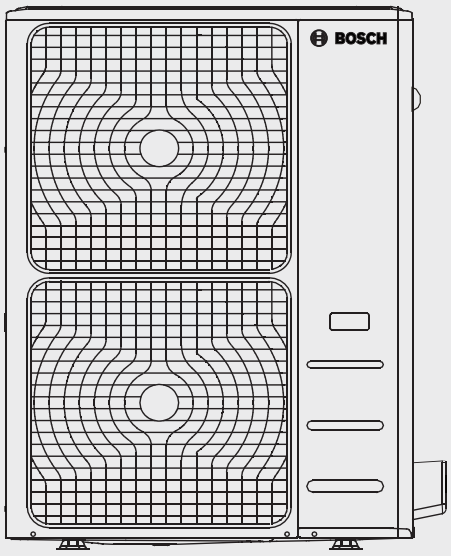
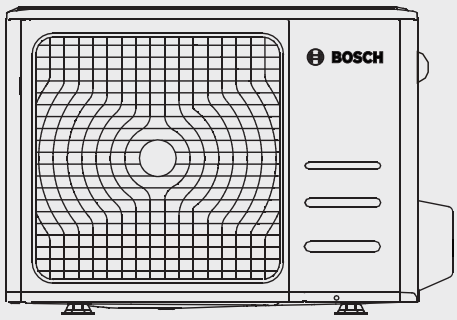



# **Bosch** Ductless Air Conditioner / Heat Pump Outdoor Unit

Climate 5000 Series

Multi Zone (Regular, Max Performance) ODU

BOSCH

Service Manual

AHRI CERTIFIED®
www.ahridirectory.org
Unitary Small HP
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

C ETL LISTED US
Intertek

## Table of Contents

# 1 Key to Symbols and Safety Instructions

## 1.1 Key to Symbols

### Warnings

Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

### Important information

This symbol indicates important information where there is no risk to people or property.

## 1.2 Safety

### Please read safety precautions before installation

Incorrect installation due to ignoring instructions can cause serious damage or injury.

**WARNING: ELECTRICAL HAZARD**

- Do not modify the length of the power supply cord or use an extension cord to power the unit.
- Do not share the electrical outlet with other appliances. Improper or insufficient power supply can cause fire or electrical shock.

**WARNING: INSTALLATION REQUIREMENTS**

- Installation must be performed by a licensed contractor, and per the instructions in the installation manual. Improper installation can cause water leakage, electrical shock, or fire.
- In North America, installation must be performed in accordance with the requirement of NEC (National Electric Code) and CEC (Canadian Electric Code) by licensed and qualified personnel only.
- Only contact a licensed contractor for repair or maintenance of this unit.
- Only use the included accessories, parts, and specified parts for installation. Using non-standard parts can cause water leakage, electrical shock, fire, and can cause the unit to fail.
- Install the unit in a solid location that can support the unit's weight. If the chosen location cannot support the unit's weight, or the installation is not done properly, the unit may drop and cause serious injury and/or damage.

**WARNING:**

- This product can expose you to chemicals including Lead and Lead components, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

**WARNING: ELECTRICAL HAZARD**

- For all electrical work, follow all local and national wiring standards, regulations, and the Installation Manual. The power supply to the outdoor unit requires a service disconnect at the unit. Only use a dedicated circuit. Never share a power source connected to this system. Insufficient electrical capacity or defects in electrical work can cause electrical shock or fire.
- For all electrical work, use the specified cables. Connect cables tightly, and clamp them securely to prevent external forces from damaging the terminal. Improper electrical connections can overheat and cause fire, and may also cause shock.
- All wiring must be properly arranged to ensure that the control board cover can close properly. If the control board cover is not closed properly, it can lead to corrosion and cause the connection points on the terminal to heat up, catch fire, or cause electrical shock.
- In certain functional environments, such as kitchens, server rooms, etc., the use of specially designed air-conditioning units are highly recommended.
- If the power supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons such as a licensed electrician in order to avoid a hazard.
- The product must be properly grounded at the time of installation, or electrical shock may occur.

**WARNING: FIRE HAZARD**

- For units that have an auxiliary electric heater, do not install the unit within 1 meter (3 feet) of any combustible materials.
- Do not install the unit in a location that may be exposed to combustible gas leaks. If combustible gas accumulates around the unit, it may cause fire.
- Do not operate your air conditioner in a wet room such as a bathroom or laundry room. Too much exposure to water can cause electrical components to short circuit.

**NOTICE: PROPERTY DAMAGE**

- Install condensate drainage piping according to the instructions in this manual. Improper condensate drainage may cause water damage to your home and property.

**CAUTION: CONTAINS REFRIGERANT**

- This air-conditioning unit contains fluorinated gases. For specific information on the type of gas and the amount, please refer to the relevant label on the outdoor unit itself.
- Installation, service, maintenance and repair of this unit must be performed by a certified technician.
- Product removal and recycling must be performed by a certified technician.
- If the system has a leak-detection system installed, it must be checked for leaks at least every 12 months.
- When the unit is checked for leaks, proper record-keeping of all checks is required.

# 2 Part Names and Model Numbers

## 2.1 Outdoor Models

| Voltage | Capacity | Max Zone | Regular Outdoor Units | Max Performance Outdoor Units |
|---|---|---|---|---|
| 208-230V | 18K | 2 | BMS500-AAM018-1CSXRA | BMS500-AAM018-1CSXHB |
| | 27K | 3 | BMS500-AAM027-1CSXRA | BMS500-AAM027-1CSXHB |
| | 36K | 4 | BMS500-AAM036-1CSXRA | BMS500-AAM036-1CSXHB |
| | 48K | 5 | BMS500-AAM048-1CSXRA | – |

*Table 1*

## 2.2 Indoor Models

| Voltage | Capacity | Wall Mounted Indoor Units | 4-Way Cassette Indoor Units | Ducted Indoor Units |
|---|---|---|---|---|
| 208-230V | 9K | BMS500-AAU009-1AHWXB | BMS500-AAU009-1AHCXB | BMS500-AAU009-1AHDXB |
| | 12K | BMS500-AAU012-1AHWXB | BMS500-AAU012-1AHCXB | BMS500-AAU012-1AHDXB |
| | 18K | BMS500-AAU018-1AHWXB | BMS500-AAU018-1AHCXB | BMS500-AAU018-1AHDXB |
| | 24K | BMS500-AAU024-1AHWXB | BMS500-AAU024-1AHCXB | BMS500-AAU024-1AHDXB |

*Table 2*

For Indoor Units, please refer to Indoor Unit Service Manual.

# 3 Dimensions

## 3.1 Outdoor Unit

**Split type outdoor unit mounting dimensions**

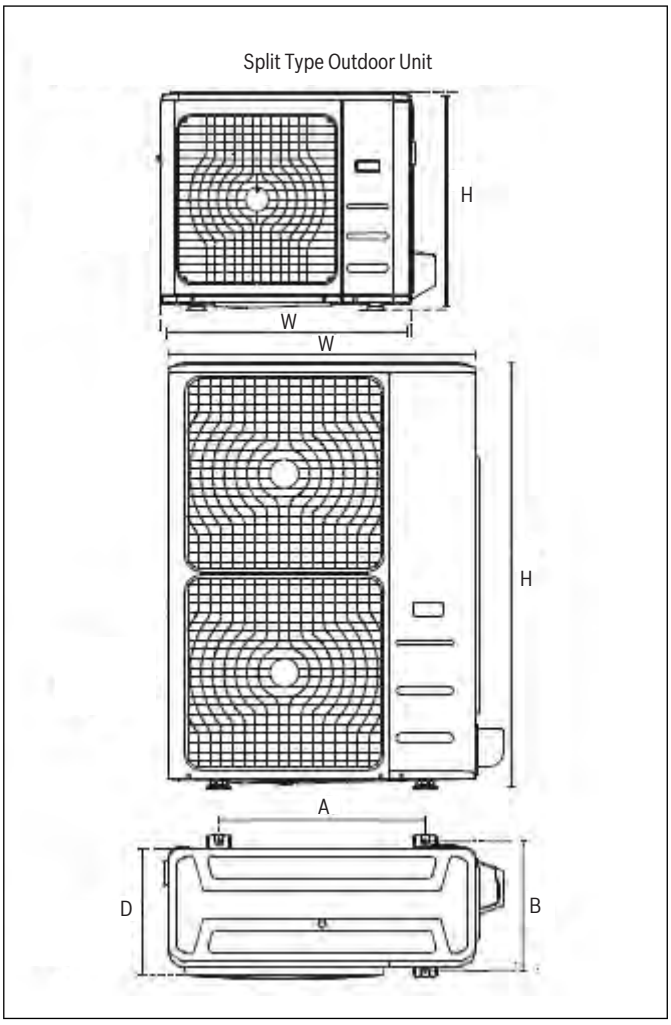



*Figure 1*

| Outdoor Model | Outdoor Unit Dimensions mm (in.) W x H x D | Mounting Dimensions mm (in.) | |
|---|---|---|---|
| | | Distance A | Distance B |
| BMS500-AAM018-1CSXRA | 845x702x363 (33.27x27.6x14.3) | 540 (21.26) | 350 (13.8) |
| BMS500-AAM027-1CSXRA, BMS500-AAM027-1CSXHB, BMS500-AAM036-1CSXRA, BMS500-AAM036-1CSXHB | 946x810x410 (37.24x31.9x16.14) | 673 (26.5) | 403 (15.87) |
| BMS500-AAM036-1CSXHB, BMS500-AAM048-1CSXRA | 952x1333x415 (37.5x52.5x16.34) | 634 (24.96) | 404 (15.9) |

*Table 3*

# 4 Refrigerant Cycle Diagrams - Outdoor Models

## 4.1 For Model: 18K Multi Zone Regular System BMS500-AAM018-1CSXRA

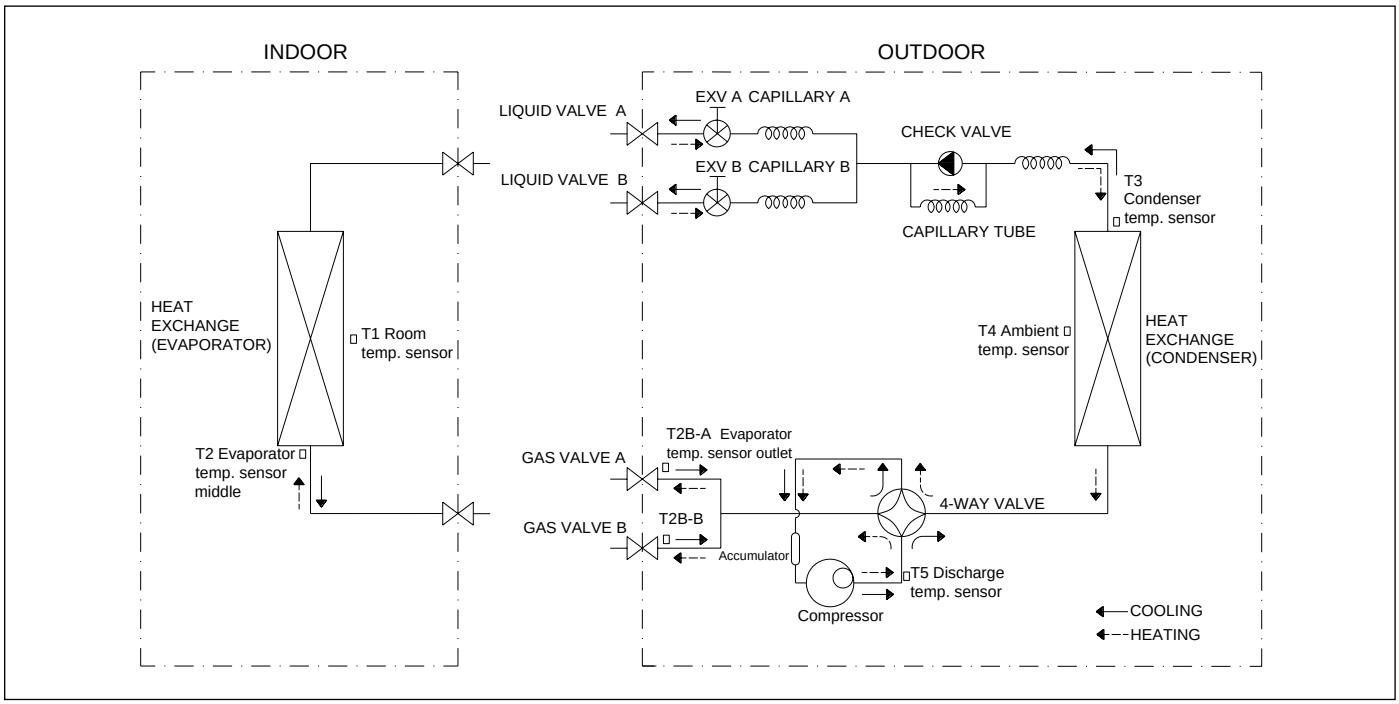



*Figure 2*

## 4.2 For Model: 18K Multi ZoneMax Performance System BMS500-AAM018-1CSXHB

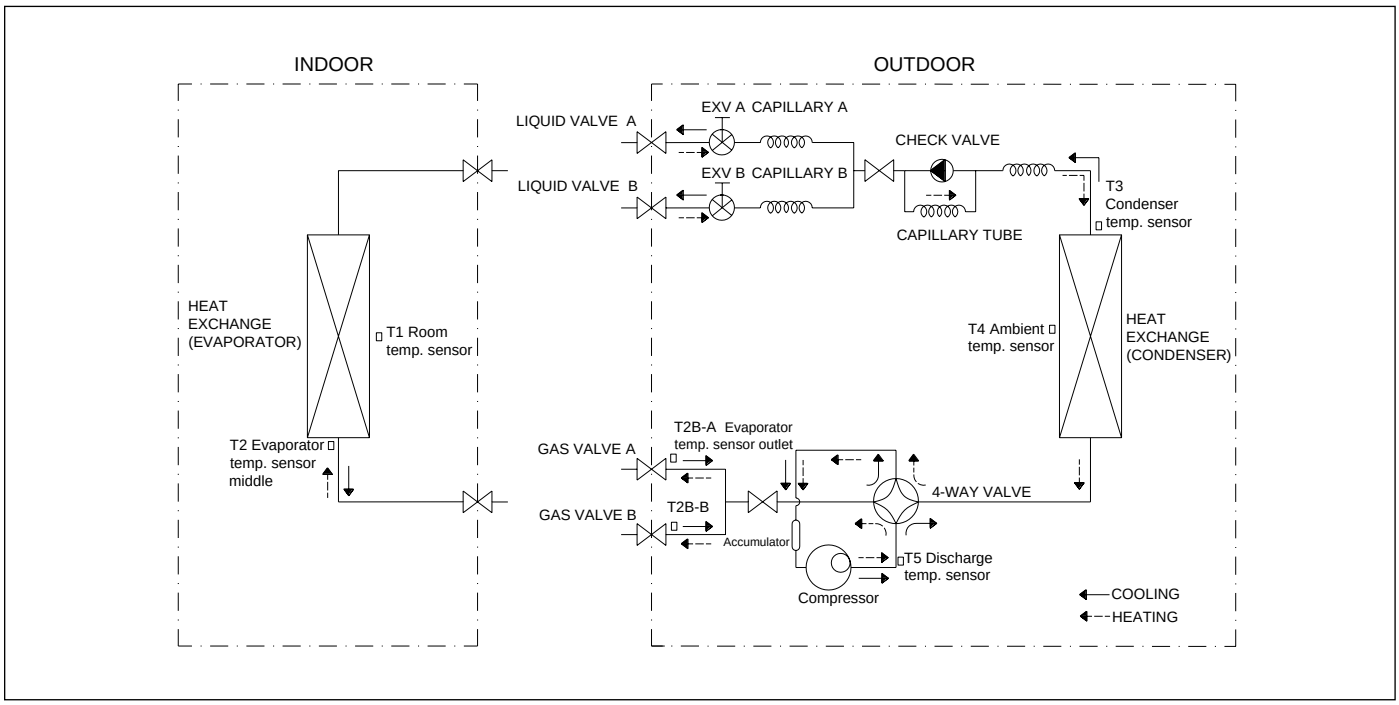



*Figure 3*

### 4.3 For Models: 27K Multi Zone Regular, 27K Multi Zone Max Performance System BMS500-AAM027-1CSXRA, BMS500-AAM027-1CSXHB

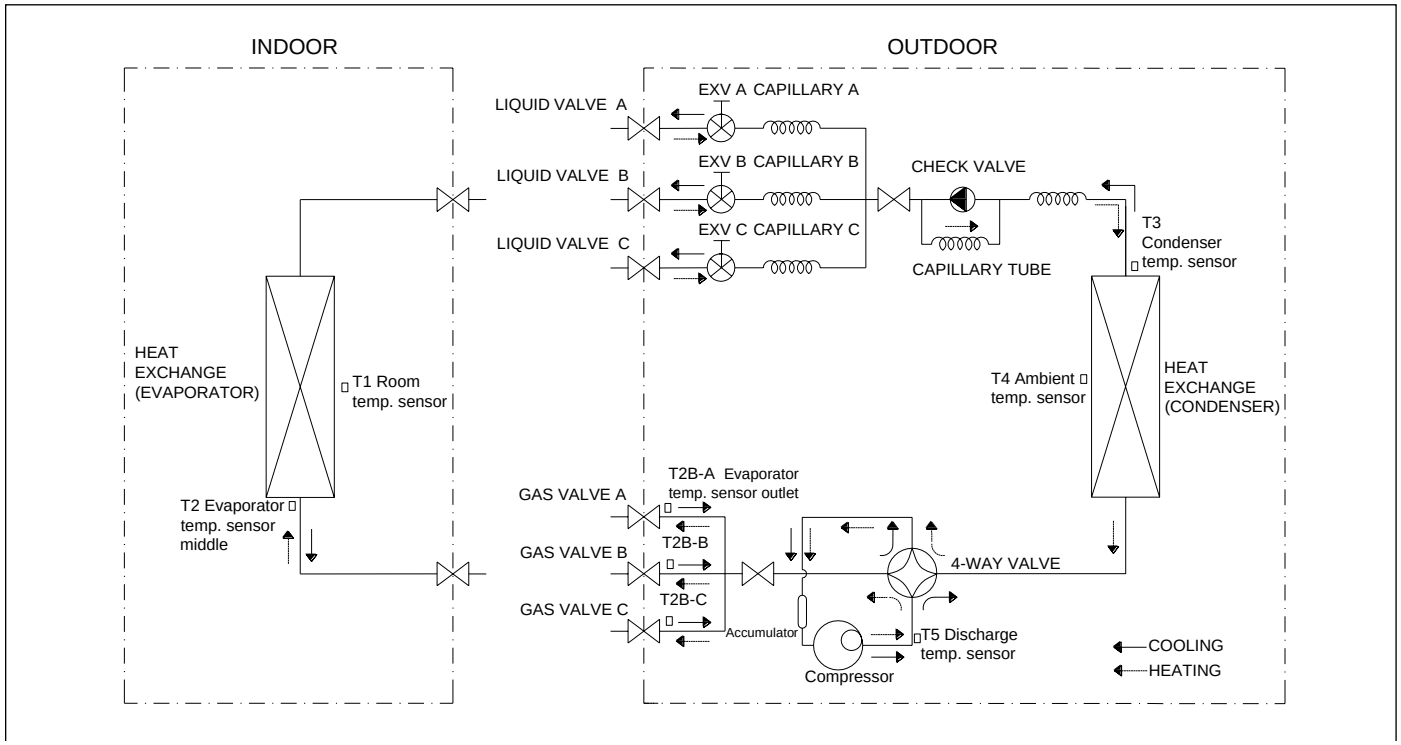



*Figure 4*

### 4.4 For Models: 36K Multi Zone Regular, 36K Multi Zone Max Performance System BMS500-AAM036-1CSXRA, BMS500-AAM036-1CSXHB

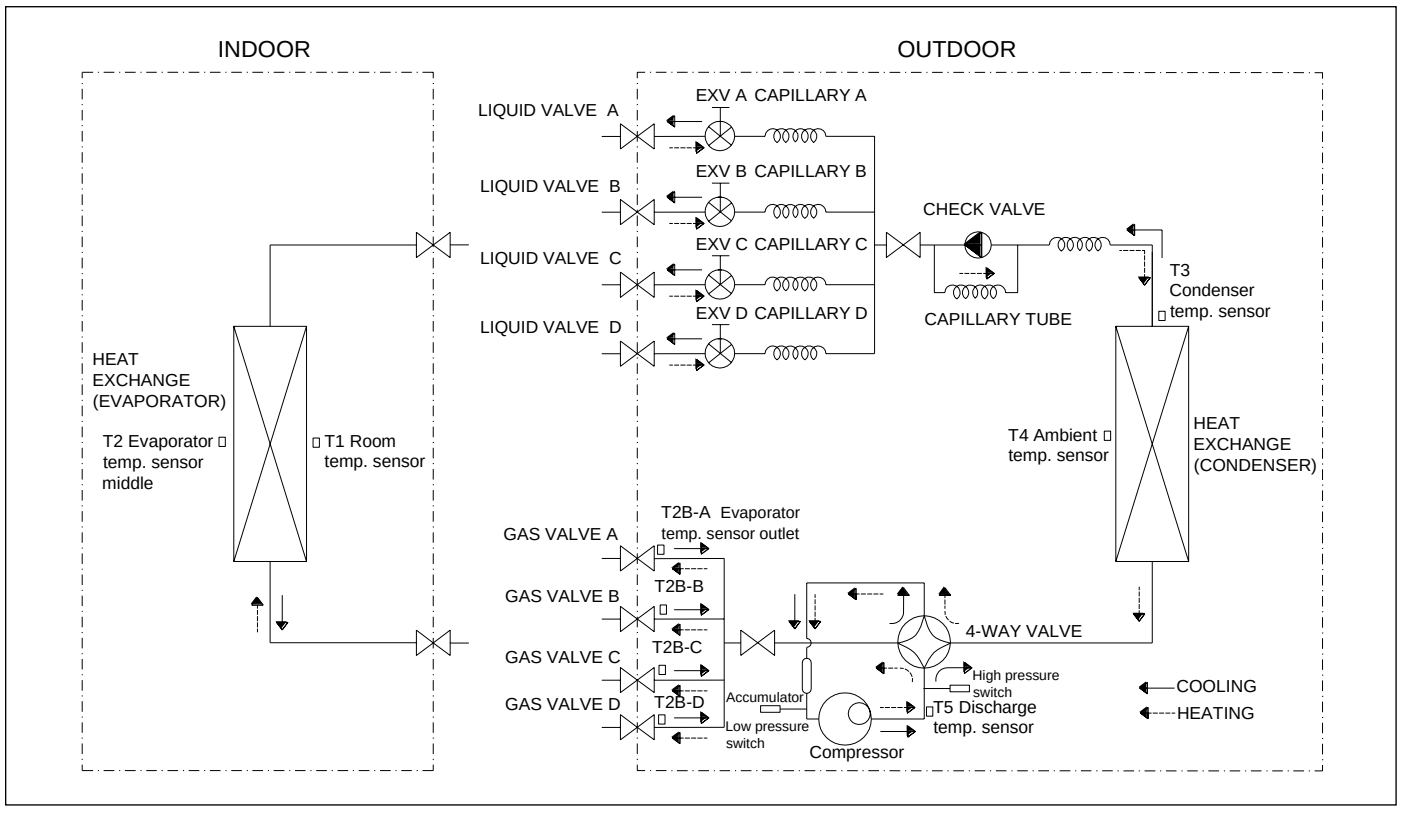



*Figure 5*

### 4.5 For Model: 48K Multi Zone Regular System BMS500-AAM048-1CSXRA

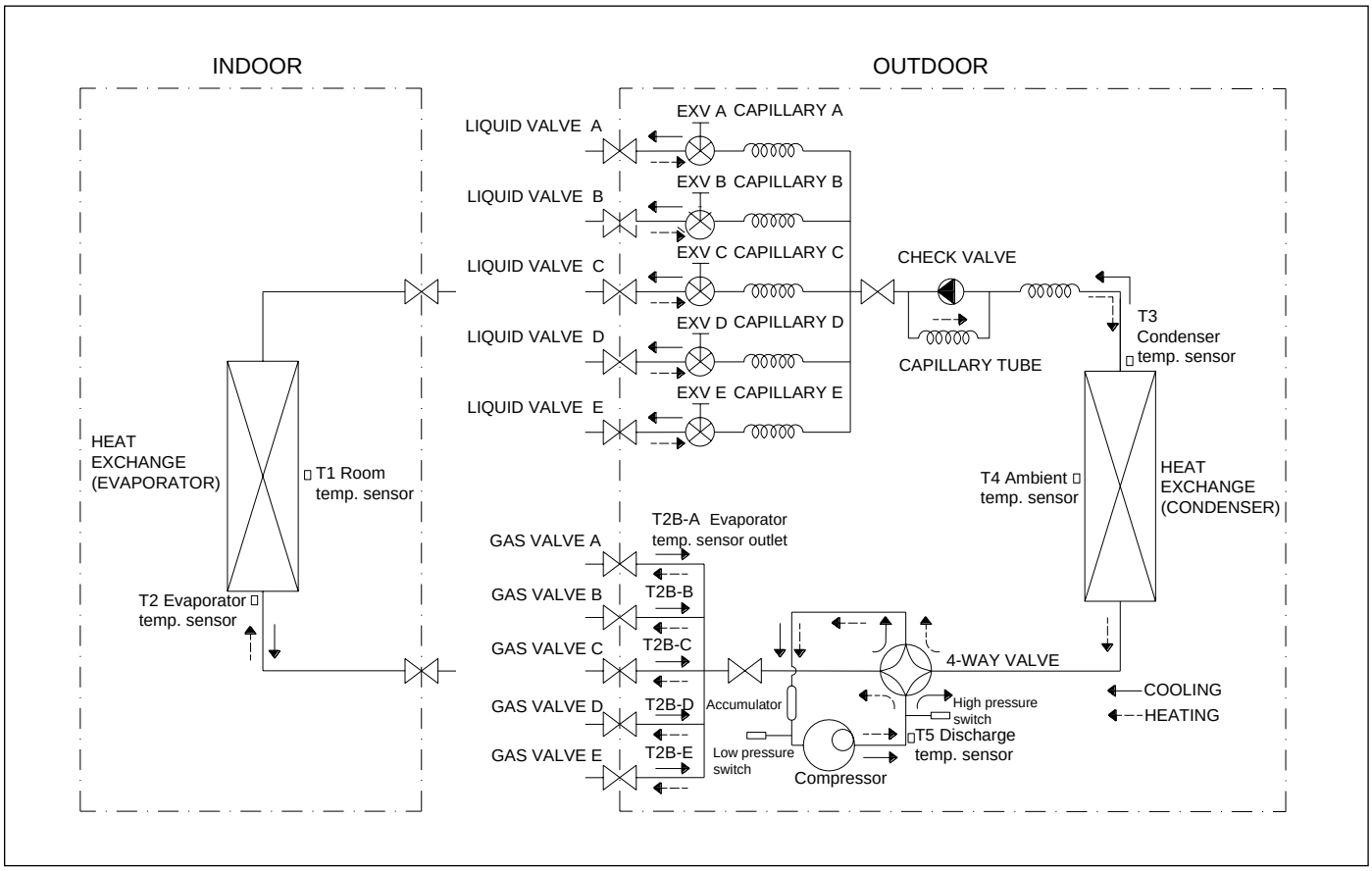



*Figure 6*

## 5 Wiring Diagram

Refer to wiring diagram in the installation manual (IOM) or on the unit.

# 6 Installation Details

## 6.1 Torque Requirements

| Pipe Diameter inch (mm) | Torque lb•ft (N•m) |
|---|---|
| 1/4 (6.35) | 13.3~14.8 (18~20) |
| 3/8 (9.52) | 23.6~28.8 (32~39) |
| 1/2 (12.7) | 36.1~43.5 (49~59) |
| 5/8 (15.9) | 42.0~52.4 (57~71) |
| 3/4 (19) | 49.4~74.5 (67~101) |
| 7/8 (22) | 62.7~81.1 (85~110) |

*Table 4*

## 6.2 Connecting the Cables

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

- Cable type: SOOW type

| Appliance Amps | AWG Wire Size |
|---|---|
| 10 | 18 |
| 13 | 16 |
| 18 | 14 |
| 25 | 12 |
| 30 | 10 |

*Table 5*

The cable sizes are determined by the maximum current indicated on the nameplate which is located on the side panel of the unit. Please refer to the nameplate before selecting the cable, fuse and switch. A means of disconnecting the power, should be within 10 feet of the outdoor unit.

## 6.3 Pipe Length and the Elevation

**Regular Multi Zone ODU**

| Capacity | Pipe size | |
|---|---|---|
| | Liquid side (in / mm) | Gas side (in / mm) |
| 18k | 2 x 1/4" / 2 x Φ6.35 | 2 x 3/8" / 2 x Φ9.52 |
| 27k | 3 x 1/4" / 3 x Φ6.35 | 3 x 3/8" / 3 x Φ9.52 |
| 36k | 4 x 1/4" / 4 x Φ6.35 | 4 x 3/8" / 4 x Φ9.52 |
| 48k | 5 x 1/4" / 5 x Φ6.35 | 3 x 3/8" + 2 x 1/2" 3 x Φ9.52 + 2 x Φ12.7 |

*Table 6*

**Max Performance Multi Zone ODU**

| Capacity | Pipe size | |
|---|---|---|
| | Liquid side (in / mm) | Gas side (in / mm) |
| 18k | 2 x 1/4" / 2 x Φ6.35 | 2 x 3/8" / 2 x Φ9.52 |
| 27k | 3 x 1/4" / 3 x Φ6.35 | 3 x 3/8" / 3 x Φ9.52 |
| 36k | 4 x 1/4" / 4 x Φ6.35 | 3 x 3/8" + 1 x 1/2" 3 x Φ9.52 + 1 x Φ12.7 |

*Table 7*

## 6.4 First Time Installation

### 6.4.1 Air Purging with Vacuum Pump

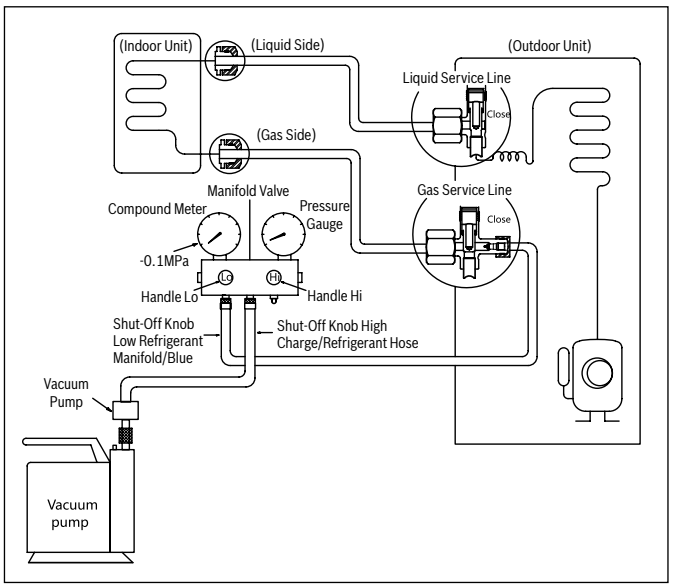



*Figure 7*

1. Completely tighten the flare nuts of the indoor and outdoor units, confirm that both the liquid service and gas service valves are set to the closed position.
2. Connect the refrigerant manifold; blue hose with the shut-off knob of the low side to the gas service valve port.
3. Connect the refrigerant manifold; yellow hose to the shut-off high side connection to the vacuum pump.
4. Fully open the shut-off knob low side of the manifold valve.
5. Operate the vacuum pump to evacuate.
6. Perform evacuation for 30 minutes and check whether the refrigeration low side pressure gauge indicates 350 ~500 microns. If the meter does not indicate 350 ~ 500 microns after evacuating for 30 minutes, it should be evacuated 20 minutes more. If the pressure can't hold 350 ~ 500 microns after evacuating 50 minutes, please check if there are any leakage points. Fully close the shut-off knob low side of the manifold and stop the operation of the vacuum pump. Confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).
7. Make sure the pressure display in the pressure indicator is a little higher than the atmospheric pressure. Then remove the charge hose from the gas service valve.
8. Fully open the liquid service valve and gas service valve and securely tighten the cap of the gas service valve. System is now evacuated and charged. (Ensure that the unit is charged per the defined specifications).

Gas leak check:

- Required after completion of refrigerant line set installation
- Unit service valves remain closed to isolate refrigerant into outdoor unit (condensing section)
- Line set and coil should be pressurized to at least 150 PSIG using dry Nitrogen
- Check for leaks using bubble solution at each braze joint

## 6.5 Adding the Refrigerant to an Existing System

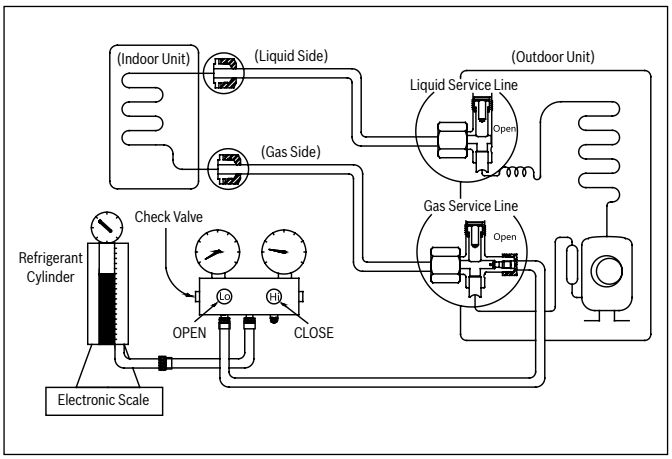



*Figure 8*

**Procedure**

1. Connect the refrigerant manifold, blue suction hose to the gas service valve's service port, open the liquid service valve and the gas service valve. Connect the refrigerant manifold, yellow hose to the valve at the top or bottom of the cylinder. If the refrigerant is R410A, ensure that cylinder is placed upside down during the charging process.
2. Purge the air from the refrigerant manifold (yellow hose). Open the valve at the top or bottom of the cylinder and press the check valve on the refrigerant manifold to purge the air.

**CAUTION: CONTAINS REFRIGERANT**

- ► Liquid refrigerant can cause frost bite. Handle with care.

3. Place the refrigerant cylinder onto the electronic scale and record the weight.
4. Operate the air conditioner in cooling mode.
5. Open the valve (low side) on the refrigerant manifold and charge the system with liquid refrigerant.
6. When the electronic scale displays the proper weight (refer to the gauge and the pressure of the low side), turn off the refrigerant low side valve and the refrigerant cylinder valve. Then turn off the unit to remove the hose from the gas service valve.
7. Replace valve stem caps on the service port. Use a torque wrench to tighten the service port cap to a torque of 18N.m. Be sure to check for gas leakage.

Recover the refrigerant as per Refrigerant Recovery and Recycling Equipment manufacturers' specification.

**Refrigerant charging**

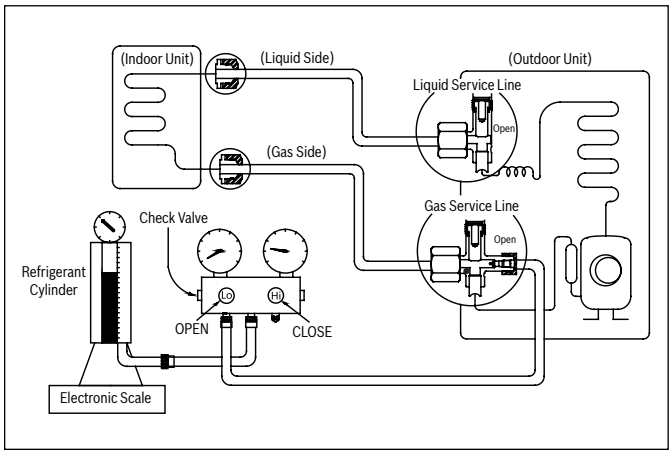



*Figure 9*

**Procedure:**

1. Connect the charge hose to the refrigerent cylinder, open the liquid and the gas service valves. Connect the charge hose which you disconnected from the vacuum pump to the valve at the top or bottom of the cylinder. If the refrigerant is R410A, make the cylinder is upside down 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 refrigerant manifold 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, if 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 gas service 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. Replace valve stem caps on the service port. Use a torque wrench to tighten the service port cap to a torque of 18N.m. Be sure to check for gas leakage.

**For models: BMS500-AAM027-1CSXRA, BMS500-AAM036-1CSXRA, BMS500-AAM048-1CSXRA, BMS500-AAM018-1CSXHB, BMS500-AAM027-1CSXHB, BMS500-AAM036-1CSXHB**

For above models, there is a set of master valve, which will allow installer to vacuum and recycle the refrigerant at a faster speed. Ensure master valves are fully open prior to system operation.

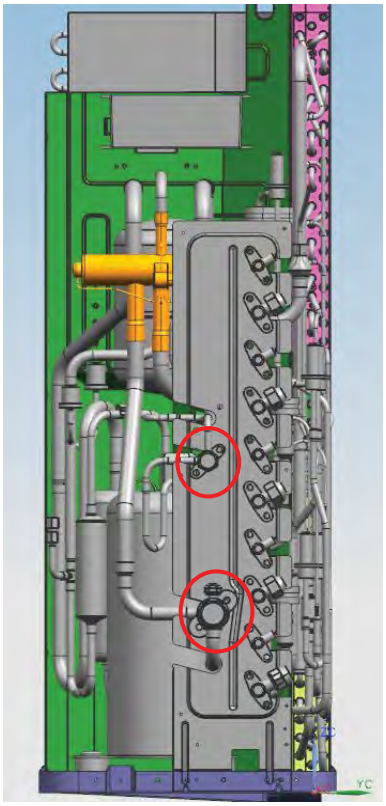


*Figure 10*

## 6.7 Operation Characteristics

| | | | COOL operation | HEAT operation | DRY operation |
|---|---|---|---|---|---|
| Room Temperature | | | 63ºF - 90ºF<br>17ºC - 32ºC | 32ºF - 86ºF<br>0ºC - 30ºC | 50ºF - 90ºF<br>10ºC - 32ºC |
| Outdoor Temperature | Regular | BMS500-AAM018-1CSXRA<br>BMS500-AAM027-1CSXRA<br>BMS500-AAM036-1CSXRA<br>BMS500-AAM048-1CSXRA | -25ºC - 50ºC<br>-13ºF - 122ºF | -25ºC - 30ºC<br>-13ºF - 86ºF | 0ºC - 50ºC<br>32ºF - 122ºF |
| | Max Performance | BMS500-AAM018-1CSXHB<br>BMS500-AAM027-1CSXHB<br>BMS500-AAM036-1CSXHB | -30ºC - 50ºC<br>-22ºF - 122ºF | -30ºC - 30ºC<br>-22ºF - 86ºF | 0ºC - 50ºC<br>32ºF - 122ºF |

*Table 8*

**Equation to convert Celsius to Fahrenheit**

**(°F) = 1.8 x (°C) + 32**

**NOTICE:**

- If the system is used beyond the above conditions, certain safety protection features may come into operation and cause the unit to operate abnormally.

**NOTICE:**

- The room relative humidity should be less than 80%. If the air conditioner operates beyond this figure, the surface of the air conditioner may attract condensation. Please set the vertical air flow louver to its maximum angle (vertically to the floor), and set to HIGH fan mode.
- The optimum performance will be achieved during this operating temperature zone.

# 7 Electronic Functions

## 7.1 Abbreviation

**T1**: Indoor room temperature

**T2**: Coil temperature of evaporator

**T3**: Coil temperature of condenser

**T4**: Outdoor ambient temperature

**T5**: Compressor discharge temperature

**Ts:** Room temperature setting

**Td:** Off-set value (Td is an advanced feature)

**T2b-A:** Suction temp for zone A in cooling (discharge temp for each zone in heating)

**T2b-B:** Suction temp for zone B in cooling (discharge temp for each zone in heating)

**T2b-C:** Suction temp for zone C in cooling (discharge temp for each zone in heating)

**T2b-D:** Suction temp for zone D in cooling (discharge temp for each zone in heating)

**T2b-E:** Suction temp for zone E in cooling (discharge temp for each zone in heating)

## 7.2 Main Protection

### 7.2.1 Three minutes delay at restart for compressor

1 minute delay for the 1st time start-up and 3 minutes delay for others.

### 7.2.2 Temperature protection of compressor discharge

When the discharge temperature of the compressor rises, the operation frequency is limited according to the following rules:

- If 105 °C (221 °F) ≤ T5 < 110 °C (230 °F), maintain the current frequency.
- If the temperature increases and T5 ≥ 110 °C (230 °F), decrease the frequency to a lower level every 2 minutes to F1.
- If T5 ≥ 115 °C (239 °F) for 10 seconds, the compressor stops and then restart until T5 < 90 °C (194 °F).

### 7.2.3 Fan speed is out of control

If outdoor fan speed is lower than 100RPM or higher than 2400RPM for 60 seconds or more, the unit stops and LED displays E8 failure code.

### 7.2.4 Inverter module protection

The Inverter module has a protection function for current, voltage and temperature. If these protections happen, the corresponding code will display on the indoor unit and the unit will stop working. The unit restarts 3 minutes after the protection mechanism has turned off.

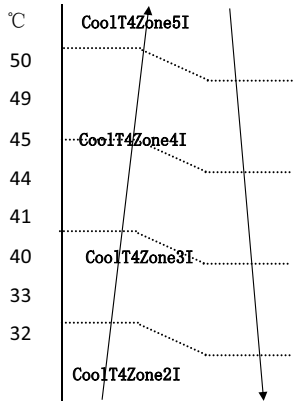
### 7.2.5 Low voltage protection

If low voltage protection triggers and voltage is not restored to normal within 3 minutes, the protection remains active even after a machine restart.

### 7.2.6 Compressor current limit protection

The temperature interval for the current limit is the same as the range of the T4 frequency limit.

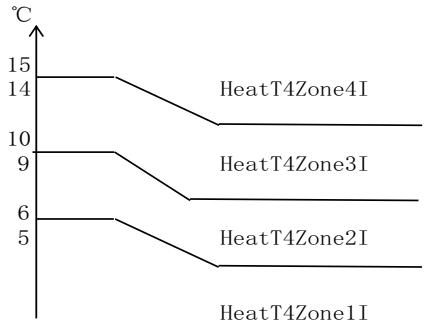
**Cooling mode:**




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

*Figure 11*

**Heating mode:**




| | |
|---|---|
| HeatReturnI | The difference between current limit and shutdown current |
| HeatT4Zone4I | Heating T4≥15℃ current limit value |
| HeatT4Zone3I | Heating 14＞T4≥10℃ current limit value |
| HeatT4Zone2I | Heating 9 ＞T4≥6℃ current limit value |
| HeatT4Zone1I | Heating 5 ＞T4℃ current limit value |
| HeatStopI | Heating stop protection current |

*Figure 12*

### 7.2.7 Indoor / outdoor units communication protection

If the indoor units do not receive the feedback signal from the outdoor units for 2 consecutive minutes, the unit stops. The unit displays the failure code.

### 7.2.8 High Condenser Coil Temperature Protection

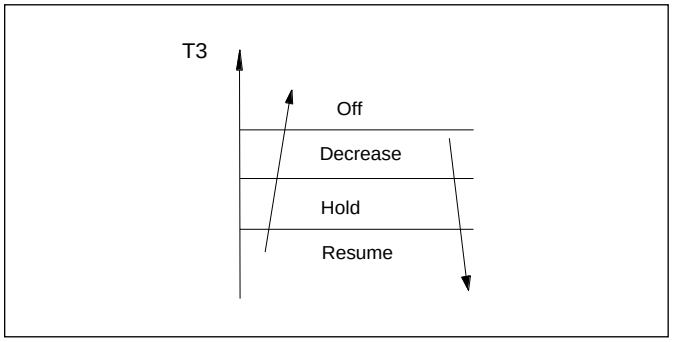



*Figure 13*

- If 55°C < T3 < 60°C, the compressor frequency will decrease to the lower level until F1 and then runs at F1. If T3 < 54°C, the compressor will keep running at the current frequency.
- If T3 < 52°C, the compressor will not limit the frequency and resume to the former frequency.
- If T3 > 60°C for 5 seconds, the compressor will stop until T3 < 52°C.

### 7.2.9 Outdoor Unit Anti-Freezing Protection

When T2 < 4°C for 250 seconds or T2 < 0°C, the indoor unit capacity demand will be kept at zero. The system resumes normal operation when T2 > 8°C and the protection time is no less than 3 minutes.

### 7.2.10 Oil Return

1. If the compressor frequency continues to be lower than the set frequency (35Hz) for about 120 minutes, the unit raises the frequency to 60Hz for about 100 seconds and then resumes with the former frequency.
2. The EXV continues at 300 pulse while indoor units maintain their operation.

### 7.2.11 Low Outdoor Ambient Temperature Protection

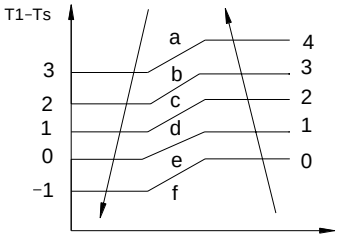
- When the compressor is off and T4 is lower than -35°C for 10 seconds, the unit stops and displays “LP.”
- When the compressor is on and T4 remains lower than -40°C for 10 seconds, the unit stops and displays “LP.”
- When T4 is higher than -32°C for 10 seconds, the unit exits protection.

## 7.4 Operation Modes and Functions

### 7.4.1 Capacity Request Calculation

Total capacity Request=Σ(Norm code × HP) /40×modify rate+correction

**Cooling Mode:**




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

*Figure 14*

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

*Table 9*

The final result is an integer.

**Use the following table and final capacity request to confirm the operating frequency.**

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

*Table 10*

The maximum running frequency is adjusted according to the outdoor ambient temperature.

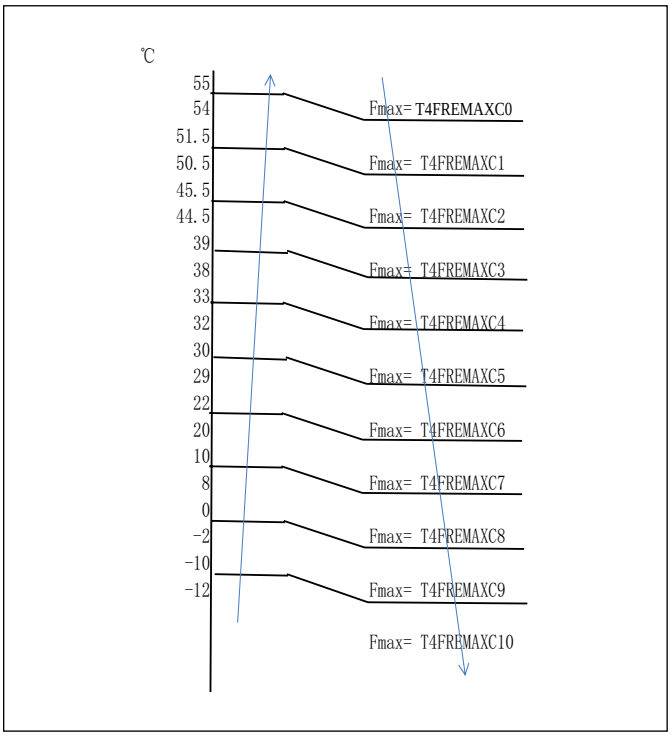
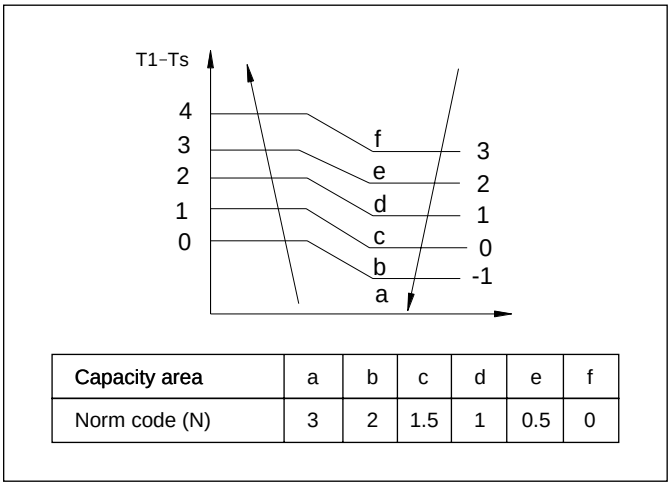



*Figure 15*

**Heating Mode:**




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

*Figure 16*

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

*Table 11*

The final result is an integer.

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

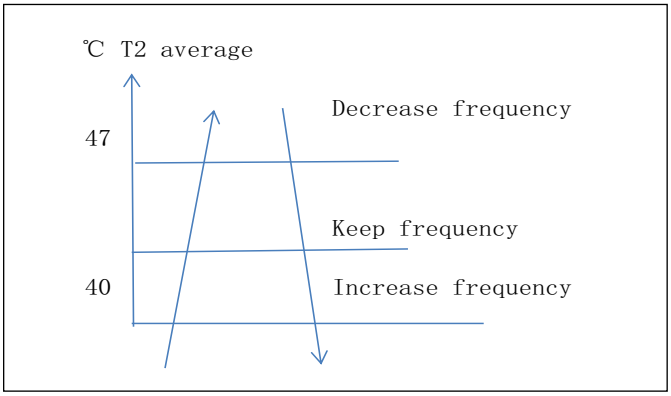



*Figure 17*

**Use the following table and final capacity request to confirm the operating frequency.**

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

*Table 12*

The maximum running frequency is adjusted according to the outdoor ambient temperature.

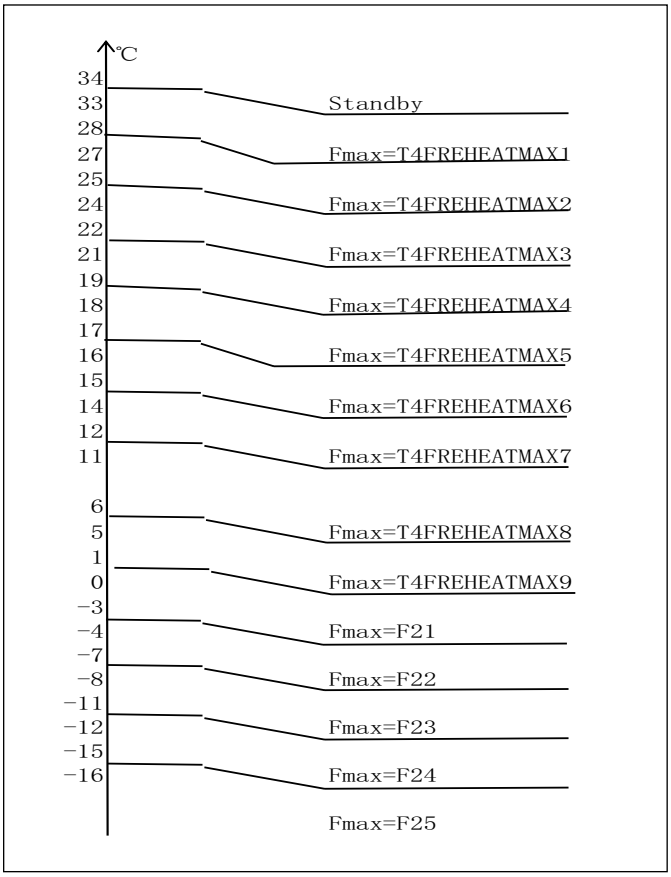



*Figure 18*

### 7.4.2 Defrost Control

**Conditions for Defrost Mode:**

After the compressor starts and enters normal operation, mark the minimum value of T3 from the 10th to 15th minute as T30.

If any one of the following conditions is satisfied, the unit enters defrost mode:

1. If the compressor's cumulative running time reaches 29 minutes and T3 < TCDI1 and T3 + T30SUBT3ONE ≤ T30.
2. If the compressor cumulative running time reaches 35 minutes and T3 < TCDI2 and T3 + T30SUBT3TWO ≤ T30.
3. If the compressor cumulative running time reaches 40 minutes and T3 < -24℃ for 3 minutes.
4. If the compressor cumulative running time reaches 120 minutes and T3 < -15℃.

**Defrost Stop Conditions**

If any one of the following conditions is satisfied, defrost mode ends and the unit returns to normal heating mode:

- T3 rises above than TCDE1℃.
- T3 remains at TCDE2℃ or above for 80 seconds.
- The machine runs for 10 consecutive minutes in defrost mode.

**Defrosting Action:**

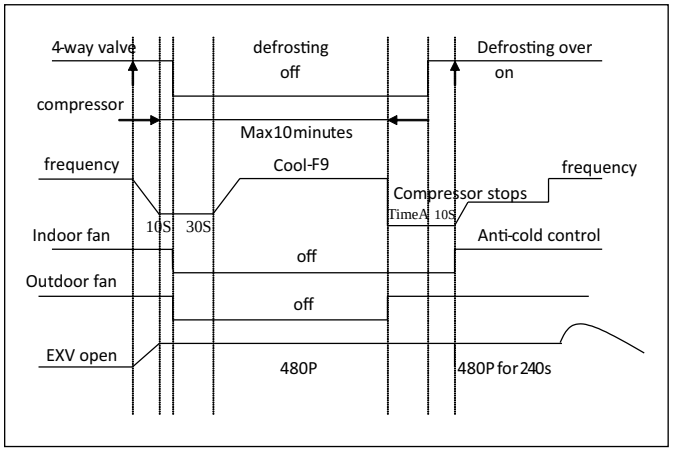



*Figure 19*

**Condition of ending defrosting:**

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

- T3 > TempQuitDefrost_ADD ℃;.
- Defrost mode runs for 10 minutes

***TempQuitDefrost_ADD*** is slightly different depending on out door models, but is about 12˚C (54˚F).

### 7.4.3 Outdoor Fan Control

#### 7.4.3.1 Cooling Mode

Under normal operating conditions, the system chooses the running fan speed according to the ambient temperature:

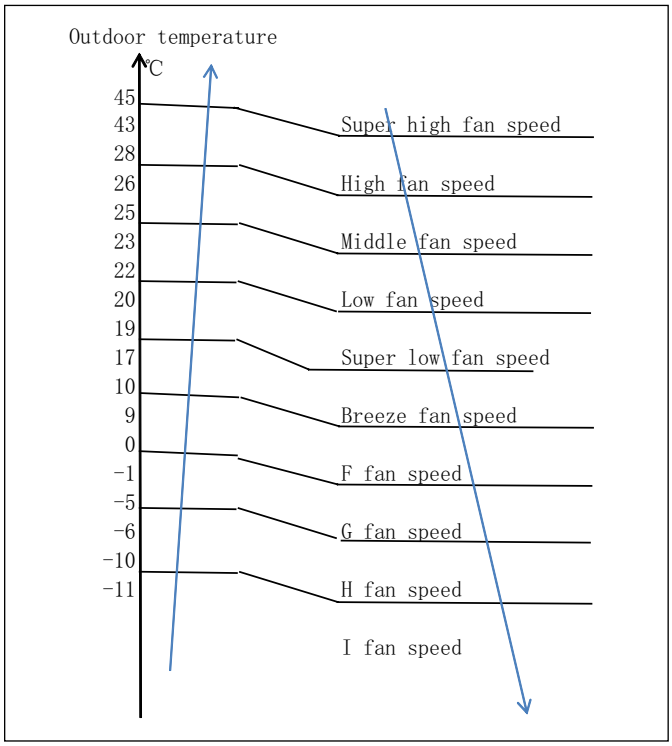



*Figure 20*

Low ambient cooling mode logic:

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

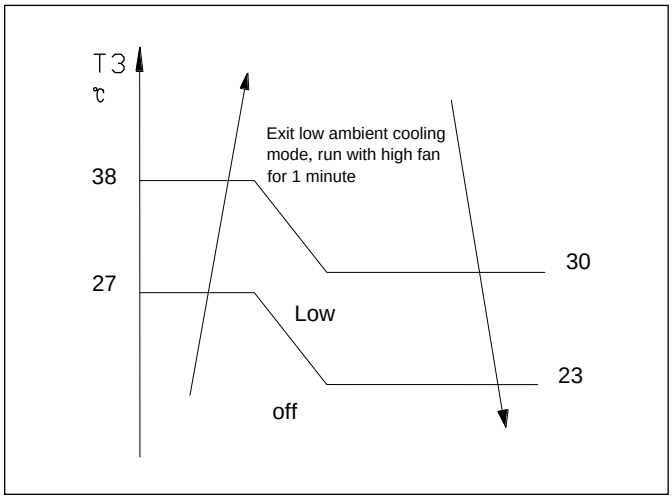



*Figure 21*

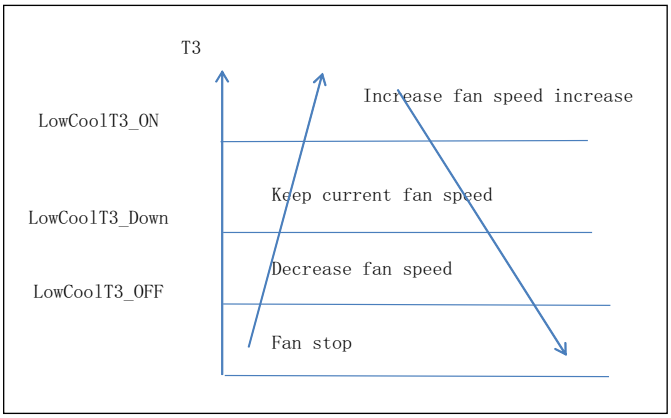



*Figure 22*

#### 7.4.3.2 Heating Mode

Under normal operating conditions, the system chooses a running fan speed according to ambient temperature:

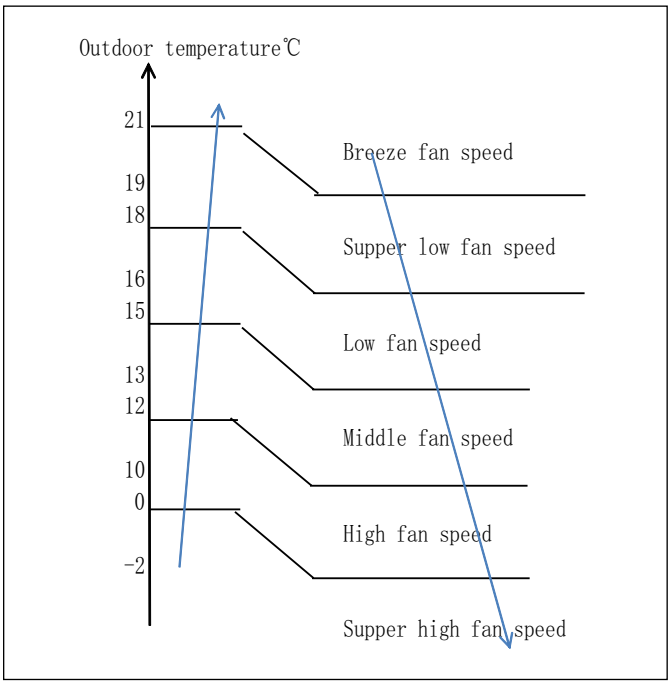



*Figure 23*

### 7.4.4 Electronic Expansion Valve (EXV) Control

1. EXV remains fully closed while the device is powering up. EXV then remains on standby with 350 pulse open. It opens to the target angle after the compressor starts.
2. EXV closes with -160 pulse when the compressor stops. Then it remains on standby with 350 pulse open. It opens to the target angle after the compressor starts.
3. The action priority for the EXVs is A-B-C-D-E.
4. The compressor and outdoor fan commence operation only after EXV initializes.

#### 7.4.4.1 Cooling Mode

The initial open angle of the EXV depends on the size of the indoor model. The adjustment range is 100 pulse - 400 pulse.

When the unit has been running for 3 minutes, the outdoor receives indoor units' capacity demand and T2B information and then calculates their average. After comparing each indoor's T2B with the average, the outdoor gives the following modification commands:

- If T2B > average, the relevant valve needs to open 16P more
- If T2B = average, the relevant valve's open range remains as is
- If T2B < average, the relevant valve needs to close 16P more

This modification is carried out every 2 minutes.

#### 7.4.4.2 Heating Mode

The initial open angle of the EXV depends on the size of the indoor model. The adjustment range is 150 pulse - 350 pulse.

When the unit has been running for 3 minutes, the outdoor unit receives the indoor units capacity demand and T2 information and then calculates their average.

After comparing each indoor unit's T2 with the average, the outdoor gives the following modification commands:

- If T2 > average +2, the relevant valve needs to close 16P more
- If average+2 ≥ T2 ≥ average -2, relevant valve's open range remains as is
- If T2 < average -2, the relevant valve needs to open 16P more

This modification is carried out every 2 minutes.

### 7.4.5 Four-Way Valve Control

In heating mode, the four-way valve is opened.

In defrost mode, the four-way valve operates according to the current defrosting action.

In other modes, the four-way valve is closed.

When the unit is switched from heating to other modes, the four-way valve turns off after the compressor has been off for 2 consecutive minutes.

Failure or protection (excluding discharge temperature protection and high/low pressure protection) causes the four-way valve to immediately shut down.

### 7.4.6 Point check function (engineering troubleshooting mode)

Press the LED DISPLAY or LED or MUTE button of the remote controller three times, and then press the AIR DIRECTION or SWING button three times in ten seconds, the buzzer will keep ring for two seconds. The air conditioner will enter into the information enquiry status. You can press the LED DISPLAY or AIR DIRECTION button to check the next or front item's information.

When the AC enter the "information enquiry" status, it will display the code name for 2 seconds, the details are as follows.

| Enquiry information | Displaying code | Meaning |
|---|---|---|
| T1 | T1 | Indoor room temperature |
| T2 | T2 | Coil temperature of evaporator |
| T3 | T3 | Coil temperature of condenser |
| T4 | T4 | Outdoor ambient temperature |
| T2B | Tb | Coil temperature of evaporator |
| TP | TP | Compressor discharge temperature |
| TH | TH | Compressor suction temperature |
| Targeted Frequency | FT | Targeted Frequency |
| Actual Frequency | FR | Actual Frequency |
| Indoor fan speed | IF | Indoor fan speed |
| Outdoor fan speed | OF | Outdoor fan speed |
| EXV opening angle | LA | EXV opening angle |
| Compressor continuous running time | CT | Compressor continuous running time |
| Causes of compressor stop. | ST | Causes of compressor stop. |
| Reserve | A0 | |
| Reserve | A1 | |
| Reserve | b0 | |
| Reserve | b1 | |
| Reserve | b2 | |
| Reserve | b3 | |
| Reserve | b4 | |
| Reserve | b5 | |
| Reserve | b6 | |
| Reserve | dL | |
| Reserve | AC | |
| Reserve | UO | |
| Reserve | Td | |

*Table 13*

When the AC enter into information enquiry status, it will display code value for the next 25s, the details are as follows:

| Enquiry information | Display value | Meaning | Remark |
|---|---|---|---|
| T1,T2,T3,T4, T2B,TP,TH, Targeted Frequency, Actual Frequency | -1F,-1E,-1d,-1c,- 1b,-1A | -25,-24,-23,-22,-21,-2, 0 | 1. All the displaying temperature is actual value.<br>2. All the temperature is °C no matter what kind of remote controller is used.<br>3. T1,T2,T3,T4,T2B display range:-25~70, TP display range:-20~130.<br>4. Frequency display range: 0~159HZ.<br>5. If the actual value exceeds the range, it will display the maximum value or minimum value. |
| | -19—99 | -19—99 | |
| | A0,A1,...A9 | 100,101,...109 | |
| | b0,b1,...b9 | 110,111,...119 | |
| | c0,c1,...c9 | 120,121,...129 | |
| | d0,d1,...d9 | 130,131,...139 | |
| | E0,E1,...E9 | 140,141,...149 | |
| | F0,F1,...F9 | 150,151,...159 | |
| Indoor fan speed /Outdoor fan speed | 0 | OFF | |
| | 1,2,3,4 | Low speed, Medium speed, High speed, Turbo | For some big capacity motors. |
| | 14-FF | Actual fan speed=Display value turns to decimal value and then multiply 10. The unit is RPM. | For some small capacity motors, display value is from 14-FF(hexadecimal), the corresponding fan speed range is from 200-2550RPM. |
| EXV opening angle | 0-FF | Actual EXV opening value=Display value turns to decimal value and then multiply 2. | The min opening angle for the EXV is 0. The max opening angle for EXV are different for different model. |
| Compressor continuous running time | 0-FF | 0-255 minutes | If the actual value exceeds the range, it will display the maximum value or minimum value. |
| Causes of compressor stop | 0-99 | For detailed meaning please consult with manufacturer | Decimal display |
| Reserve | 0-FF | | |

*Table 14*

0 - FF is a hexidecimal display value. Not OFF.

# 8 Troubleshooting

## Safety

**WARNING: ELECTRICAL HAZARD**

- Electricity power is still kept in capacitors even though power supply is shut off. Do not forget to discharge the electricity in capacitor.

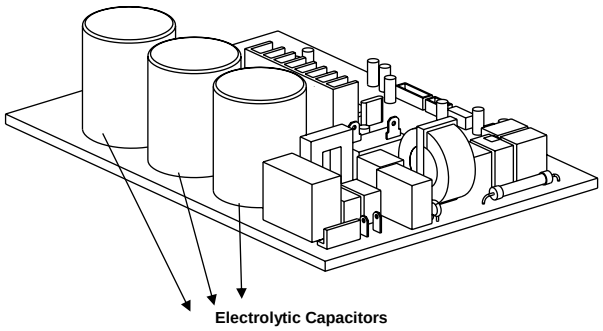



*Figure 24*

The value of resistance is between 1500Ω to 2000Ω.

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

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

## 8.1 Multi Zone Outdoor Unit Error Codes

**NOTICE**

- If below error codes appear, please turn off the system and contact an Authorized Service Provider.

| ODU Display | Possible Causes | Indoor Display |
|---|---|---|
| E0 | Outdoor unit EEPROM parameter error | F4 |
| E2 | Communication malfunction between indoor and outdoor units | E1 |
| E3 | Communication malfunction between IPM board and outdoor main control board | — |
| E4 | Outdoor temperature sensor (coil sensor T3, ambient sensor T4, Compressor discharge sensor T5, indoor coil outlet pipe sensor T2B) malfunction | F2/F1/F3/F6 |
| E5 | Over-voltage or under-voltage protection | P1 |
| E6 | PFC module protection | — |
| E8 | Outdoor fan speed malfunction | F5 |
| F1 | No. A Indoor unit coil outlet temp. sensor malfunction | — |
| F2 | No. B Indoor unit coil outlet temp. sensor malfunction | — |
| F3 | No. C Indoor unit coil outlet temp. sensor malfunction | — |
| F4 | No. D Indoor unit coil outlet temp. sensor malfunction | — |
| F5 | No. E Indoor unit coil outlet temp. sensor malfunction | — |
| F6 | No. F Indoor unit coil outlet temp. sensor malfunction | — |
| P0 | High temperature protection: top of compressor | P2 |
| P1 | High pressure protection | P6 |
| P2 | Low pressure protection | P6 |
| P3 | Current overload protection | F0 |
| P4 | Temperature protection of compressor discharge | — |
| P5 | Condenser high temperature protection | — |
| P6 | Inverter module (IPM) malfunction | P0 |
| LP | Low ambient temperature protection | — |

*Table 15*

For Indoor Error Codes, please refer to the indoor service manual.

## 8.2 Quick Check by Error Codes

| Cause | E0 | E2 | E3 | E4 | E5 | E6 | E8 | P0 | P1 | P2 | P3 | P4 | P5 | P6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IDU PCB | | | | ● | | | | | | | | | | |
| ODU PCB | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Display Board | | | | | | | | | | | | | | |
| IDU Fan Motor | | | | | | | | | | | | | | |
| ODU Fan Motor | | | | | | | ● | | | | | | | ● |
| T1 Sensor | | | | | | | | | | | | | | |
| T2 Sensor | | | | ● | | | | | | | | | | |
| T2B Sensor | | | | ● | | | | | | | | | | |
| T3 Sensor | | | | ● | | | | | | | | | ● | |
| T4 Sensor | | | | ● | | | | | | | | | | |
| T5 Sensor | | | | ● | | | | | | | | ● | | |
| Water Level Switch | | | | | | | | | | | | | | |
| Condensate Pump | | | | | | | | | | | | | | |
| Reactor | | | | | | | | | | | | | | |
| Compressor | | | | | | | | | | | | | | ● |
| IPM Board | | | ● | | | | | | | | | | | ● |
| Over Load Protector | | | | | | | | ● | ● | ● | ● | | | |
| PFC Module | | | | | | ● | | | | | | | | |
| PFC Module Inductance | | | | | | ● | | | | | | | | |
| Bridge Rectifier | | | | | | | | | | | | | | |
| Wiring Mistake | | ● | | | | ● | ● | ● | ● | ● | ● | ● | | ● |
| Refrigerant Charge / Leak | | | | | ● | | | ● | | | | ● | ● | |
| System Block | | | | | ● | | | ● | ● | ● | ● | | ● | |
| Power Supply | | | | | ● | | | | | | | | | |

*Table 16*

## 8.3 ODU PCB & IPM

### 8.3.1 PCB: Multi Zone Regular 18K, 27K & Max Performance 18K BMS500-AAM018-1CSXRA, BMS500-AAM027-1CSXRA, BMS500-AAM018-1CSXHB

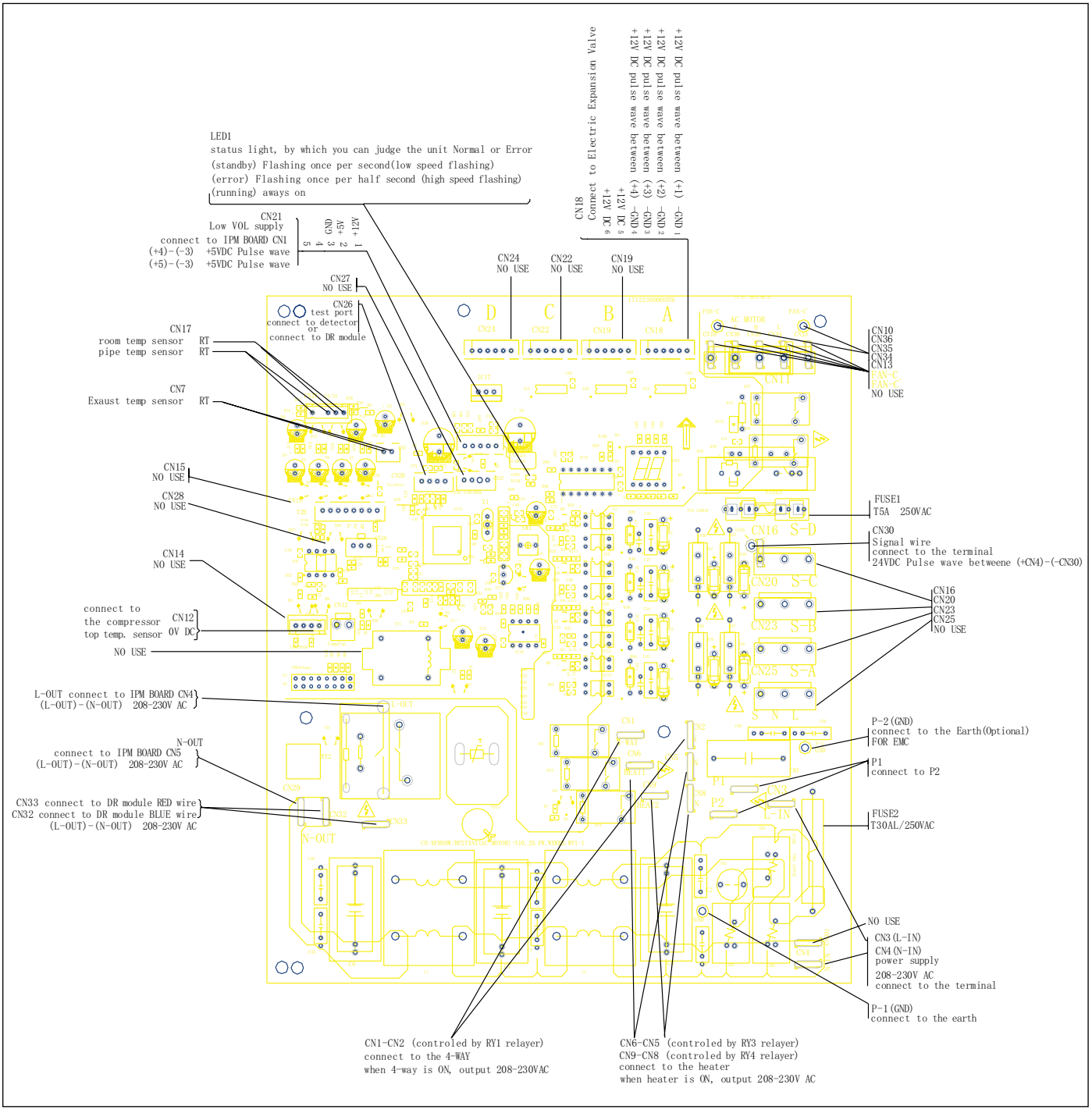



*Figure 25*

### 8.3.2 IPM: Multi Zone Regular 18K, 27K & Max Performance 18K BMS500-AAM018-1CSXRA, BMS500-AAM027-1CSXRA, BMS500-AAM018-1CSXHB

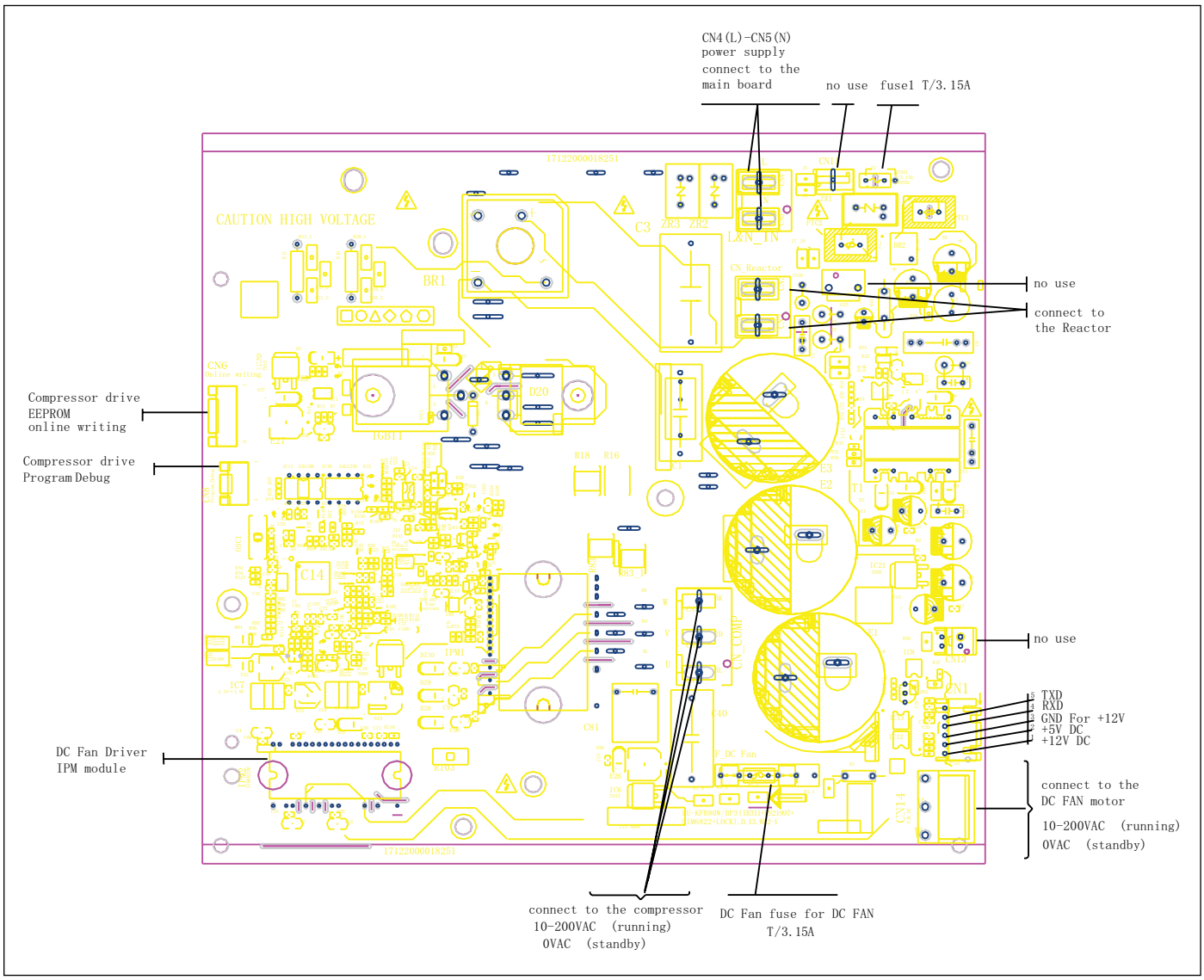



*Figure 26*

### 8.3.3 PCB: Multi Zone Regular 36K & Max Performance 27K
### BMS500-AAM036-1CSXRA, BMS500-AAM027-1CSXHB

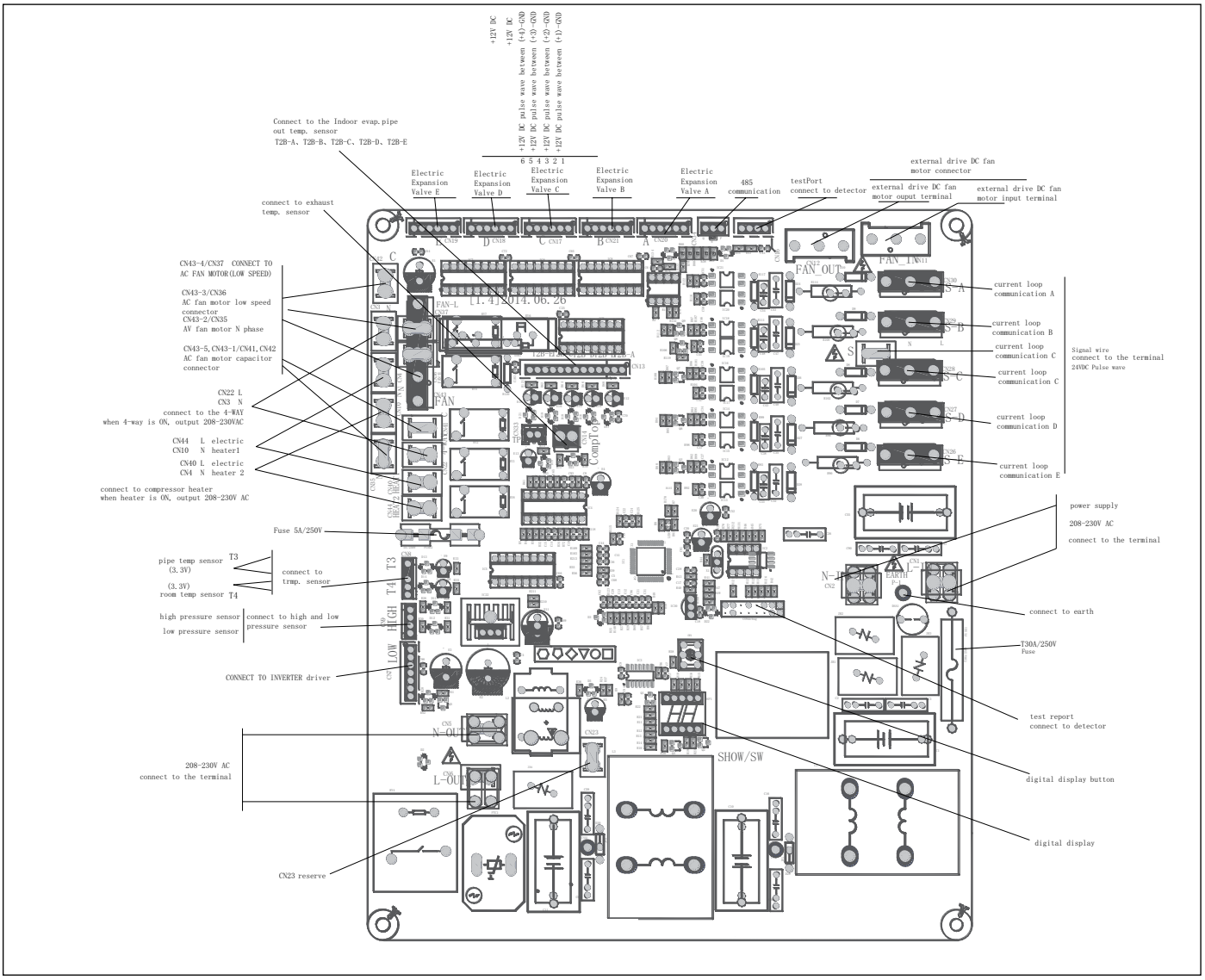



*Figure 27*

### 8.3.4 IPM: Multi Zone Regular 36K & Max Performance 27K

**BMS500-AAM036-1CSXRA, BMS500-AAM027-1CSXHB**

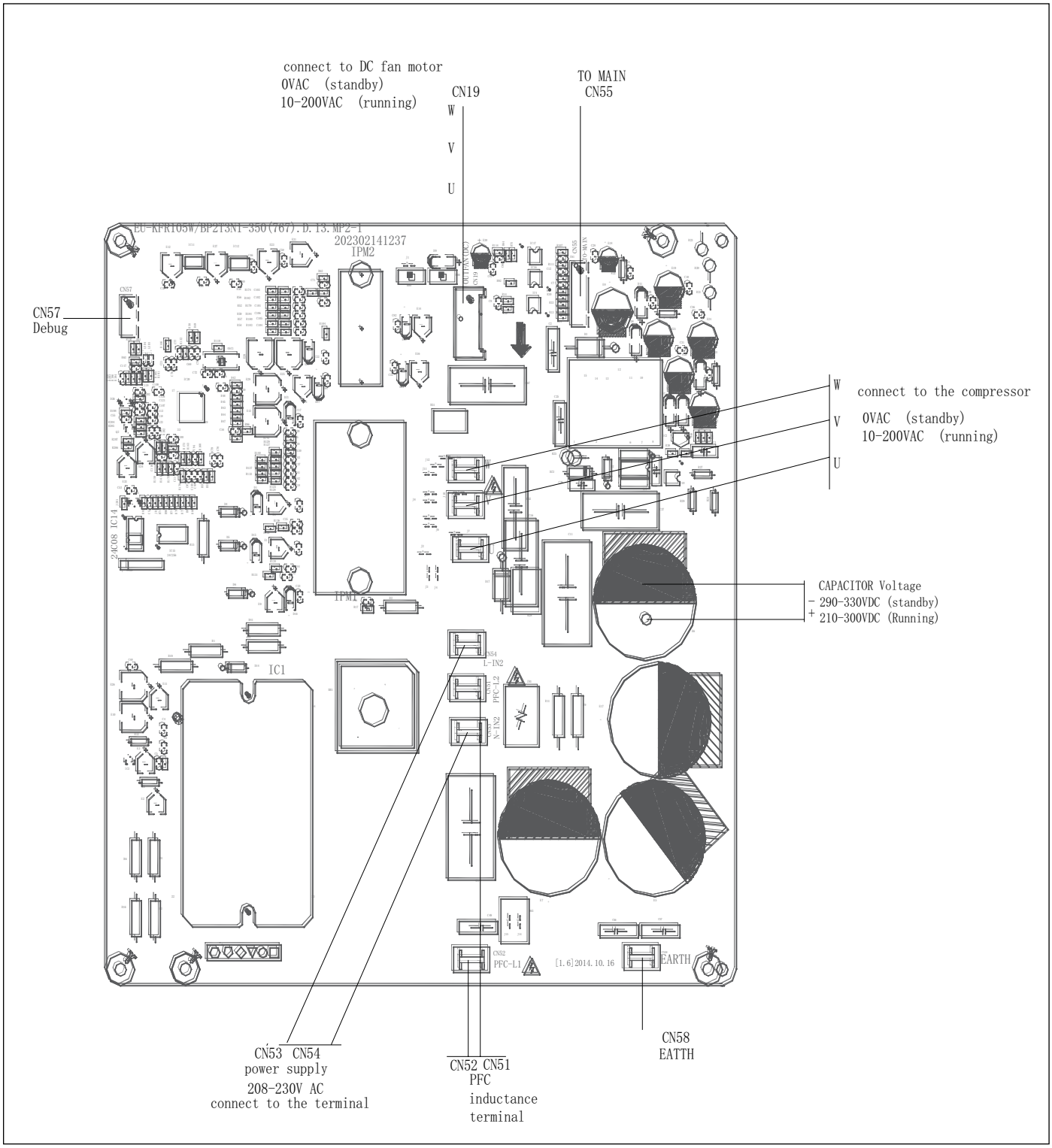



*Figure 28*

### 8.3.5 PCB: Multi Zone Regular 48K & Max Performance 36K
### BMS500-AAM048-1CSXRA, BMS500-AAM036-1CSXHB

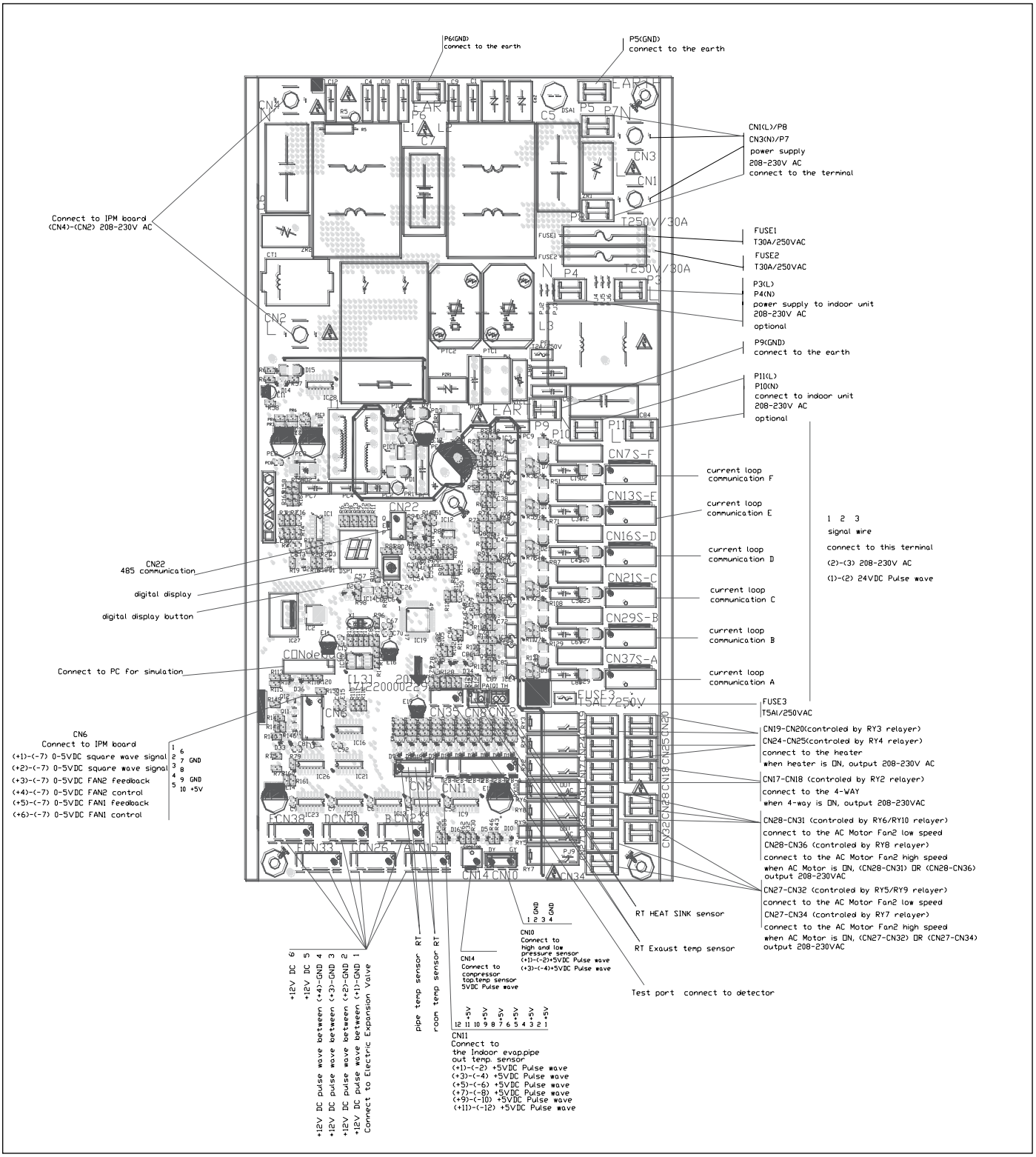



*Figure 29*

### 8.3.6 IPM: Multi Zone Regular 48K & Max Performance 36K
### BMS500-AAM048-1CSXRA, BMS500-AAM036-1CSXHB

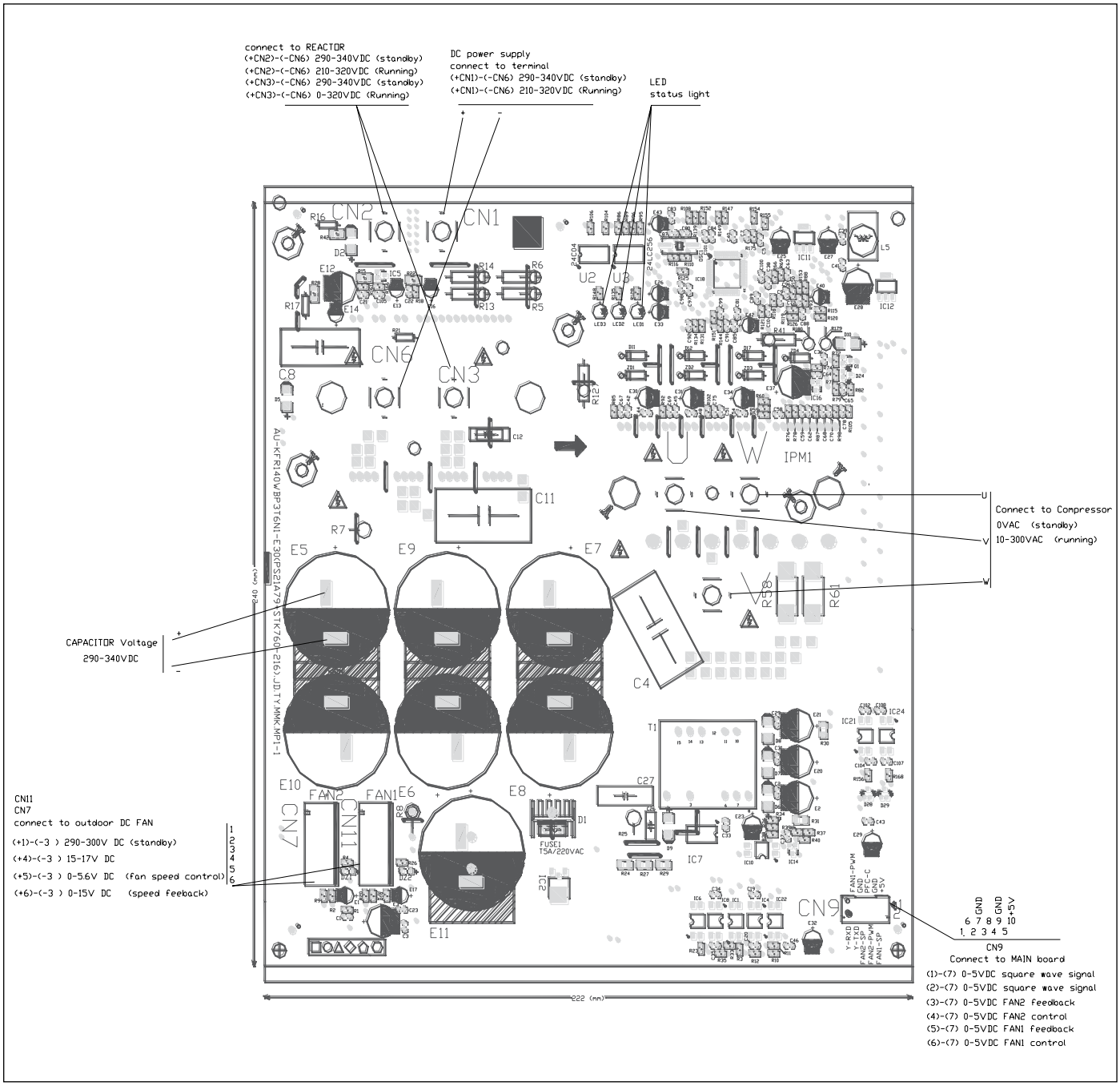



*Figure 30*

## 8.4 Outdoor Unit Display

### 8.4.1 Outdoor Unit Point Check Function

A check switch is included on the outdoor PCB. Push SW1 to check the unit's status while running. The digital display shows the following codes each time the SW1 is pushed. See Tables 17 & 18.

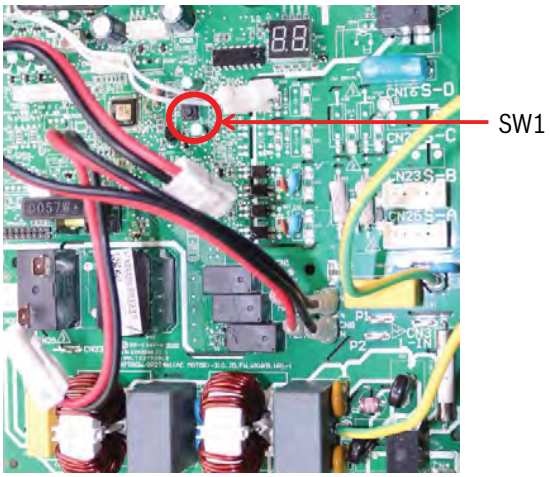



*Figure 31*

| Number of Presses | Display | Remark |
|---|---|---|
| 0 | Normal display | Displays running frequency, running state, or malfunction code |
| 1 | Quantity of indoor units with working connection | Actual data<br>Display / Number of indoor unit: 1/1, 2/2, 3/3, 4/4 |
| 2 | Outdoor unit running mode code | Off: 0, Fan only: 1, Cooling: 2, Heating: 3, Forced cooling: 4. Forced Defrost: A |
| 3 | Indoor unit A capacity | Current capacity/horse power<br>If the indoor unit is not connected,<br>the digital display shows the following: "—"<br>(9K:1HP, 12K:1.2HP, 18K:1.5HP) |
| 4 | Indoor unit B capacity | |
| 5 | Indoor unit C capacity | |
| 6 | Indoor unit D capacity | |
| 7 | Indoor unit E capacity | |
| 8 | Indoor unit A capacity demand code | Norm code*HP<br>(9K: 1HP, 12K: 1.2HP, 18K: 1.5HP) |
| 9 | Indoor unit B capacity demand code | |
| 10 | Indoor unit C capacity demand code | |
| 11 | Indoor unit D capacity demand code | |
| 12 | Indoor unit E capacity demand code | |
| 13 | Outdoor unit amendatory capacity demand code | — |
| 14 | The frequency corresponding to the total indoor units' amendatory capacity demand | — |
| 15 | The frequency after the frequency limit | |
| 16 | The frequency sent to compressor control chip | |
| 17 | Indoor unit A evaporator outlet temperature ($T_{2B}$A) | If the temperature is lower than -9 ℃, the digital display shows "-9."<br>If the temperature is higher than 70 ℃, the digital display shows "70."<br>If the indoor unit is not connected, the digital display shows: "—" |
| 18 | Indoor unit B evaporator outlet temperature ($T_{2B}$B) | |
| 19 | Indoor unit C evaporator outlet temperature ($T_{2B}$C) | |
| 20 | Indoor unit D evaporator outlet temperature ($T_{2B}$D) | |
| 21 | Indoor unit E evaporator outlet temperature ($T_{2B}$E) | |

*Table 17*

| Number of Presses | Display | Remark | | |
|---|---|---|---|---|
| 22 | Indoor unit A room temperature ($T_1A$) | If the temperature is lower than 0 ℃, the digital display shows “0.”<br>If the temperature is higher than 50 ℃, the digital display shows “50.”<br>If the indoor unit is not connected, the digital display shows: “—” | | |
| 23 | Indoor unit B room temperature ($T_1B$) | | | |
| 24 | Indoor unit C room temperature ($T_1C$) | | | |
| 25 | Indoor unit D room temperature ($T_1D$) | | | |
| 26 | Indoor unit E room temperature ($T_1E$) | | | |
| 27 | Indoor unit A evaporator temperature ($T_2A$) | If the temperature is lower than -9 ℃, the digital display shows “-9.”<br>If the temperature is higher than 70 ℃, the digital display shows “70.”<br>If the indoor unit is not connected, the digital display shows: “—” | | |
| 28 | Indoor unit B evaporator temperature ($T_2B$) | | | |
| 29 | Indoor unit C evaporator temperature ($T_2C$) | | | |
| 30 | Indoor unit D evaporator temperature ($T_2D$) | | | |
| 31 | Indoor unit E evaporator temperature ($T_2E$) | | | |
| 32 | Condenser pipe temperature (T3) | | | |
| 33 | Outdoor ambient temperature (T4) | | | |
| 34 | Compressor discharge temperature (TP) | The display value is between 30–129 ℃.<br>If the temperature is lower than 30 ℃, the digital display shows “30.”<br>If the temperature is higher than 99 ℃, the display will show a decimal point. For example, if the digital display shows “0.5",<br>the compressor discharge temperature is 105 ℃. | | |
| 35 | AD value of current | The display value is a hex number. For example, the digital display tube shows “Cd”, it means AD value is 205. | | |
| 36 | AD value of voltage | The display value is a hex number. For example, the digital display tube shows “Cd”, it means AD value is 205. | | |
| 37 | EXV open angle for A indoor unit | Actual data/4.<br>If the value is higher than 99, the digital display will show a decimal point.<br>For example, if the digital display shows “2.0",<br>the EXV open angle is 120×4=480 pulse. | | |
| 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 a hexidecimal number. For example, the digital display show 2A, then Bit5=1, Bit3=1, and Bit1=1. This means that a frequency limit may be caused by T4, T3, or the 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 with 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 temperature ($T_{2B}F$) | | | |
| 49 | F indoor unit room temperature ($T_1F$) | | | |
| 50 | F indoor unit evaporator temperature ($T_2F$) | | | |
| 51 | EXV open angle for F indoor unit | | | |

*Table 18*

## 8.5 Outdoor Wiring Diagram

### 8.5.1 Regular Multi Zone (18K)

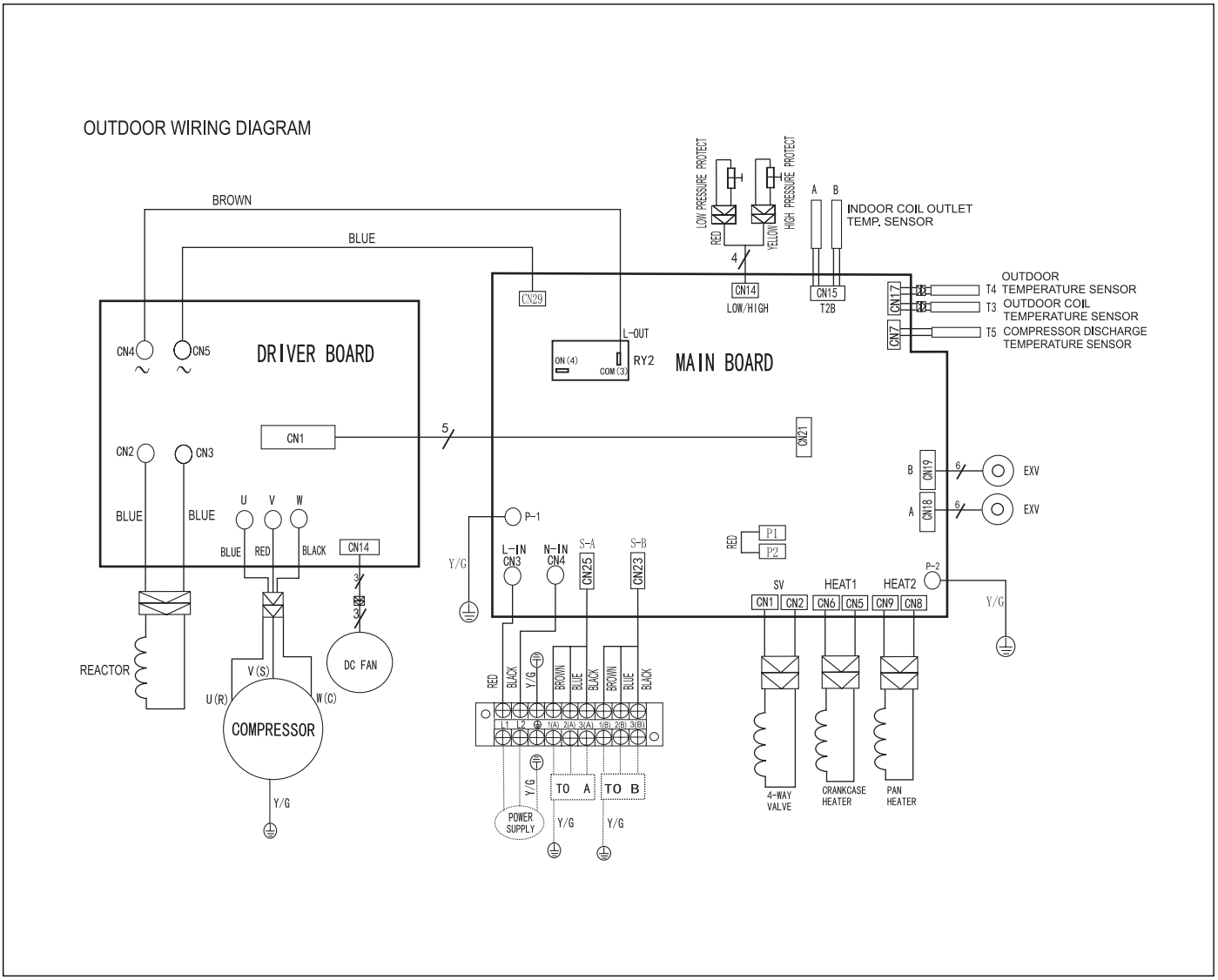



*Figure 32*

### 8.5.2 Regular Multi Zone (27K)

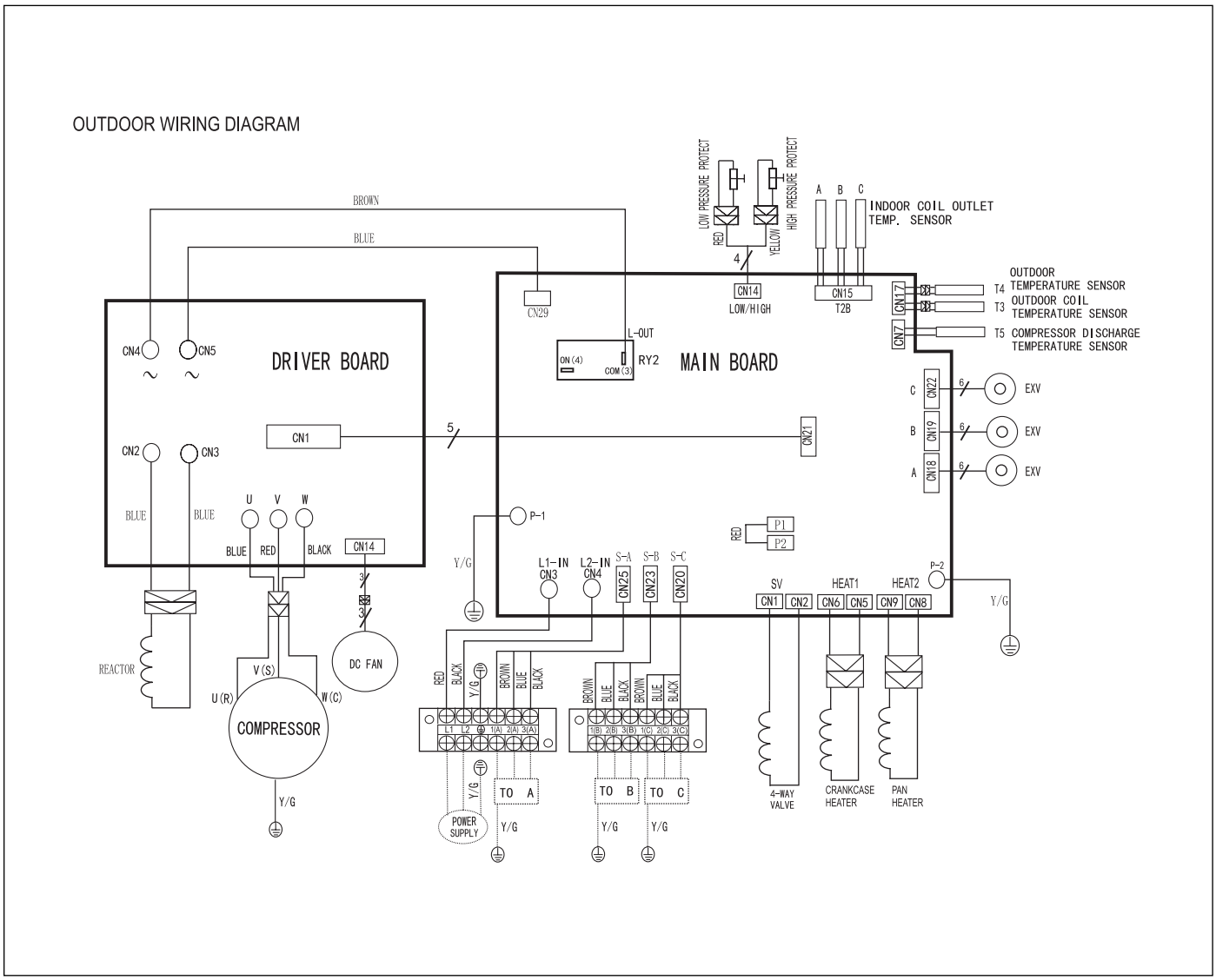
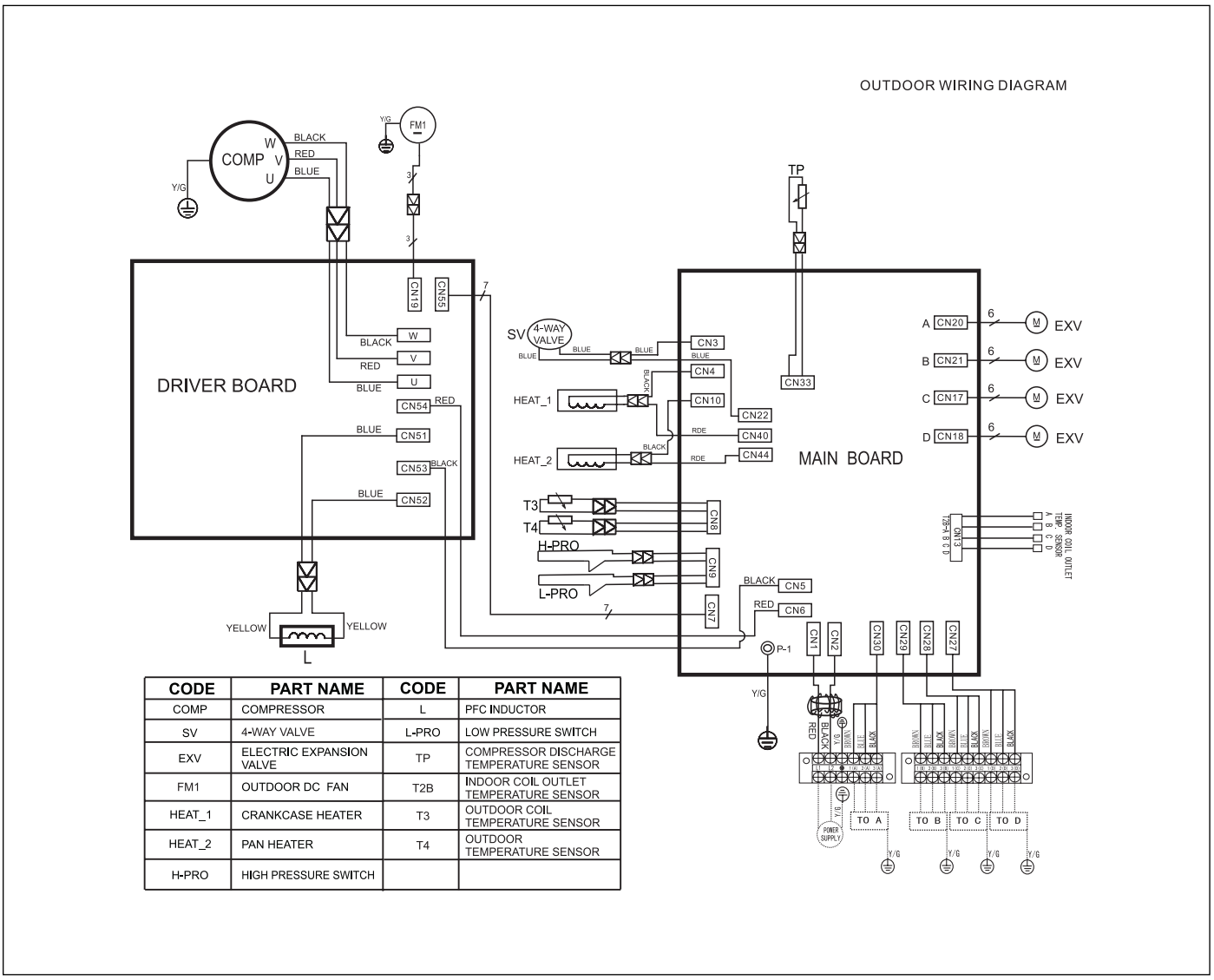



*Figure 33*

### 8.5.3 Regular Multi Zone (36K)




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

*Figure 34*

### 8.5.4 Regular Multi Zone (48K)

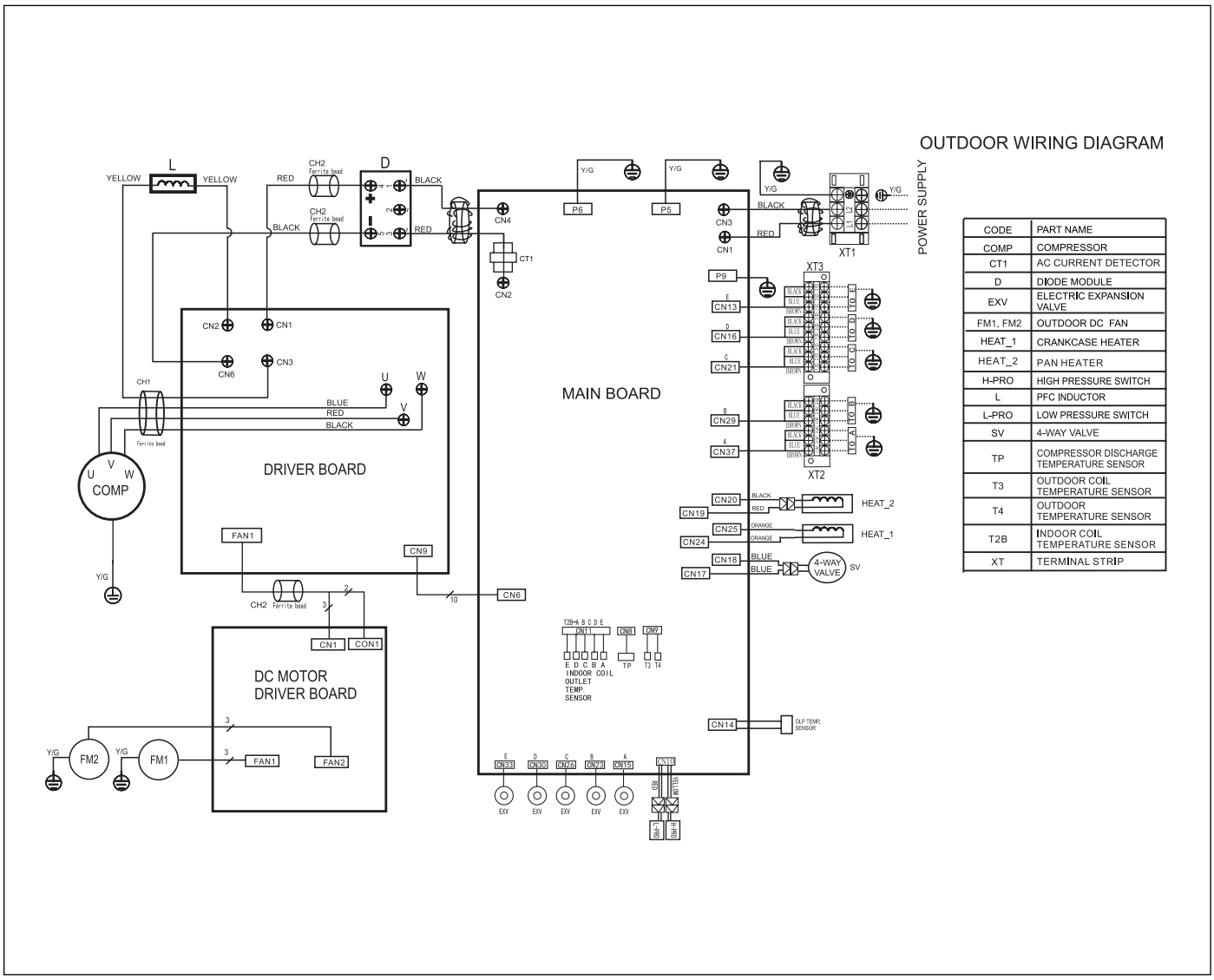



*Figure 35*

### 8.5.5 Max Performance Multi Zone (18K)

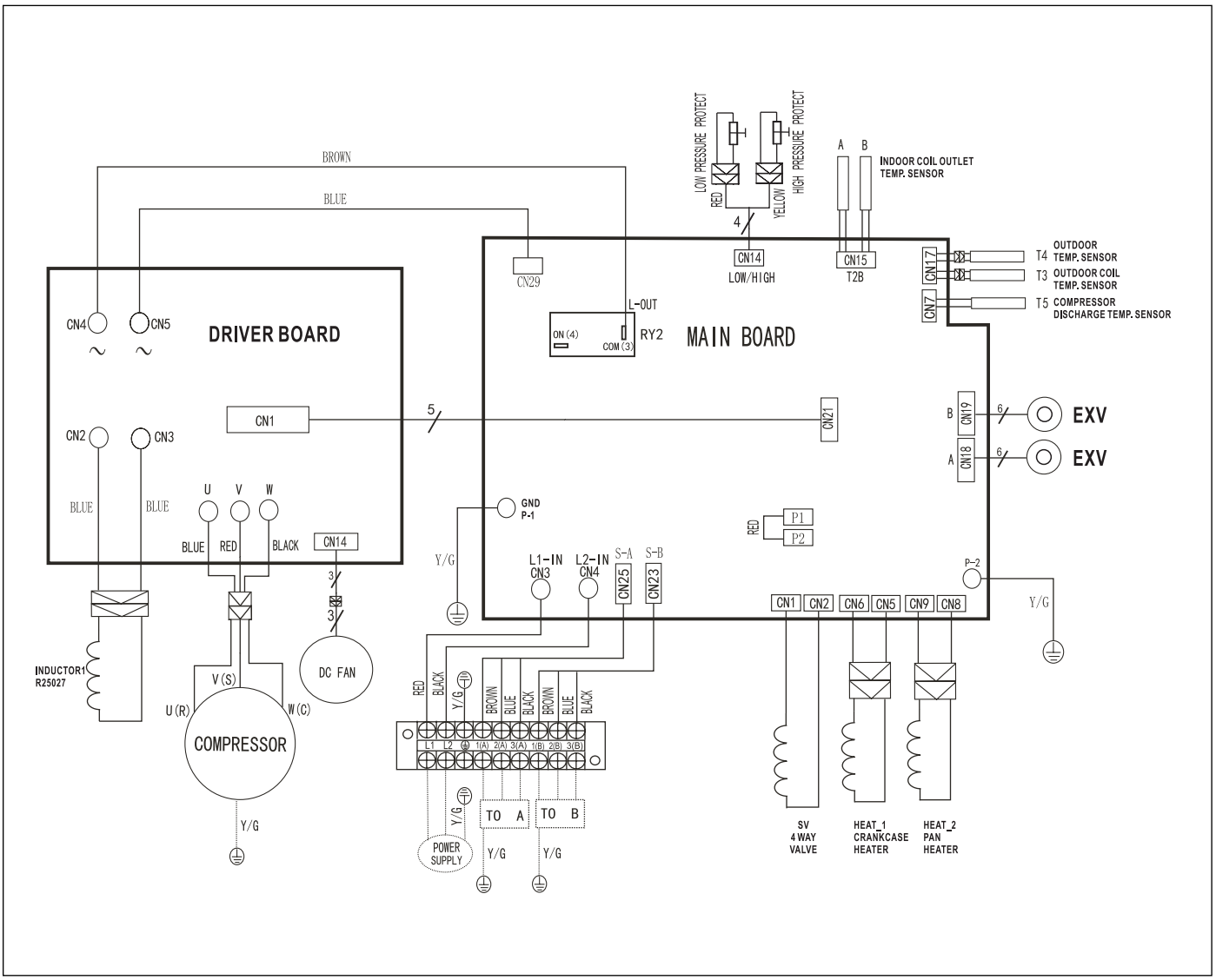
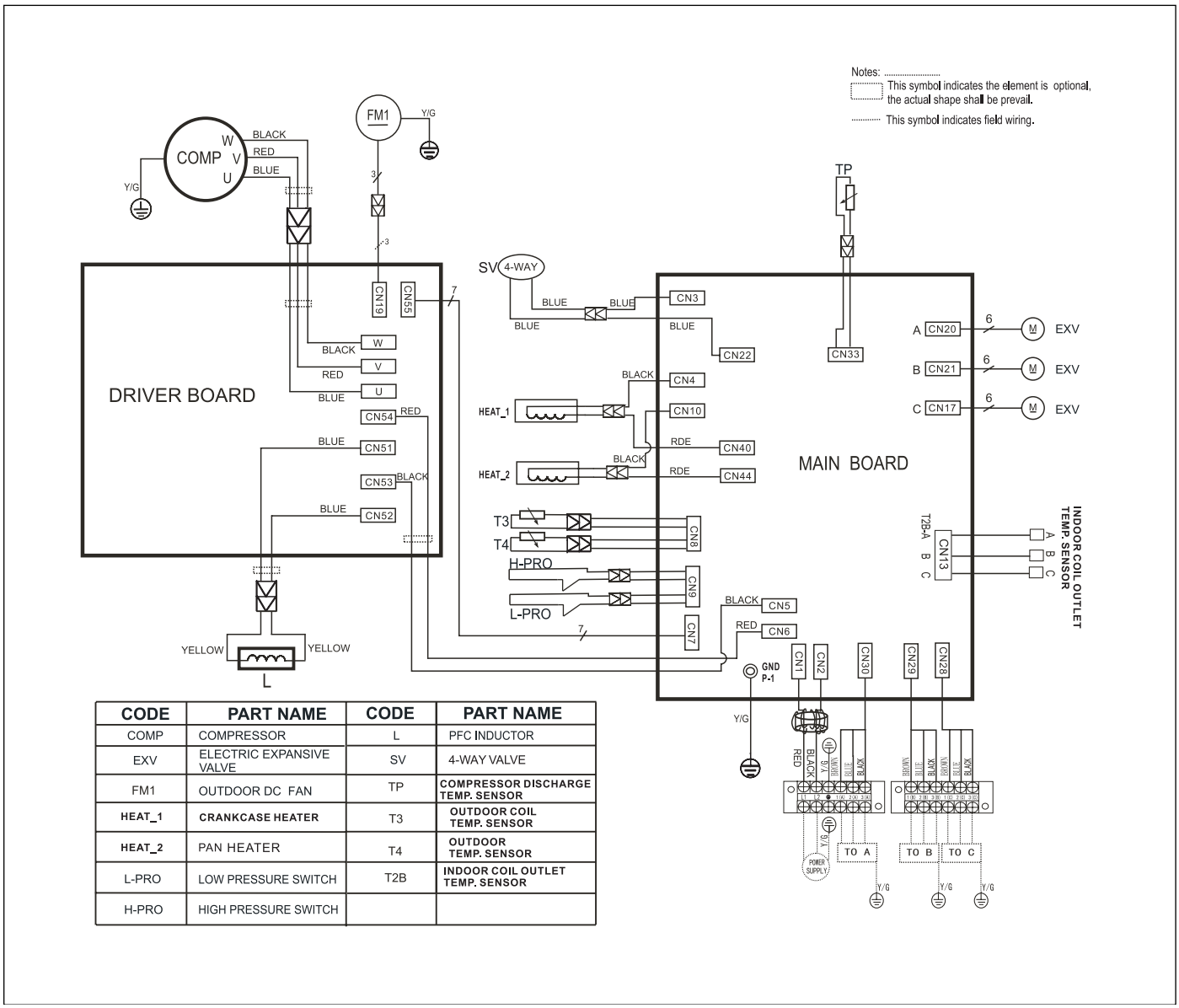



*Figure 36*

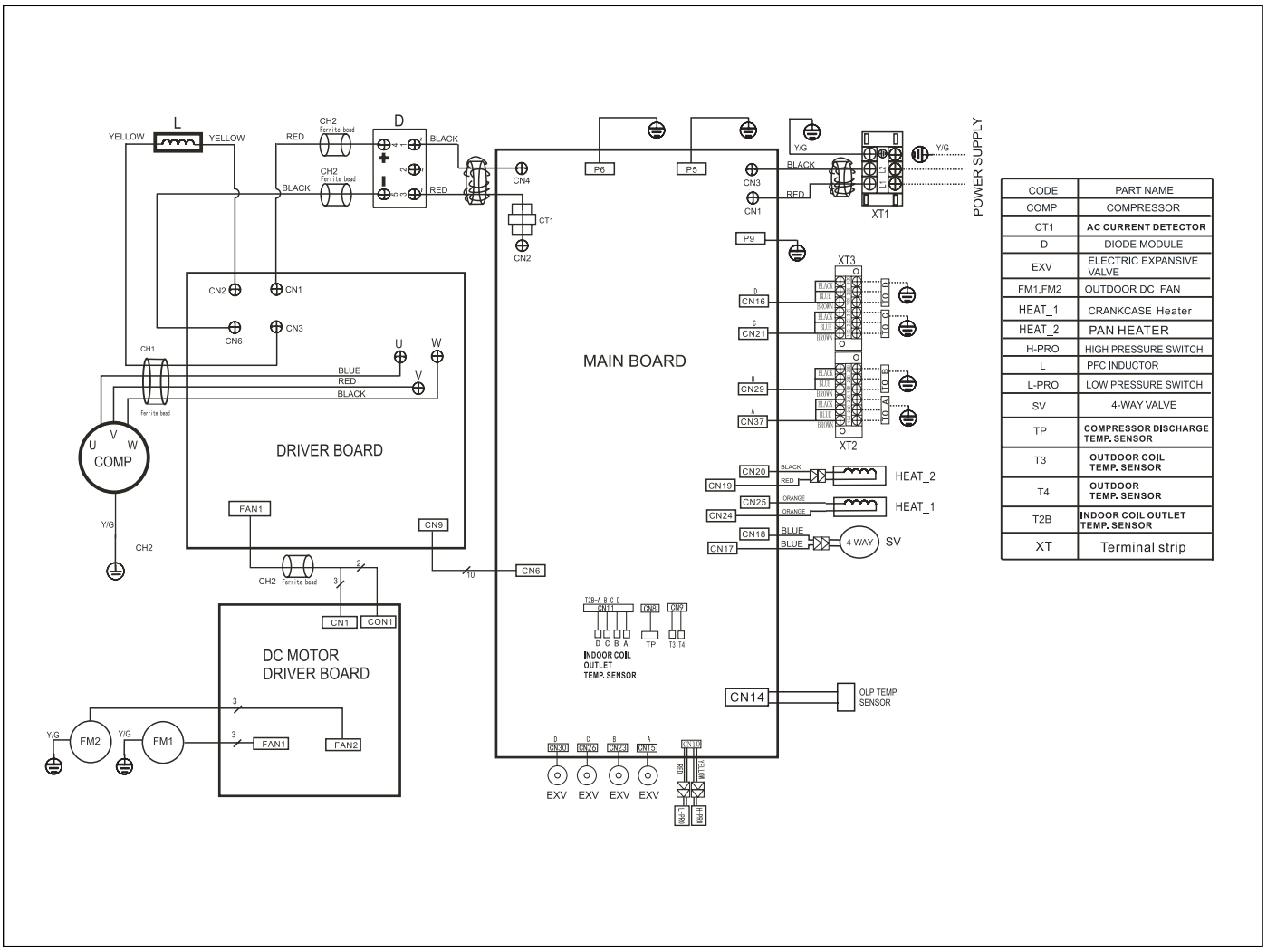
### 8.5.6 Max Performance Multi Zone (27K)




| 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 | | |

*Figure 37*

### 8.5.7 Max Performance Multi Zone (36K)




| 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 |

*Figure 38*

## 8.6 Diagnosis and Solution

### 8.6.1 EEPROM parameter error (E0)

| | |
|---|---|
| Error Code | E0 |
| Malfunction decision conditions | Outdoor PCB main chip does not receive feedback from EEPROM chip. |
| Supposed causes | ▶ Incorrect installation of indoor to outdoor control wire or line voltage wiring<br>▶ PCB faulty |

*Table 19*

**Troubleshooting:**

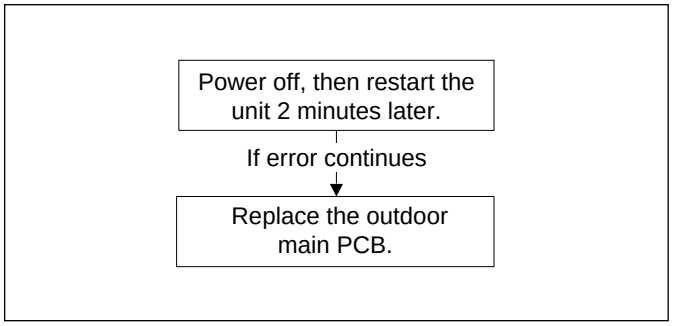



*Figure 39*

**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.

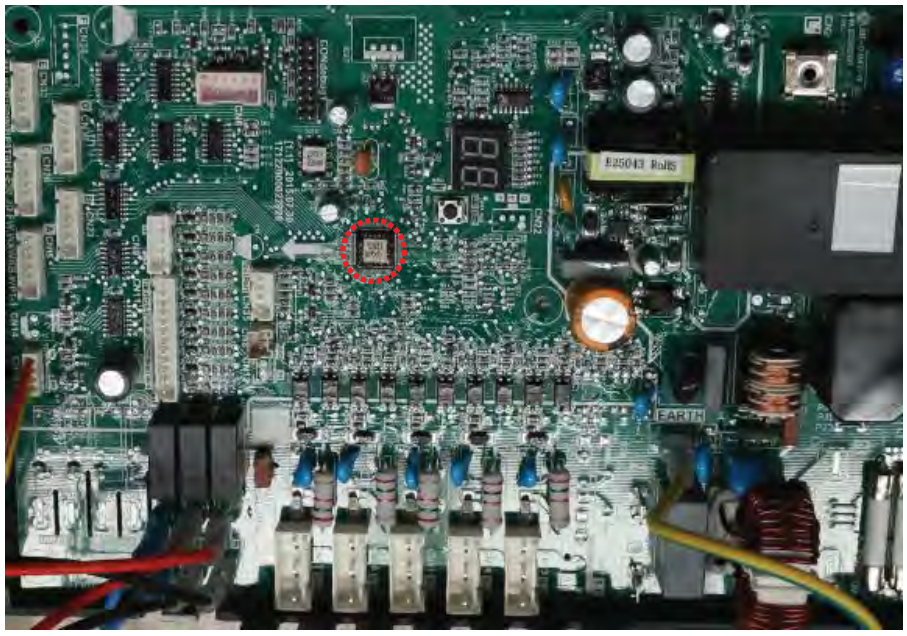



*Figure 40*

The photo above is for reference only, it may not be identical to the PCB shipped with your equipment.

### 8.6.2 Indoor / outdoor communication error (E2)

| | |
|---|---|
| Error Code | E2 |
| Malfunction decision conditions | Indoor unit does not receive the feedback from outdoor unit for 120 seconds or outdoor unit does not receive the feedback from any one indoor unit for 180 seconds. |
| Supposed causes | ▶ Incorrect installation of indoor to outdoor control wire<br>▶ Electromagnetic interference<br>▶ Indoor or outdoor PCB faulty |

*Table 20*

**Troubleshooting:**

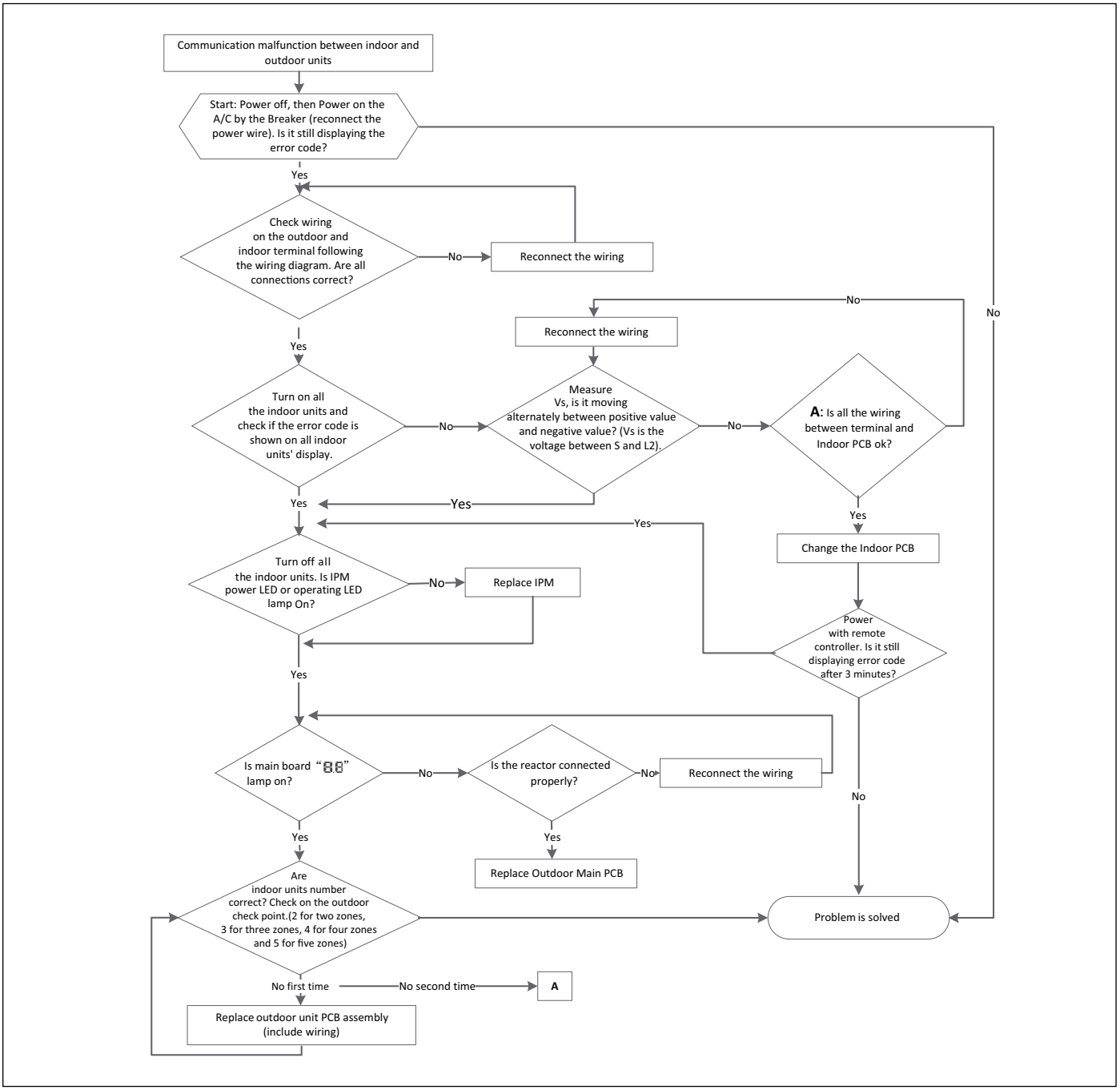



*Figure 41*

**Note:**

- Use a multimeter to test the DC voltage between 2 (old: L2) port and 3 port of outdoor unit. The red pin of multimeter connects with 2 (old: L2) port while the black pin is for 3 port. When AC is normal running, the voltage will move alternately between positive value and negative value.


*Figure 42*

**IPM board (18K & 27K Models):**

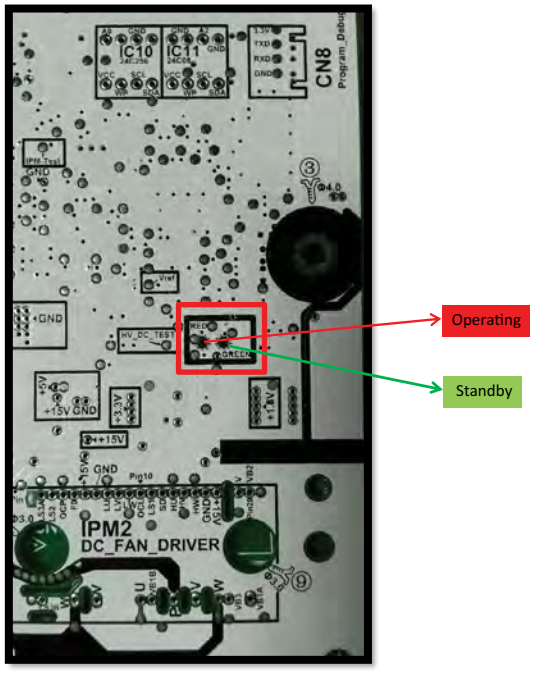



*Figure 43*

**IPM board - Regular: 36K & 48K Models / Max Performance: 27K & 36K Models**

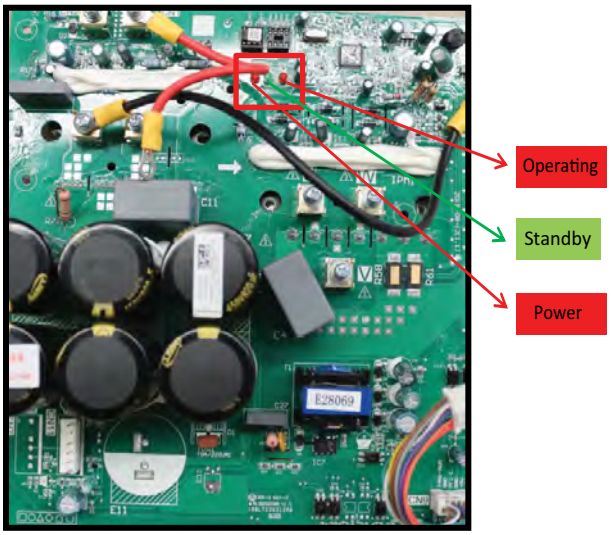



*Figure 44*

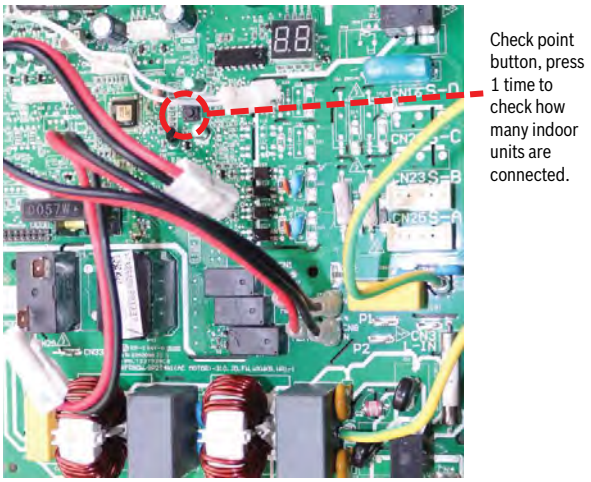



*Figure 45*

### 8.6.3 IPM / outdoor PCB communication error (E3)

| | |
|---|---|
| Error Code | E3 |
| Malfunction decision conditions | PCB main chip does not receive feedback from IPM module for 60 seconds. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ IPM faulty<br>▶ Outdoor PCB faulty |

*Table 21*

**Troubleshooting:**

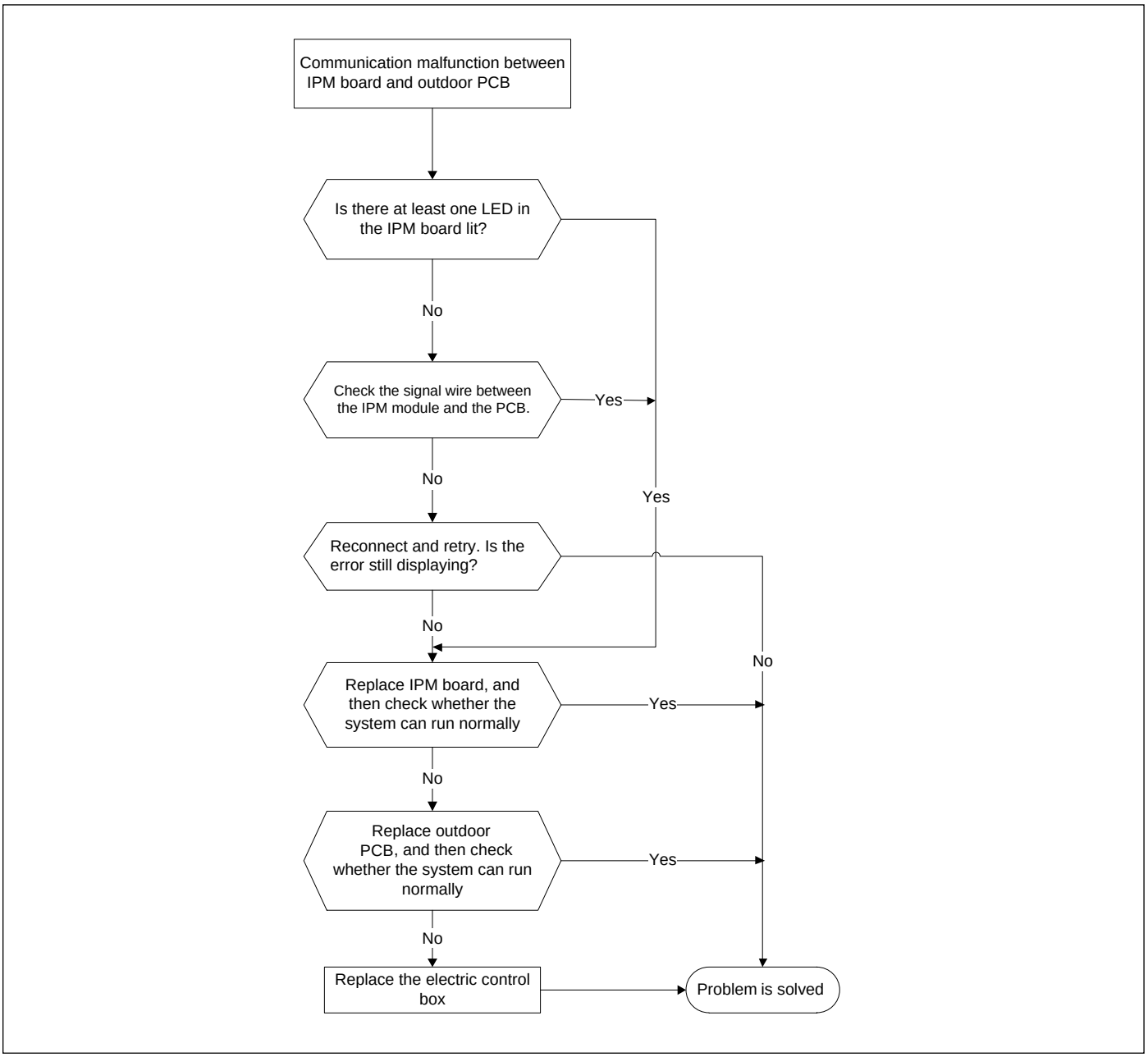



*Figure 46*

**Note:**

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

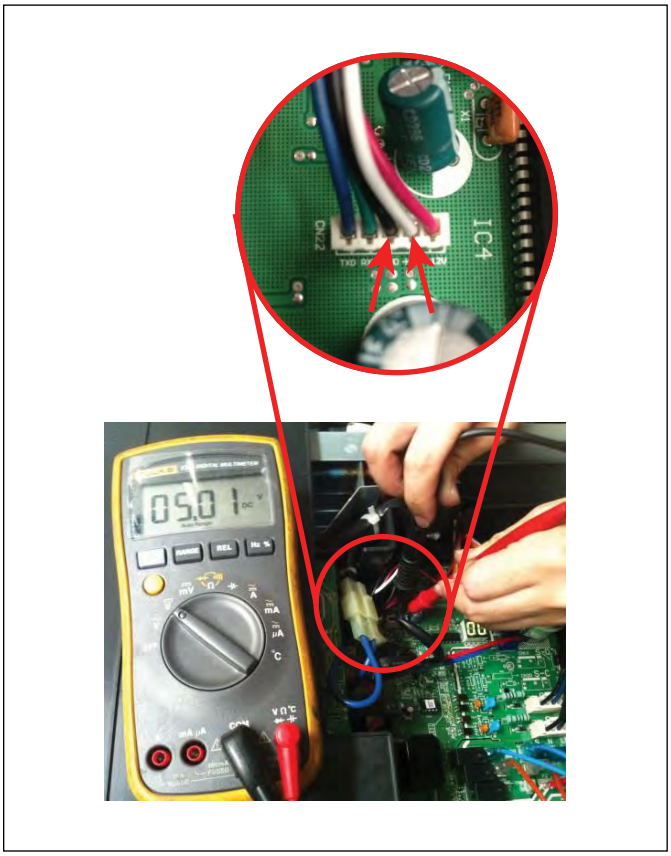



*Figure 47*

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

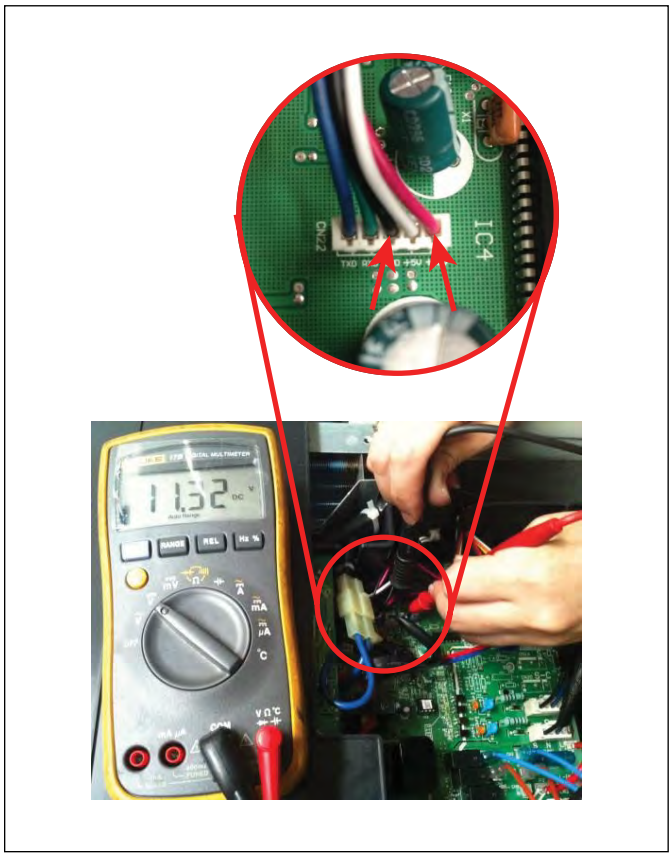



*Figure 48*

### 8.6.4 Open circuit or short circuit of temperature sensor (E4 (outdoor) / F1 / F2 / F3 / F4/ F5 (indoor))

| | |
|---|---|
| Error Code | E4 (outdoor) / F1, F2, F3, F4, F5 (indoor) |
| 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 | ▶ Improper / Incorrect Wiring<br>▶ Sensor faulty<br>▶ Indoor / Outdoor PCB faulty |

*Table 22*

**Troubleshooting:**

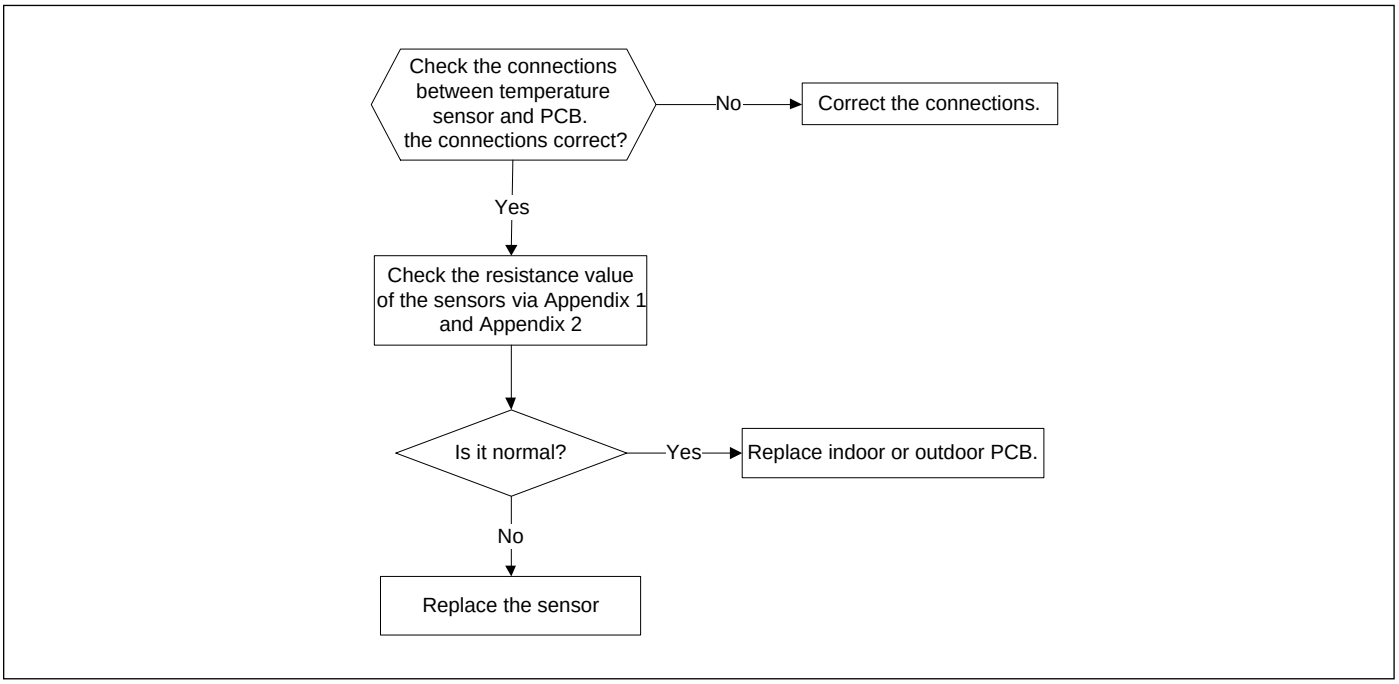



*Figure 49*

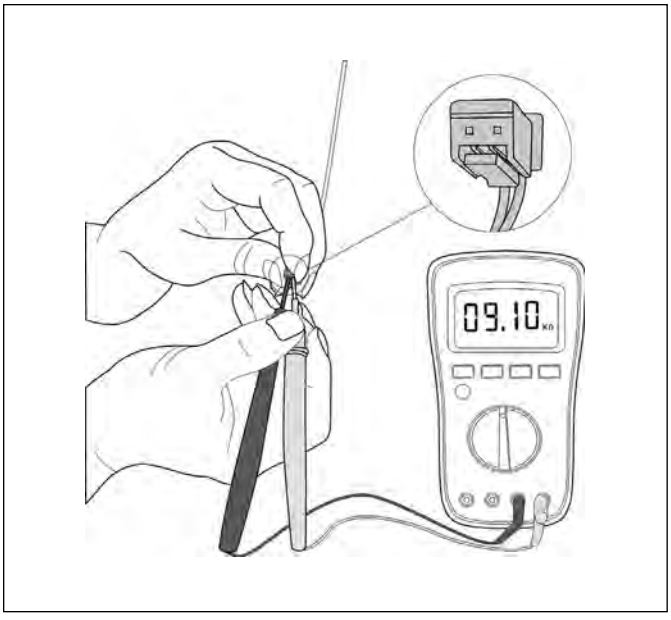



*Figure 50*

### 8.6.5 High / Low voltage protection (E5)

| | |
|---|---|
| Error Code | E5 |
| Malfunction decision conditions | An abnormal voltage rise or drop is detected by built-in logic in PCB |
| Supposed causes | ▶ Power supply problems<br>▶ System problems, such as leakage or blockage<br>▶ Outdoor PCB faulty |

*Table 23*

**Troubleshooting:**

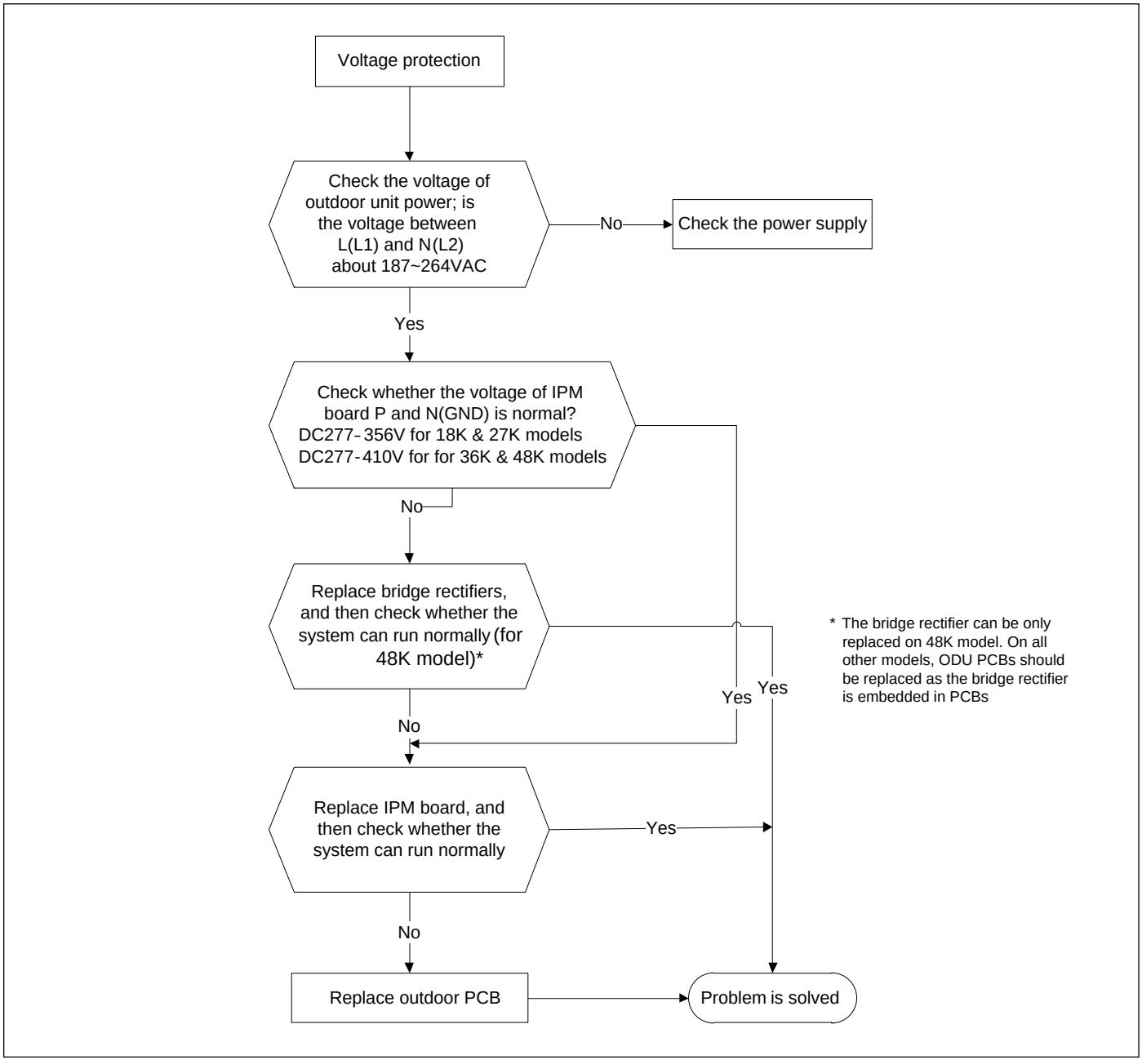



*Figure 51*

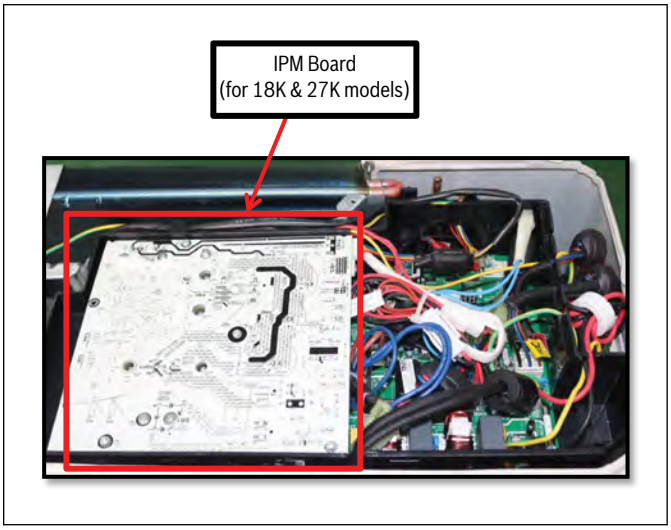



*Figure 52*

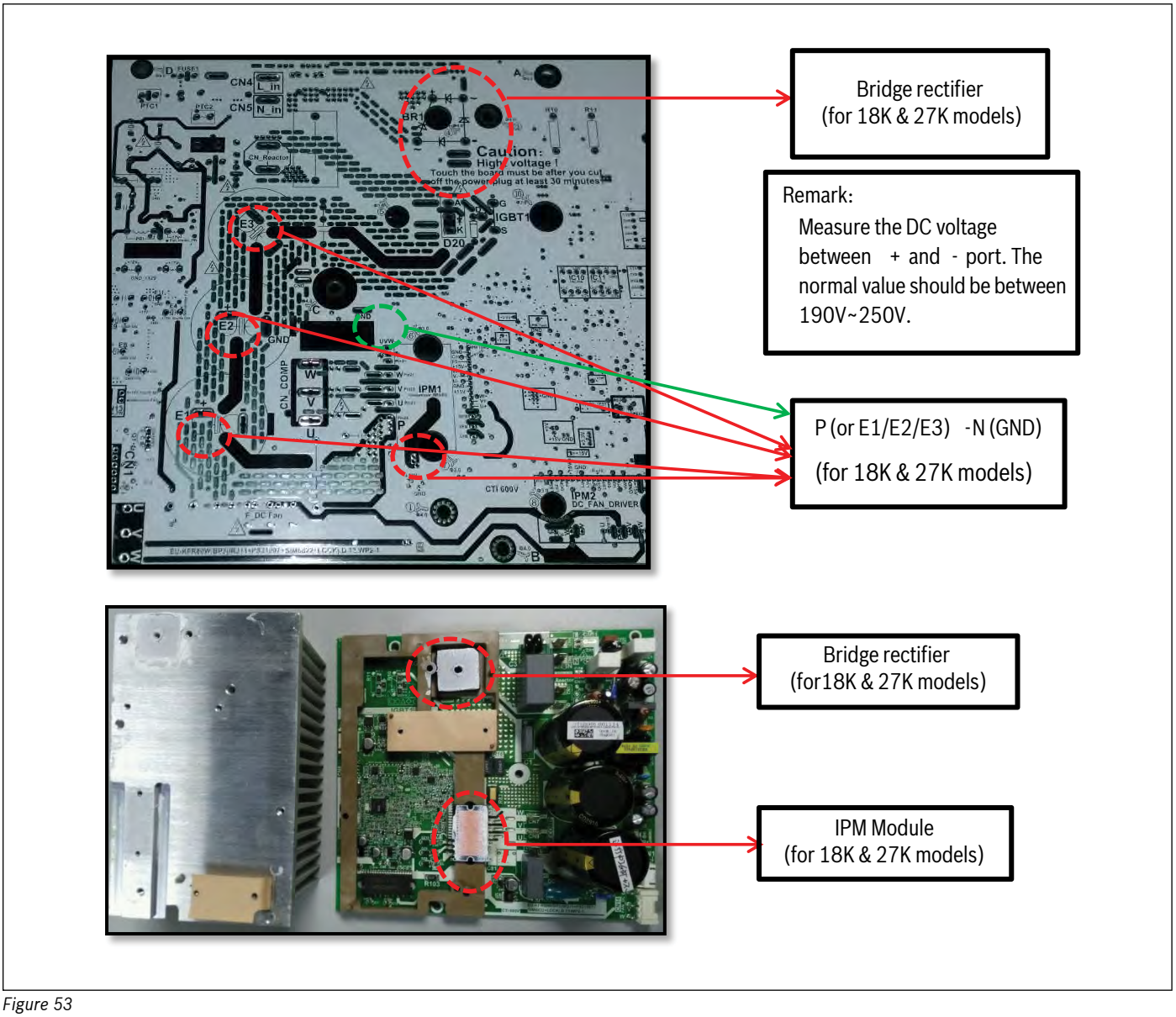



*Figure 53*

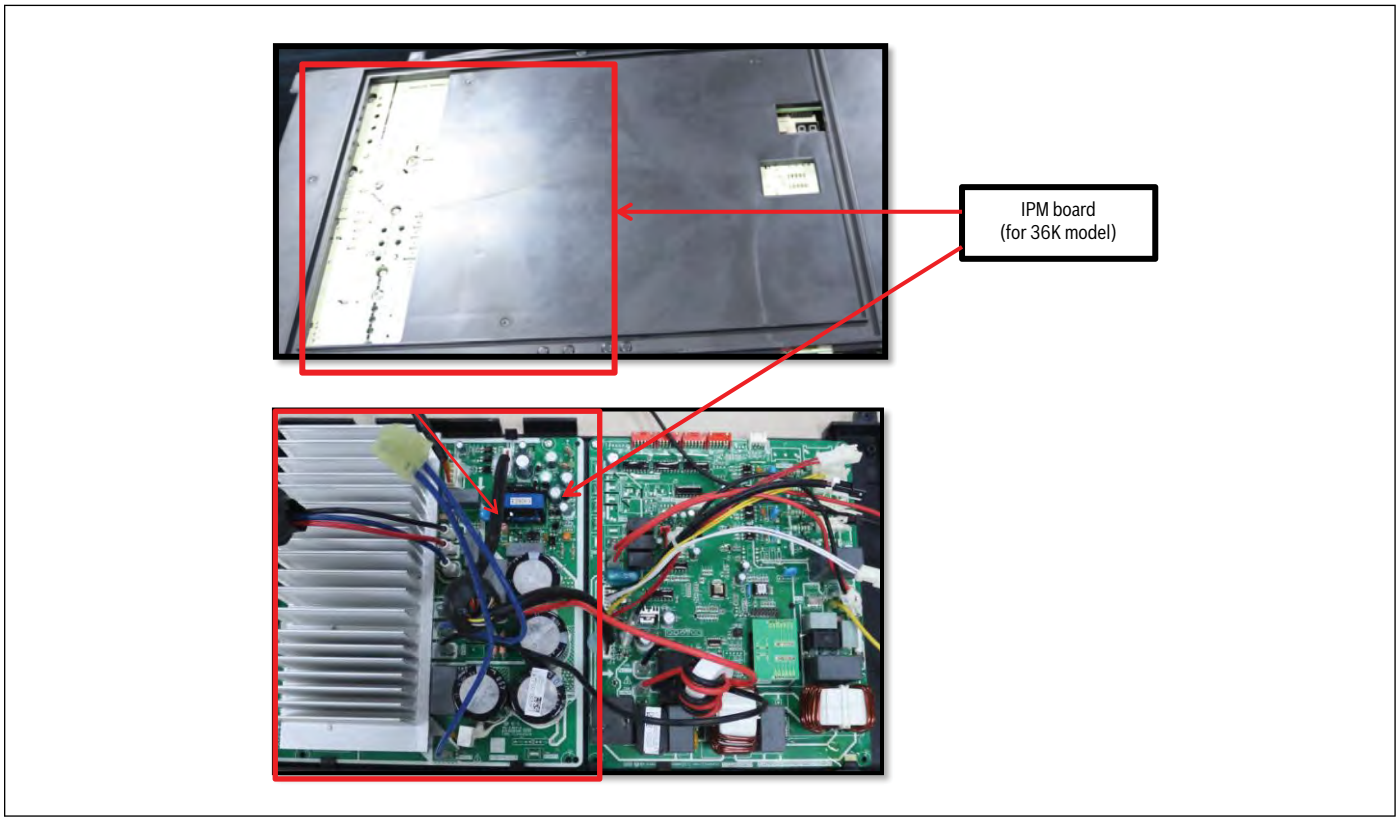



*Figure 54*

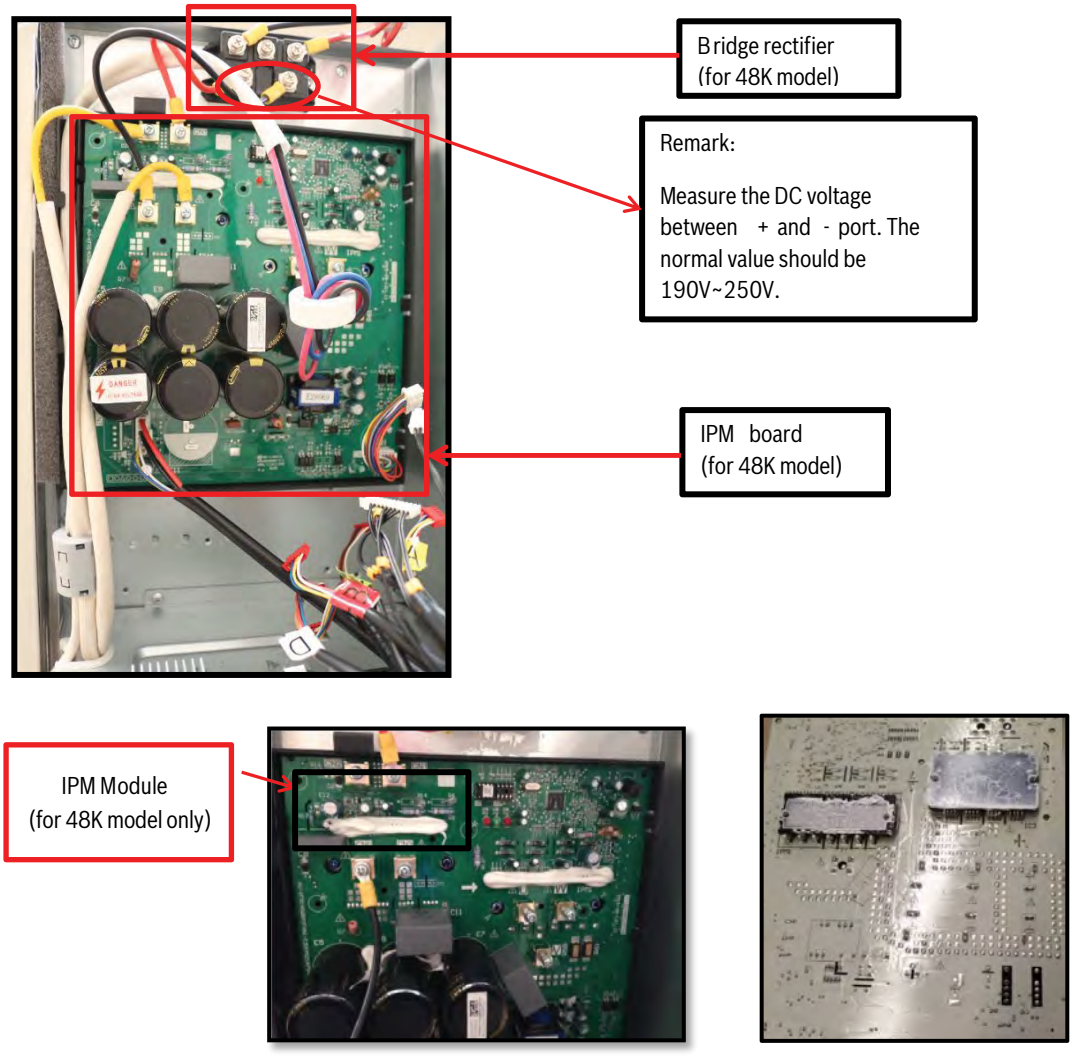

Bridge rectifier
(for 48K model)
Remark:
Measure the DC voltage between + and - port. The normal value should be 190V~250V.
IPM board
(for 48K model)
IPM Module
(for 48K model only)

*Figure 55*

### 8.6.6 PFC module protection error (E6)

| | |
|---|---|
| Error Code | 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 | ▶ Improper / Incorrect Wiring<br>▶ Outdoor PCB faulty<br>▶ PFC module inductance faulty<br>▶ PFC module faulty |

*Table 24*

**Troubleshooting:**

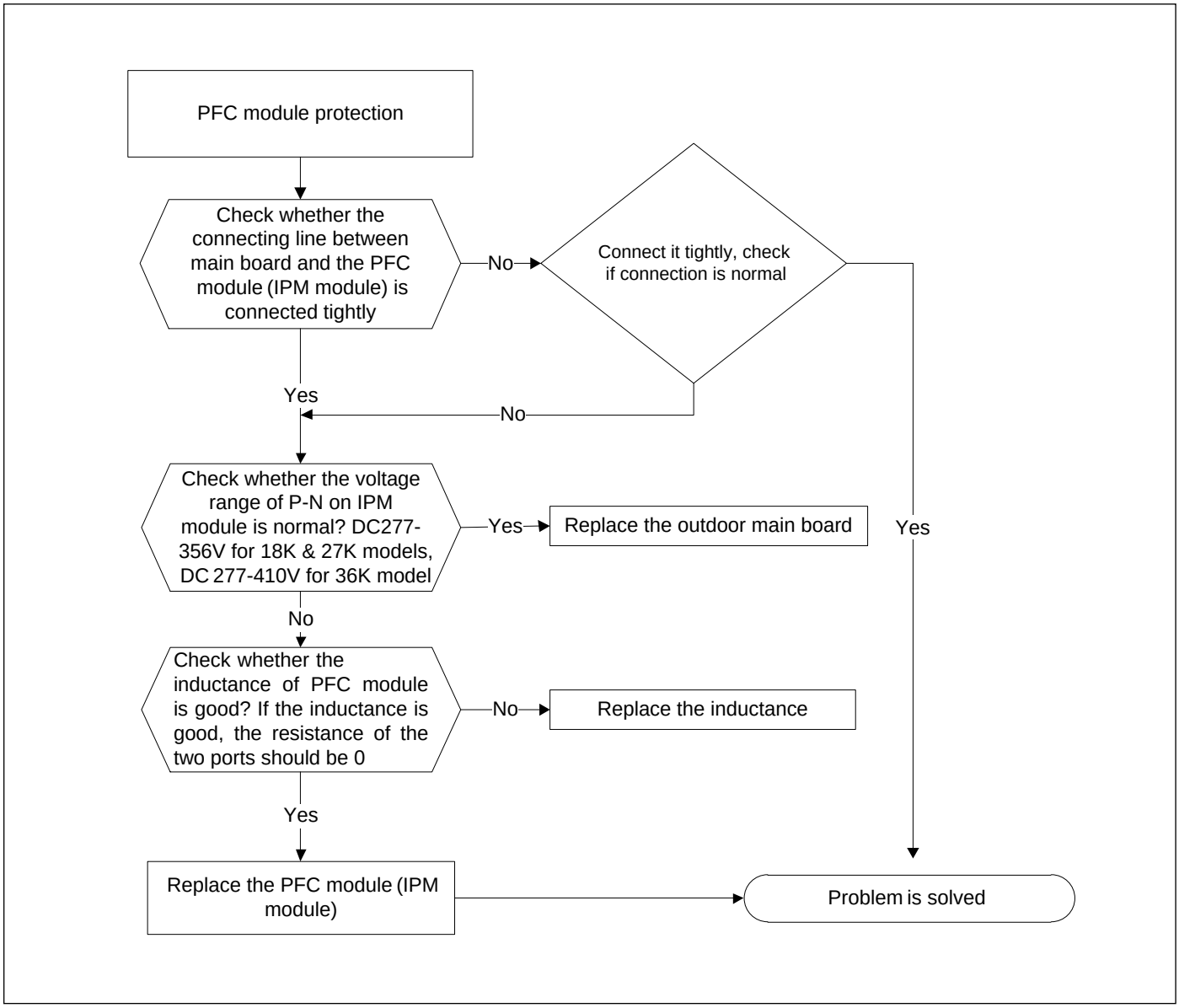



*Figure 56*


*Figure 57*

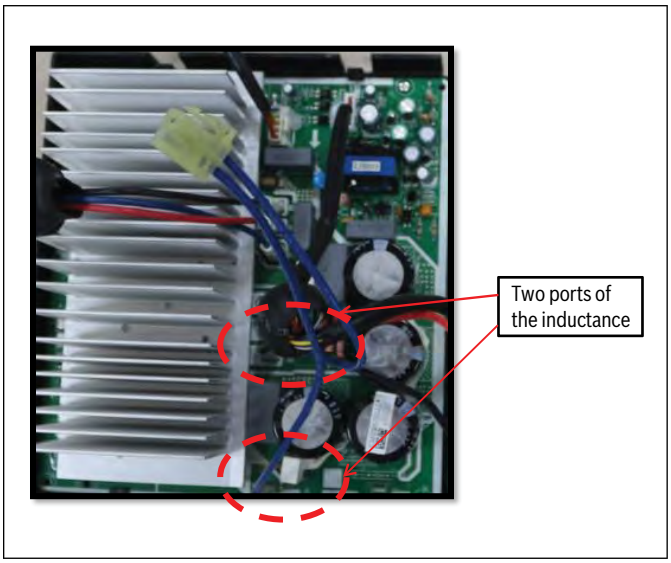



*Figure 58*

### 8.6.7 Outdoor fan speed malfunction (E8)

| | |
|---|---|
| Error Code | E8 |
| Malfunction decision conditions | When outdoor fan speed is kept too low (300RPM) or too high (2400RPM) for certain amount of time, the unit will stop and the LED will display the failure. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ Outdoor fan assembly faulty<br>▶ Outdoor PCB faulty |

*Table 25*

**Troubleshooting:**

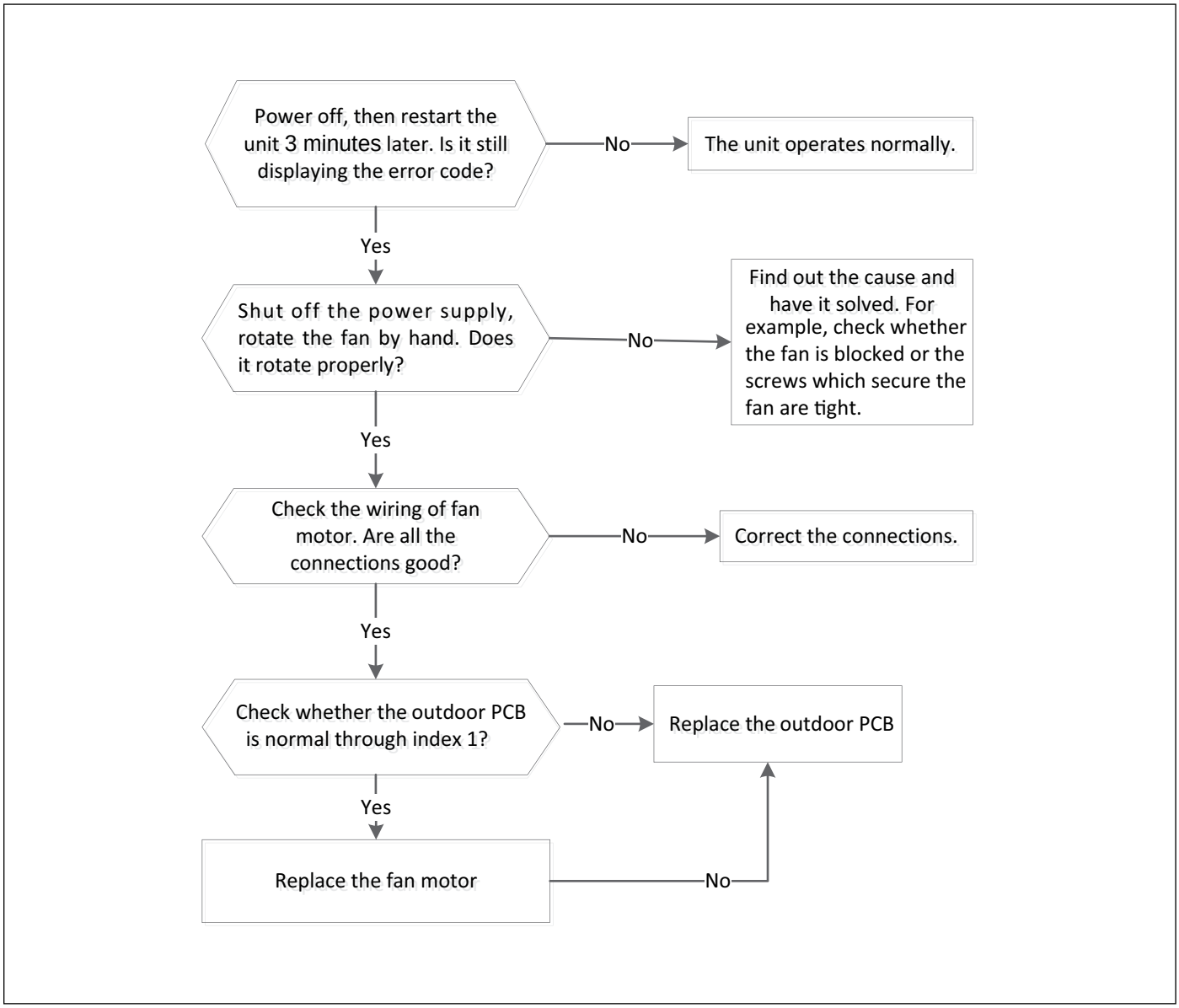



*Figure 59*

**DC fan motor(control chip is inside fan motor)**

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin3-pin4 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.

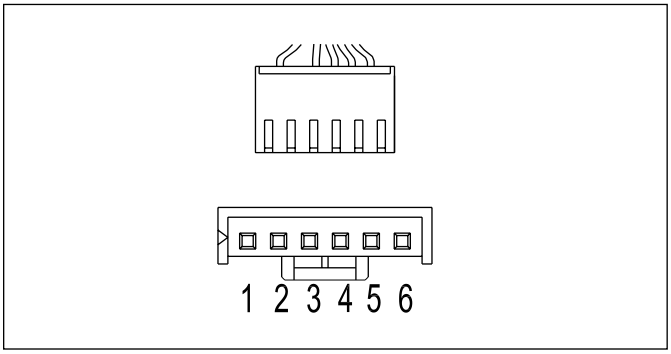



*Figure 60*

**DC motor voltage input and output**

| NO. | Color | Signal | Voltage |
|---|---|---|---|
| 1 | Red | Vs/Vm | 200~380V |
| 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 |

*Table 26*

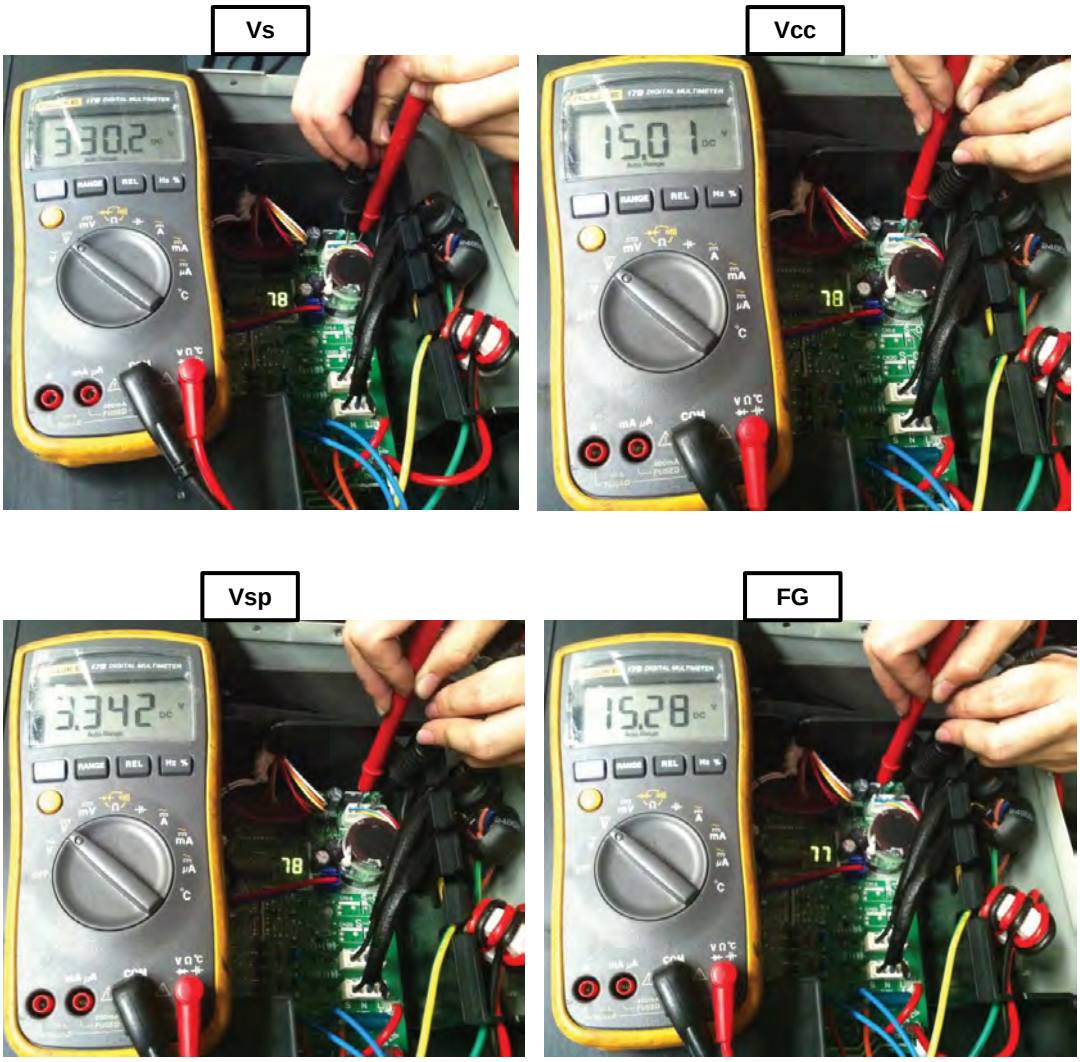



*Figure 61*

### 8.6.8 High pressure protection (P1)

| | |
|---|---|
| Error Code | P1 |
| Malfunction decision conditions | If the sampling voltage is not 5V, the LED will display the failure. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ Over load protector faulty<br>▶ System blockage<br>▶ Outdoor PCB faulty |

*Table 27*

**Troubleshooting:**

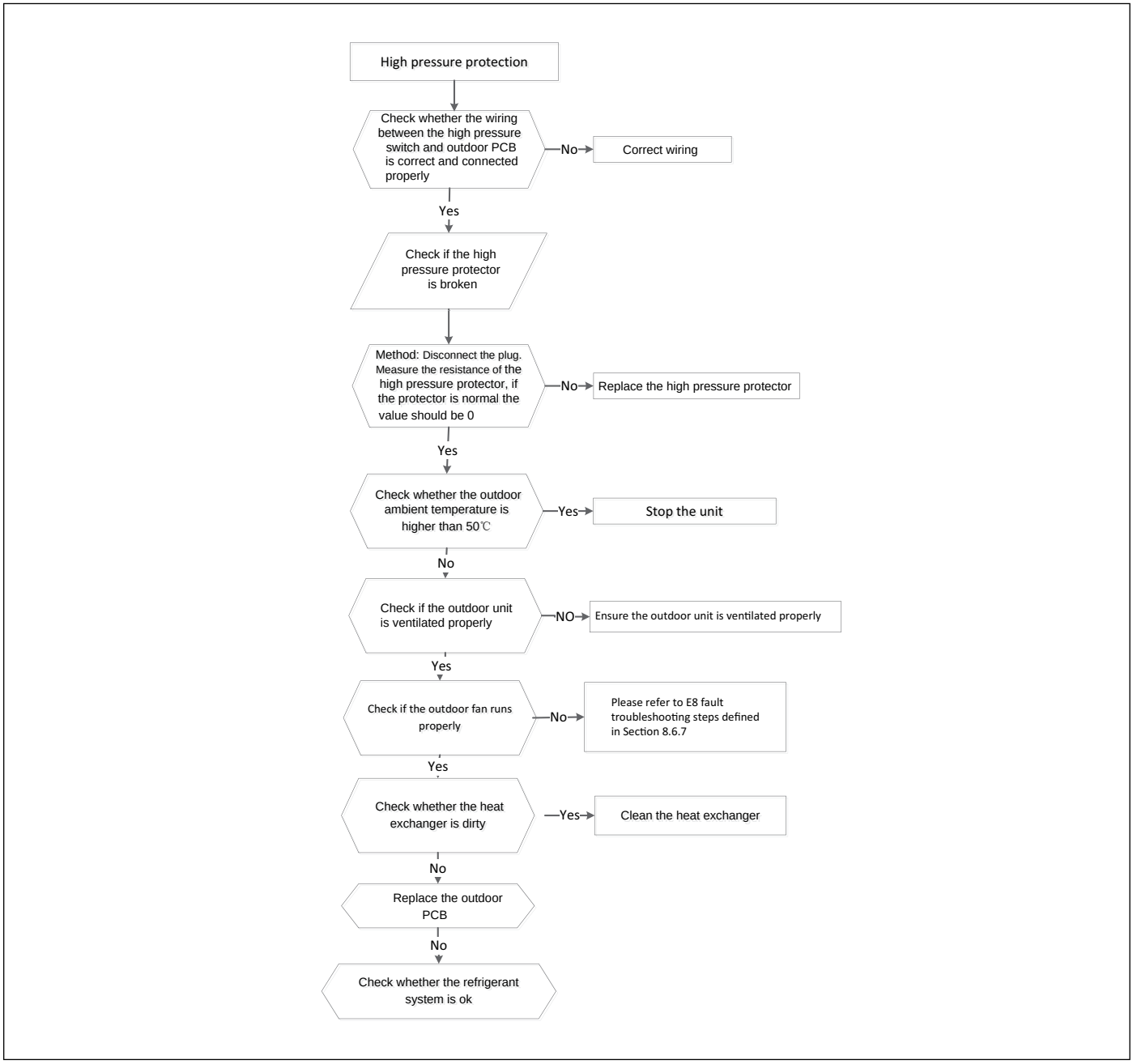



*Figure 62*


*Figure 63*

### 8.6.9 High pressure protection (P2)

| | |
|---|---|
| Error Code | P2 |
| Malfunction decision conditions | If the sampling voltage is not 5V, the LED will display the failure. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ Over load protector faulty<br>▶ System blockage<br>▶ Outdoor PCB faulty |

*Table 28*

**Troubleshooting:**

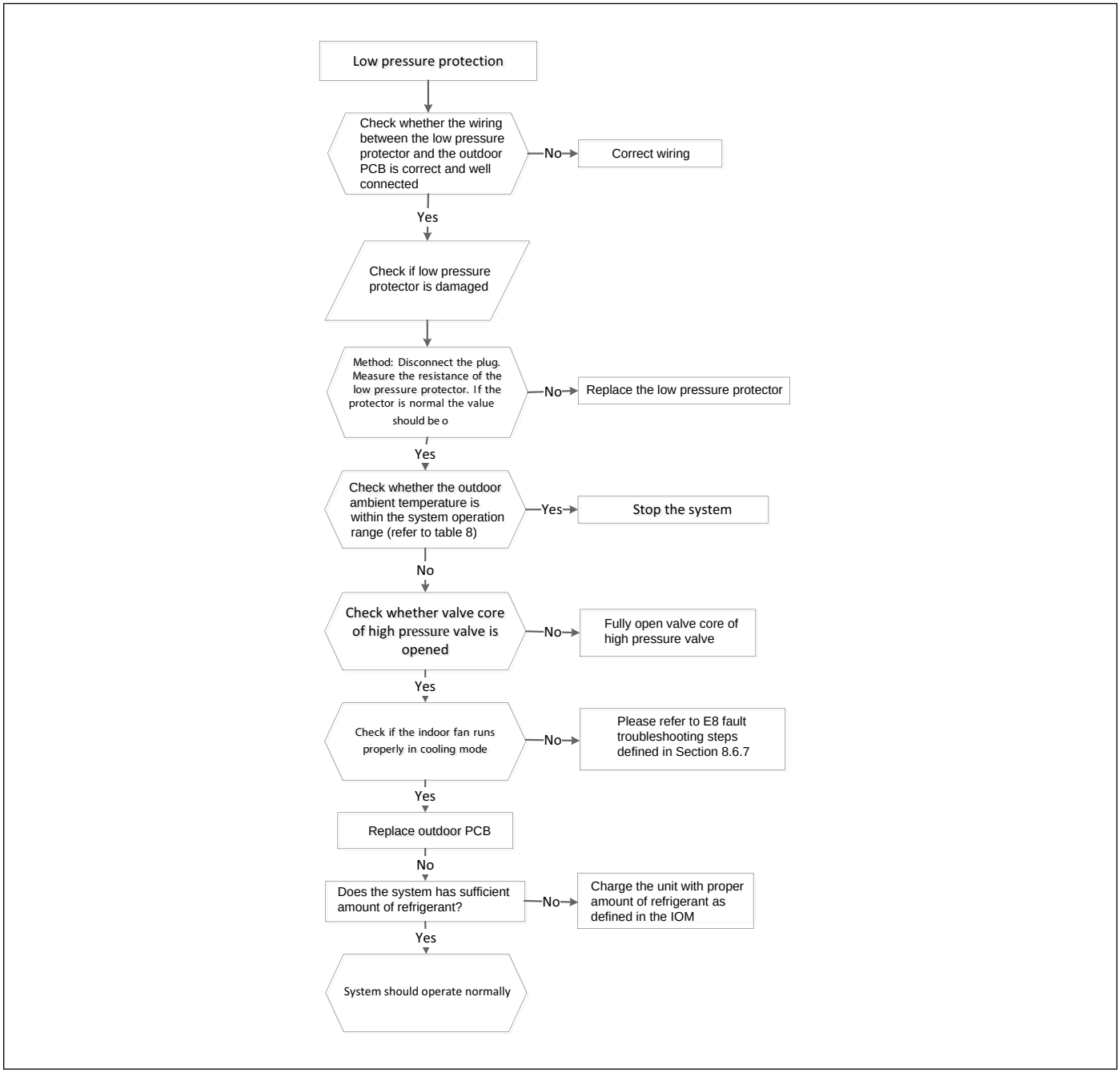



*Figure 64*


*Figure 65*

### 8.6.10 Current overload protection (P3)

| | |
|---|---|
| Error Code | P3 |
| Malfunction decision conditions | If the outdoor current exceeds the current limit value, the LED will display the failure. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ Over load protector faulty<br>▶ System blockage<br>▶ Outdoor PCB faulty |

*Table 29*

**Troubleshooting:**

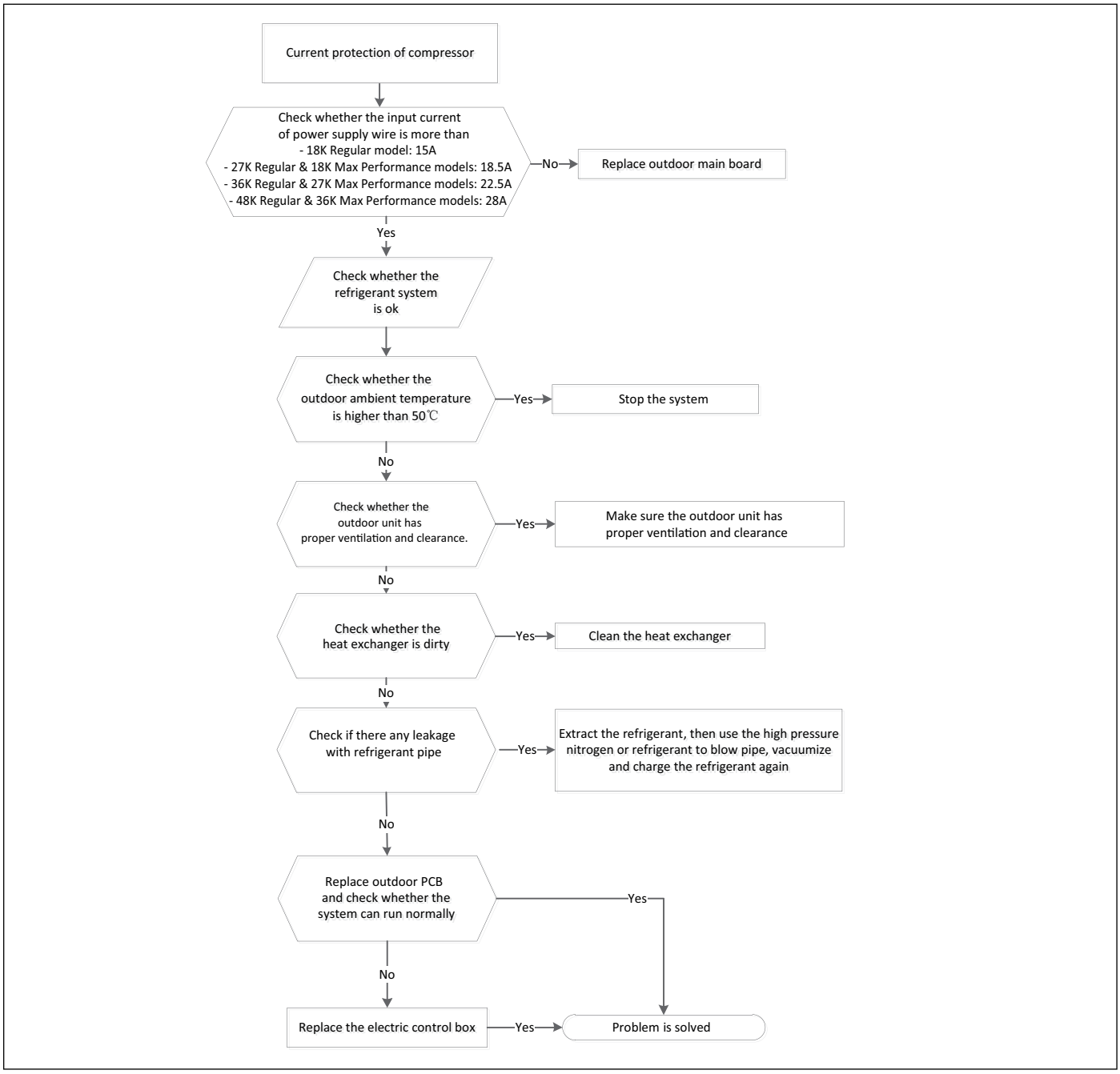



*Figure 66*


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

*Figure 67*

### 8.6.11 Temperature protection of compressor discharge (P4)

| | |
|---|---|
| Error Code | P4 |
| Malfunction decision conditions | When the compressor discharge temperature(T5) is more than 115℃ for 10 seconds, the compressor will stop and restart when T5 is less than 90℃. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ System leakage<br>▶ Discharge temperature (T5) sensor faulty<br>▶ Outdoor PCB faulty |

*Table 30*

**Troubleshooting:**

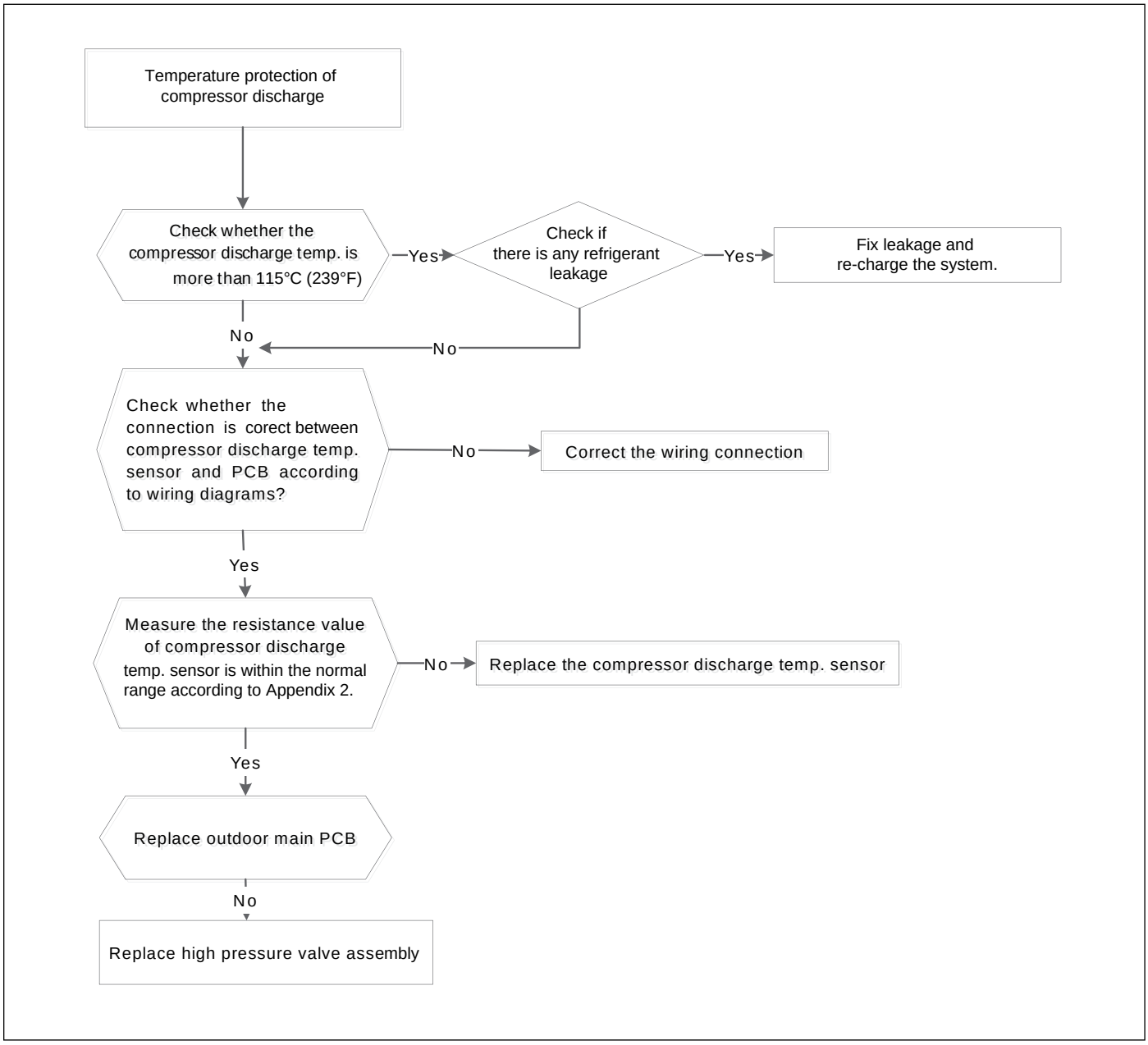



*Figure 68*

### 8.6.12 High temperature protection (condenser) (P5)

| | |
|---|---|
| Error Code | P5 |
| Malfunction decision conditions | When the outdoor pipe temperature is more than 65°C, the system will stop. The system will operate again when outdoor pipe temperature is less than 52°C. |
| Supposed causes | ▶ Condenser temperature sensor (T3) faulty<br>▶ Dirty heat exchanger<br>▶ System leakage or blockage<br>▶ Outdoor PCB faulty |

*Table 31*

**Troubleshooting:**

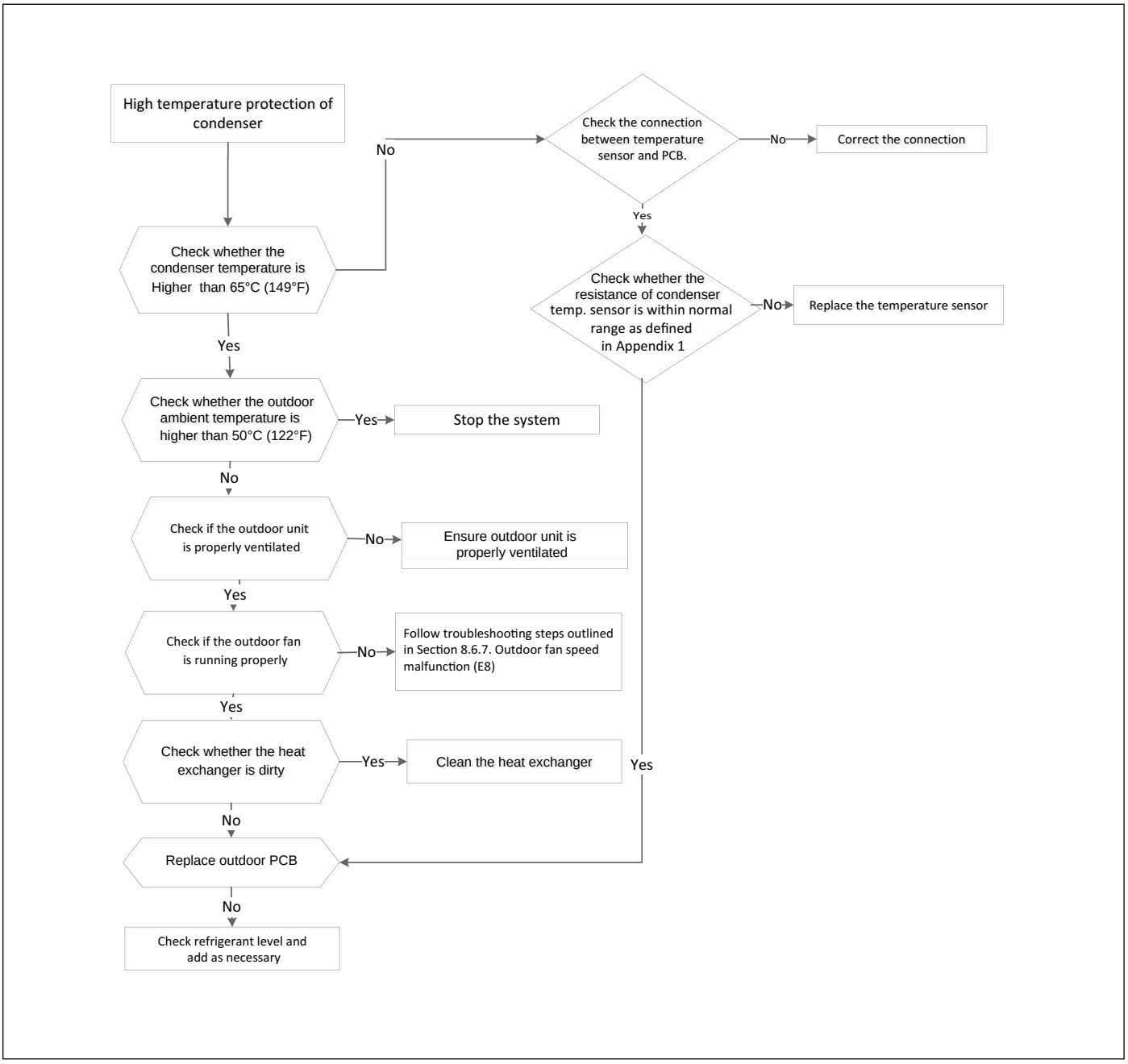



*Figure 69*

### 8.6.13 IPM malfunction (P6)

| | |
|---|---|
| Error Code | P6 |
| Malfunction decision conditions | When the voltage signal that IPM send to compressor drive chip is abnormal, the display LED will show "P6" and AC will turn off. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ IPM malfunction<br>▶ Outdoor fan assembly faulty<br>▶ Compressor malfunction<br>▶ Outdoor PCB faulty |

*Table 32*

**Troubleshooting:**

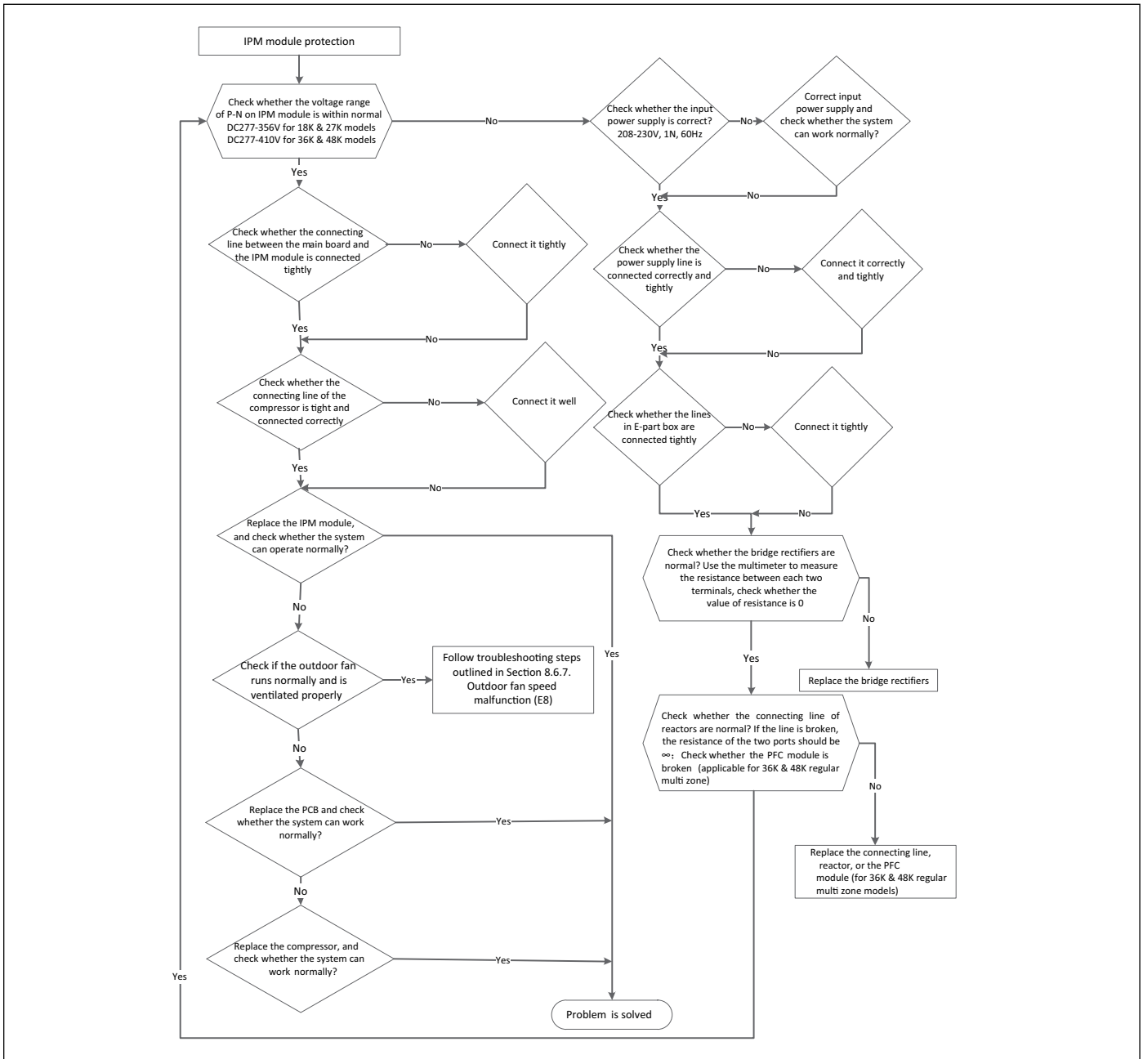



*Figure 70*

### 8.6.14 High temperature protection (compressor) (P0)

| | |
|---|---|
| Error Code | P0 |
| Malfunction decision conditions | If the sampling voltage is not 5V, the LED will display the failure. |
| Supposed causes | ▶ Improper / Incorrect Wiring<br>▶ Over load protector faulty<br>▶ System leakage or blockage<br>▶ Outdoor PCB faulty |

*Table 33*

**Troubleshooting:**

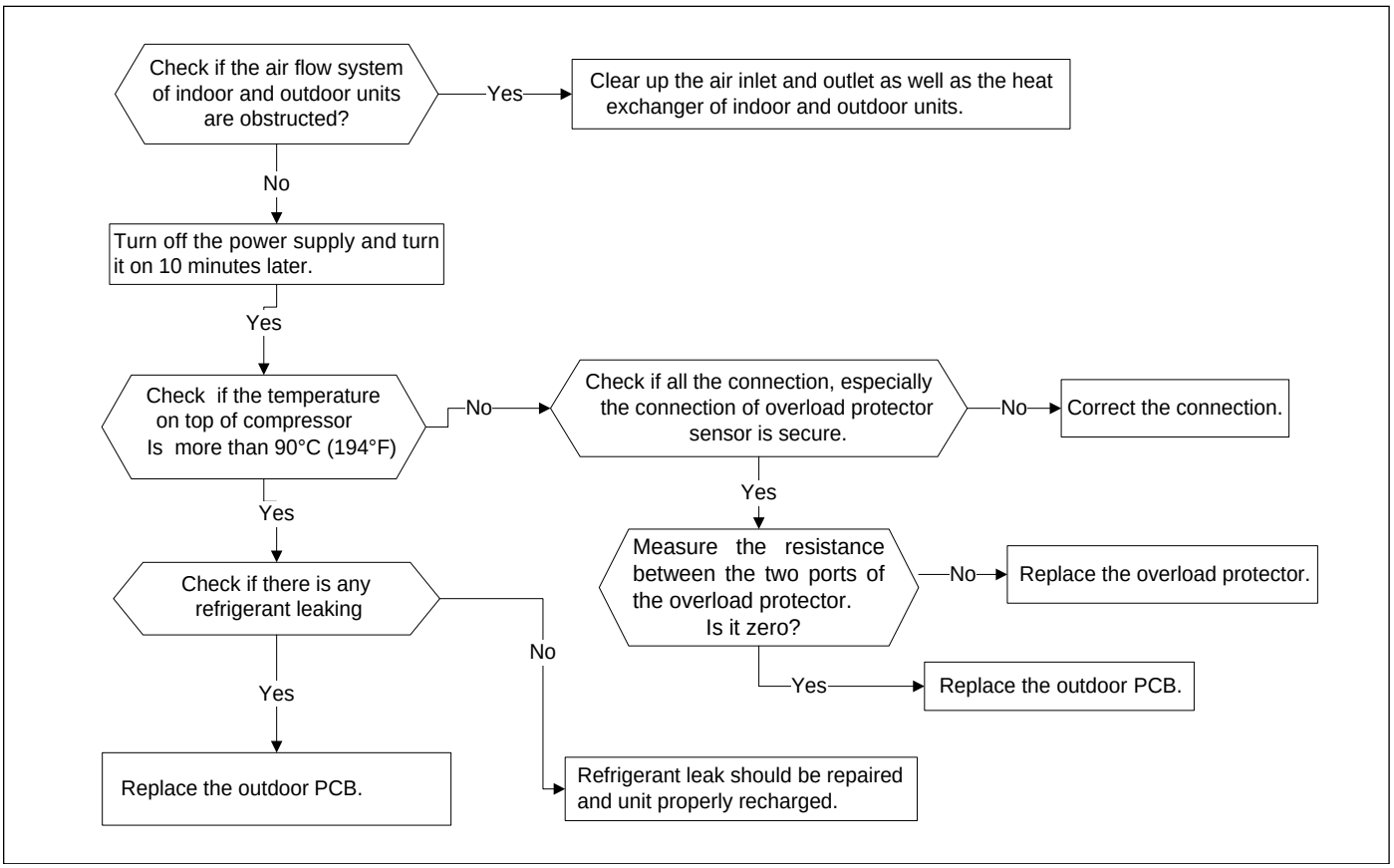



*Figure 71*

### 8.6.15 Main Parts Check

**1. Temperature sensor check**

**WARNING: ELECTRICAL HAZARD**

- Be sure to turn off all power supplies or disconnect all wires to avoid electric shock.
- Operate after compressor and coil have returned to normal temperature to avoid injury.

- Disconnect the temperature sensor from PCB.
- Measure the resistance value of the sensor using a multi-meter.
- Check corresponding temperature sensor resistance value table (Appendix 1).

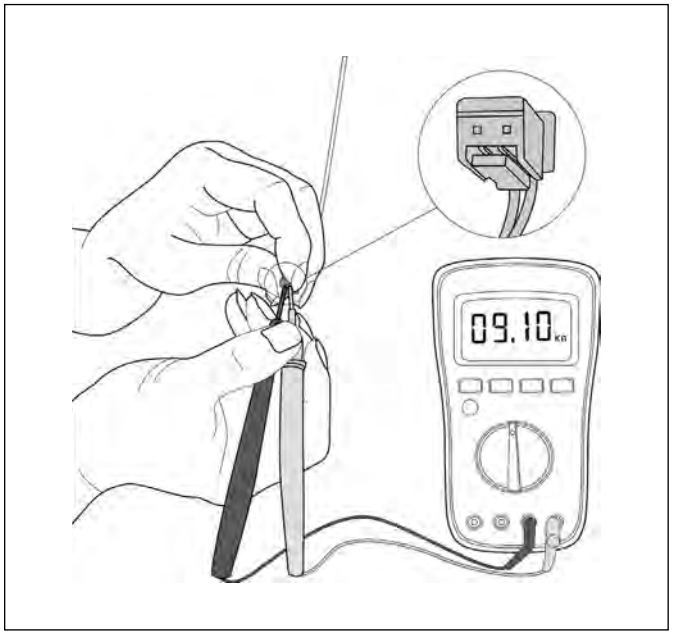



*Figure 72*

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

**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.

**Appendix 1 Resistance to Temperature value table for resistive sensors:**
**T1,T2,T3,T4 (°C/°F/K Ohm)**

| ℃ | ℉ | K Ohm | ℃ | ℉ | K Ohm | ℃ | ℉ | K Ohm | ℃ | ℉ | 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 34*

**Appendix 2 Resistance to Discharge Temperature value table: T5 (°C/°F/K Ohm)**

| ℃ | ℉ | K Ohm | ℃ | ℉ | K Ohm | ℃ | ℉ | K Ohm | ℃ | ℉ | 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 | | | |

*Table 35*

**2. Compressor check**

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

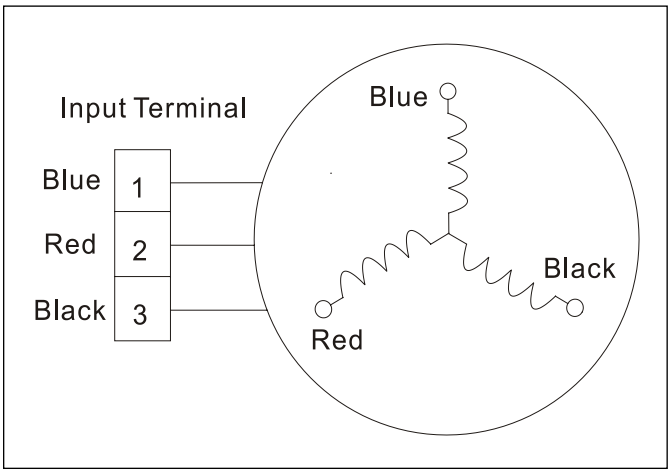



*Figure 73*

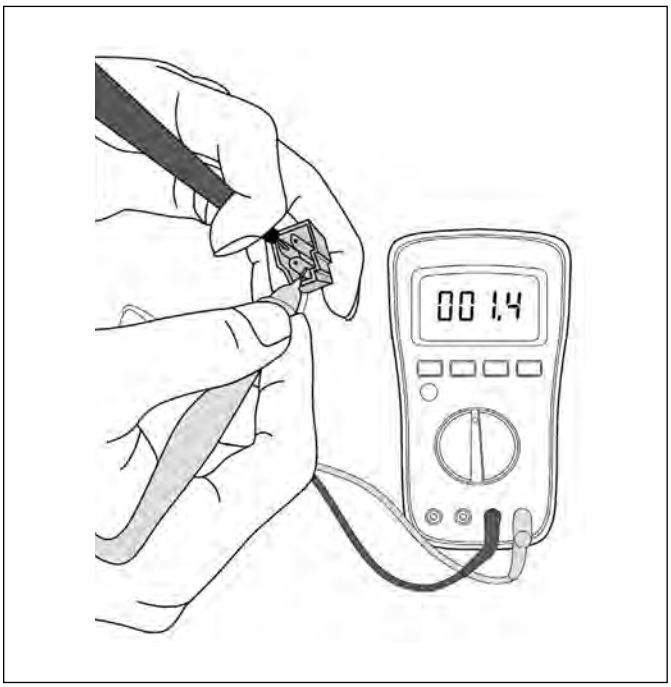



*Figure 74*

| Position | Resistance Value per Compressor Model | | | |
|---|---|---|---|---|
| | 18K Regular | 27K Regular<br>18K Max Performance | 36K Regular<br>27K Max Performance | 48K Regular<br>36K Max Performance |
| Blue - Red | 1.72Ω | 0.75Ω | 0.65Ω | 0.37Ω |
| Blue - Black | | | | |
| Red - Black | | | | |

*Table 36*

**3. IPM continuity check**

**WARNING: ELECTRICAL HAZARD**

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

Turn off the power, let the large capacity electrolytic capacitors discharge completely, then 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 | | |

*Table 37*

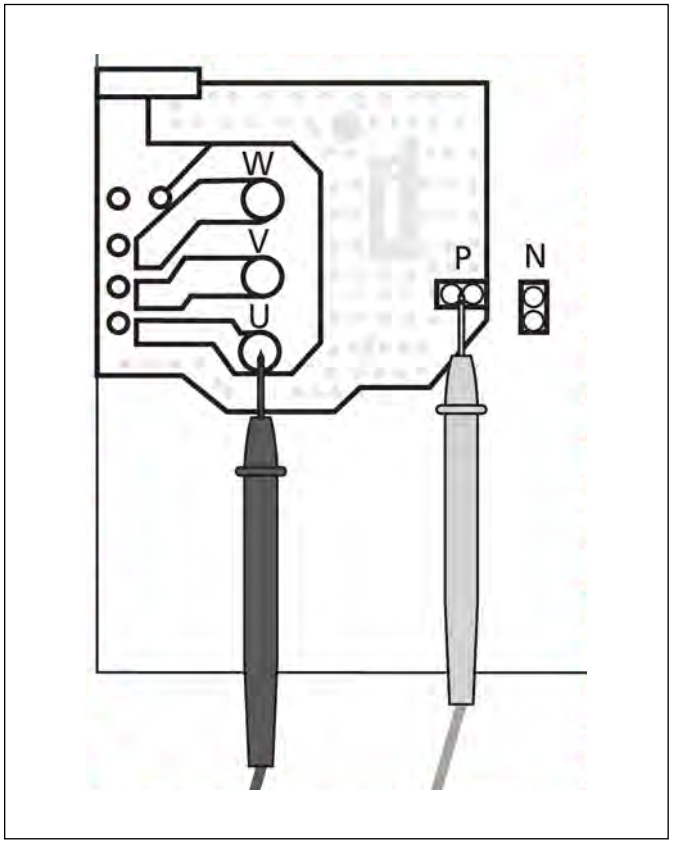



*Figure 75*

**4. Four - Way Valve**

Step 1. Power on, use a digital tester to measure the voltage. When the unit operates in cooling mode, value should be 0V. When the unit operates in heating mode, the value should be about 230VAC.

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

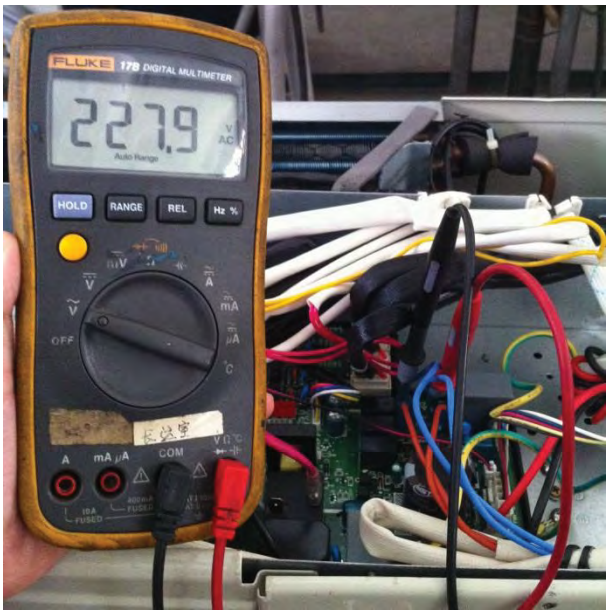




*Figure 76*

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

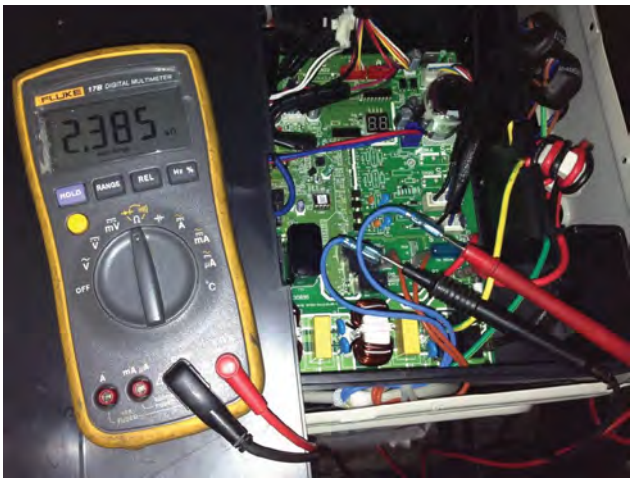



*Figure 77*

**5. EXV check**

Step 1. Disconnect EXV connectors from PCB

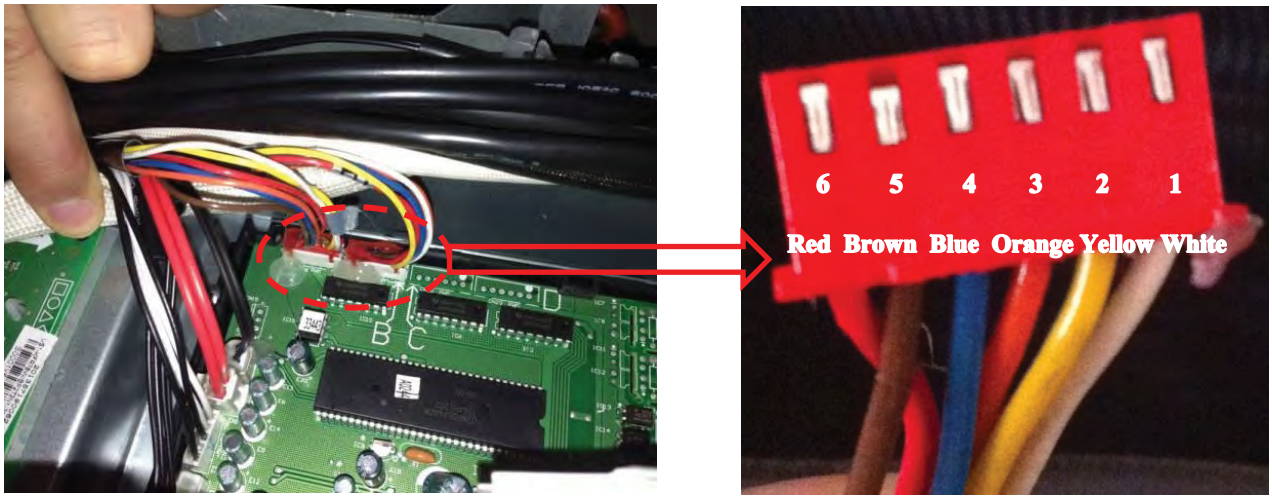



*Figure 78*

Step 2. Check the resistance value on EXV coil

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

*Table 38*

# 9 Disassembly Guide

Pictures are provided as a reference only. Each unit will be different depending on the your model number.

## 9.1 Outdoor Unit - BMS500-AAM018-1CSXRA

### 9.1.1 Removing the fan assembly

1. Stop operation of the system and turn “OFF” the power at the disconnect.
2. Remove the air outlet grille.

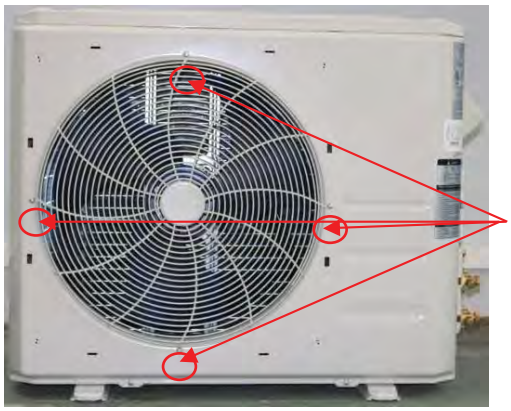


*Figure 79*

3. Remove the hex nut that is fixing the fan.

*Figure 80*

4. Remove the fan.
5. Remove the top cover (3 screws).

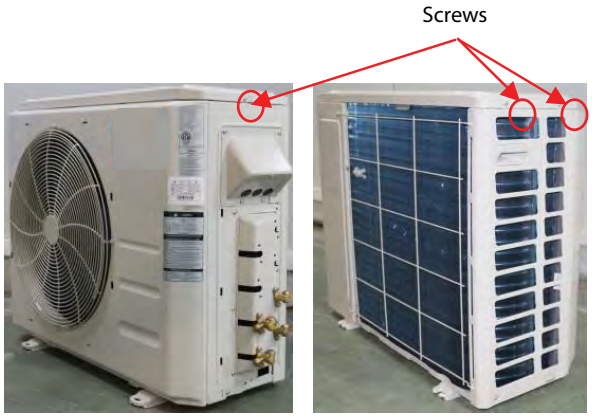



*Figure 81*

6. Remove the black cover of the electrical control box.

*Figure 82*

7. Disconnect the fan motor connector CN14 (white, 3p) from IPM.

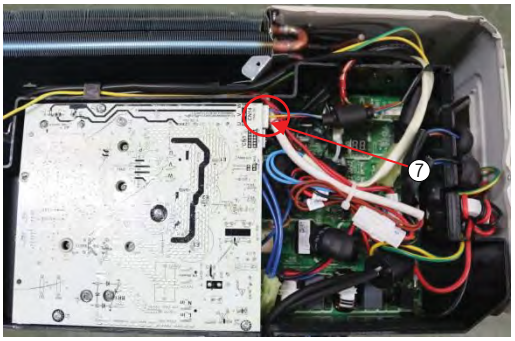



*Figure 83*

8. Remove the four fixing screws of the fan motor, then remove the fan motor.

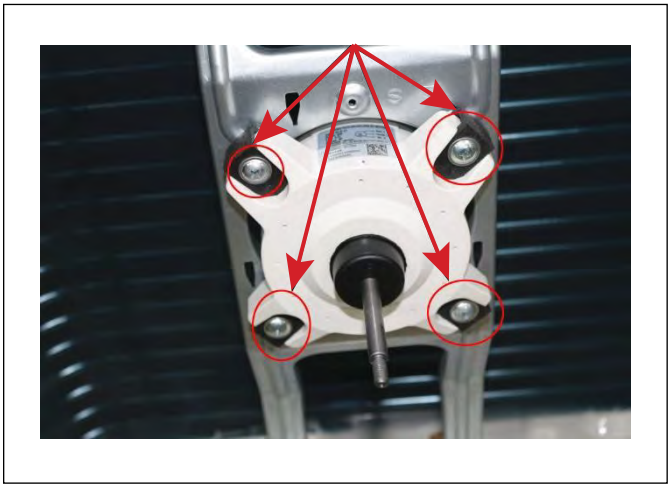


*Figure 84*

### 9.1.2 Removing the panel plates

1. Stop operation of the system and turn "OFF" the power at the disconnect.
2. Remove the front panel (6 screws).

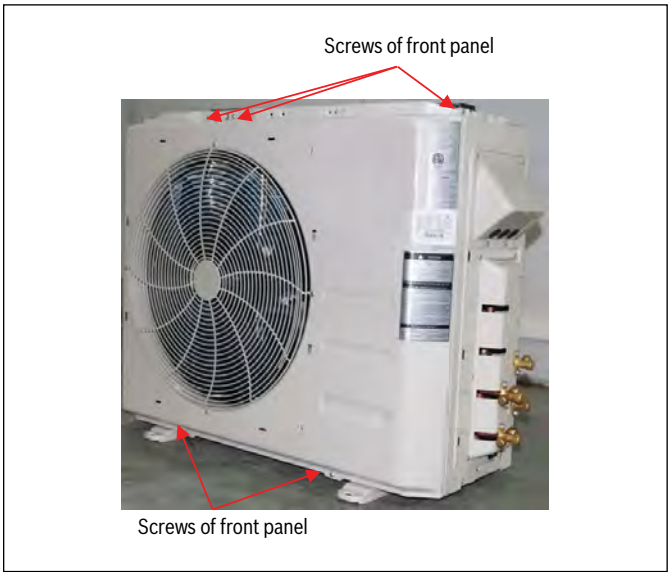



*Figure 85*

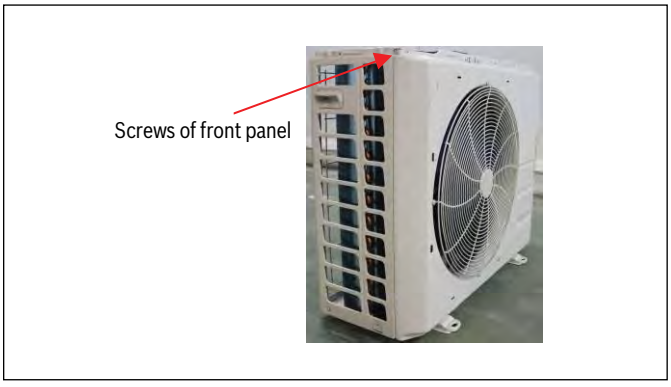



*Figure 86*

3. Remove the big handle (4 screws).


*Figure 87*

4. Remove the right panel (2 screws from terminal block and 7 screws from right rear panel).

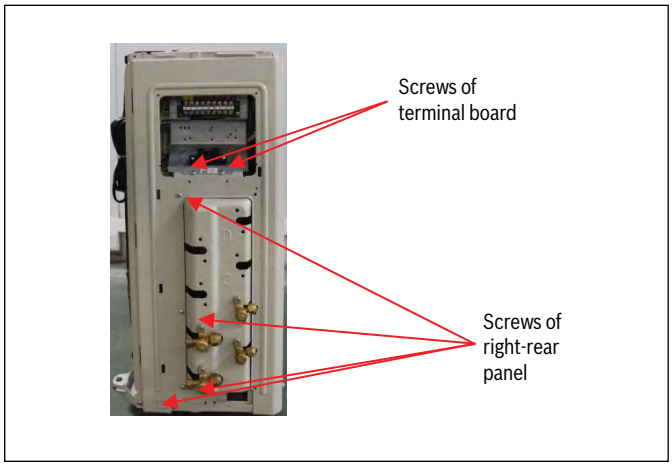



*Figure 88*

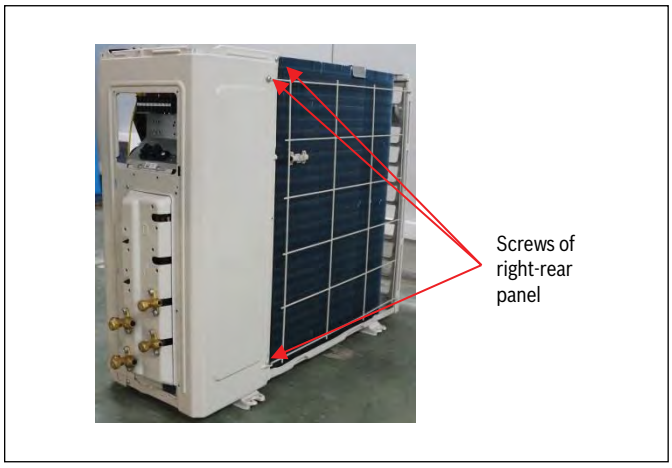



*Figure 89*

### 9.1.3 Removing the electrical parts

1. Follow steps outlined in Section 9.1.1.
2. Remove screws on IPM board (4 screws).

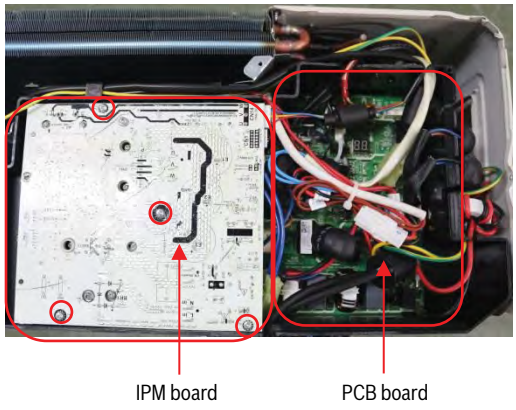



*Figure 90*

3. Disconnect the connector for the Reactor (A) and Compressor (B).

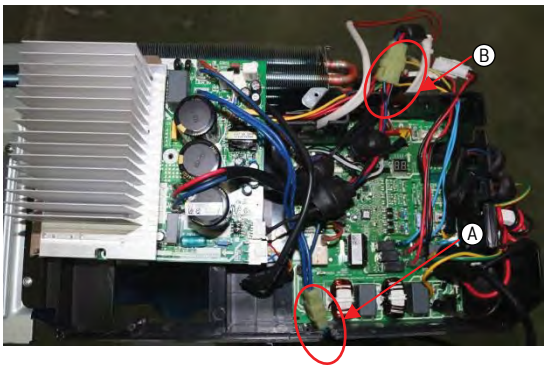



*Figure 91*

4. Disconnect connectors as shown in Figure 94.

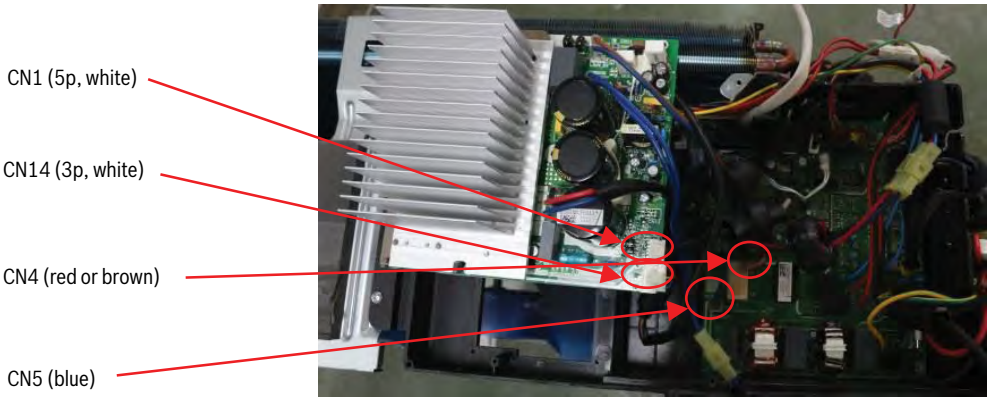



*Figure 92*

5. Remove the IPM board.

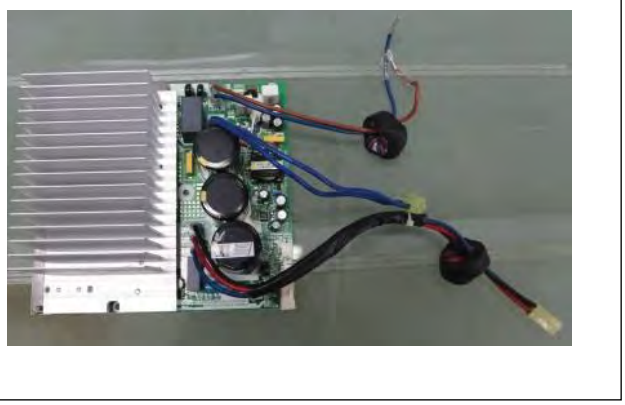


*Figure 93*

6. Disconnect below connectors and wires from PCB.

**Connectors:**

- CN17:T3/T4 temperature sensor (2p/2p,white)
- CN7: Discharge temperature sensor (2p,white)
- CN15:T2B-A,B temperature sensor (2p/2p,white)
- CN18/CN19: Electronic expansion valve A,B (6p/6p,red/red)
- CN25/CN23: S-A,S-B (3p/3p,white/white)

**Wires:**

- CN1/CN2: 4-way valve (blue-blue)
- CN5/CN6: Crankcase heating cable (red-red)
- CN3:L-IN (red)
- CN4:N-IN (black)

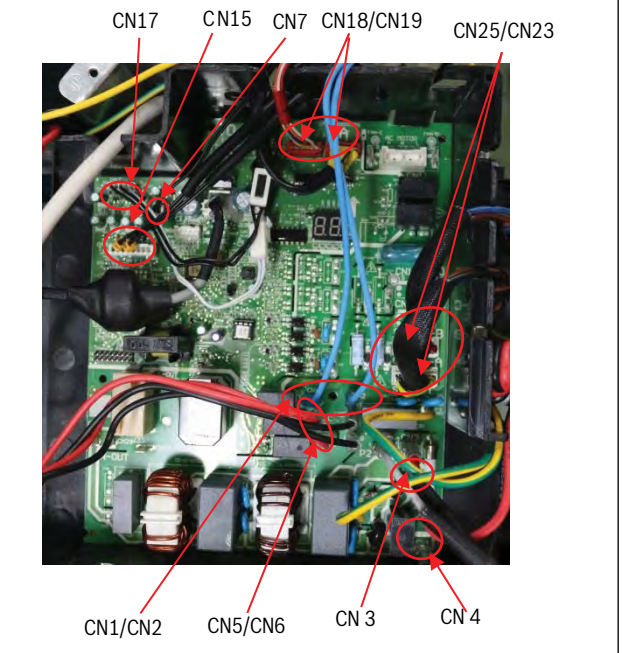



*Figure 94*

7. Disconnect the grounding wire (yellow-green) after removing the big handle and the right-rear panel.

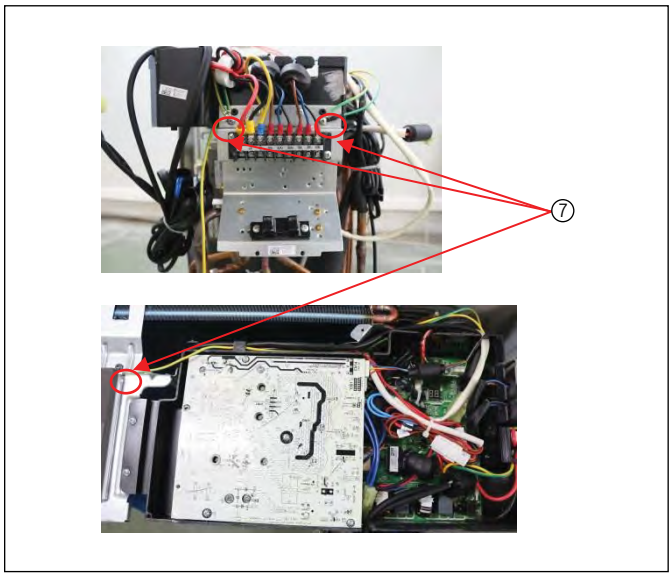



*Figure 95*

8. Remove PCB and replace as needed.

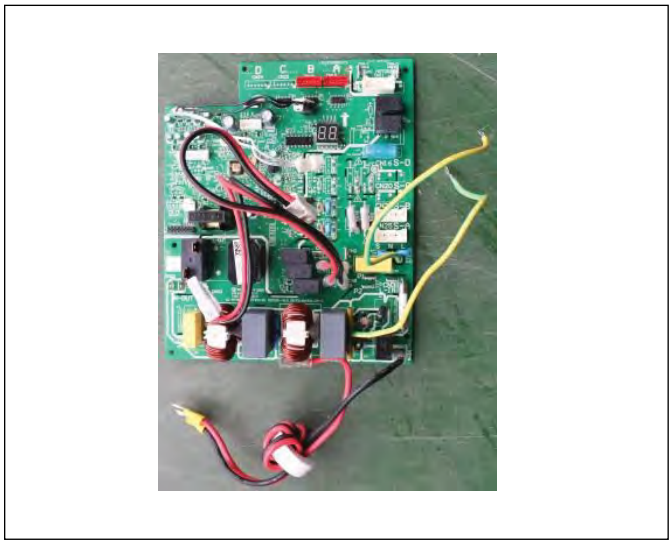


*Figure 96*

### 9.1.4 Removing the compressor

1. Follow steps outlined in Section 9.1.2.
2. Remove the electrical control box cover and extract refrigerant from the refrigerant circuit.
3. Remove the sound insulation material and crankcase heating cable.
4. Remove terminal cover of compressor, and disconnect wires of crankcase electric heater and compressor from the terminal.
5. Remove the discharge pipe and suction pipe with a burner

*Figure 97*

6. Remove the hex nuts and washers fixing the compressor on bottom plate.

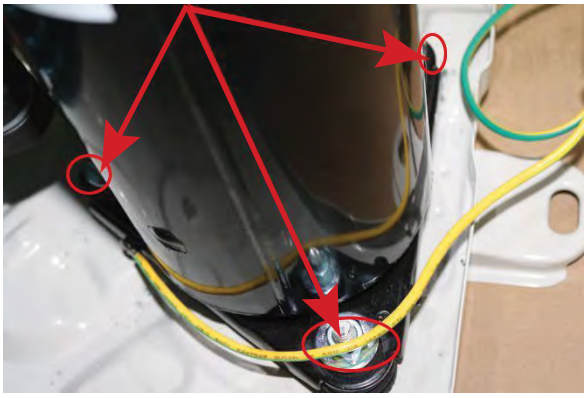


*Figure 98*

7. Lift the compressor from the base pan assembly.

### 9.1.5 Removing the reactor

1. Follow steps outlined in Section 9.1.2.
2. Remove connector between IPM and reactor.

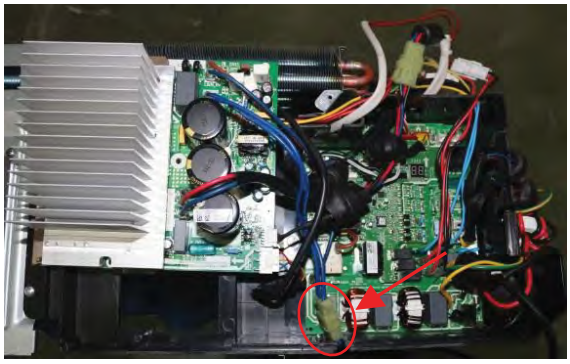


*Figure 99*

3. Remove the screws of reactor (3 screws).

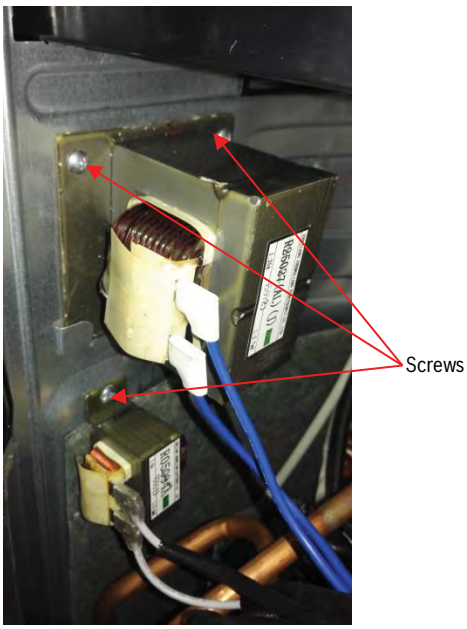



*Figure 100*

### 9.1.6 Removing the 4-way valve

1. Follow steps outlined in Section 9.1.2.
2. Extract refrigerant gas and remove electrical parts by following previous step.
3. Remove fixing screw of the coil, and remove the coil.
4. Detach the welded parts of 4-way valve and pipe.

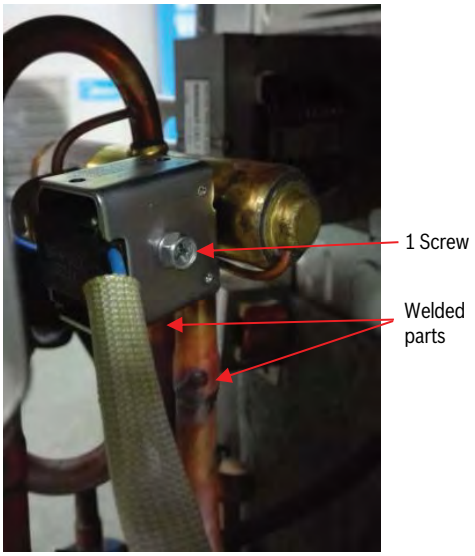



*Figure 101*

### 9.1.7 Removing the expansion valve

1. Follow steps outlined in Section 9.1.2.
2. Remove the coils & detach the welded parts of expansion valves and pipes.

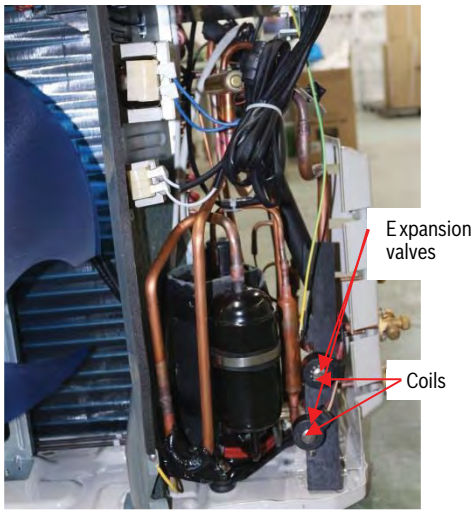



*Figure 102*

## 9.2 Outdoor Unit - BMS500-AAM027-1CSXRA, BMS500-AAM018-1CSXHB, BMS500-AAM027-1CSXHB

### 9.2.1 Removing the panel plate

1. Stop operation of the system and turn “OFF” the power at the disconnect.
2. Remove the big handle (4 screws).

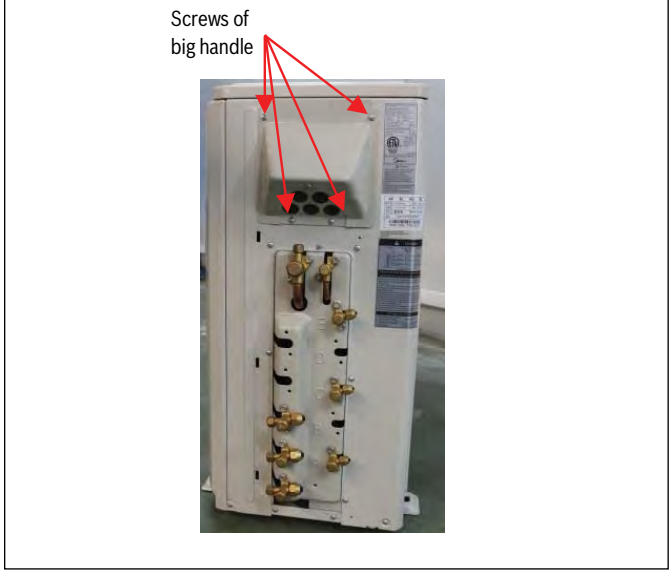



*Figure 103*

3. Remove the top cover (4 screws).

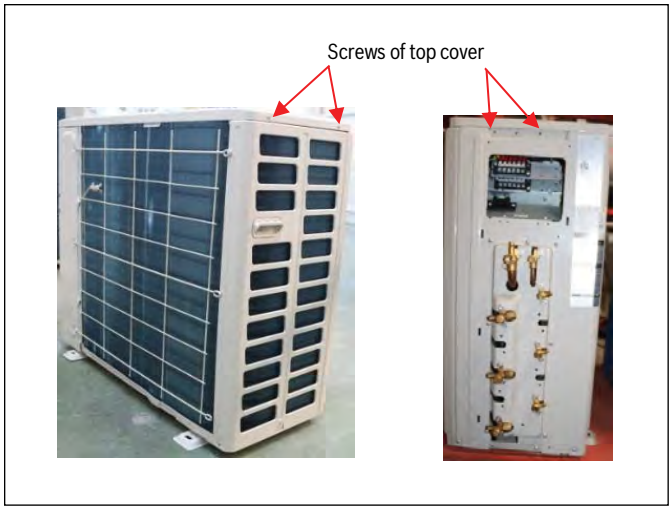



*Figure 104*

4. Remove the right side panel (1 screw).

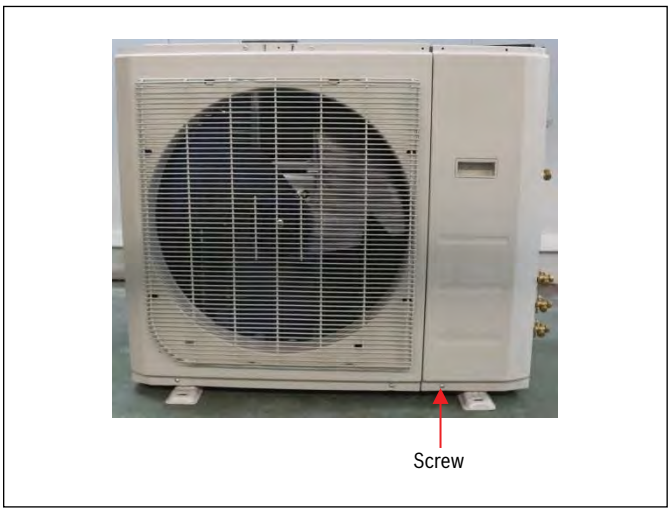



*Figure 105*

5. Remove the front panel (8 screws).

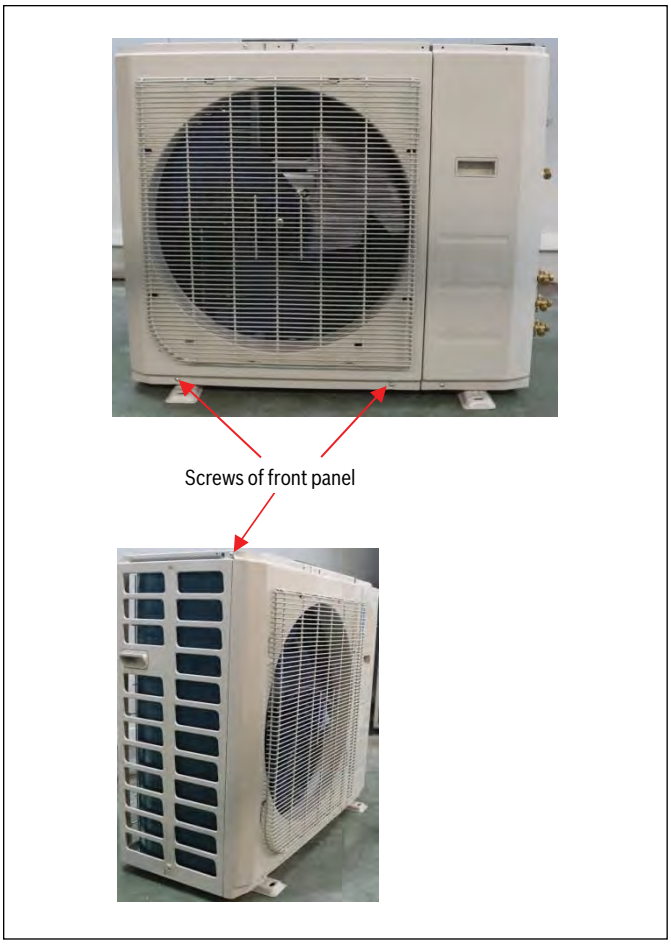



*Figure 106*

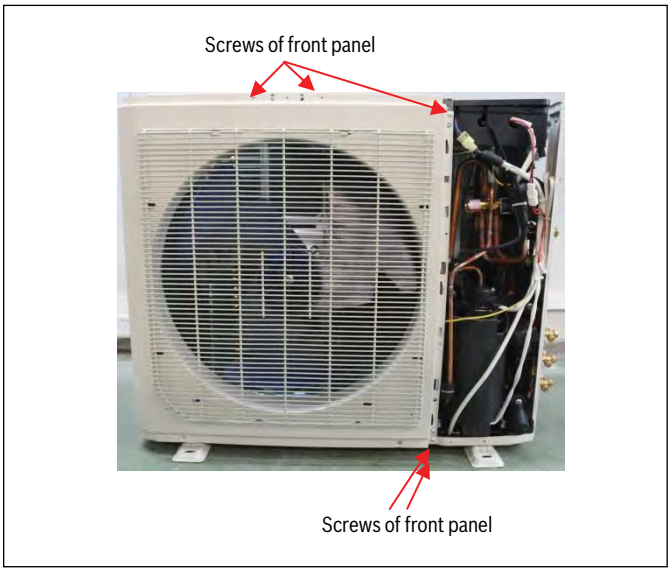



*Figure 107*

6. Remove the right & rear panel (15 screws).

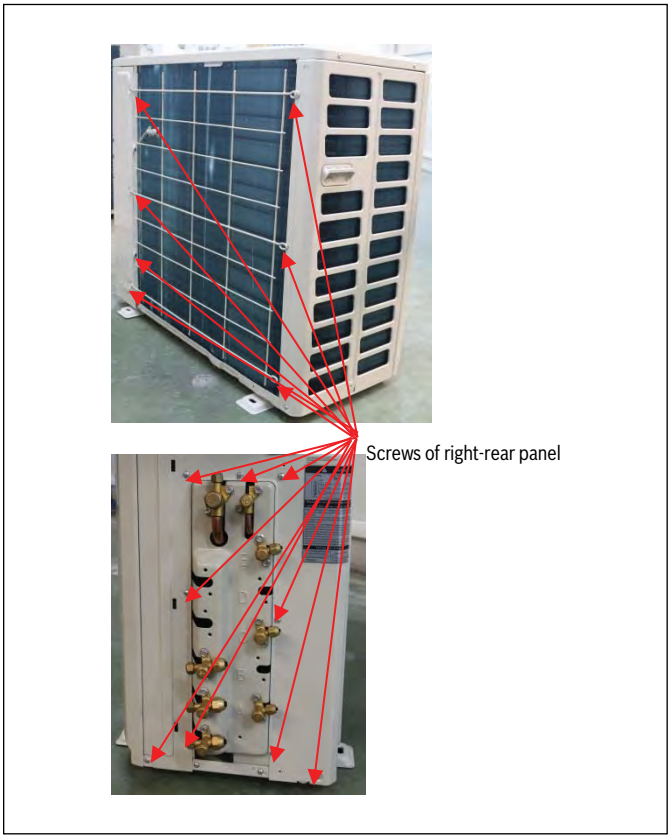



*Figure 108*

7. Remove the terminal board (2 screws).

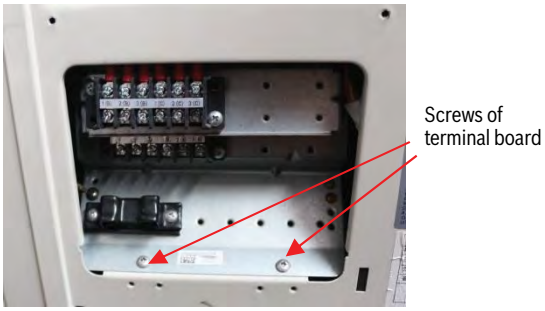



*Figure 109*

### 9.2.2 Removing the fan assembly

1. Follow steps outlined in Section 9.2.1.
2. Remove the hex nut fixing the fan, and then remove the fan.

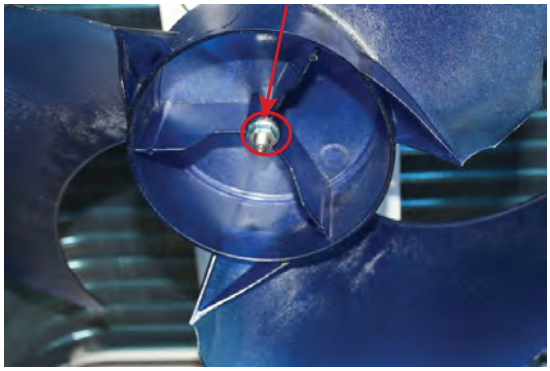


*Figure 110*

3. Remove the cover of electrical control box cover.

*Figure 111*

4. Disconnect the fan motor connector CN14 from the IPM board.

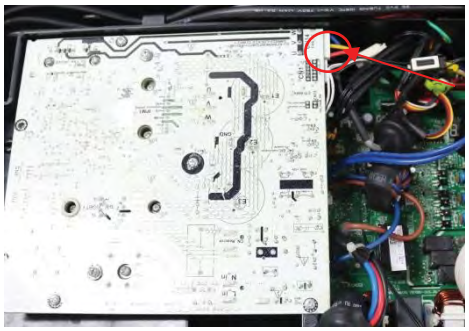


*Figure 112*

5. Remove the four fixing screws of the fan motor. Then remove the fan motor.

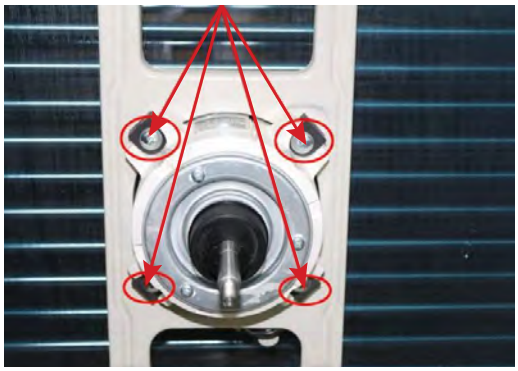


*Figure 113*

### 9.2.3 Removing the electrical parts

1. Follow steps outlined in Section 9.2.1.
2. Remove the screws of the IPM board (4 screws).

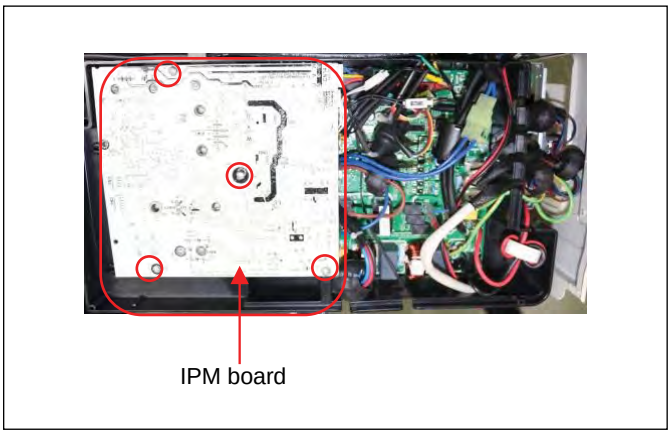



*Figure 114*

3. Disconnect the connector to reactor from PCB.

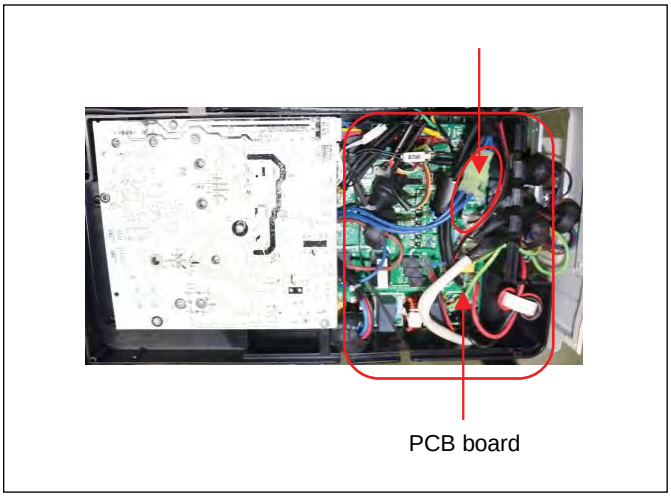



*Figure 115*

4. Disconnect the compressor wire.

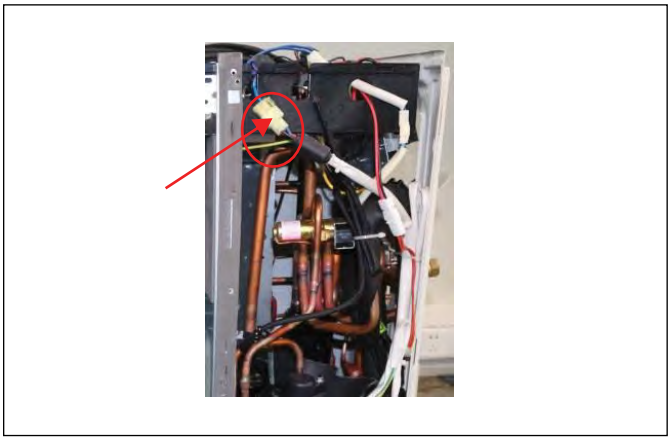


*Figure 116*

5. Disconnect wires between IPM board and PCB as shown below.

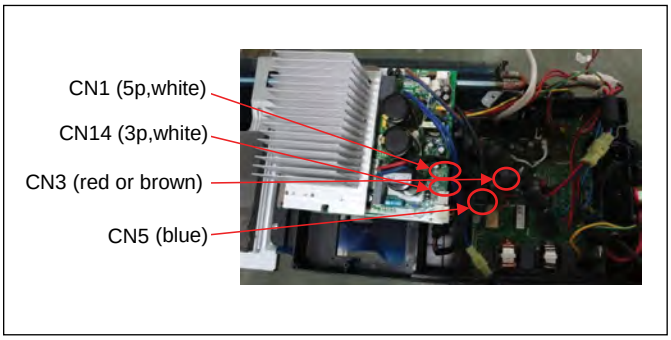



*Figure 117*

6. Remove the IPM board.

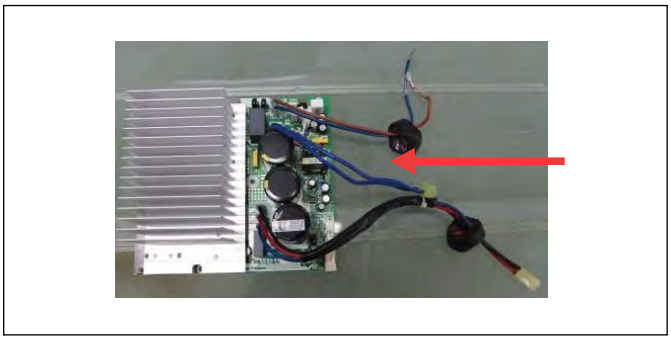


*Figure 118*

7. Disconnect the connectors and wires connected the PCB from other parts.

**Connectors:**

- CN17: T3/T4 Temperature sensor (2p/2p,white)
- CN7: Discharge temperature sensor (2p,white)
- CN15:T2B-A,B,C temperature sensor (2p/2p/2p,white)
- CN18/CN19/CN22: Electronic expansion valve A,B,C (6p/6p/6p,red/red/red)
- CN25/CN23/CN20: S-A,S-B,S-C (3p/3p/3p,white/white/white)

**Wires:**

- CN1/CN2: 4-way valve (blue-blue)
- CN5/CN6: Crankcase heating cable (red-red)
- CN3:L1-IN (red)
- CN4:L2-IN (black)

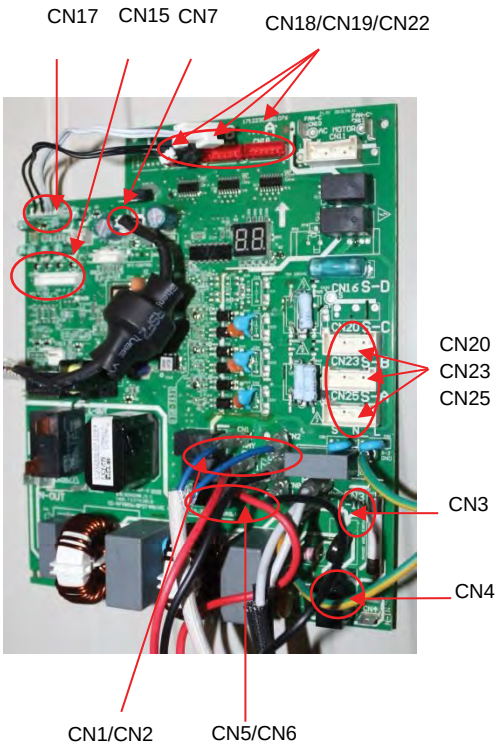



*Figure 119*

8. Disconnect the grounding wire (yellow-green).

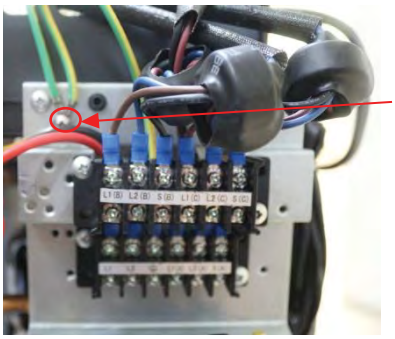


*Figure 120*

9. Remove PCB.

### 9.2.4 Removing the compressor

1. Follow steps outlined in Section 9.2.1.
2. Recover refrigerant from the refrigerant circuit.
3. Remove the sound insulation material and crankcase heating cable.
4. Remove terminal cover of compressor and disconnect wires of compressor thermo and compressor from the terminal.
5. Apply heat and remove discharge and suction pipes.

*Figure 121*

6. Remove the hex nuts and washers fixing the compressor on bottom plate.

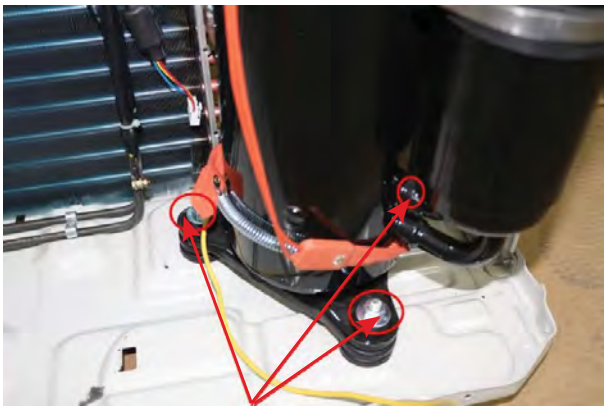


*Figure 122*

7. Lift the compressor from the base pan assembly.

### 9.2.5 Removing the reactor

1. Follow steps outlined in Section 9.2.1.
2. Disconnect the connection between the reactor and IPM board.
3. Remove the cover of inductance (2 screws).


*Figure 123*

4. Disconnect two pieces of wires connected from the cover of inductance.
5. Remove the reactor (4 screws).

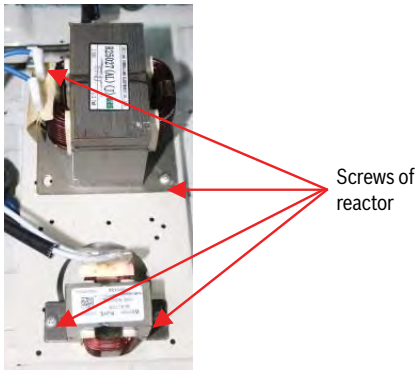



*Figure 124*

### 9.2.6 Removing the 4-way valve

1. Follow steps outlined in Section 9.2.1.
2. Remove fixing screw of the coil and remove the coil (1 screw).

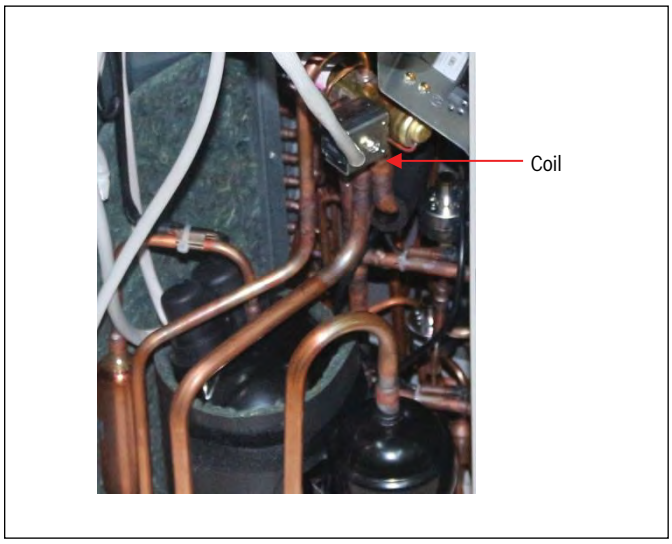



*Figure 125*

3. Detach the welded parts of 4-way valve and pipe.

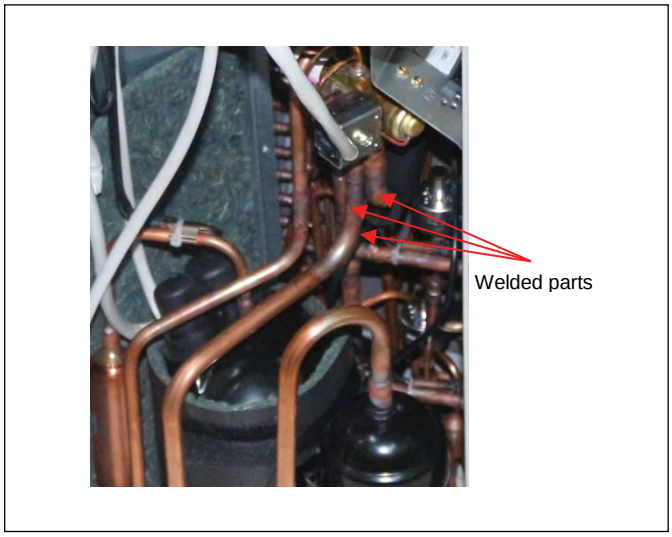



*Figure 126*

### 9.2.7 Removing the expansion valve

1. Follow steps outlined in Section 9.2.1 and evacuate the refrigerant from the unit.
2. Remove the coils and detach the welded parts of expansion valves & pipes.

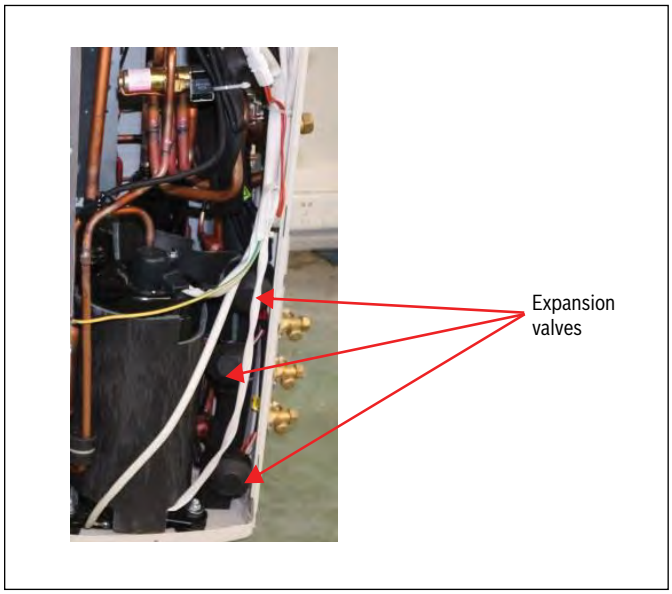



*Figure 127*

## 9.3 Outdoor Unit - BMS500-AAM036-1CSXRA

### 9.3.1 Removing the panel plate

1. Stop operation of the system and turn “OFF” the power at the disconnect.
2. Remove the big handle (4 screws).

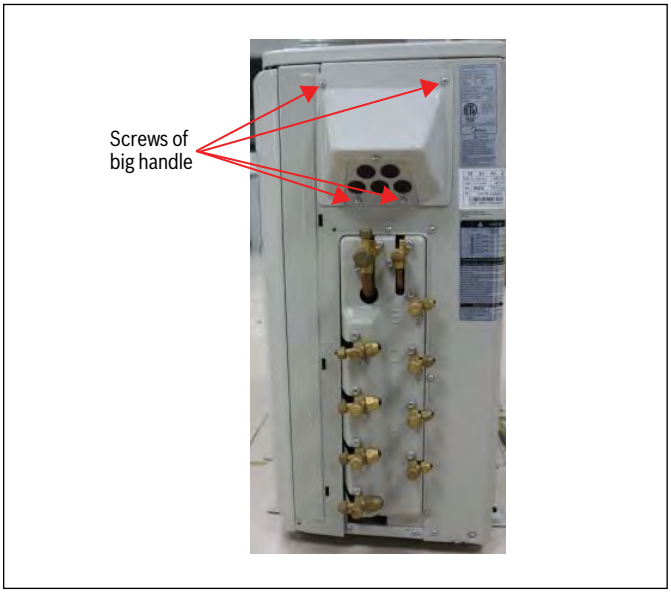



*Figure 128*

3. Remove the top cover (4 screws).

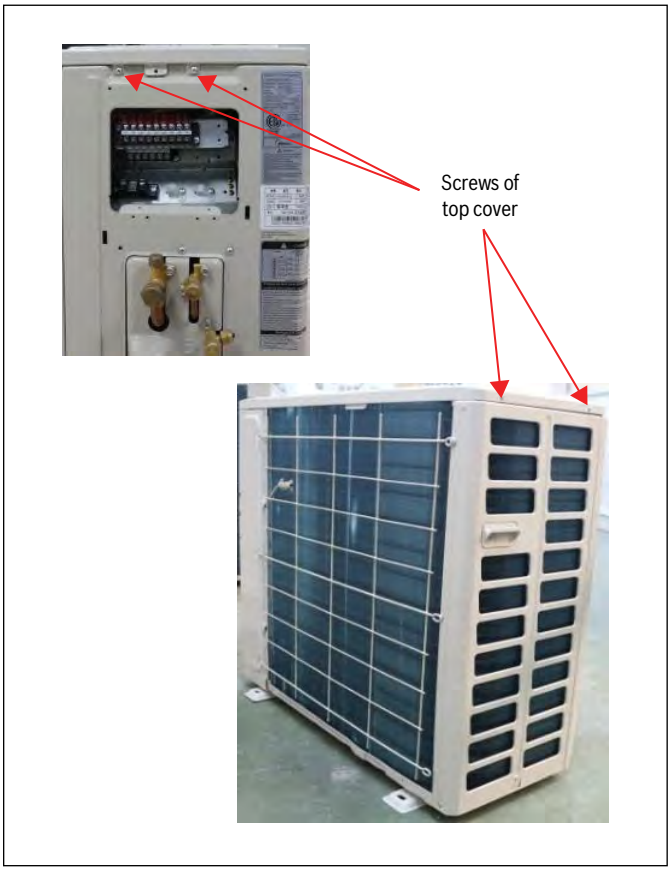



*Figure 129*

4. Remove the front right panel (1 screw).

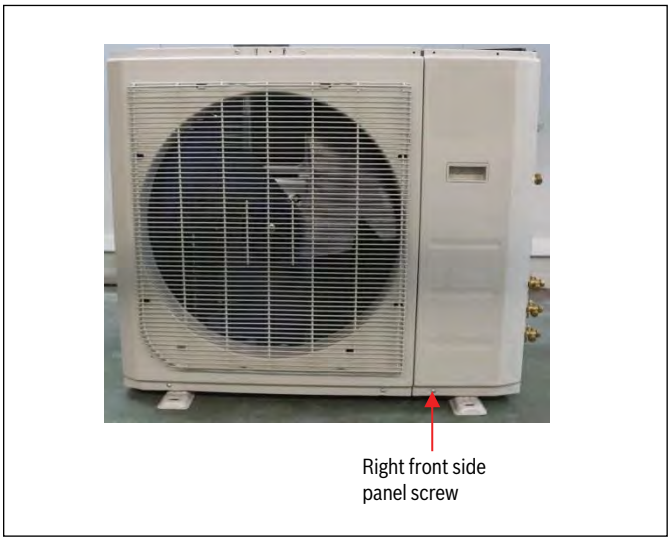



*Figure 130*

5. Remove front panel (8 screws).

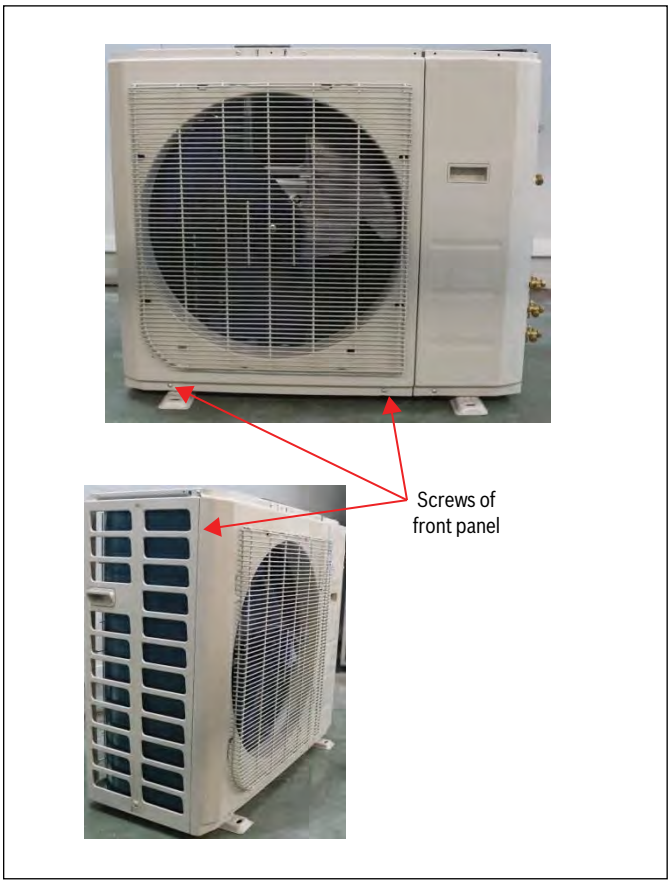



*Figure 131*

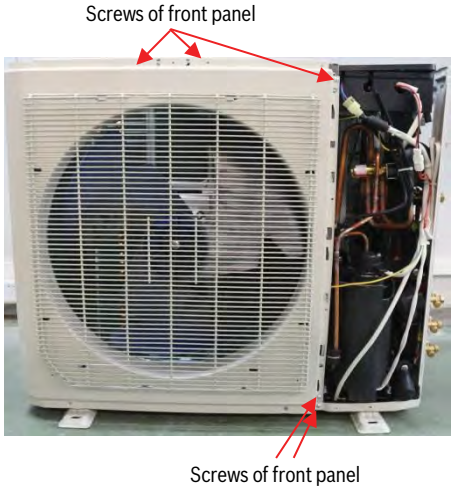



*Figure 132*

6. Remove terminal board and water collector cover.

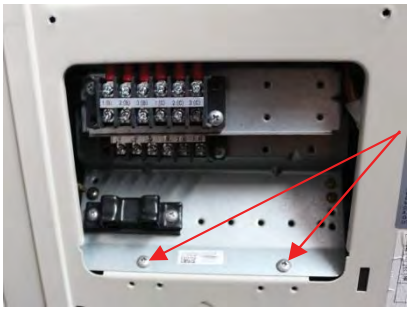



*Figure 133*

7. Remove right and rear panel (16 screws).

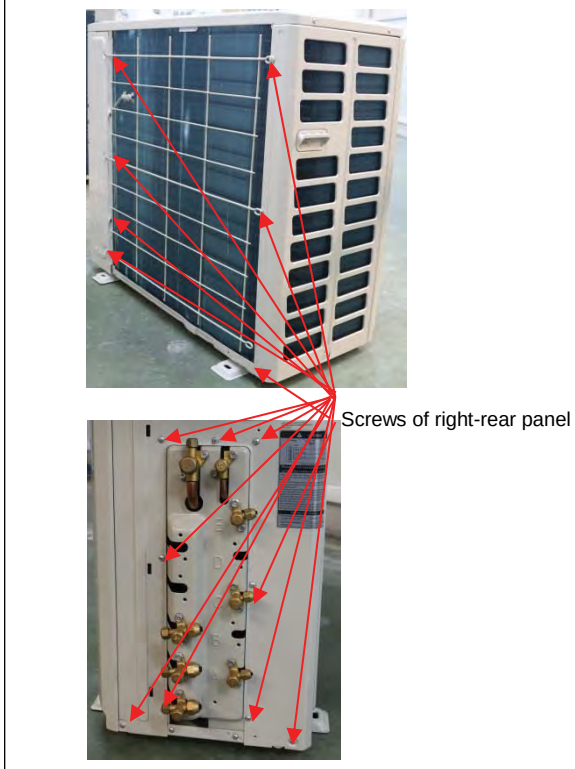



*Figure 134*

### 9.3.2 Removing the fan assembly

1. Follow steps outlined in Section 9.3.1.
2. Remove the nut fixing the fan and remove the fan.

*Figure 135*

3. Unfix the hooks and then open the electronic control box cover.

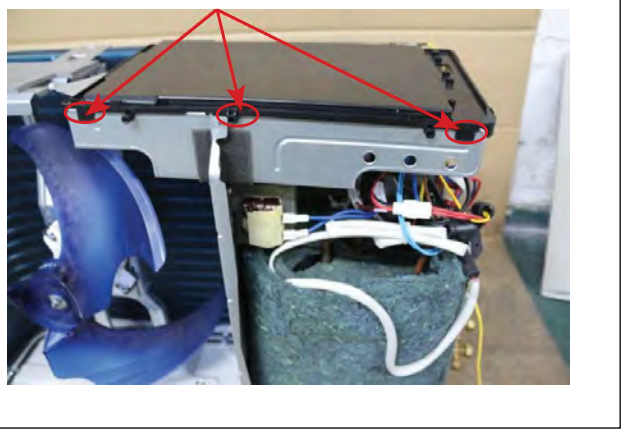


*Figure 136*

4. Disconnect the fan motor, connector CN19.

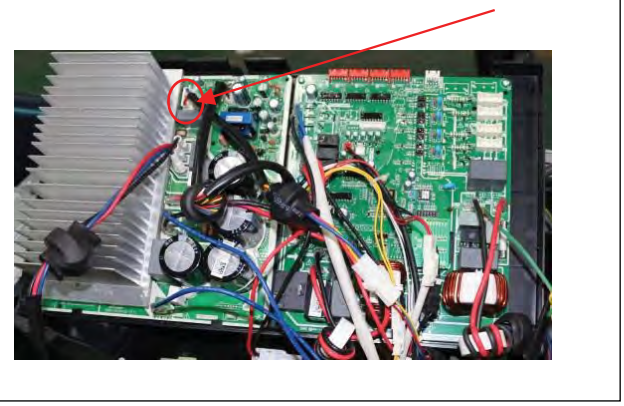


*Figure 137*

5. Remove the four fixing screws of the fan motor, then remove the motor.

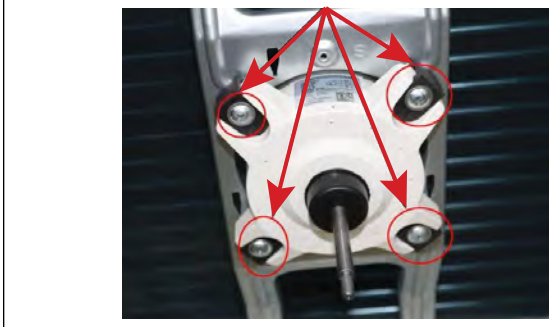


*Figure 138*

### 9.3.3 Removing the electrical parts

1. Follow steps outlined in Section 9.3.1.
2. Pull out connectors of reactor, compressor and PFC inductor.

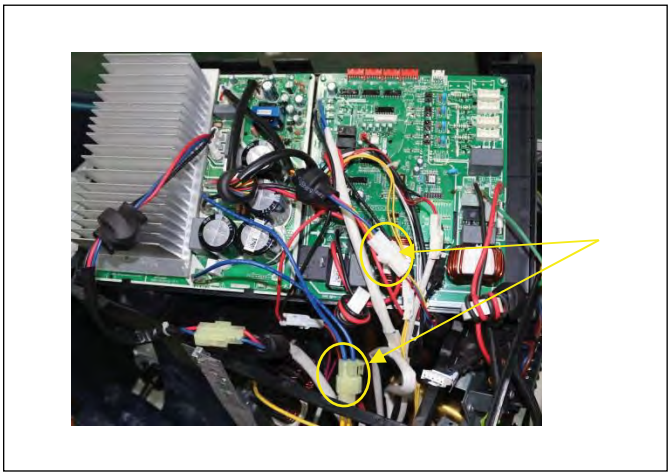


*Figure 139*

3. Disconnect CN53, CN54 and CN55 connectors from driver board and PCB.

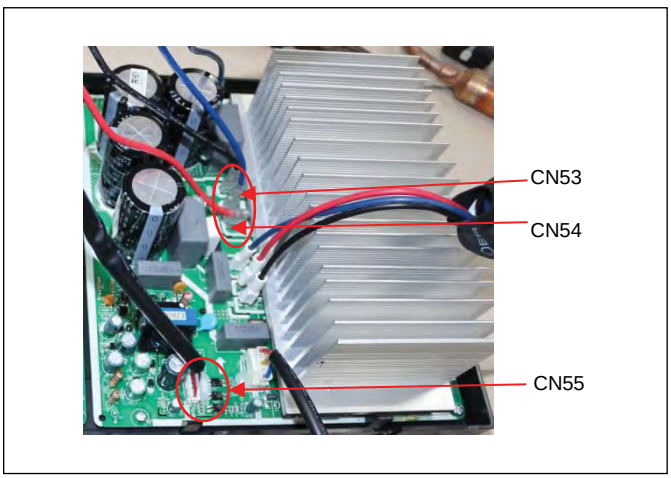



*Figure 140*

4. Remove screw to take out the driver board.
5. Disconnect the connectors and wires connected from PCB and other parts.

**Connectors:**

- CN8: T3/T4 temperature sensor (2p/2p, white)
- CN33: Discharge temperature sensor (2p, white)
- CN13: T2B-A, B, C, D temperature sensor (2p/2p/2p/2p, white)
- CN18/CN17/CN21/CN20: Electronic expansion valve A, B, C, D (6p/6p/6p, red/red/red)
- CN30/CN29/CN28/CN27: S-A, S-B, S-C, S-D (3p/3p/3p/3p, white)
- CN9: High and low pressure switch (2p/2p, white)

**Wires:**

- CN3/CN22: 4-way valve (blue-blue)
- CN4/CN40: Crankcase heating cable (black-red)
- CN10/CN44: Crankcase heating cable (black-red)
- CN1: L1-IN (red)
- CN2: L2-IN (black)

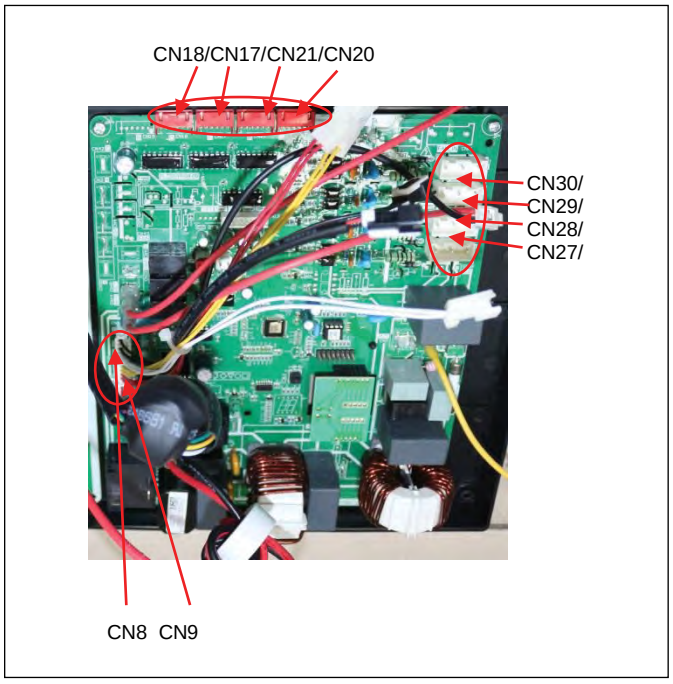



*Figure 141*

6. Remove the right rear panel and disconnect the ground wire (yellow-green).

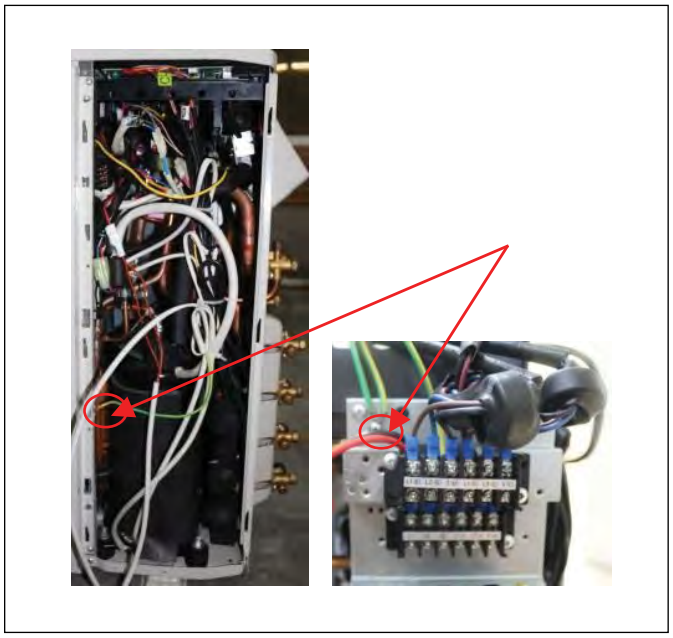


*Figure 142*

7. Remove PCB.

### 9.3.4 Removing the compressor

1. Follow steps outlined in Section 9.3.1.
2. Recover refrigerant from the refrigerant circuit and remove the electrical control box and partition plate.
3. Remove the sound insulation material and crankcase heating cable.
4. Remove terminal cover of compressor and disconnect wires.
5. Remove the discharge and suction pipes with a burner.

*Figure 143*

6. Remove the hex nuts and washers fixing the compressor on bottom plate.

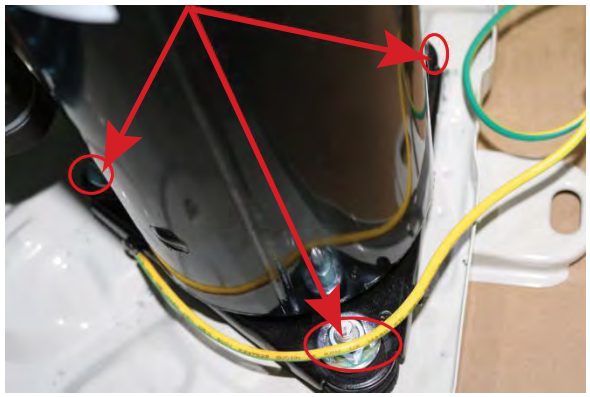


*Figure 144*

7. Lift the compressor from the base pan assembly.

### 9.3.5 Removing the 4-way valve

1. Follow steps outlined in Section 9.3.1.
2. Recover refrigerant from the refrigerant circuit.
3. Remove the coil (1 screw) and detach the welded parts of 4-way valve & pipe.

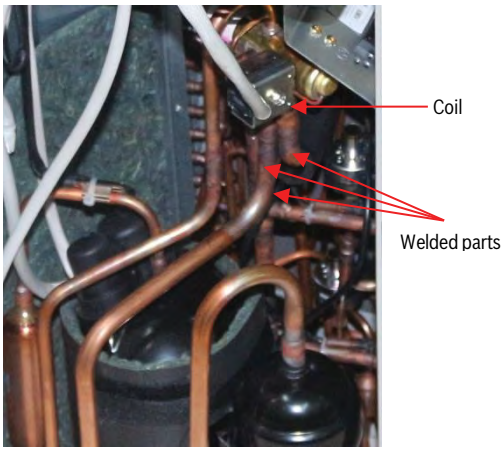



*Figure 145*

### 9.3.6 Removing the expansion valve

1. Follow steps outlined in Section 9.3.1.
2. Remove the coils.
3. Detach the welded parts of expansion valves and pipes.

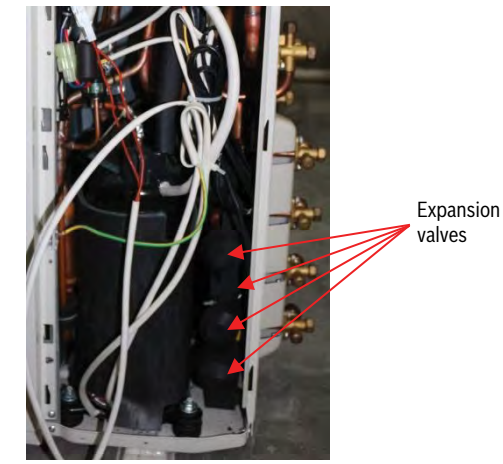



*Figure 146*

## 9.4 Outdoor Unit - BMS500-AAM048-1CSXRA, BMS500-AAM036-1CSXHB

### 9.4.1 Removing the fan assembly

1. Stop operation of the system and turn “OFF” the power at the disconnect.
2. Remove the air outlet grille (8 screws).

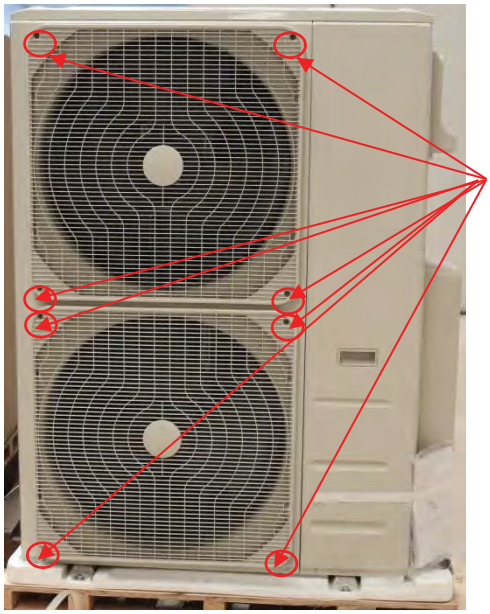


*Figure 147*

3. Remove the nut fixing the fan, and remove the fan.

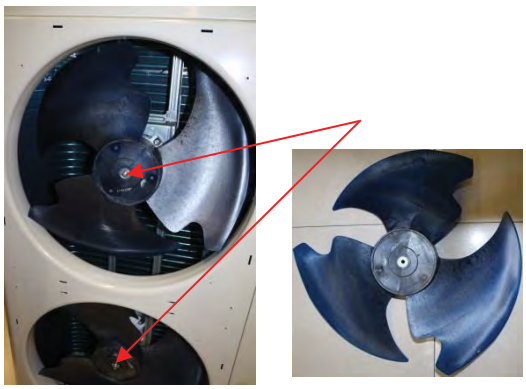


*Figure 148*

4. Remove the top cover (4 screws).

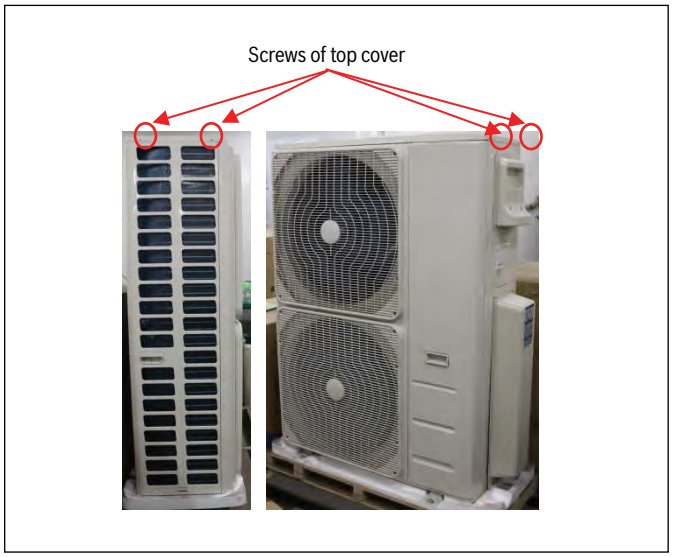



*Figure 149*

5. Remove the front side panel (1 screw).

*Figure 150*

6. Disconnect the fan motor connectors FAN1 (3p, white) and FAN2 (3p, white) from DC motor driver board.

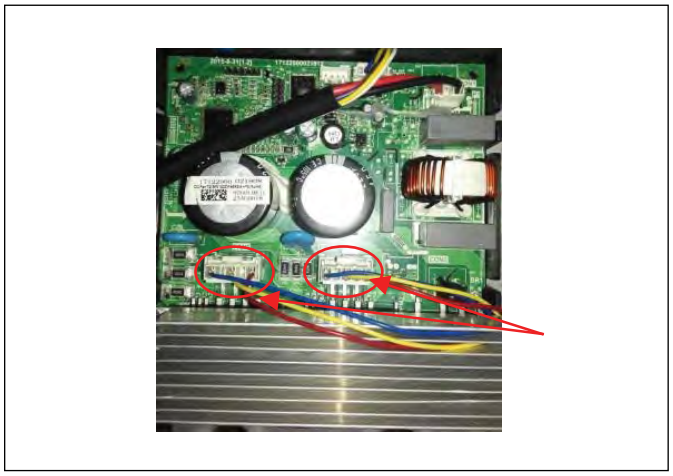


*Figure 151*

7. Remove the four fixing screws of the fan motor. Then remove the fan motor.

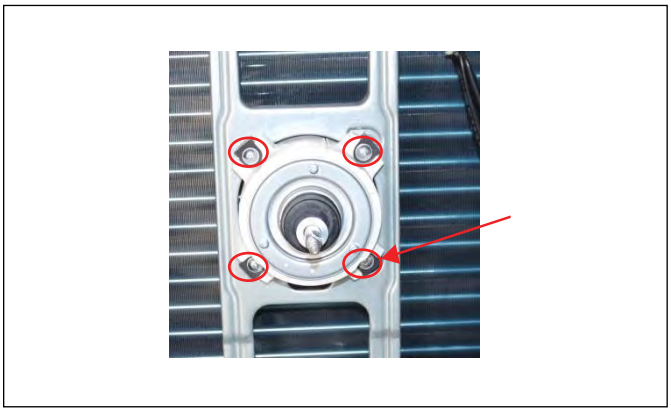


*Figure 152*

### 9.4.2 Removing the panel plate

1. Stop operation of the air conditioner and turn “OFF” the power breaker.
2. Remove the big handle and water collector (4 screws).

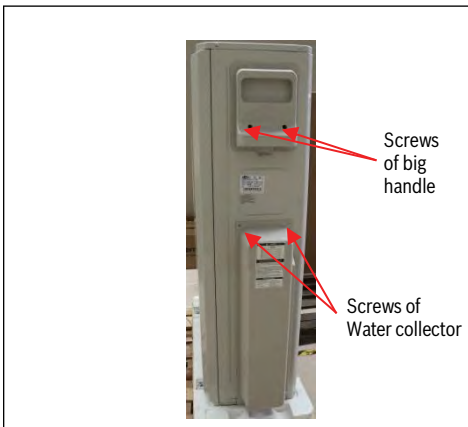



*Figure 153*

3. Remove side and rear panel (17 screws).

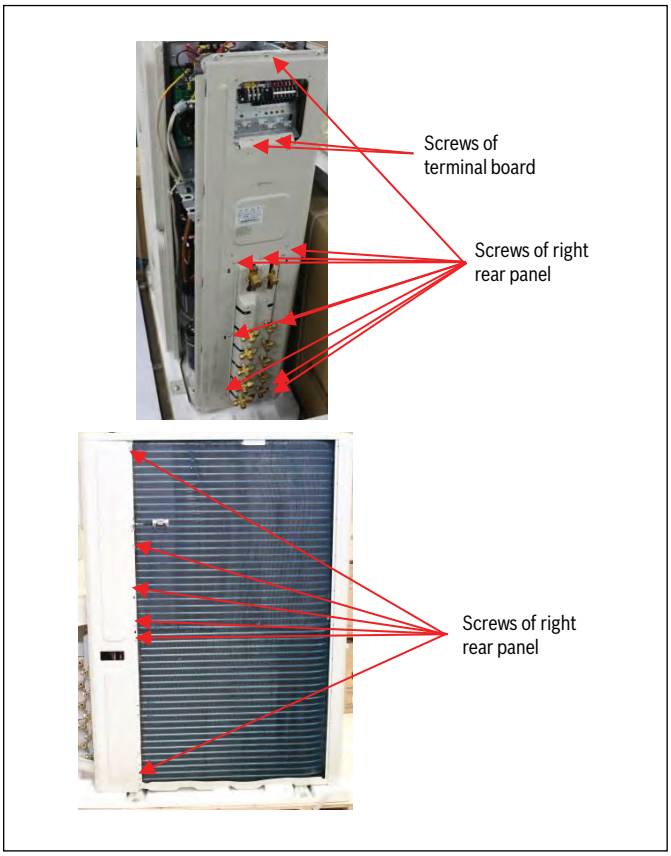



*Figure 154*

### 9.4.3 Removing the electrical parts

1. Follow steps outlined in Section 9.4.2.

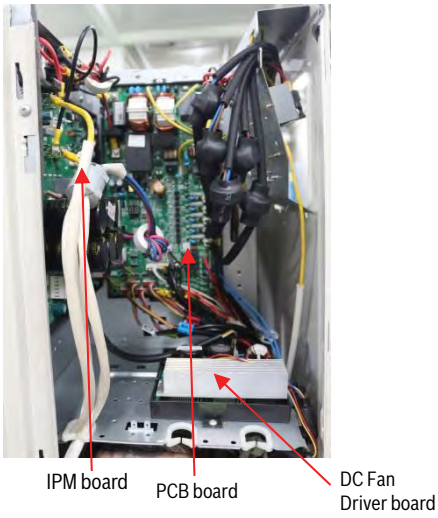



*Figure 155*

2. Disconnect the fan motor connector (5p, white) from the IPM board.

*Figure 156*

3. Disconnect following connection wires and connectors from the IPM board.
   - CN1, CN2, CN3, CN6, CN9 and U, V, W

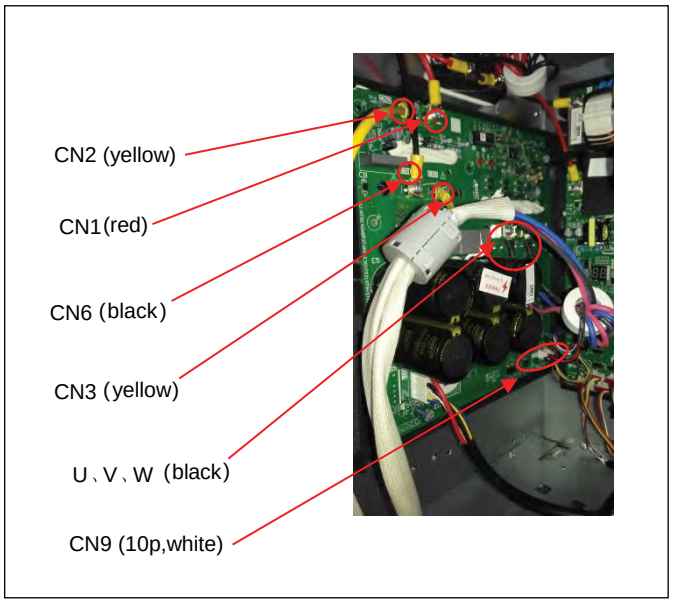



*Figure 157*

4. Remove the screws of the IPM board to remove it.
5. Disconnect the connectors and wires connected from the PCB.

**Connectors:**

- CN8: Discharge temperature sensor (2p, white)
- CN12: Heat sink temperature sensor (2p, red)
- CN9: T3/T4 temperature sensor (2p/2p, white)
- CN11: T2B-A, B, C, D, E temperature sensor (2p/2p/2p/2p/2p, white)
- CN15/CN23/CN26/CN30/CN33: Electronic expansion valve (6p/6p/6p/6p/6p, red)
- CN37/CN29/CN21/CN16/CN13: SA, S-B,S-C,S-D,S-E (3p/3p/3p/3p/3p, white)
- CN10: High and low pressure switch (2p/2p, white)

**Wires:**

- CN17/CN18: 4-way valve (blue-blue)
- CN19/CN20: Connected to crankcase
- heating cable (black-red)
- CN24/CN25: Electric heater of
- chassis (orange-orange)
- CN1: L-IN (red)
- CN3: N-IN (black)

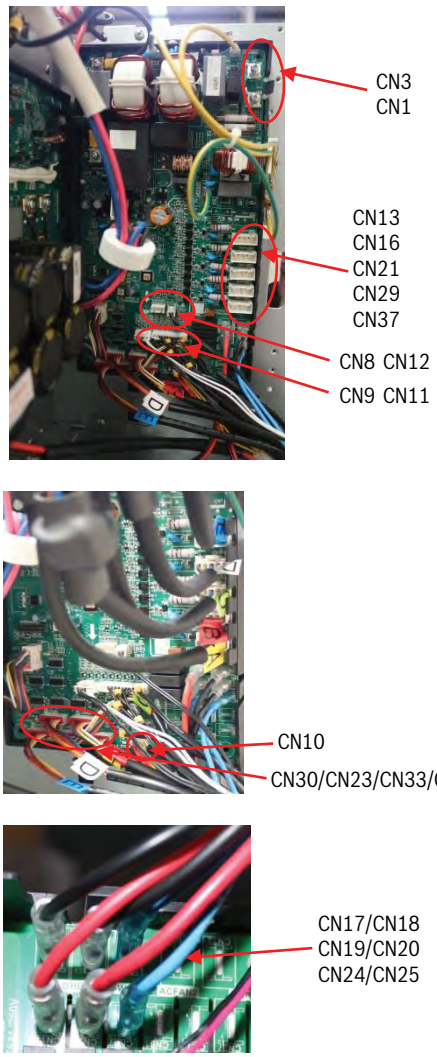



*Figure 158*

6. Disconnect the ground wire (yellow-green) after removing the big handle.

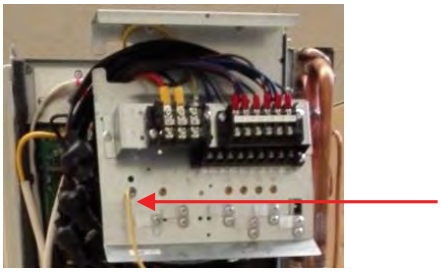


*Figure 159*

7. Remove PCB.

*Figure 160*

### 9.4.4 Removing the compressor

1. Follow steps outlined in Section 9.4.2.
2. Recover refrigerant from the refrigerant circuit.
3. Remove the sound insulation material and crankcase heating cable.
4. Remove terminal cover of compressor, and disconnect wires of crankcase electric heater and compressor from the terminal.
5. Remove the discharge pipe and suction pipe with a burner.

*Figure 161*

6. Remove the hex nuts and washers fixing the compressor on bottom plate.

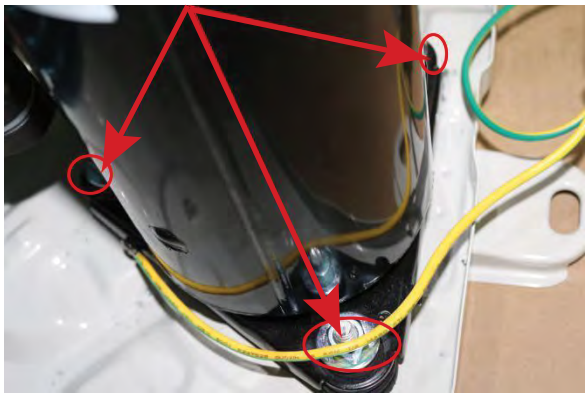


*Figure 162*

7. Lift the compressor from the base pan assembly.

### 9.4.5 Removing the 4-way valve

1. Follow steps outlined in Section 9.4.2.
2. Recover refrigerant from the refrigerant circuit.
3. Remove the coil (1 screw) and detach the welded parts of 4-way valve & pipe.

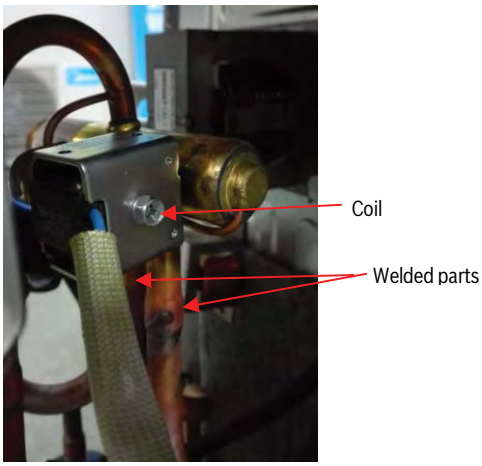



*Figure 163*

### 9.4.6 Removing the expansion valve

1. Follow steps outlined in Section 9.4.2.
2. Remove the coil.
3. Detach the welded parts of expansion valves and pipes.

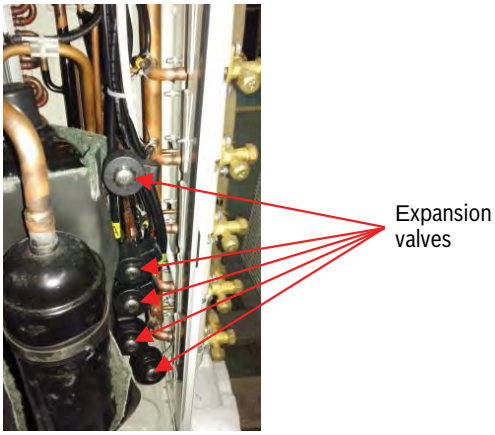



*Figure 164*

**Online Help Resources**

Alternatively, please visit our Service & Support webpage to find FAQs, videos, service bulletins, and more; bosch-homecomfort.us/service or use your cellphone to scan the code below.

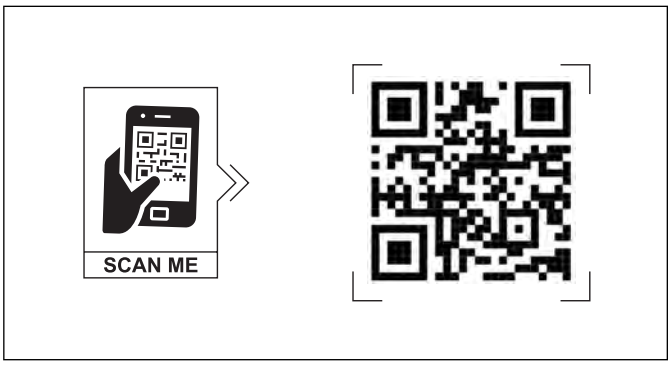



*Figure 165*

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