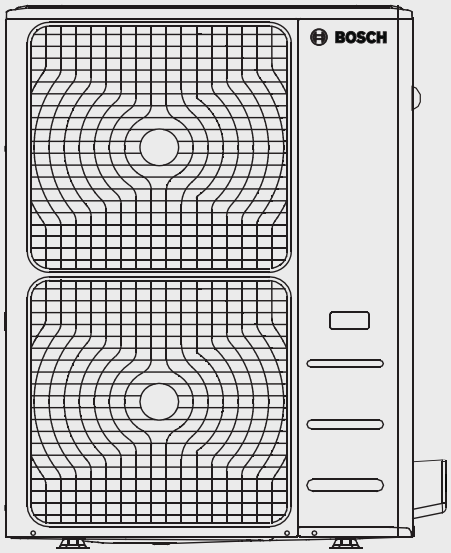

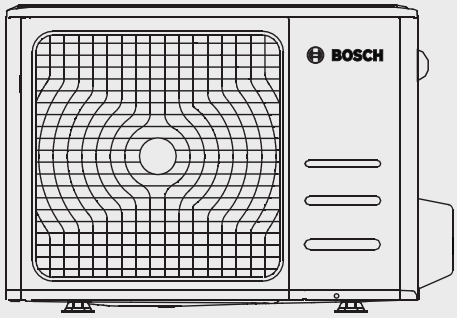

Bosch Ductless Air Conditioner / Heat Pump

Climate 5000 Series

Multi Zone Outdoor Units

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

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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	Hyper Heat 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

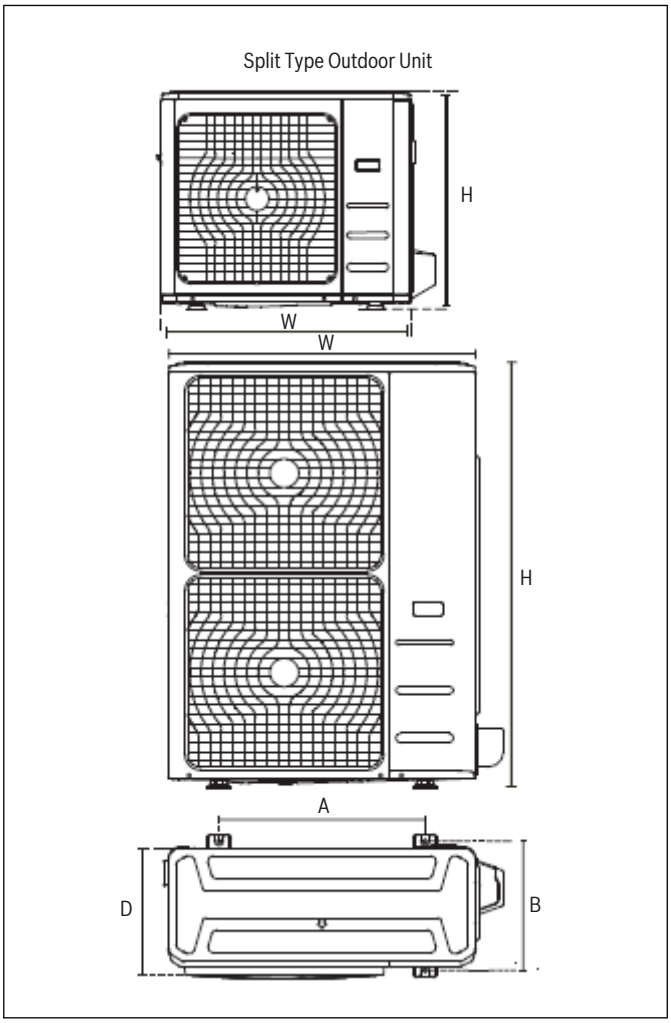


Figure 1

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

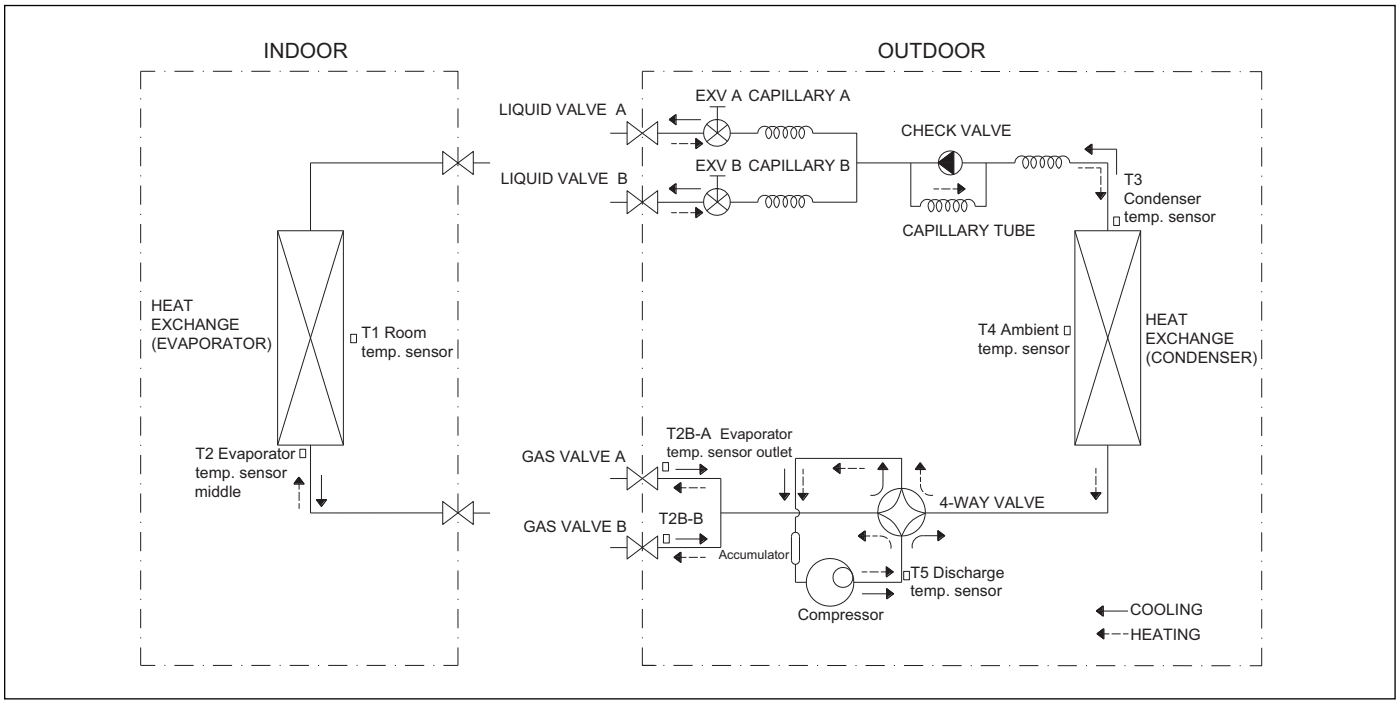


Figure 2

4.2 For Model: 18K Multi Zone Hyper Heat System BMS500-AAM018-1CSXHB

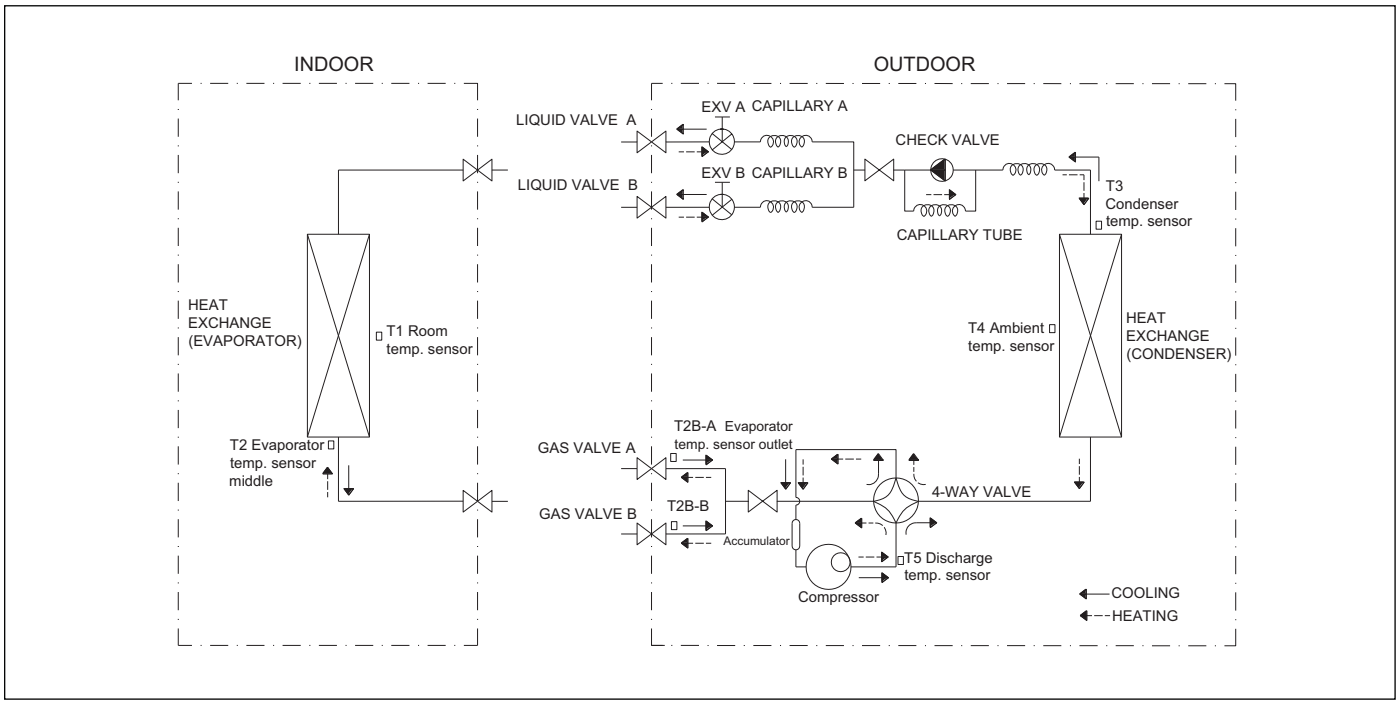


Figure 3

4.3 For Models: 27K Multi Zone Regular, 27K Multi Zone Hyper Heat System BMS500-AAM027-1CSXRA, BMS500-AAM027-1CSXHB

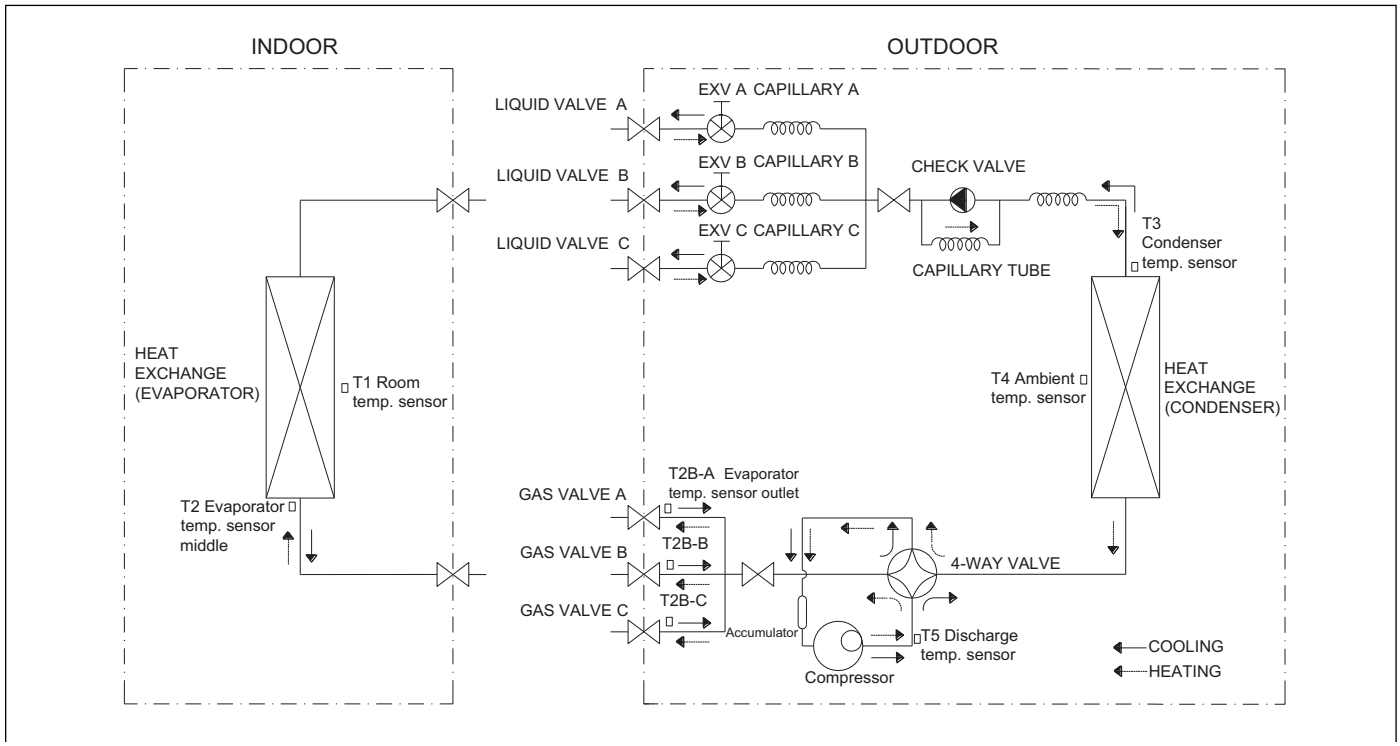


Figure 4

4.4 For Models: 36K Multi Zone Regular, 36K Multi Zone Hyper Heat System BMS500-AAM036-1CSXRA, BMS500-AAM036-1CSXHB

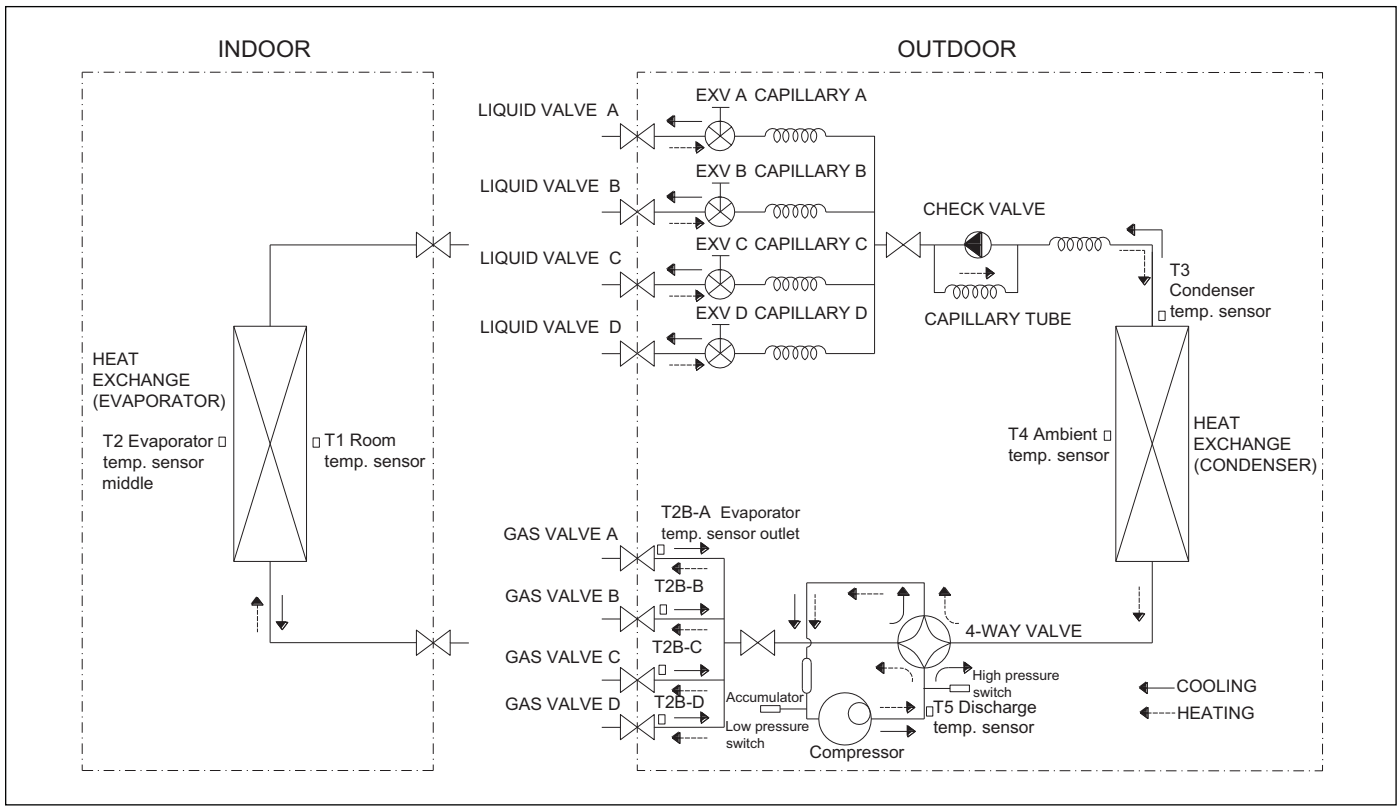


Figure 5

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

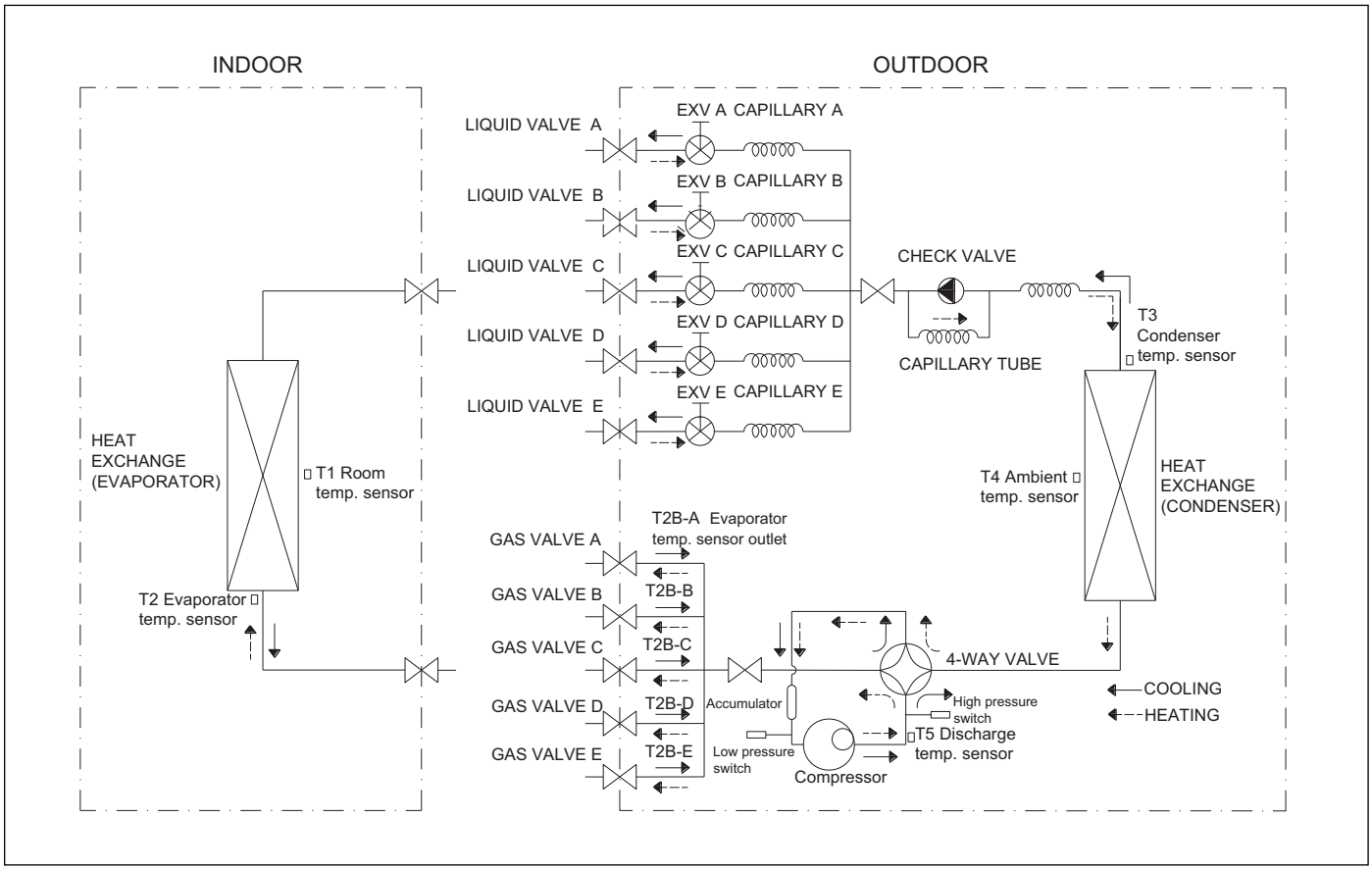


Figure 6

5 Wiring Diagram

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

6 Installation Details

6.1 Torque Requirements

Outer Diameter of Tube mm (in.)	Tightening Torque N•m (lb ft)	Max. Tightening Torque N•m (lb ft)
Ø 6.35 (Ø 0.25”)	1,500 (11lb • ft)	1,600 (11.8lb • ft)
Ø 9.52 (Ø 0.375”)	2,500 (18.4lb • ft)	2,600 (19.18lb • ft)
Ø 12.7 (Ø 0.5”)	3,500 (25.8lb • ft)	3,600 (26.55lb • ft)
Ø 15.9 (Ø 0.625”)	4,500 (33.19lb • ft)	4,700 (34.67lb • ft)

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

Hyper Heat 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

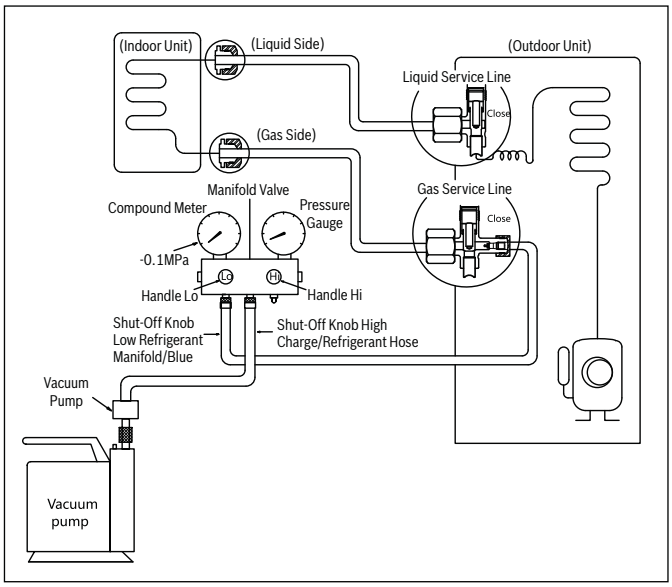


Figure 7

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

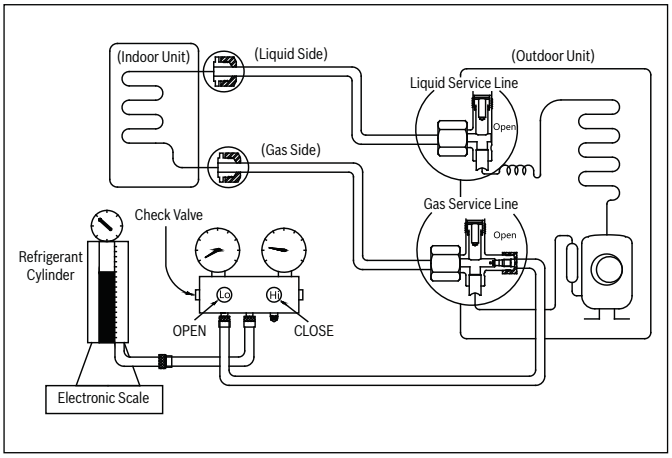


Figure 8

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

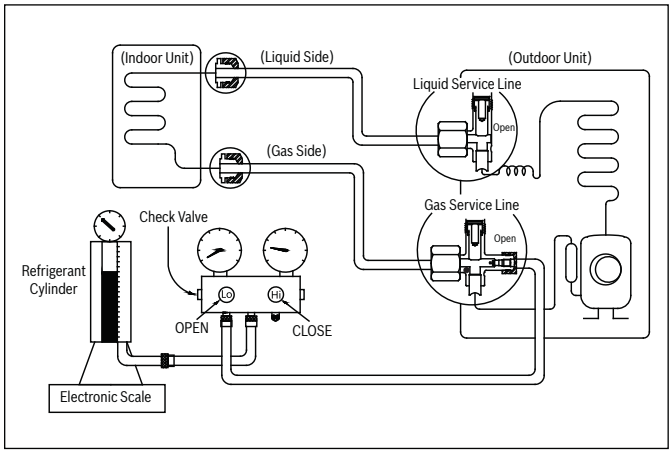


Figure 9

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.

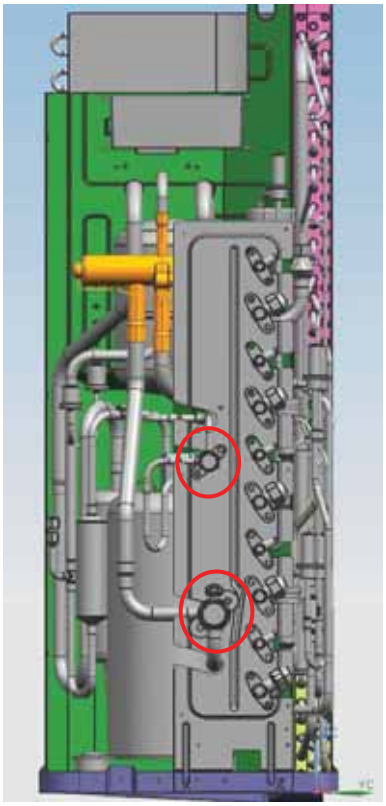


Figure 10

6.7 Operation Characteristics

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

Table 8

Equation to convert Celsius to Fahrenheit

$$(°F) = 1.8 \times (°C) + 32$$

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.

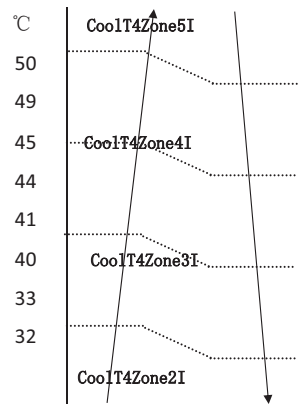
7.2.5 Low voltage protection

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.

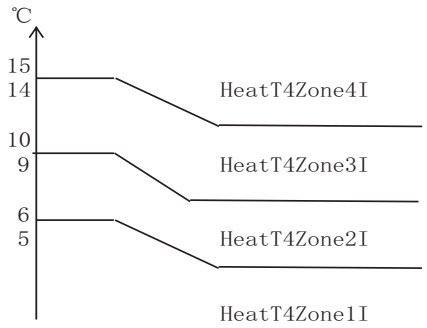
Cooling mode:



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

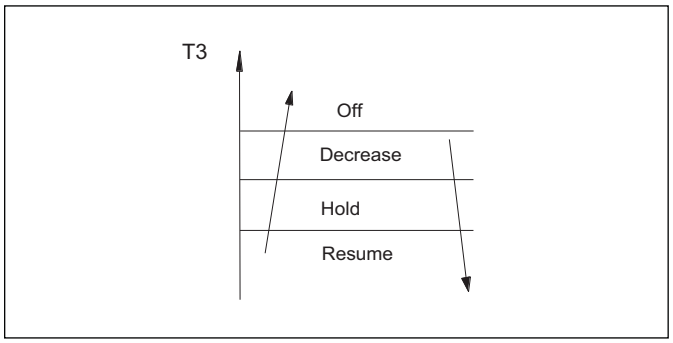


Figure 13

- 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

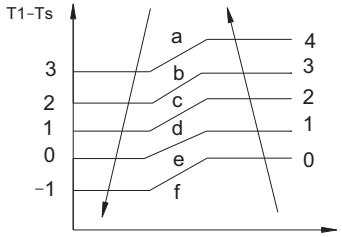
- When the compressor is off and T4 is lower than -35°C for 10 seconds, the unit stops and displays “LP.”
- When the compressor is on and T4 remains lower than -40°C for 10 seconds, the unit stops and displays “LP.”
- When T4 is higher than -32°C for 10 seconds, the unit exits protection.

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.

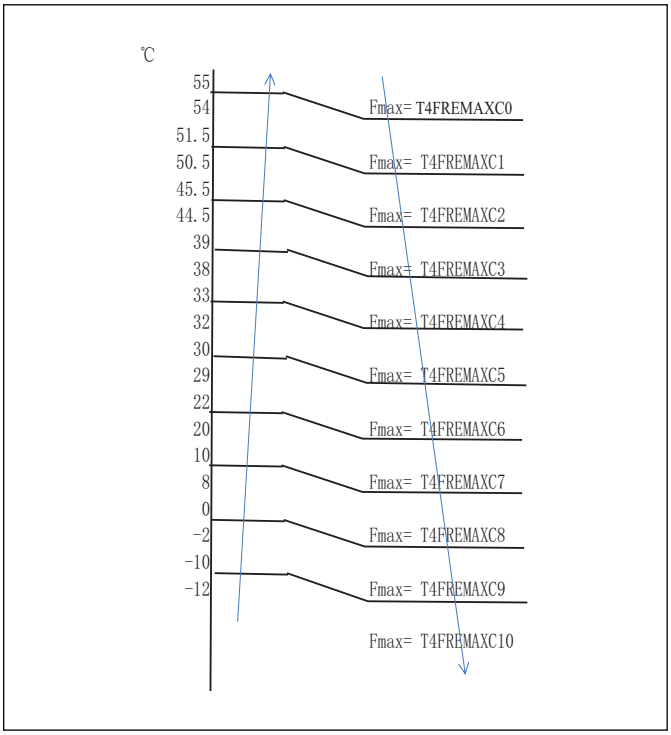
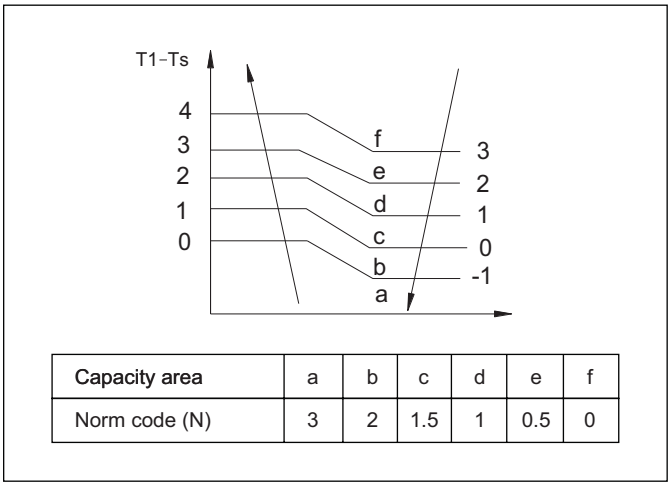


Figure 15

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):

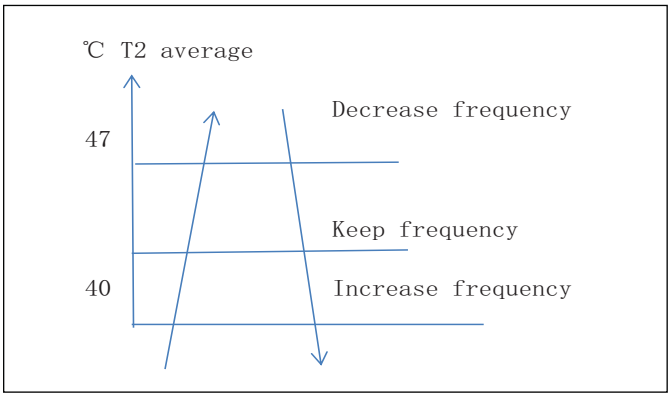


Figure 17

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.

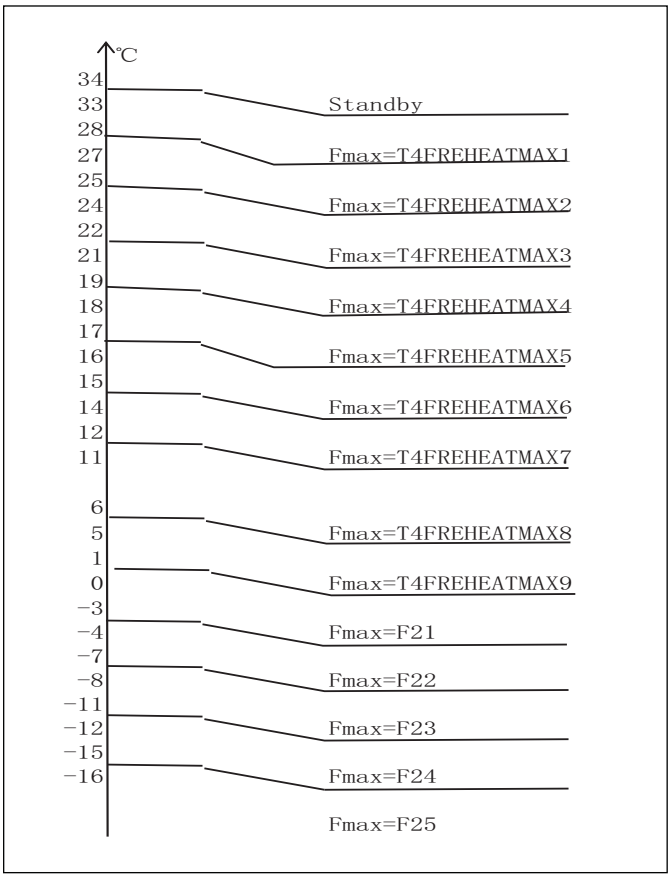


Figure 18

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°C for 3 minutes.
4. If the compressor cumulative running time reaches 120 minutes and T3 < -15°C.

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°C.
- T3 remains at TCDE2°C or above for 80 seconds.
- The machine runs for 10 consecutive minutes in defrost mode.

Defrosting Action:

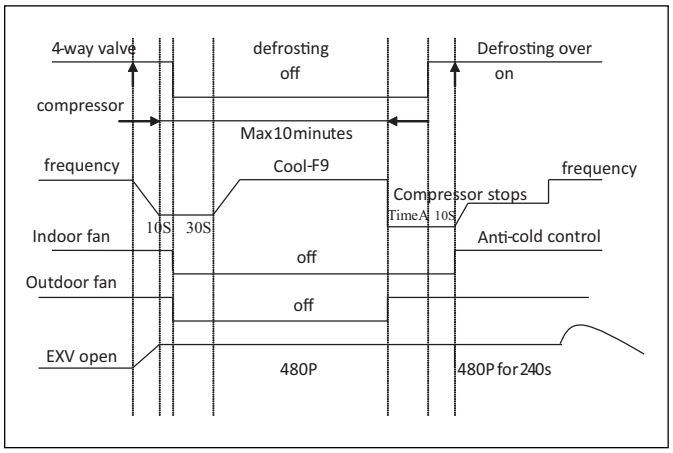


Figure 19

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 °C;.
- 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:

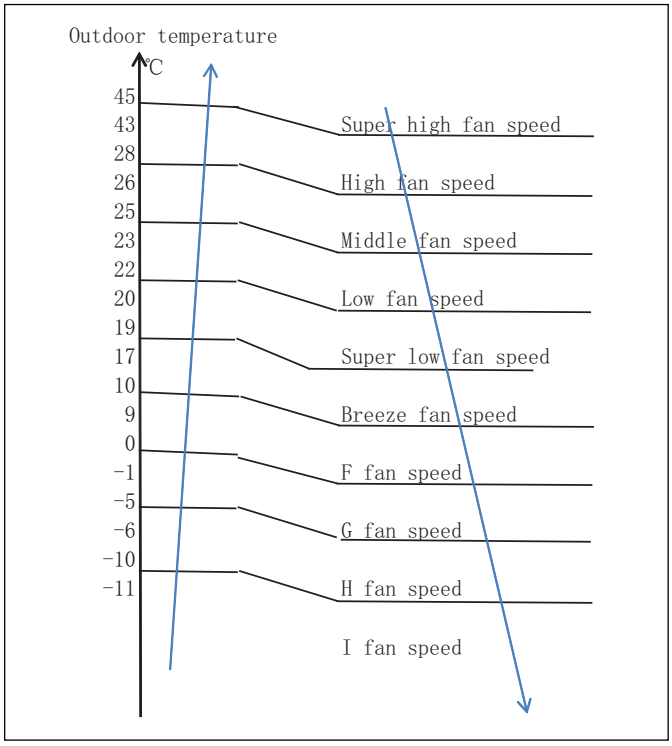


Figure 20

Low ambient cooling mode logic:

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

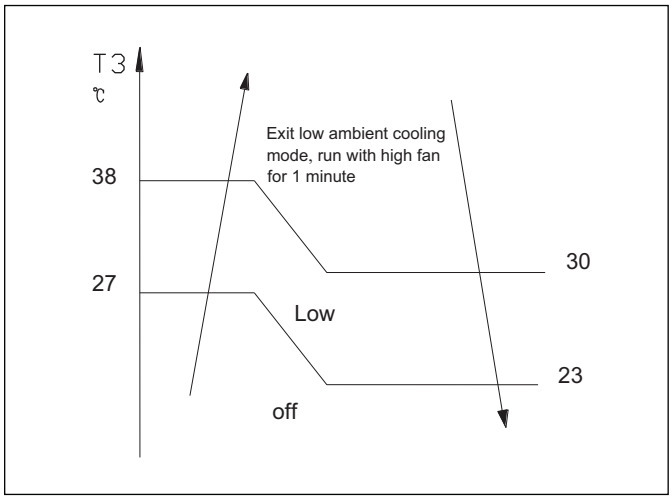


Figure 21

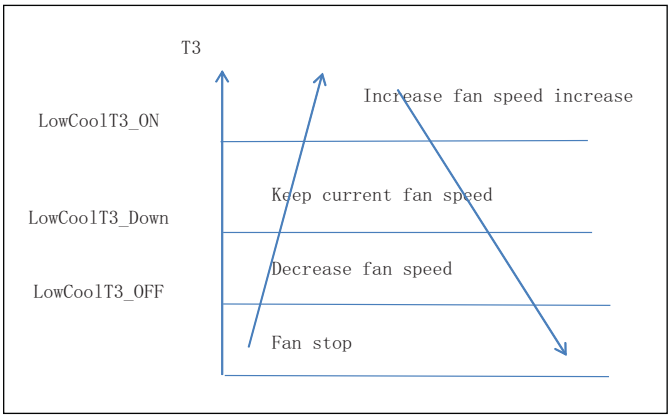


Figure 22

7.4.3.2 Heating Mode

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

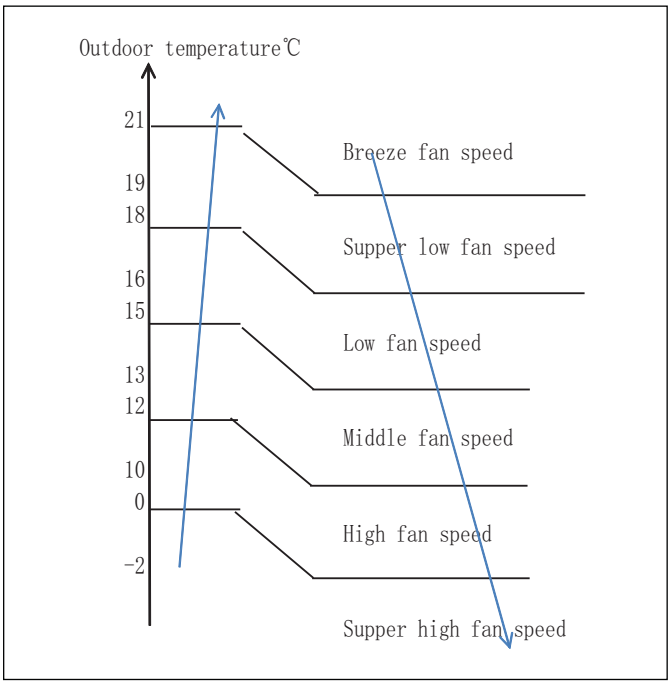


Figure 23

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. 2. All the temperature is °C no matter what kind of remote controller is used. 3. T1,T2,T3,T4,T2B display range:-25~70, TP display range:-20~130. 4. Frequency display range: 0~159HZ. 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.

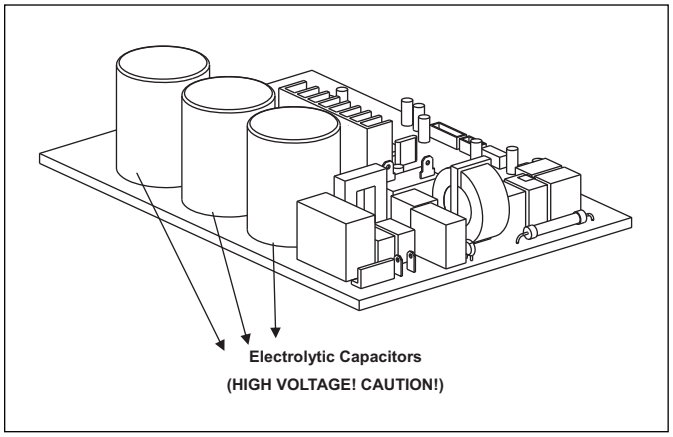


Figure 24

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 & Hyper Heat 18K

BMS500-AAM018-1CSXRA, BMS500-AAM027-1CSXRA, BMS500-AAM018-1CSXHB

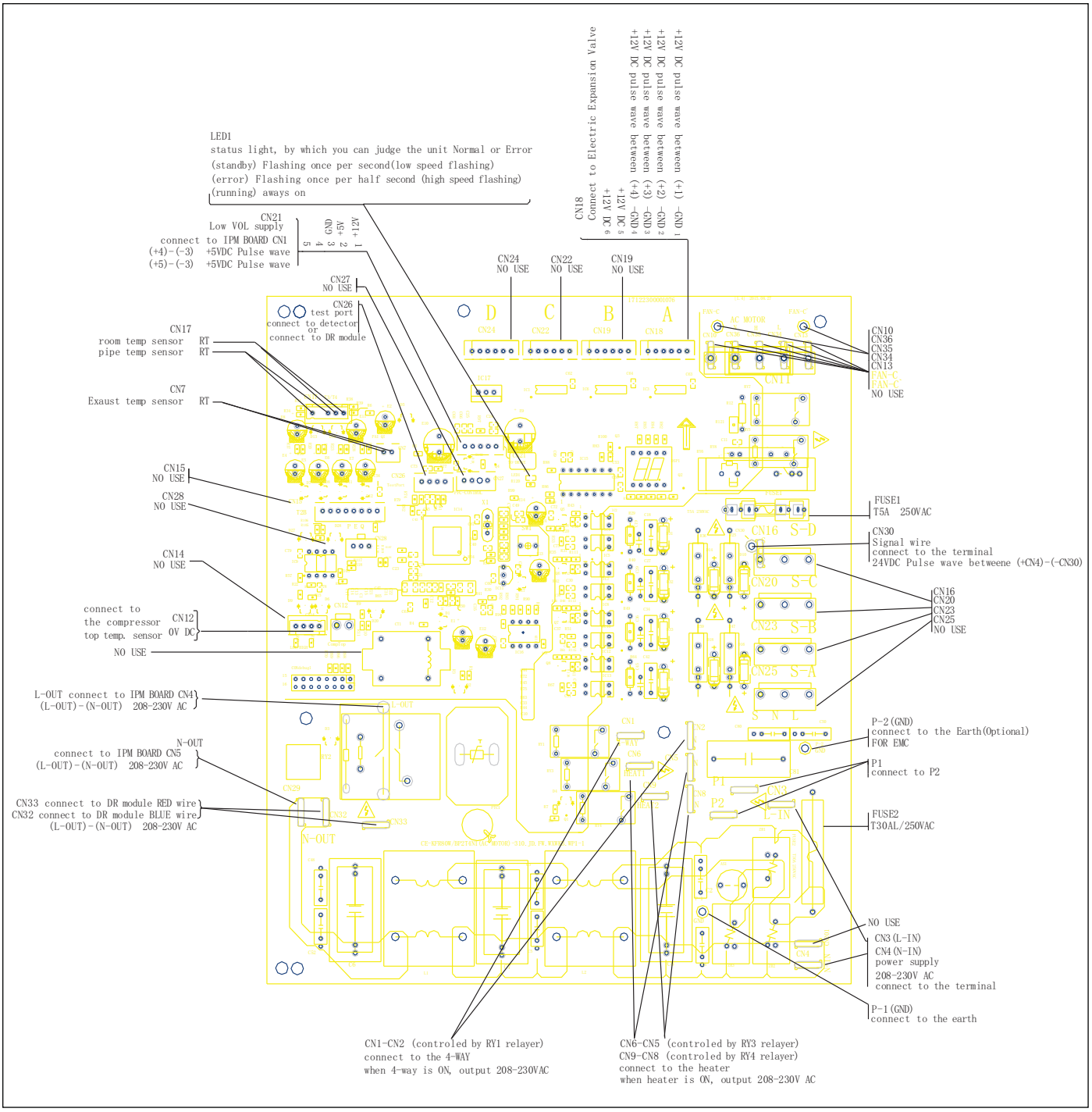


Figure 25

8.3.2 IPM: Multi Zone Regular 18K, 27K & Hyper Heat 18K

BMS500-AAM018-1CSXRA, BMS500-AAM027-1CSXRA, BMS500-AAM018-1CSXHB

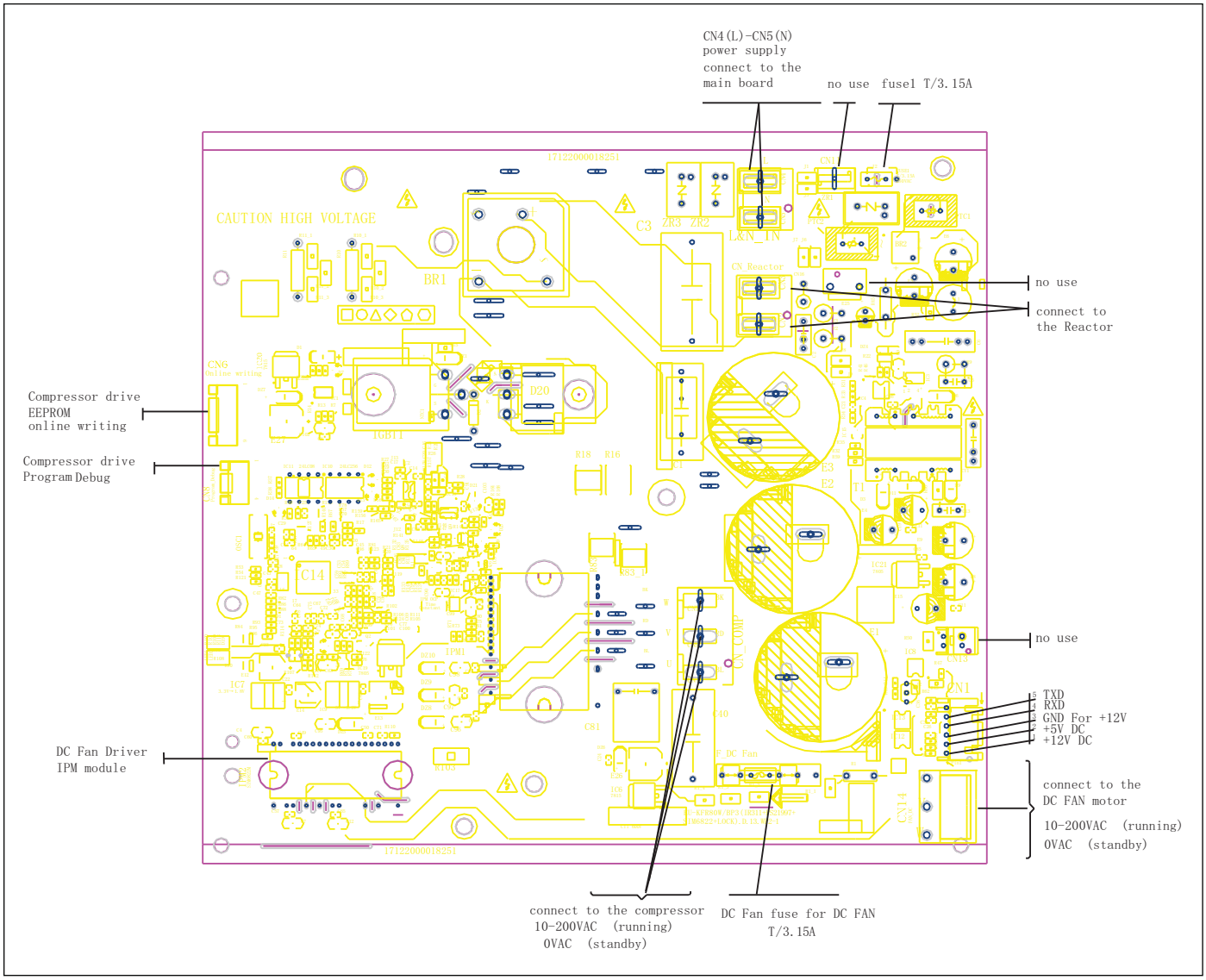


Figure 26

8.3.3 PCB: Multi Zone Regular 36K & Hyper Heat 27K

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

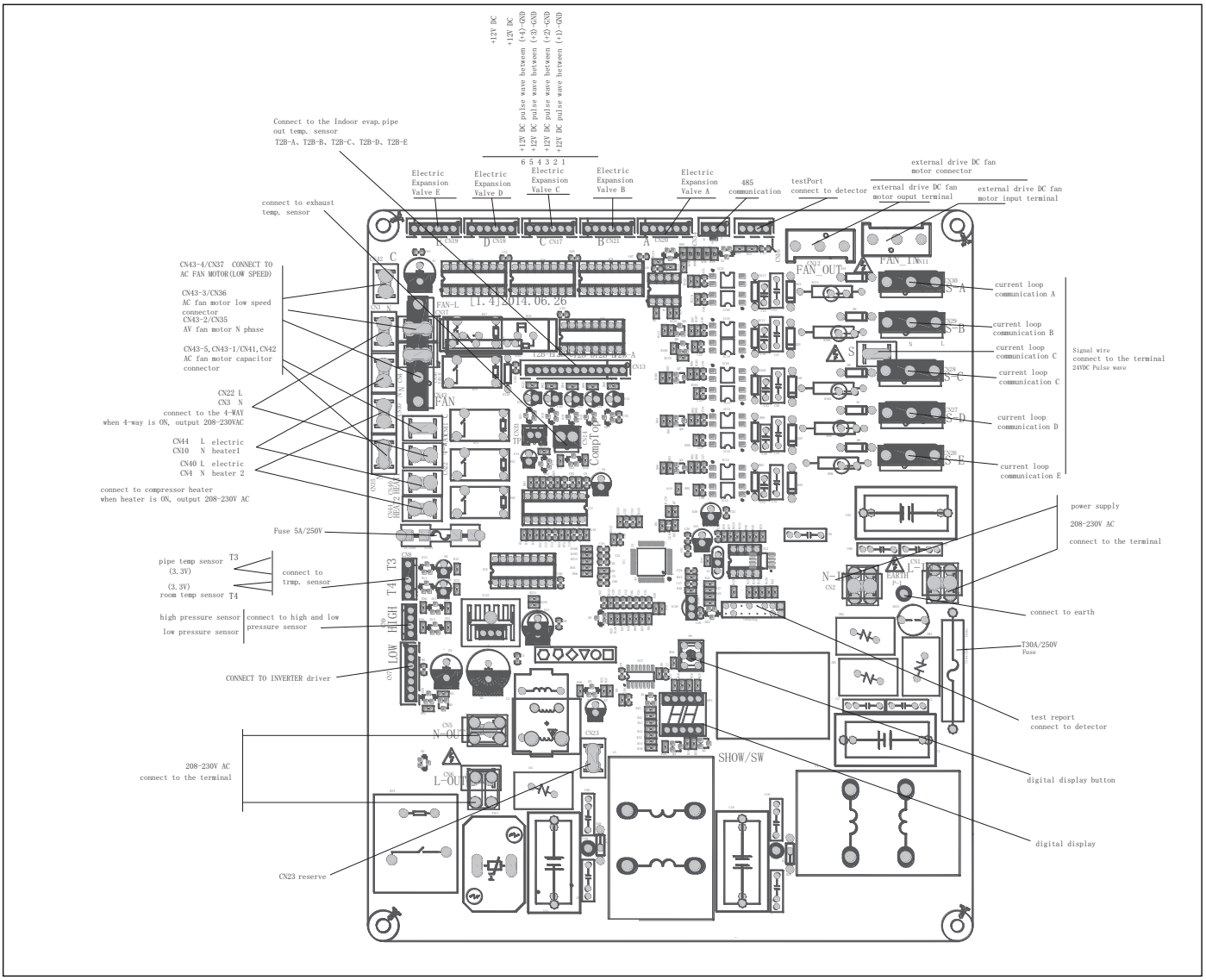


Figure 27

8.3.4 IPM: Multi Zone Regular 36K & Hyper Heat 27K
BMS500-AAM036-1CSXRA, BMS500-AAM027-1CSXH

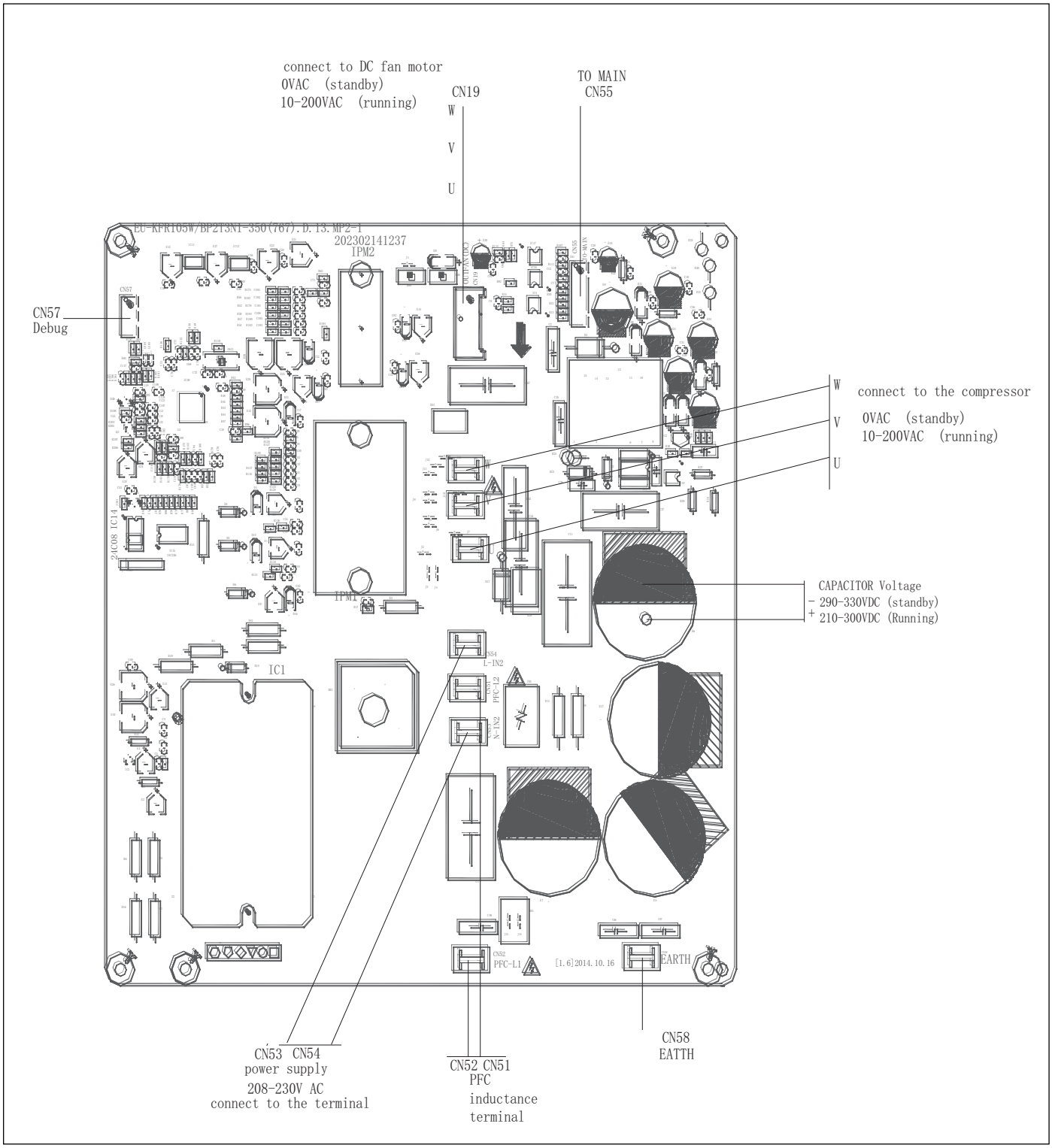


Figure 28

8.3.5 PCB: Multi Zone Regular 48K & Hyper Heat 36K
BMS500-AAM048-1CSXRA, BMS500-AAM036-1CSXHB

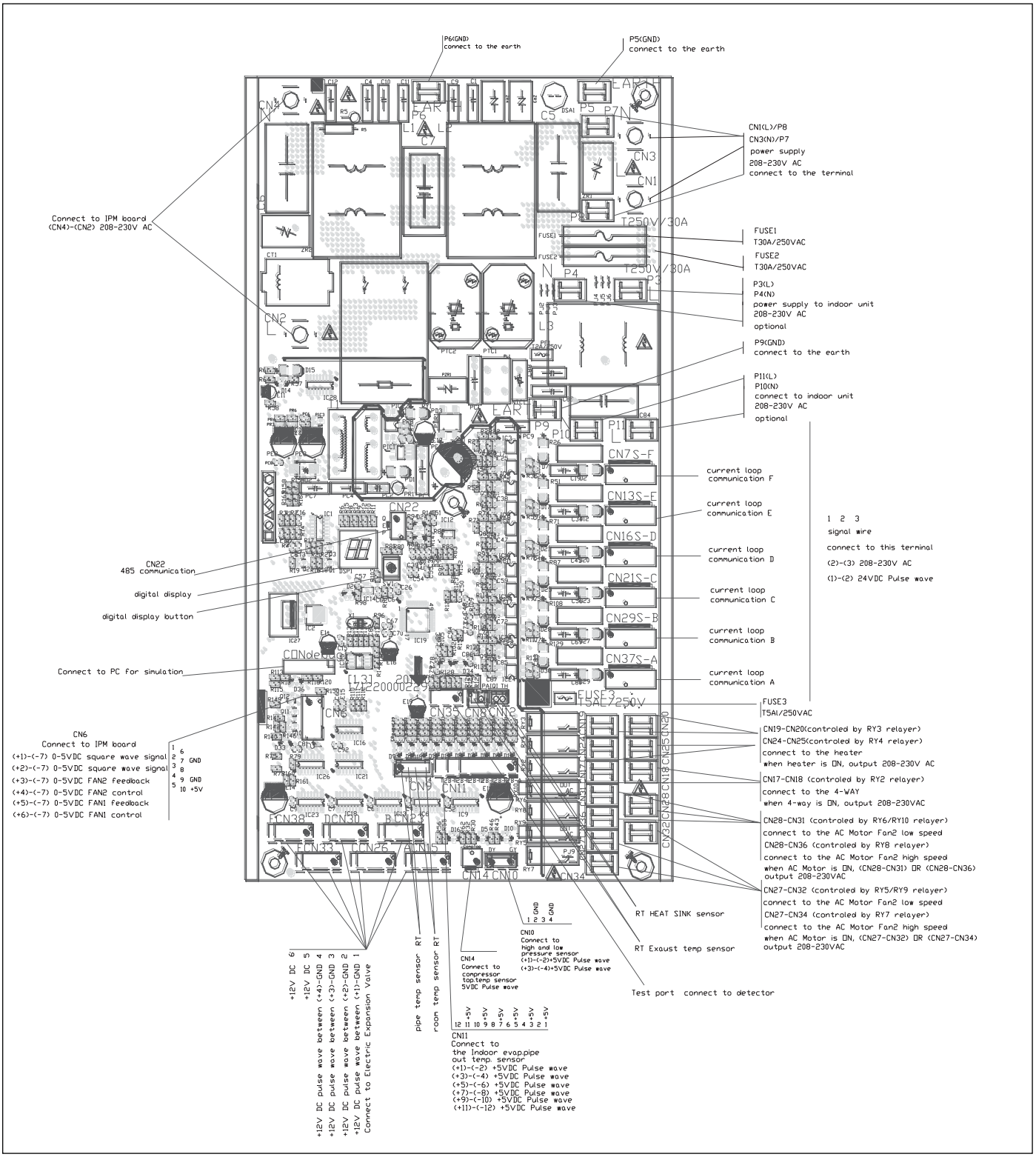


Figure 29

8.3.6 IPM: Multi Zone Regular 48K & Hyper Heat 36K
BMS500-AAM048-1CSXRA, BMS500-AAM036-1CSXHB

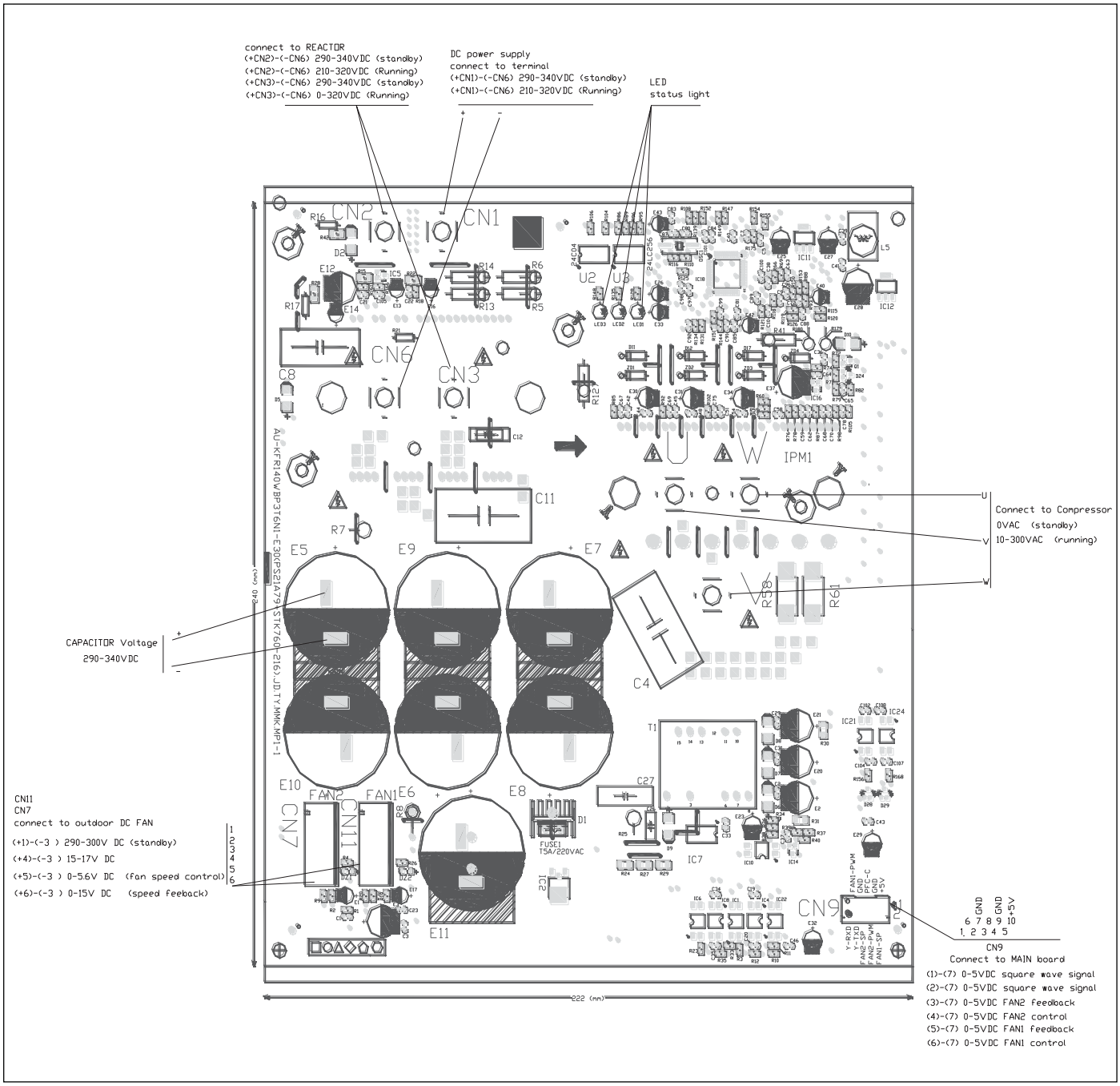


Figure 30

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.

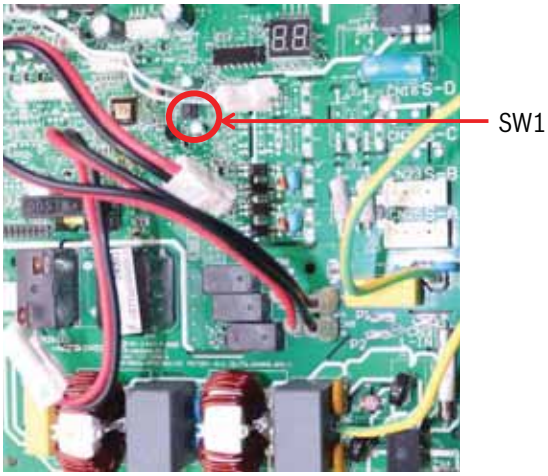


Figure 31

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 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 If the indoor unit is not connected, the digital display shows the following: "—" (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 (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_{2BA})	If the temperature is lower than -9 °C, the digital display shows "-9." If the temperature is higher than 70 °C, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
18	Indoor unit B evaporator outlet temperature (T_{2BB})	
19	Indoor unit C evaporator outlet temperature (T_{2BC})	
20	Indoor unit D evaporator outlet temperature (T_{2BD})	
21	Indoor unit E evaporator outlet temperature (T_{2BE})	

Table 17

Number of Presses	Display	Remark
22	Indoor unit A room temperature (T_1A)	If the temperature is lower than 0 °C, the digital display shows “0.” If the temperature is higher than 50 °C, the digital display shows “50.” 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 °C, the digital display shows “-9.” If the temperature is higher than 70 °C, the digital display shows “70.” 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 °C. If the temperature is lower than 30 °C, the digital display shows “30.” If the temperature is higher than 99 °C, the display will show a decimal point. For example, if the digital display shows “0.5”, the compressor discharge temperature is 105 °C.
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. If the value is higher than 99, the digital display will show a decimal point. For example, if the digital display shows “2.0”, 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 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 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.
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)

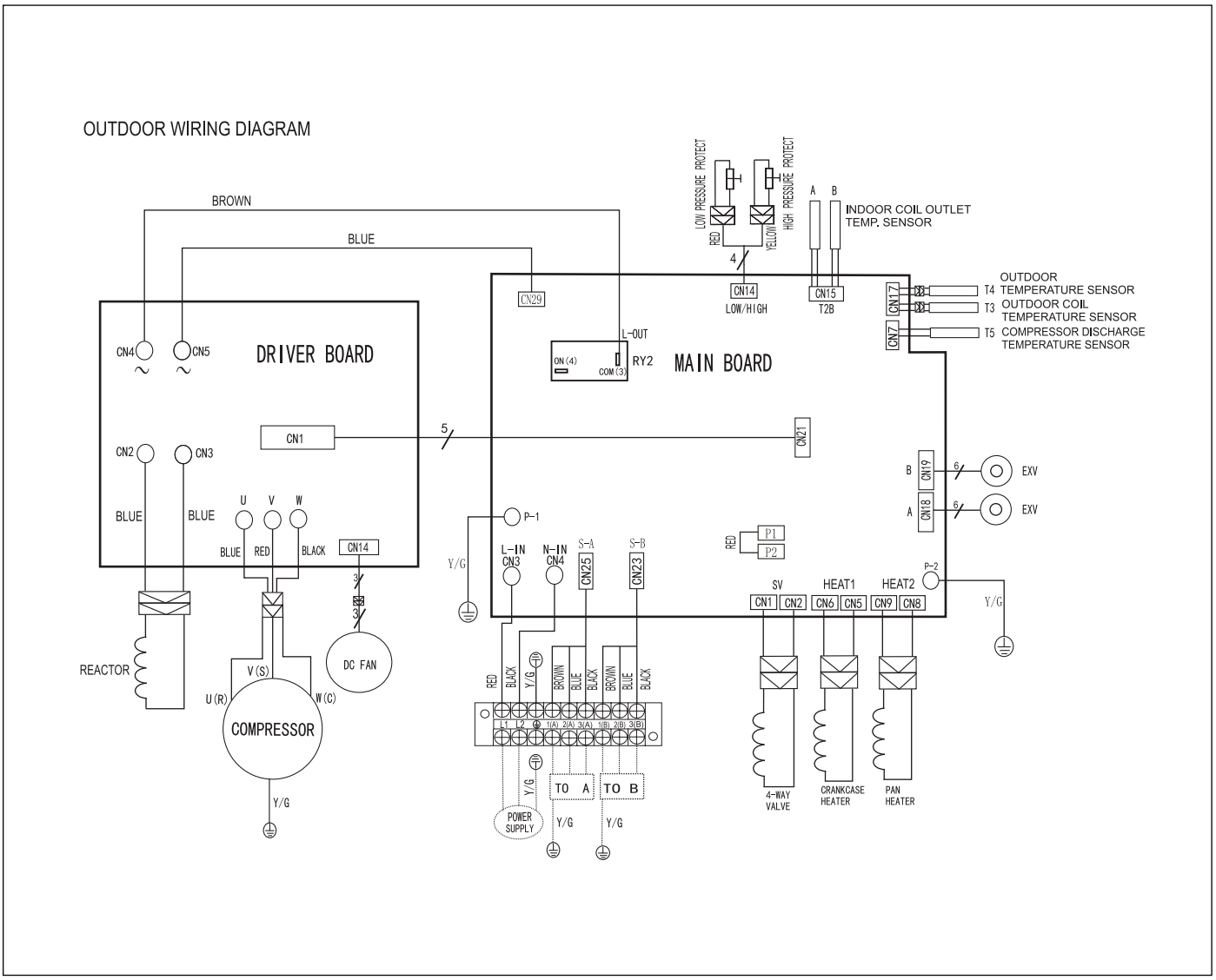


Figure 32

8.5.2 Regular Multi Zone (27K)

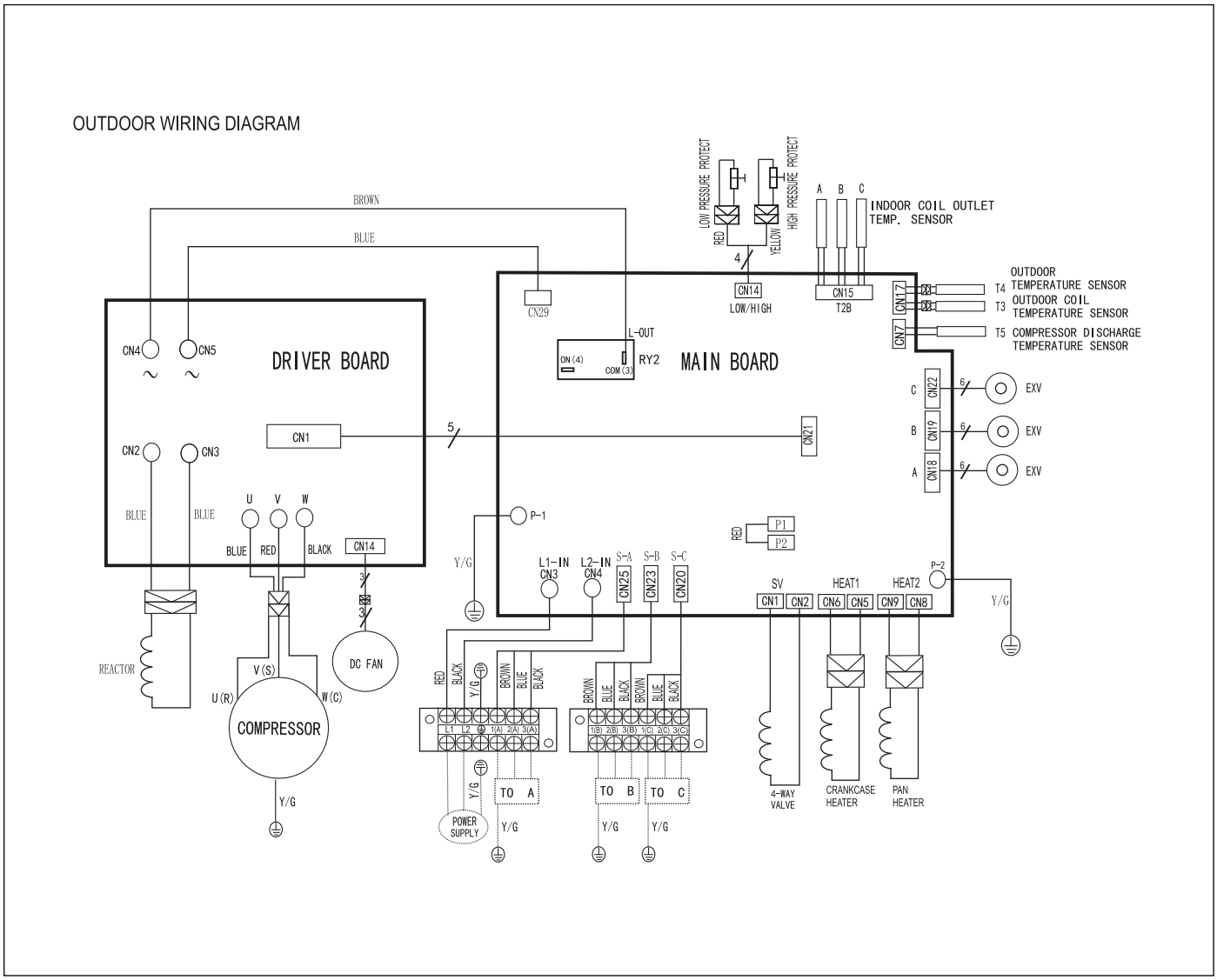
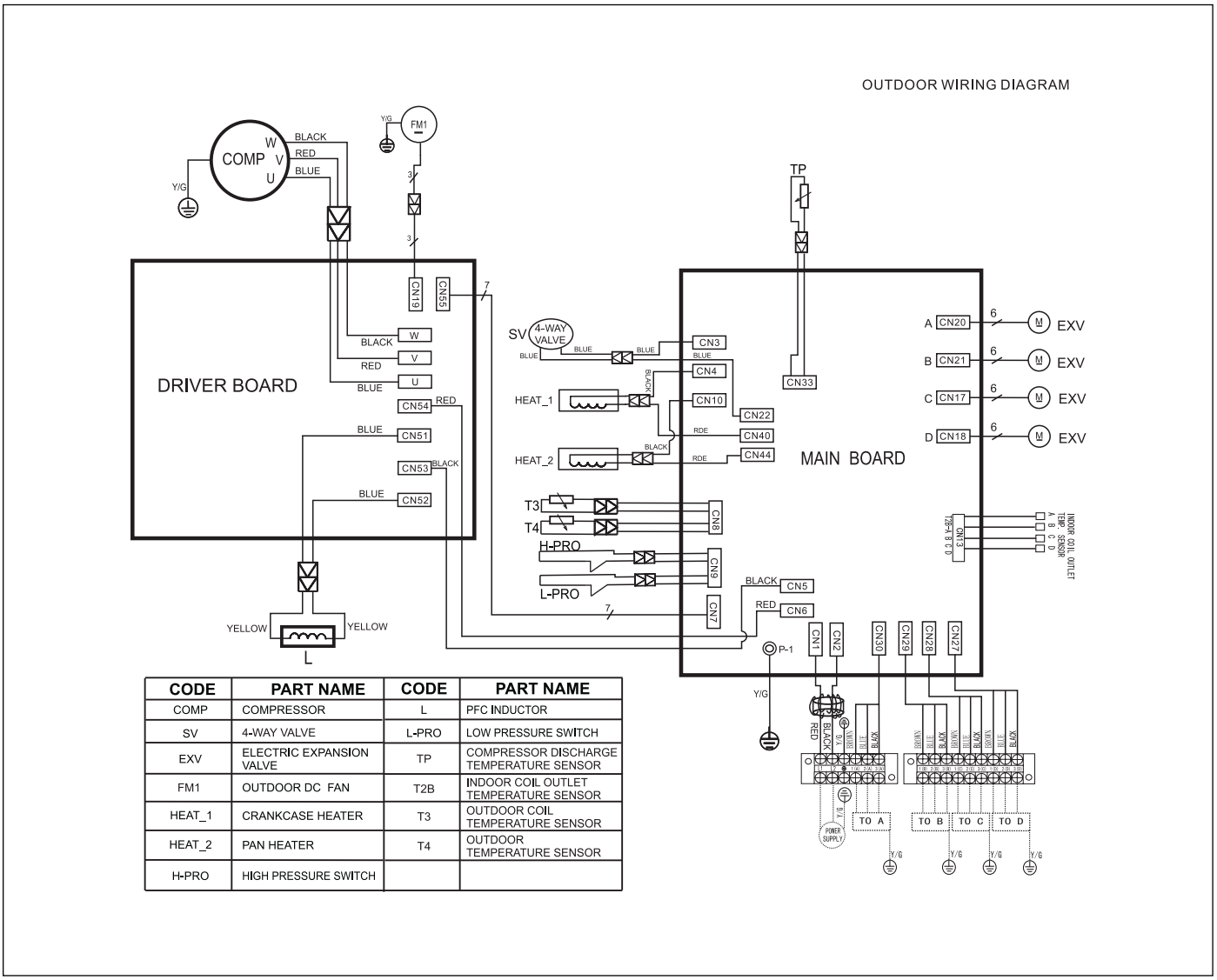


Figure 33

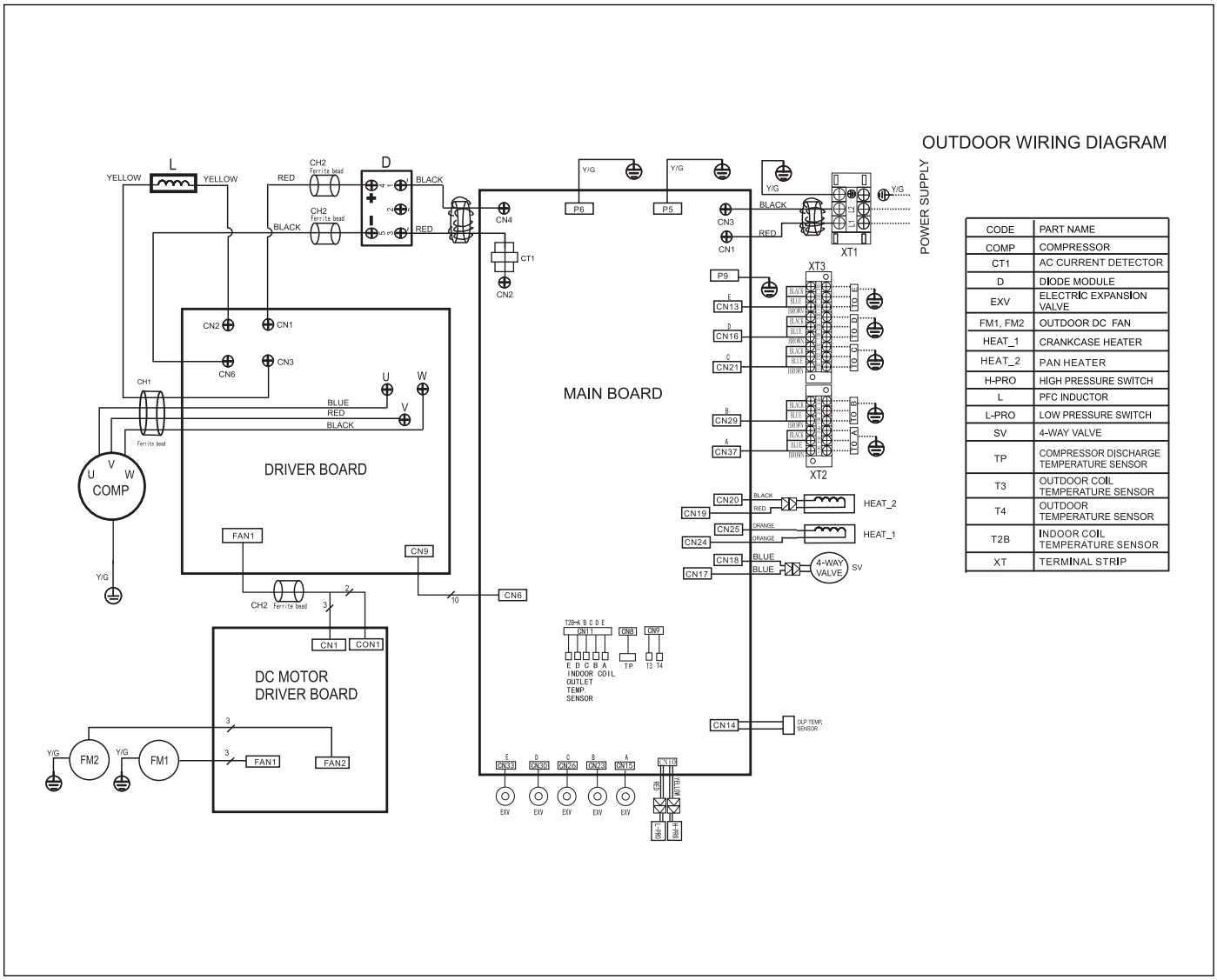
8.5.3 Regular Multi Zone (36K)



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)



CODE	PART NAME
COMP	COMPRESSOR
CT1	AC CURRENT DETECTOR
D	DIODE MODULE
EXV	ELECTRIC EXPANSION 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 TEMPERATURE SENSOR
T3	OUTDOOR COIL TEMPERATURE SENSOR
T4	OUTDOOR TEMPERATURE SENSOR
T2B	INDOOR COIL TEMPERATURE SENSOR
XT	TERMINAL STRIP

Figure 35

8.5.5 Hyper Heat Multi Zone (18K)

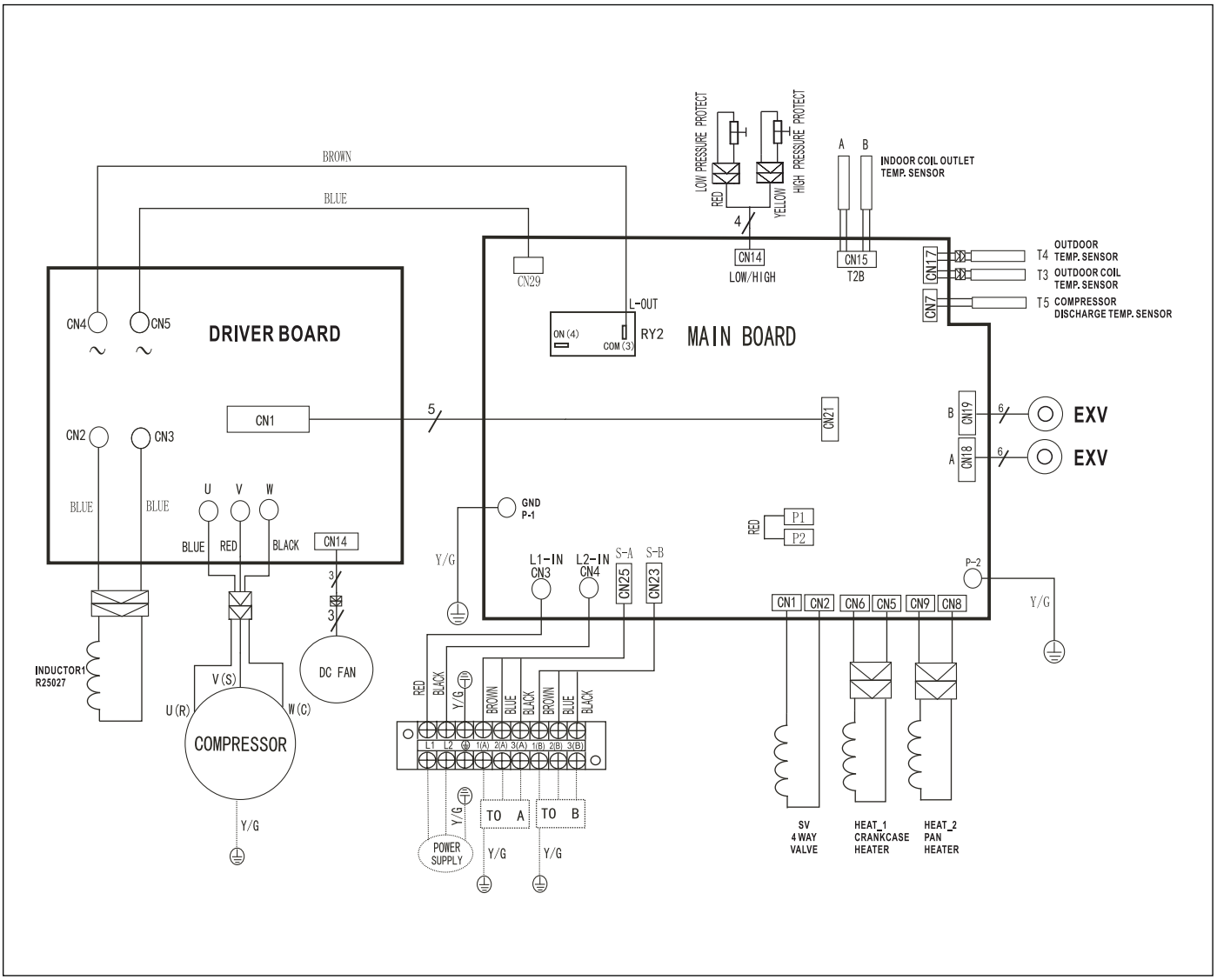
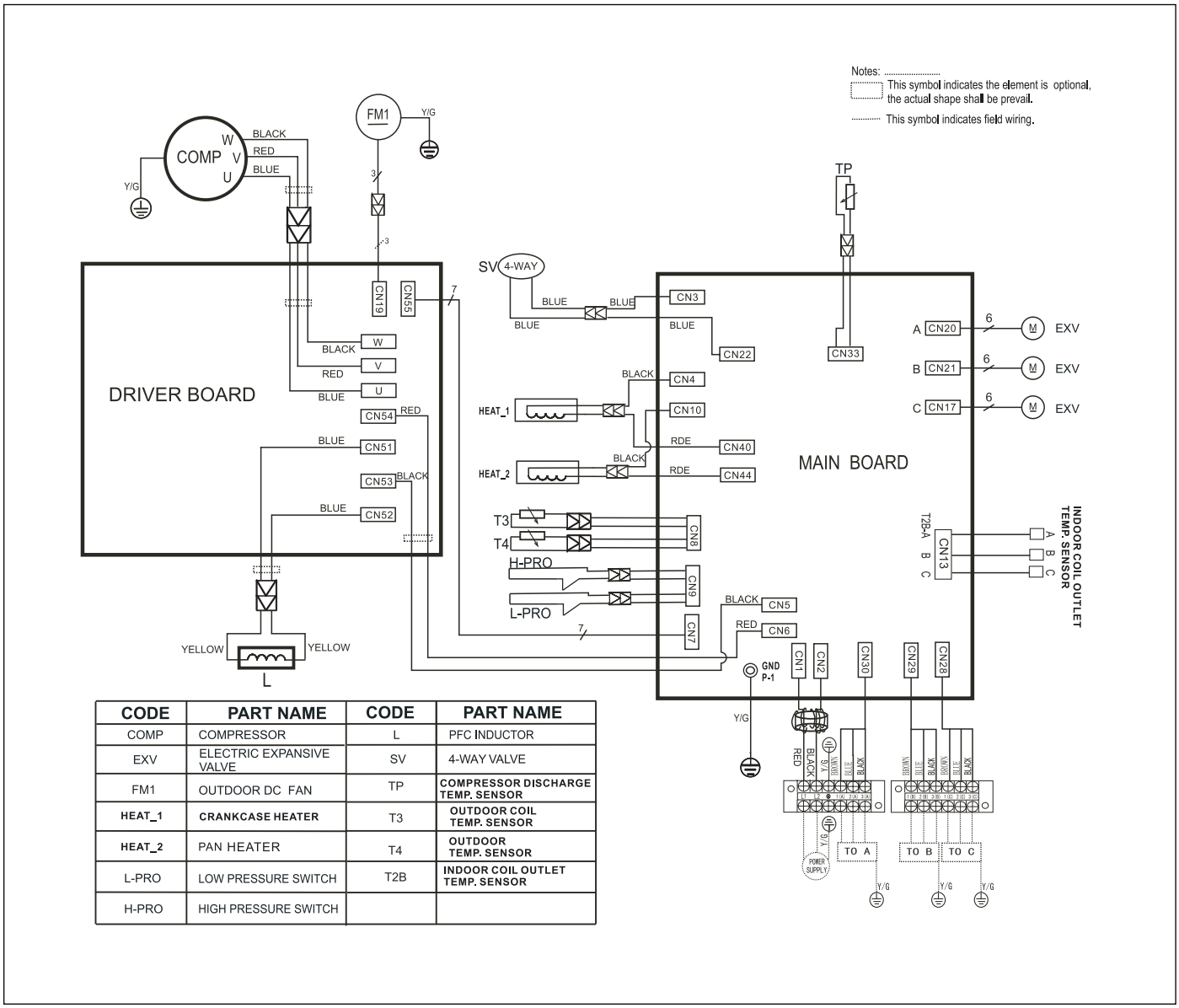


Figure 36

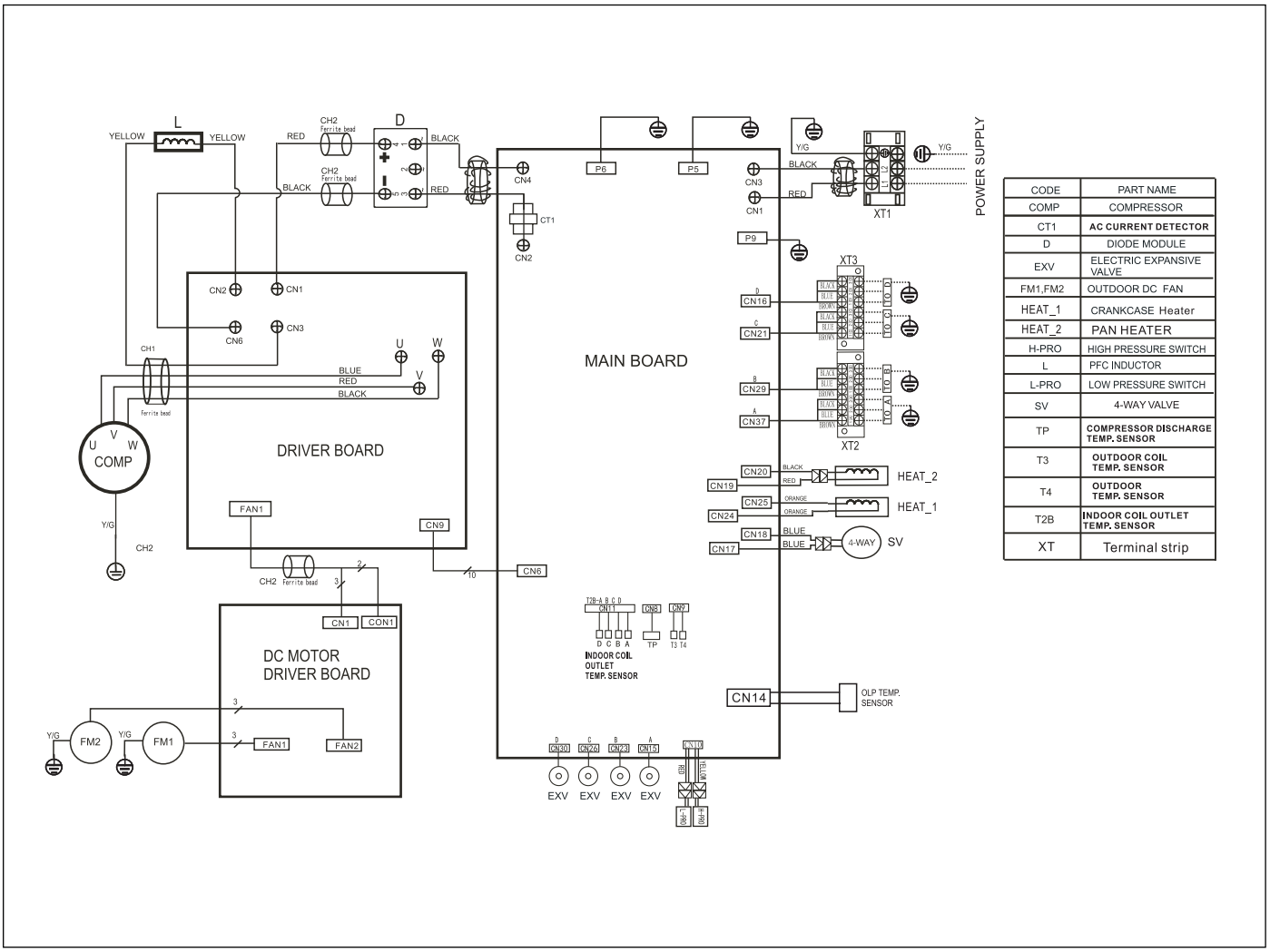
8.5.6 Hyper Heat Multi Zone (27K)



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 Hyper Heat 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 ▶ PCB faulty

Table 19

Troubleshooting:

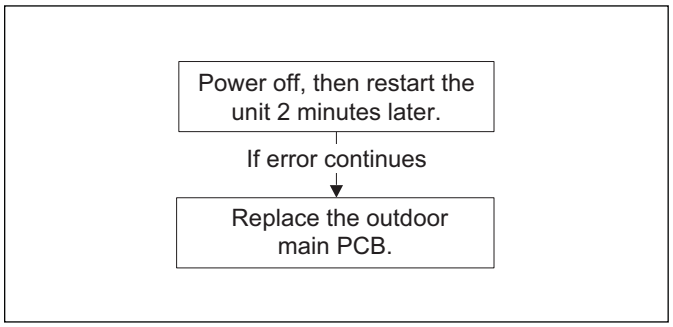


Figure 39

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.

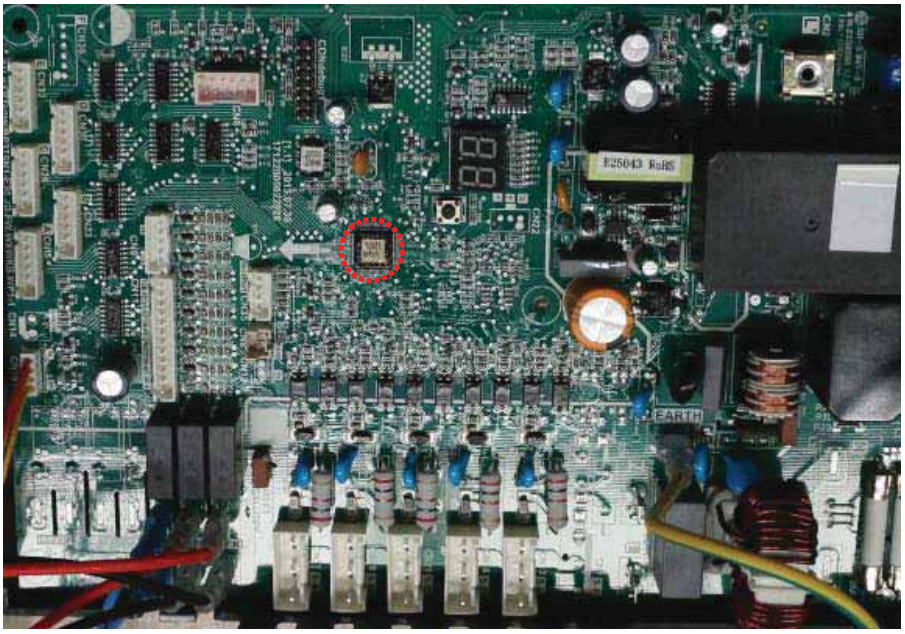


Figure 40

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 ▶ Electromagnetic interference ▶ Indoor or outdoor PCB faulty

Table 20

Troubleshooting:

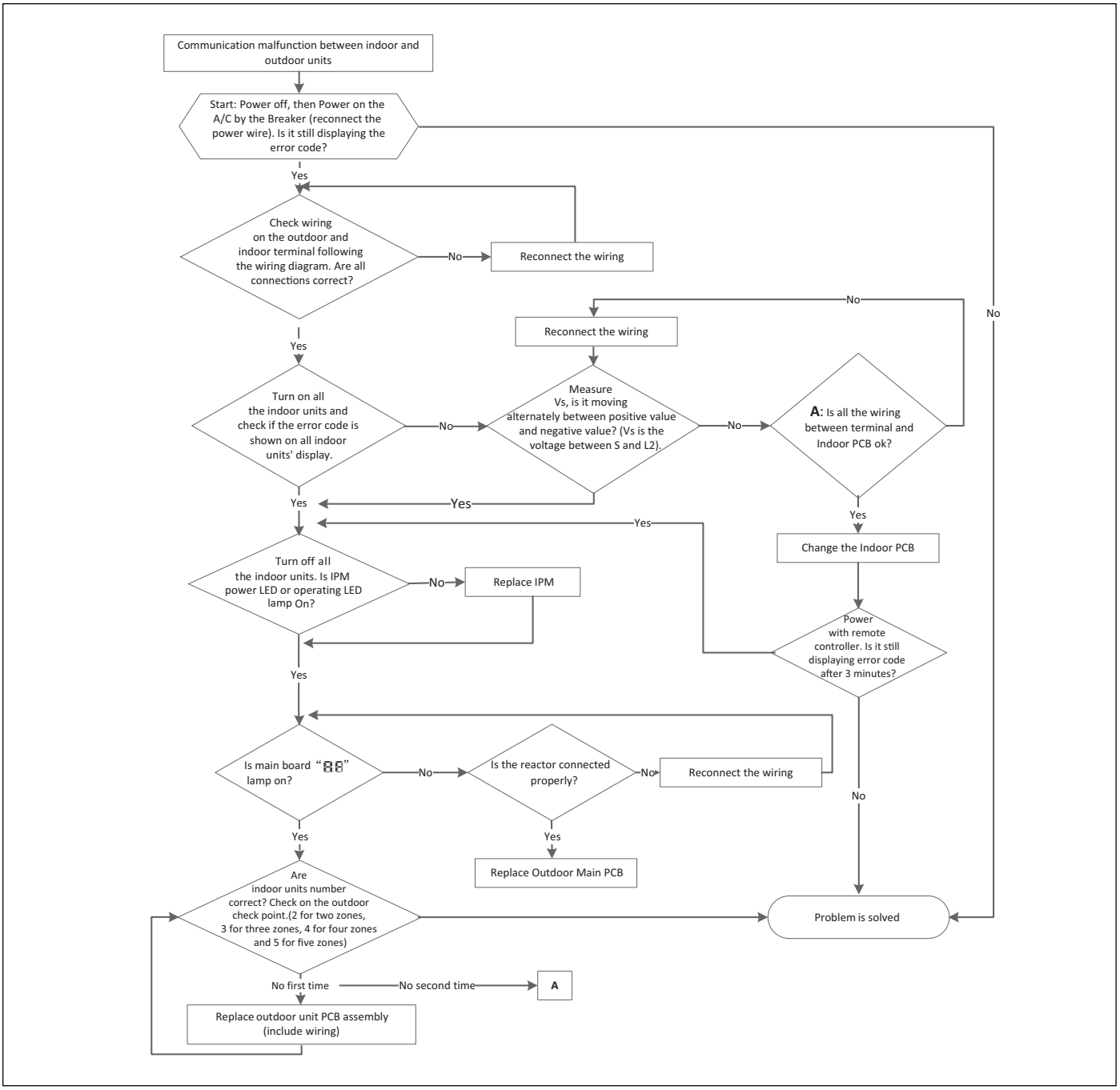


Figure 41

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):

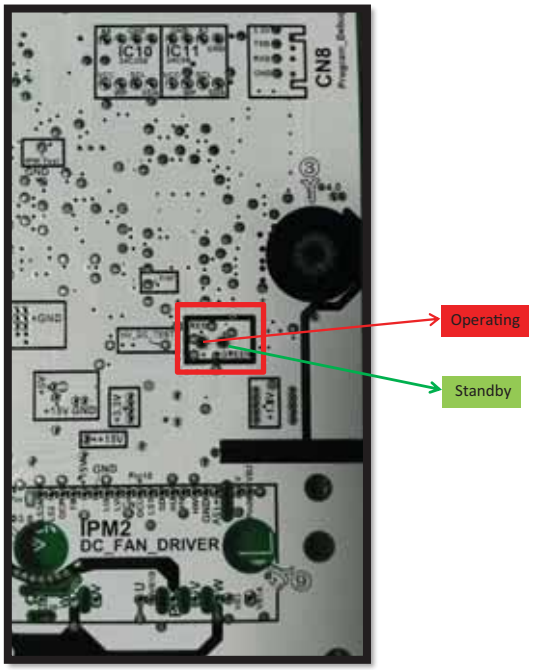


Figure 43

IPM board - Regular: 36K & 48K Models / HyperHeat: 27K & 36K Models:

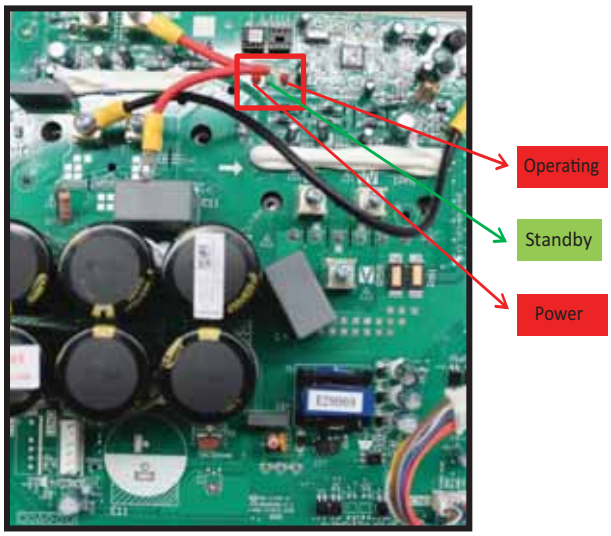


Figure 44

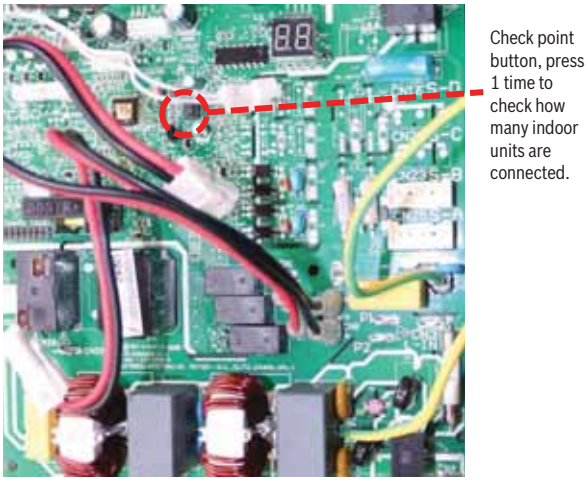


Figure 45

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 ▶ IPM faulty ▶ Outdoor PCB faulty

Table 21

Troubleshooting:

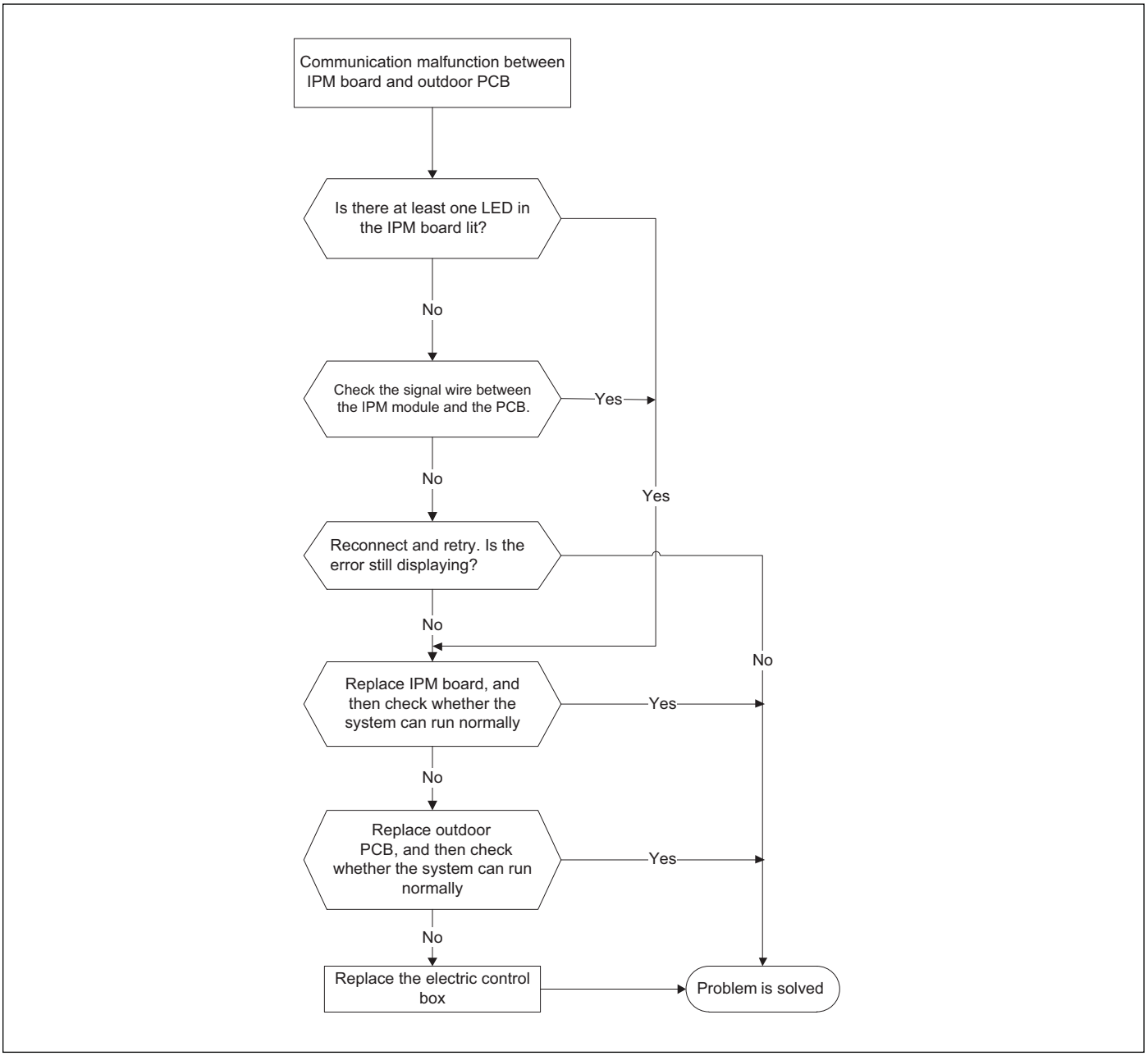


Figure 46

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.

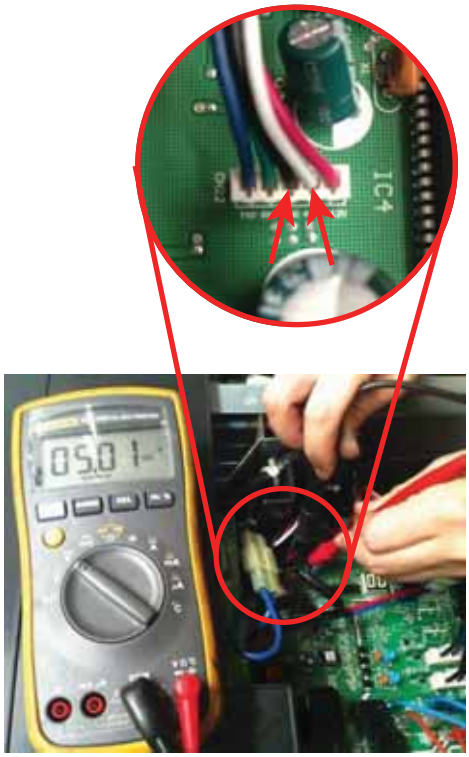


Figure 47

- 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 ▶ Sensor faulty ▶ Indoor / Outdoor PCB faulty

Table 22

Troubleshooting:

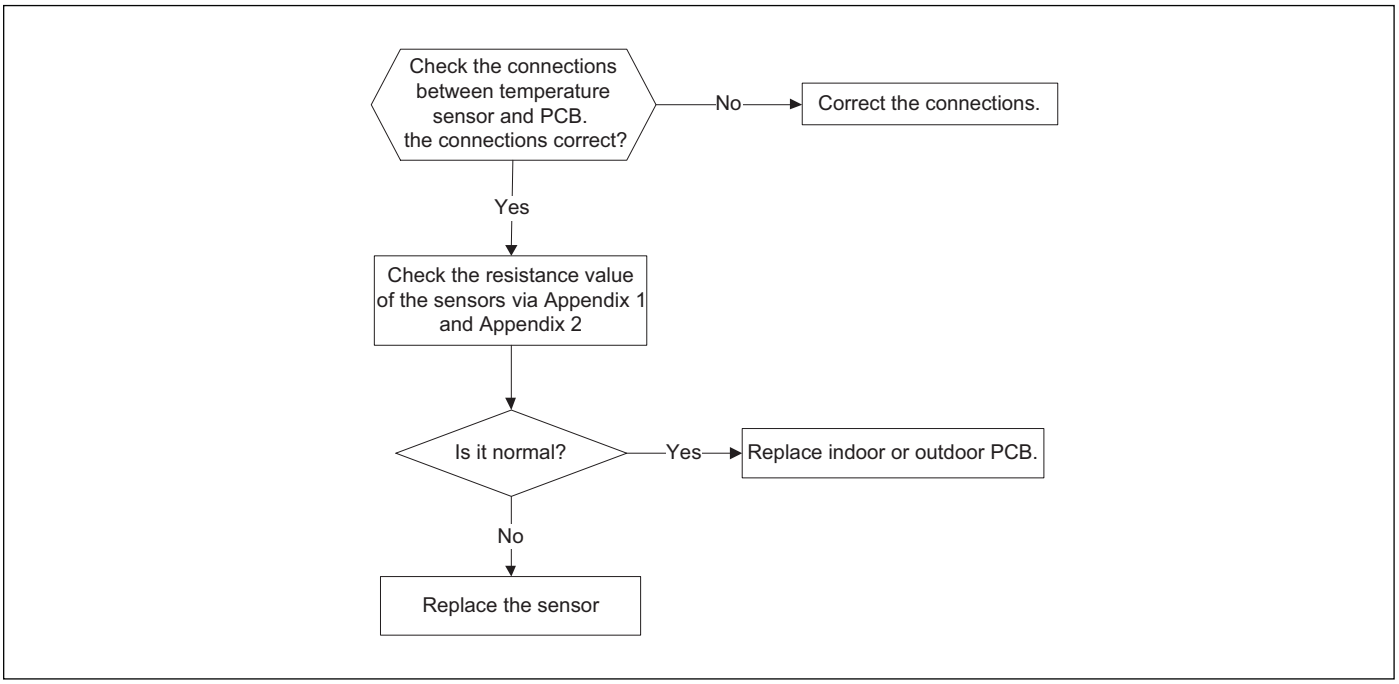


Figure 49

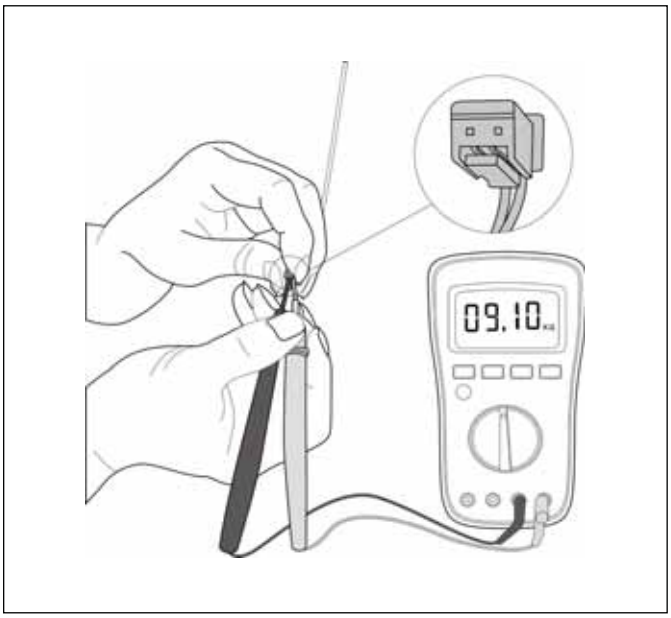


Figure 50

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 ▶ System problems, such as leakage or blockage ▶ Outdoor PCB faulty

Table 23

Troubleshooting:

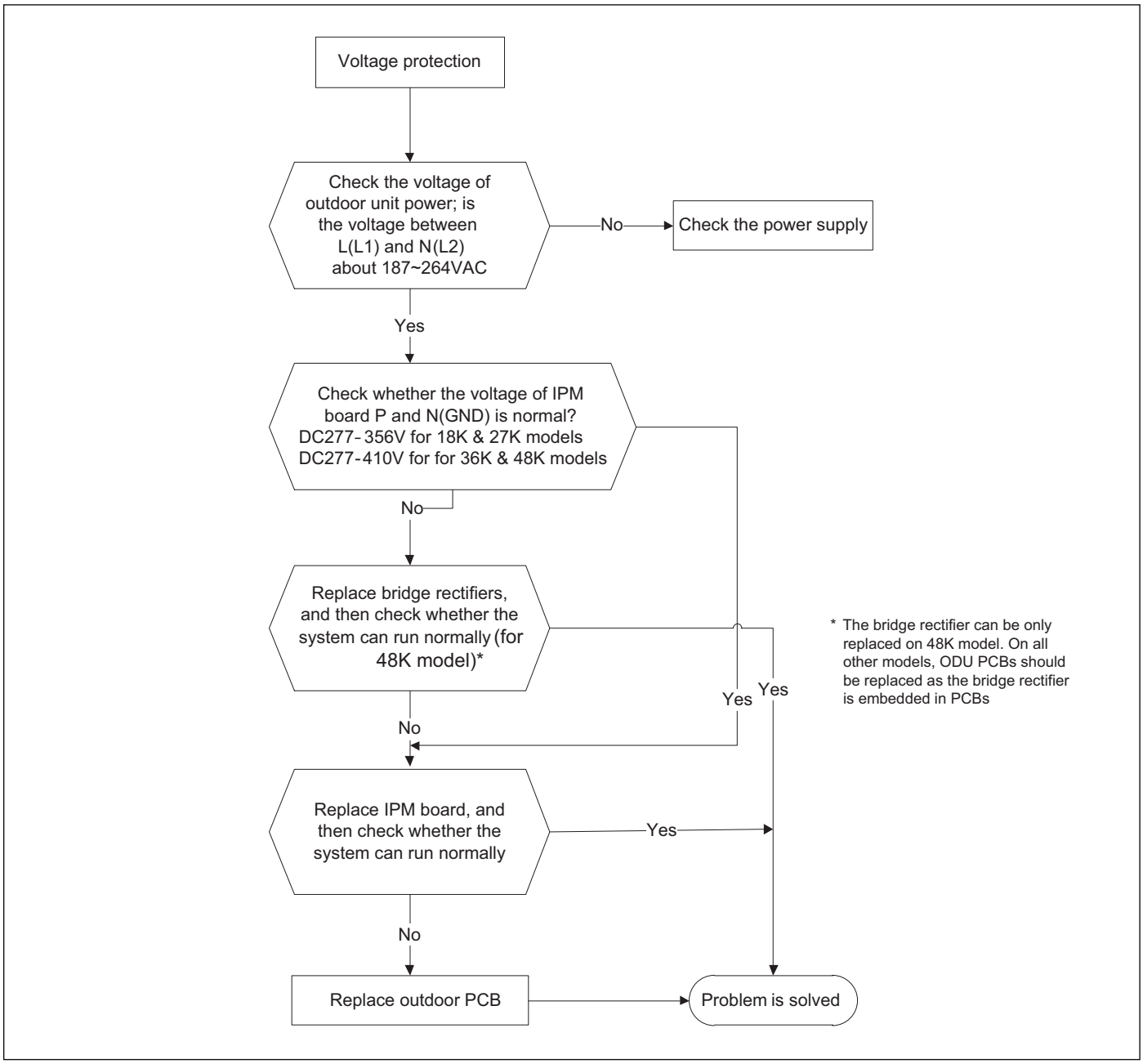


Figure 51

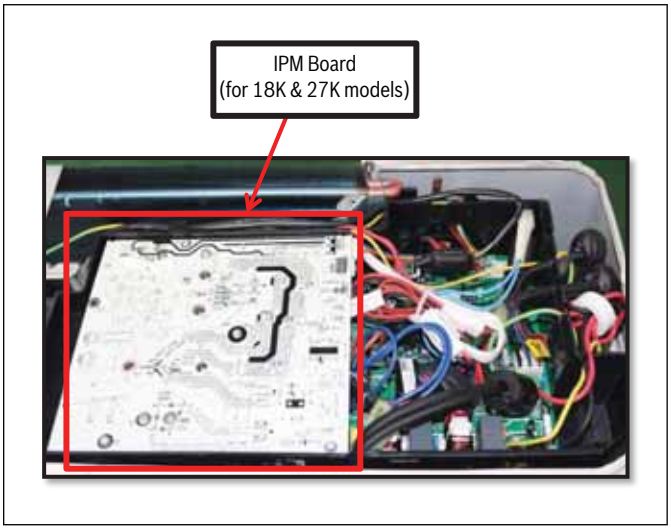


Figure 52

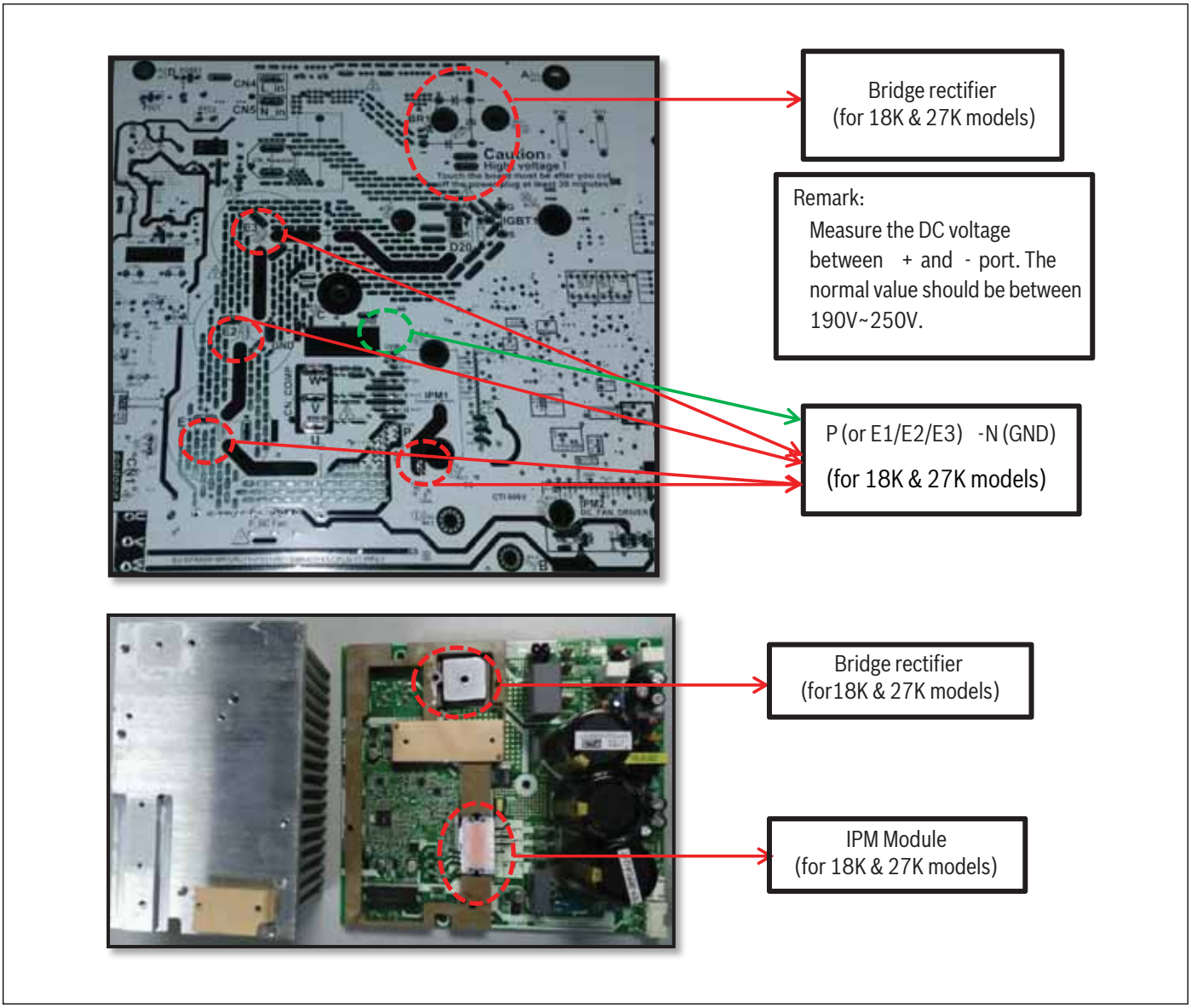


Figure 53

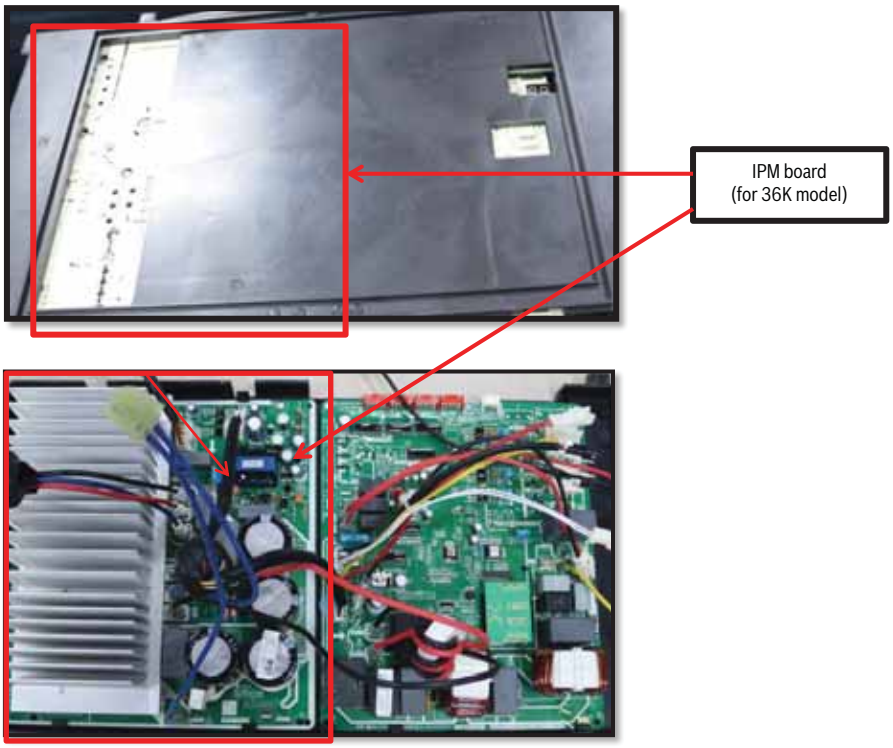


Figure 54

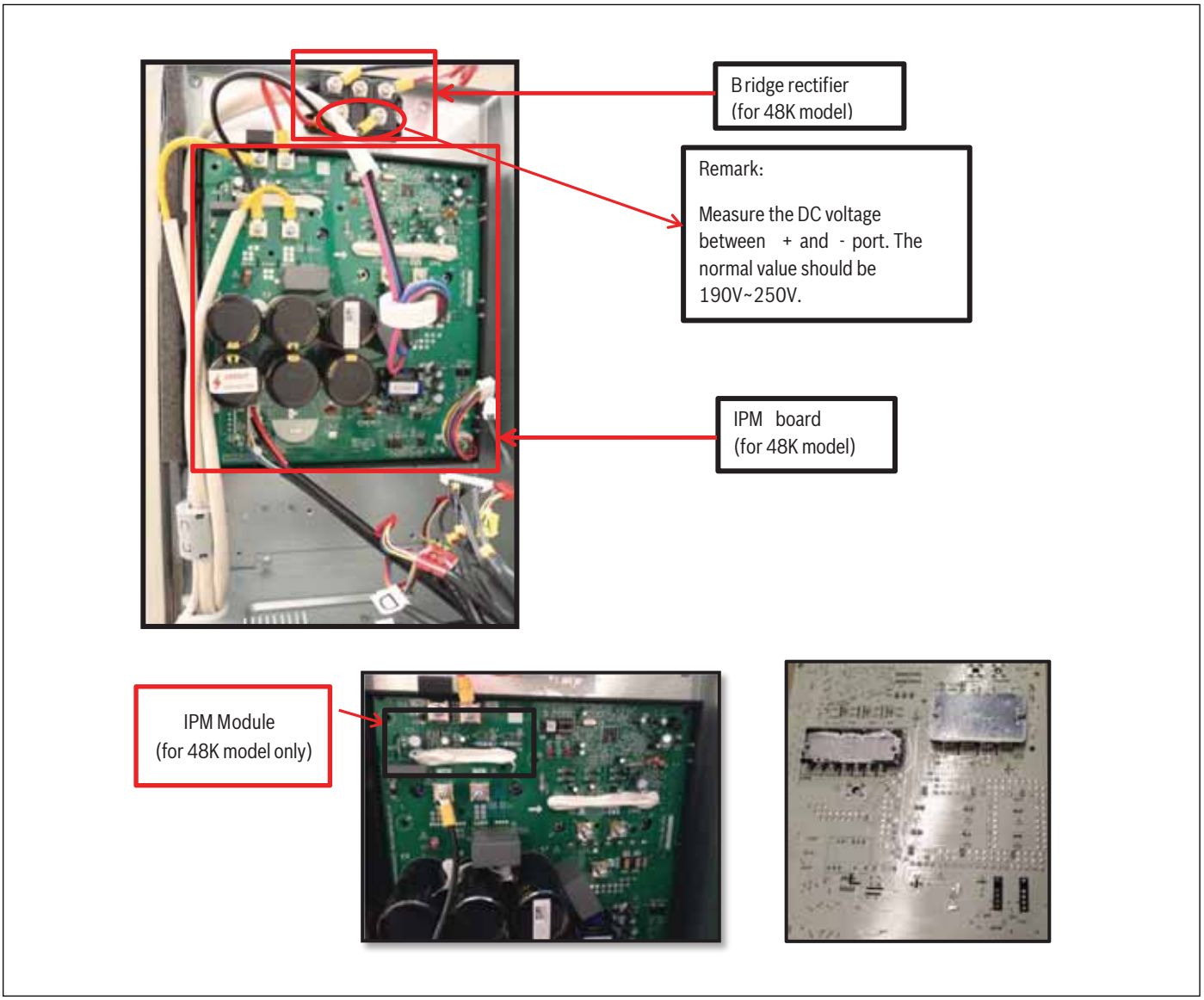

Bridge rectifier
(for 48K model)
Remark:
Measure the DC voltage between + and - port. The normal value should be 190V~250V.
IPM board
(for 48K model)
IPM Module
(for 48K model only)

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 ▶ Outdoor PCB faulty ▶ PFC module inductance faulty ▶ PFC module faulty

Table 24

Troubleshooting:

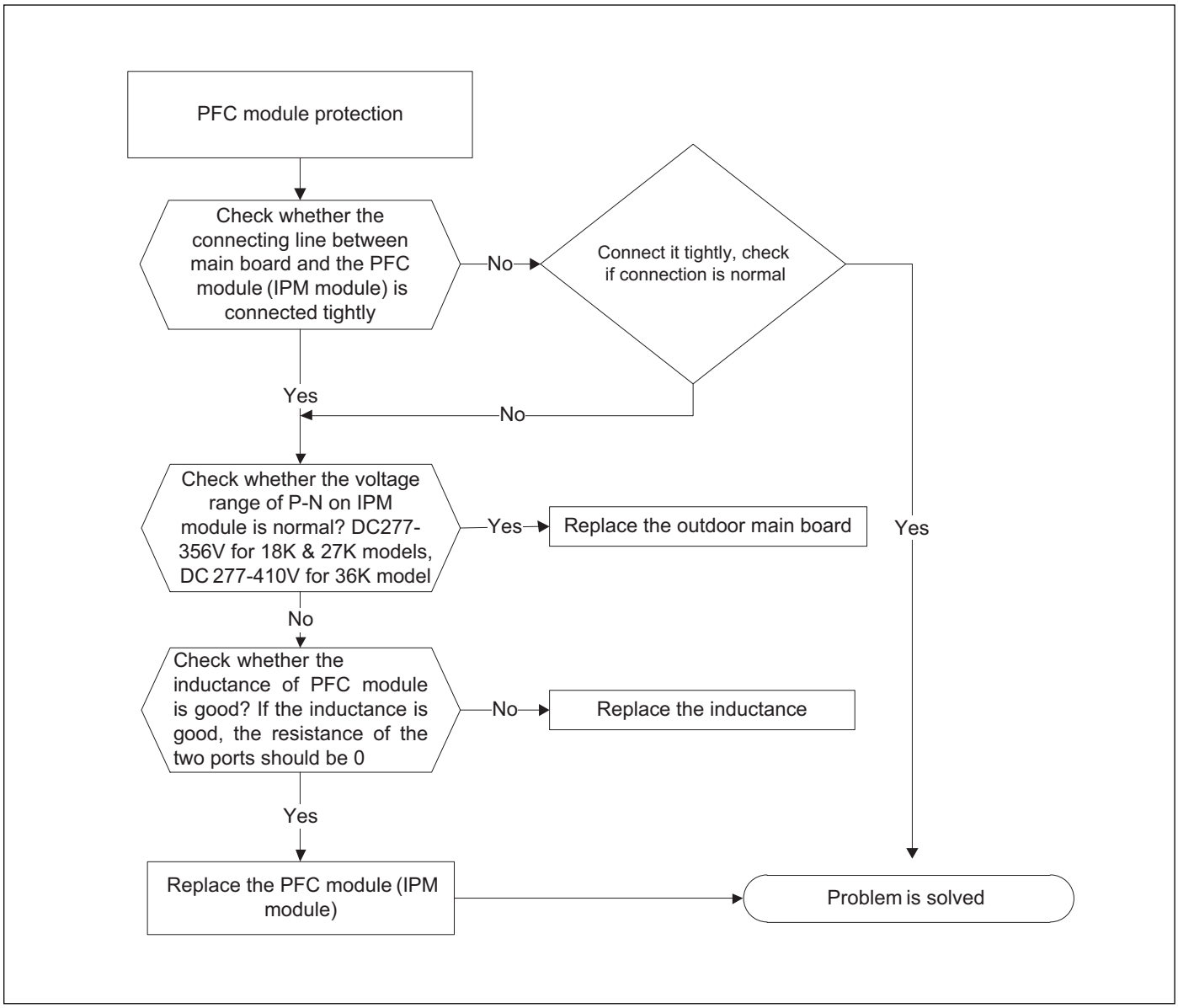


Figure 56

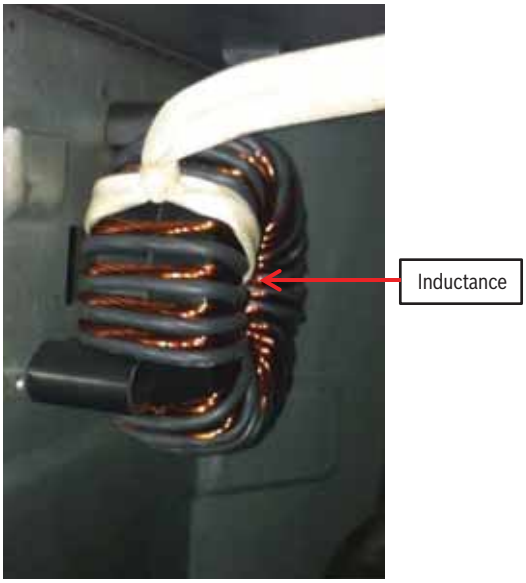


Figure 57

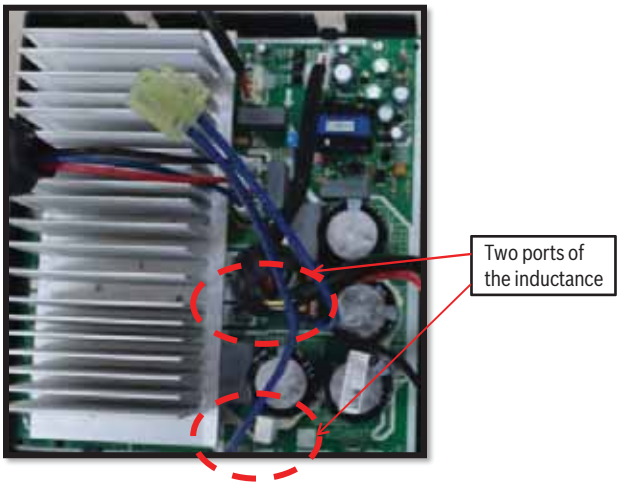


Figure 58

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 ▶ Outdoor fan assembly faulty ▶ Outdoor PCB faulty

Table 25

Troubleshooting:

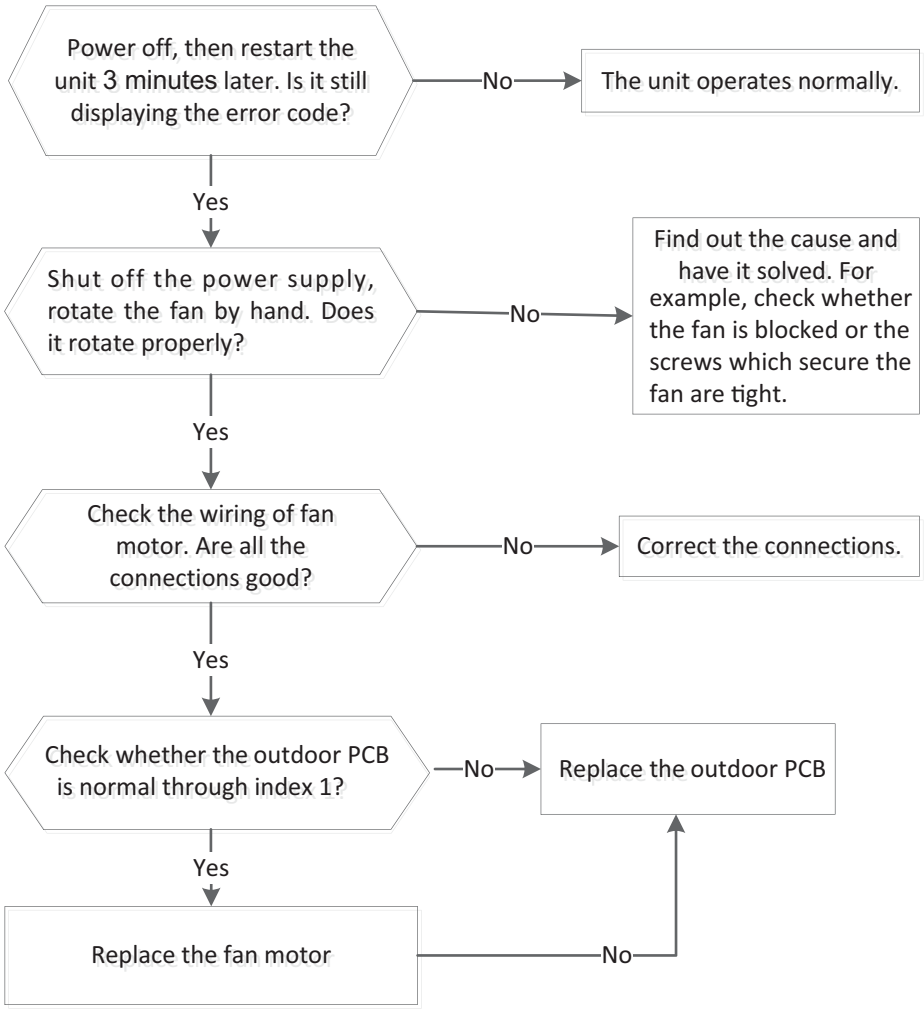


Figure 59

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.

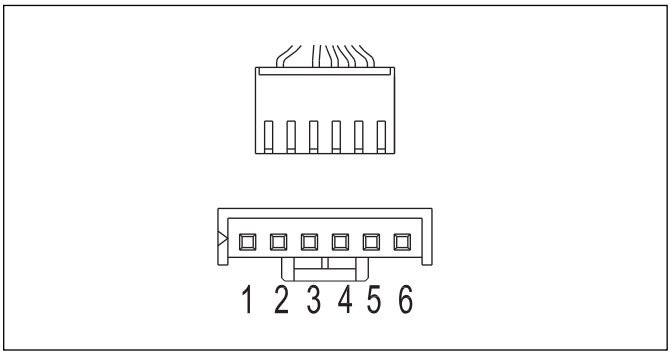


Figure 60

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

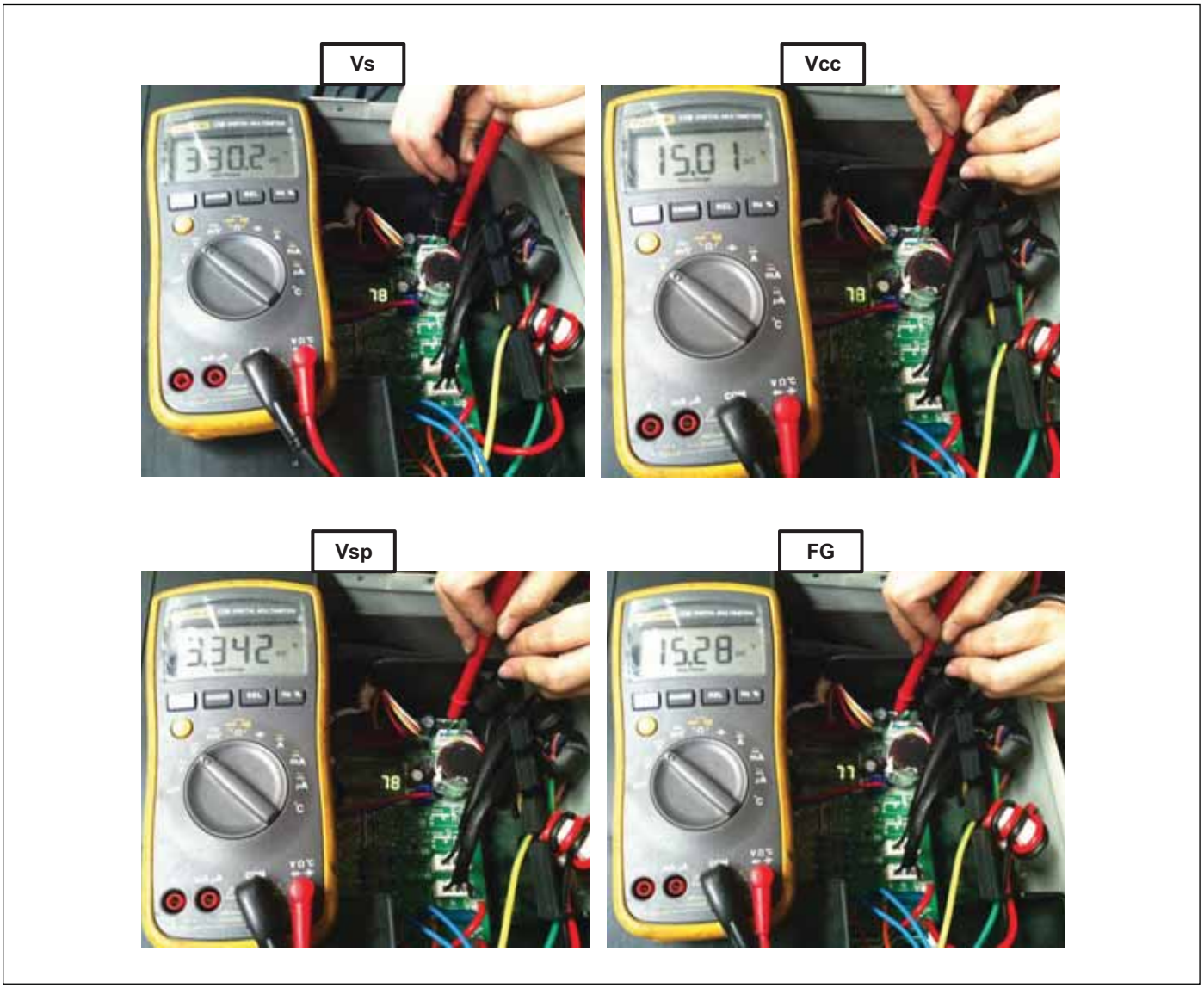


Figure 61

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 ▶ Over load protector faulty ▶ System blockage ▶ Outdoor PCB faulty

Table 27

Troubleshooting:

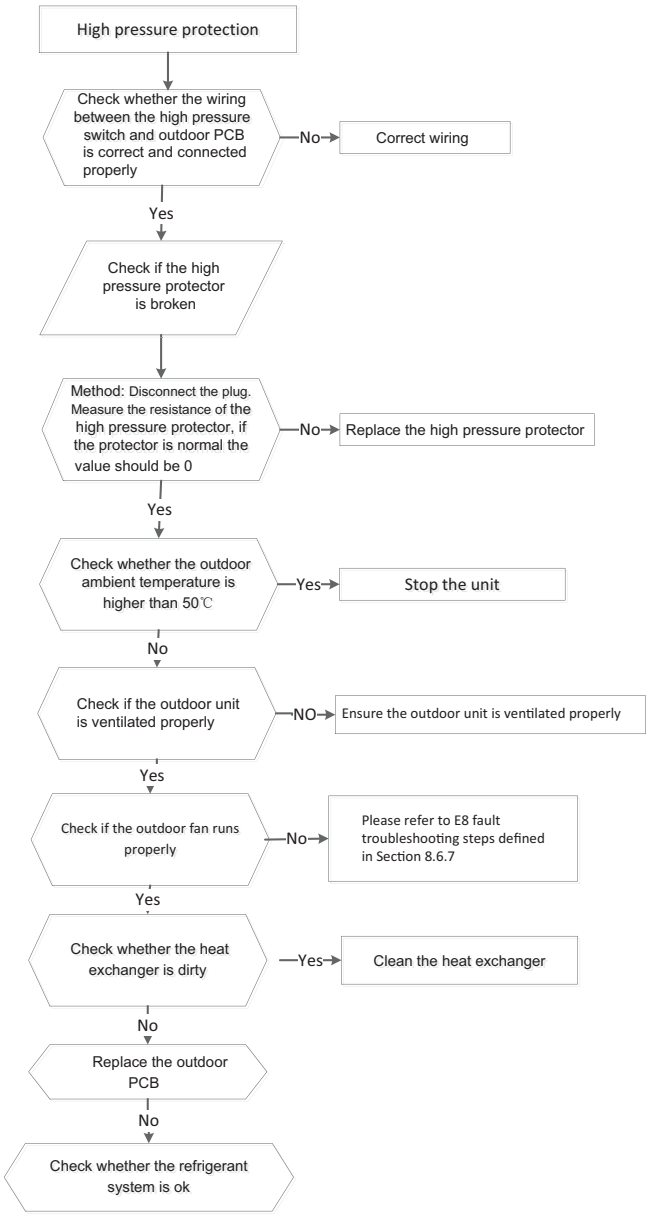
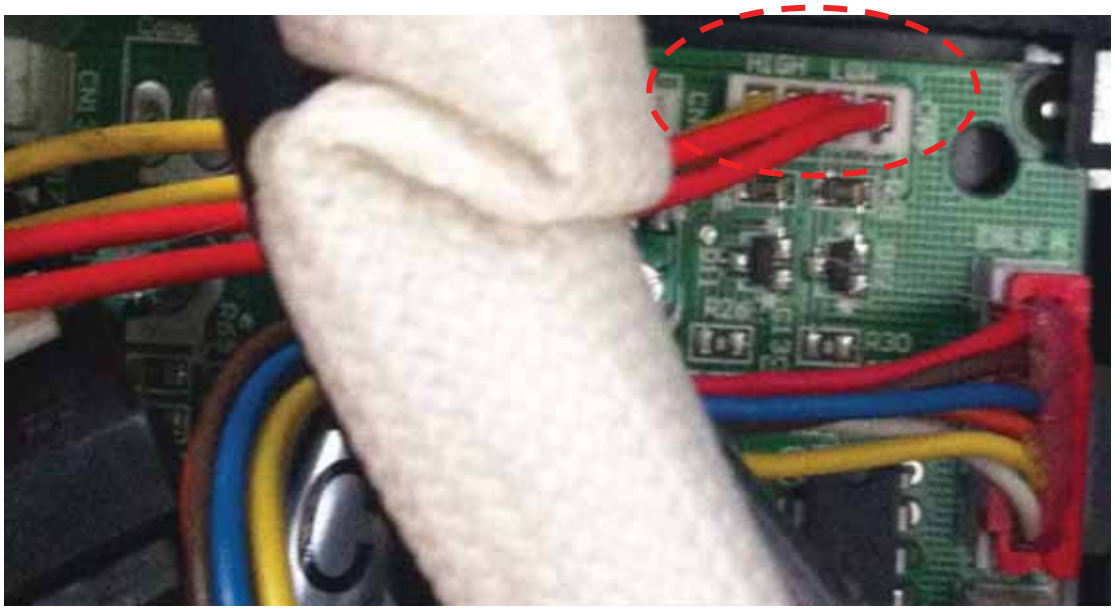


Figure 62



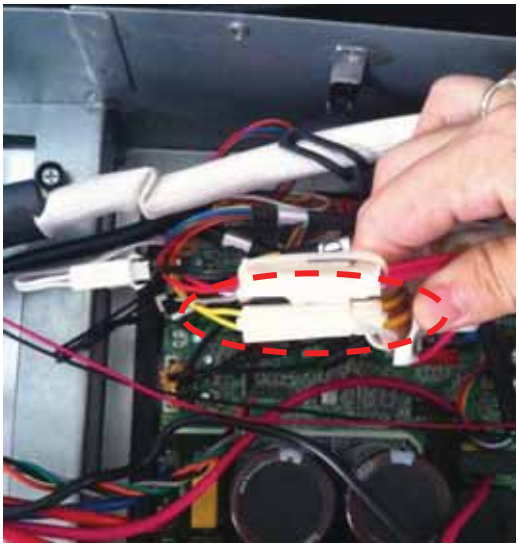


Figure 63

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 ▶ Over load protector faulty ▶ System blockage ▶ Outdoor PCB faulty

Table 28

Troubleshooting:

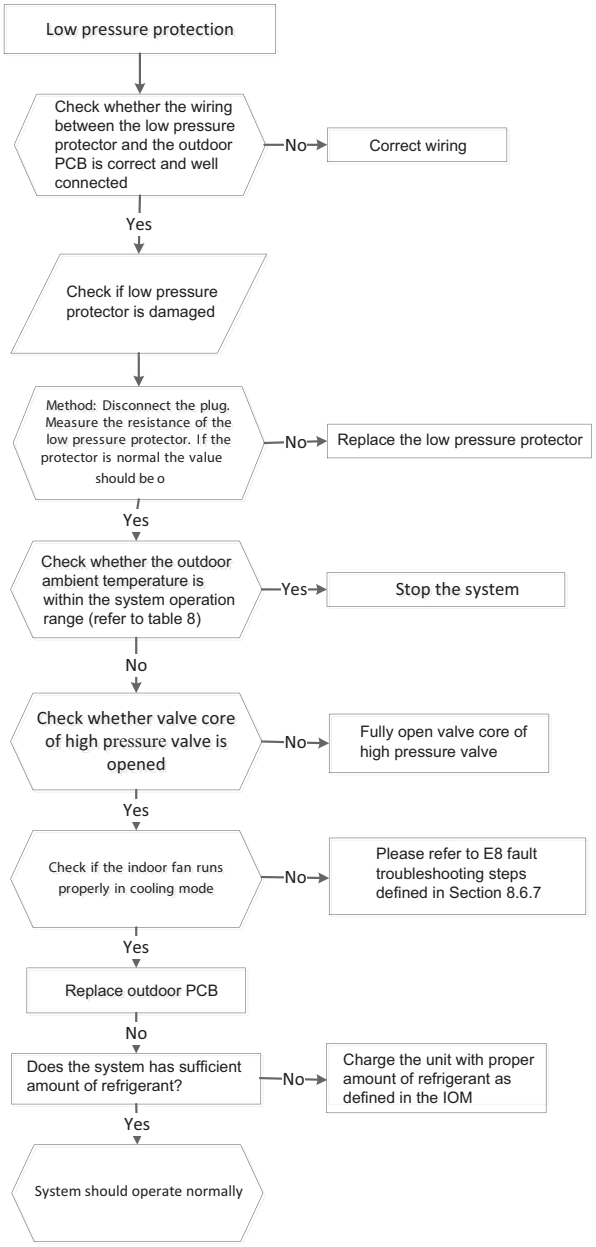
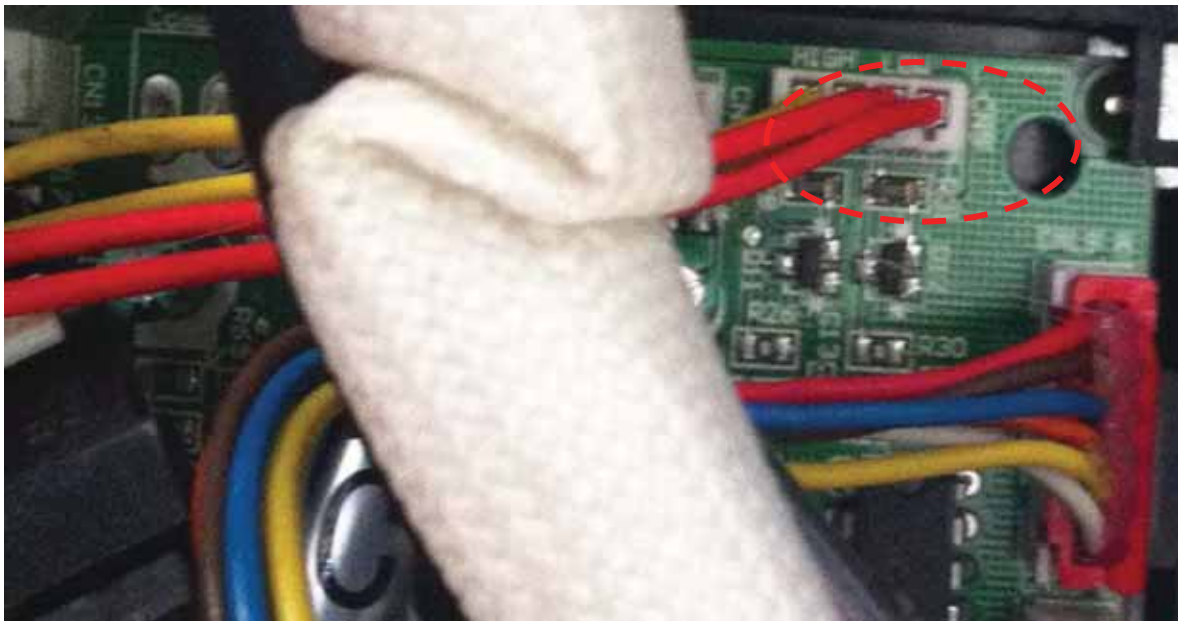


Figure 64



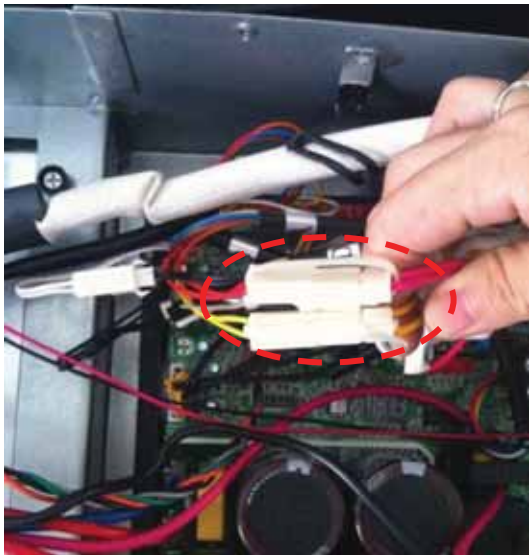


Figure 65

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 ▶ Over load protector faulty ▶ System blockage ▶ Outdoor PCB faulty

Table 29

Troubleshooting:

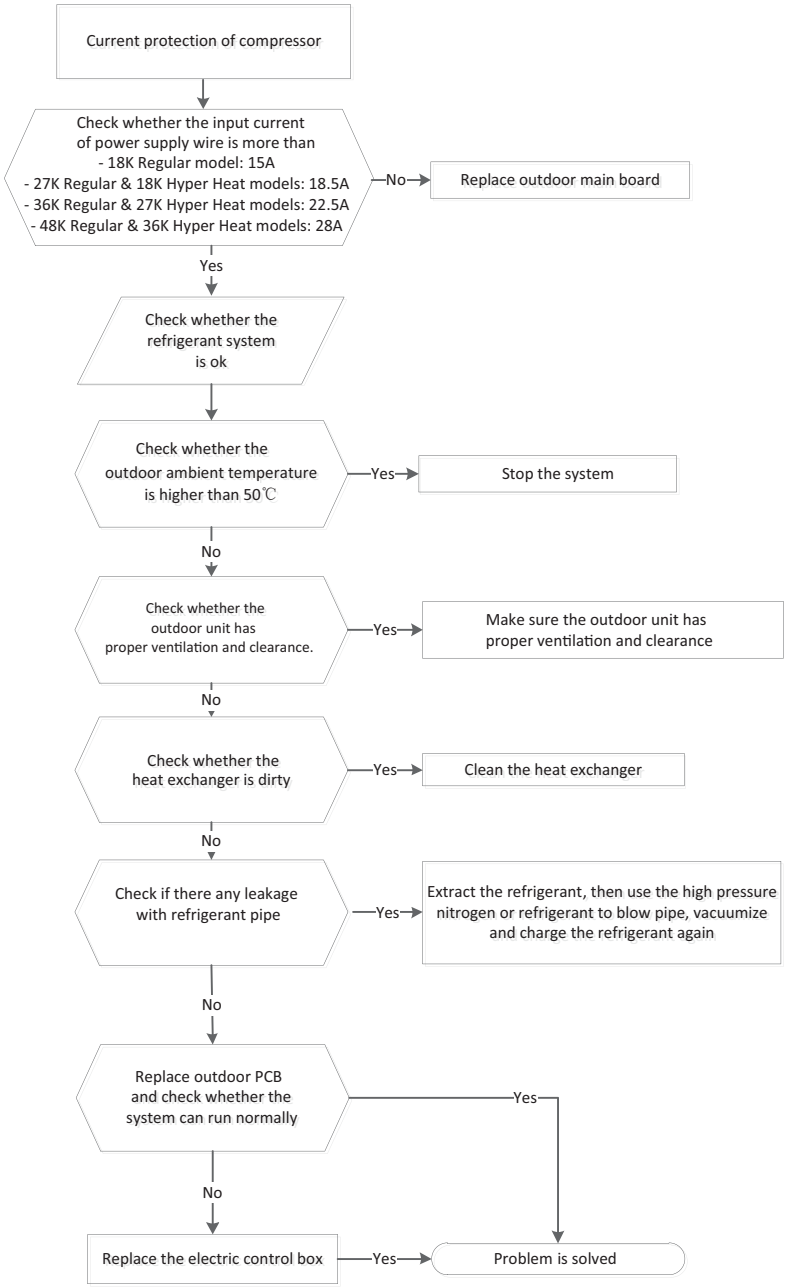


Figure 66

RANGE
HOLD
HIOKI 3282
6.53
DIGITAL CLAMP ON HITESTER
~600V
CAT
COM
TEMP
RANGE
HOLD
HIOKI 3282
6.61
DIGITAL CLAMP ON HITESTER
~600V
CAT
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 ▶ System leakage ▶ Discharge temperature (T5) sensor faulty ▶ Outdoor PCB faulty

Table 30

Troubleshooting:

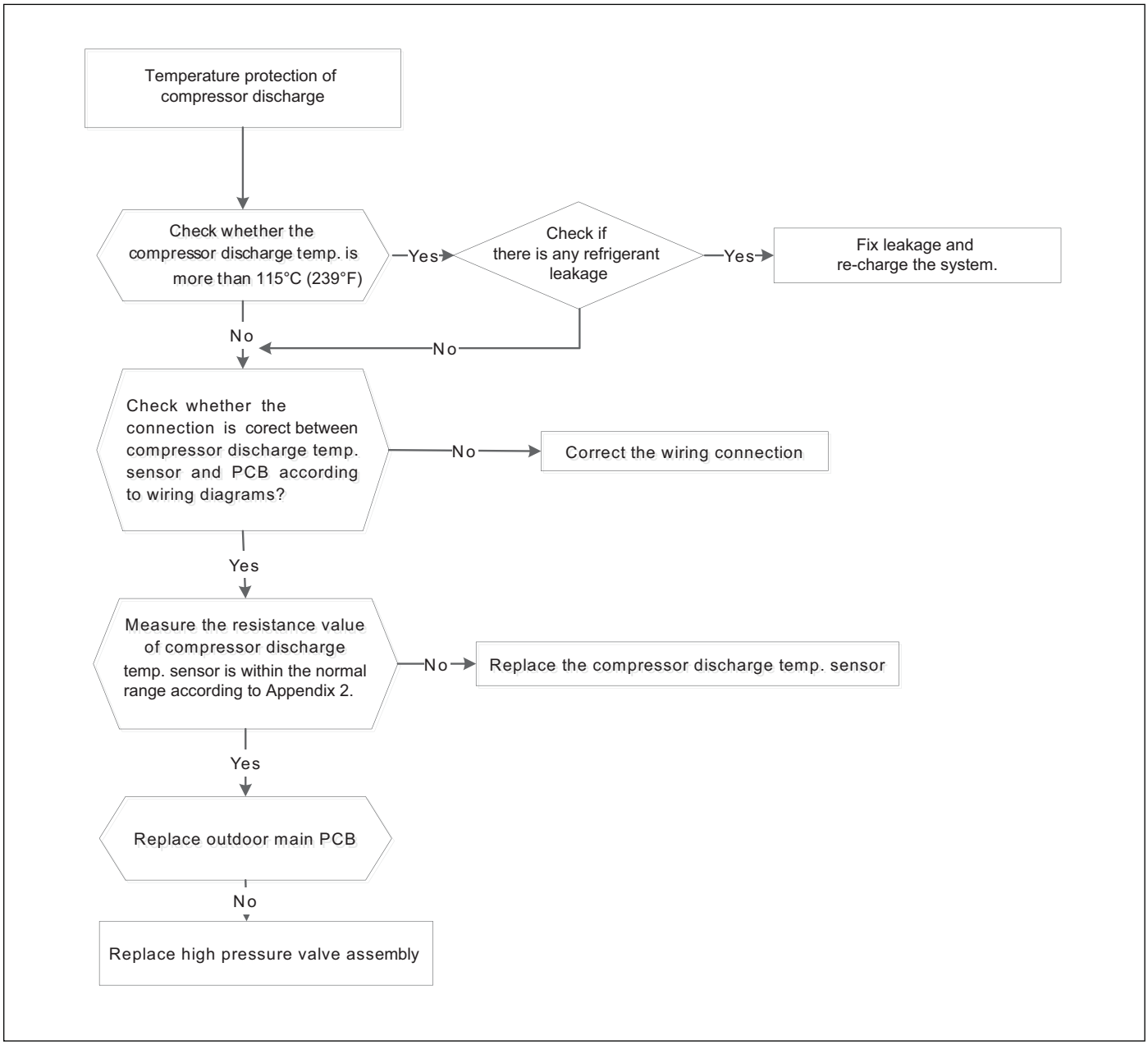


Figure 68

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 ▶ Dirty heat exchanger ▶ System leakage or blockage ▶ Outdoor PCB faulty

Table 31

Troubleshooting:

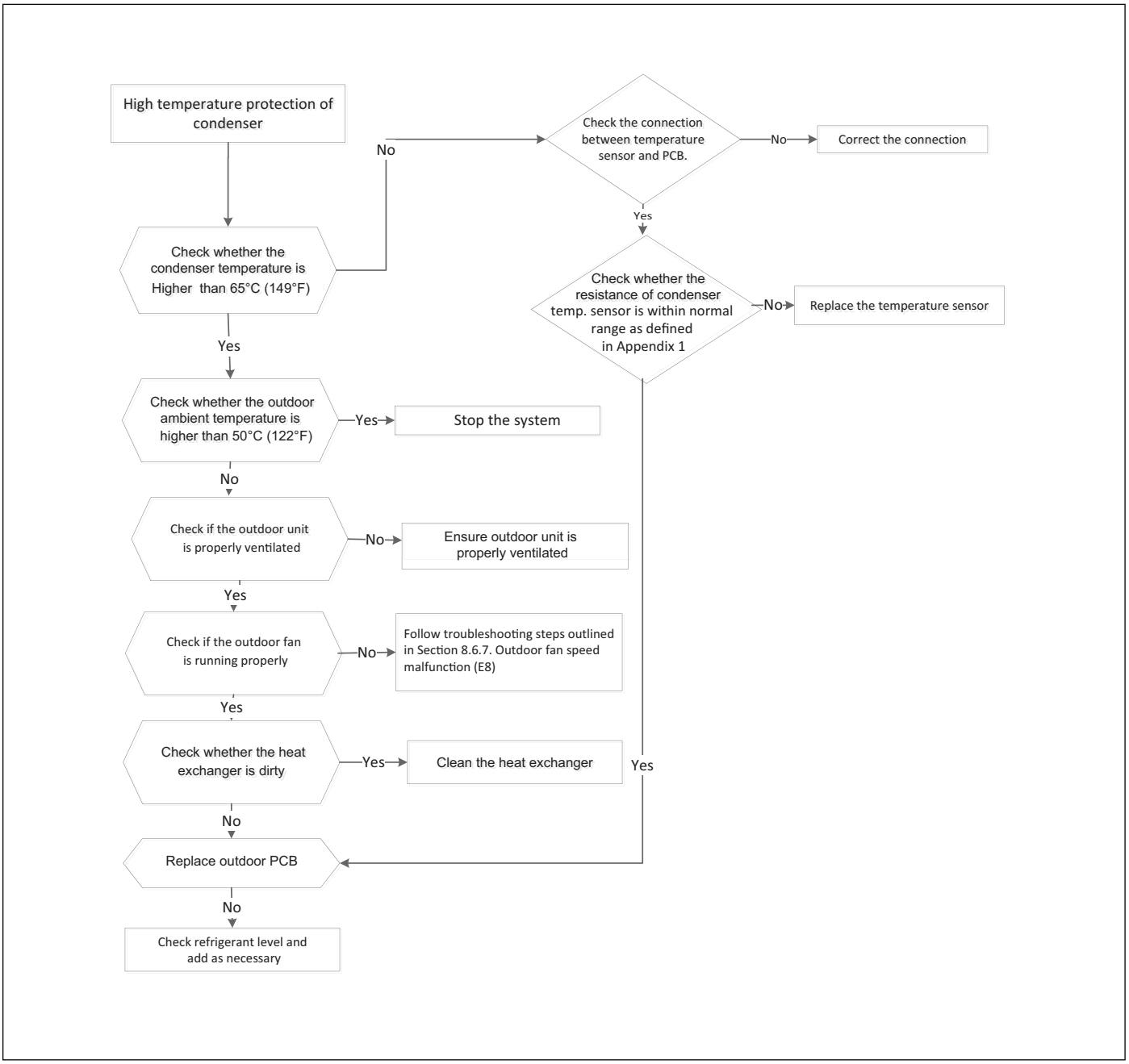


Figure 69

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 ▶ IPM malfunction ▶ Outdoor fan assembly faulty ▶ Compressor malfunction ▶ Outdoor PCB faulty

Table 32

Troubleshooting:

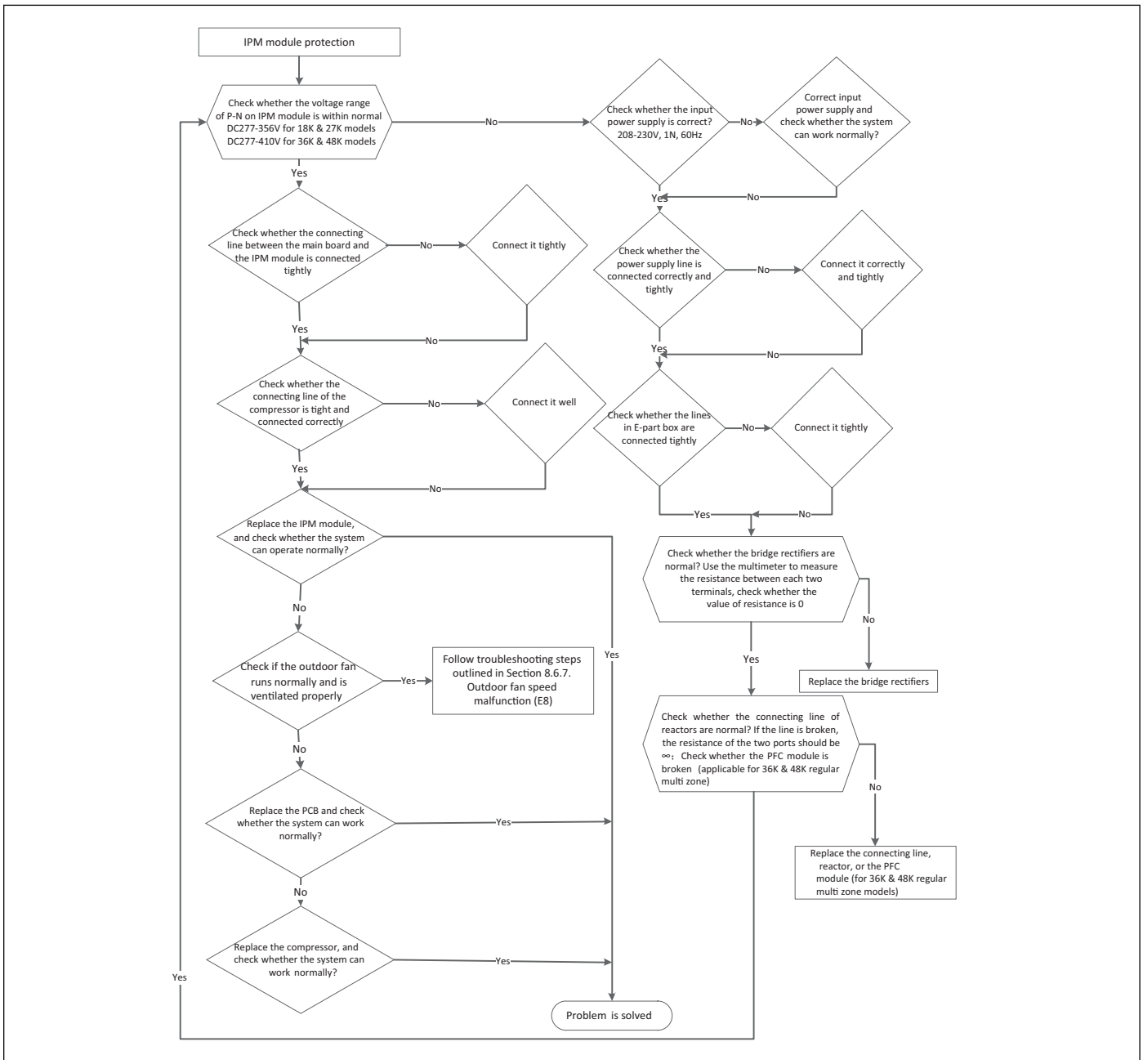


Figure 70

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 ▶ Over load protector faulty ▶ System leakage or blockage ▶ Outdoor PCB faulty

Table 33

Troubleshooting:

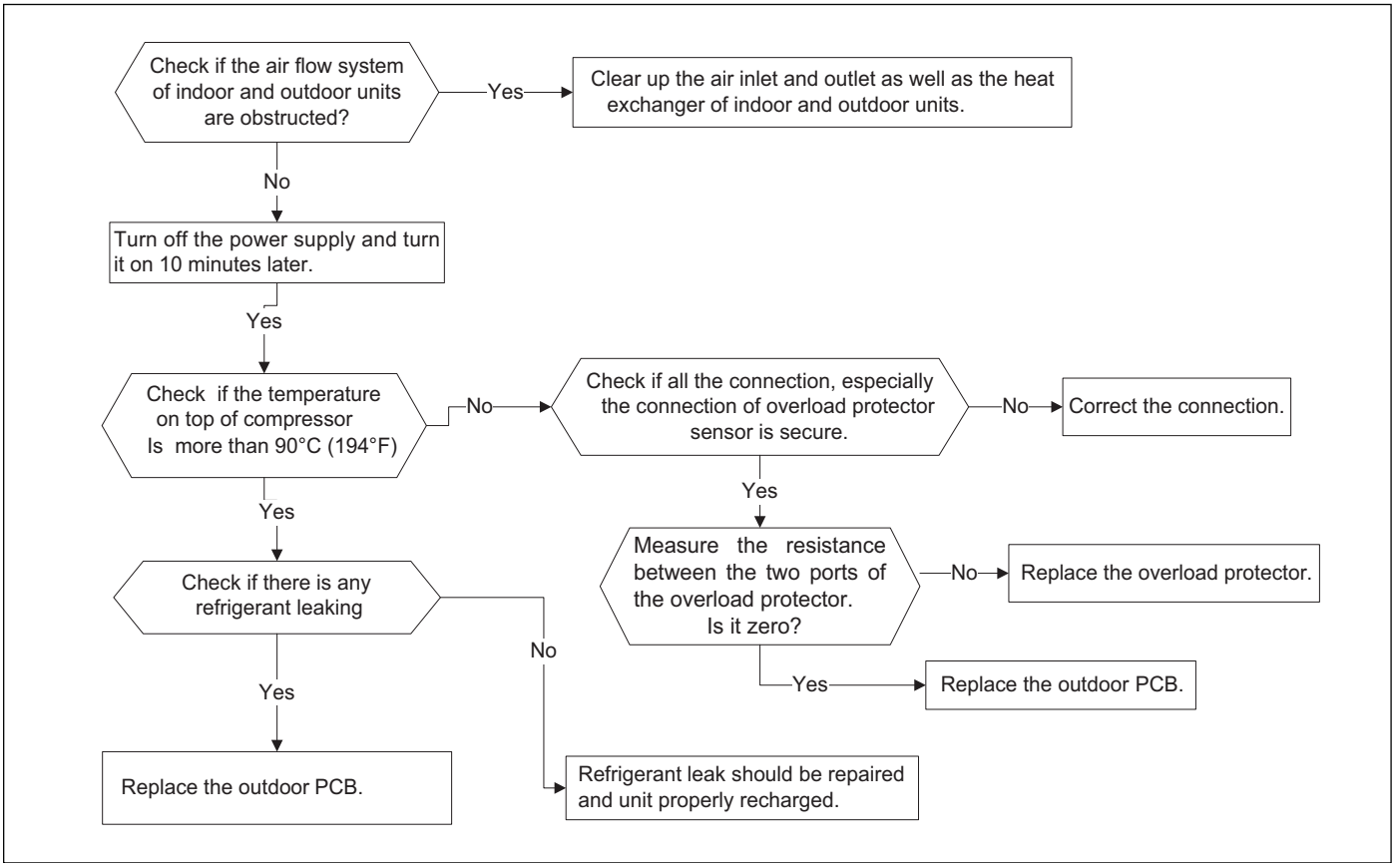


Figure 71

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)

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

Table 34

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

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

Table 35

2. Compressor check

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

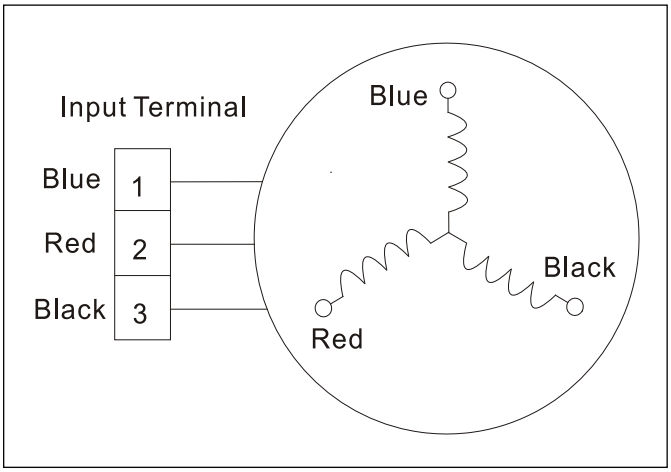


Figure 73

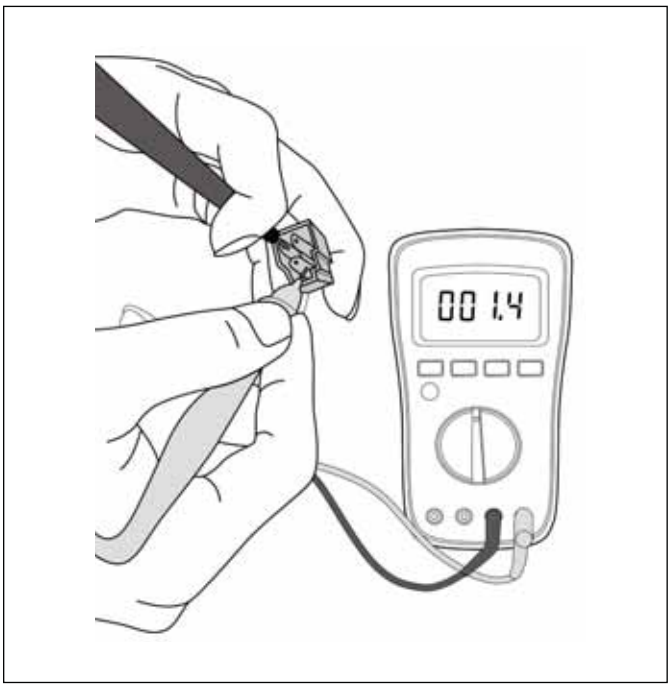


Figure 74

Position	Resistance Value per Compressor Model			
	18K Regular	27K Regular 18K Hyper Heat	36K Regular 27K Hyper Heat	48K Regular 36K Hyper Heat
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	∞ (Several MΩ)	(+)Red	(-)Black	∞ (Several MΩ)
P	N		U	N	
	U		V		
	V		W		
	W		(+)Red		

Table 37

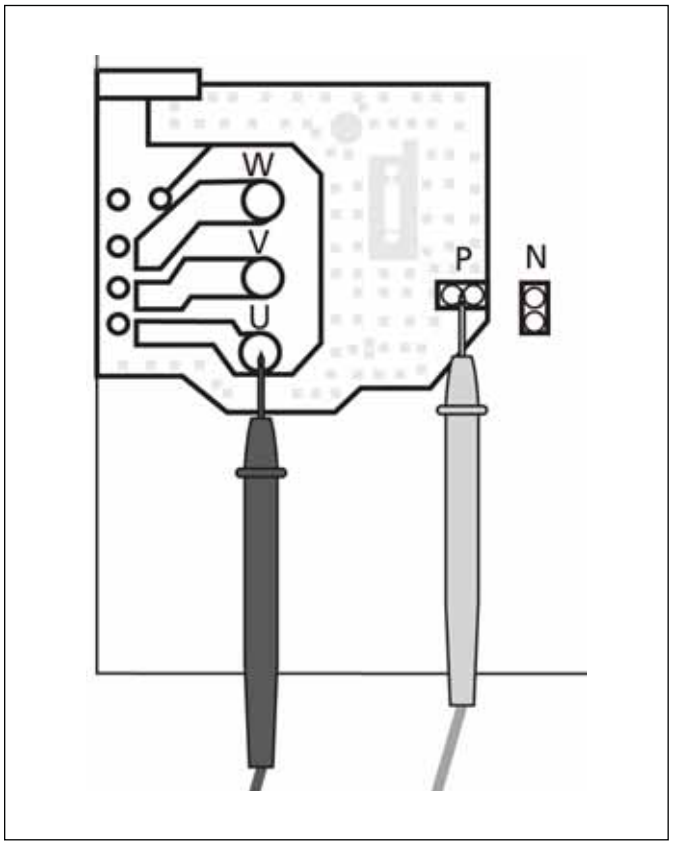


Figure 75

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

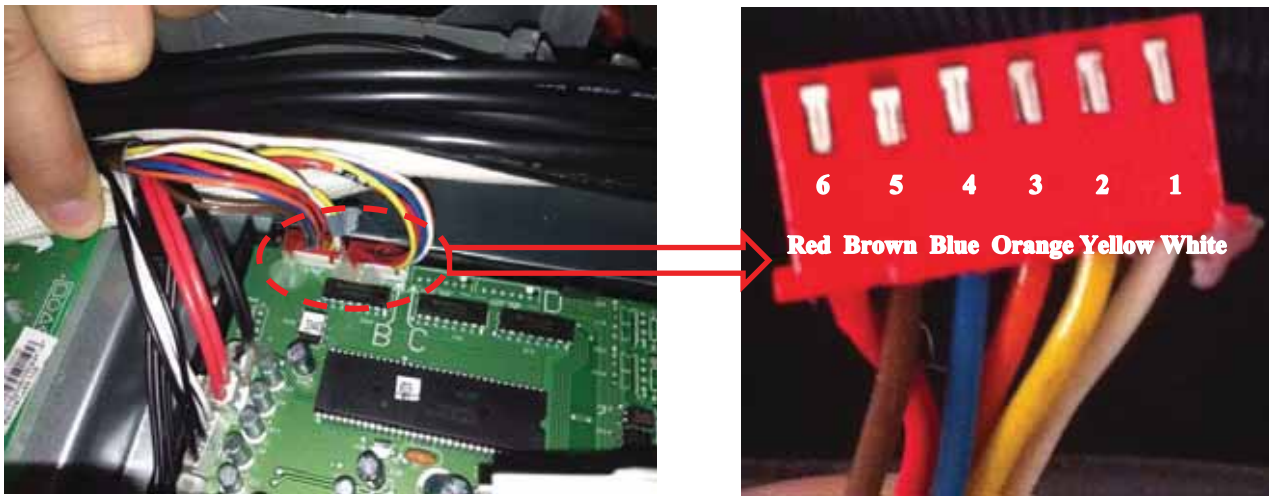


Figure 78

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.

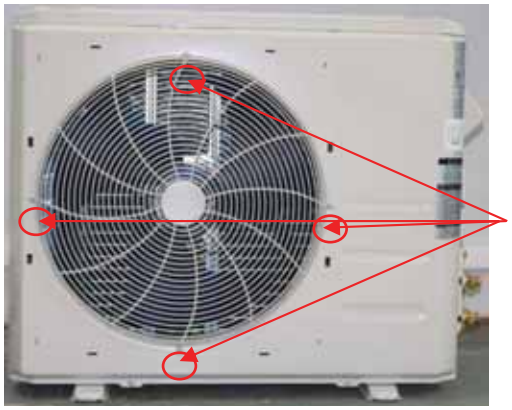


Figure 79

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.

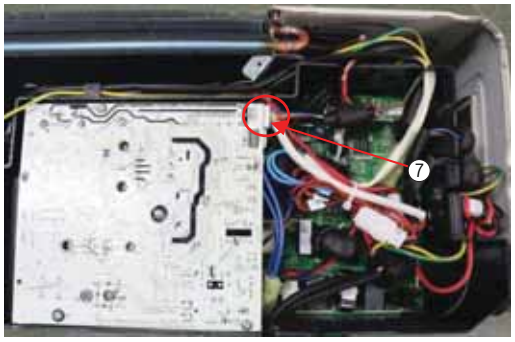


Figure 83

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

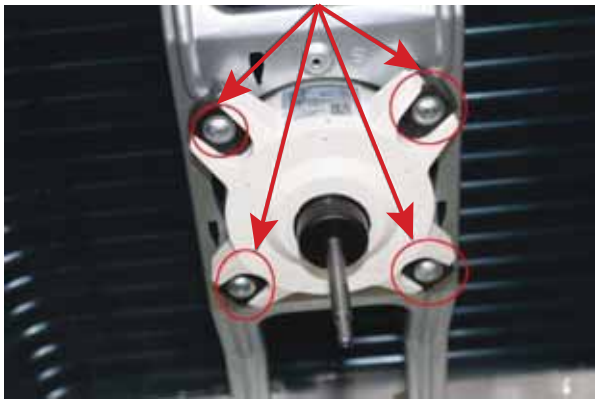


Figure 84

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

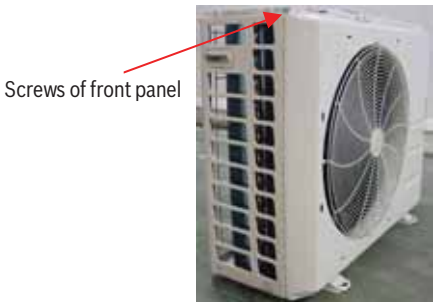


Figure 86

3. Remove the big handle (4 screws).

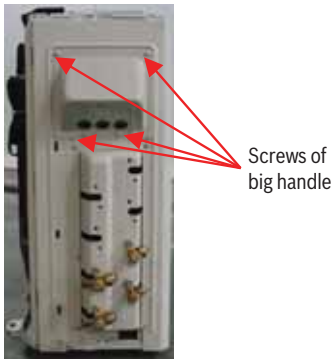


Figure 87

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

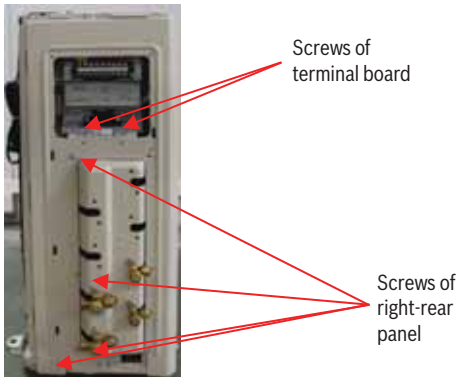


Figure 88

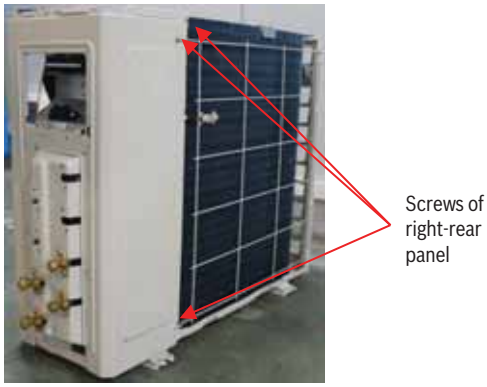


Figure 89

9.1.3 Removing the electrical parts

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

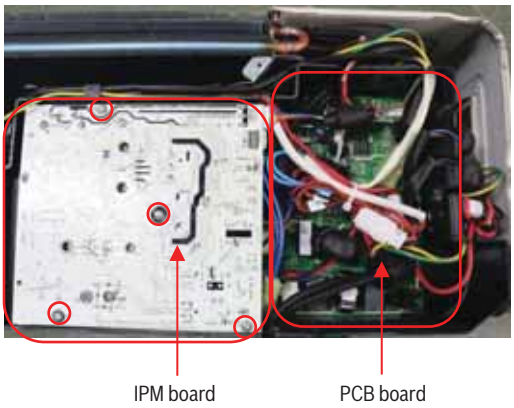


Figure 90

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

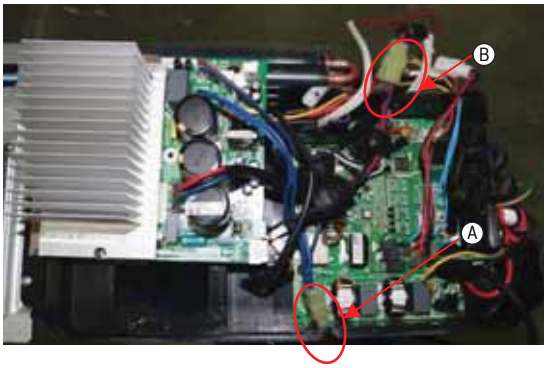


Figure 91

4. Disconnect connectors as shown in Figure 94.

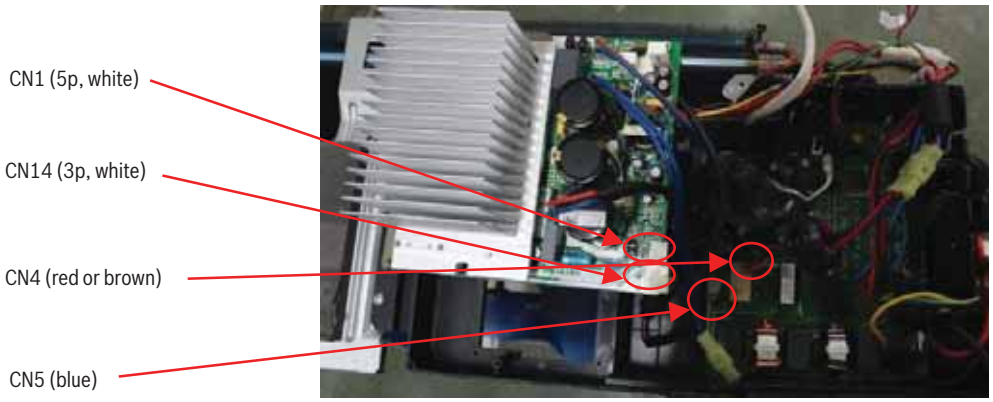


Figure 92

5. Remove the IPM board.

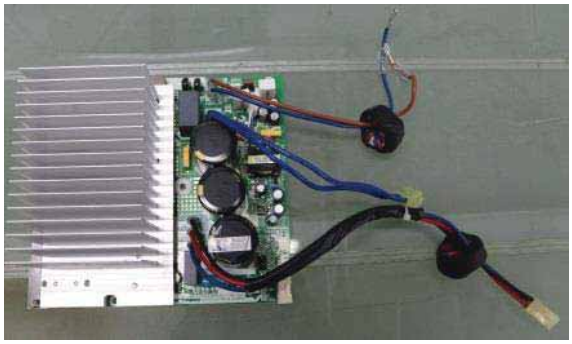


Figure 93

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)

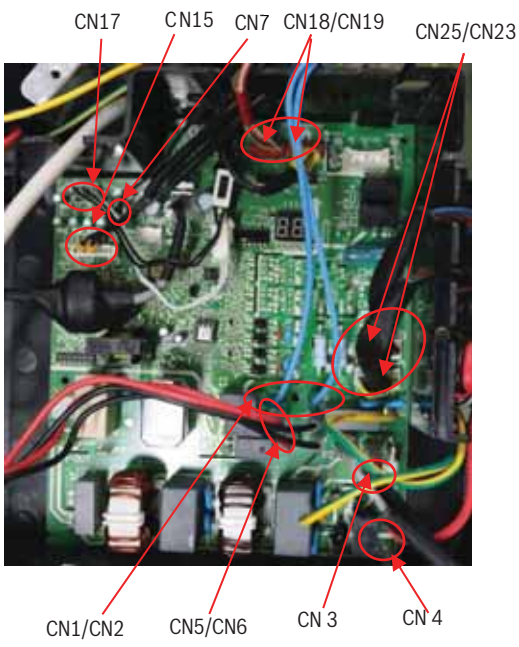


Figure 94

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

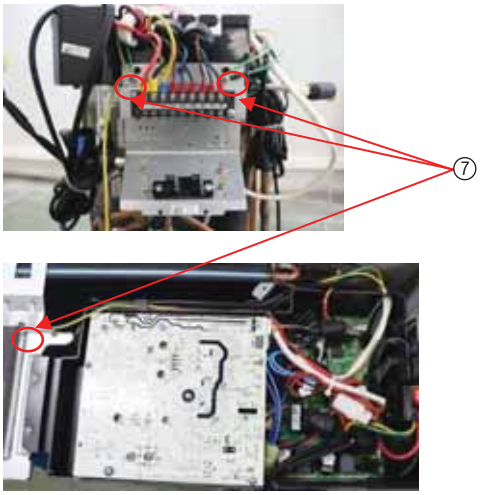


Figure 95

8. Remove PCB and replace as needed.

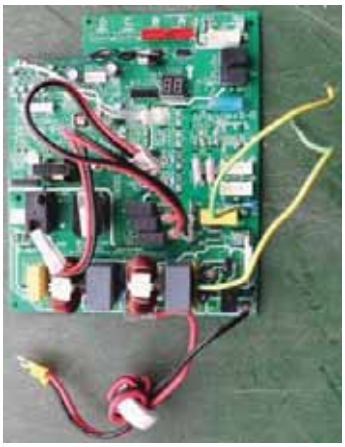


Figure 96

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.

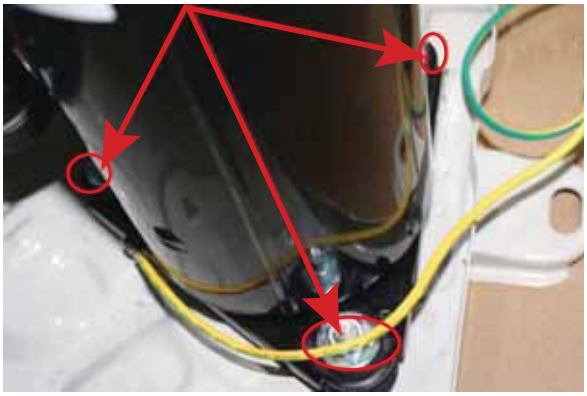


Figure 98

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).

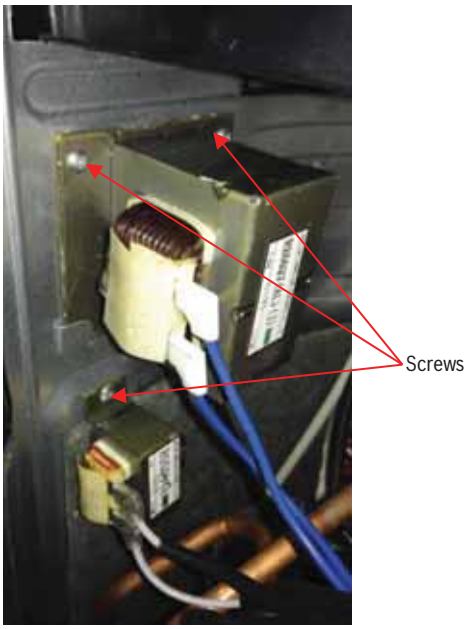


Figure 100

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.

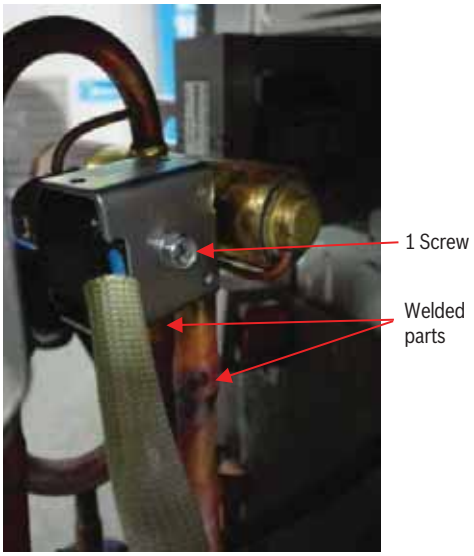


Figure 101

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.

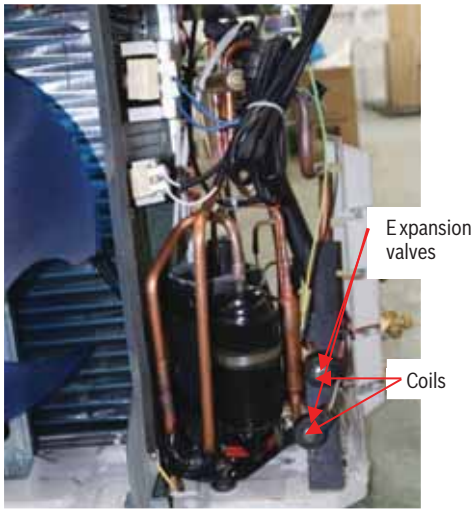


Figure 102

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).

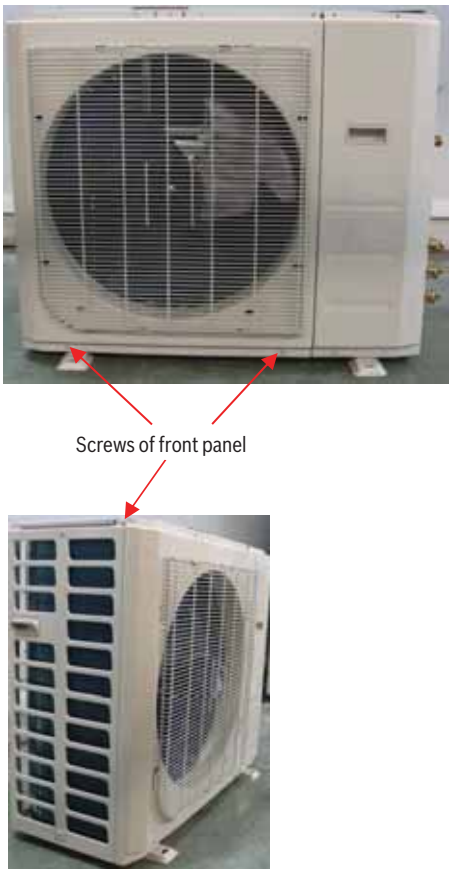


Figure 106

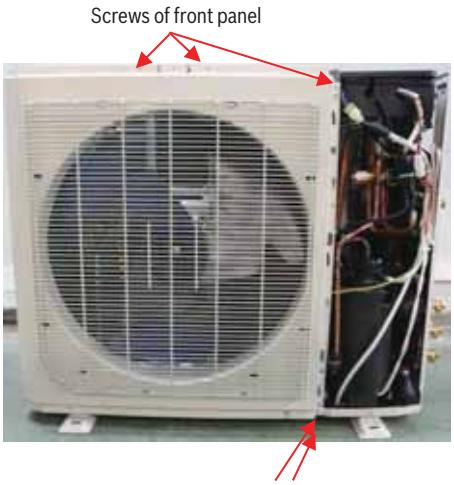


Figure 107

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

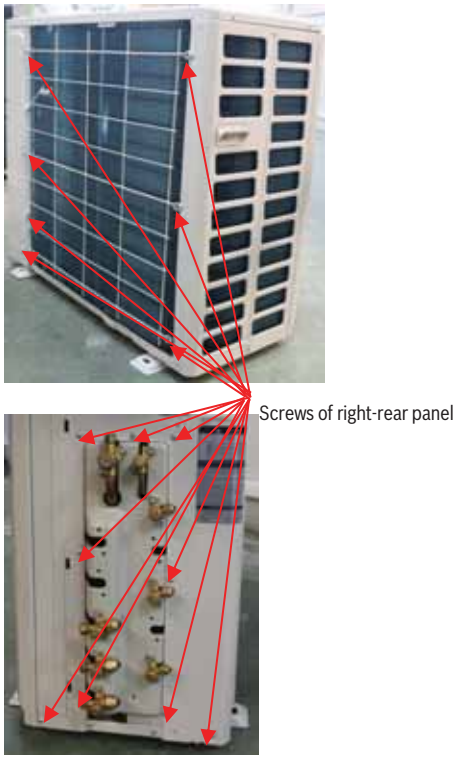


Figure 108

7. Remove the terminal board (2 screws).

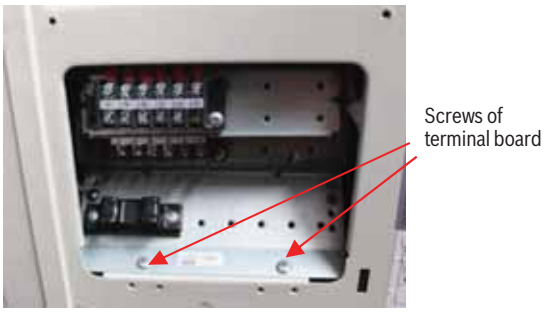


Figure 109

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.

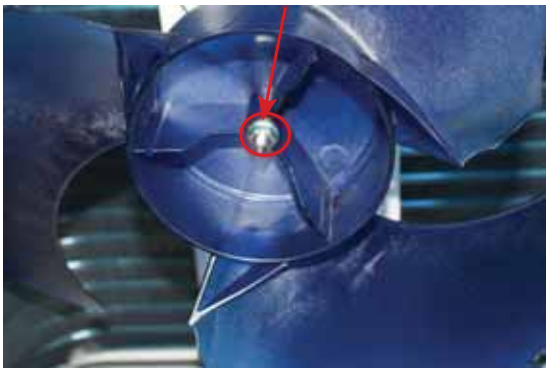


Figure 110

3. Remove the cover of electrical control box cover.

Figure 111

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

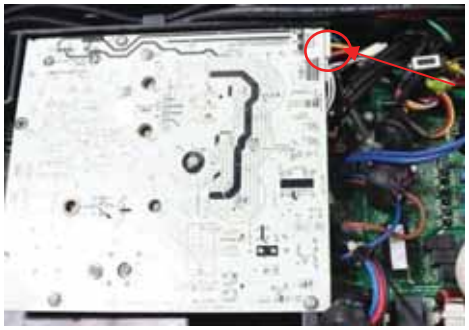


Figure 112

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

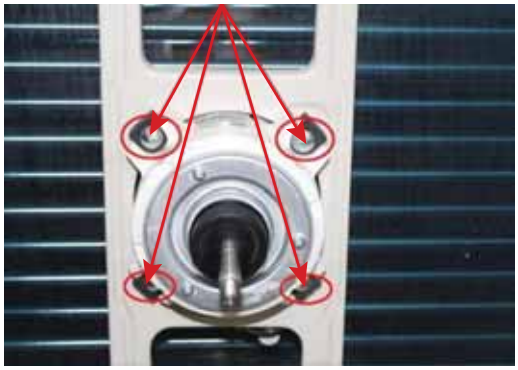


Figure 113

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).

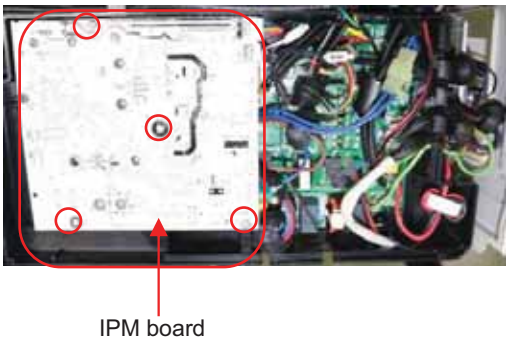


Figure 114

3. Disconnect the connector to reactor from PCB.

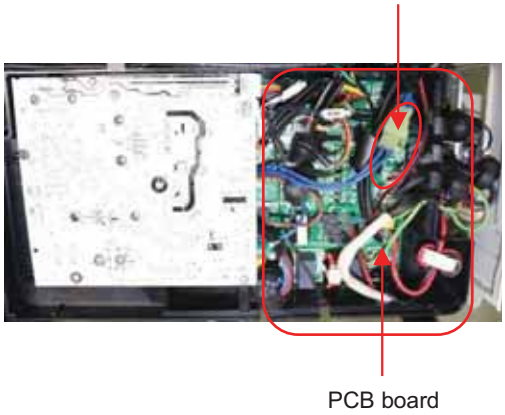


Figure 115

4. Disconnect the compressor wire.

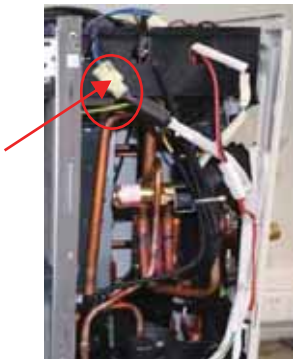


Figure 116

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

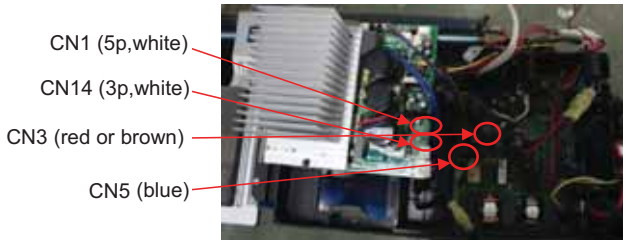


Figure 117

6. Remove the IPM board.

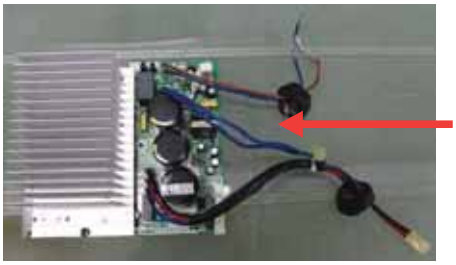


Figure 118

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)

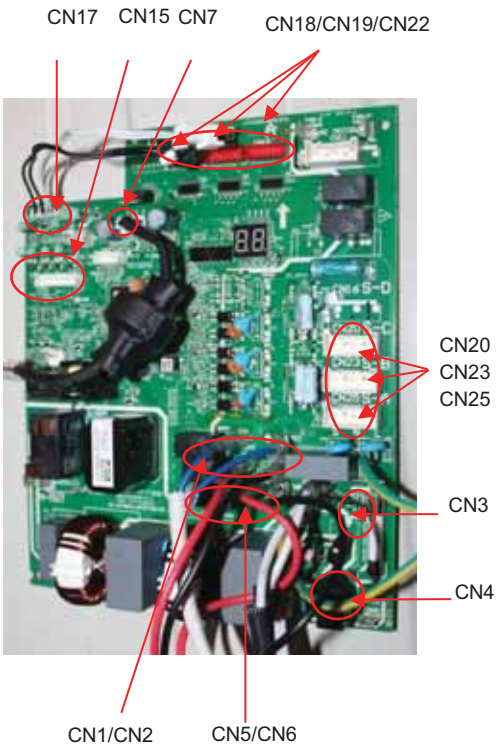


Figure 119

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

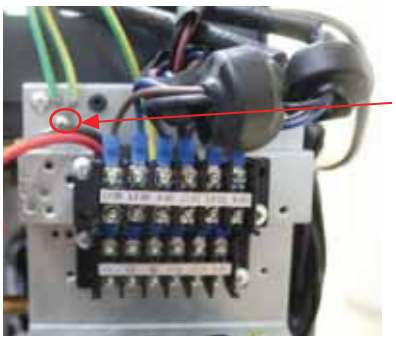


Figure 120

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.

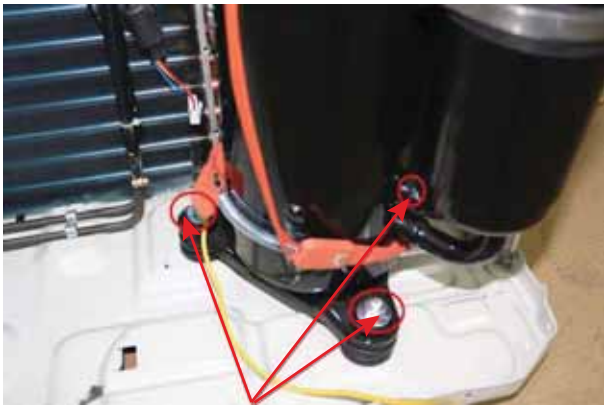


Figure 122

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).

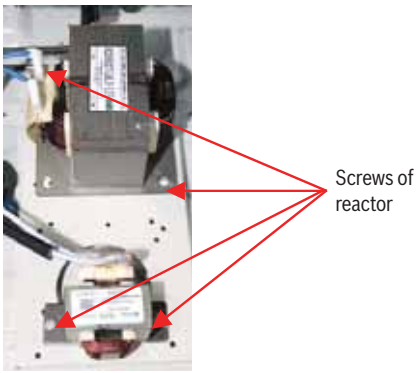


Figure 124

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).

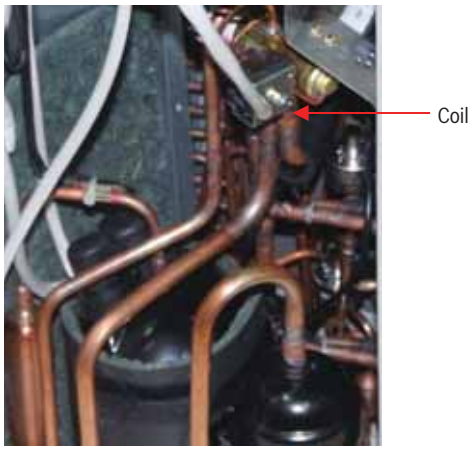


Figure 125

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

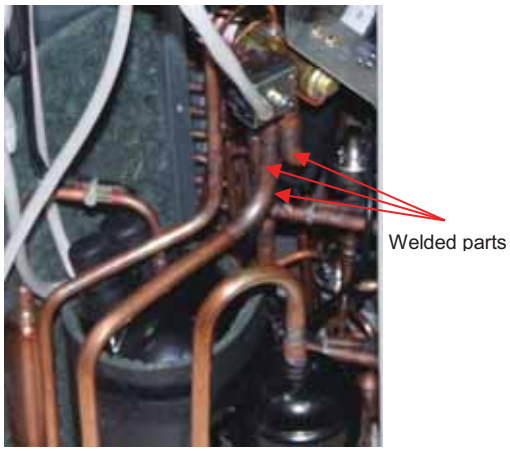


Figure 126

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.

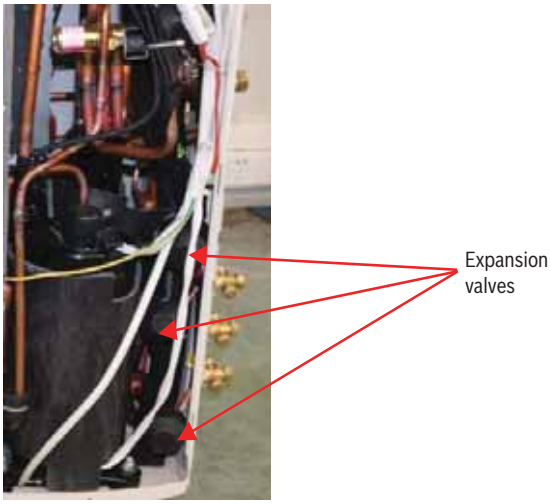


Figure 127

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).

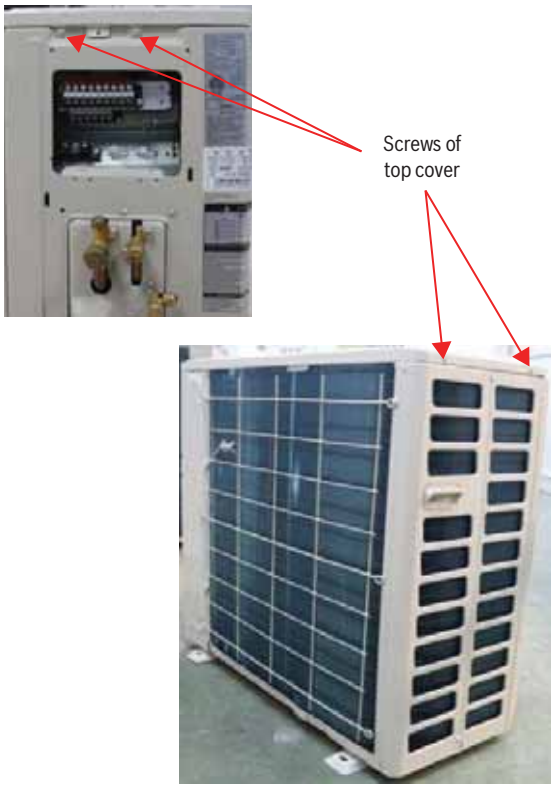


Figure 129

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

Figure 130

5. Remove front panel (8 screws).

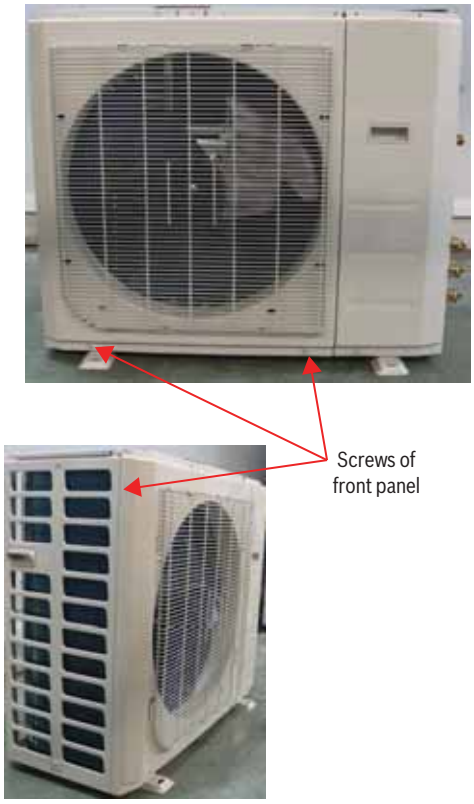


Figure 131

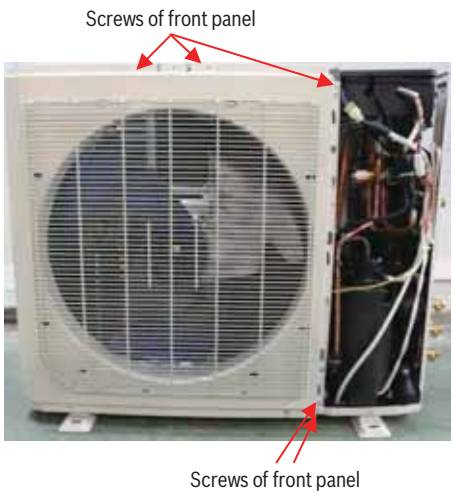


Figure 132

6. Remove terminal board and water collector cover.

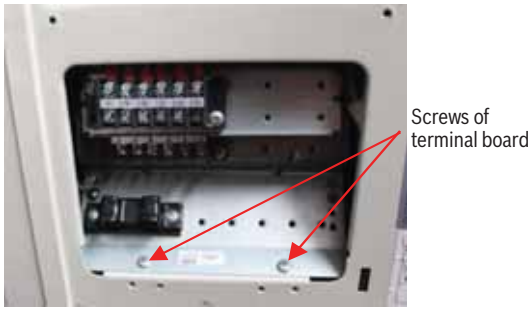


Figure 133

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

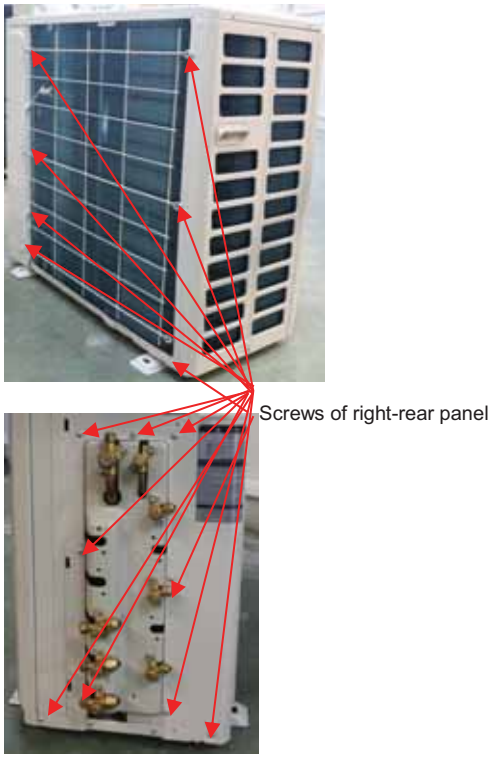


Figure 134

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.

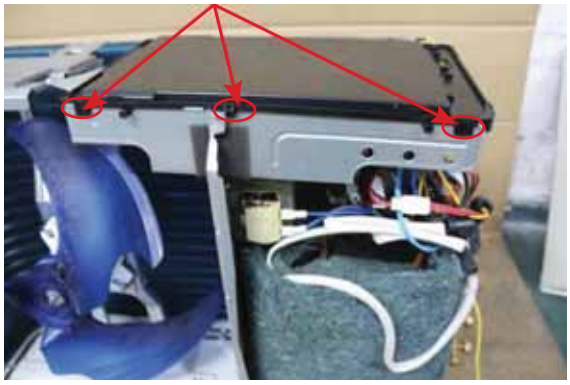


Figure 136

4. Disconnect the fan motor, connector CN19.

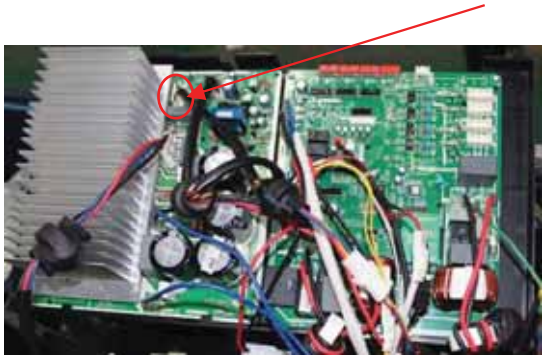


Figure 137

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.

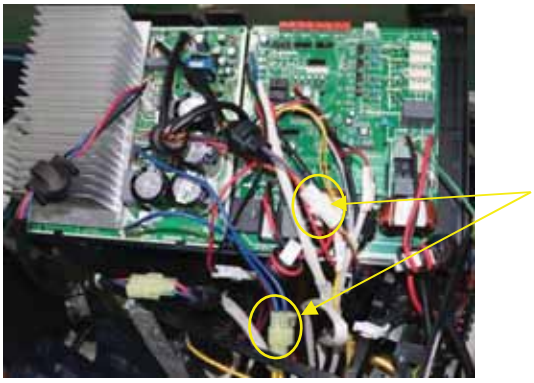


Figure 139

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

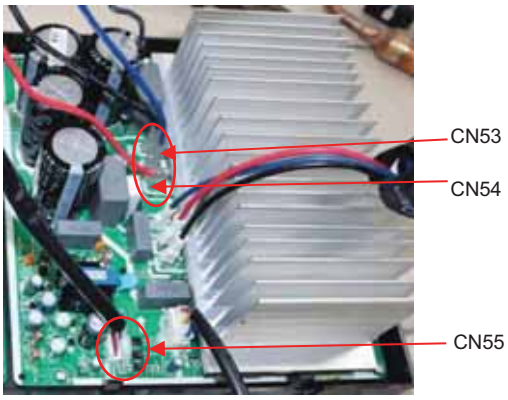


Figure 140

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).

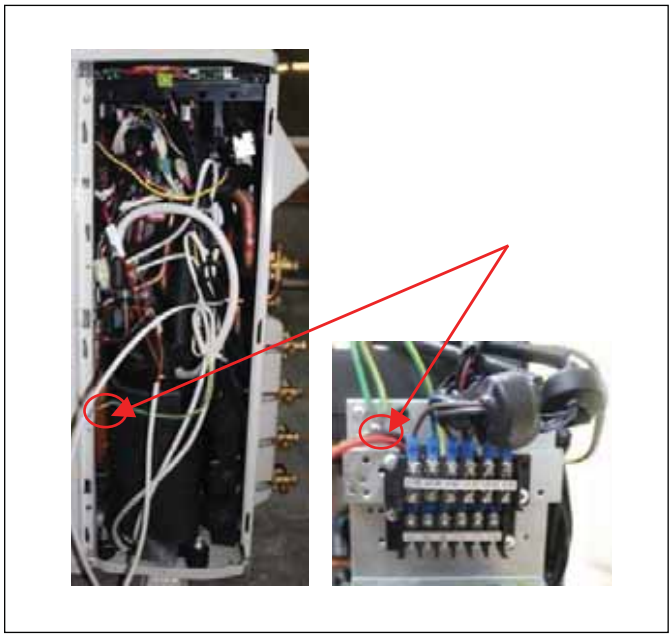


Figure 142

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.

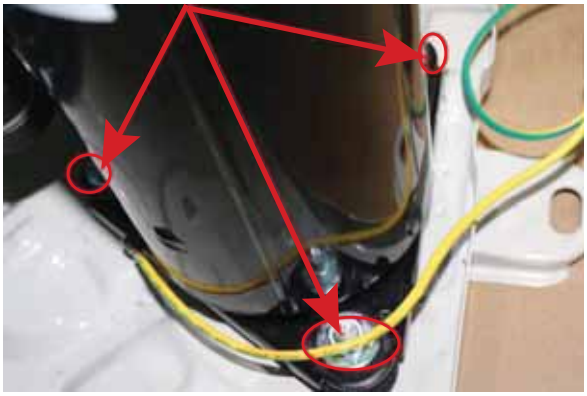


Figure 144

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.

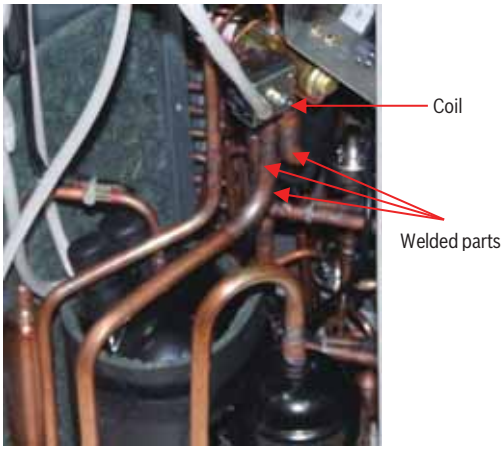


Figure 145

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.

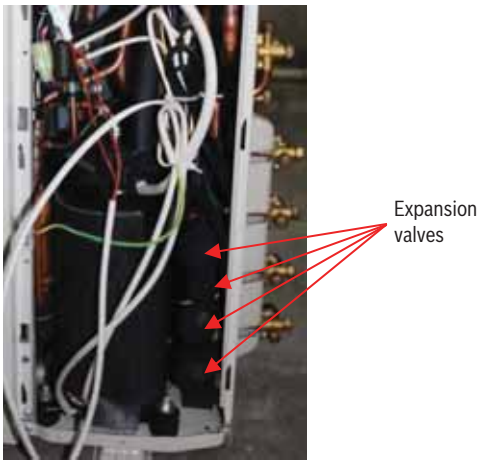


Figure 146

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).

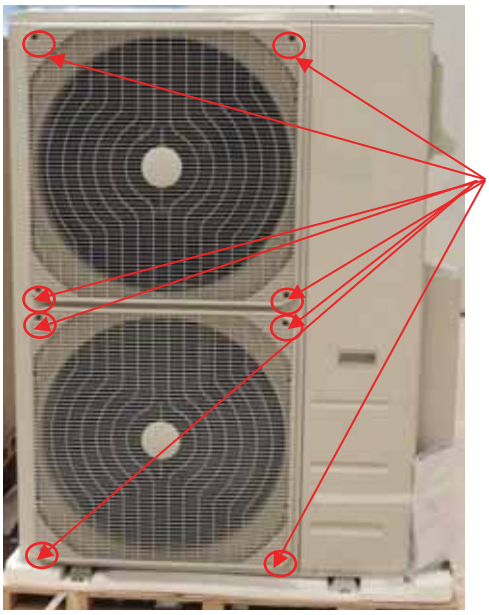


Figure 147

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

Figure 148

4. Remove the top cover (4 screws).

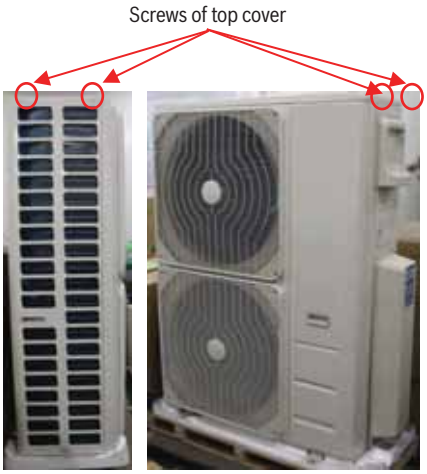


Figure 149

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.

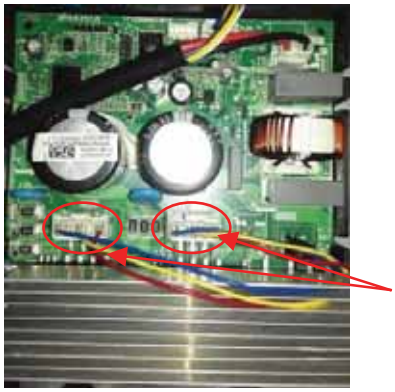


Figure 151

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

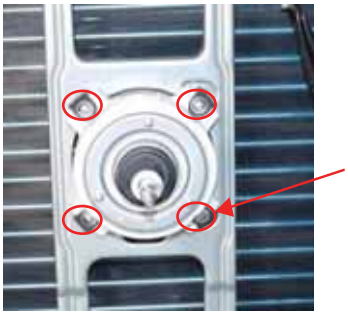


Figure 152

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).

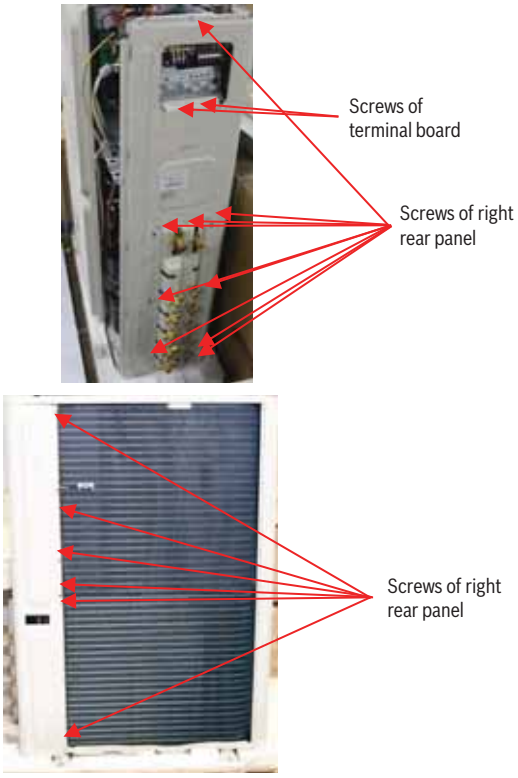


Figure 154

9.4.3 Removing the electrical parts

1. Follow steps outlined in Section 9.4.2.

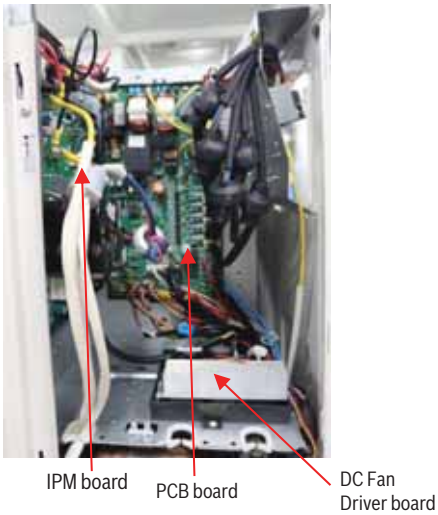


Figure 155

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

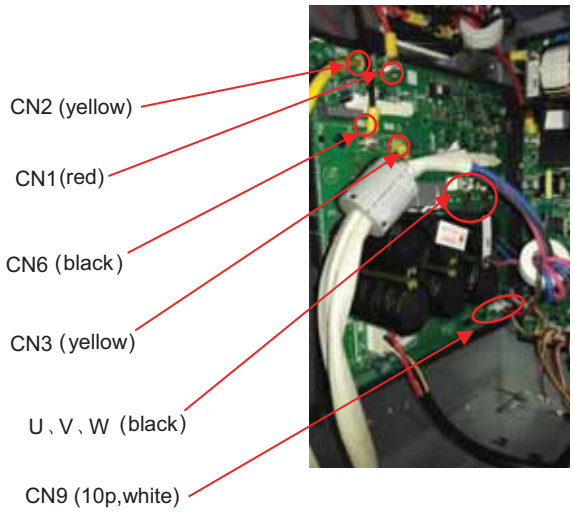


Figure 157

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)

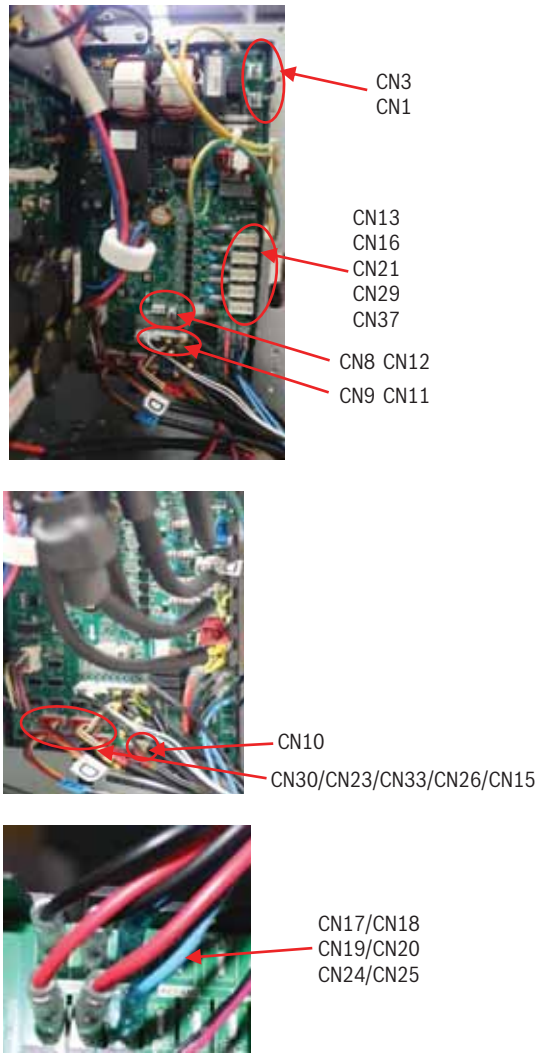


Figure 158

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

Figure 159

7. Remove PCB.

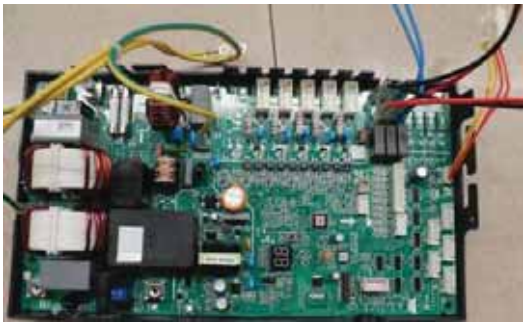


Figure 160

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.

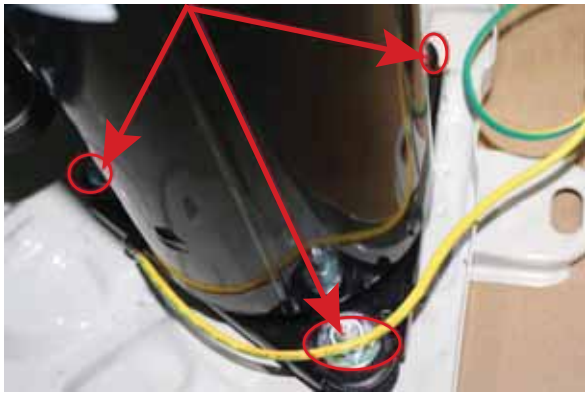


Figure 162

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.

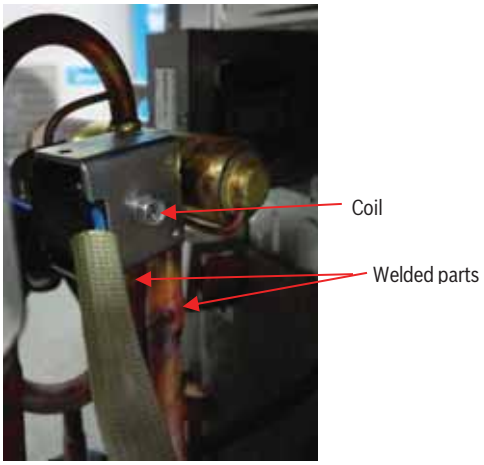


Figure 163

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.

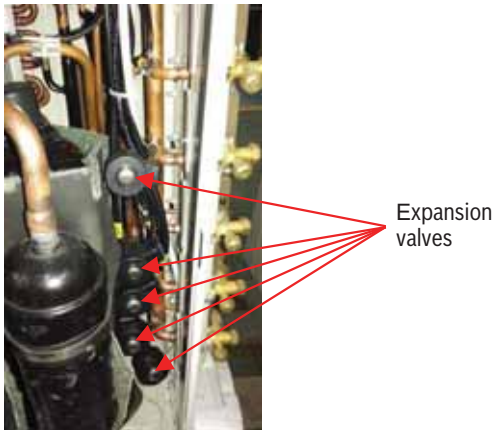


Figure 164

United States and Canada

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