

## TROUBLESHOOTING GUIDE



### Models:

MHD-18

MHD-18U

MHD-24

MHD-24U

**Servicing of the unit must be performed by a qualified service technician.**

The Atmos diagnostic tool R99Z034 is highly recommended for troubleshooting this unit.

Dettson Industries Inc.  
Sherbrooke, Qc, Canada  
[www.dettson.com](http://www.dettson.com)

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# 1 Safety

Follow all safety information provided in the outdoor unit manual X62434.

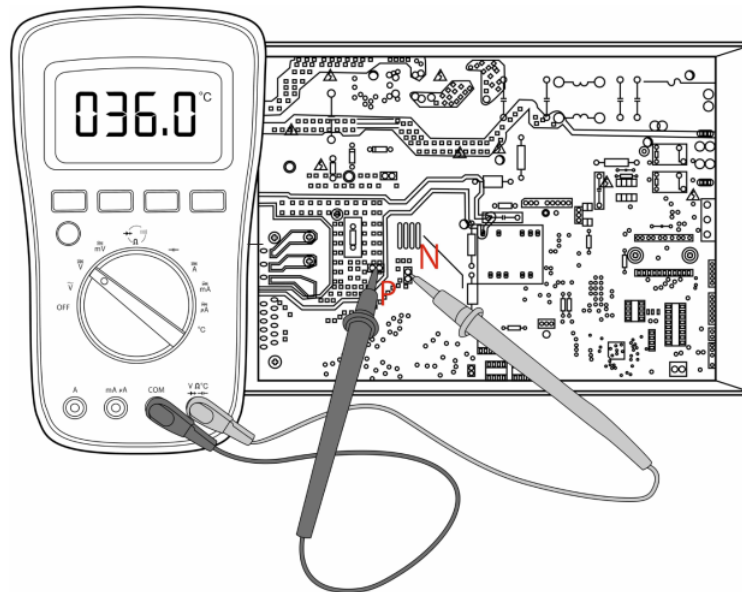
## Warning

Be sure to turn off all power supplies or disconnect all wires to avoid electric shock. While checking PCB, antistatic gloves or wrist strap must be worn to avoid damaging the board.

## Warning

Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before troubleshooting

Test the voltage between P and N on the back of the main PCB with a multimeter. If the voltage is lower than 36V, the capacitors are discharged.



## 2 Error Display

### 2.1 Outdoor Unit

There are 2 LED lights (RED and GREEN) on the outdoor unit main board. They may be difficult to see due to their location on the board.

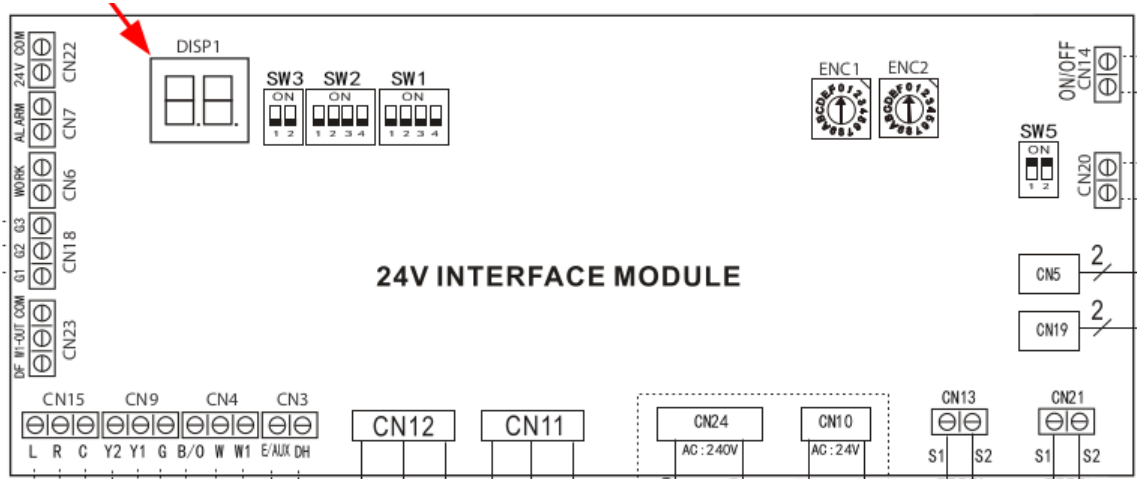
**Table 1: Outdoor Unit LED statuses**

#	Status	Green LED	Red LED
1	Standby (normal)	On	Off
2	Operating (normal)	Off	On
3	EEPROM error for compressor	On	Flash
4	IPM malfunction or Over-current protection	Flash	Off
5	Voltage protection (high or low)	On	On
6	Inverter compressor drive error	Off	Flash
7	Inverter compressor drive error	Flash	On
8	Communication error with compressor	Flash	Flash

## 2.2 24V Adapter Kit (R99G045)

The adapter kit for 24V thermostats has a 2-digit 7-segment display to show the system status.

Figure 1: 24V Adapter Kit (R99G045)



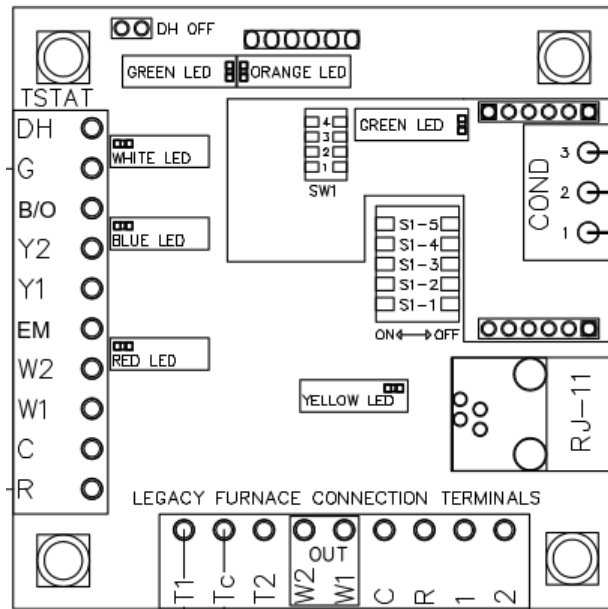
All codes starting with "0" show a normal running status.

Table 2: Error Codes (24V Adapter Kit)

Display	Malfunction & protection indication
E0	Indoor EEPROM error
E2	Cross-zero detection error
E3	Indoor fan speed malfunction
E4	Indoor room temperature sensor error
E5	Evaporator coil temperature sensor error
E7	Refrigerant leak detection system malfunction
EE	Water level warning
F0	Current overload protection
F1	Outdoor ambient temperature sensor (T4) malfunction
F2	Condenser coil temperature sensor (T3) malfunction
F3	Condenser coil temperature sensor (T5) malfunction
F4	Outdoor unit EEPROM parameter error
F5	Outdoor fan speed has been out of control
F6	T2b sensor error
P0	Inverter module (IPM) malfunction
P1	Over-voltage or under-voltage protection
P2	Compressor top high temperature protection (OLP)
P3	Low ambient temperature cut-off in heating
--	Mode conflict
P4	Compressor drive malfunction
P6	Compressor low-pressure protection
00	Module boot mode and indoor running mode for power off
10	Module and indoor unit communication malfunction
0U	Module and outdoor unit communication malfunction

## 2.3 Interface Board (K03085)

Figure 2: Interface Board (K03085)



### Green LED

There are two green LEDs.

The upper green LED should blink steadily, otherwise it indicates an error code from the outdoor unit.

The lower green LED, along with the orange LED next to it, will indicate the current error code (see table below).

### Orange LED

The orange LED, along with the green LED next to it, will indicate the current error code (see table below).

### Yellow LED

In communicating mode, the yellow LED should be blinking by short bursts. If not, there is a communication issue with the furnace. RJ-11 cable and wires 1 and 2 should be checked.

In legacy mode (24V), this LED should stay off.

### Blue LED

The blue LED will turn on when there is a call for cooling from the thermostat.

### Red LED

The red LED will turn on when there is a call for heating from the thermostat.

### White LED

The white LED will turn on when there is a call for ERV fan or dehumidification. In communicating mode, this LED will blink when there is a dehumidification call.

**Table 3: Error Codes (Interface Board)**

<b>Green LED</b>	<b>Orange LED</b>	<b>Status</b>
Off	Off	No power (check R & C)
Off	Blink	Outdoor fan speed control error
Off	Rapid	Compressor protection error
Off	On	IPM protection
Blink	Off	Communication error with indoor unit
Blink	Blink	Normal operation
Blink	On	Communication error with outdoor unit
Rapid	Off	Low pressure protection
Rapid	Blink	Compressor high temperature (overheat)
Rapid	Rapid	Voltage protection
Rapid	On	Current protection
On	Off	Outdoor condenser temperature sensor error
On	Blink	Outdoor ambient temperature sensor error
On	Rapid	Outdoor condenser high temperature
On	On	Compressor exhaust temperature sensor error

## 2.4 Communicating Thermostat (R02P034)

The communicating thermostat (R02P034) is able to fetch error code from the outdoor unit. This is accessed by navigating to the *Interface Board Equipment User Menu* (refer to the thermostat manual X00507). Under the *Status* menu, there is an *Error* (E r 6) entry where the current error code will be displayed.

**Table 4: Outdoor Unit Error Codes (Thermostat)**

Code	Description
n0	No error
R5	Outdoor ambient temperature sensor error
E0	Communication error with outdoor unit
E5	Outdoor condenser temperature sensor error
E1	Communication error with indoor unit
EP	Compressor protection error
E5	Compressor exhaust temperature sensor error
FR	Outdoor fan speed control error
HC	Outdoor condenser high temperature
Ht	Compressor high temperature (overheat)
IP	IPM protection
LP	Low pressure protection
oC	Current protection
UP	Voltage protection



### 3 Error Diagnosis

Table 5: Quick Error Diagnosis

		Problem										Possible Cause	Possible Solution			
		Unit will not start	Power on, but fan does not start	Unit runs, but quickly stops	Unit starts and stops frequently	Unit runs, but insufficient cooling/heating	Unit is noisy	Fan runs, but compressor will not start	Compressor and fan will not start	Compressor overload (short-cycles)	High discharge pressure			Low discharge pressure	High suction pressure	Low suction pressure
Electrical circuit	●														Power failure	Test voltage
	●														Blown fuse or varistor	Inspect fuse type and size
	●	●													Loose connections	Inspect connections
	●							●	●						Shorted or broken wires	Test circuits
	●														Safety device opens	Test continuity of safety device
	●	●						●	●						Thermostat command not sent	Check thermostat settings
	●	●													Faulty transformer	Check control circuit
									●						Faulty capacitor	Check capacitor
				●				●	●	●					Faulty contactor for compressor	Test continuity
				●	●	●									Faulty contactor for fan	Test continuity
			●	●	●					●					Low voltage	Test voltage
									●	●					Faulty stepping motor	Replace the stepping motor
									●	●					Shorted or grounded compressor	Check resistance
														Shorted or grounded fan motor	Check resistance	
Refrigerant circuit							●								Compressor stuck	Replace the compressor
			●			●			●		●		●		Shortage of refrigerant	Leak test
			●			●									Restricted liquid line	Replace restricted part
						●									Dirty air filter	Clean or replace
						●									Dirty evaporator coil	Clean coil
						●									Insufficient air through coil	Check fan and settings
			●				●		●	●			●		Overcharge of refrigerant	Change refrigerant charge
						●			●	●					Dirty or blocked condenser	Clean condenser
						●				●					Incompressible gas in refrigerant cycle	Purge, evacuate and recharge
						●				●					Short cycling of condensing air	Remove airflow obstruction
						●									Broken compressor parts	Replace compressor
						●						●	●		Inefficient compressor	Test compressor efficiency
Others		●											●		Expansion valve obstructed / stuck closed	Replace valve
													●	●	Poor installation of probe	Fix probe installation
						●							●		Heavy load conditions	Check heat load
		●					●								Loose bolts or screws	Tighten bolts or screws
															Electrical interference	Power cycle
						●									Contact of piping with other metal	Rectify piping

# 4 Error Troubleshooting

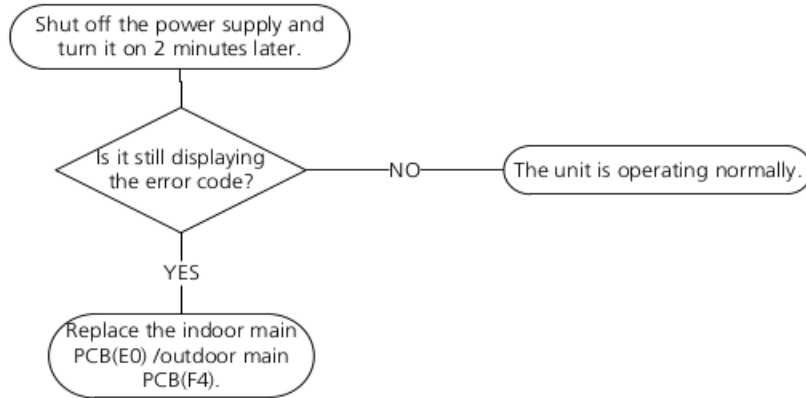
## 4.1 EEPROM Error

**Description:** Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip.

**Recommended parts to prepare:**

- Indoor PCB
- Outdoor PCB

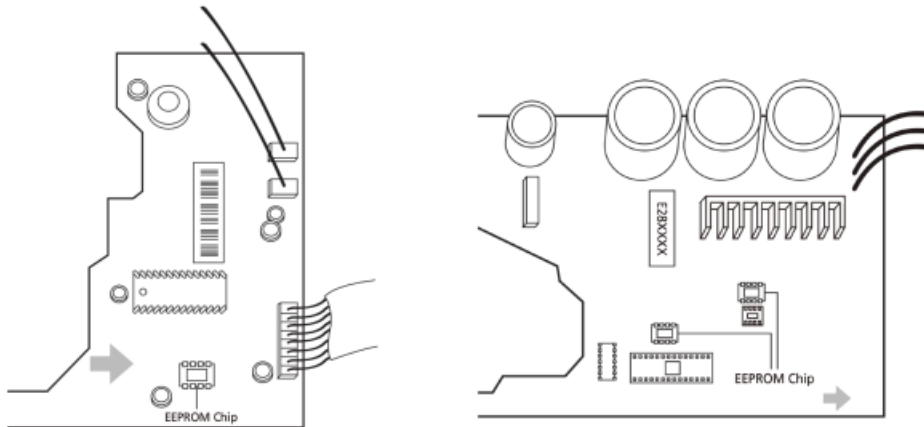
**Troubleshooting and repair:**



**Remarks:**

**EEPROM:** A read-only memory whose contents can be erased and reprogrammed using a pulsed voltage.

The location of the EEPROM chip on the indoor and outdoor PCB is shown in the following two images:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole. This pictures are only for reference, actual appearance may vary.

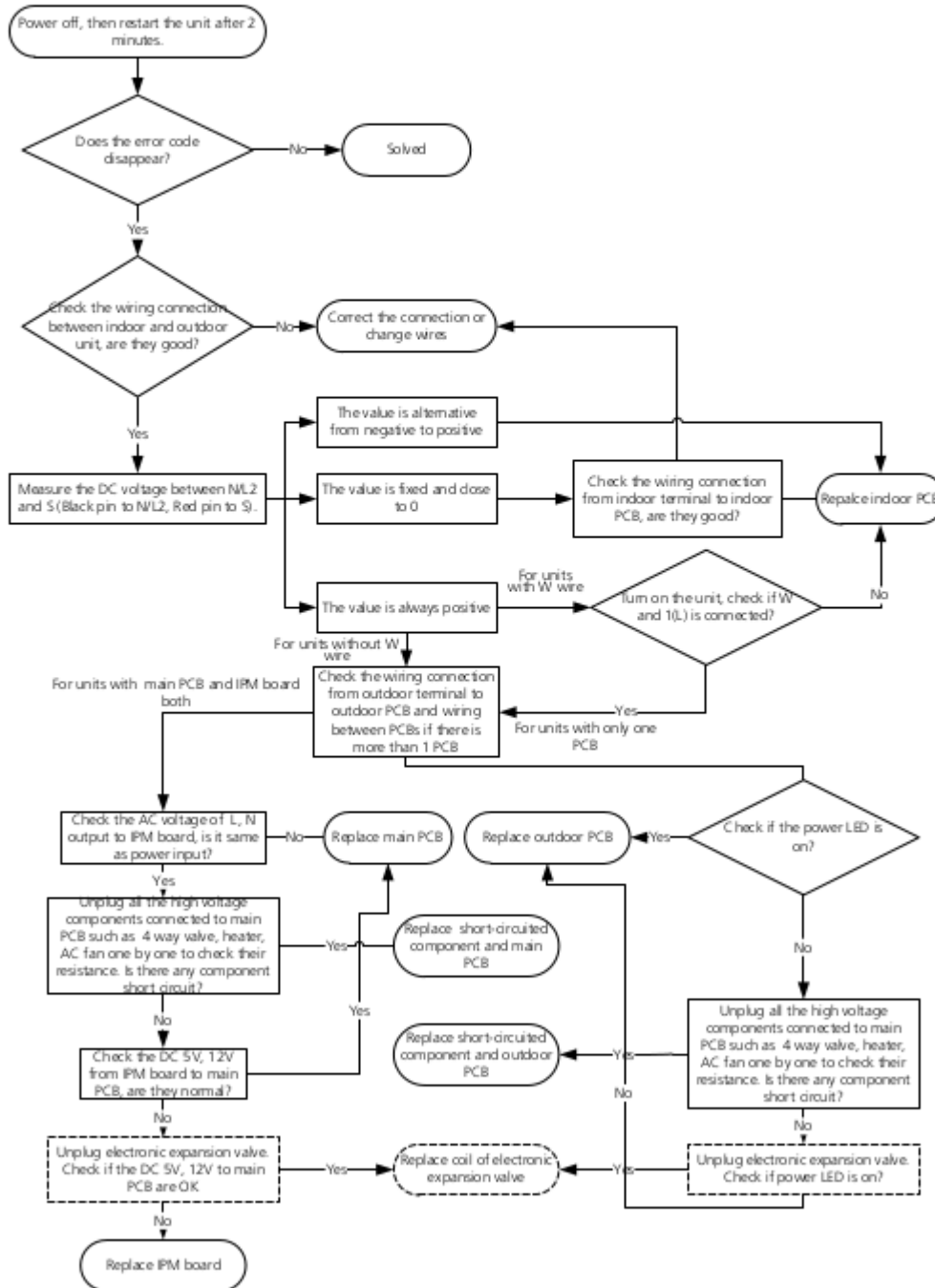
## 4.2 Communication Error

**Description:** Indoor unit can not communicate with outdoor unit

**Recommended parts to prepare:**

- Indoor PCB
- Outdoor PCB
- Short-circuited component

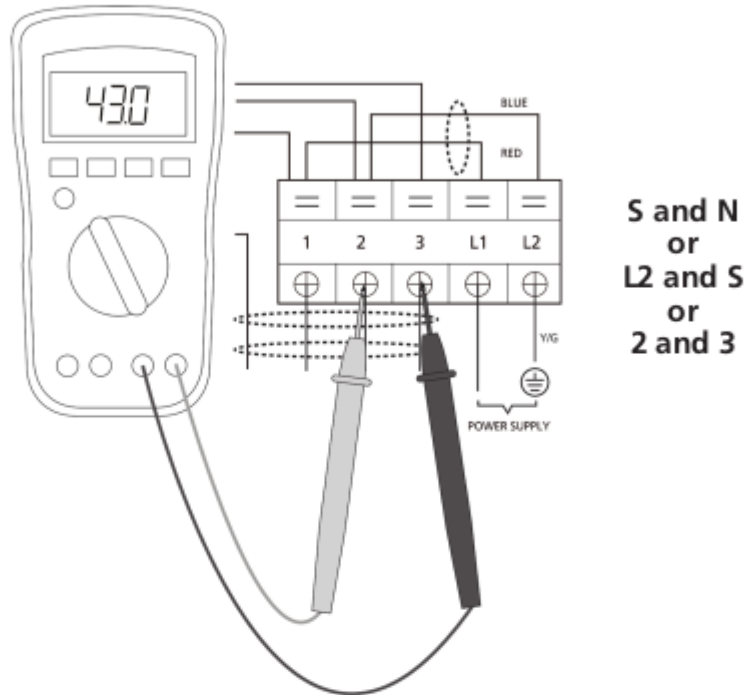
**Troubleshooting and repair:**



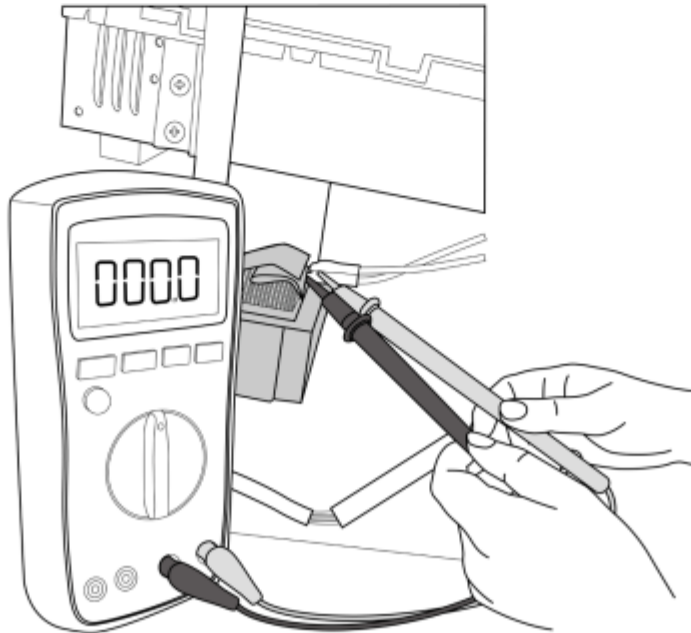
**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

**Remarks:**

- Use a multimeter to test the DC voltage between 2 port(or S or L2 port) and 3 port(or N or S port) of outdoor unit. The red pin of multimeter connects with 2 port(or S or L2 port) while the black pin is for 3 port(or N or S port) .
- When AC is normal running, the voltage will move alternately between -25V to 25V.
- If the outdoor unit has malfunction, the voltage will move alternately with positive value.
- While if the indoor unit has malfunction, the voltage will be a certain value.



- Use a multimeter to test the resistance of the reactor which does not connect with capacitor.
- The normal value should be around zero ohm. Otherwise, the reactor must have malfunction.



**Note:** The picture and the value are only for reference, actual condition and specific value may vary.

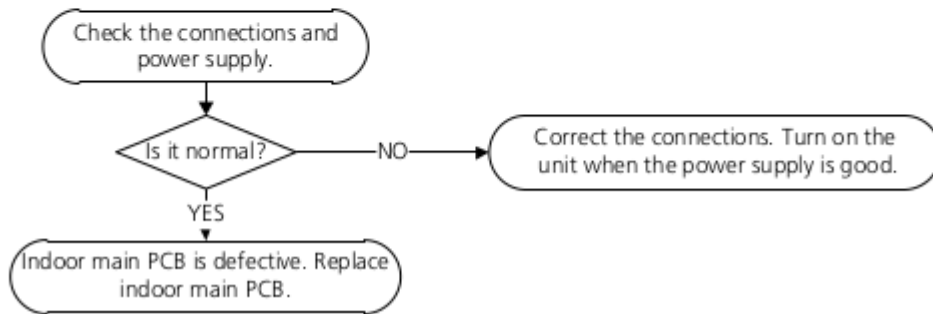
### 4.3 Zero Crossing Detection Error

**Description:** When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.

**Recommended parts to prepare:**

- Connection wires
- PCB

**Troubleshooting and repair:**



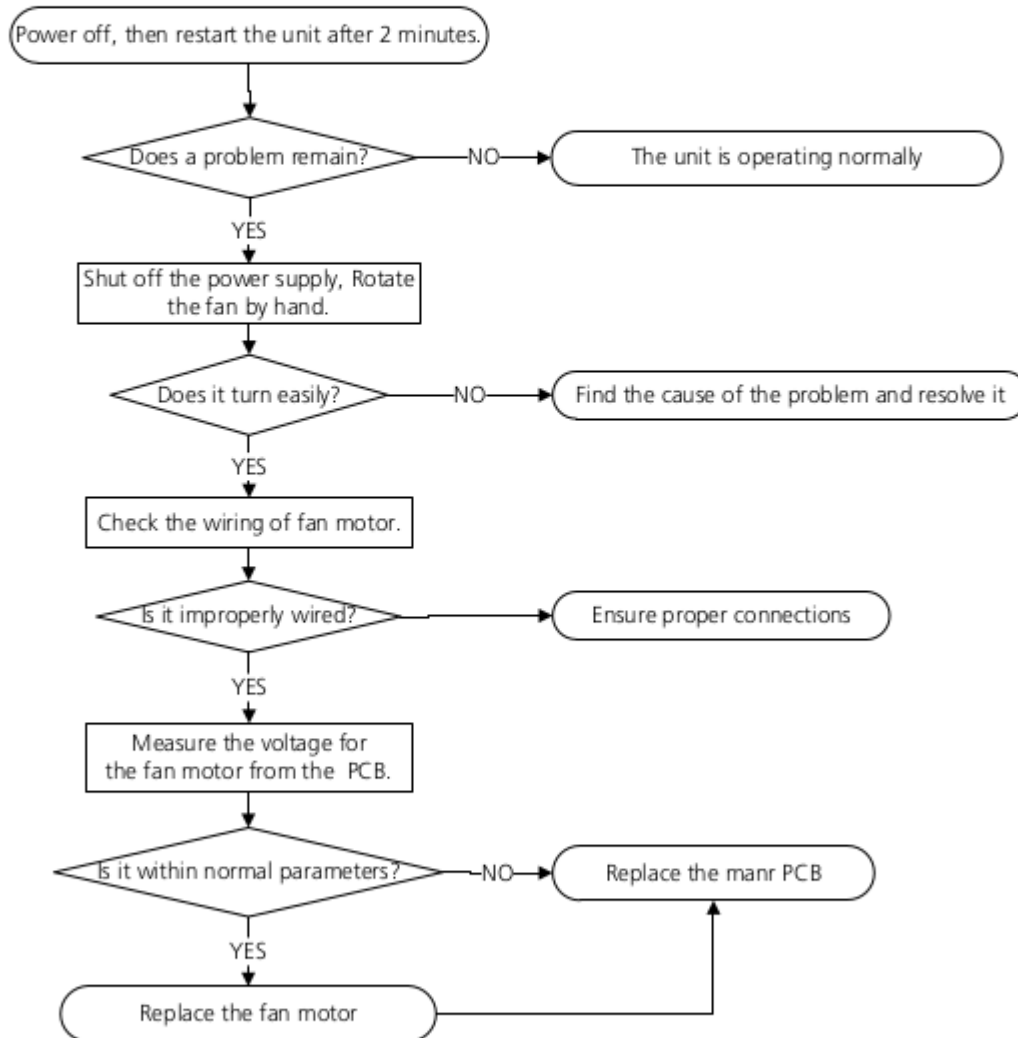
## 4.4 Fan Speed Error

**Description:** When indoor / outdoor fan speed keeps too low or too high for a certain time, the LED displays the failure code and the AC turns off.

### Recommended parts to prepare:

- Connection wires
- Fan assembly
- Fan motor
- PCB

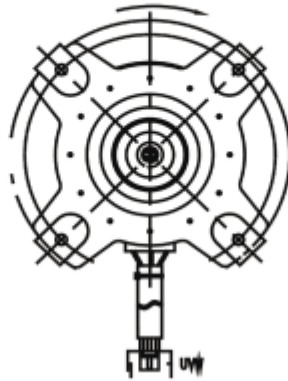
### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

### Outdoor DC Fan Motor (control chip is in outdoor PCB)

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 have problems and need to be replaced. otherwise the PCB must have problems and need to be replaced.



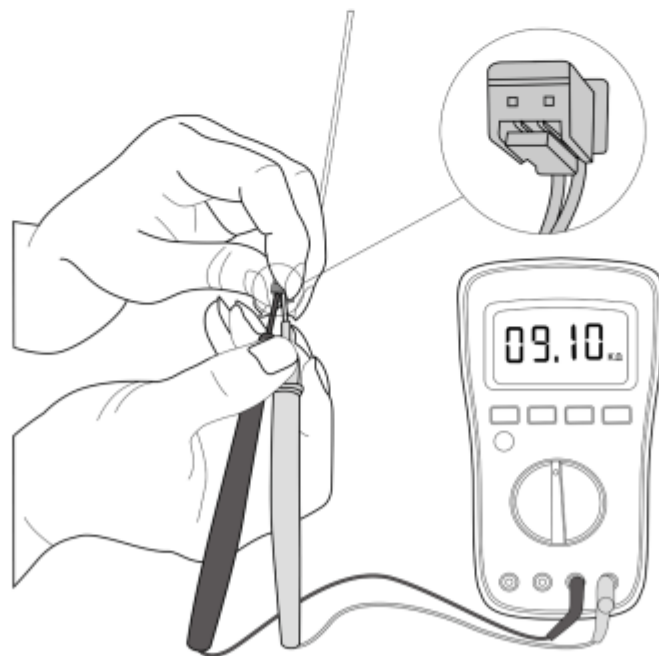
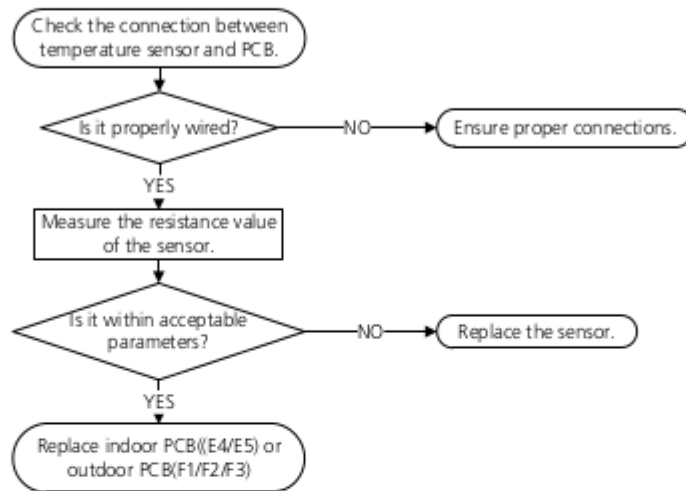
## 4.5 Temperature Sensor Error

**Description:** If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure code.

### Recommended parts to prepare:

- Connection wires
- Sensors
- PCB

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole. This picture and the value are only for reference, actual appearance and value may vary



## 4.6 Refrigerant Leakage Detection

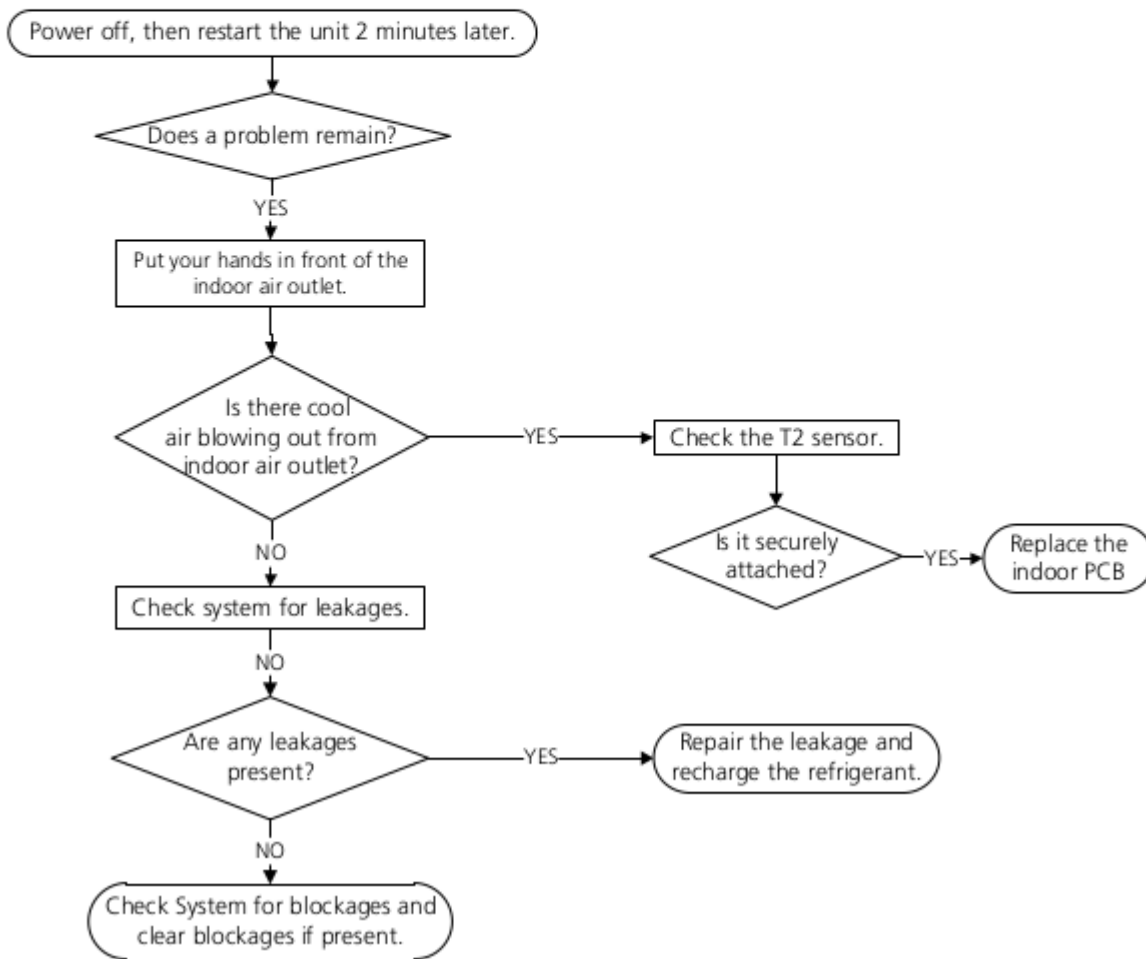
**Description:** Define the evaporator coil temperature T2 of the compressor just starts running as Tcool.

In the beginning 5 minutes after the compressor starts up, if  $T2 < T_{cool} - 1^{\circ}\text{C}$  ( $1.8^{\circ}\text{F}$ ) does not keep continuous 4 seconds and compressor running frequency higher than 50Hz does not keep for 3 minutes, and this situation happens 3 times, the LED displays the failure code and the AC turns off..

### Recommended parts to prepare:

- T2 sensor
- Indoor PCB
- Additional refrigerant

### Troubleshooting and repair:



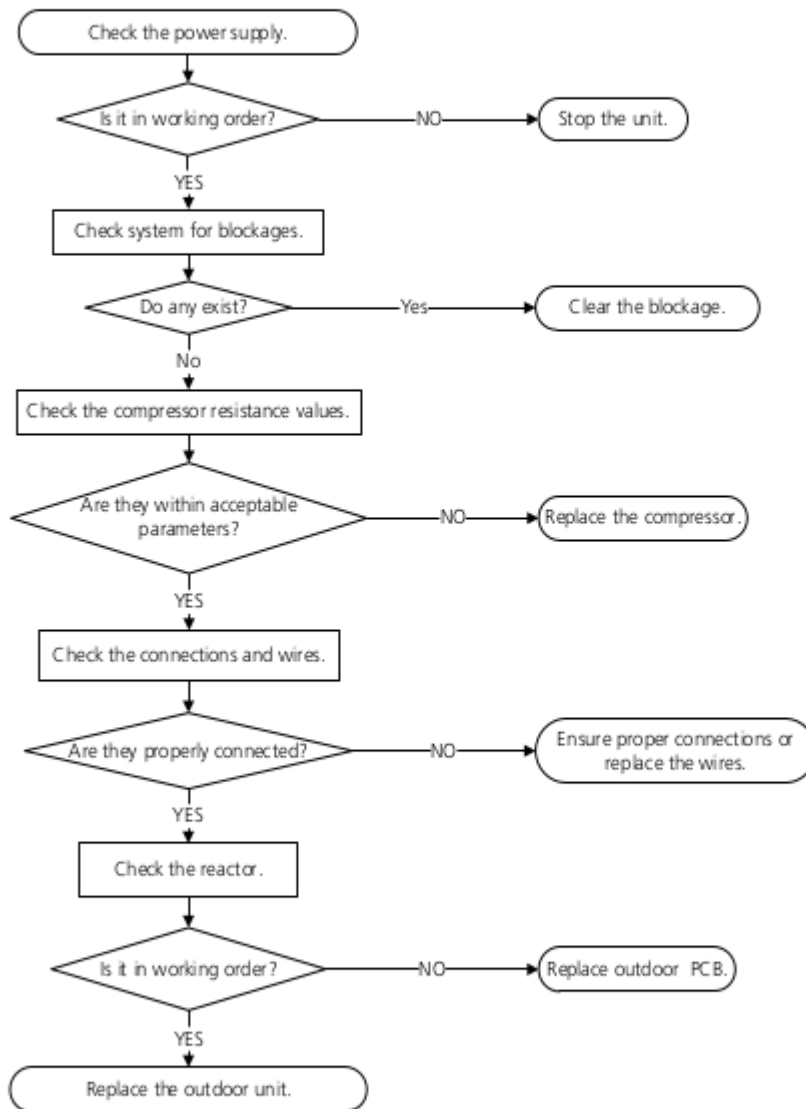
## 4.7 Overload Current Protection

**Description:** An abnormal current rise is detected by checking the specified current detection circuit.

### Recommended parts to prepare:

- Outdoor PCB
- Connection wires
- Compressor

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

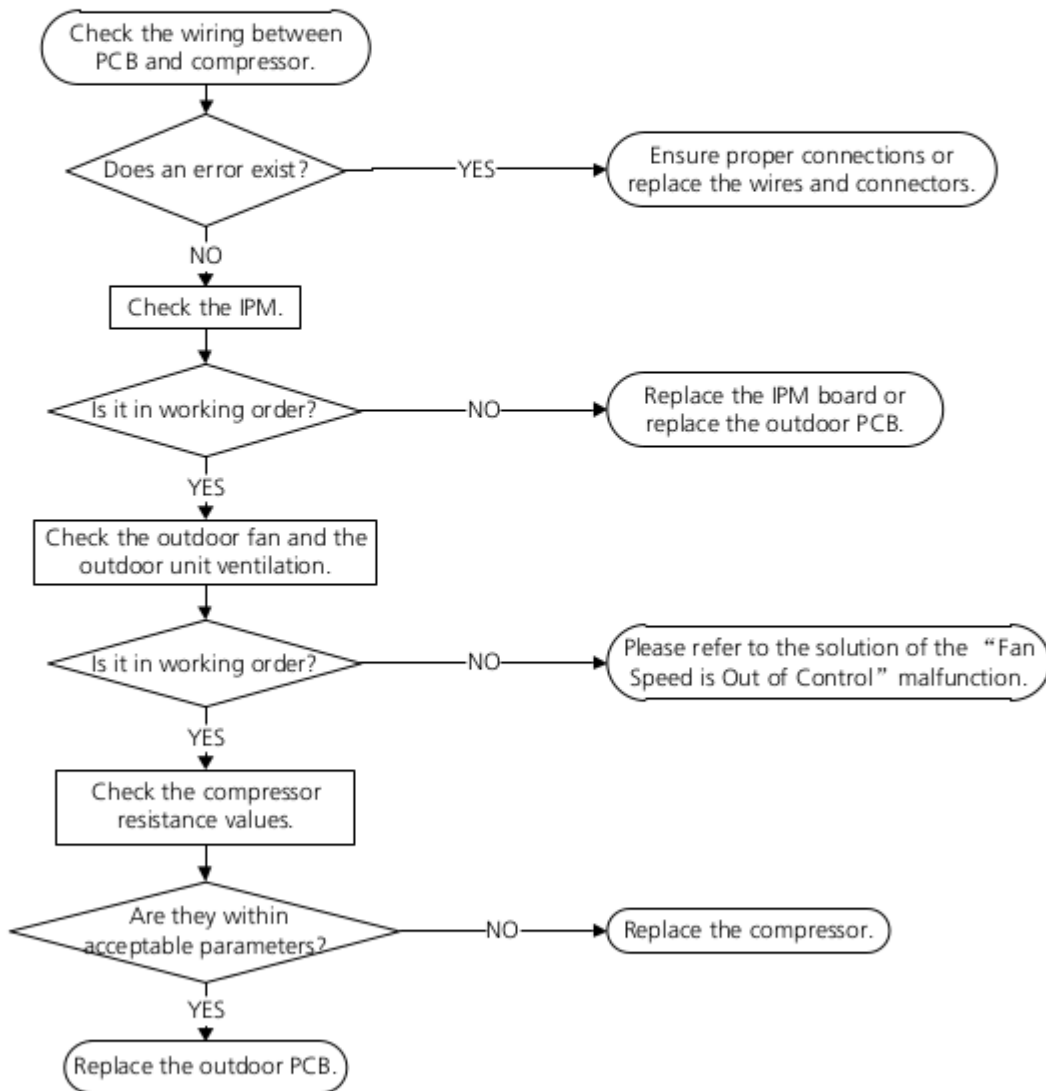
## 4.8 IPM Error or Overcurrent Protection

**Description:** When the voltage signal the IPM sends to the compressor drive chip is abnormal, the LED displays the failure code and the AC turns off.

### Recommended parts to prepare:

- Connection wires
- IPM module board
- Outdoor fan assembly
- Compressor
- Outdoor PCB

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

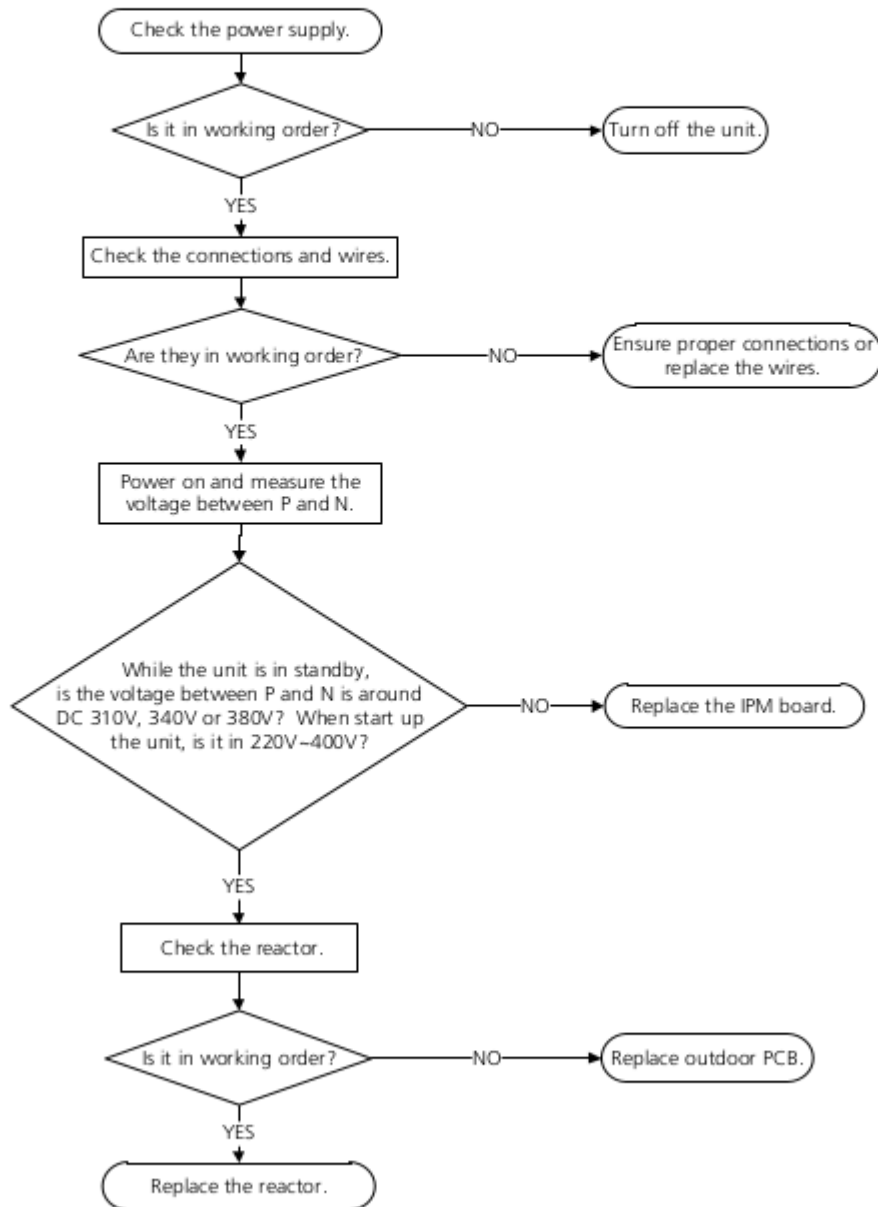
## 4.9 Voltage Protection

**Description:** Abnormal increases or decreases in voltage are detected by checking the specified voltage detection circuit.

### Recommended parts to prepare:

- Power supply wires
- IPM module board
- PCB
- Reactor

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

## 4.10 IPM High Temperature Protection or High Pressure Protection

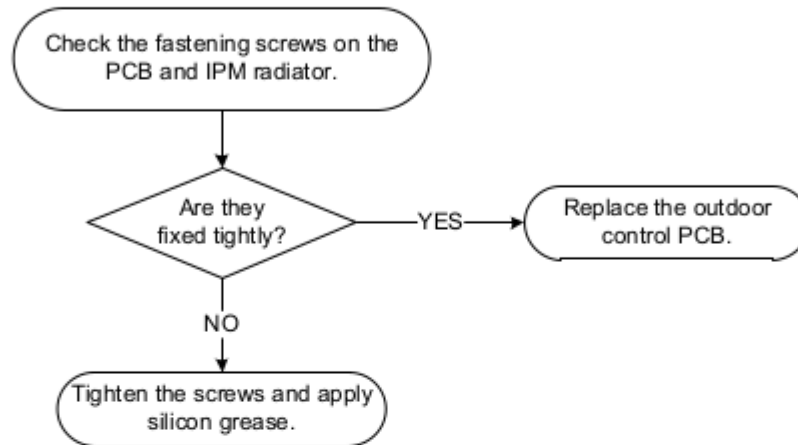
**Description:** If the temperature of IPM module is higher than a certain value, the LED displays the failure code.

For some models with high pressure switch, outdoor pressure switch cut off the system because high pressure is higher than 4.4 MPa, the LED displays the failure code.

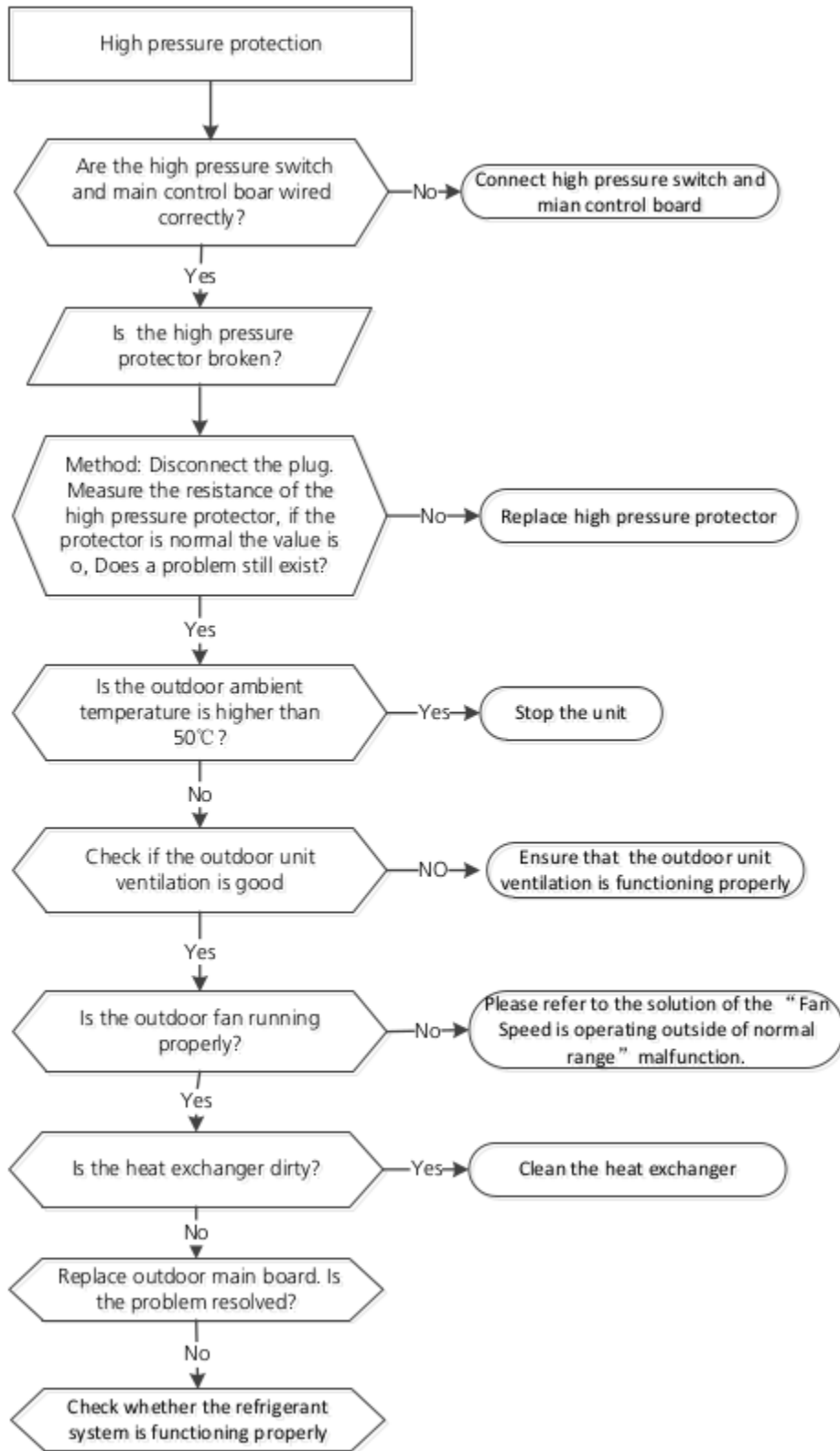
### Recommended parts to prepare:

- Outdoor PCB
- IPM module board

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.



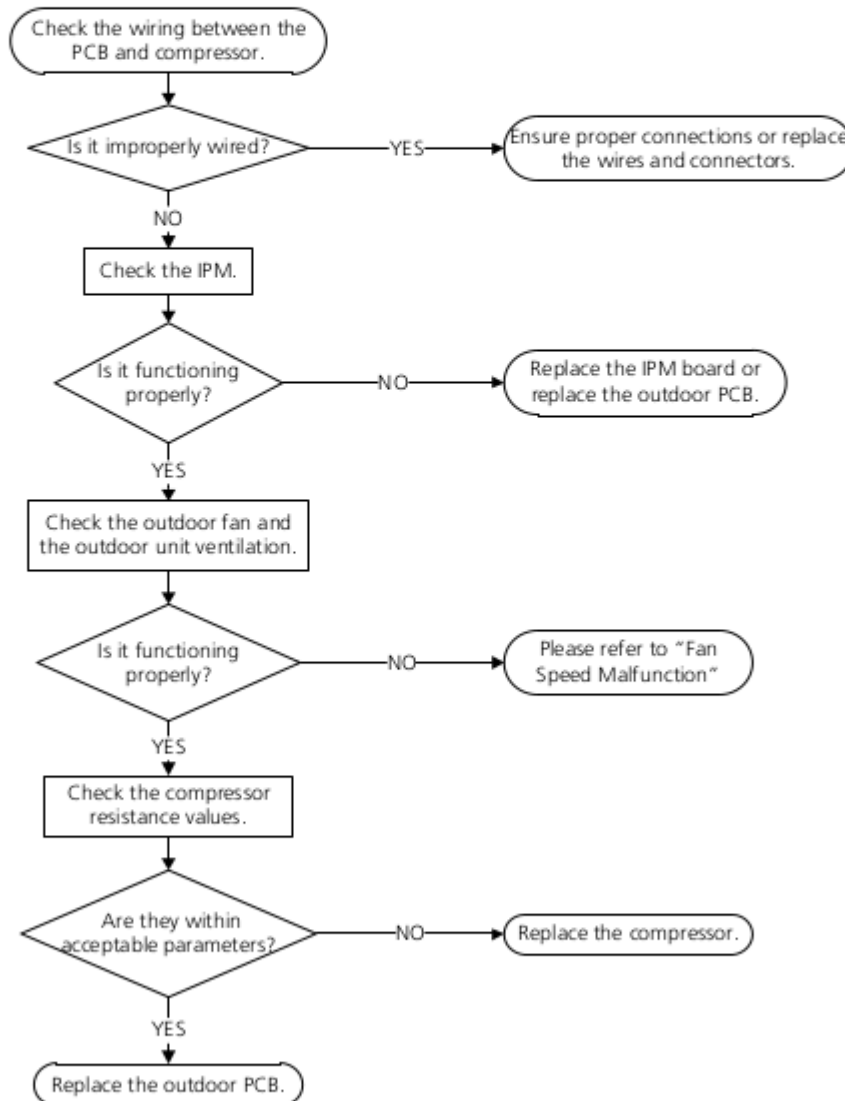
## 4.11 Compressor Drive Error

**Description:** An abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.

### Recommended parts to prepare:

- Connection wires
- IPM module board
- Outdoor fan assembly
- Compressor
- Outdoor PCB

### Troubleshooting and repair:



**Note:** For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

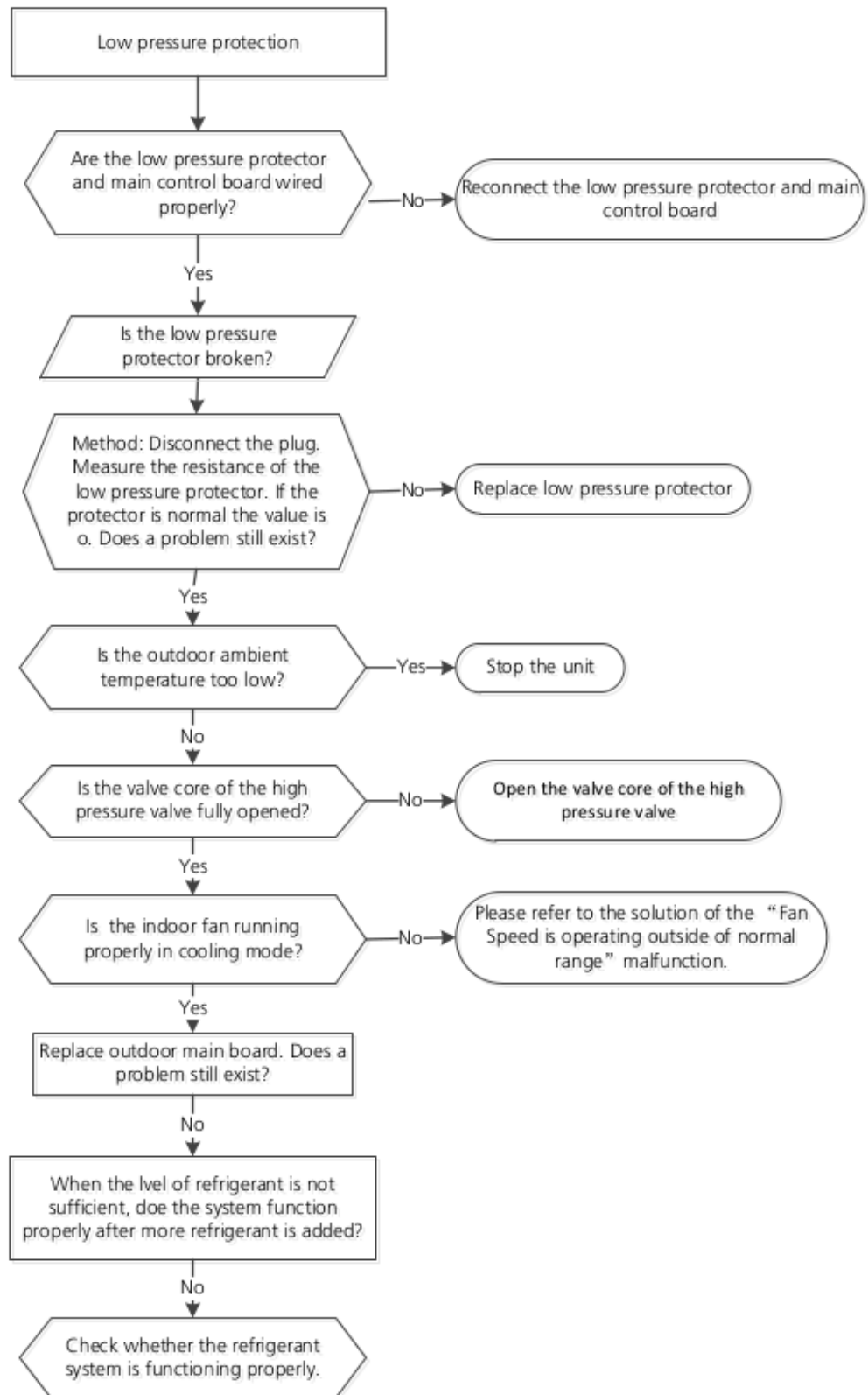
## 4.12 Low Pressure Protection

**Description:** Outdoor pressure switch cut off the system because low pressure is lower than 0.13 MPa, the LED displays the failure code

**Recommended parts to prepare:**

- Connection wires
- Outdoor PCB
- Low pressure protector
- Refrigerant

**Troubleshooting and repair:**





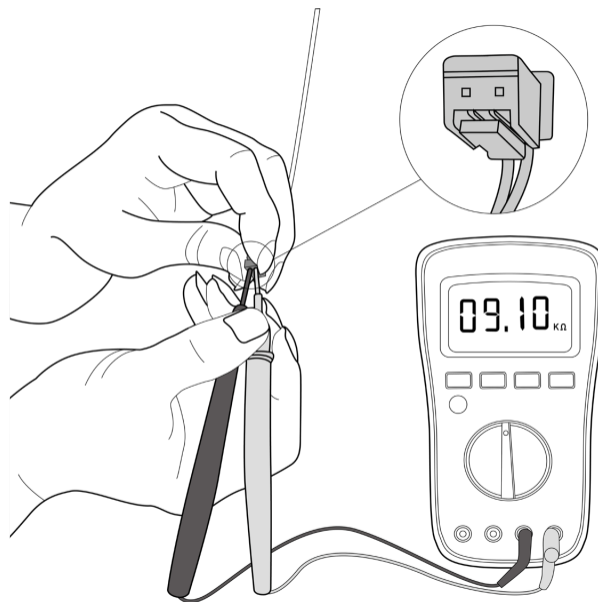
## 5 Check Procedures

### 5.1 Temperature Sensor Check

#### Warning

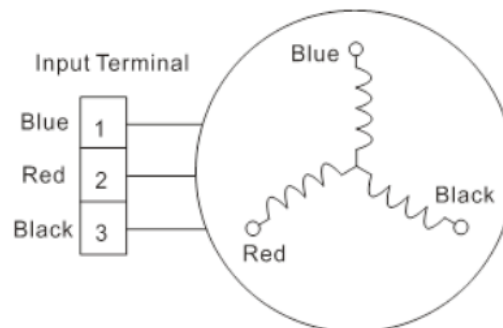
Be sure to turn off all power supplies or disconnect all wires to avoid electric shock. Wait until compressor and coil have returned to normal temperature.

1. Disconnect the temperature sensor from PCB (refer the disassembly manual X62436).
2. Measure the resistance value of the sensor using a multimeter.
3. Check corresponding temperature sensor resistance value using table 9.



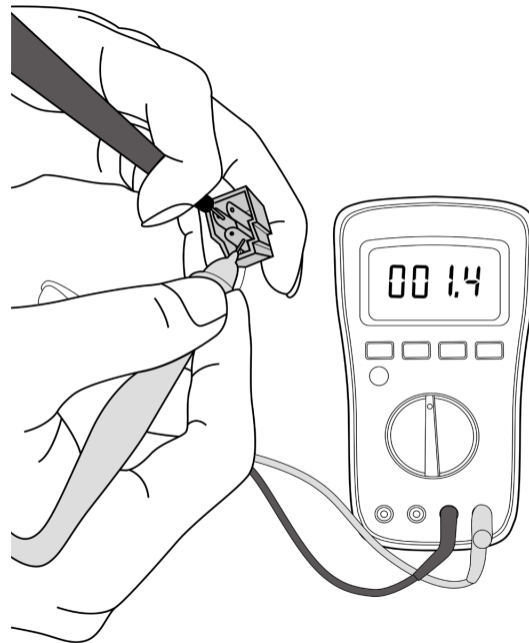
### 5.2 Compressor Check

1. Disconnect the compressor power cord from outdoor PCB (refer the disassembly manual X62436).
2. Measure the resistance value of each winding using a multimeter.
3. Check the resistance value of each winding using table 6.



**Table 6: Compressor Resistance Values**

	Blue-Red	Blue-Black	Red-Black
ASM135D23UFZ		1.75Ω	
ATQ420D1UMU		0.37Ω	
ASN98D22UFZ		1.57Ω	
ATF235D22UMT		0.75Ω	
ATQ360D1UMU		0.37Ω	
ATM115D43UFZ2		1.87Ω	
ATF250D22UMT		0.75Ω	
ATF310D43UMT		0.65Ω	
KSK103D33UEZ3(YJ)		2.13Ω	
ASM98D32UFZ		2.2Ω	
ASN140D21UFZ		1.28Ω	
ASK89D29UEZD		1.99Ω	
KSN140D21UFZ		1.28Ω	
KTM240D57UMT		0.62Ω	
KSK103D33UEZ3		2.02Ω	
KTF310D43UMT		0.65Ω	
KTQ420D1UMU		0.37Ω	
ATN150D30UFZA		1.03Ω	
KTM240D43UKT		1.03Ω	
KTN110D42UFZ		1.82Ω	
KTF250D22UMT		0.75Ω	
KSN140D58UFZ		1.86Ω	

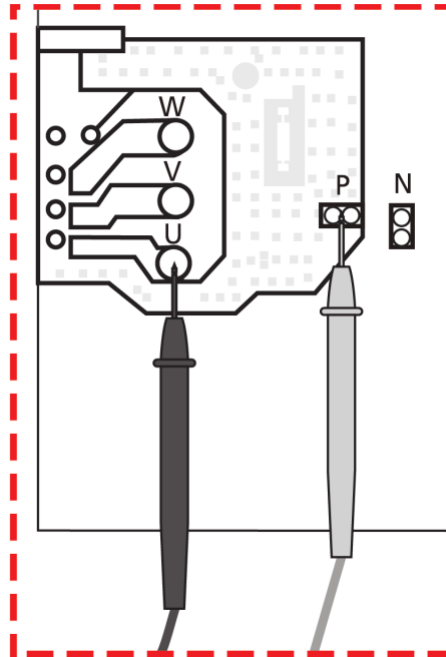


## 5.3 IPM Continuity Check

### Warning

Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before troubleshooting.

1. Turn off outdoor unit and disconnect power supply.
2. Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
3. Disassemble outdoor PCB or disassemble IPM board.
4. Measure the resistance value between P and U(V, W, N); U(V, W) and N.



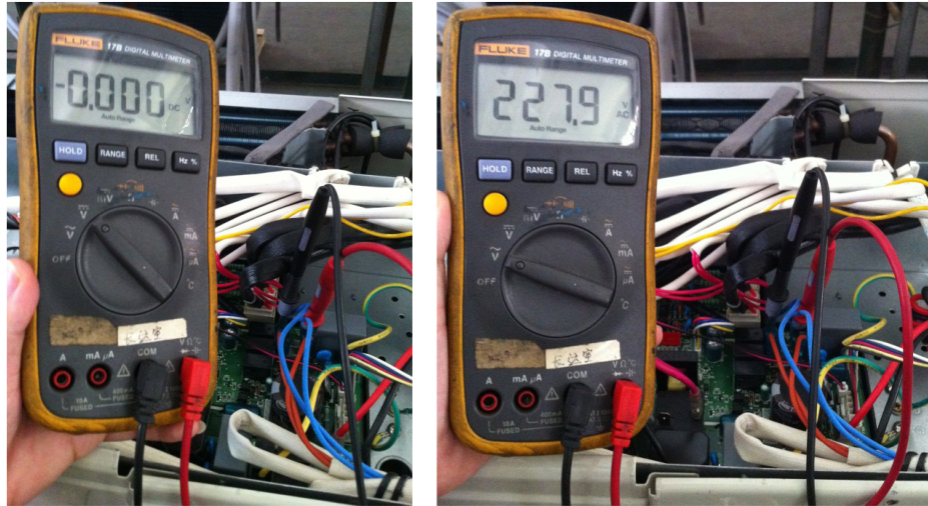
**Table 7: IPM Resistance Values**

Digital Tester		Resistance	Digital Tester		Resistance
(+) Red	(-) Black		(+) Red	(-) Black	
P	N	$\infty$ (Several M $\Omega$ )	U	N	$\infty$ (Several M $\Omega$ )
	U				
	V				
	W				
			-		

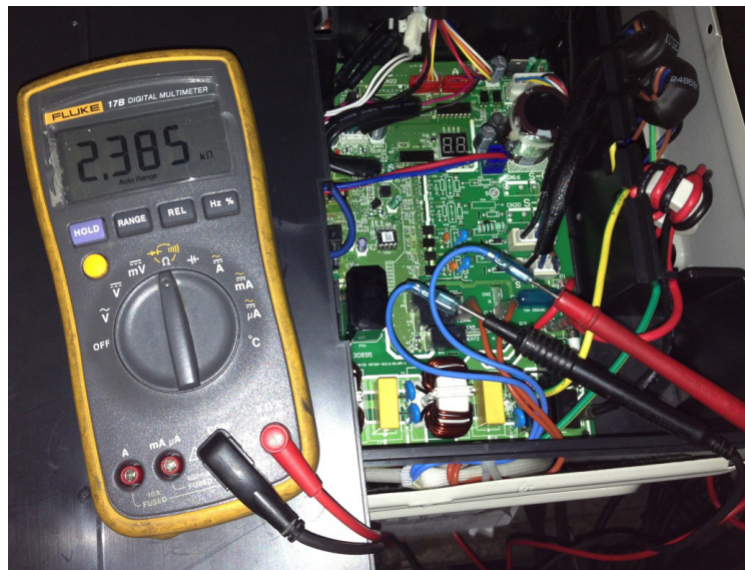
## 5.4 4-way Valve Check

1. Power on, measure the voltage. When the unit operates in cooling, it is 0V. When the unit operates in heating, it is around 230VAC.

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



2. Turn off the power, measure the resistance. The value should be 1.8 – 2.5k $\Omega$ .

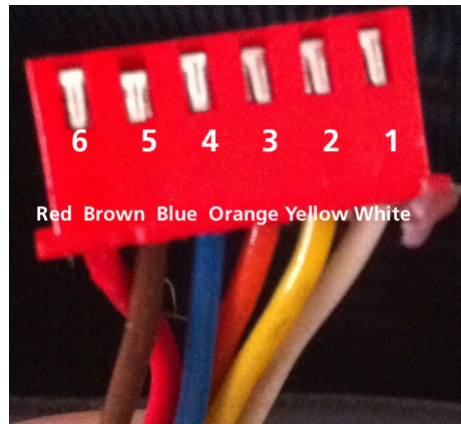


## 5.5 Expansion Valve Check

### Warning

Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before troubleshooting.

1. Disconnect the connector from outdoor PCB.
2. Measure the resistance value of each winding using a multimeter.
3. Check the resistance value of each winding using table 8.



**Table 8: EXV Resistance Values**

Color	Normal Value
Red - Blue	Around 50Ω
Red - Yellow	
Brown - Orange	
Brown - White	

## 6 Sensor Reference Values

Table 9: Temperature Sensor Resistance Values (T1, T2, T3, T4)

°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
-20	-4	115.266	20	68	12.6431	60	140	2.35774	100	212	0.62973
-19	-2	108.146	21	70	12.0561	61	142	2.27249	101	214	0.61148
-18	0	101.517	22	72	11.5	62	144	2.19073	102	216	0.59386
-17	1	96.3423	23	73	10.9731	63	145	2.11241	103	217	0.57683
-16	3	89.5865	24	75	10.4736	64	147	2.03732	104	219	0.56038
-15	5	84.219	25	77	10	65	149	1.96532	105	221	0.54448
-14	7	79.311	26	79	9.55074	66	151	1.89627	106	223	0.52912
-13	9	74.536	27	81	9.12445	67	153	1.83003	107	225	0.51426
-12	10	70.1698	28	82	8.71983	68	154	1.76647	108	226	0.49989
-11	12	66.0898	29	84	8.33566	69	156	1.70547	109	228	0.486
-10	14	62.2756	30	86	7.97078	70	158	1.64691	110	230	0.47256
-9	16	58.7079	31	88	7.62411	71	160	1.59068	111	232	0.45957
-8	18	56.3694	32	90	7.29464	72	162	1.53668	112	234	0.44699
-7	19	52.2438	33	91	6.98142	73	163	1.48481	113	235	0.43482
-6	21	49.3161	34	93	6.68355	74	165	1.43498	114	237	0.42304
-5	23	46.5725	35	95	6.40021	75	167	1.38703	115	239	0.41164
-4	25	44	36	97	6.13059	76	169	1.34105	116	241	0.4006
-3	27	41.5878	37	99	5.87359	77	171	1.29078	117	243	0.38991
-2	28	39.8239	38	100	5.62961	78	172	1.25423	118	244	0.37956
-1	30	37.1988	39	102	5.39689	79	174	1.2133	119	246	0.36954
0	32	35.2024	40	104	5.17519	80	176	1.17393	120	248	0.35982
1	34	33.3269	41	106	4.96392	81	178	1.13604	121	250	0.35042
2	36	31.5635	42	108	4.76253	82	180	1.09958	122	252	0.3413
3	37	29.9058	43	109	4.5705	83	181	1.06448	123	253	0.33246
4	39	28.3459	44	111	4.38736	84	183	1.03069	124	255	0.3239
5	41	26.8778	45	113	4.21263	85	185	0.99815	125	257	0.31559
6	43	25.4954	46	115	4.04589	86	187	0.96681	126	259	0.30754
7	45	24.1932	47	117	3.88673	87	189	0.93662	127	261	0.29974
8	46	22.5662	48	118	3.73476	88	190	0.90753	128	262	0.29216
9	48	21.8094	49	120	3.58962	89	192	0.8795	129	264	0.28482
10	50	20.7184	50	122	3.45097	90	194	0.85248	130	266	0.2777
11	52	19.6891	51	124	3.31847	91	196	0.82643	131	268	0.27078
12	54	18.7177	52	126	3.19183	92	198	0.80132	132	270	0.26408
13	55	17.8005	53	127	3.07075	93	199	0.77709	133	271	0.25757
14	57	16.9341	54	129	2.95896	94	201	0.75373	134	273	0.25125
15	59	16.1156	55	131	2.84421	95	203	0.73119	135	275	0.24512
16	61	15.3418	56	133	2.73823	96	205	0.70944	136	277	0.23916
17	63	14.6181	57	135	2.63682	97	207	0.68844	137	279	0.23338
18	64	13.918	58	136	2.53973	98	208	0.66818	138	280	0.22776
19	66	13.2631	59	138	2.44677	99	210	0.64862	139	282	0.22231



**Table 10: Temperature Sensor Resistance Values (TP)**

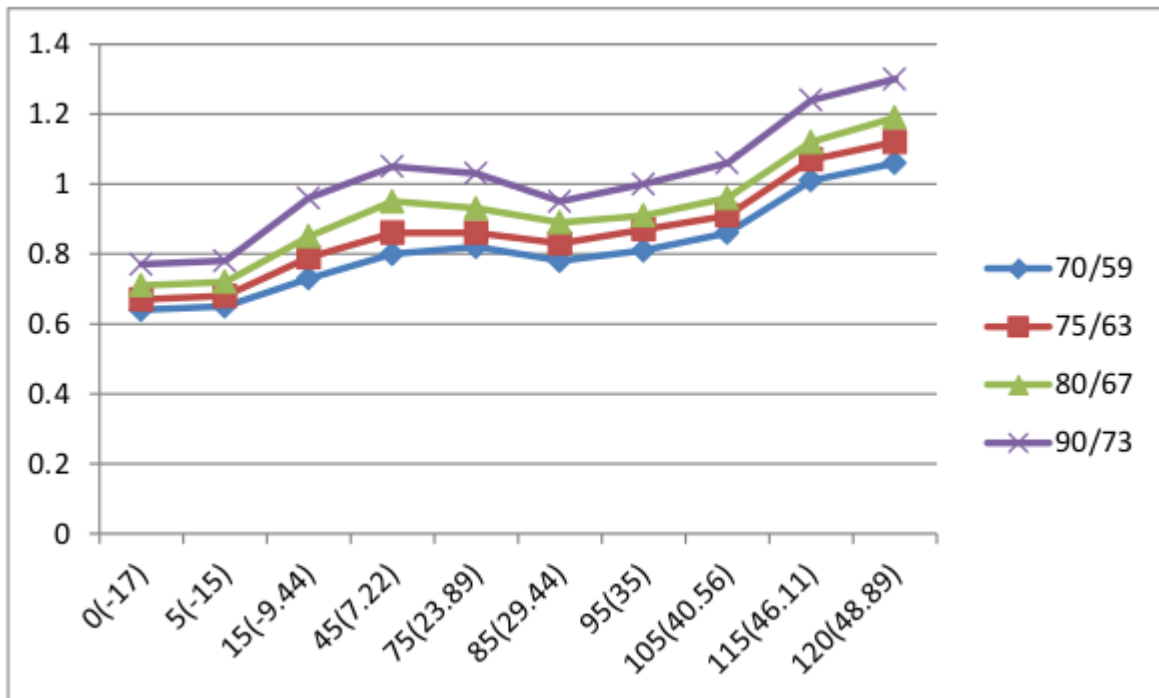
°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
-20	-4	542.7	20	68	68.66	60	140	13.59	100	212	3.702
-19	-2	511.9	21	70	65.62	61	142	13.11	101	214	3.595
-18	0	483	22	72	62.73	62	144	12.65	102	216	3.492
-17	1	455.9	23	73	59.98	63	145	12.21	103	217	3.392
-16	3	430.5	24	75	57.37	64	147	11.79	104	219	3.296
-15	5	406.7	25	77	54.89	65	149	11.38	105	221	3.203
-14	7	384.3	26	79	52.53	66	151	10.99	106	223	3.113
-13	9	363.3	27	81	50.28	67	153	10.61	107	225	3.025
-12	10	343.6	28	82	48.14	68	154	10.25	108	226	2.941
-11	12	325.1	29	84	46.11	69	156	9.902	109	228	2.86
-10	14	307.7	30	86	44.17	70	158	9.569	110	230	2.781
-9	16	291.3	31	88	42.33	71	160	9.248	111	232	2.704
-8	18	275.9	32	90	40.57	72	162	8.94	112	234	2.63
-7	19	261.4	33	91	38.89	73	163	8.643	113	235	2.559
-6	21	247.8	34	93	37.3	74	165	8.358	114	237	2.489
-5	23	234.9	35	95	35.78	75	167	8.084	115	239	2.422
-4	25	222.8	36	97	34.32	76	169	7.82	116	241	2.357
-3	27	211.4	37	99	32.94	77	171	7.566	117	243	2.294
-2	28	200.7	38	100	31.62	78	172	7.321	118	244	2.233
-1	30	190.5	39	102	30.36	79	174	7.086	119	246	2.174
0	32	180.9	40	104	29.15	80	176	6.859	120	248	2.117
1	34	171.9	41	106	28	81	178	6.641	121	250	2.061
2	36	163.3	42	108	26.9	82	180	6.43	122	252	2.007
3	37	155.2	43	109	25.86	83	181	6.228	123	253	1.955
4	39	147.6	44	111	24.85	84	183	6.033	124	255	1.905
5	41	140.4	45	113	23.89	85	185	5.844	125	257	1.856
6	43	133.5	46	115	22.89	86	187	5.663	126	259	1.808
7	45	127.1	47	117	22.1	87	189	5.488	127	261	1.762
8	46	121	48	118	21.26	88	190	5.32	128	262	1.717
9	48	115.2	49	120	20.46	89	192	5.157	129	264	1.674
10	50	109.8	50	122	19.69	90	194	5	130	266	1.632
11	52	104.6	51	124	18.96	91	196	4.849			
12	54	99.69	52	126	18.26	92	198	4.703			
13	55	95.05	53	127	17.58	93	199	4.562			
14	57	90.66	54	129	16.94	94	201	4.426			
15	59	86.49	55	131	16.32	95	203	4.294			
16	61	82.54	56	133	15.73	96	205	4.167			
17	63	78.79	57	135	15.16	97	207	4.045			
18	64	75.24	58	136	14.62	98	208	3.927			
19	66	71.86	59	138	14.09	99	210	3.812			

## 7 Service Port Pressure

Table 11: Cooling Pressure

°F(°C)	ODU(DB)		0(-17)	5(-15)	15(-9.44)	45(7.22)	75(23.89)	85(29.44)	95(35)	105(40.56)	115(46.11)	120(48.89)
	IDU(DBWB)											
BAR	70/59 (21.11/15)		6.4	6.5	7.3	8.0	8.2	7.8	8.1	8.6	10.1	10.6
	75/63 (23.89/17.22)		6.7	6.8	7.9	8.6	8.6	8.3	8.7	9.1	10.7	11.2
	80/67 (26.67/19.44)		7.1	7.2	8.5	9.5	9.3	8.9	9.1	9.6	11.2	11.9
	90/73 (32.22/22.78)		7.7	7.8	9.6	10.5	10.3	9.5	10.0	10.6	12.4	13.0
PSI	70/59 (21.11/15)		93	94	106	116	119	113	117	125	147	154
	75/63 (23.89/17.22)		97	99	115	125	124	120	126	132	155	162
	80/67 (26.67/19.44)		103	104	123	138	135	129	132	140	162	173
	90/73 (32.22/22.78)		112	113	139	152	149	138	145	154	180	189
MPa	70/59 (21.11/15)		0.64	0.65	0.73	0.8	0.82	0.78	0.81	0.86	1.01	1.06
	75/63 (23.89/17.22)		0.67	0.68	0.79	0.86	0.86	0.83	0.87	0.91	1.07	1.12
	80/67 (26.67/19.44)		0.71	0.72	0.85	0.95	0.93	0.89	0.91	0.96	1.12	1.19
	90/73 (32.22/22.78)		0.77	0.78	0.96	1.05	1.03	0.95	1	1.06	1.24	1.3

Figure 3: Cooling Pressure

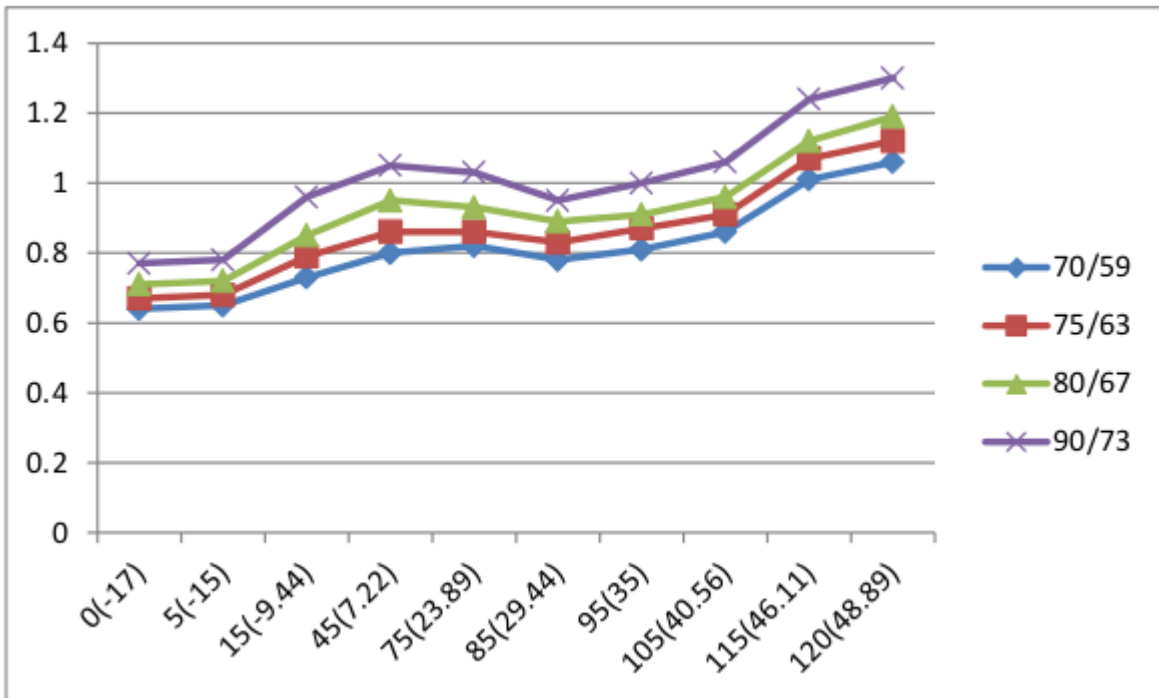




**Table 12: Heating Pressure**

°F(°C)	ODU(DB)	0(-17)	5(-15)	15 (-9.44)	45 (7.22)	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)	120 (48.89)
	IDU(DB/WB)										
BAR	70/59 (21.11/15)	6.4	6.5	7.3	8.0	8.2	7.8	8.1	8.6	10.1	10.6
	75/63 (23.89/17.22)	6.7	6.8	7.9	8.6	8.6	8.3	8.7	9.1	10.7	11.2
	80/67 (26.67/19.44)	7.1	7.2	8.5	9.5	9.3	8.9	9.1	9.6	11.2	11.9
	90/73 (32.22/22.78)	7.7	7.8	9.6	10.5	10.3	9.5	10.0	10.6	12.4	13.0
PSI	70/59 (21.11/15)	93	94	106	116	119	113	117	125	147	154
	75/63 (23.89/17.22)	97	99	115	125	124	120	126	132	155	162
	80/67 (26.67/19.44)	103	104	123	138	135	129	132	140	162	173
	90/73 (32.22/22.78)	112	113	139	152	149	138	145	154	180	189
MPa	70/59 (21.11/15)	0.64	0.65	0.73	0.8	0.82	0.78	0.81	0.86	1.01	1.06
	75/63 (23.89/17.22)	0.67	0.68	0.79	0.86	0.86	0.83	0.87	0.91	1.07	1.12
	80/67 (26.67/19.44)	0.71	0.72	0.85	0.95	0.93	0.89	0.91	0.96	1.12	1.19
	90/73 (32.22/22.78)	0.77	0.78	0.96	1.05	1.03	0.95	1	1.06	1.24	1.3

**Figure 4: Heating Pressure**



**Table 13: System Pressure**

Pressure			Temperature		Pressure			Temperature	
Kpa	bar	PSI	°C	°F	Kpa	bar	PSI	°C	°F
100	1	14.5	-51.623	-60.921	2350	23.5	340.75	38.817	101.871
150	1.5	21.75	-43.327	-45.989	2400	24	348	39.68	103.424
200	2	29	-36.992	-34.586	2450	24.5	355.25	40.531	104.956
250	2.5	36.25	-31.795	-25.231	2500	25	362.5	41.368	106.462
300	3	43.5	-27.351	-17.232	2550	25.5	369.75	42.192	107.946
350	3.5	50.75	-23.448	-10.206	2600	26	377	43.004	109.407
400	4	58	-19.953	-3.915	2650	26.5	384.25	43.804	110.847
450	4.5	65.25	-16.779	1.798	2700	27	391.5	44.592	112.266
500	5	72.5	-13.863	7.047	2750	27.5	398.75	45.37	113.666
550	5.5	79.75	-11.162	11.908	2800	28	406	46.136	115.045
600	6	87	-8.643	16.444	2850	28.5	413.25	46.892	116.406
650	6.5	94.25	-6.277	20.701	2900	29	420.5	47.638	117.748
700	7	101.5	-4.046	24.716	2950	29.5	427.75	48.374	119.073
750	7.5	108.75	-1.933	28.521	3000	30	435	49.101	120.382
800	8	116	0.076	32.137	3050	30.5	442.25	49.818	121.672
850	8.5	123.25	1.993	35.587	3100	31	449.5	50.525	122.945
900	9	130.5	3.826	38.888	3150	31.5	456.75	51.224	124.203
950	9.5	137.75	5.584	42.052	3200	32	464	51.914	125.445
1000	10	145	7.274	45.093	3250	32.5	471.25	52.596	126.673
1050	10.5	152.25	8.901	48.022	3300	33	478.5	53.27	127.886
1100	11	159.5	10.471	50.848	3350	33.5	485.75	53.935	129.083
1150	11.5	166.75	11.988	53.578	3400	34	493	54.593	130.267
1200	12	174	13.457	56.223	3450	34.5	500.25	55.243	131.437
1250	12.5	181.25	14.879	58.782	3500	35	507.5	55.885	132.593
1300	13	188.5	16.26	61.268	3550	35.5	514.75	56.52	133.736
1350	13.5	195.75	17.602	63.684	3600	36	522	57.148	134.866
1400	14	203	18.906	66.031	3650	36.5	529.25	57.769	135.984
1450	14.5	210.25	20.176	68.317	3700	37	536.5	58.383	137.089
1500	15	217.5	21.414	70.545	3750	37.5	543.75	58.99	138.182
1550	15.5	224.75	22.621	72.718	3800	38	551	59.591	139.264
1600	16	232	23.799	74.838	3850	38.5	558.25	60.185	140.333
1650	16.5	239.25	24.949	76.908	3900	39	565.5	60.773	141.391
1700	17	246.5	26.074	78.933	3950	39.5	572.75	61.355	142.439
1750	17.5	253.75	27.174	80.913	4000	40	580	61.93	143.474
1800	18	261	28.251	82.852	4050	40.5	587.25	62.499	144.498
1850	18.5	268.25	29.305	84.749	4100	41	594.5	63.063	145.513
1900	19	275.5	30.338	86.608	4150	41.5	601.75	63.62	146.516
1950	19.5	282.75	31.351	88.432	4200	42	609	64.172	147.510
2000	20	290	32.344	90.219	4250	42.5	616.25	64.719	148.494
2050	20.5	297.25	33.319	91.974	4300	43	623.5	65.259	149.466
2100	21	304.5	34.276	93.697	4350	43.5	630.75	65.795	150.431
2150	21.5	311.75	35.215	95.387	4400	44	638	66.324	151.383
2200	22	319	36.139	97.050	4450	44.5	645.25	66.849	152.328
2250	22.5	326.25	37.047	98.685	4500	45	652.5	67.368	153.262
2300	23	333.5	37.939	100.290					