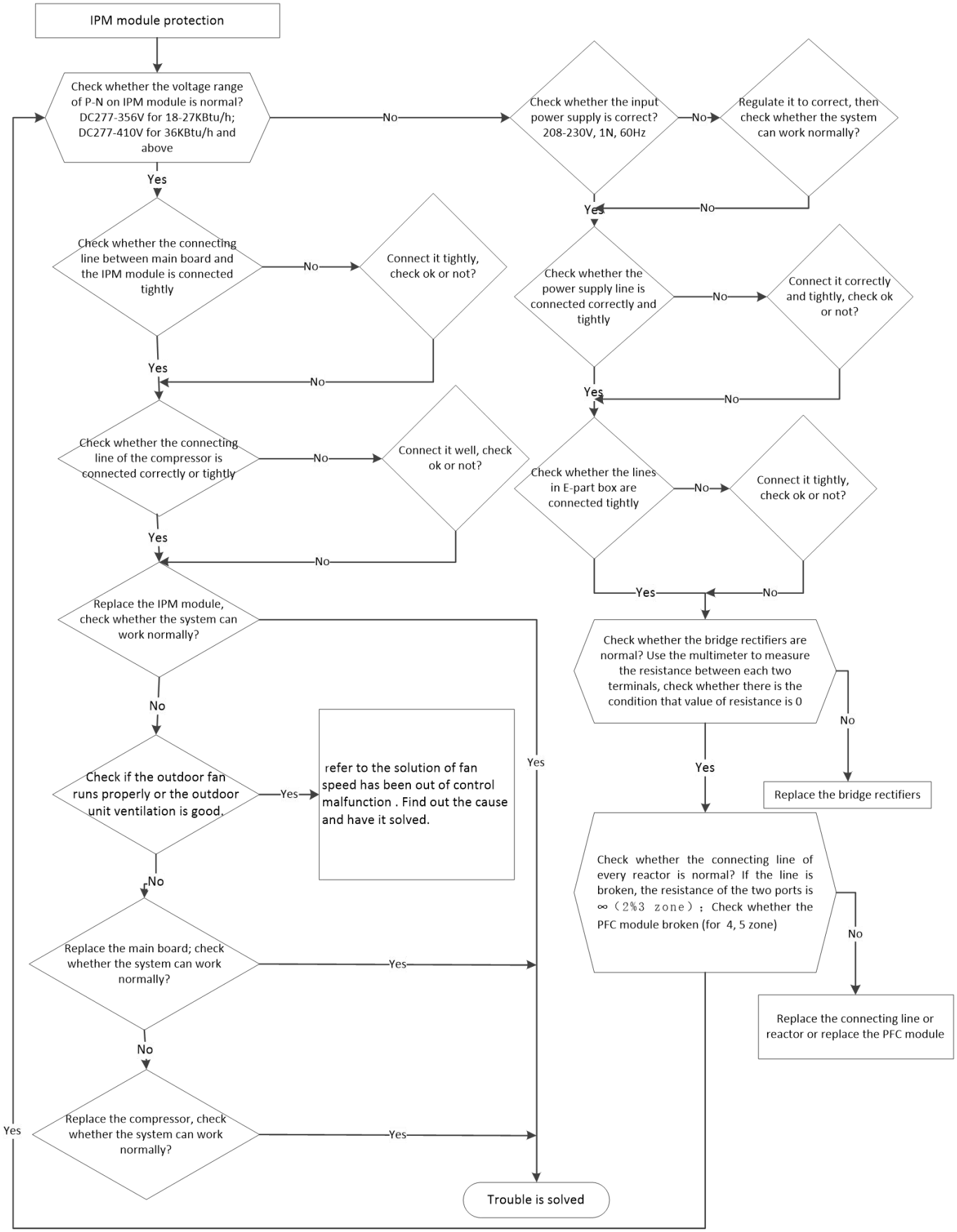
Index 1:

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.

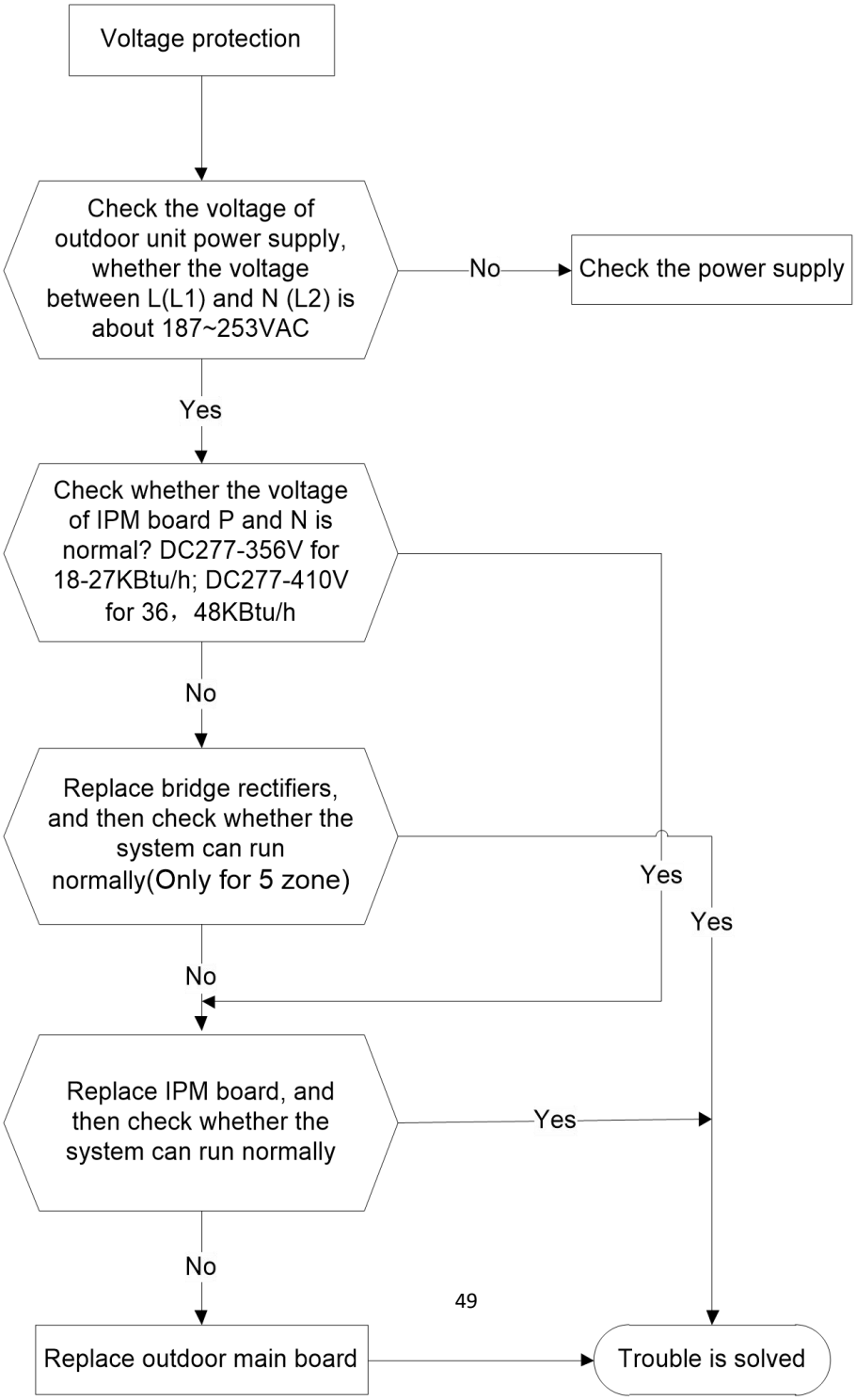
Error code	**IDU ERROR P0, ODU ERROR P6, IPM malfunction** **IDU ERROR P4, ODU ERROR P6, Inverter compressor drive error**
Malfunction decision conditions	When the voltage signal that IPM send to compressor drive chip is abnormal, the ODU display LED will show “P6” and AC will turn off.
Supposed causes	● Wiring mistake ● IPM malfunction ● Outdoor fan ass’y faulty ● Compressor malfunction ● Outdoor PCB faulty

Trouble shooting:


IPM module protection
Check whether the voltage range of P-N on IPM module is normal? DC277-356V for 18-27KBtu/h; DC277-410V for 36KBtu/h and above
No
Check whether the input power supply is correct? 208-230V, 1N, 60Hz
No
Regulate it to correct, then check whether the system can work normally?
Yes
No
Yes
Check whether the connecting line between main board and the IPM module is connected tightly
No
Connect it tightly, check ok or not?
Check whether the power supply line is connected correctly and tightly
No
Connect it correctly and tightly, check ok or not?
Yes
No
Yes
No
Check whether the connecting line of the compressor is connected correctly or tightly
No
Connect it well, check ok or not?
Check whether the lines in E-part box are connected tightly
No
Connect it tightly, check ok or not?
Yes
No
Yes
No
Replace the IPM module, check whether the system can work normally?
Yes
Check whether the bridge rectifiers are normal? Use the multimeter to measure the resistance between each two terminals, check whether there is the condition that value of resistance is 0
No
Replace the bridge rectifiers
No
Check if the outdoor fan runs properly or the outdoor unit ventilation is good.
Yes
refer to the solution of fan speed has been out of control malfunction . Find out the cause and have it solved.
Yes
Yes
Check whether the connecting line of every reactor is normal? If the line is broken, the resistance of the two ports is ∞（2%3 zone）; Check whether the PFC module broken (for 4, 5 zone)
No
Replace the connecting line or reactor or replace the PFC module
No
Replace the main board; check whether the system can work normally?
Yes
No
Replace the compressor, check whether the system can work normally?
Yes
Yes
Trouble is solved

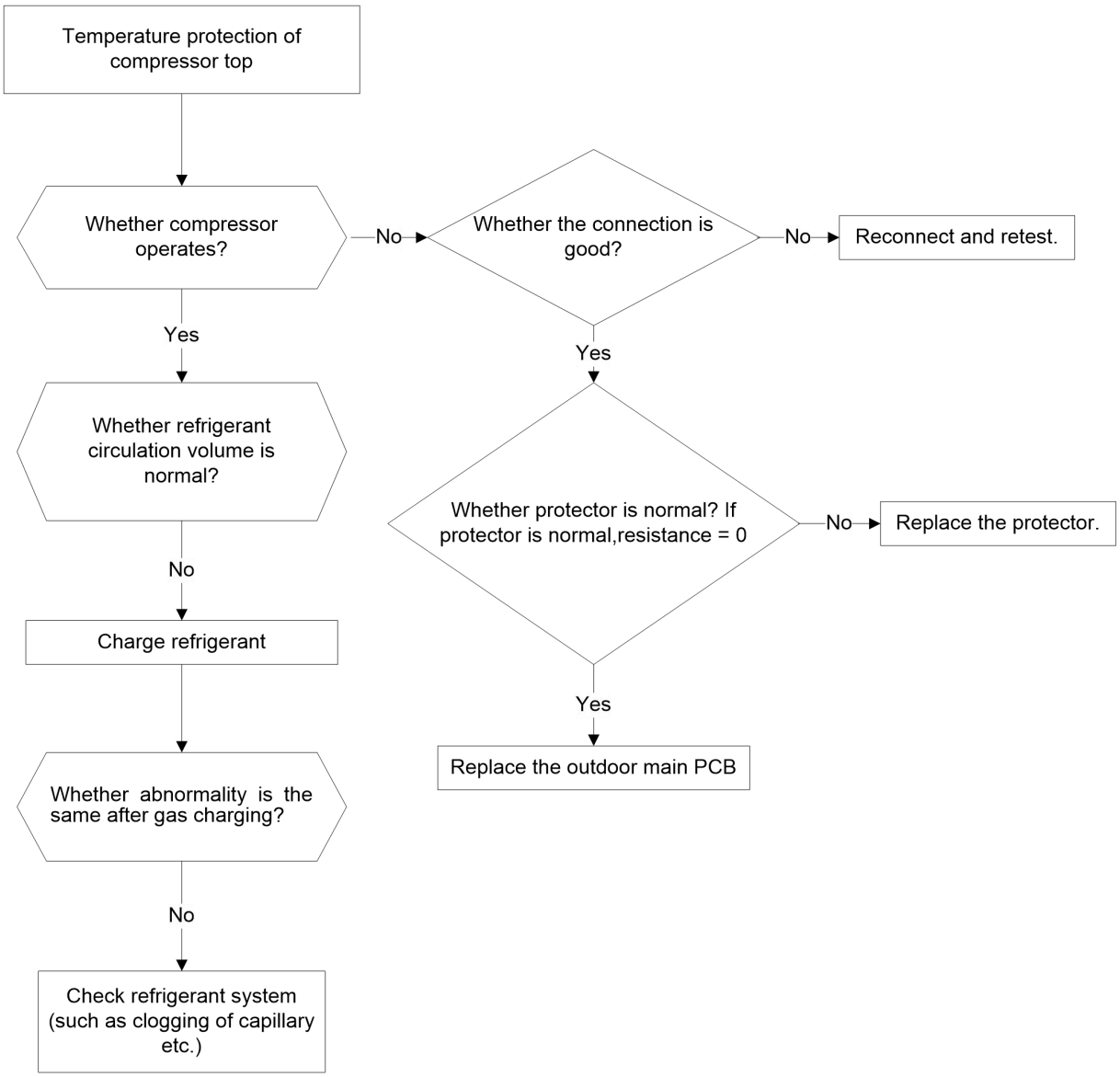
8.4.1.10 Over voltage or too low voltage protection diagnosis and solution.

Error code	IDU ERROR P1, ODU ERROR E5
Malfunction decision conditions	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
Supposed causes	● Power supply abnormal ● Wiring mistake ● Bridge rectifier faulty ● IPM board faulty



8.4.1.11 Temperature protection of compressor top diagnosis and solution.

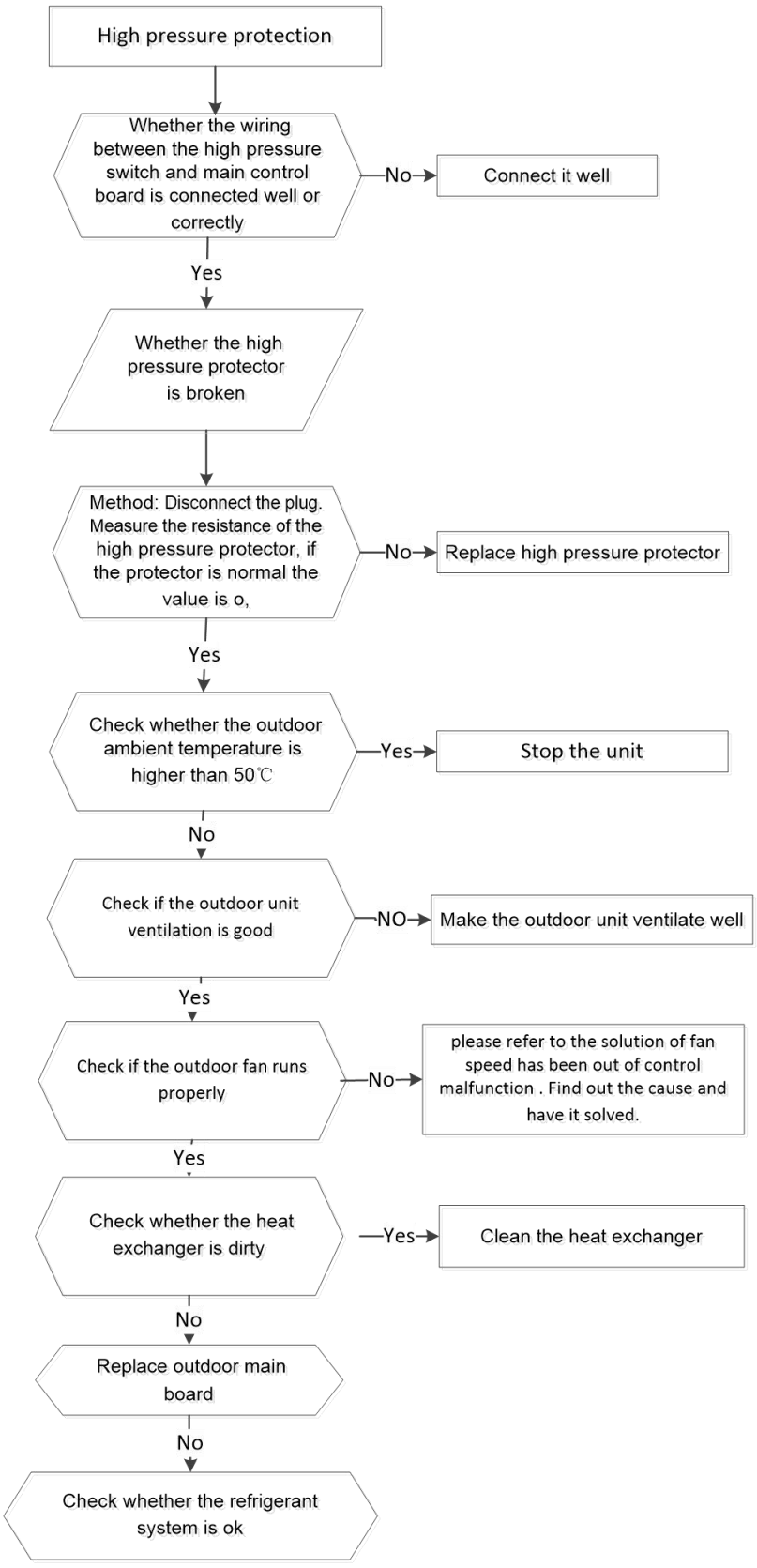
Error code	IDU ERROR P2, ODU ERROR P0
Malfunction decision conditions	If the sampling voltage is not 5V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Over load protector faulty ● System block ● Outdoor PCB faulty

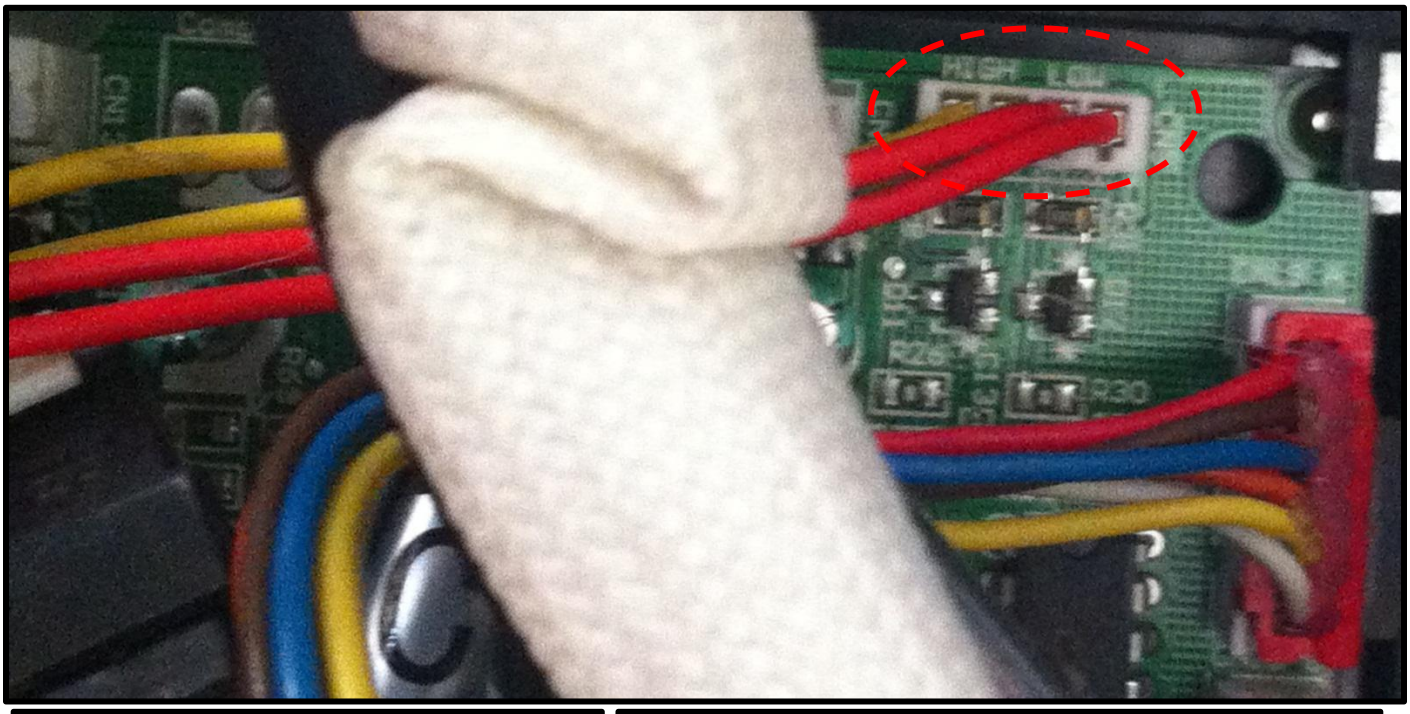


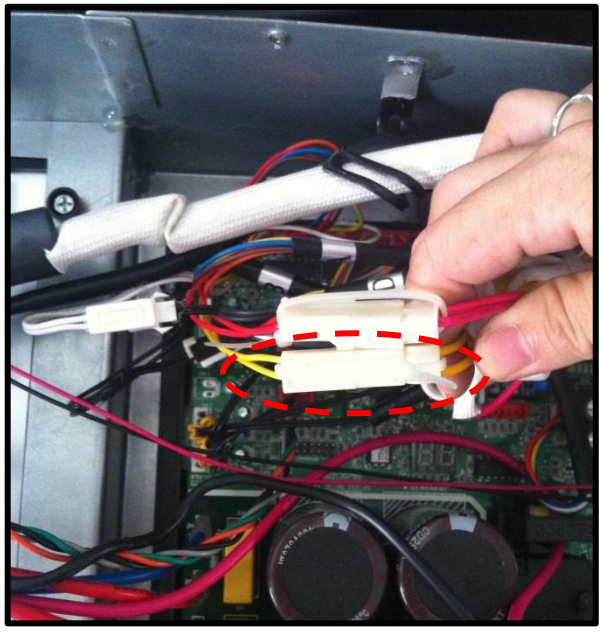
8.4.1.12 P1 (High pressure protection) error diagnosis and solution.

Error Code	IDU ERROR P2, ODU ERROR P1
Malfunction decision conditions	If the sampling voltage is not 5V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Over load protector faulty ● System block ● Outdoor PCB faulty

Trouble shooting:


High pressure protection
Whether the wiring between the high pressure switch and main control board is connected well or correctly
No
Connect it well
Yes
Whether the high pressure protector is broken
Method: Disconnect the plug. Measure the resistance of the high pressure protector, if the protector is normal the value is o,
No
Replace high pressure protector
Yes
Check whether the outdoor ambient temperature is higher than 50℃
Yes
Stop the unit
No
Check if the outdoor unit ventilation is good
NO
Make the outdoor unit ventilate well
Yes
Check if the outdoor fan runs properly
No
please refer to the solution of fan speed has been out of control malfunction . Find out the cause and have it solved.
Yes
Check whether the heat exchanger is dirty
Yes
Clean the heat exchanger
No
Replace outdoor main board
No
Check whether the refrigerant system is ok



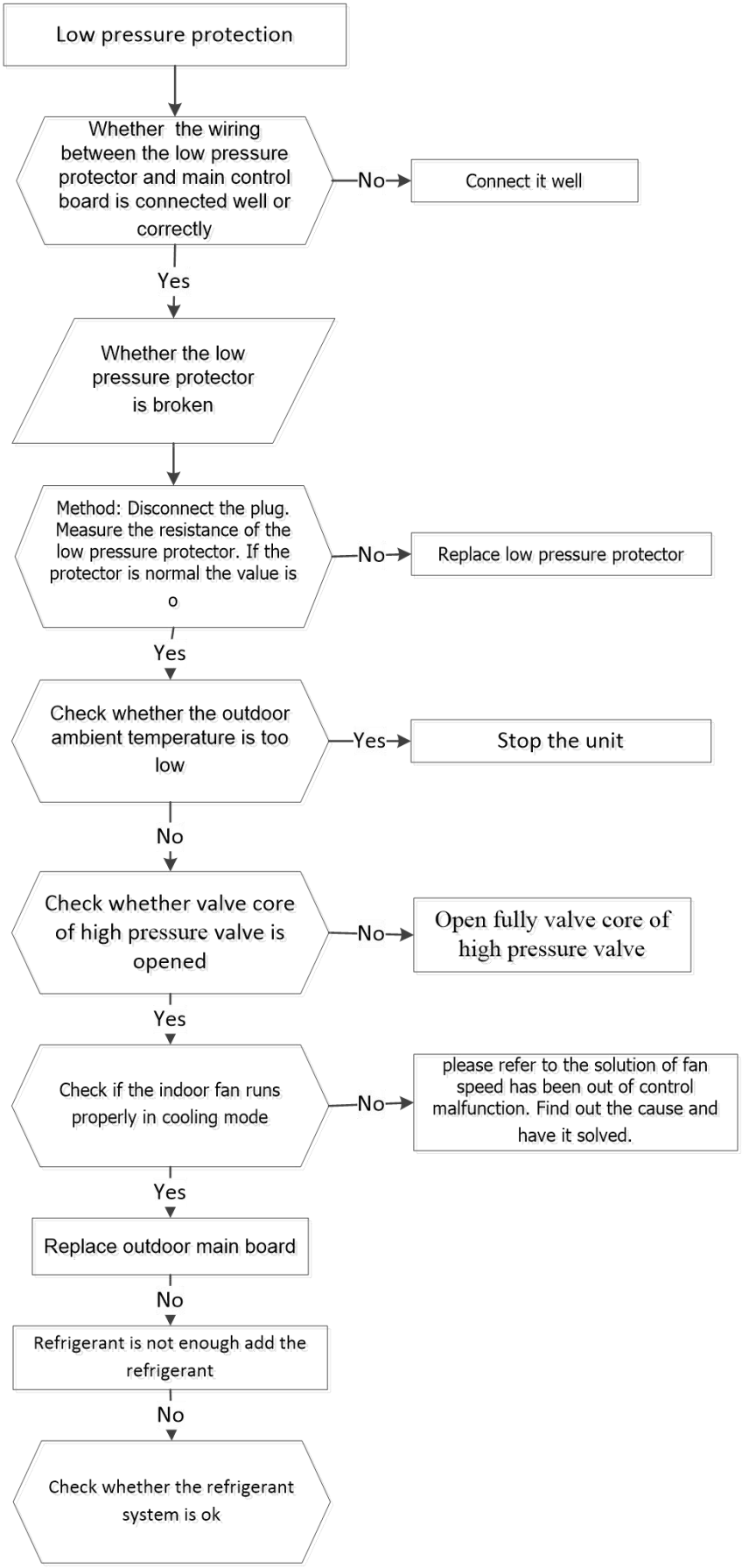


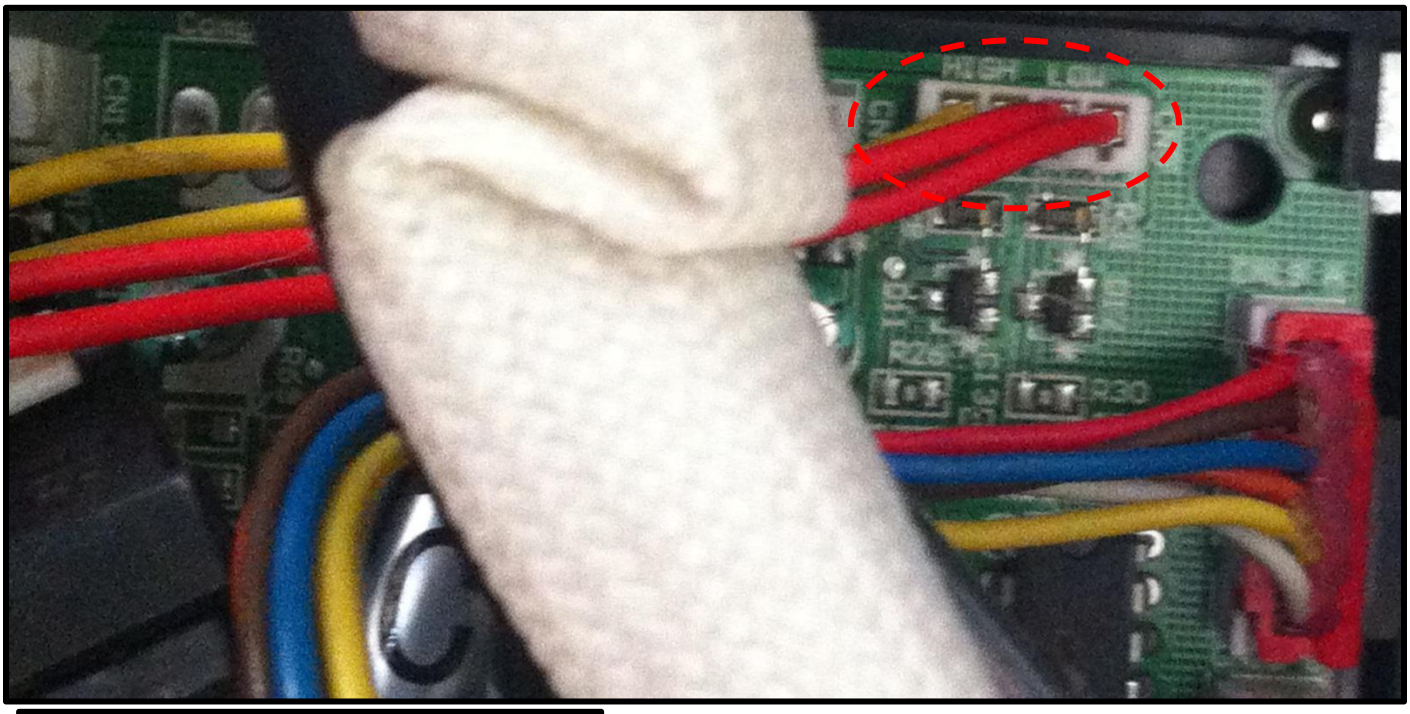

FLUKE
OFF
300mV

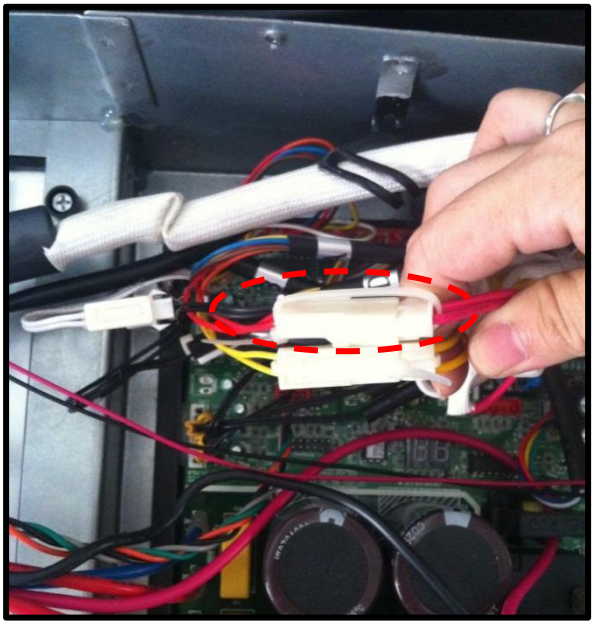
8.4.2.13 Low pressure protection error diagnosis and solution.

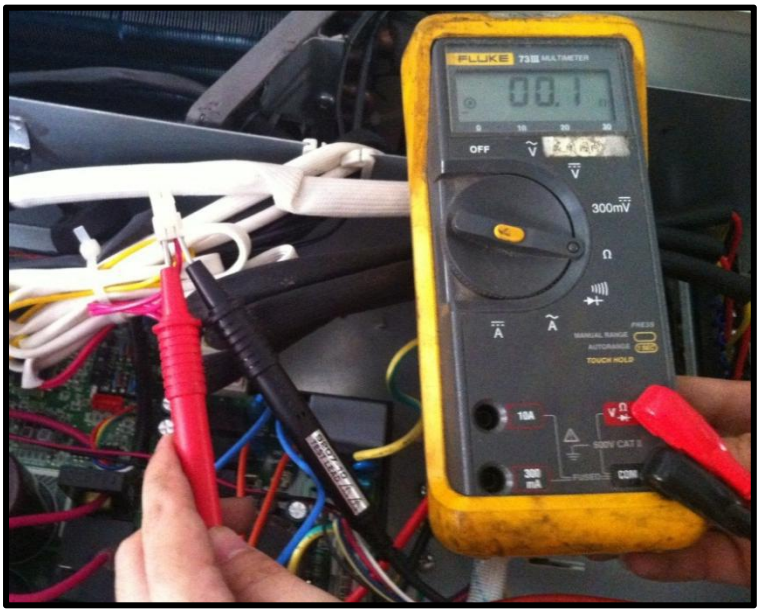
Error Code	IDU ERROR P2, ODU ERROR P2
Malfunction decision conditions	If the sampling voltage is not 5V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Over load protector faulty ● System block ● Outdoor PCB faulty

Trouble shooting:


Low pressure protection
Whether the wiring between the low pressure protector and main control board is connected well or correctly
No
Connect it well
Yes
Whether the low pressure protector is broken
Method: Disconnect the plug. Measure the resistance of the low pressure protector. If the protector is normal the value is o
No
Replace low pressure protector
Yes
Check whether the outdoor ambient temperature is too low
Yes
Stop the unit
No
Check whether valve core of high pressure valve is opened
No
Open fully valve core of high pressure valve
Yes
Check if the indoor fan runs properly in cooling mode
No
please refer to the solution of fan speed has been out of control malfunction. Find out the cause and have it solved.
Yes
Replace outdoor main board
No
Refrigerant is not enough add the refrigerant
No
Check whether the refrigerant system is ok

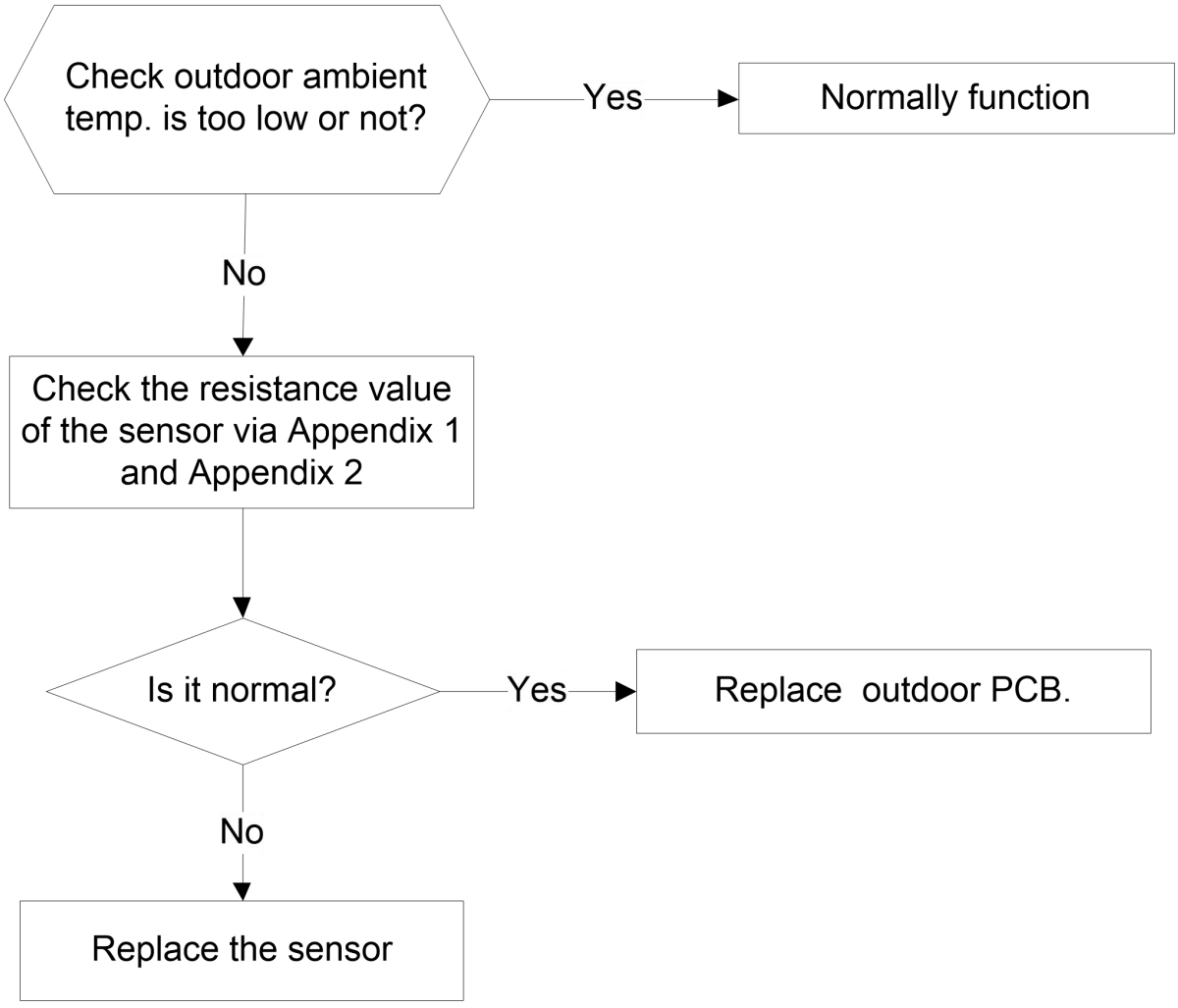





FLUKE
OFF
300mV
Ω
10A

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	● Outdoor ambient temperature too low. ● Outdoor ambient temperature sensor defective. ● Oudoor PCB defective.



8.4.1.15 Mode conflict.

Error Code	P5
Malfunction decision conditions	The indoor units cannot work cooling mode and heating at same time. Heating mode has a priority.
Unit action	● 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. ● 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.

	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

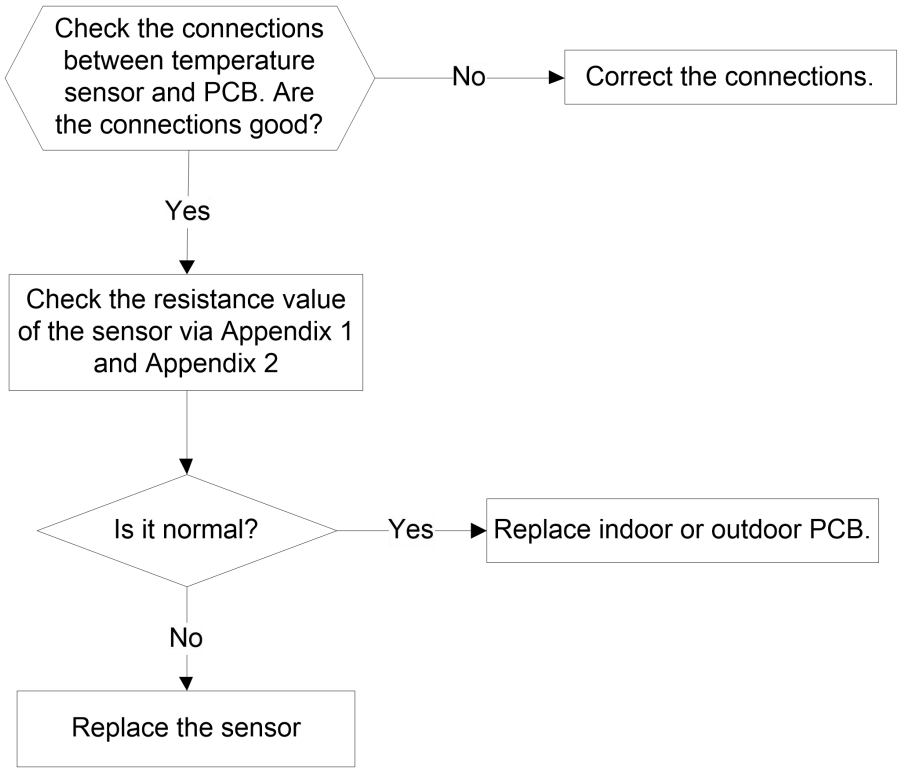
No: No mode conflict;

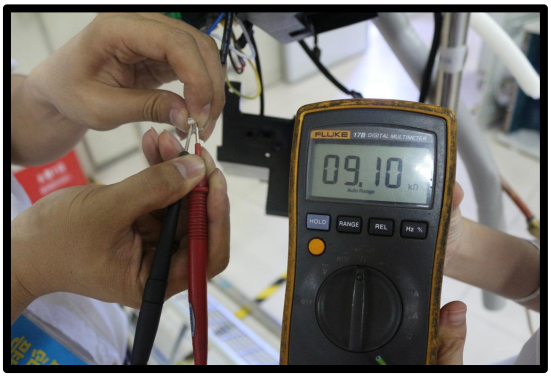
Yes: Mode conflict

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

Malfunction decision conditions	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
Supposed causes	● Wiring mistake ● Sensor faulty ● PCB faulty

Trouble shooting:


Check the connections between temperature sensor and PCB. Are the connections good?
No
Correct the connections.
Yes
Check the resistance value of the sensor via Appendix 1 and Appendix 2
Is it normal?
Yes
Replace indoor or outdoor PCB.
No
Replace the sensor

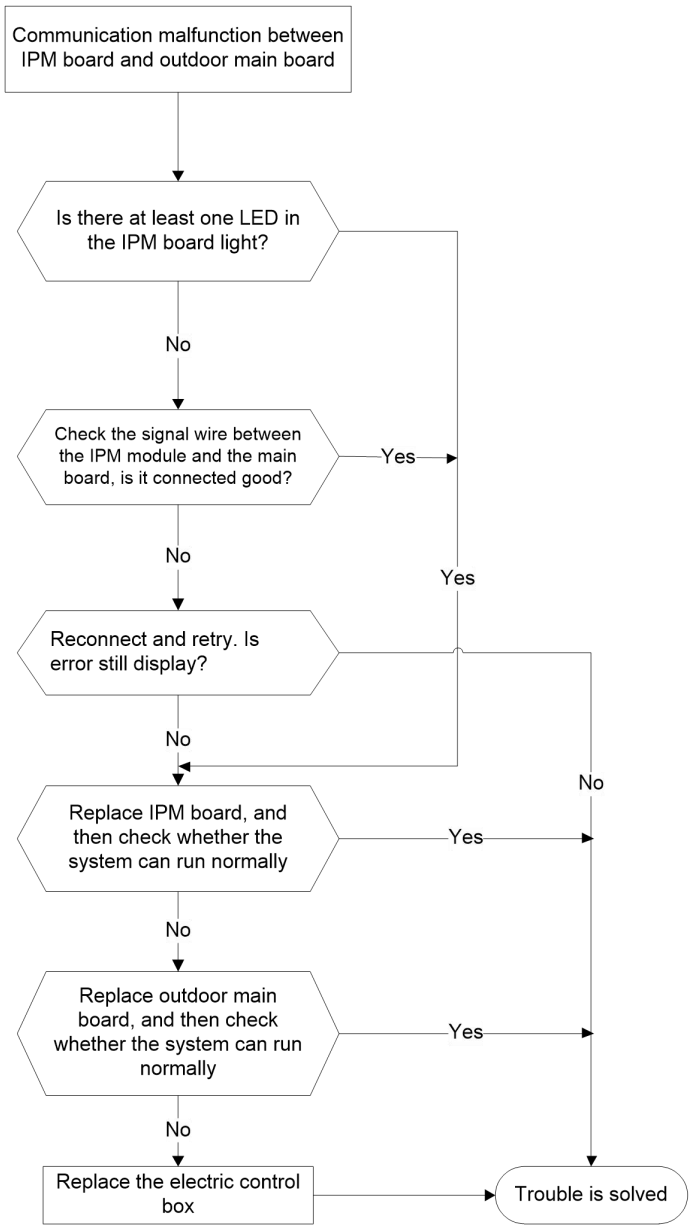

FLUKE
09.10
HOLD
RANGE
REL

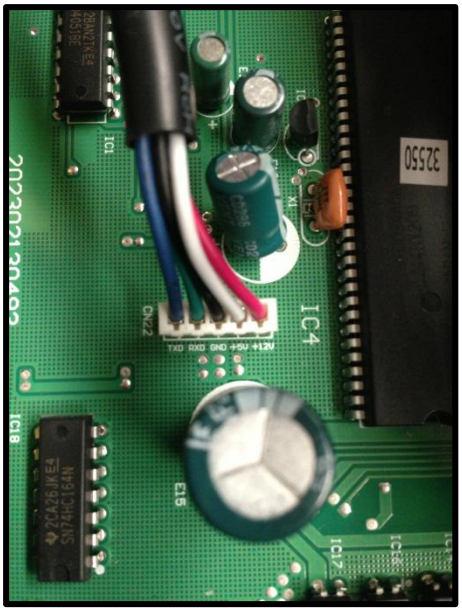
8.4.2. Outdoor unit error code (if there is a correspond error code on indoor unit, pls refer indoor unit error code)

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

Error Code	E3
Malfunction decision conditions	PCB main chip does not receive feedback from IPM module during 60 seconds.
Supposed causes	● Wiring mistake ● PCB faulty

Trouble shooting:

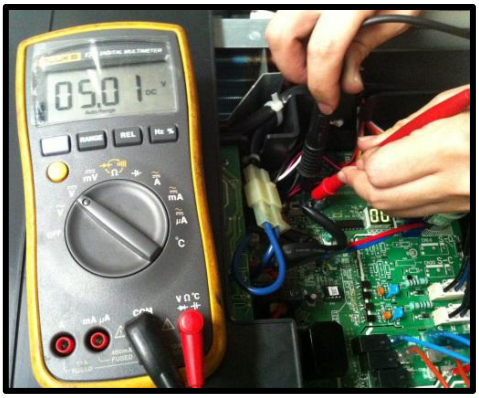


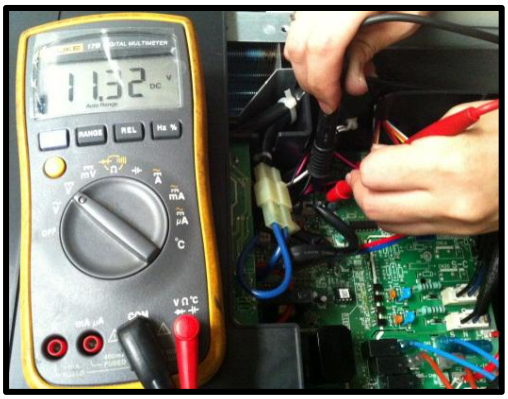


Remark:

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.

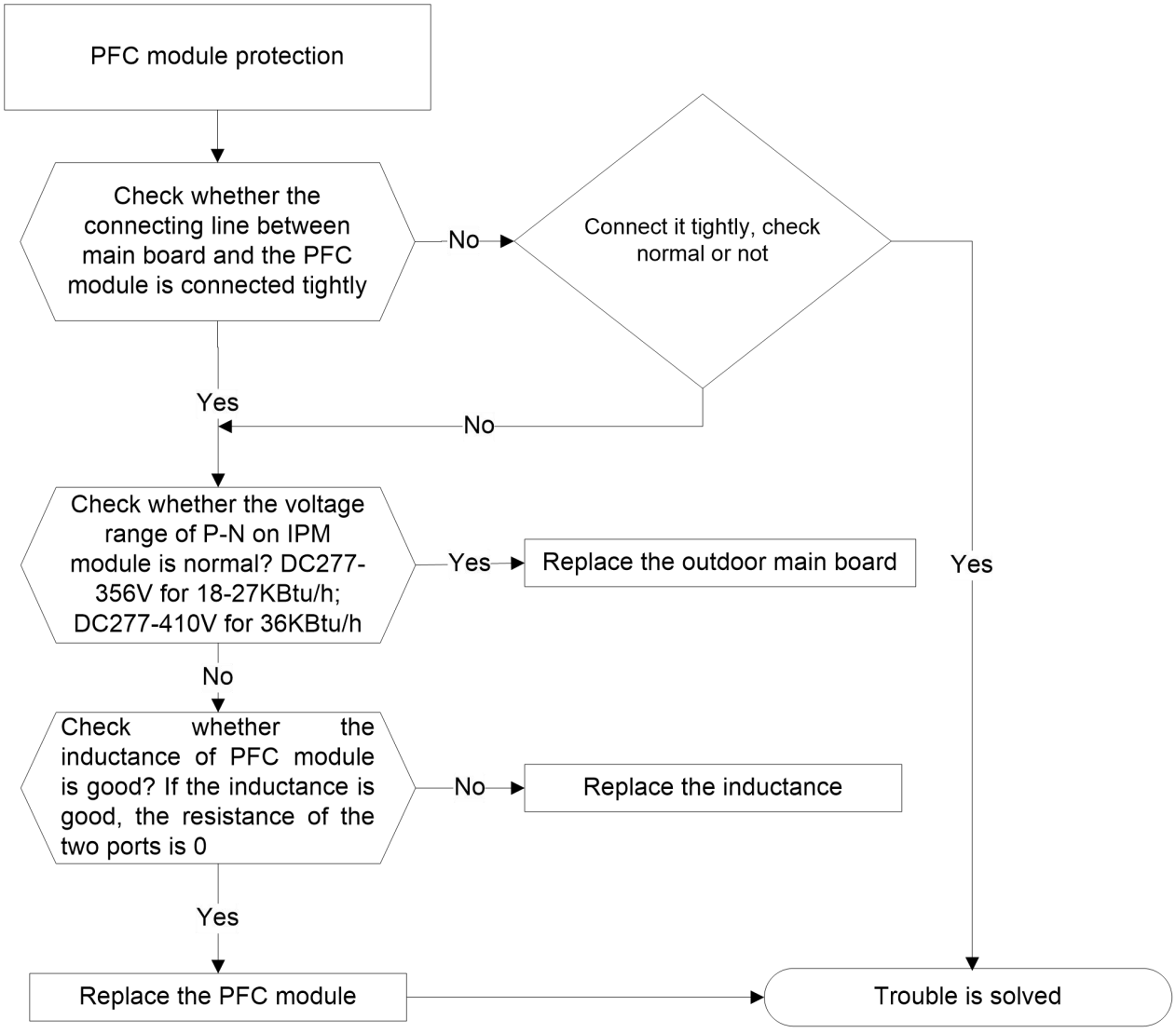


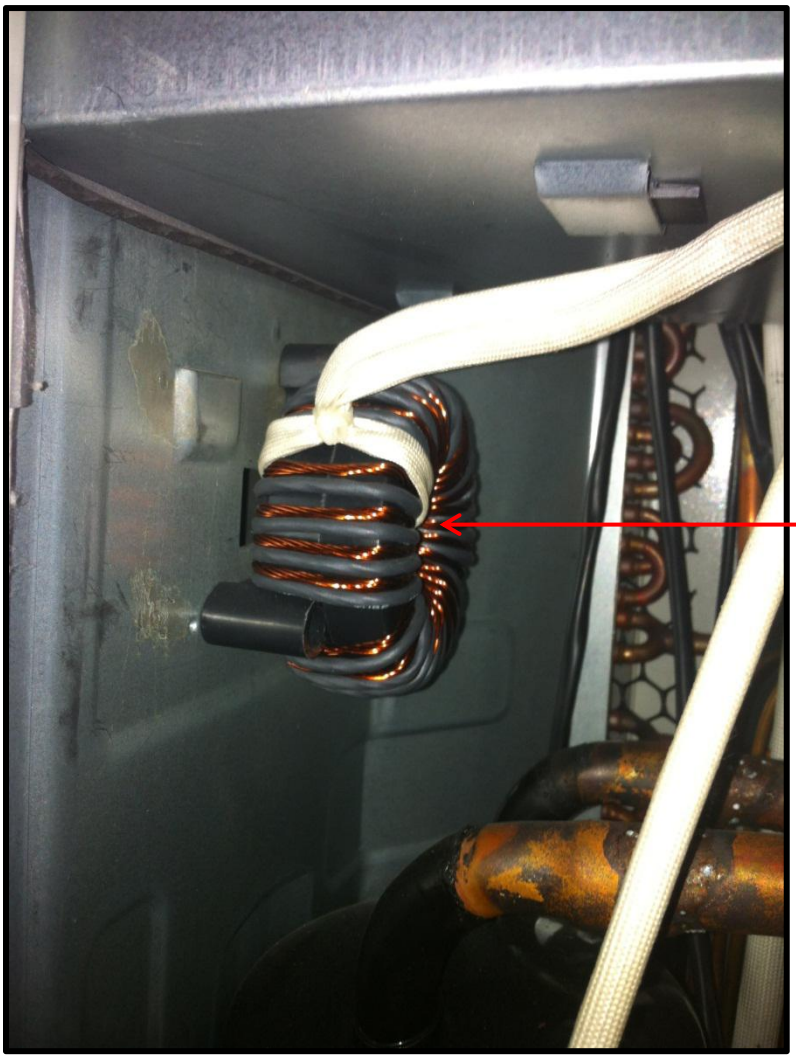


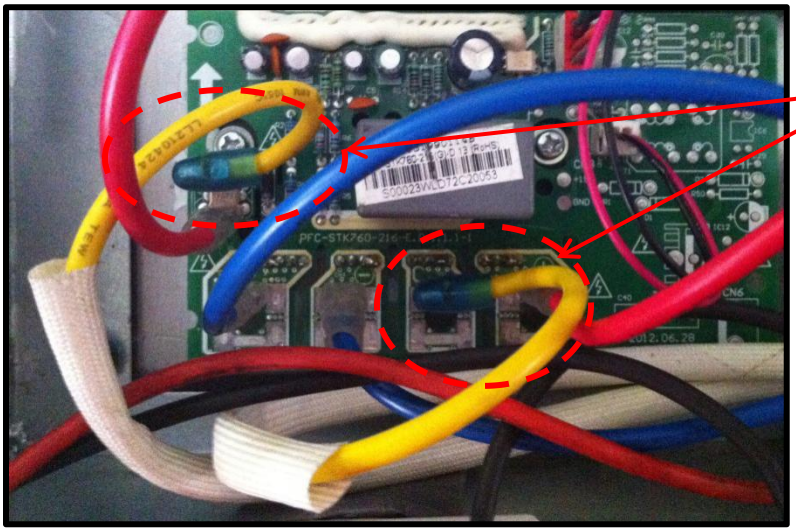
8.4.2.2 PFC module protection) error diagnosis and solution. (For 36K and 48k)

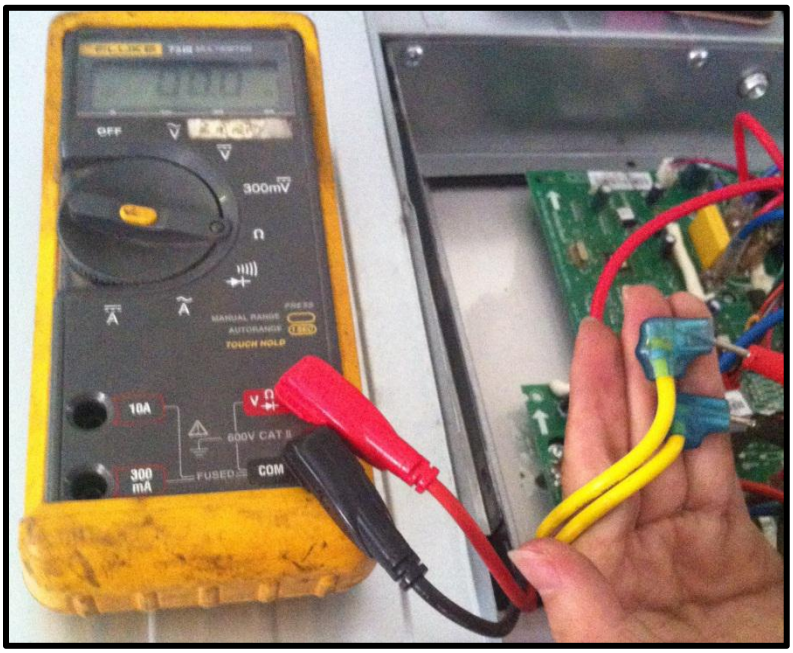
Error Code	ODU ERROR E6
Malfunction decision conditions	When the voltage signal that PFC sends to main control board is abnormal, the display LED will show “E6” and AC will turn off.
Supposed causes	● Wiring mistake ● Outdoor PCB faulty ● Inductance of PFC module faulty ● PFC module malfunction

Trouble shooting:




Inductance

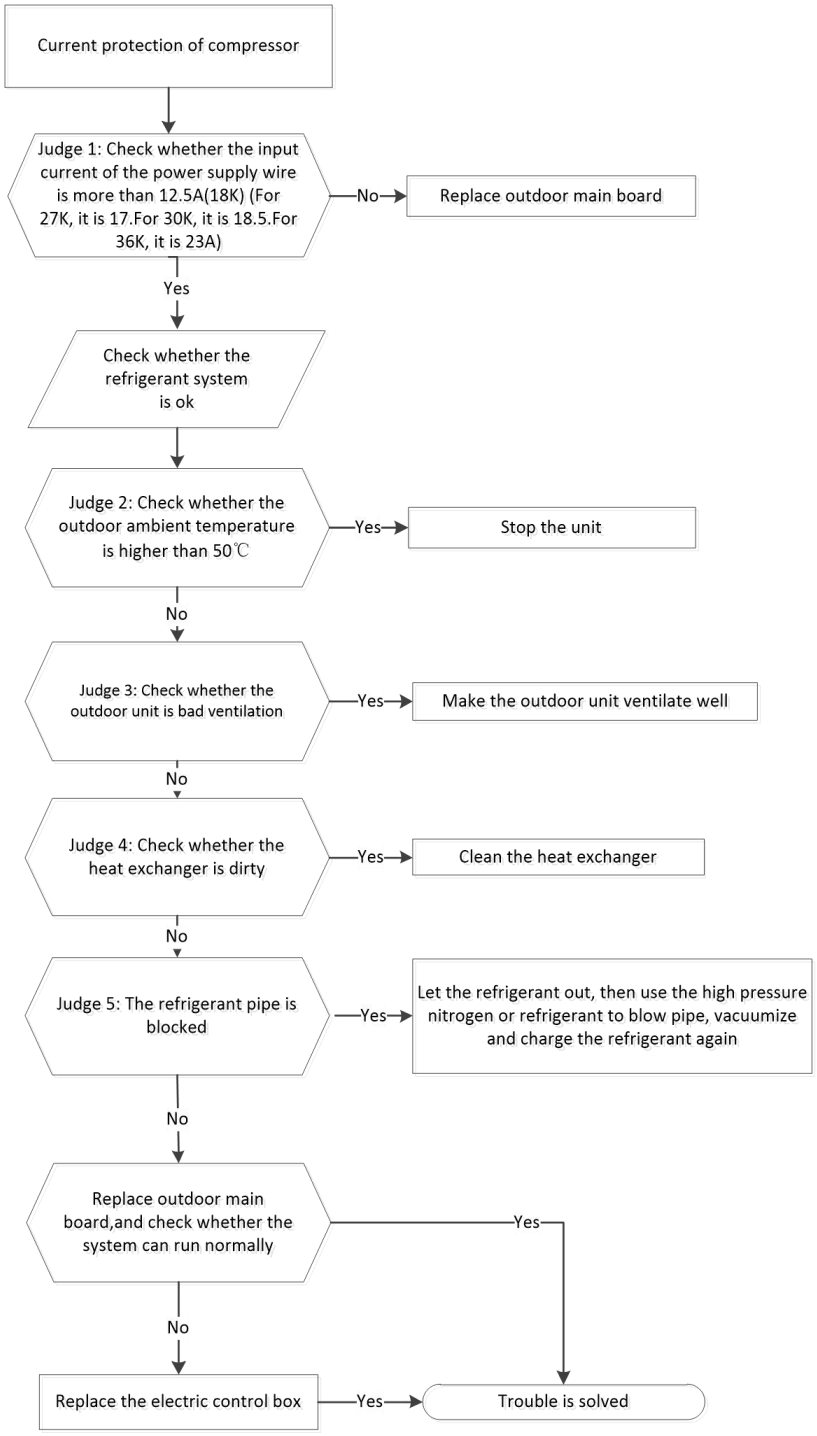

Two ports of the inductance


OFF
300mV
MANUAL RANGE
AUTORANGE
TOUCH HOLD
10A
300 mA
FUSED
COM

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	● Wiring mistake ● Over load protector faulty ● System block ● Outdoor PCB faulty

Trouble shooting:


Current protection of compressor
Judge 1: Check whether the input current of the power supply wire is more than 12.5A(18K) (For 27K, it is 17.For 30K, it is 18.5.For 36K, it is 23A)
No
Replace outdoor main board
Yes
Check whether the refrigerant system is ok
Judge 2: Check whether the outdoor ambient temperature is higher than 50℃
Yes
Stop the unit
No
Judge 3: Check whether the outdoor unit is bad ventilation
Yes
Make the outdoor unit ventilate well
No
Judge 4: Check whether the heat exchanger is dirty
Yes
Clean the heat exchanger
No
Judge 5: The refrigerant pipe is blocked
Yes
Let the refrigerant out, then use the high pressure nitrogen or refrigerant to blow pipe, vacuumize and charge the refrigerant again
No
Replace outdoor main board,and check whether the system can run normally
Yes
No
Replace the electric control box
Yes
Trouble is solved

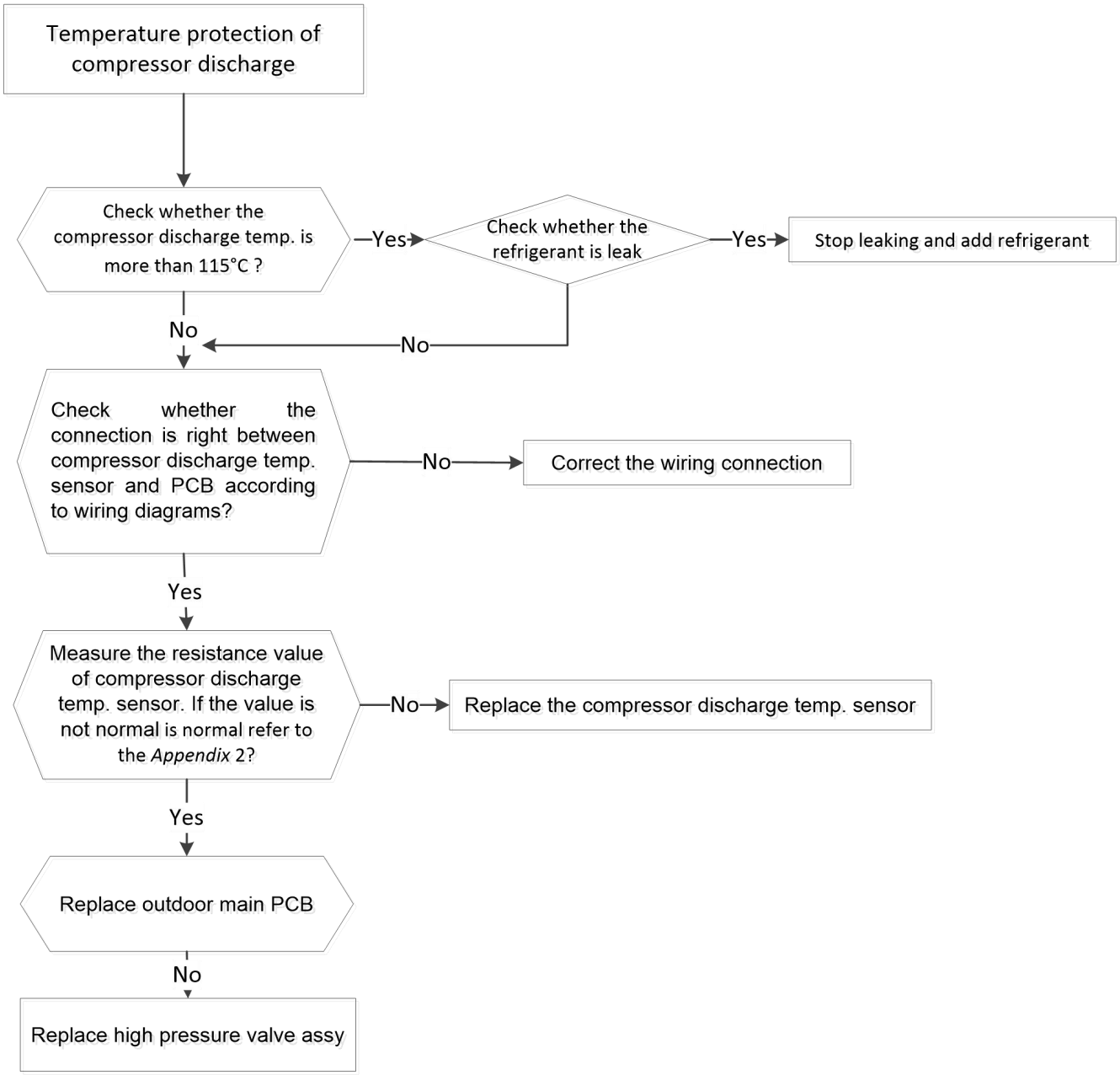

HIOKI 3282
6.53
DIGITAL CLAMP ON HITESTER
CAT IV
600V
COM
TEMP


HIOKI 3282
6.61
DIGITAL CLAMP ON HITESTER
CAT IV
600V
COM
TEMP

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	● Refrigerant leakage ● Wiring mistake ● The discharge temperature sensor faulty ● Outdoor PCB faulty

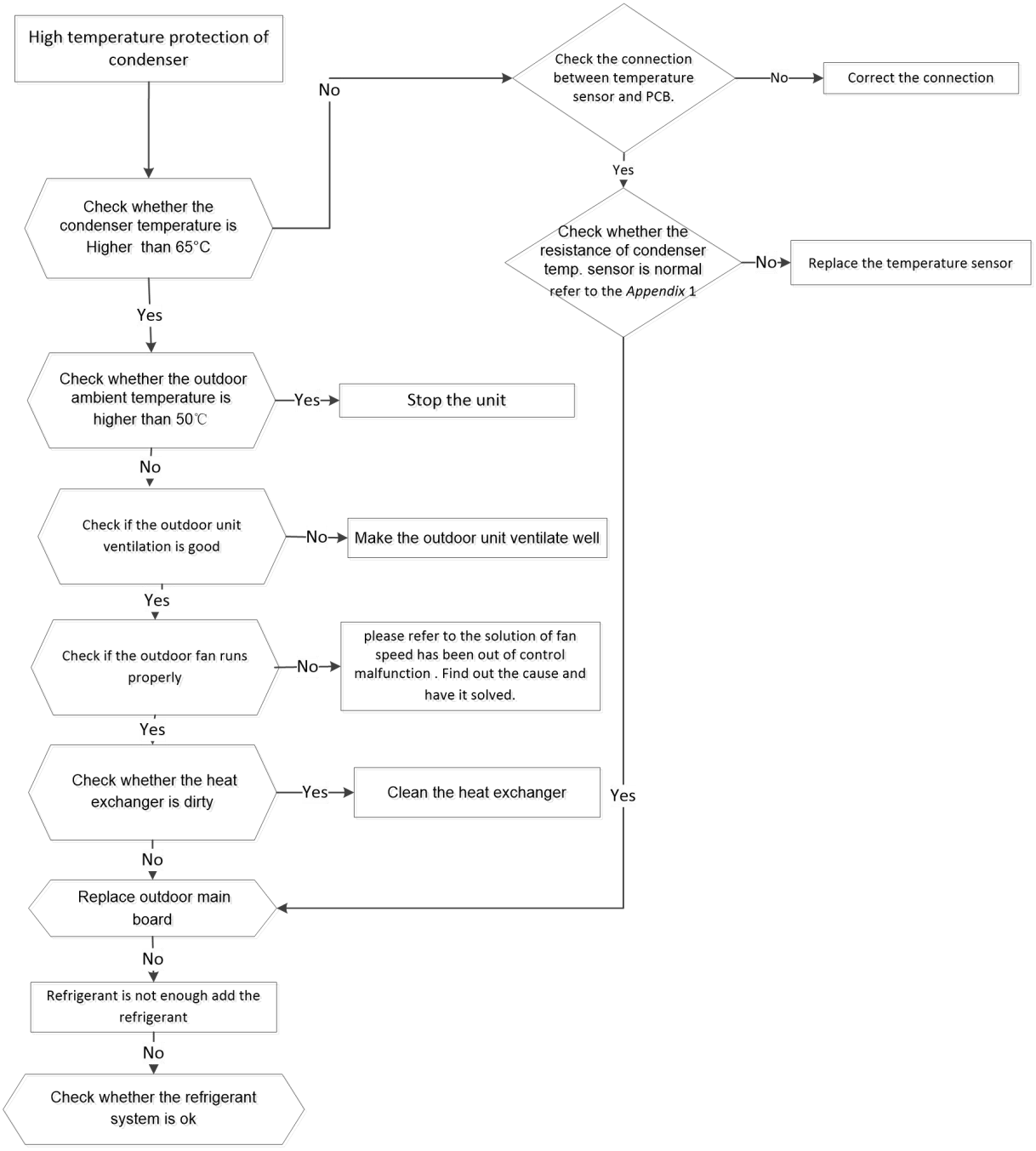
Trouble shooting:



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	● The condenser temperature sensor faulty ● Heat exchanger dirty ● System block

Trouble shooting:


High temperature protection of condenser
Check whether the condenser temperature is Higher than 65°C
No
Check the connection between temperature sensor and PCB.
No
Correct the connection
Yes
Check whether the resistance of condenser temp. sensor is normal refer to the Appendix 1
No
Replace the temperature sensor
Yes
Check whether the outdoor ambient temperature is higher than 50℃
Yes
Stop the unit
No
Check if the outdoor unit ventilation is good
No
Make the outdoor unit ventilate well
Yes
Check if the outdoor fan runs properly
No
please refer to the solution of fan speed has been out of control malfunction . Find out the cause and have it solved.
Yes
Check whether the heat exchanger is dirty
Yes
Clean the heat exchanger
Yes
No
Replace outdoor main board
No
Refrigerant is not enough add the refrigerant
No
Check whether the refrigerant system is ok

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.

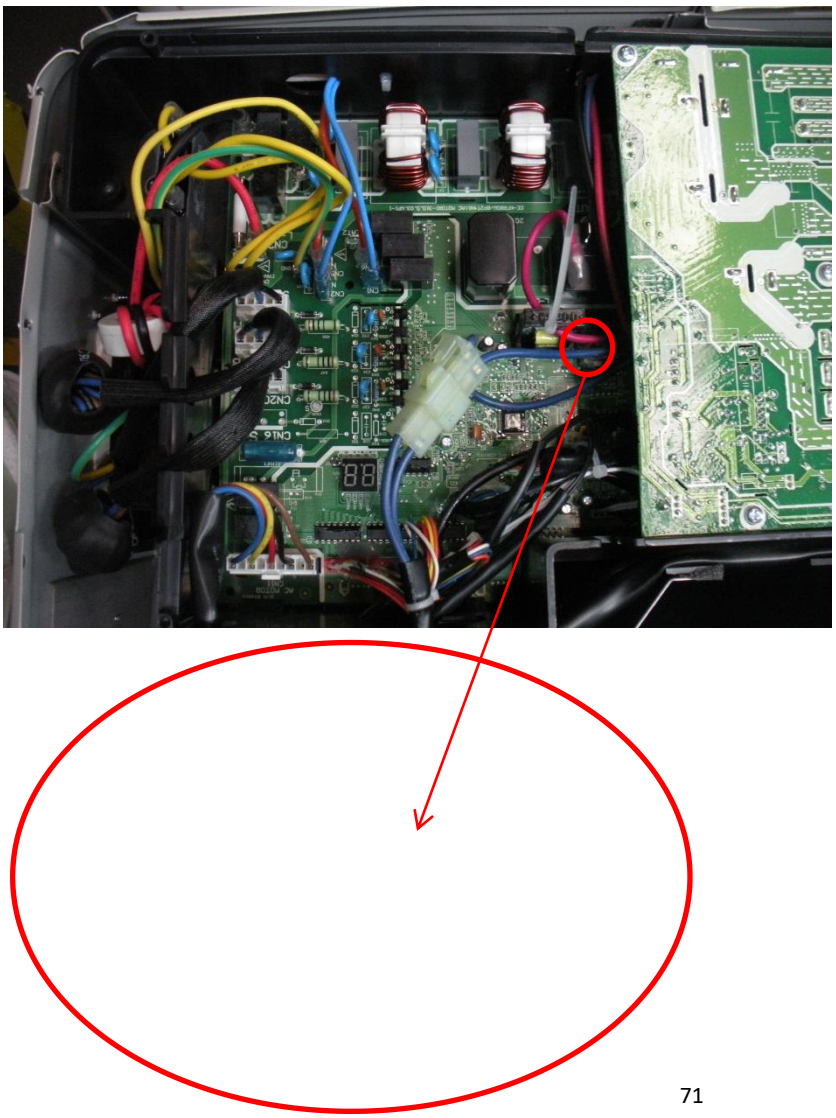
8.4.2.7 When cooling, heat exchanger of non-operating indoor unit frosts.

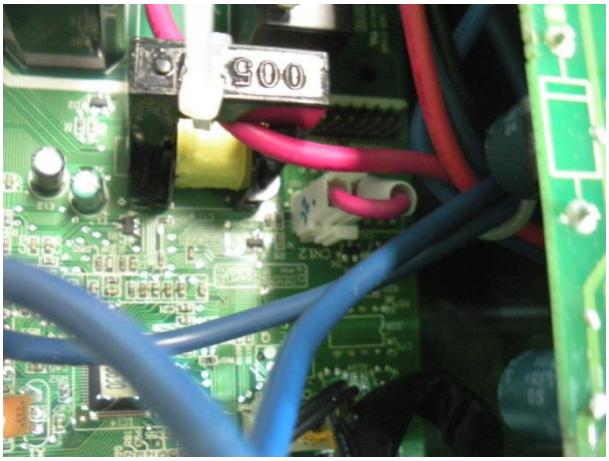
When heating, non-operating indoor unit get warm.

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".

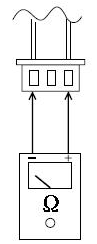




8.5 Trouble Criterion Of Main Parts.

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 (℃--K)

℃	K Ohm	℃	K Ohm	℃	K Ohm	℃	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

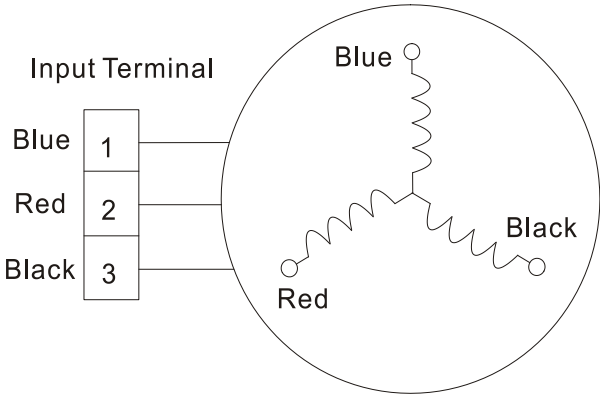
Unit: ℃---K			Discharge temp. sensor table				
-20	542.7	20	68.66	60	13.59	100	3.702
-19	511.9	21	65.62	61	13.11	101	3.595
-18	483	22	62.73	62	12.65	102	3.492
-17	455.9	23	59.98	63	12.21	103	3.392
-16	430.5	24	57.37	64	11.79	104	3.296
-15	406.7	25	54.89	65	11.38	105	3.203
-14	384.3	26	52.53	66	10.99	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℃)=5KΩ±3%	
18	75.24	58	14.62	98	3.927		
19	71.86	59	14.09	99	3.812		

Appendix 3:

℃	10	11	12	13	14	15	16	17	18	19	20	21	22
℉	48	50	52	54	56	58	60	62	64	66	68	70	72
℃	23	24	25	26	27	28	29	30	31	32	33	34	35
℉	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

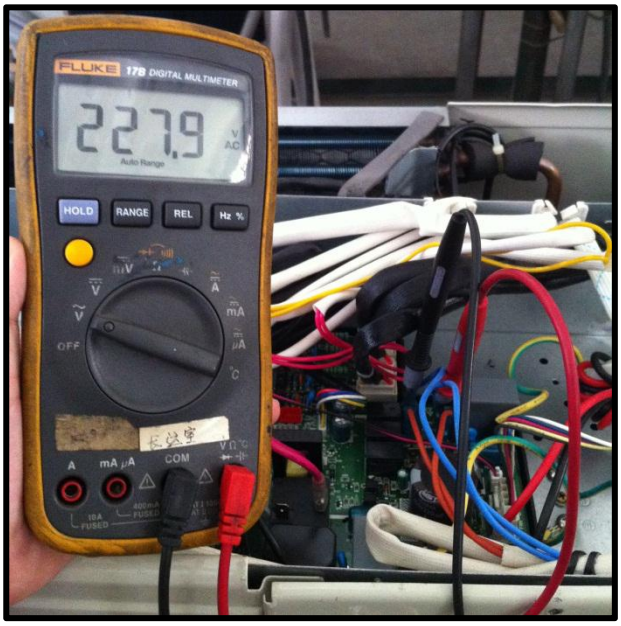
Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

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

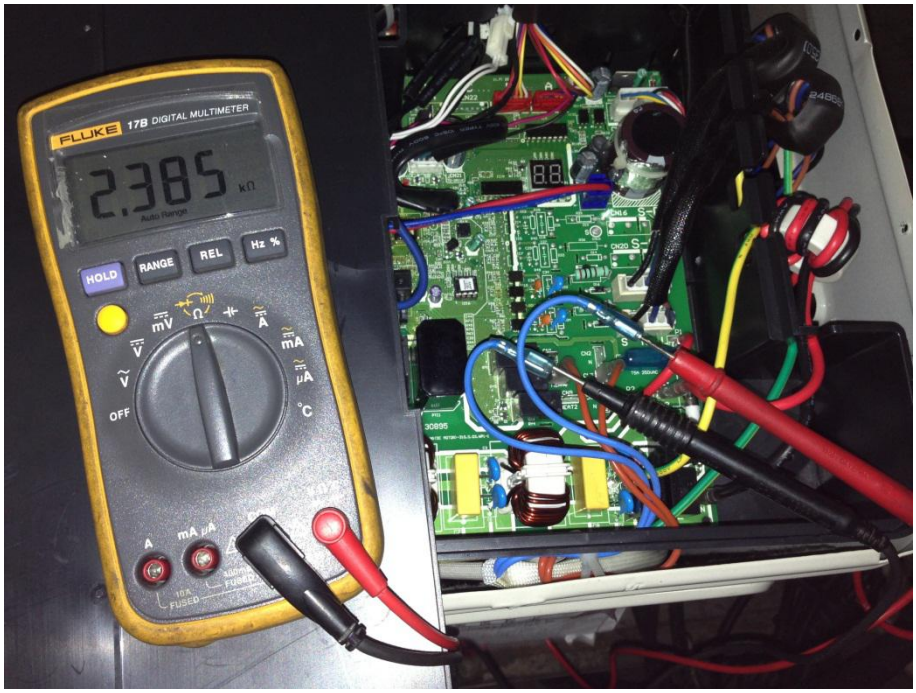
4 .4-way valve

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.

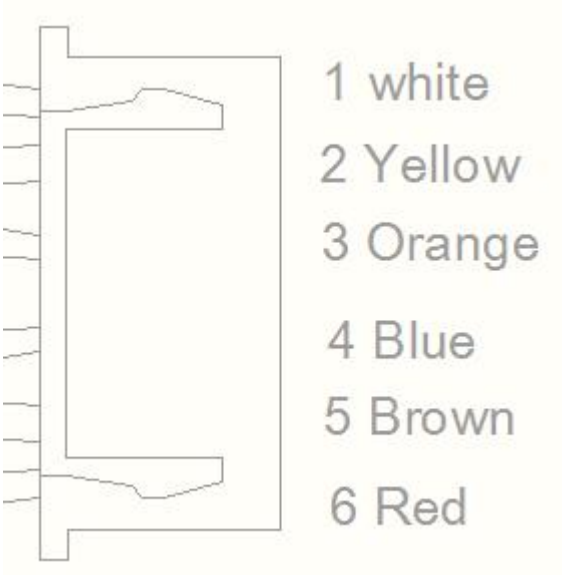


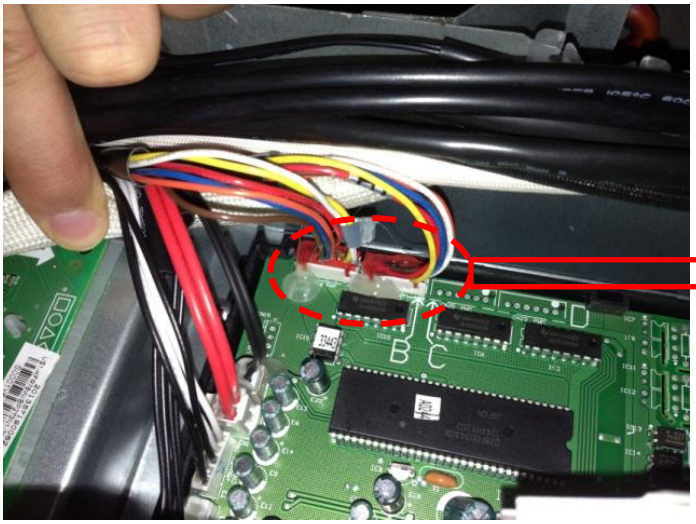
2 Turn off the power, use a digital tester to measure the resistance. The value should be 1.8~2.5 KΩ.

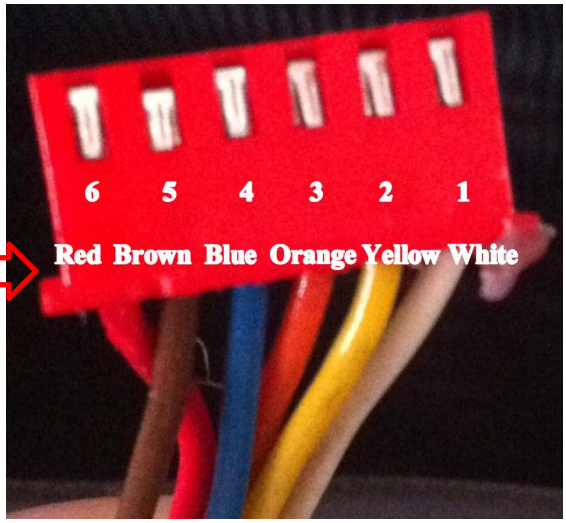


5.EXV check

Disconnect the connectors.

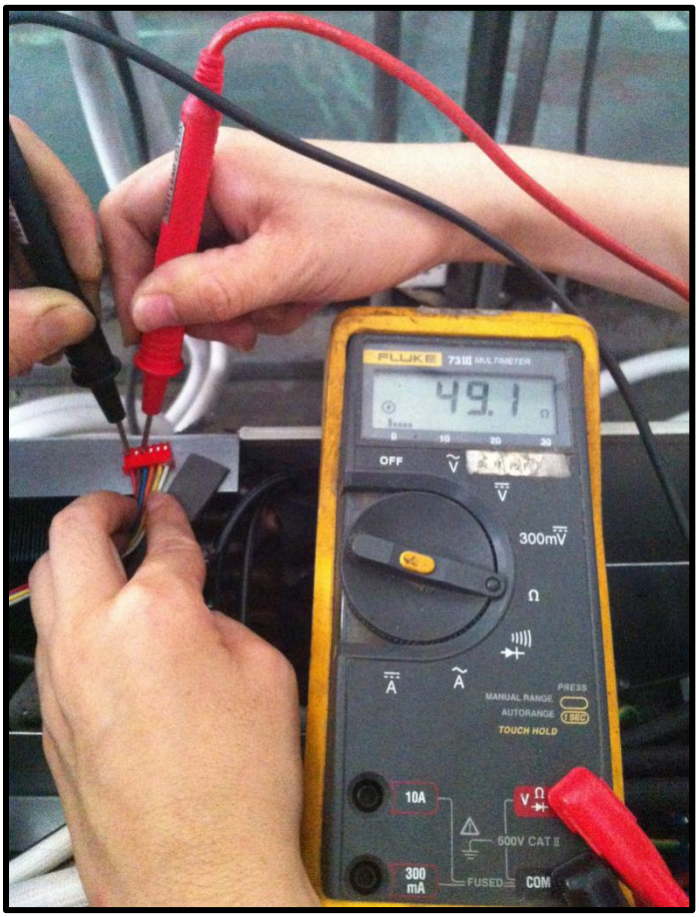






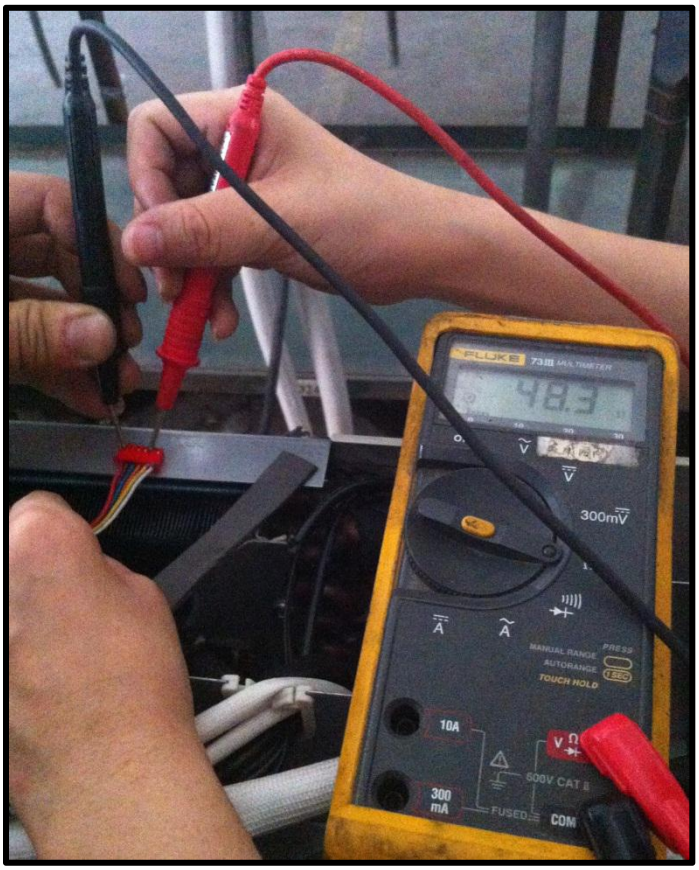
Resistance to EXV coil

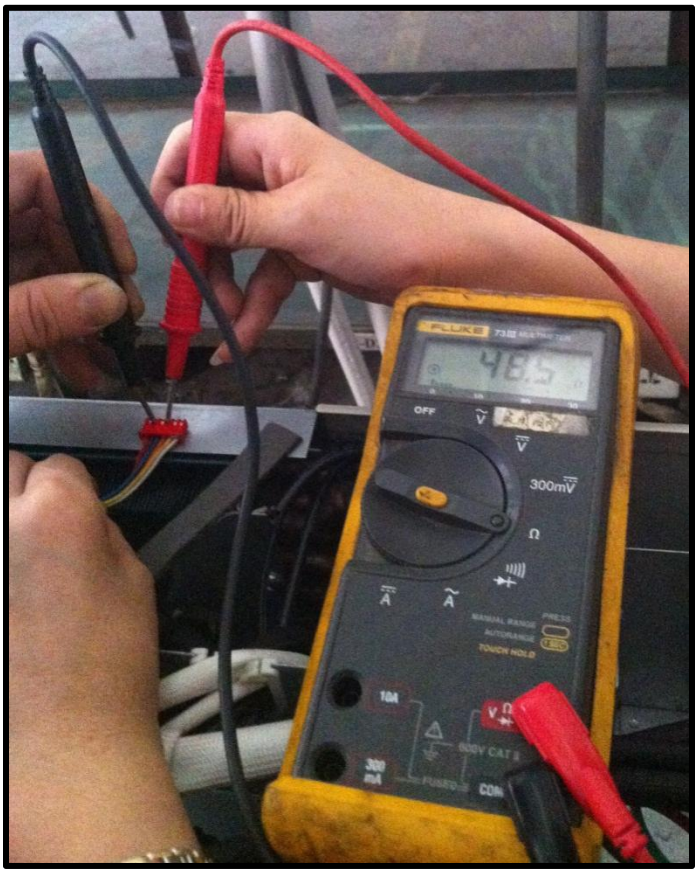
Color of lead wire	Normal Value
Red- Blue	About 50Ω
Red - Yellow	
Brown-Orange	
Brown-White	



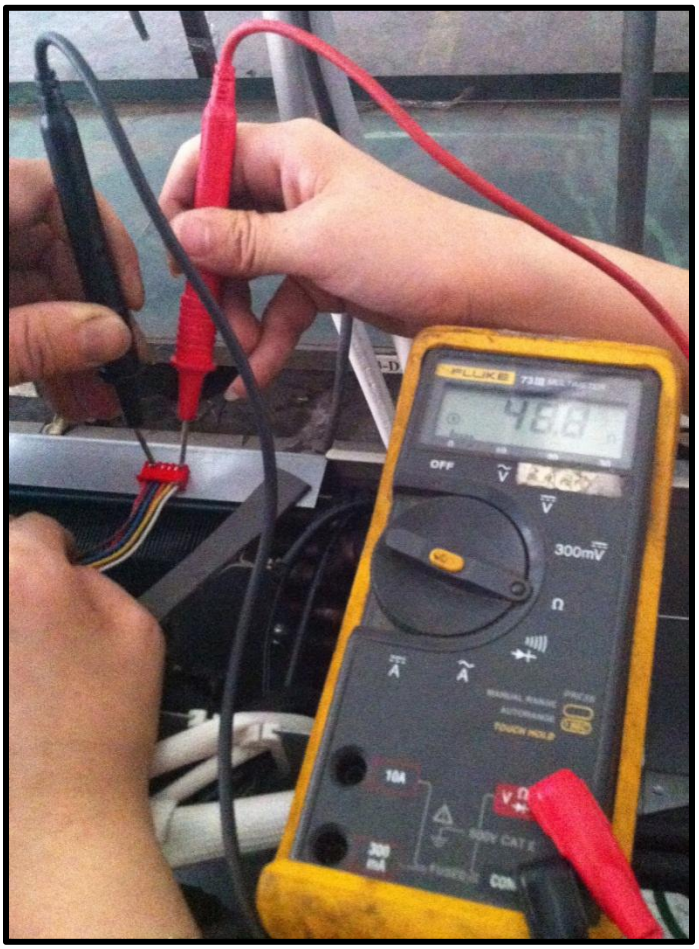
Red- Blue

Red - Yellow


FLUKE 73III MULTIMETER
48.3
300mV
MANUAL RANGE
AUTORANGE
TOUCH HOLD
10A
300 mA
FUSED
600V CAT II
COM



Brown-Orange



Brown-White