38MG(R/H)B
Multi-zone Outdoor Unit Ductless System
Sizes 18R, 24HH, 30HH, 36R, 36HH, 48R and 48HH

SERVICE MANUAL

TABLE of CONTENTS

SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment. Untrained personnel can perform basic maintenance functions such as coil cleaning. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep a quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment.

Read this manual thoroughly and follow all warnings or cautions included in the literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements. Recognize safety information.

This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: **DANGER**, **WARNING**, and **CAUTION**.

These words are used with the safety-alert symbol. **DANGER** identifies the most serious hazards which **will** result in severe personal injury or death. **WARNING** signifies hazards which **could** result in personal injury or death. **CAUTION** is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. **NOTE** is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death. Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch.

Lock out and tag switch with a suitable warning label.

⚠ WARNING

EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury, and/or property damage. Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation. Do not bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units. If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during extended periods of system shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

INTRODUCTION

This service manual provides the necessary information to service, repair, and maintain the multi-zone family of heat pumps. This manual has an appendix with data required to perform troubleshooting. see “APPENDICES” on page 73 Use the “TABLE of CONTENTS” on page 1 to locate a desired topic.

MODEL / SERIAL NUMBER NOMENCLATURES

Table 1 — Unit Sizes

SYSTEM TONS	kBTUh	VOLTAGE - PHASE	OUTDOOR MODEL
1.5	18	208/230-1	38MGRBQ18B--3
2	24	208/230-1	38MGRBQ24C--3
2.5	30	208/230-1	38MGRBQ30D--3
3	36	208/230-1	38MGRBQ36D--3
4	48	208/230-1	38MGRBQ48E--3

OUTDOOR UNIT

38 MG R Q B 18 B A 3

38 = OUTDOOR UNIT

MG = ALL

UNIT TYPE
R = STANDARD/REGULAR HEAT
H = HIGH HEAT

SYSTEM TYPE
Q = OUTDOOR UNIT

B = REVISION LEVEL

NOMINAL CAPACITY
18 - 1 1/2 TONS
24 - 2 TONS
30 - 2 1/2 TONS
36 - 3 TONS
48 - 4 TONS

VOLTAGE
3 = 208/230-1-60

VARIATION
A = STANDARD

MAXIMUM NUMBER OF FAN COIL UNITS TH
CAN BE CONNECTED TO THE OUTDOOR U
B = 1:2
C = 1:3
D = 1:4
E = 1:5

15 22 V 10001

Week of Manufacture

Year of Manufacture

V = ALL MODELS

Sequential Serial Number

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

CONNECTION DIAGRAMS

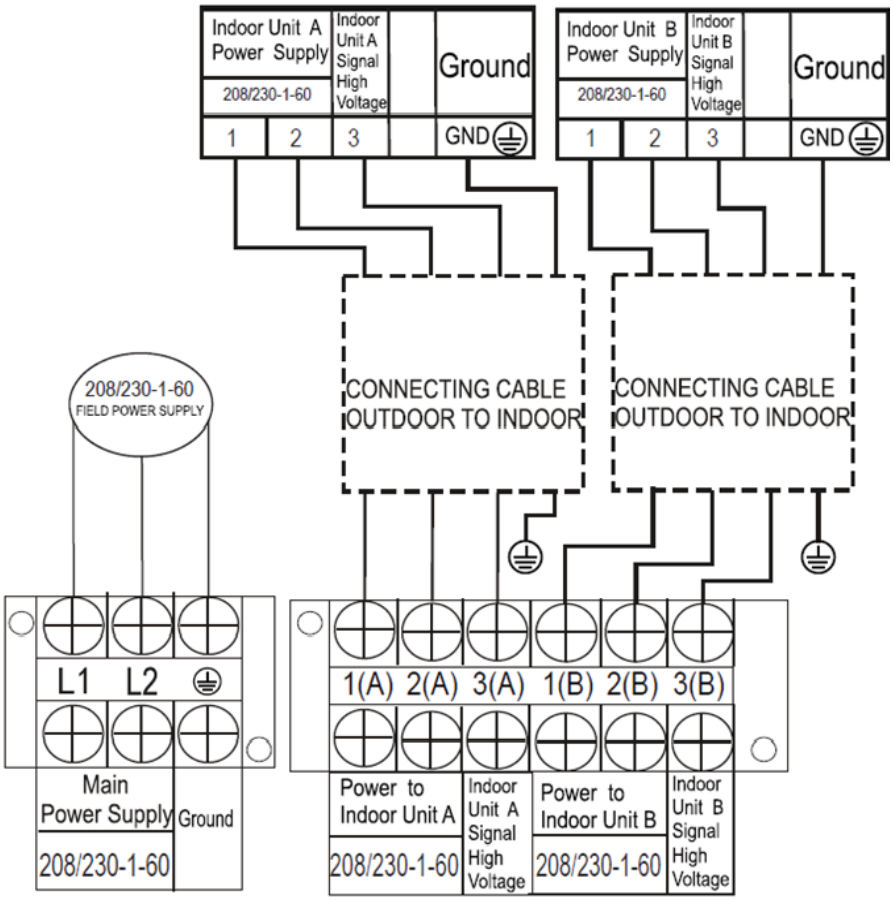


Fig. 1 — Size 18K 2 Zone (18R)

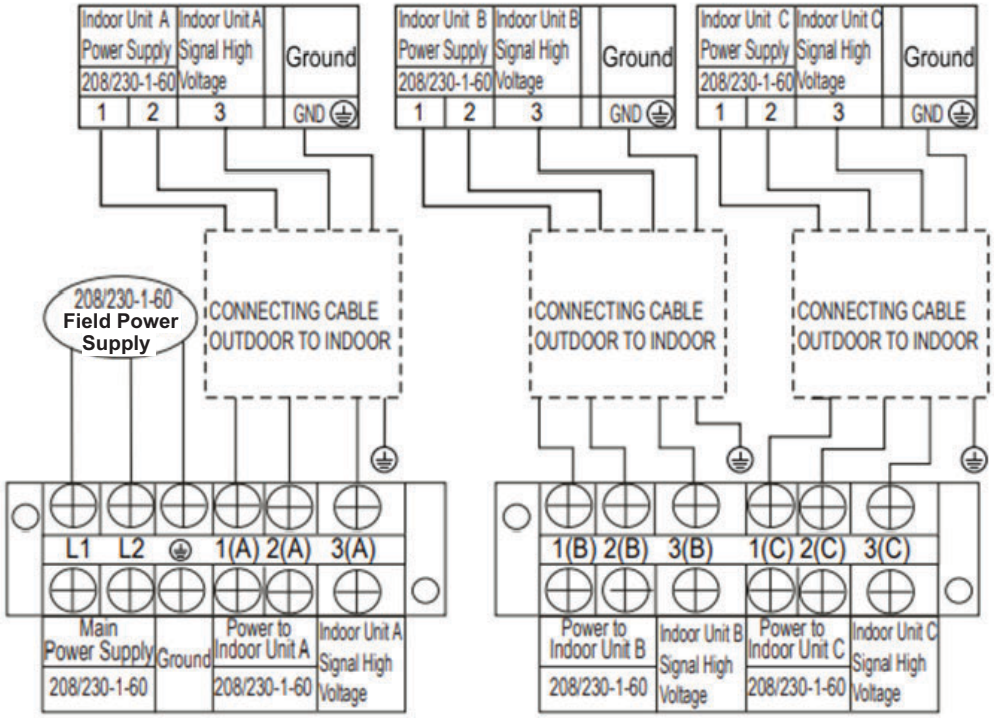


Fig. 2 — Size 24K 3 Zone (24R)

CONNECTION DIAGRAMS (CONT)

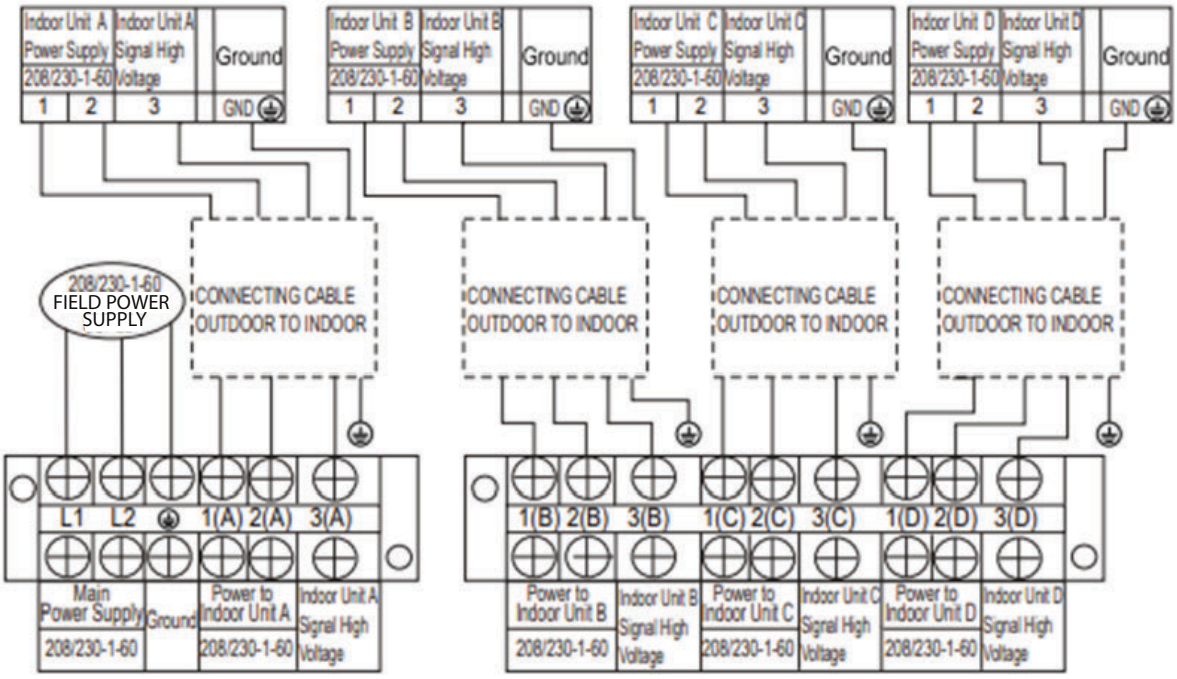


Fig. 3 — Size 30K (30R) and 36K 4 Zone

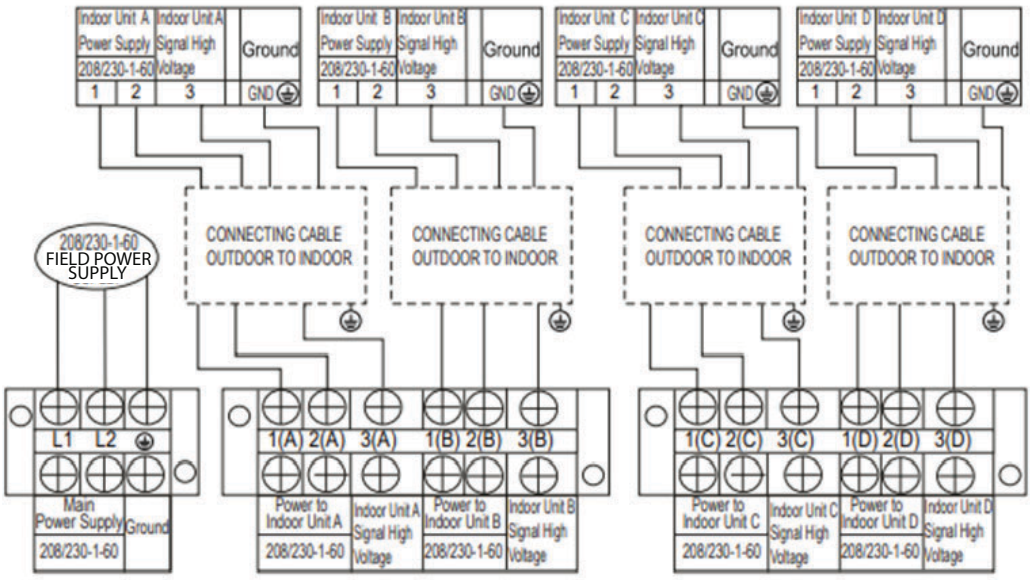


Fig. 4 — Size 36K High Heat 4 Zone

CONNECTION DIAGRAMS (CONT)

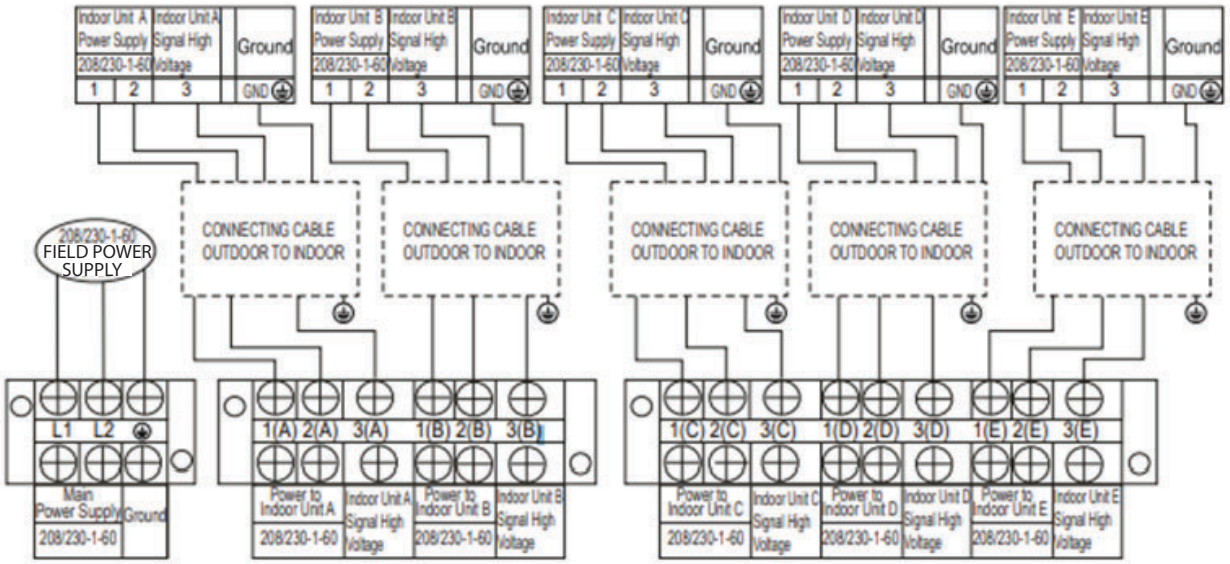


Fig. 5 — Size 48K (48R) 5 Zone

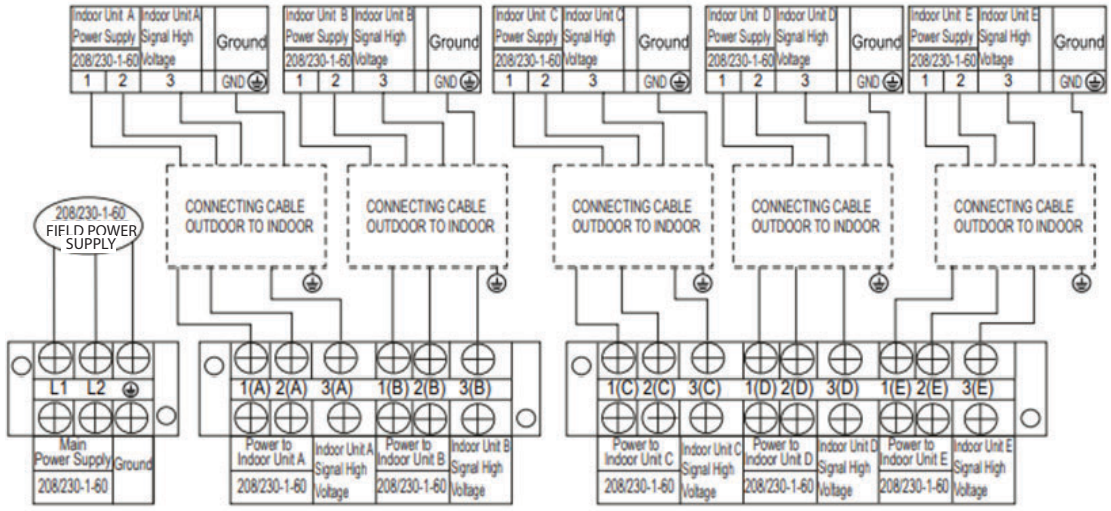


Fig. 6 — Size 48K High Heat 5 Zone

AUTOMATIC WIRING/PIPING CORRECTION

The unit is capable of automatically correcting a wiring/piping error. Indoor units do not have to be in the run mode. The outdoor temperature should be above 41°F (5°C) to use this feature. Press **CHECK** on the outdoor unit PCB board for 6 seconds until the display shows “CE” (“FA” may appear first – continue to press **CHECK**).

The outdoor unit takes control of the indoor units and adjust fan speed(s) according to the program. Setpoint display (if available) will be “76” and outdoor unit will start the compressor and fan to dispense refrigerant to the indoor heads to determine piping setup versus physical wiring.

When the controller has adjusted control so that each indoor unit is synced to its piping port (approximately 5-10 minutes, depending on temperature, unit size, etc.), “CE” is replaced with “00” on the display and the control program terminates.

NOTE: The indoor units will not automatically release from the “76” setting or return to previous control. Use the indoor units’ remote controllers to restore them to normal function.

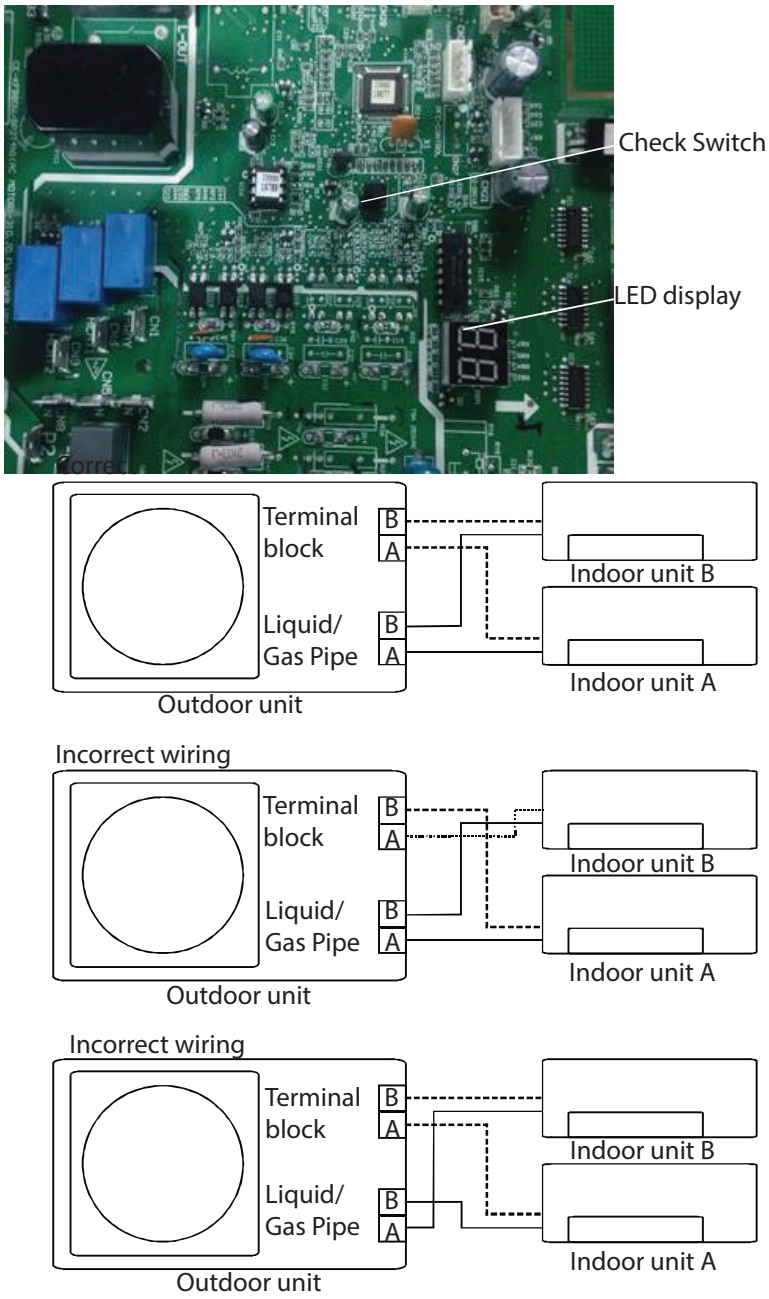


Fig. 7 — Automatic Wiring/Piping Correction

WIRING DIAGRAMS
Size 18K (18R)

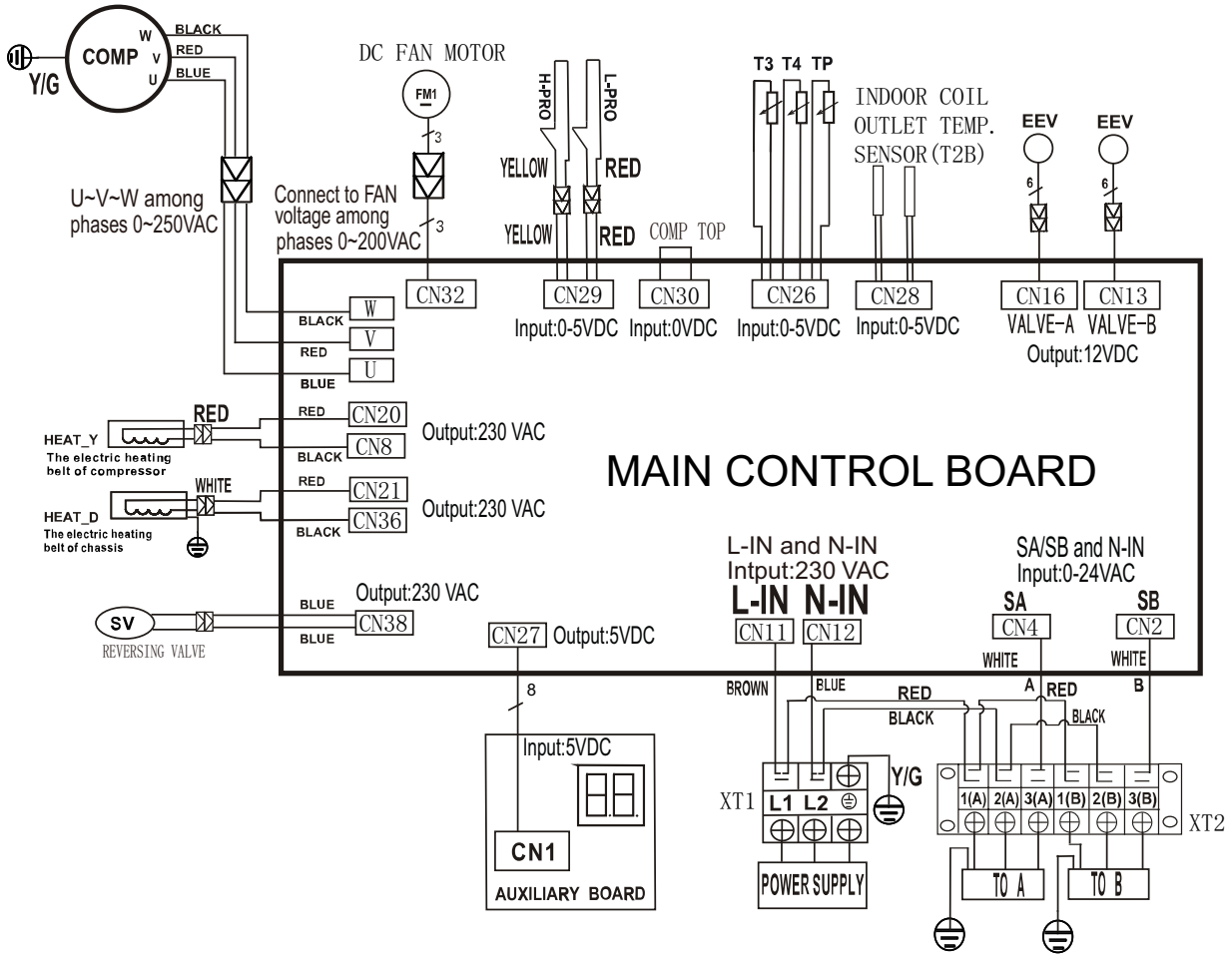


Fig. 8 — Wiring Diagram Size 18K (18R) - 2 Zone

Table 2 — Wiring Diagram Size 18K (18R) - 2 Zone Max Codes

CODE	PART NAME
COMP	Compressor
EEV	Electric Expansion Valve
FM1	DC Fan Motor
HEAT_D	Chassis Heater
HEAT_Y	Crankcase Heater
H-PRO	High Pressure Switch
L-PRO	Low Pressure Switch
SV	Reversing Valve
TP	Comp. Discharge Temperature Sensor
T3	Outdoor Coil Temperature Sensor
T4	Outdoor Ambient Temperature Sensor
COMP TOP	Compressor TOP OLP Temperature Sensor

WIRING DIAGRAMS (CONT)

Size 24K (24R)

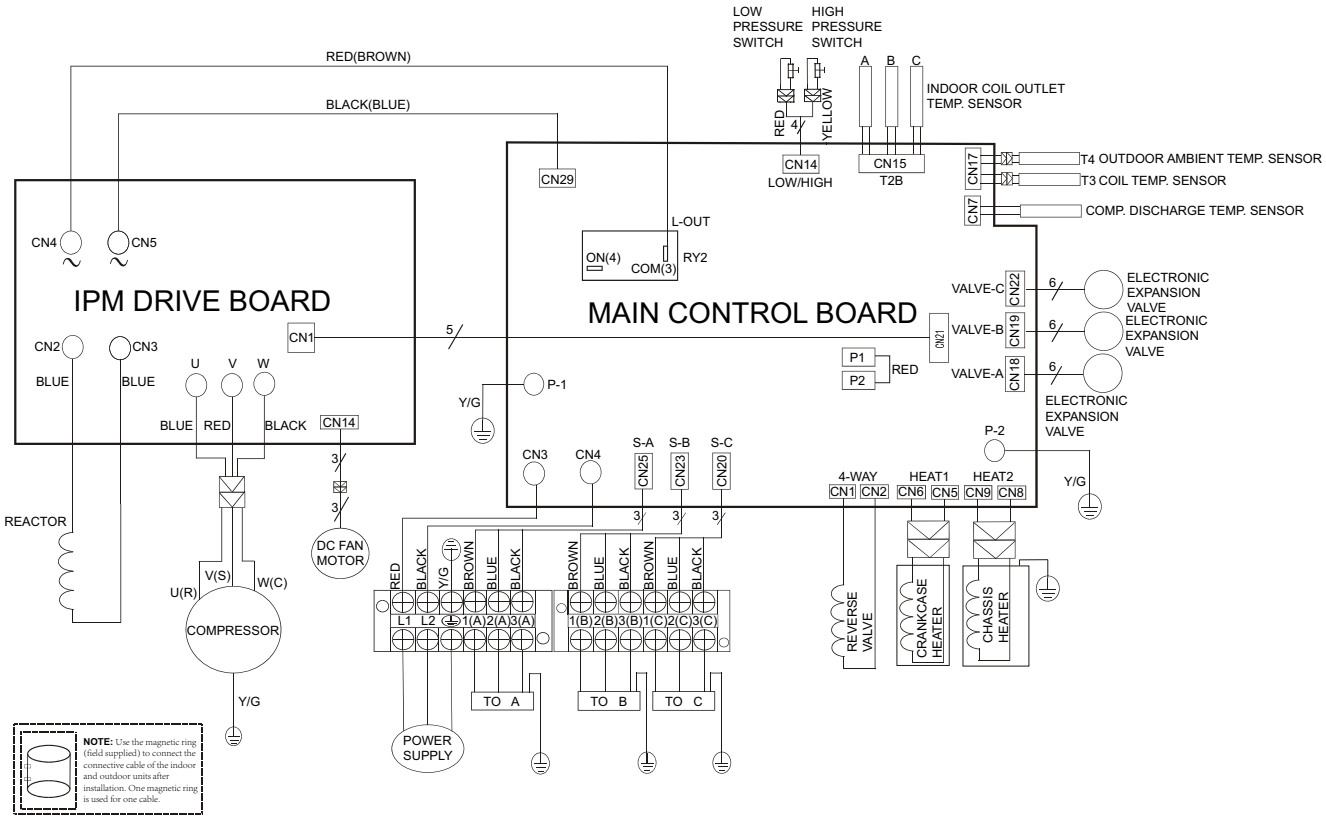


Fig. 9 — Wiring Diagram Size 24K (24R) - 3 Zone Max High Heat

Table 3 — Wiring Diagram Size 24K (24R) - 3 Zone Max Codes

CODE	PART NAME
CN3~CN4	Input: 230VAC High voltage
CN20,CN23,CN25	Output: Pin1 (Connection of the high voltage)---“S” Pin2~Pin3 (230VAC High voltage)---”L1&L2”
P1~P2	Output: Short Circuit with Red Wire
CN1~CN2	Output: 230VAC High voltage --- 4 Way Valve
CN5~CN6	Output: 230VAC High voltage --- Compressor Crankcase Heater
CN8~CN9	Output: 230VAC High voltage --- Chassis Crankcase Heater
P-1~P-2	Connection to the earth
CN18,CN19,CN22	Output: Pin1-Pin4: Pulse waveform (0-12VDC), Pin5, Pin6 (12VDC)---EEV
CN7	Input: Pin1 (0-5VDC), Pin2 (5VDC) --- Discharge Sensor
CN17	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0-5VDC)-OUD Conditioner Temperature
CN15	Input: Pin1, Pin3, Pin5 (5VDC) Pin2, Pin4, Pin6 (0-5VDC) --- IDU Pipe Temp
CN14	Input: Pin2, Pin4 (0VDC), Pin1, Pin3 (0-5VDC) --- H/L Pressure Switch
CN12	Input: Pin1 (5VDC), Pin2 (0-5VDC) --- Compressor Temp
CN29~L-OUT	Output: 230VAC High voltage to IPM Board
CN21	Connect to the IPM BOARD

CODE	OUTDOOR UNIT IPM DRIVE BOARD
CN4~CN5	Input: 230VAC High voltage - from main board
CN2~CN3	Output: Connection of the REACTOR
U~V~W	Connect to compressor voltage among phases 0~200VAC
CN14	Connect to the DC FAN
CN1	Connect to the MAIN BOARD

WIRING DIAGRAMS (CONT)
Size 30K HH, 36K (36R)

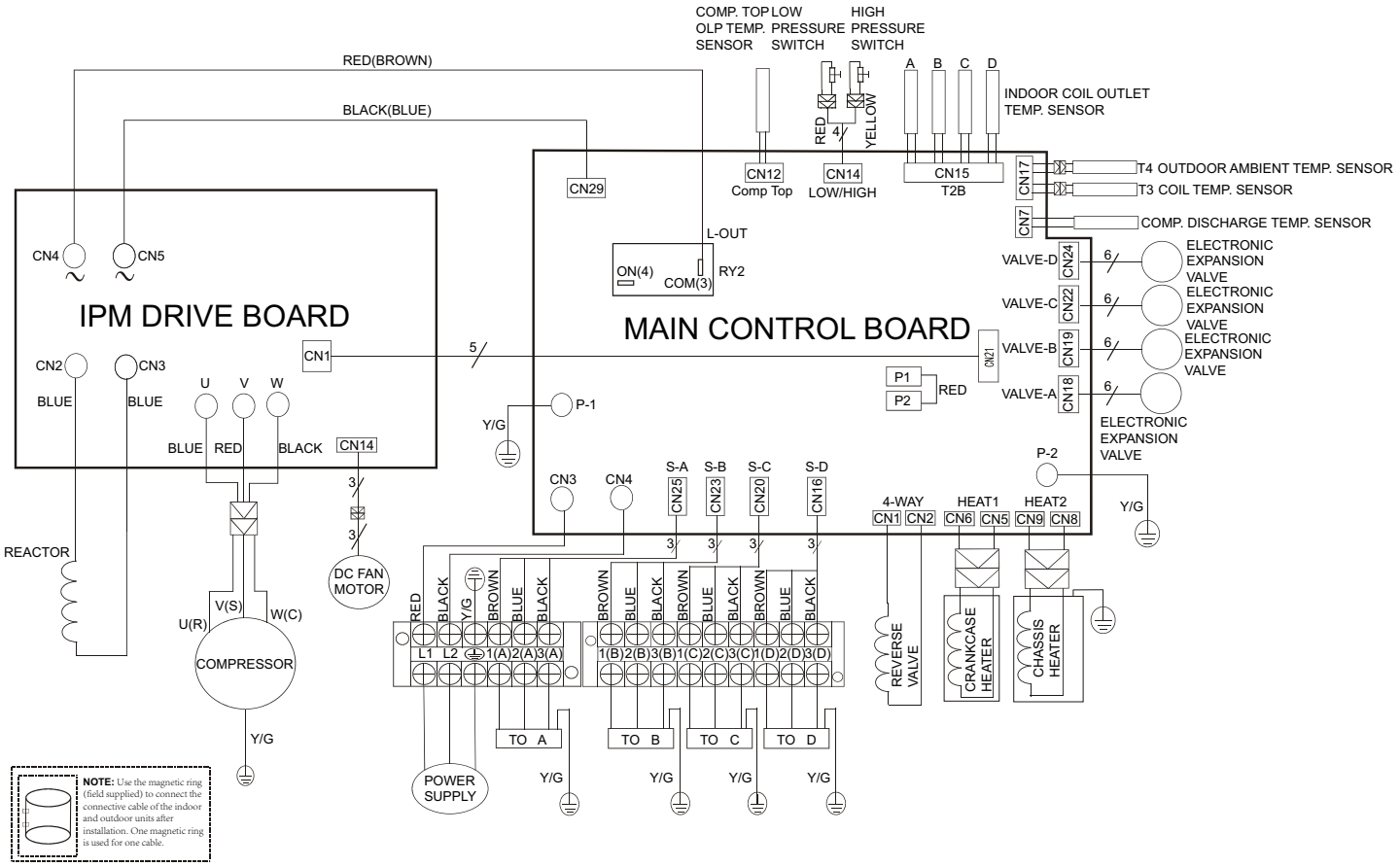


Fig. 10 — Wiring Diagram Size 30 HH (High Heat) 36K (36R) - 4 Zone Max

Table 4 — Wiring Diagram Size 30 HH (High Heat) (36R) 4 Zone Max Codes

CODE	PART NAME
CN3~CN4	Input: 230VAC High voltage
CN16~CN20 CN23, CN25	Output: Pin1(Connection of the high voltage)---"S" Pin2~Pin3(230VAC High Voltage)---"L1&L2"
P-1~P2	Output: Short Circuit with RED WIRE
CN1~CN2	Output: 230VAC High voltage---4-WAY VALUE
CN5~CN6	Output: 230VAC High voltage -- COMPRESSOR CRANKCASE HEATER
CN8~CN9	Output: 230VAC High voltage -- CHASIS CRANKCASE HEATER
P-1~P-2	Connection to the earth
CN18,CN19, CN22,CN24	Output: Pin-Pin4:Pulse waveform (0-12VDC),Pin5,Pin6(12VDC)--EEV
CN7	Input: Pin1 (0-5VDC)---Discharge Sensor
CN17	Input:Pin3,Pin4(5VDC),Pin5(0-5VDC)---OUD Cond. Temperature
CN15	Input:Pin1,Pin3,Pin5,Pin7(5VDC)Pin2,Pin4,Pin6Pin8,(0-5VDC)---IDO PIPE TEMOP
CN14	Input:Pin2,Pin4(0-5VDC,Pin1,Pin3(0VDC)---H/L Pressure Switch
CN12	Input:Pin1(5VDC),Pin2(0-5VDC)---Compressor Temp.
CN29-L-OUT	Output:230VAC High Voltage--To IPM Board
CN21	Connect to IPM Board

CODE	OUTDOOR UNIT PFC AND IPM BOARD
CN4~CN5	Input: 230VAC High voltage---From Main Board
CN2~CN3	Output: Connection to the REACTOR
U~V~W	Connect to compressor voltage among phases 0~200VAC
CN14	Connection the DC FAN
CN1	Connection to MAIN BOARD

WIRING DIAGRAMS (CONT)
Size 36K HH

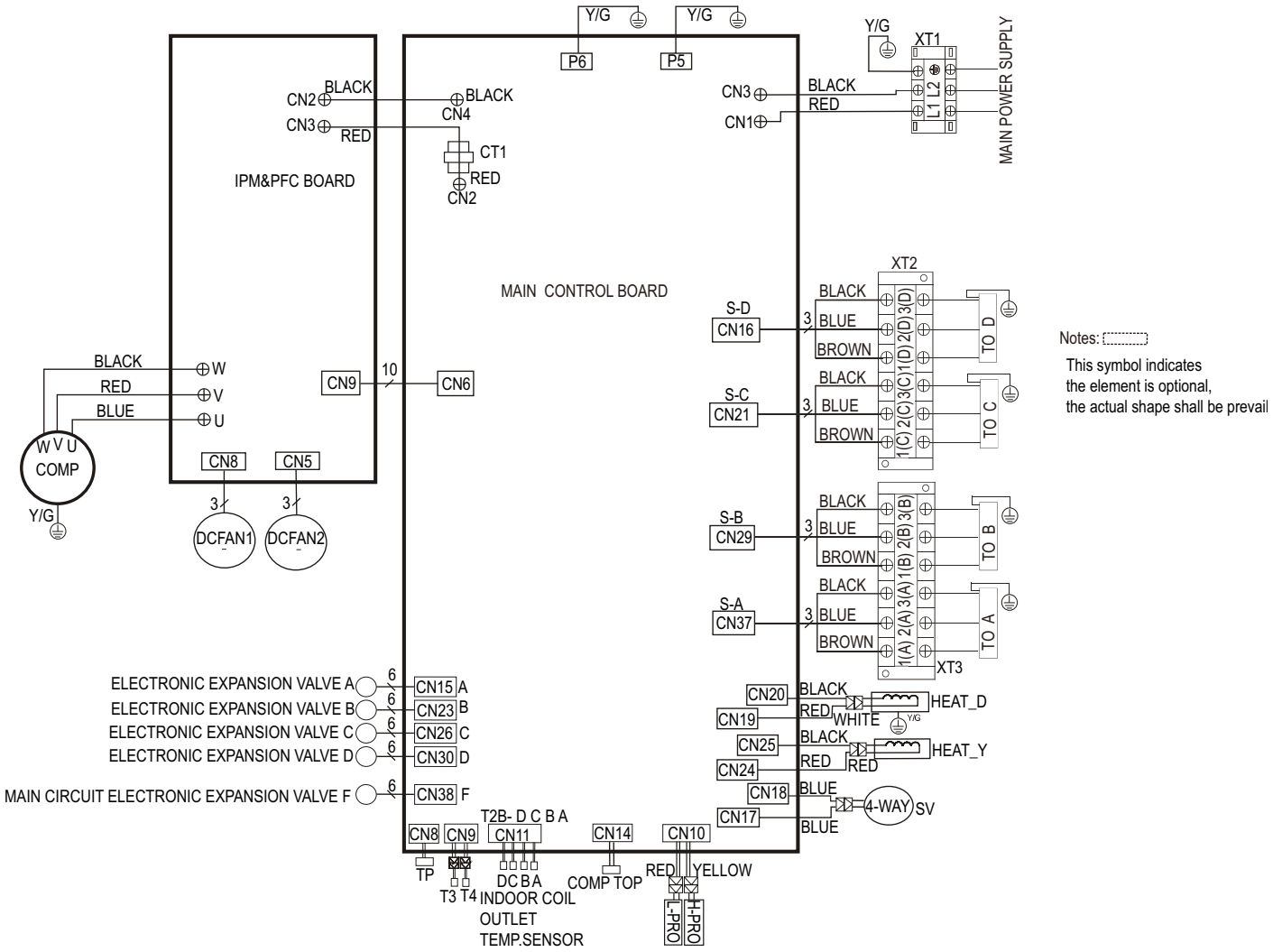


Fig. 11 — Wiring Diagram Size 36K HH - 4 Zone Max

NOTE: Electronic Expansion Valve E is only available on the 48K - 5 Zone Max (See Fig. 12 — on page 12).

WIRING DIAGRAMS (CONT)
Size 36K HH

Table 5 — 36K HH - 4 Zone Max

CODE	OUTDOOR UNIT MAIN BOARD SIZE 36K
CN1~ CN3	Input: 230VAC High voltage
CN16, CN21, CN29, CN37	Output: Pin1(Connection of the high voltage) “S” Pin2~ Pin3 (230VAC High voltage)“L1& L2”
P5, P6	Connection to the earth
CN17~ CN18	Output: 230VAC High voltage --- REVERSING VALVE
CN24~CN25	Output: 230VAC High voltage --- CRANKCASE HEATER
CN19~ CN20	Output: 230VAC High voltage --- CHASSIS HEATER
CN11	Input: Pin1, Pin3, Pin5, Pin7, Pin9 (5VDC) Pin2, Pin4, Pin6, Pin8, Pin10 (0-5VDC) indoor coil outlet temp. sensor
CN8	Input: Pin1 (0-5VDC), Pin2 (5VDC)
CN9	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0-5VDC)
CN15, CN23, CN26, CN30, CN33, CN38	Output: Pin1-Pin4: Pulse waveform (0-12VDC), Pin5, Pin6 (12VDC) to EEV
CN6	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC) Pin8 (0-5VDC), Pin10 (5VDC)--to IPM & PFC board
CN2~ CN4	Output: 230VAC High voltage to IPM & PFC Board
CN10	Input: Pin2, Pin4 (0VDC), Pin1, Pin3 (0-5VDC)--H/L Pressure switch
CN14	Input:Pin1(5VDC),Pin2(0-5VDC--COMP. TOP OLP TEMP SENSOR

Table 6 — 36K HH - 4 Zone Max

CODE	OUTDOOR UNIT PFC AND IPM BOARD SIZE 36K
CN2~CN3	Input230VAC High voltage
CN9	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC), Pin10 (5VDC) to outdoor main control board
U~V~W	Connect to compressor voltage among phases 0~250VAC
CN8, CN5	Connect to DCFAN voltage among phases 0~200VAC

WIRING DIAGRAMS (CONT)

Size 48K

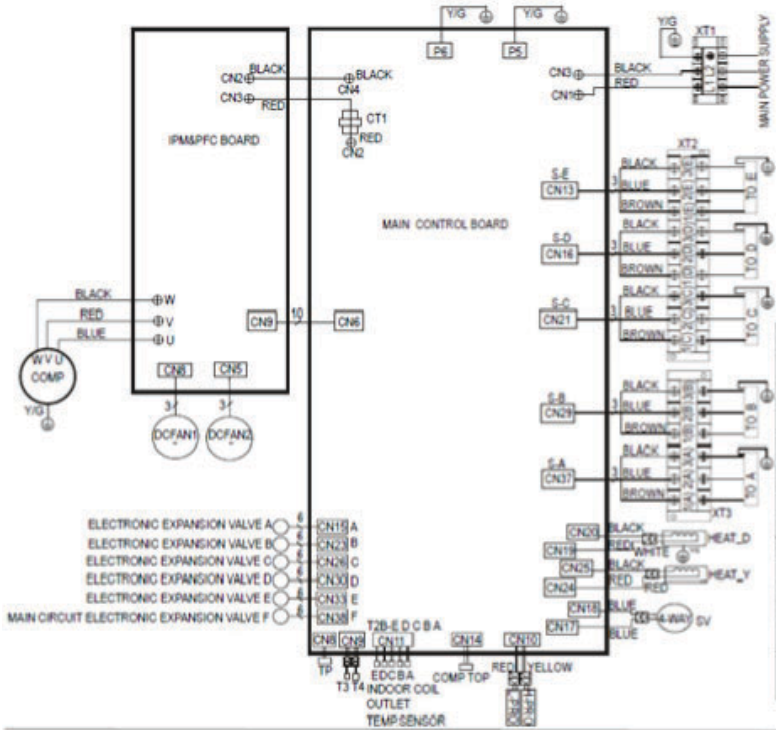


Fig. 12 — Wiring Diagram Size 48K - 5 Zone Max

Table 7 — Wiring Diagram Size 48K - 5 Zone Max

CODE	OUTDOOR UNIT MAIN BOARD SIZE 48K
CN1~CN3	Input: 230VAC High voltage
CN13,CN16,CN21,CN29,CN37	Output: Pin1 (Connection of the high voltage) “S” Pin2~Pin3 (230VAC High voltage) “L1 & L2”
P5,P6,P9	Connection to the earth
CN17~CN18	Output: 230VAC High voltage --- REVERSING VALUE
CN24~CN25	Output: 230VAC High voltage --- CRANKCASE HEATER
CN19~CN20	Output: 230VAC High voltage --- CHASSIS HEATER
CN11	Input: Pin1, Pin3, Pin5, Pin7, Pin9 (5VDC) Pin2, Pin4, Pin6, Pin8, Pin10 (0-5VDC) indoor coil outlet sensor
CN8	Input: Pin1 (0-5VDC), Pin2 (5VDC)
CN9	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0-5VDC)
CN15,CN23,CN26 CN30,CN33,CN38	Output: Pin1-Pin4: Pulse waveform (0-12VDC), Pin5, Pin6 (12VDC) to EEV
CN6	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC) Pin8 (0-5VDC), Pin10 (5VDC)--to IPM & PFC board
CN2~CN4	Output: 230VAC High voltage to IPM & PFC Board
CN10	Input: Pin2, Pin4 (0VDC), Pin1, Pin3 (0-5VDC)--H/L Pressure switch
CN14	Input:Pin1(5VDC),Pin2(0-4VDC)--COMP.TOP OLP TEMP.SENSOR

Table 8 — Wiring Diagram Size 48K - 5 Zone Max

CODE	OUTDOOR UNIT PFC AND IPM BOARD SIZE 48K
CN2~CN6	Output: 224-380VDC High voltage
CN9	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC), Pin8 (0-5VDC), Pin10 (5VDC) to the main board
U~V~W	Connect to compressor voltage among phases 0~250VAC
CN8 CN5	Connect to DC FAN voltage among phases 0-200VAC

WIRING DIAGRAMS (CONT)

Size 48K

Table 9 — Wiring Diagram Size 48K - 5 Zone Max

CODE	PART NAME
COMP	COMPRESSOR
EEV	ELECTRONIC EXPANSION VALVE
DCFAN1 DCFAN2	OUTDOOR DC FAN MOTOR
HEAT_D	CHASSIS HEATER
HEAT_Y	CRANKCASE HEATER
H-PRO	HIGH PRESSURE SWITCH
L-PRO	LOW PRESSURE SWITCH
SV	REVERSING VALVE
TP	COMP. DISCHARGE TEMP. SENSOR
T3	COIL DISCHARGE SENSOR
T4	OUTDOOR AMBIENT TEMP. SENSOR
COMP TOP	COMP.TOP OLP TEMP. SENSOR
T2B	INDOOR COIL OUTLET TEMP SENSOR

WIRING DIAGRAMS (CONT)

Size 48K HH

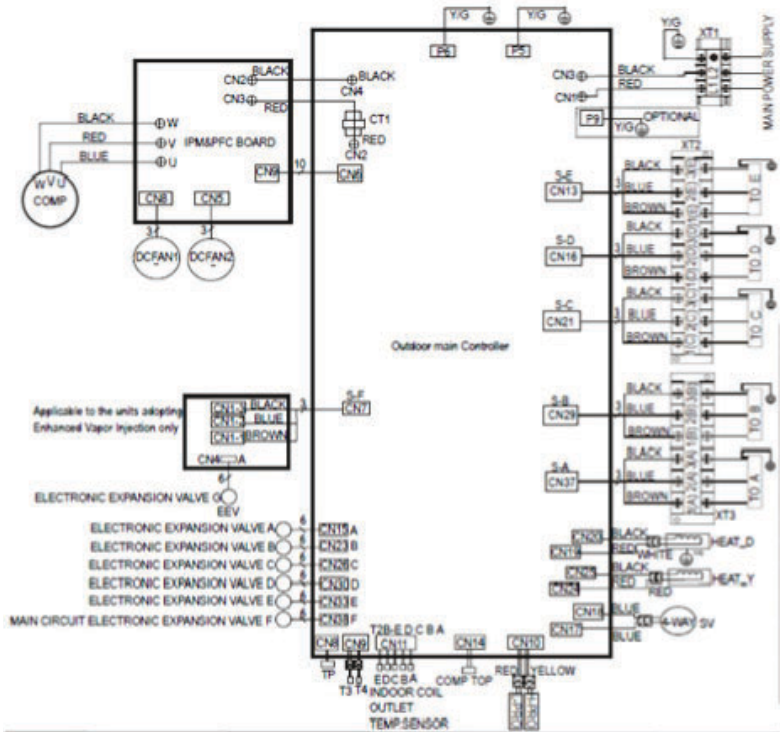


Fig. 13 — Wiring Diagram Size 48K HH - 5 Zone Max

Table 10 — Wiring Diagram Size 48K HH - 5 Zone Max

CODE	OUTDOOR UNIT MAIN BOARD SIZE 48K
CN1~CN3	Input: 230VAC High voltage
CN13,CN16,CN21,CN29,CN37	Output: Pin1 (Connection of the high voltage) “S” Pin2~Pin3 (230VAC High voltage) “L1 & L2”
P5,P6,P9	Connection to the earth
CN17~CN18	Output: 230VAC High voltage --- REVERSING VALUE
CN24~CN25	Output: 230VAC High voltage --- CRANKCASE HEATER
CN19~CN20	Output: 230VAC High voltage --- CHASSIS HEATER
CN11	Input: Pin1, Pin3, Pin5, Pin7, Pin9 (5VDC) Pin2, Pin4, Pin6, Pin8, Pin10 (0-5VDC) indoor coil outlet sensor
CN8	Input: Pin1 (0-5VDC), Pin2 (5VDC)
CN9	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0-5VDC)
CN15,CN23,CN26 CN30,CN33,CN38	Output: Pin1-Pin4: Pulse waveform (0-12VDC), Pin5, Pin6 (12VDC) to EEV
CN6	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC) Pin8 (0-5VDC), Pin10 (5VDC)--to IPM & PFC board
CN2~CN4	Output: 230VAC High voltage to IPM & PFC Board
CN10	Input: Pin2, Pin4 (0VDC), Pin1, Pin3 (0-5VDC)--H/L Pressure switch
CN14	Input:Pin1(5VDC),Pin2(0-4VDC)--COMP.TOP OLP TEMP.SENSOR
CN7	OutputPin1(Connector of the high voltage) “S”Pin2-Pin3(230VAC) High voltage)”L1&L2”

Table 11 — Wiring Diagram Size 48K HH - 5 Zone Max

CODE	OUTDOOR UNIT PFC AND IPM BOARD SIZE 48K
CN2~CN3	Input: 224-380VAC High voltage
CN9	Communication: Pin1-Pin6: Pulse waveform (0-5VDC), Pin7, Pin9 (0VDC), Pin8 (0-5VDC), Pin10 (5VDC) to the main board
U~V~W	Connect to compressor voltage among phases 0~250VAC
CN8 CN5	Connect to DC FAN voltage among phases 0-200VAC

Table 12 — Wiring Diagram Size 48K HH - 5 Zone Max

CODE	OUTDOOR UNIT
CN1-1-CN1-2	Input: 230VAC High voltage
CN1-3	Input: (Connection of the high voltage) “S”
CN4	Output:Pin1,Pin4 Pulse waveform(0-12VDC),Pin5,Pin6(12VDC) to EEV

REFRIGERATION CYCLE DIAGRAMS

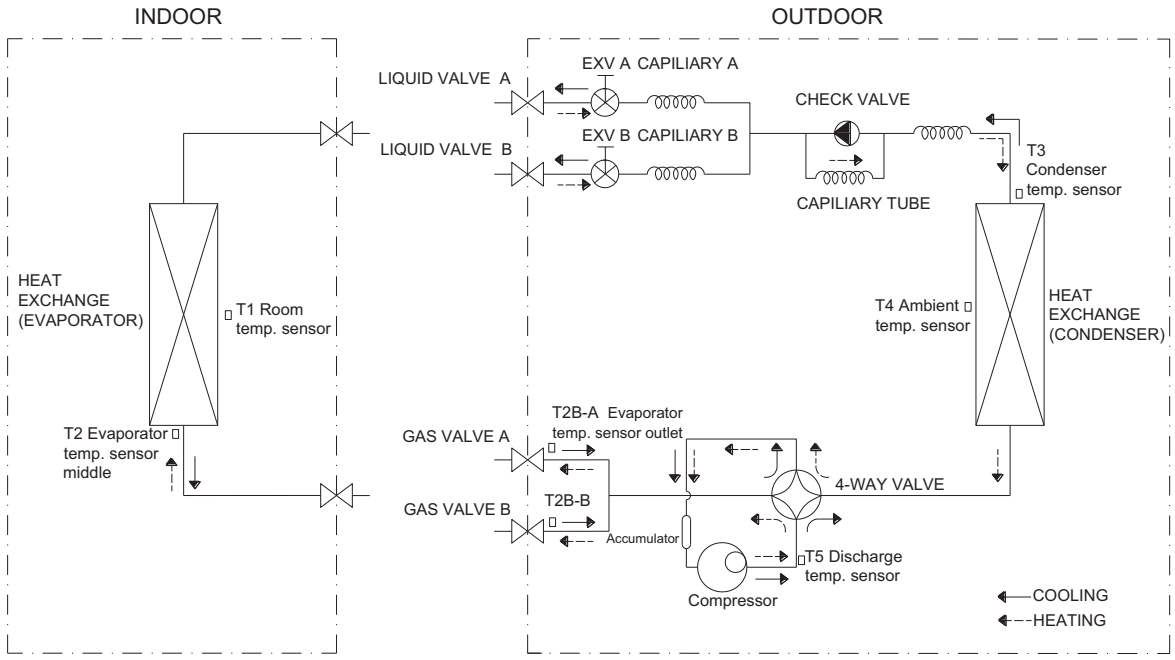


Fig. 14 — Size 18K (18R)

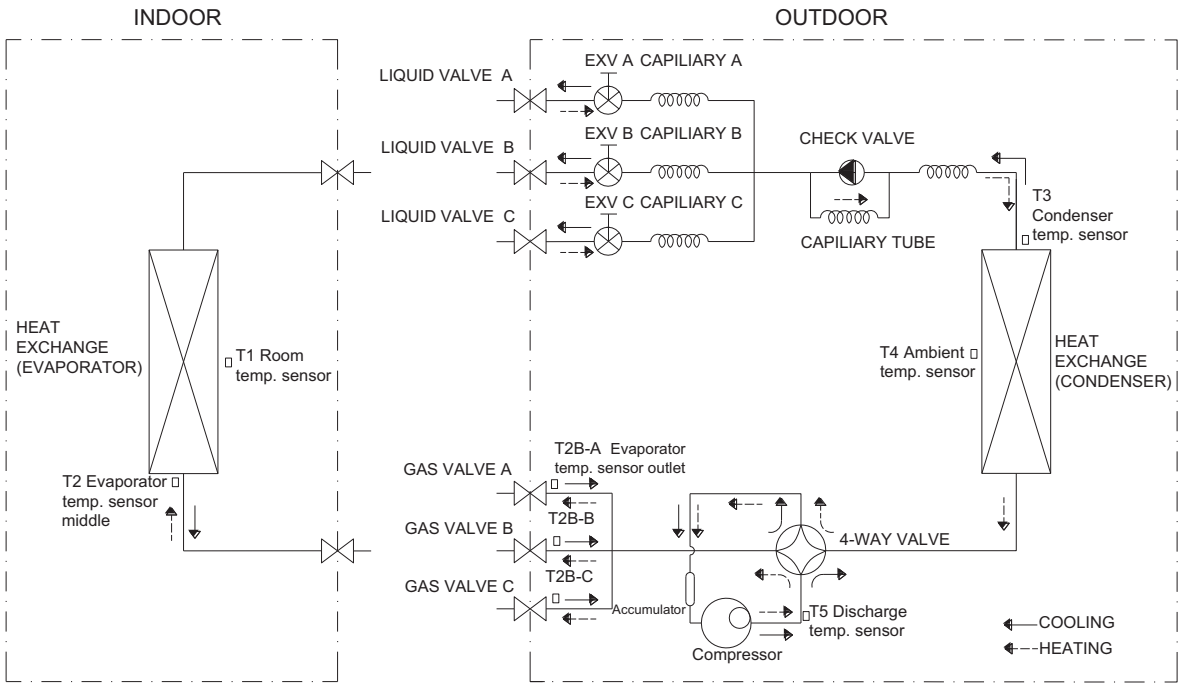


Fig. 15 — Size 24K (24R)

REFRIGERATION CYCLE DIAGRAMS (CONT)

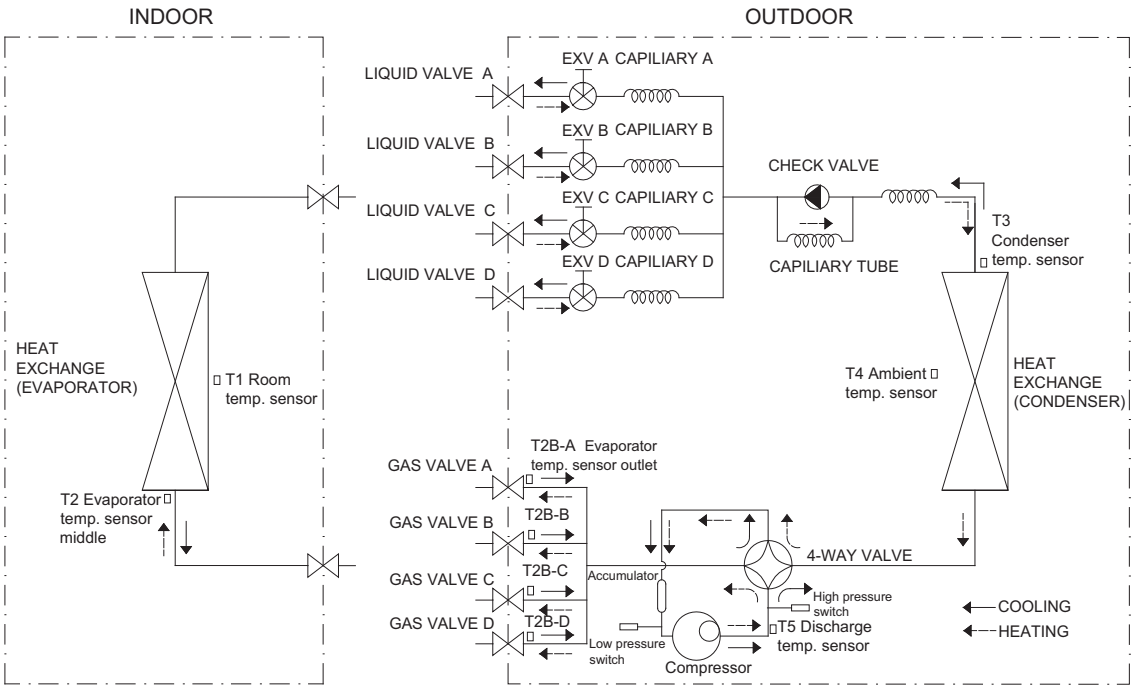


Fig. 16 — Sizes 30K (30R) and 36K (36R)

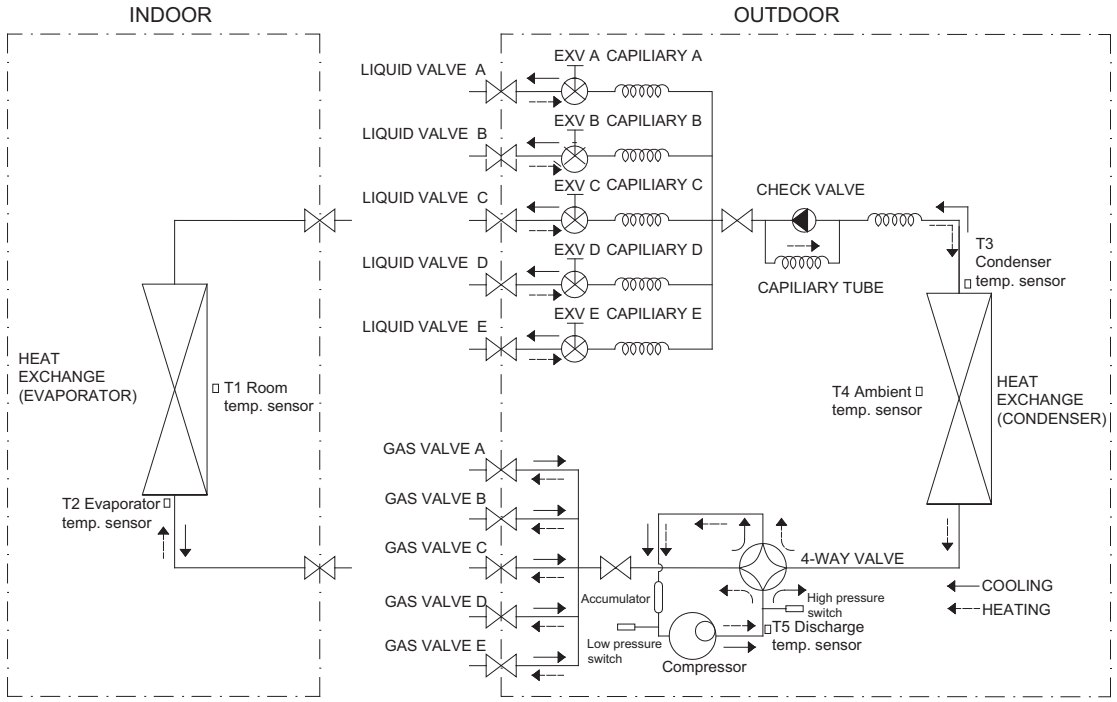


Fig. 17 — Size 48K (48R)

REFRIGERANT LINES

General Refrigerant Line Sizing

1. The outdoor units are shipped with a full charge of R410A refrigerant. All charges, line sizing, and capacities are based on runs of 25 ft. (7.6 m) per number of zones. For runs over 25 ft. (7.6 m), consult the see “Long Line Applications:” on page 18 for proper charge adjustments.
2. The minimum refrigerant line length between the indoor and outdoor units is 10 ft. (3 m).
3. Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36in (914 mm) should be buried. Provide a minimum 6in (152 mm) vertical rise to the service valves to prevent refrigerant migration.
4. Both lines must be insulated. Use a minimum of 1/2in. (12.7 mm) thick insulation. Closed-cell insulation is recommended in all long-line applications.
5. Special consideration should be given to isolating interconnecting tubing from the building structure. Isolate the tubing so vibration or noise is not transmitted into the structure.

IMPORTANT: Both refrigerant lines must be insulated separately.

Table 13 displays the following maximum lengths allowed.

Table 13 — Piping and Refrigerant

38MGRBQ Size		STANDARD	HIGH HEAT	HIGH HEAT	STANDARD	HIGH HEAT	STANDARD	VAPOR CYCLE
		18R	24HH	30HH	36R	36HH	48R	48K
		(208/230 V)						
Min. Piping Length per each indoor unit	ft. (m)	10 (3)						
Standard Piping Length per each indoor unit	ft. (m)	25 (7.5)						
Max. outdoor-indoor height difference (OU higher than IU)	ft. (m)	49(15)	49(15)	49(15)	49(15)	65(20)	65(20)	65(20)
Max. outdoor-indoor height difference (IU higher than OU)	ft. (m)	49(15)	49(15)	49(15)	49(15)	65(20)	65(20)	65(20)
Max. height different between indoor units	ft. (m)	32 (10)						
Max. Length per each indoor unit	ft. (m)	82 (25)	98 (30)	115(35)	115(35)	115(35)	115 (35)	115 (35)
Max. Piping Length with no additional refrigerant charge per System (Standard Piping length x No. of Zones)	ft. (m)	49 (15)	74 (22)	98 (30)	98 (30)	98 (30)	123 (37.5)	123 (37.5)
Total Maximum Piping Length per system	ft. (m)	131(40)	197(60)	262(80)	262(80)	262(80)	328(100)	328(100)
Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16 (15)						
Number of IDU		2	3	4	4	4	5	5
Suction Pipe (size - connection type)	in	3/8*2	3/8*3	1/2 *1+ 3/8*3	1/2 *1+ 3/8*3	1/2 *2+ 3/8*2	1/2 *2+ 3/8*3	1/2 *2+ 3/8*3
	(mm)	9.52*2	9.52*3	12.7*1+9.52*3	12.7*1+9.52*3	12.7*2+9.52*2	12.7*2+9.52*3	12.7*2+9.52*3
Liquid Pipe (size - connection type)	in	1/4*2	1/4*3	1/4*4	1/4*4	1/4*4	1/4*5	1/4*5
	(mm)	6.35*2	6.35*3	6.35*4	6.35*4	6.35*4	6.35*5	6.35*5
Refrigerant Type		R410A						
Heat Pump Models Charge Amount	Lbs (kg)	4.08(1.85)	5.73(2.6)	8.38(3.8)	8.38(3.8)	10.14 (4.6)	10.14 (4.6)	10.14(4.6)

NOTE: The refrigerant charge included is adequate for the outdoor unit’s maximum number of zones multiplied by the standard piping length per zone. For piping runs greater than the “Maximum Piping Length with no additional refrigerant charge per System”.

NOTE: Multi-zone outdoor unit compatibility can only support one (1) AHU per unit. When the 30K or 36K AHU is utilized in multi-zone 48K ODU applications, 500 grams (17.6 oz) of additional refrigerant charge must be added to the system

Long Line Applications:

1. No change in line sizing is required.
2. Add refrigerant.

Table 14 — Additional Charge Table Per Zone

Unit Size	No. of Zones	Charge oz. (kg.)	Additional Charge Required After ft. (m)	Additional Charge oz./ft. (g/m)	Total Maximum Piping Length ft. (m.)
18	2	70.55 (2.0)	49 (15)	0.16 (15)	131 (40)
24	3	98.76 (2.8)	74 (22.5)	0.16 (15)	197 (60)
30	4	105.82 (3.0)	98 (30)	0.16 (15)	263 (80)
36	4	162.26 (4.6)	123 (37.5)	0.16 (15)	328 (100)
48	5	162.26 (4.6)	123 (37.5)	0.16 (15)	328 (100)

NOTE: If the calculation results in a negative number no additional refrigerant is required. Electronic expansion valves in the outdoor unit are used as metering devices.

SYSTEM EVACUATION AND CHARGING

CAUTION

UNIT DAMAGE HAZARD
Failure to follow this caution may result in equipment damage or improper operation.

Never use the system compressor as a vacuum pump.

Refrigerant tubes and indoor coil should be evacuated using the recommended deep vacuum method of 500 microns. The alternate triple evacuation method may be used if the following procedure is followed. Always break a vacuum with dry nitrogen.

NOTE: All units (except the 18,000 BTU model) have a Master Suction and Liquid Line Service Valve.

System Vacuum and Charge

Using Vacuum Pump

1. Completely tighten the flare nuts (A, B, C, D, E). Fully open all circuits service valves. Connect the manifold gage charge hose to the charge port of the low side Master service valve to evacuate all circuits at the same time (see Fig. 18).
2. Connect charge hose to vacuum pump.
3. Fully open the low side of manifold gage (see Fig. 19).
4. Start vacuum pump
5. Evacuate using the triple evacuation method.
6. After evacuation is complete, fully close the low side of manifold gage and stop operation of vacuum pump.
7. The factory charge contained in the outdoor unit is good for up to 25ft. (8 m) of line length. For refrigerant lines longer than 25ft. (8 m), add refrigerant.
8. Disconnect the charge hose from charge connection of the low side service valve.
9. Securely tighten caps of service valves.

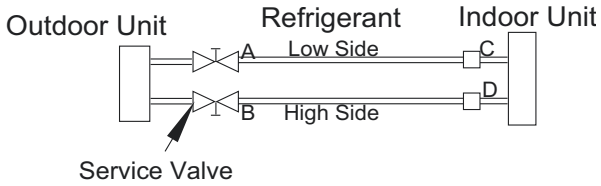


Fig. 18 — Service Valve

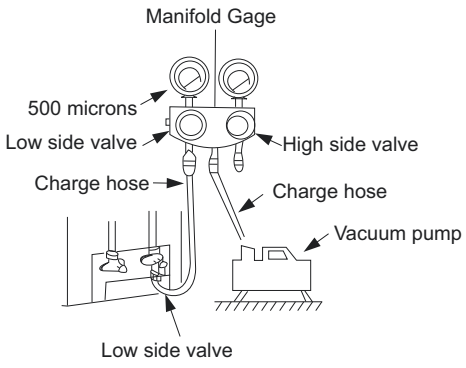


Fig. 19 — Manifold

Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water (see Fig. 20).

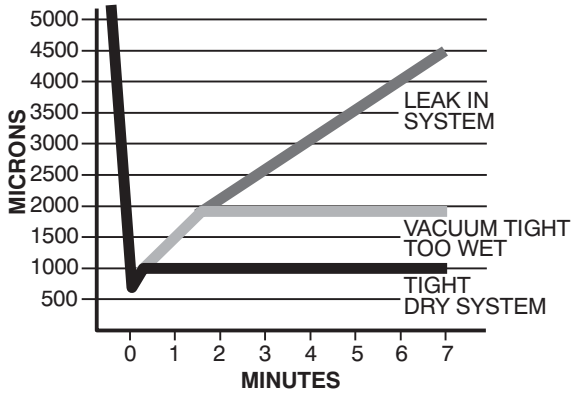


Fig. 20 — Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 21 and proceed as follows:

1. Pump the system down to 1500 microns and allow the pump to continue operating for an additional 15 minutes.
2. Close the service valves and shut off the vacuum pump.
3. Connect a dry nitrogen cylinder and regulator to the system and break vacuum until the system reaches 2 psig.
4. Close the service valve and allow the system to stand for 1 hour. During this time, the dry nitrogen can diffuse throughout the system absorbing moisture.
5. Pump the system down to 1000 microns.
6. Break the vacuum with dry nitrogen (2 psig).
7. Pump the system down to 500 microns.
8. Perform the hold test for 30 minutes.

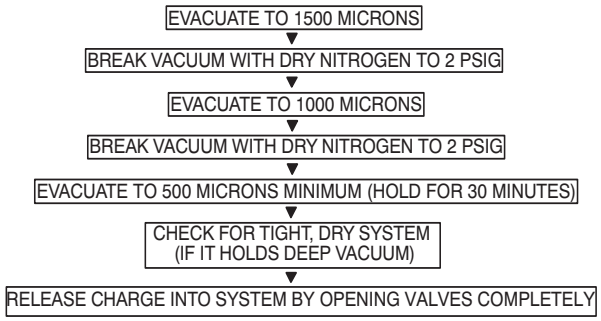


Fig. 21 — Triple Evacuation Method

Final Tubing Check

IMPORTANT: Check to be certain factory tubing on both indoor and outdoor unit has not shifted during shipment. Ensure tubes are not rubbing against each other or any sheet metal. Pay close attention to feeder tubes, making sure wire ties on feeder tubes are secure and tight.

ELECTRONIC FUNCTION

Abbreviation

- **T1: Indoor ambient temperature**
- **T2: Indoor heat exchanger coil temperature**
- **T2B: Indoor heat exchanger exhaust coil temperature (located on the outdoor unit)**
- **T3: Outdoor heat exchanger pipe temperature**
- **T4: Outdoor ambient temperature**
- **T5/TP: Compressor discharge temperature**

Electric Control Working Environment

- **Input voltage: 230V**
- **Input power frequency: 60Hz**
- **Indoor fan standard working amp.: <1A**
- **Outdoor fan standard working amp.: <1.5A**
- **Four-way valve standard amp.: <1A**

Main Protection

Compressor Restart Delay

The compressor takes one minute to start up the first time. Further restarts take three minutes.

Compressor Discharge Temperature Protection

When the compressor's discharge temperature rises, the running frequency is limited according to the following rules:

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

Fan Speed Malfunction

If the outdoor fan speed is lower than 100RPM or higher than 2400RPM for 60 seconds or more, the unit stops and the LED displays the **EC 07 / E8** failure code.

Inverter Module Protection

The inverter protection module ensures that faults related to current, voltage, or temperature do not damage the inverter.

Low Voltage Protection

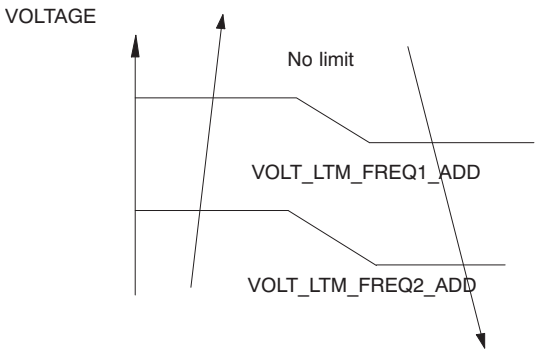


Fig. 22 — Low Voltage Protection

If these protections are triggered, the A/C unit stops and the LED displays the failure code. The unit restarts three minutes after the protection mechanism turns off.

NOTE: If the low voltage protection triggers and the voltage does not restore to normal within three minutes, the protection remains active even after the unit restarts.

Compressor Current Limit Protection

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

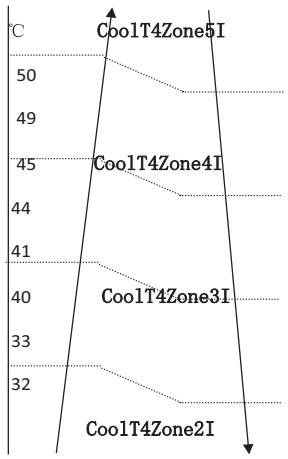


Fig. 23 — Cooling Mode

Table 15 — Cooling Mode

CoolReturnI	Difference between current limit and shutdown current
CoolT4Zone5I	Cooling T4≥50 °C current limit value
CoolT4Zone4I	Cooling 49>T4≥45 °C current limit value
CoolT4Zone3I	Cooling 44>T4≥41°C current limit value
CoolT4Zone2I	Cooling 40 > T4≥33 °C current limit value
CoolT4Zone1I	Cooling 32>T4 °C current limit value
CoolStopI	Cooling stop protection current value

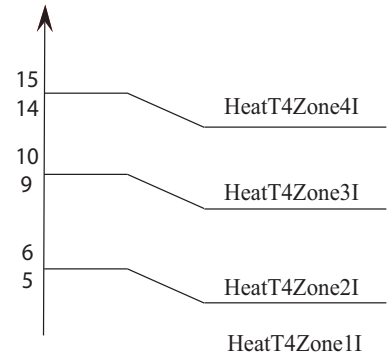


Fig. 24 — Heating Mode

Table 16 — Heating Mode

HeatReturnI	Difference between current limit and shutdown current
HeatT4Zone4I	Heating T4≥15°C current limit value
HeatT4Zone3I	Heating 14 > T4≥10°C current limit value
HeatT4Zone2I	Heating 9 > T4≥6°C current limit value
HeatT4Zone1I	Heating 5>T4 current limit value
HeatStopI	Heating stop protection current value

Indoor / Outdoor Units Communication Protection

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

High Condenser Coil Temperature Protection

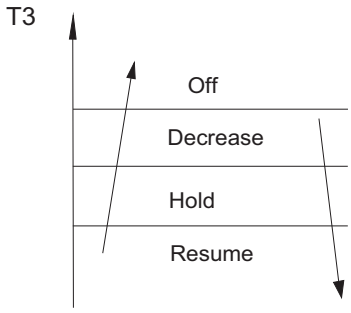


Fig. 25 — High Condenser Coil Temperature Protection

Outdoor Unit Anti-Freezing Protection

When T2<39°F (4°C) for 250 seconds or T2< 32°F (0°C), the indoor unit capacity demand is zero and resumes the normal operation when T2>46.4°F (8°C) and the protection time is no less than three minutes.

Oil Return

Rules for Operation:

1. If the compressor frequency remains lower than the frequency set for the setting time, the unit raises the frequency to the frequency set for the setting time and then resumes the former frequency.
2. The EXV continues at 300p while the indoor units maintain their operation. If the outdoor ambient temperature is higher than the set frequency during the oil return, the unit stops the oil return process.

Low Outdoor Ambient Temperature Protection

When the compressor is off and T4 is lower than -31°F (-35°C) for ten seconds, the unit stops and displays “LP.”

When the compressor is on and T4 remains lower than -40°F (-40°C) for ten seconds, the unit stops and displays “LP.”

When T4 is no lower than -25.6°F(-32°C) for ten seconds, the unit exits protection.

Controls and Functions

Capacity Request Calculation

Cooling Mode

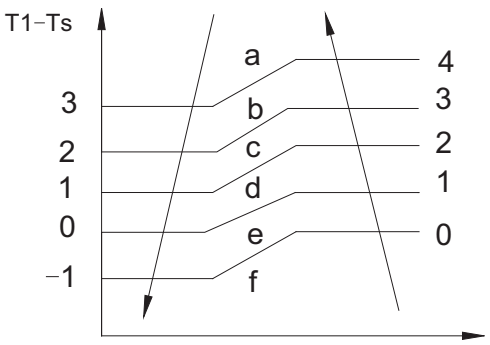


Fig. 26 — Cooling Mode

Table 17 — Cooling Mode

CAPACITY AREA	a	b	c	d	e	f
NORM CODE (N)	3	2	1.5	1	0.5	0

Table 18 — Cooling Mode

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

NOTE: The final result is an integer.

Use Table 19 and the final capacity request to confirm the operating frequency.

Table 19 — Cooling Mode

Frequency (Hz)	0	COOL_F1	COOL_F2	... ...	COOL_F24	COOL_F25
Amendatory Capacity Demand	0	1	2	... ...	24	25

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

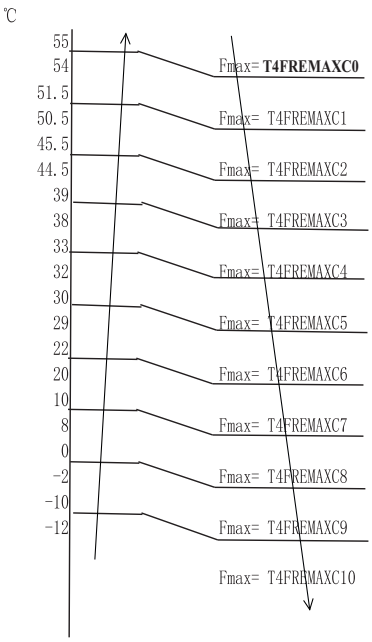


Fig. 27 — Maximum Running Frequency

Heating Mode

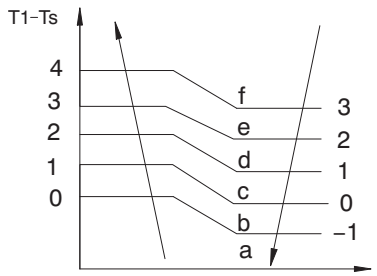


Fig. 28 — Heating Mode

Table 20 — Heating Mode

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

Table 21 — Heating Mode

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

NOTE: The final result is an integer.

Modify the result according to a T2 average (correction).

NOTE: Average value of T2; sum of T2 value of all indoor units)/ (indoor units number).

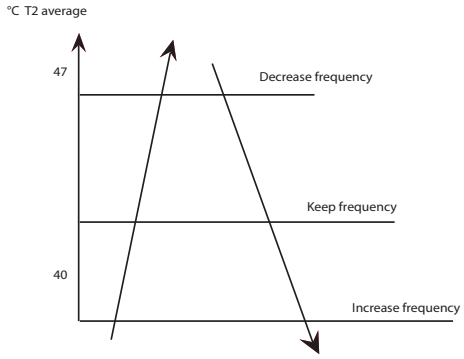


Fig. 29 — T2 Average

Use Table 22 and the final capacity request to confirm the operating frequency.

Table 22 — T2 Average

Frequency (Hz)	0	HEAT_F1	HEAT_F2	… …	HEAT_F24	HEAT_F25
Amendatory Capacity Demand	0	1	2	… …	24	25

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

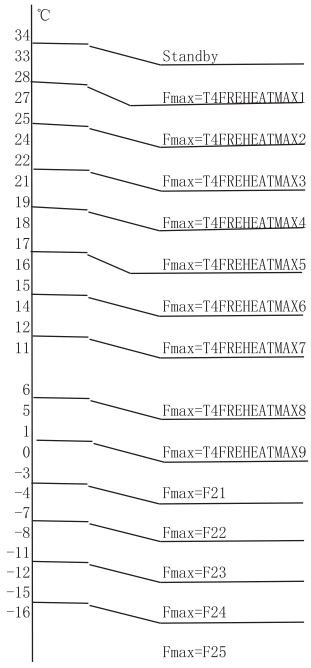


Fig. 30 — T2 Average

Defrosting Control

Defrosting Conditions

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

If any one of the following conditions is satisfied, the unit enters the **Defrosting** 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 of the following conditions is satisfied, defrosting ends and the unit returns to the normal heating mode:

....T3 rises above than TCDE1°C

....T3 remains at TCDE2°C or above for 80 seconds

....Unit runs for ten consecutive minutes in **DEFROSTING** mode

Defrosting Actions

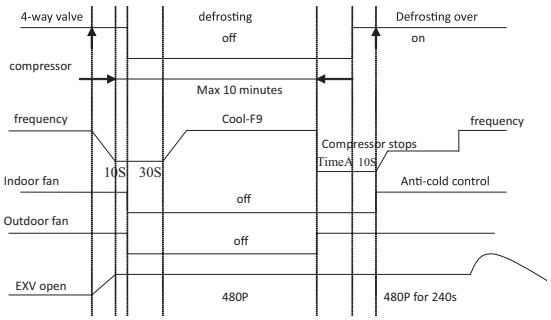


Fig. 31 — Defrosting Action

End Defrosting Action

If any one of following items is satisfied, defrosting stops and the machine enters the normal Heating mode.

1. T3 > TempQuitDefrost_ADD °C
2. The defrosting time achieves 10 minutes
3. Turn to other modes or **OFF**

Outdoor Fan Control

Cooling Mode

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

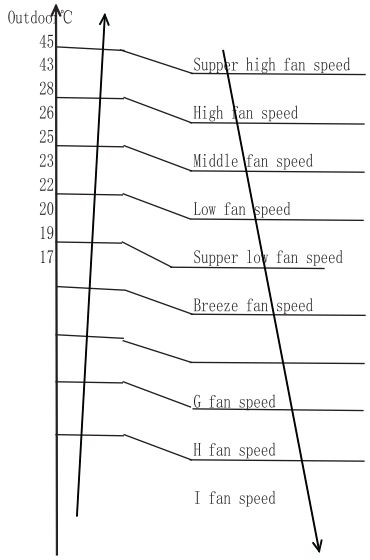


Fig. 32 — Cooling Mode

When low ambient cooling is in effect:

The outdoor fan speed controls logic (low ambient cooling).

When T4 < 59.(15°C) and T3 < 86.(30°C), the unit enters into the low ambient cooling mode. The outdoor fan chooses a speed according to T3.

When T3⩾100.4.(38°C) or when T4⩾68.(20°C), the outdoor fan chooses a speed according to T4 again.

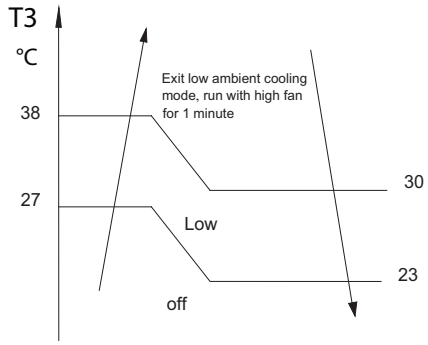


Fig. 33 — Cooling Mode

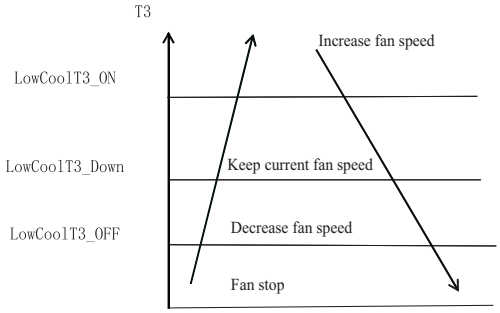


Fig. 34 — Cooling Mode

Heating Mode

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

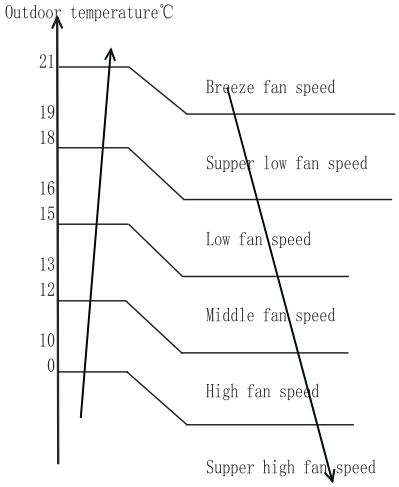


Fig. 35 — Heating Mode

Electronic Expansion Valve (EXV) Control

1. EXV is fully closed when power is turned on. The EXV will standby with the 350P open and then opens to the target angle after the compressor starts.
2. EXV closes with - 160P when the compressor stops. Then EXV will standby with the 350P open and then opens to the target angle after the compressor starts.
3. The action priority of the EXVs is A-B-C-D-E.
4. Compressor and the outdoor fan start operation only after the EXV is initialized.

Cooling Mode

The initial open angle of EXV is dependent on indoor model size, adjustment range is 100-400p. When the unit starts to work for three minutes, the outdoor unit receives the indoor units' (of capacity demand) T2B information and calculates their average.

After comparing each indoor T2B with the average. the outdoor gives the following modification commands: if the T2B>average, the relevant valve needs more 16p open. If the T2B = average, the relevant valve's open range remains. If the T2B<average, the relevant valve needs more 16p close. This modification will be carried out every two minutes.

Heating Mode

The initial open angle of EXV is 250P, dependent on indoor model size, adjustment range is 100-400p. After the unit works for three minutes, the outdoor unit receives the indoor units (of capacity demand) T2 information and calculates the their average. After comparing each indoor units' T2 with the average, the outdoor unit gives the following modification commands.

If the T2<average +2, the relevant valve needs more 16p close. If average +2≥the T2≥ average.2, the relevant valve's open range remains. If the T2< average.2, the relevant valve needs more 16p open. This modification occurs every two minutes.

Four-way valve control

In **HEATING** mode, the four-way valve opens. In **DEFROST** mode, the four way valve operates in accordance to the Defrosting action. In other modes, the four-way valve is closed.

When the **HEATING** mode changes to other modes, the four-way valve closes after the compressor is off for two minutes. Failure or protection (not including discharge temperature protection, high and low pressure protection), the four-way valve immediately shuts down.

TROUBLESHOOTING

This section provides the required flow charts to troubleshoot problems.

NOTE: Information required in the diagnoses can be found either on the wiring diagrams or in the appendix.

Required Tools:

The following tools are needed when diagnosing the units:

- **Digital multimeter**
- **Screw drivers (Phillips and straight head)**
- **Needle-nose pliers**
- **Refrigeration gauges**

Recommended Steps

1. Refer to the diagnostic hierarchy charts below and determine the problem at hand.
2. Go to the chart listed in the diagnostic hierarchy and follow the steps in the chart for the selected problem.

For the ease of service, the systems are equipped with diagnostic code display LED’s on both the indoor and outdoor units. The outdoor diagnostic display is on the outdoor unit board and is limited to very few errors. Refer to the Indoor Unit's Service Manual to determine the error code display method. If possible always check the diagnostic codes displayed on the indoor unit first.

Problems may occur that are not covered by a diagnostic code, but are covered by the diagnostic flow charts. These problems are typical air conditioning mechanical or electrical issues that can be corrected using standard air conditioning repair techniques.

For problems requiring measurements at the control boards, note the following:

1. Always disconnect the main power.
2. When possible check the outdoor board first.
3. Start by removing the outdoor unit top cover.
4. Reconnect the main power.
5. Probe the outdoor board inputs and outputs with a digital multi-meter referring to the wiring diagrams.
6. Connect the red probe to hot signal and the black probe to the ground or negative.
7. Note that some of the DC voltage signals are pulsating voltages for signal. This pulse should be rapidly moving at all times when there is a signal present.
8. If it is necessary to check the indoor unit board, you must start by disconnecting the main power.
9. Remove the front cover of the unit and then control box cover.
10. Carefully remove the indoor board from the control box. Place it face up on a plastic surface (not metal).
11. Reconnect the main power and repeat steps 5, 6, and 7.
12. Disconnect the main power before reinstalling the board to avoid shock hazard and board damage.

Diagnostic Guides

Table 23 — Outdoor Unit Error Display

DISPLAY	MALFUNCTION AND PROTECTION INDICATION
EL01	Communication malfunction between indoor and outdoor units
FL14	Incapability between indoor and outdoor units
EC50	Outdoor temperature sensor
EC51	Outdoor EEPROM error
EC52	Condenser coil temperature sensor (T3) malfunction
EC53	Outdoor ambient temperature sensor (T4) malfunction
EC54	Compressor discharge temperature sensor TP is in an open circuit or has short circuited
EC55	Outdoor IPM module temperature sensor malfunction
EC56	Outdoor T2B sensor error
EC57	Refrigerant pipe temperature sensor error
EC07	Outdoor DC fan motor malfunction speed out of control
EC71	Over current failure of outdoor DC fan motor
EC72	Lack phase failure of outdoor DC fan motor
PC00	Inverter module (IPM) protection
PC02	Top temperature protection of compressor
PC06	Discharge temperature protection of compressor
PC08	Outdoor overcurrent protection
PC0A	High temperature protection of condenser
PC0F	PFC module protection
PC0L	Low temperature outdoor unit protection
PC10	Outdoor unit low AC voltage protection
PC11	Outdoor unit low AC voltage protection
PC12	Outdoor unit main control board DC bus high voltage protection /341 MCE error
PC30	System high pressure protection
PC31	System low pressure protection
PC40	Communication error between the outdoor main chip and the compressor driven chip
PC42	Compressor start failure of the outdoor unit
PC43	Outdoor compressor lack phase protection
PC44	Outdoor unit zero speed protection
PC45	Outdoor unit IR chip drive failure
PC46	Compressor speed is out of control
PC49	Compressor overcurrent failure
PCA1	Condensation protection of the refrigerant pipe
PH90	High temperature protection of the evaporator
PH91	Low temperature protection of the evaporator
LC06	High temperature protection of inverter module (IPM)
	NOTE: If displays DF or FC, it is a normal operation, not a malfunction.

Diagnostic Guides (Cont)

Table 24 — Outdoor Unit Error Display (48 High Heat Only)

DISPLAY	MALFUNCTION AND PROTECTION INDICATION
E1	Communication Malfunction between indoor and outdoor units
F0	Current Overload Protection
F1	Outdoor Ambient Temperature Sensor (T4) malfunction
F2	Condenser coil temperature sensor (T3) malfunction
F3	Compressor discharge temperature sensor (T5) malfunction
F4	Outdoor unit EEPROM parameter error
F5	Outdoor fan speed is out of control
P0	Inverter module (IPM) malfunction
P1	Over-voltage or under voltage protection
P2	Compressor top high temperature protection (OLP)
P3	Low ambient temperature cut off in **HEATING**
P4	Compressor drive malfunction
J0	High temperature protection of outdoor coil in **COOLING**
J1	Outdoor temperature protection of indoor coil in **HEATING**
J2	Temperature protection of compressor discharge
J3	PFC Module Protection
J4	Communication malfunction between control board and IPM board
J5	High pressure protection
J6	Low pressure protection
P7	Outdoor IPM module temperature sensor malfunction
J8	AC voltage protection
Fb	Injection enthalpy inlet temperature sensor error
Fd	Injection enthalpy outlet temperature sensor error

OUTDOOR UNIT DIGITAL DISPLAY

A digital display is featured on the outdoor PCB. The LED displays different codes in the following situations:

- Standby: “- -.”
- Compressor operation: the running frequency.
- Defrosting mode: “dF” or alternative displays between running frequency and “dF” (ach appears for 0.5s.)
- Compressor pre-heating: “PH” or alternative displays between running frequency and “PH” (each appears for 0.5s.)
- Oil return process: “RO” or alternative displays between running frequency and “RO” (each appears for 0.5s.)
- Low ambient cooling mode: “LC” or alternative displays between running frequency and “LC” (each appears for 0.5s.)
- Forced cooling mode: the LED displays “FC” or alternative displays between running frequency and “FC” (each appears for 0.5s).
- PFC module protection occurs three times within 15 minutes: “E6” or alternates between displays of running frequency and “E6” (each appears for 0.5s.)

In protection or malfunction, the LED displays an error code or protection code.

OUTDOOR UNIT DISPLAY

Outdoor Unit Point Function

A check switch is included on the outdoor PCB.

Push SW1 to check the unit’s status while running. The digital display displays codes (see Table 25 on page 29) each time the SW1 is pushed.

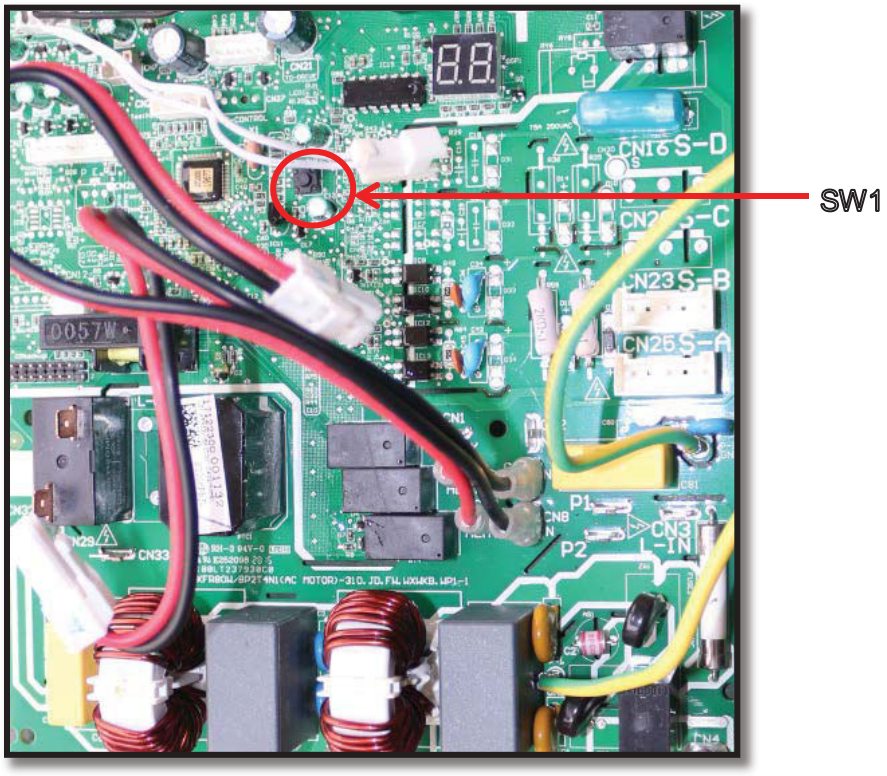


Fig. 36 — Outdoor PCB (18K shown)

OUTDOOR UNIT DISPLAY (CONT)

Table 25 — Outdoor PCB (All Sizes)

(Sheet 1 of 2)

PRESS #	DISPLAY	REMARKS		
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 Units**	
		1	1	
		2	2	
		3	3	
		4	4	
		5	5	
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	The capacity unit is 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 sending to compressor control chip			
17	Indoor unit A evaporator outlet temperature (T2BA)	If the temperature is lower than 15.8°F(-9 ℃), the digital display shows "-9." If the temperature is higher than 158°F(70 ℃), the digital display shows "70." If the indoor unit is not connected, the digital display shows: "--"		
18	Indoor unit B evaporator outlet temperature (T2BB)			
19	Indoor unit C evaporator outlet temperature (T2BC)			
20	Indoor unit D evaporator outlet temperature (T2BD)			
21	Indoor unit E evaporator outlet temperature (T2BE)			
22	Indoor unit A room temperature (T1A)	If the temperature is lower than 32°F (0 ℃), the digital display shows "0." If the temperature is higher than 122°F (50 ℃), the digital display shows "50." If the indoor unit is not connected, the digital display shows: "--"		
23	Indoor unit B room temperature (T1B)			
24	Indoor unit C room temperature (T1C)			
25	Indoor unit D room temperature (T1D)			
26	Indoor unit E room temperature (T1E)			
27	Indoor unit A evaporator temperature (T2A)	If the temperature is lower than 15.8°F(-9 ℃), the digital display shows "-9." If the temperature is higher than 158°F(70 ℃), the digital display shows "70." If the indoor unit is not connected, the digital display shows: "--"		
28	Indoor unit B evaporator temperature (T2B)			
29	Indoor unit C evaporator temperature (T2C)			
30	Indoor unit D evaporator temperature (T2D)			
31	Indoor unit E evaporator temperature (T2E)			
32	Condenser pipe temperature (T3)			
33	Outdoor ambient temperature (T4)			
34	Compressor discharge temperature (TP)	The display value is between 86-264°F(30–129 °C). If the temperature is lower than 86°F(F30 °C), the digital display shows "30." If the temperature is higher than 210°F(99 ℃), the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 221°F (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			
37	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows "2.0", the EXV open angle is 120×4=480p.		
38	EXV open angle for B indoor unit			
39	EXV open angle for C indoor unit			
40	EXV open angle for D indoor unit			
41	EXV open angle for E indoor unit			
42	Frequency limit symbol	Bit7	Frequency limit caused by IGBT radiator	The display value is a hexadecimal number. For example, the digital display show 2A, then Bit5=1, Bit3=1, and Bit1=1. This means that a frequency limit may be caused by T4, T3, or the current.
		Bit6	Frequency limit caused by PFC	
		Bit5	Frequency limit caused by T4.	
		Bit4	Frequency limit caused by T2.	
		Bit3	Frequency limit caused by T3.	
		Bit2	Frequency limit caused by T5.	
		Bit1	Frequency limit caused by current	
		Bit0	Frequency limit caused by voltage	
43	Average value of T2	(Sum T2 value of all indoor units)/(number of indoor units in good connection)		
44	Outdoor unit fan motor state	Off: 0, High speed:1, Med speed: 2, Low speed: 3, Breeze:4, Super breeze: 5		
45	The last error or protection code	00 means No Malfunction and Protection		
46	F indoor unit capacity			
47	F indoor unit capacity demand code			
48	F indoor unit evaporator outlet temperature (T2BF)			
49	F indoor unit room temperature (T1F)			

(Sheet 2 of 2)

PRESS #	DISPLAY	REMARKS		
50	F indoor unit evaporator temperature (T2F)			
51	EXV open angle for F indoor unit			
52	Reason for stop			
53	EVI valve target angle (only for M5OG-48HFN1-M-[X])	Change only for 38MGHBQ48EA3 (48K High Heat Model) Actual data/4. If the value is higher than 99, the digital display tube displays a single digit and a tens digit. For example, the digital display tube displays “2.0”, which means the EXV open angle is 120×4=480p.)		
54	EVI valve open angle (only for M5OG-48HFN1-M-[X])			
55	EVI valve angle (only for M5OG-48HFN1-M-[X])			

Table 26 — Outdoor PCB (18K Only)

Press #	DISPLAY	REMARK		
0	Normal Display	Displays running frequency, running state, or malfunction code		
1	Quantity of indoor units with working connection	Actual Data		
			Display	Indoor Unit #
			1	1
			2	2
			3	3
			4	4
			5	5
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	The capacity unit is horse power. If the indoor unit is not connected, the digital display shows the following: "—" (9K:1HP,12K:1.2HP,18K:1.5HP,24K:2.0HP)		
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,24K:2.0HP)		
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 sending to compressor control chip			
17	Indoor unit A evaporator outlet temperature (T2BA)	If the temperature is lower than 15.8°F (-9°C), the digital display shows 15.8°F (-9°C) If the temperature is higher than 158°F (70°C), the digital display shows 158°F (70°C). If the indoor unit is not connected, the digital display shows: "-----"		
18	Indoor unit B evaporator outlet temperature (T2BB)			
19	Indoor unit C evaporator outlet temperature (T2BC)			
20	Indoor unit D evaporator outlet temperature (T2BD)			
21	Indoor unit E evaporator outlet temperature (T2BE)			
22	Indoor unit A room temperature (T1A)	If the temperature is lower than 32°F(0°C), the digital display shows 32°F(0°C). If the temperature is higher than 122°F(50°C) the digital display shows 122°F(50°C). If the indoor unit is not connected, the digital display shows: "-----"		
23	Indoor unit B room temperature (T1B)			
24	Indoor unit C room temperature (T1C)			
25	Indoor unit D room temperature (T1D)			
26	Indoor unit E room temperature (T1E)			
27	Indoor unit A evaporator temperature (T2A)	If the temperature is lower than 15.8°F (-9°C), the digital display shows 15.8°F (-9°C). If the temperature is higher than 158°F (70°C), the digital display shows 158°F (70°C) If the indoor unit is not connected, the digital display shows:"-----"		
28	Indoor unit B evaporator temperature (T2B)			
29	Indoor unit C evaporator temperature (T2C)			
30	Indoor unit D evaporator temperature (T2D)			
31	Indoor unit E evaporator temperature (T2E)			
32	Condenser pipe temperature (T3)			
33	Outdoor ambient temperature (T4)			
34	Compressor discharge temperature (TP)	The display value is between 86°F-264°F(30-129°C). If the temperature is lower than 86°F(30°C), the digital display shows 86°F(30°C). If the temperature is higher than 210°F(99°C), the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 221°F(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 AC voltage			
37	AD value of DC voltage			
38	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows "2.0", the EXV open angle is 120×4=480p.		
39	EXV open angle for B indoor unit			
40	EXV open angle for C indoor unit			
41	EXV open angle for D indoor unit			
42	EXV open angle for E indoor unit			
43	MVI valve open angle			
44	EVI valve open angle			
45	Frequency limit symbol	Bit7	Reserve	The display value is a hexadecimal 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 current, IPM or T3.
		Bit6	Frequency limit caused by voltage	
		Bit5	Frequency limit caused by current	
		Bit4	Reserve	
		Bit3	Frequency limit caused by IPM	
		Bit2	Frequency limit caused by T5	
		Bit1	Frequency limit caused by T3	
		Bit0	Frequency limit caused by T2	
46	T2B fault	00:No fault,01:T2B-A fault, ,02:T2B-B fault ,03:T2B-C fault,04:T2B-D fault, 05:T2B-E fault, 06:T2B-F fault (The display priority is A-B-C-D-E-F)		
47	Average value of T2	(Sum T2 value of all indoor units)/(number of indoor units in good connection) (The heating is the average value of T2, and the cooling is the average value of T2B)		
48	Outdoor unit fan motor state	Off: 0, Super ultra high speed:1, Super high speed:2, High speed:3, Med speed: 4, Low speed: 5, Breeze:6, Super breeze: 7		
49	Reason of stop			

Outdoor Unit Digital Codes

Table 27 — Outdoor Unit Digital Codes

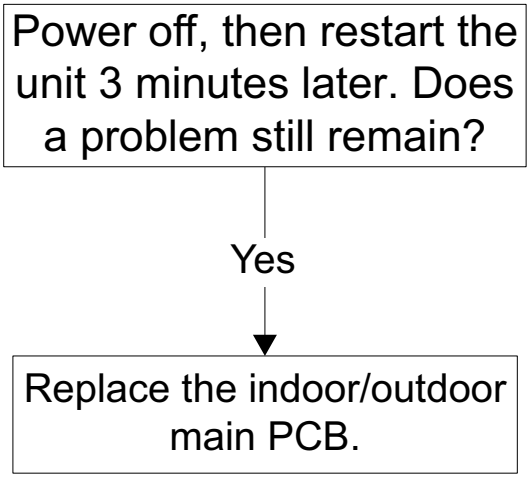
DISPLAY	LED STATUS	NEW INDOOR ERROR
E0	Outdoor unit EEPROM parameter error	F4
E2	Communication malfunction between indoor and outdoor units	E1
E3	Communication malfunction between IPM board and outdoor main control board	——
E4	Outdoor temperature sensor (coil sensor T3,ambient sensor T4, Compressor discharge 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 of compressor top	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	——
Ed	Communication malfunction between inverter board and outdoor main control board (only for M5OG-48HFN1-M-[X]) 38MGHBQ48EA3	——

DIAGNOSIS AND SOLUTION

Indoor unit EEPROM parameter error diagnosis and solution

ERROR CODE	REFER TO INDOOR UNIT SERVICE MANUAL
MALFUNCTION DECISION CONDITIONS	Indoor or outdoor PCB main chip does not receive feedback from EEPROM
SUPPOSED CAUSES	Faulty PCB Installation mistake

Troubleshooting



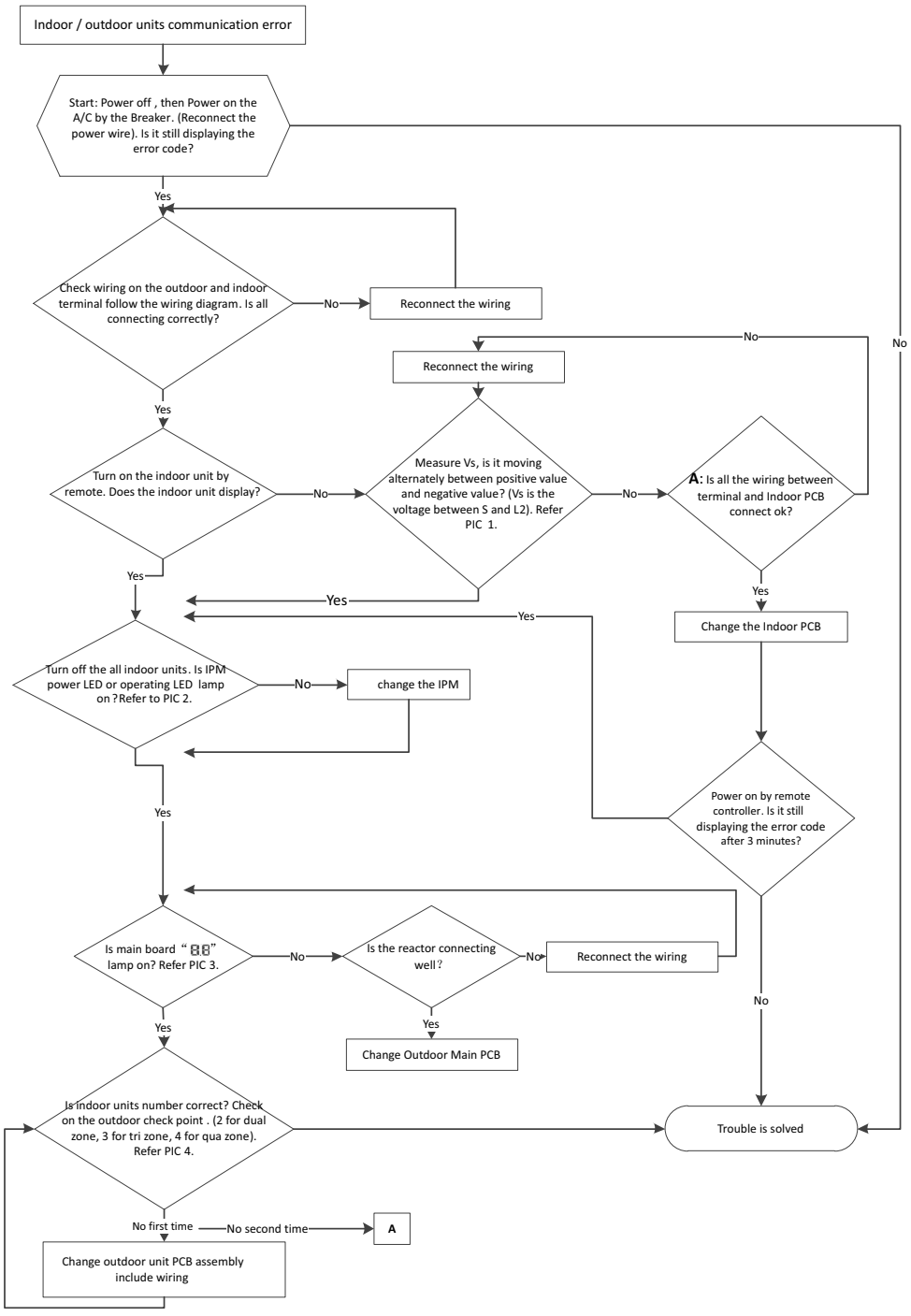
NOTE: EEPROM: a type of read-only memory. The contents can be erased and reprogrammed using a pulsed voltage to locate the EEPROM chip.

DIAGNOSIS AND SOLUTION (CONT)

Communication malfunction between the indoor and outdoor units diagnosis and solution

Error Code	**E2 / EL 01**
Malfunction decision conditions	If the indoor unit does not receive the feedback from outdoor unit during 120 seconds.
Supposed Causes	Wiring Mistake Faulty indoor or outdoor PCB

Troubleshooting



NOTE: The Pics (images) mentioned in the flowchart are located on the following pages.

DIAGNOSIS AND SOLUTION (CONT)

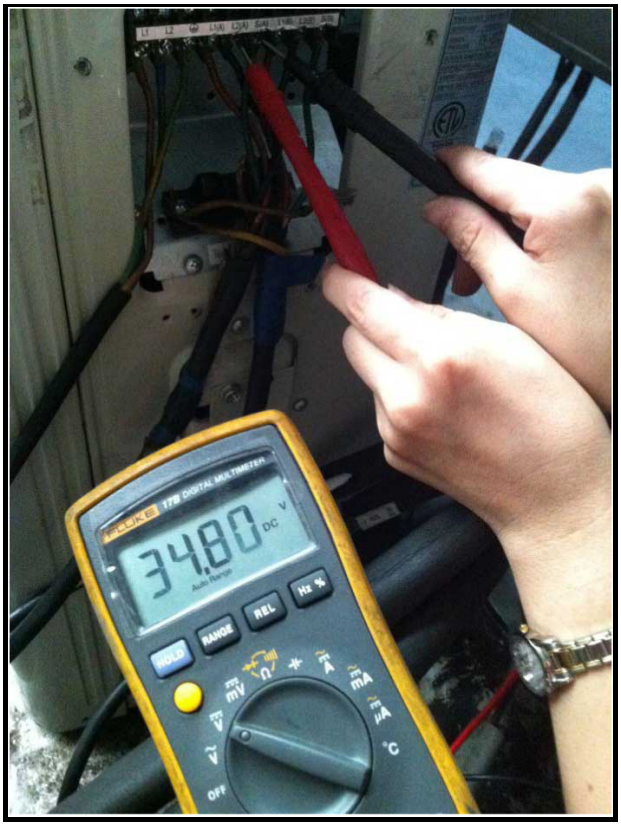


Fig. 37 — Pic 1

Use a multimeter to test the DC voltage between 2 (old: L2) port and the outdoor unit's S port. The multimeter's red pin connects with 2 (old: L2) port while the black pin is for S port. When the unit is running normally, the voltage moves alternately between the positive and negative values.

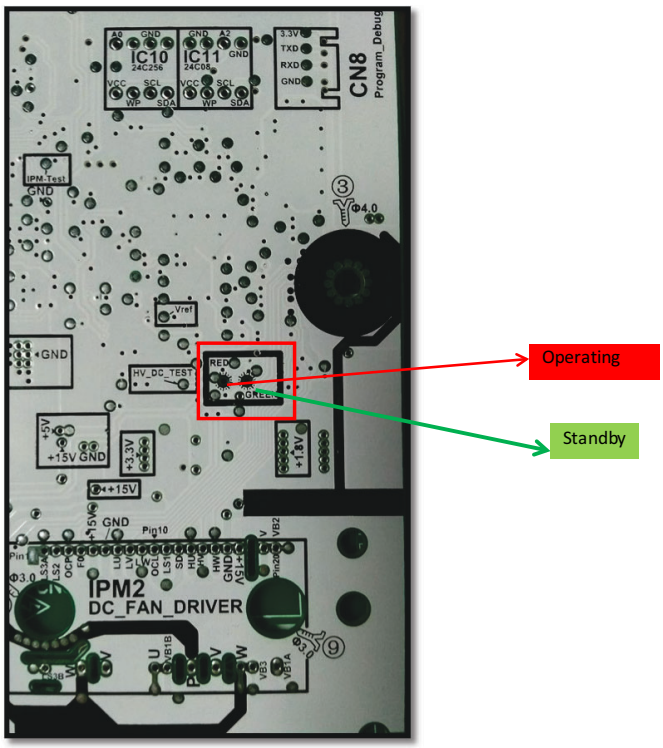
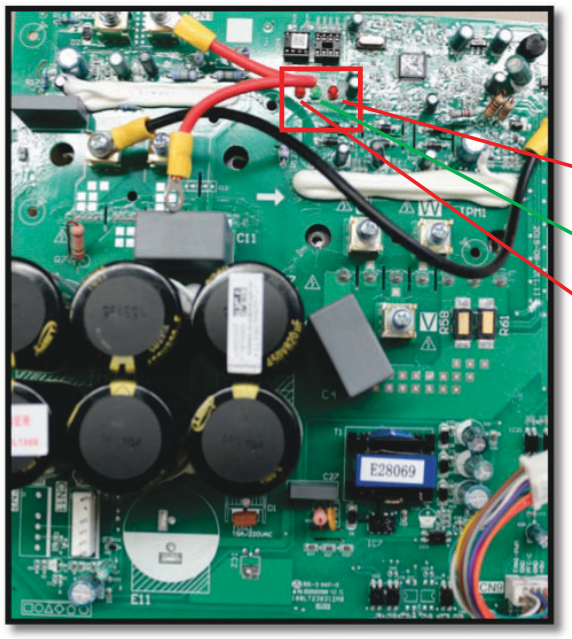
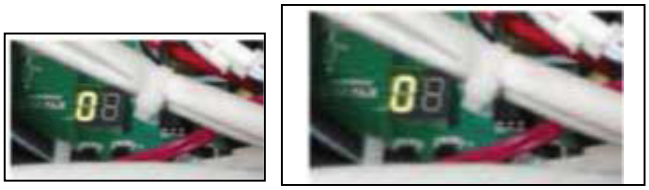


Fig. 38 — Pic 2: IPM (for 2 zone/3-zone)

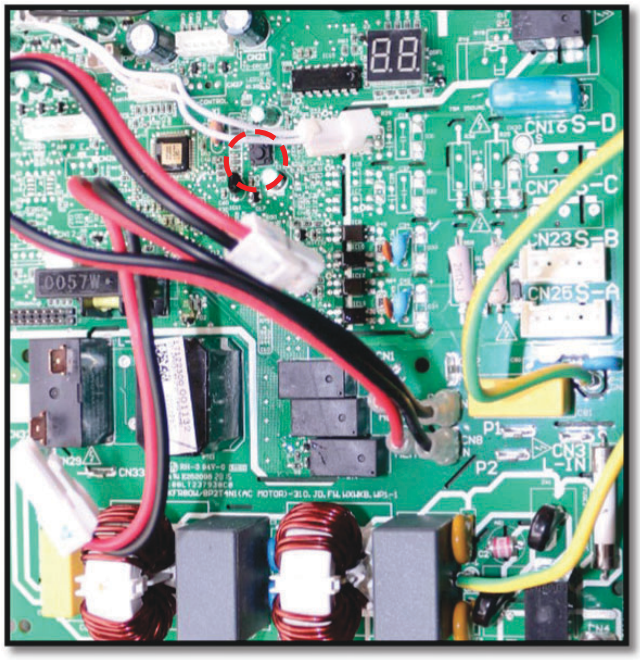
DIAGNOSIS AND SOLUTION (CONT)



PIC2: IPM (for 4 zone and 5 zone)



PIC3: Main board LED when power on and unit standby.



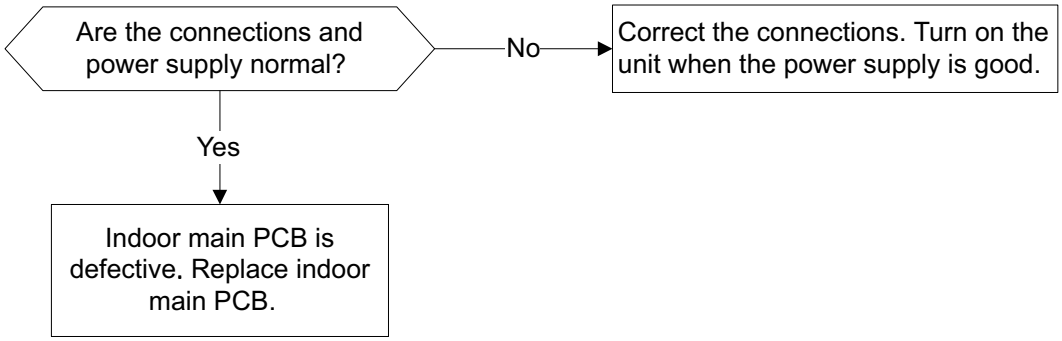
PIC 4: Check point button, press 1 time for check how many indoor units are connected.

DIAGNOSIS AND SOLUTION (CONT)

Zero-crossing signal detection error diagnosis and solution

ERROR CODE	**EC / PC 40**
MALFUNCTION DECISION CONDITIONS	When the PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.
SUPPOSED CAUSES	Connection mistake PCB faulty

Troubleshooting

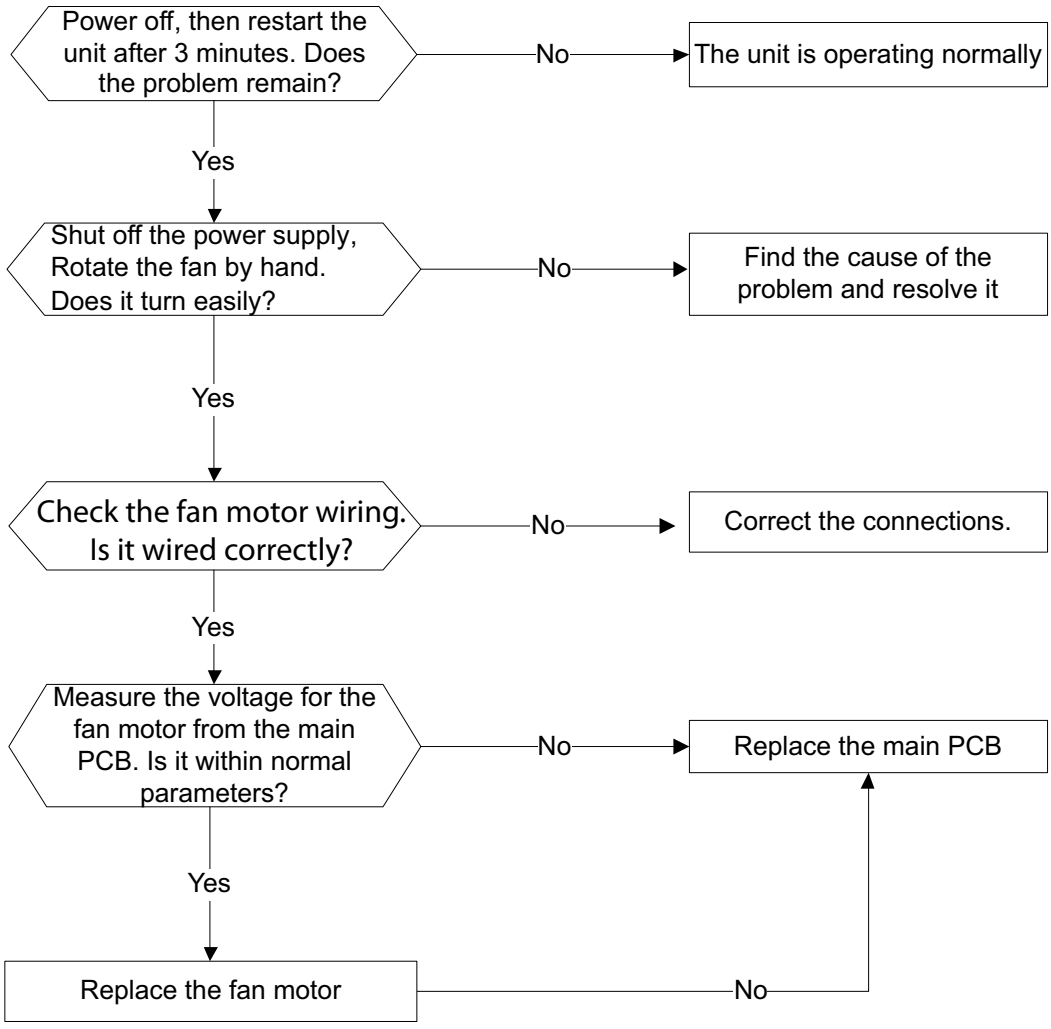


DIAGNOSIS AND SOLUTION (CONT)

Indoor fan speed malfunction diagnosis and solution

ERROR CODE	REFER TO INDOOR UNIT SERVICE MANUAL
MALFUNCTION DECISION CONDITIONS	When the indoor fan speed is too low (300RPM) for a certain period of time, the unit ceases operation and the LED displays a failure code.
SUPPOSED CAUSES	Wiring mistake Faulty fan assembly Faulty fan motor Faulty PCB

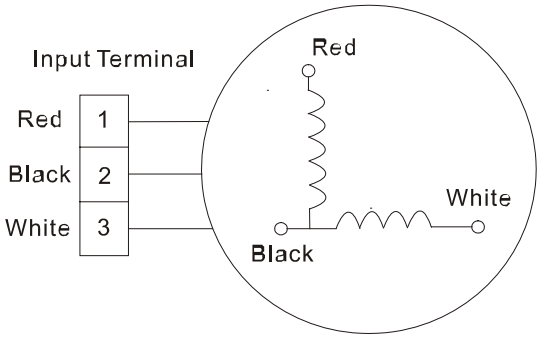
Troubleshooting



Index 1:

1. **Indoor AC Fan Motor**

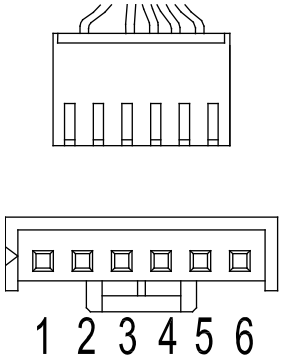
   Power on the unit and set the unit running in fan mode at the high fan speed. After running for 15 seconds, measure the voltage of pin1 and pin2. If the value of the voltage is less than 100V (208~240V power supply) or 50V(115V power supply), the PCB has an issue and needs to be replaced.



2. **Indoor DC Fan Motor (Control Chip is inside the fan motor)**

   Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in the fan motor connector. If the voltage value is not in the range shown in table, the PCB has an issue and needs to be replaced.

   For other models:



DC motor voltage input and output

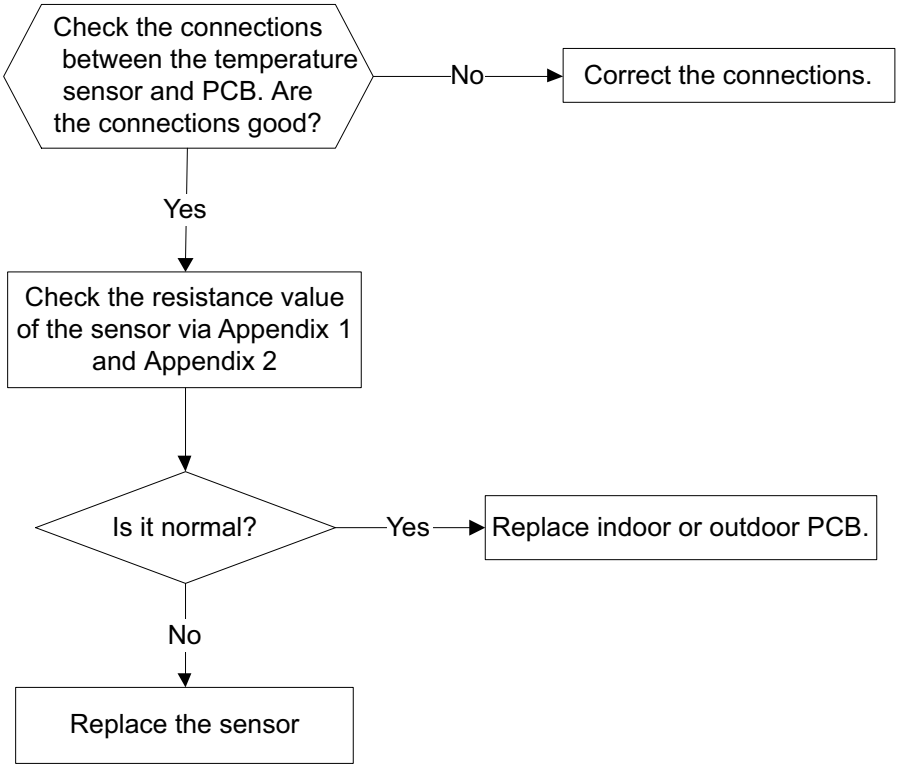
NO.	COLOR	SIGNAL	VOLTAGE
1	Red	Vs/Vm	200V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	13.5-16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5-16.5V

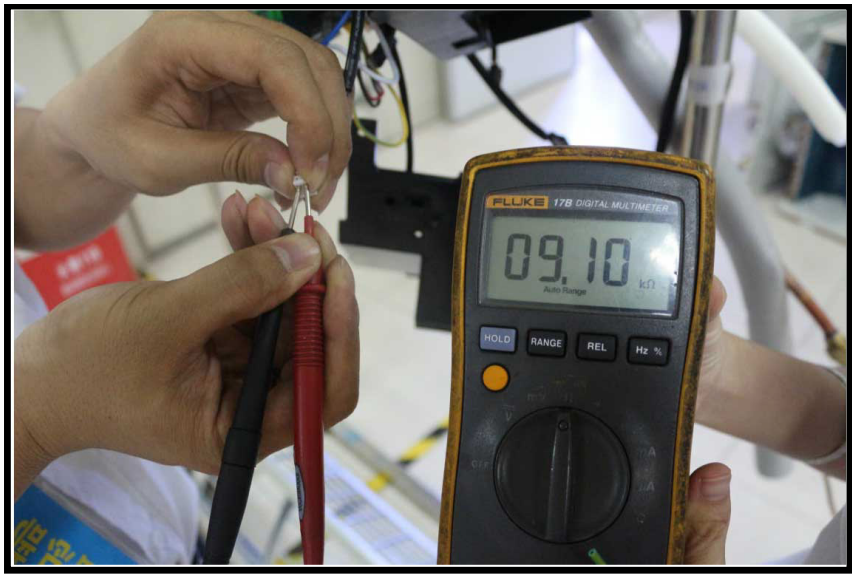
DIAGNOSIS AND SOLUTION (CONT)

Temperature sensor malfunction diagnosis and solution

ERROR CODE	**E4, EC 53, EC 54, EC 56 OR EC 50**
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays a failure.
SUPPOSED CAUSES	PCB faulty Sensor faulty Wiring mistake

Troubleshooting



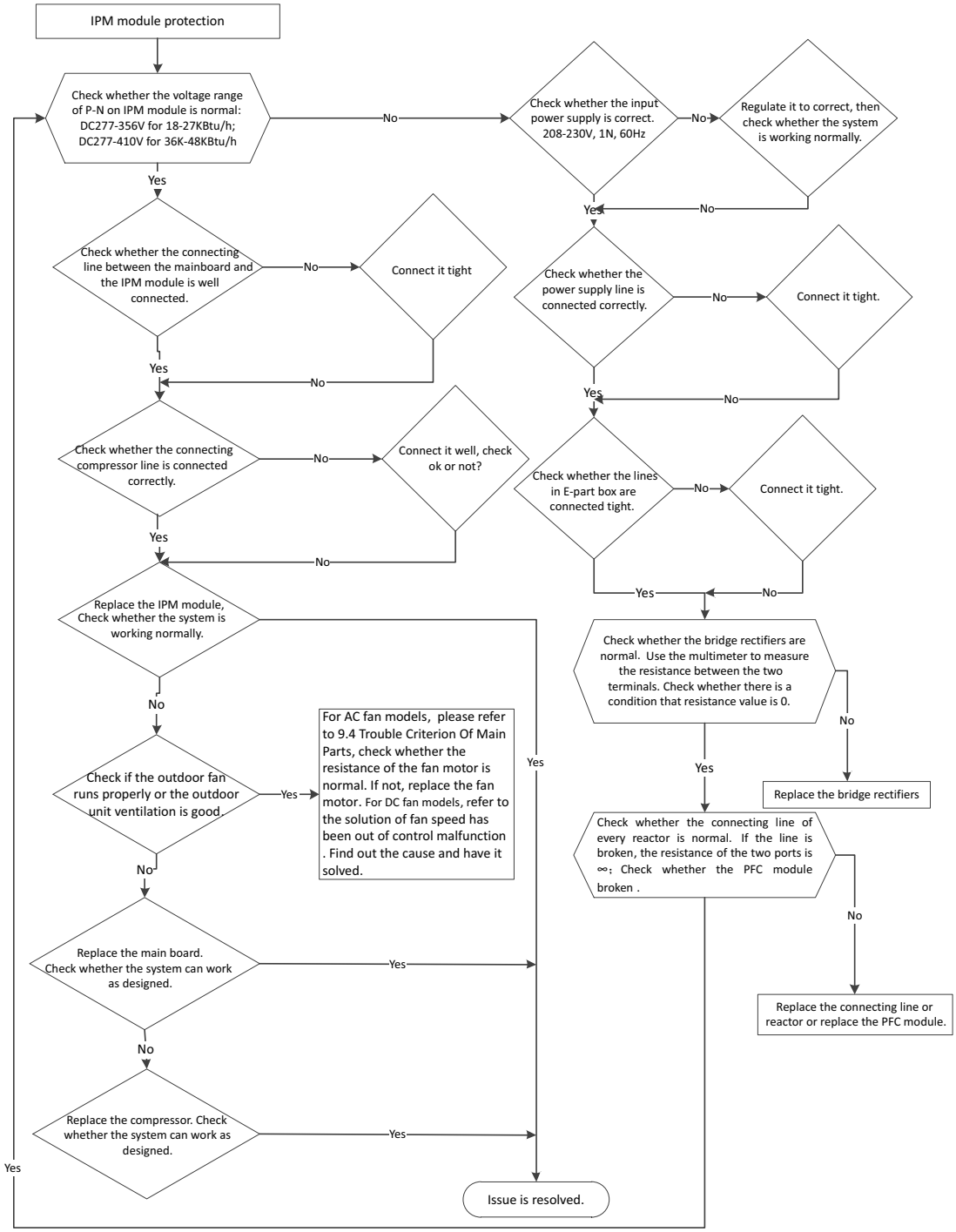


DIAGNOSIS AND SOLUTION (CONT)

Inverter module (IPM) malfunction diagnosis and solution

ERROR CODE	**P6 / PC 00**
MALFUNCTION DECISION CONDITIONS	When the voltage signal, that the IPM sends to the compressor drive chip is abnormal, the display LED displays **P6 or PC 00** and the unit turns off.
SUPPOSED CAUSES	Wiring mistake IPM malfunction Faulty outdoor fan assembly Compressor malfunction Faulty outdoor PCB

Troubleshooting

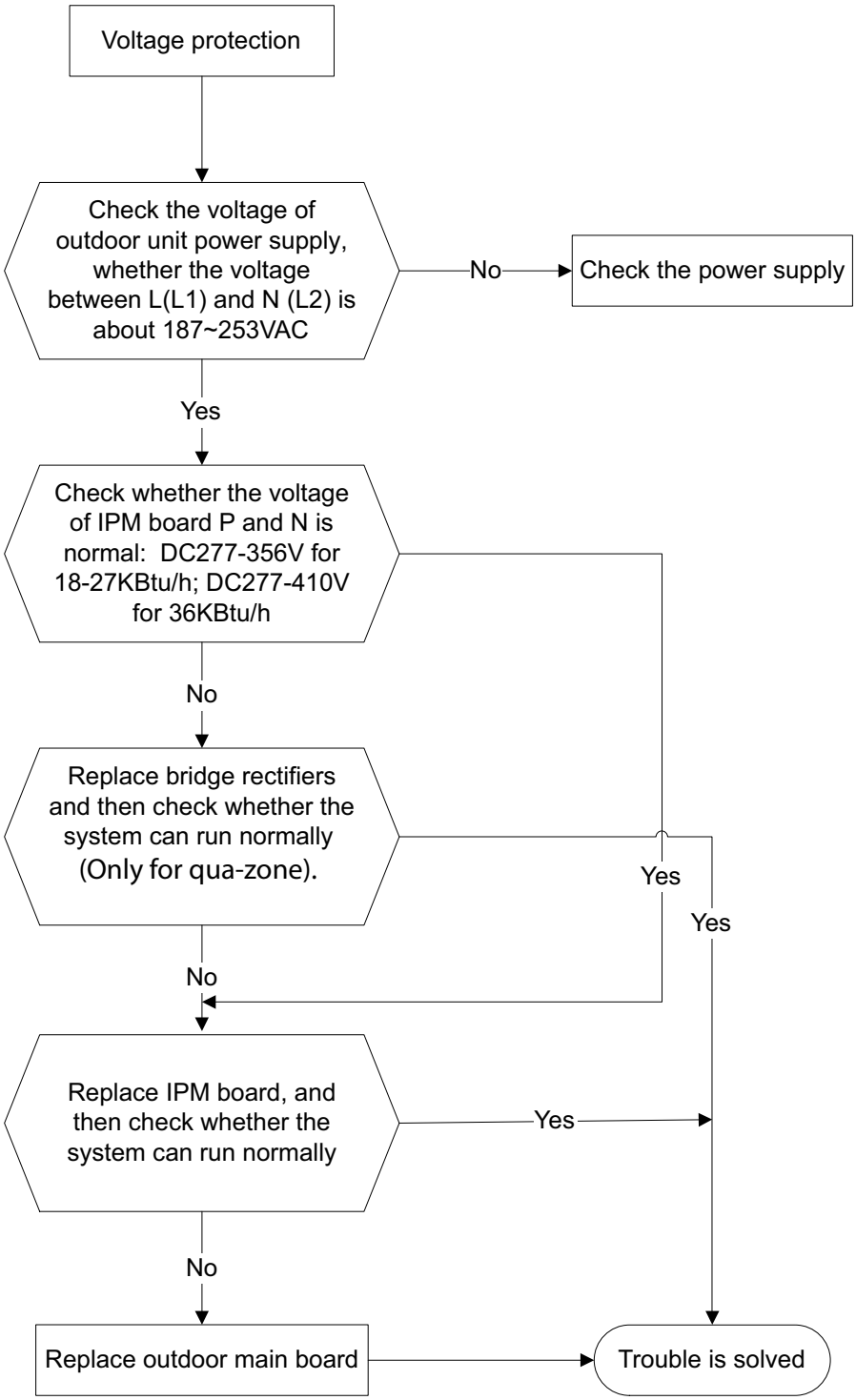


DIAGNOSIS AND SOLUTION (CONT)

Over-voltage or under-voltage protection diagnosis and solution

ERROR CODE	E5, PC 10, PC 11 OR PC 12
MALFUNCTION DECISION CONDITIONS	When the supply voltage to the unit or to the main control board is outside the acceptable tolerance, the unit's LED displays E5, PC 10, PC 11 or PC 12 and then the unit turns off.
SUPPOSED CAUSES	Issues with supply voltage Wiring mistake IPM malfunction Faulty outdoor PCB

Troubleshooting

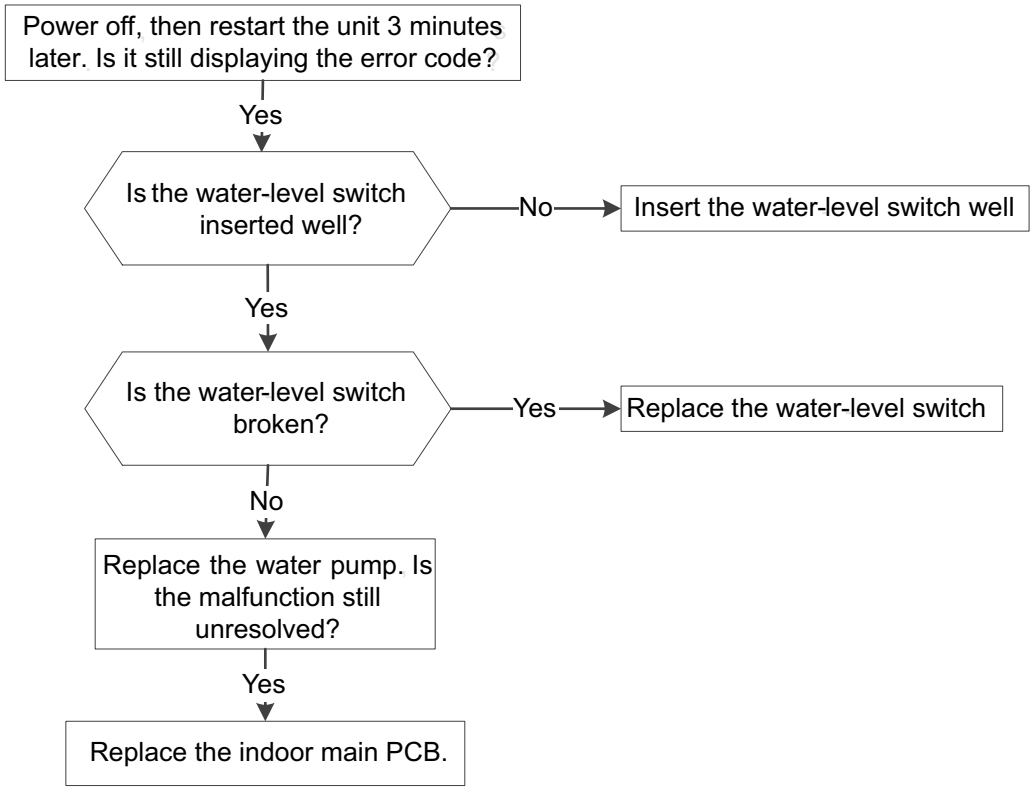


DIAGNOSIS AND SOLUTION (CONT)

Water-level alarm malfunction diagnosis and solution

ERROR CODE	REFER TO INDOOR UNIT SERVICE MANUAL
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is not 5V, the LED displays the failure code.
SUPPOSED CAUSES	Wiring mistakes Faulty water-level switch Faulty water pump Faulty indoor PCB

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

Indoor units mode conflict

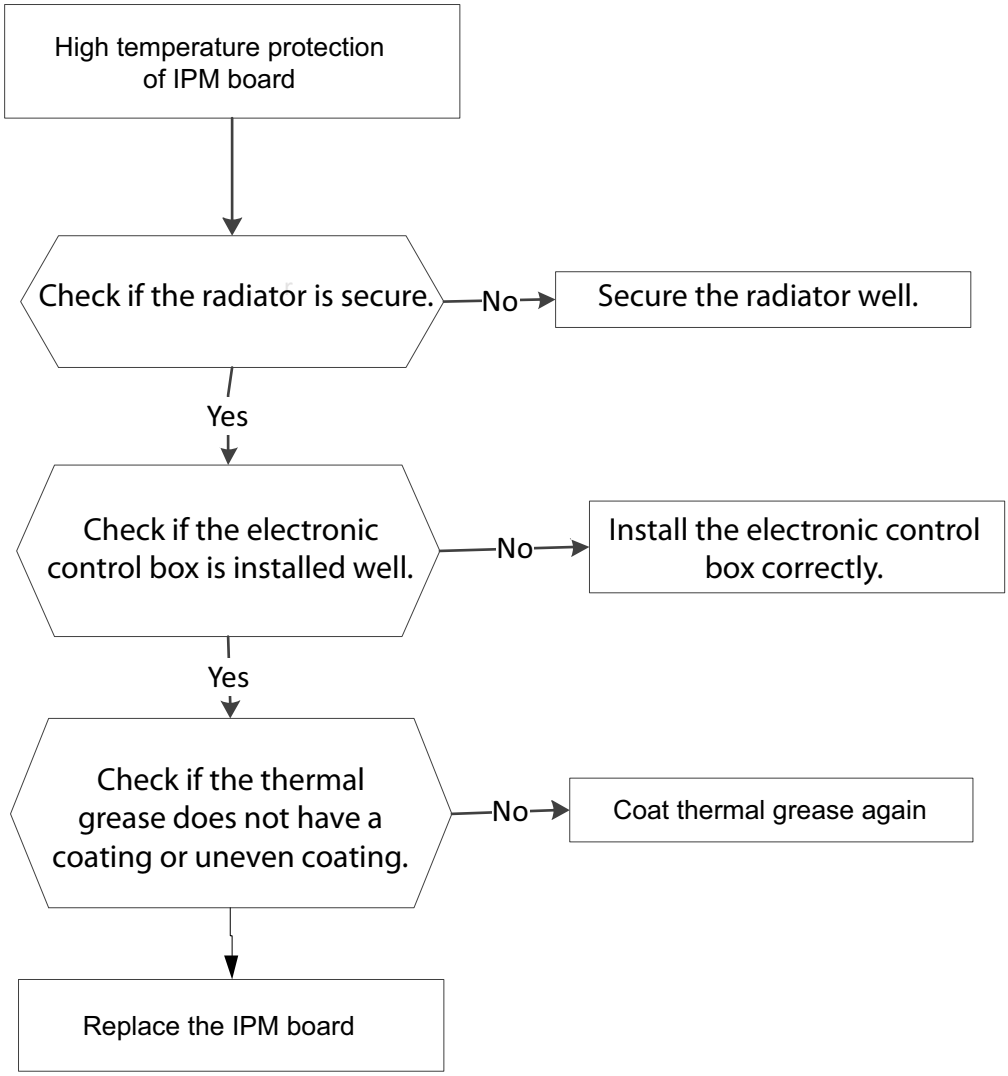
ERROR CODE	REFER TO INDOOR UNIT SERVICE MANUAL
MALFUNCTION DECISION CONDITIONS	The indoor units cannot work cooling mode and heating at same time. Heating mode has the priority.
SUPPOSED CAUSES	If indoor unit A is working in **COOLING** mode or fan mode, and indoor unit B is set to **HEATING** mode, then A will switch off and B will work in **HEATING** mode. If indoor unit A is working in **HEATING** mode, and indoor unit B is set to **COOLING** mode or fan mode, then B will change to standby and A will not change.

	COOLING MODE	HEATING MODE	FAN	OFF
COOLING MODE	No	Yes	No	No
HEATING MODE	Yes	No	Yes	
FAN	No	Yes	No	
OFF	No	No	No	

No: No Mode Conflict:

Yes: Mode Conflict

Troubleshooting

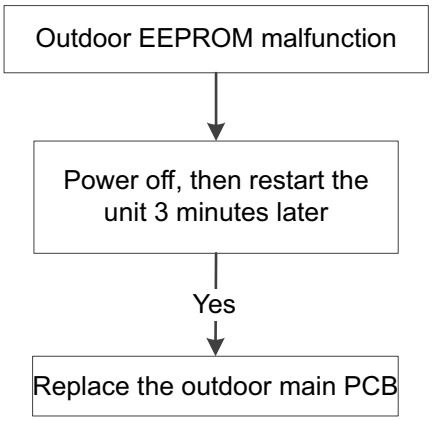


DIAGNOSIS AND SOLUTION (CONT)

E0/ EC 51 (Outdoor unit EEPROM parameter error) diagnosis and solution

ERROR CODE	**E0/ EC 51**
MALFUNCTION DECISION CONDITIONS	PCB main chip does not receive feedback from EEPROM chip
SUPPOSED CAUSES	Installation mistake Faulty PCB

Troubleshooting



EEPROM: a type of memory. The contents can be erased and reprogrammed using a pulsed voltage (see figure 39).

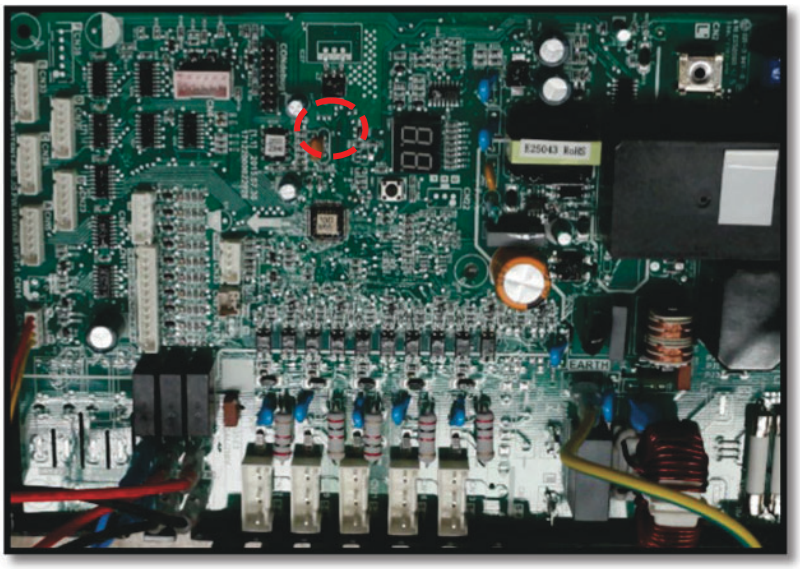


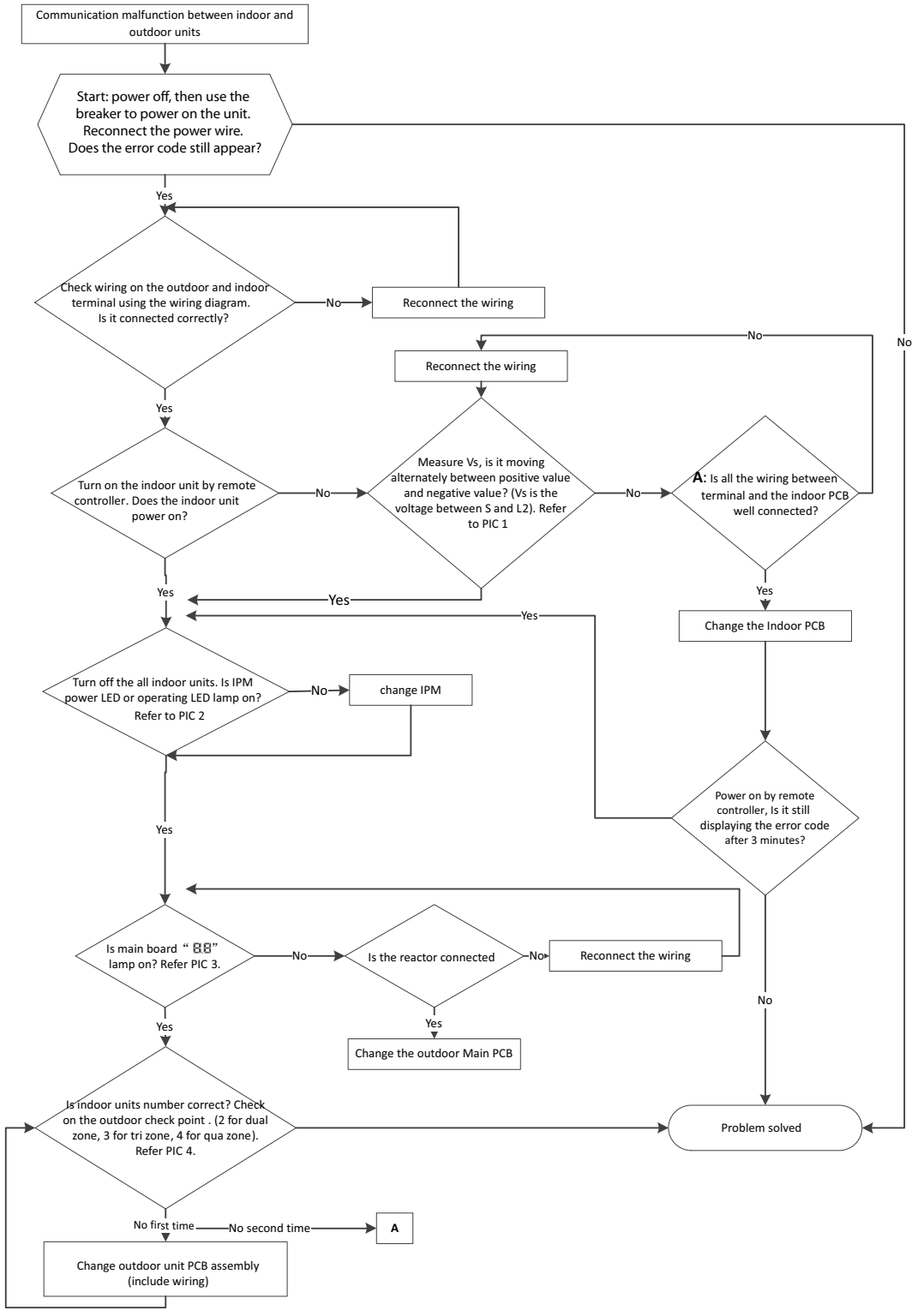
Fig. 39 — EEPROM

DIAGNOSIS AND SOLUTION (CONT)

E2/ EL 01 (Communication malfunction between indoor and outdoor units) diagnosis and solution

ERROR CODE	E2/ EL 01
MALFUNCTION DECISION CONDITIONS	Indoor unit does not receive the feedback from outdoor unit during 120 seconds or outdoor unit does not receive the feedback from any one indoor unit during 180 seconds.
SUPPOSED CAUSES	Wiring mistake Faulty indoor or outdoor PCB

Troubleshooting



E2/ EL 01 (Communication malfunction between indoor and outdoor units) diagnosis and solution (Cont)

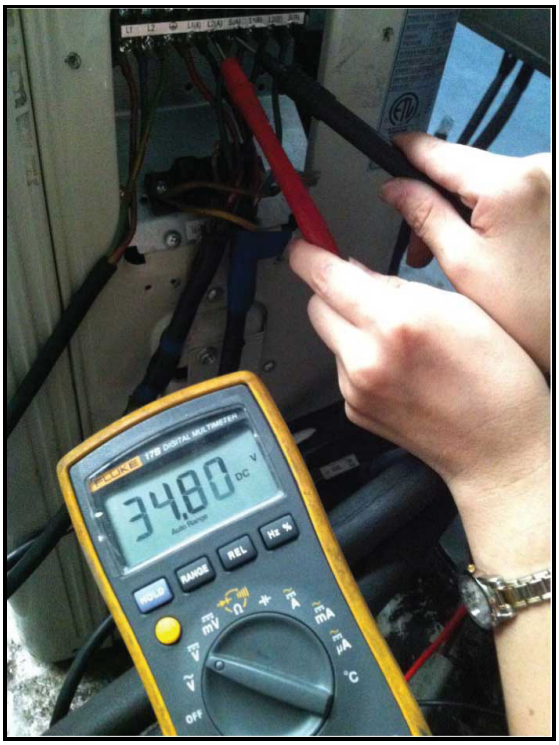


Fig. 40 — PIC 1

PIC 1: Use a multimeter to test the DC voltage between the outdoor unit's 2 (old: L2) port and 3 port. The multimeter's red pin connects with 2 (old: L2) port while the black pin is for 3 port.

When the unit is normal running, the voltage moves alternately between positive and negative values.

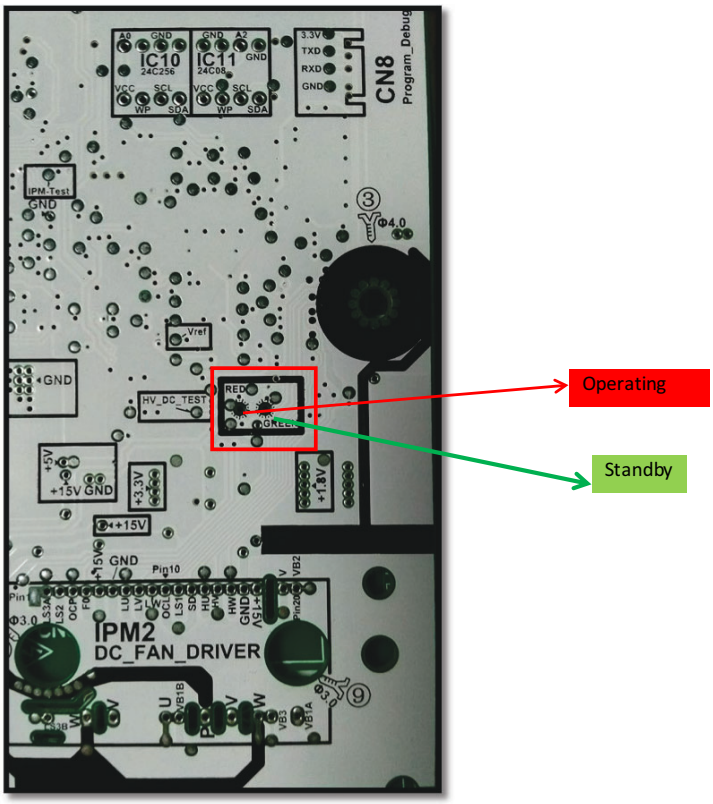


Fig. 41 — PIC: 2 IPM board (for 2 zone/ 3-zone)

DIAGNOSIS AND SOLUTION (CONT)

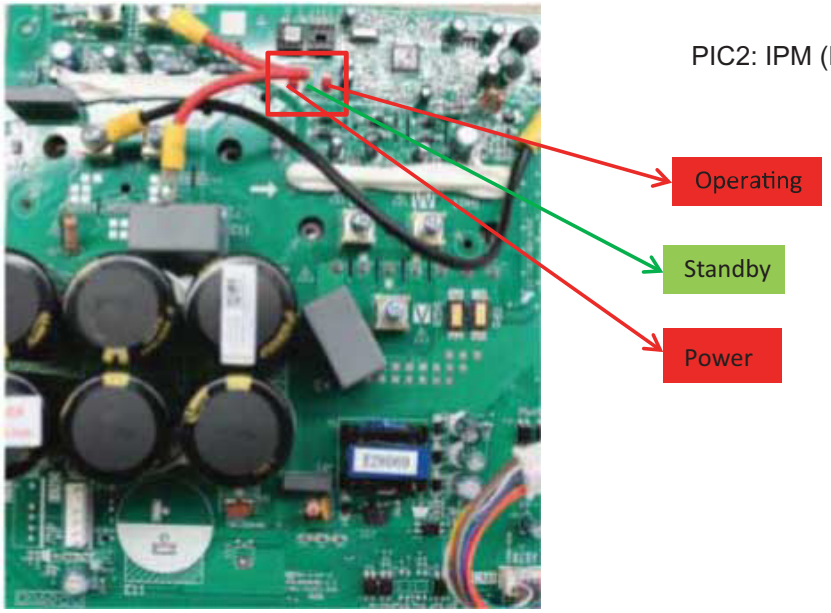


Fig. 42 — IPM for four and five zone

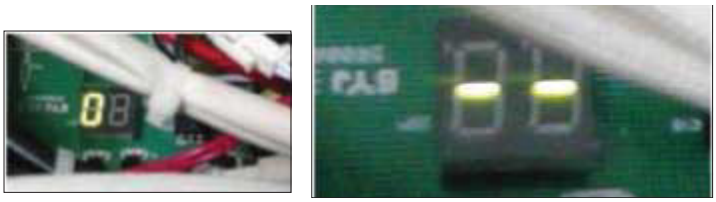


Fig. 43 — Main Board

PIC3: The main board LED displays when the power is on and the unit is in standby.

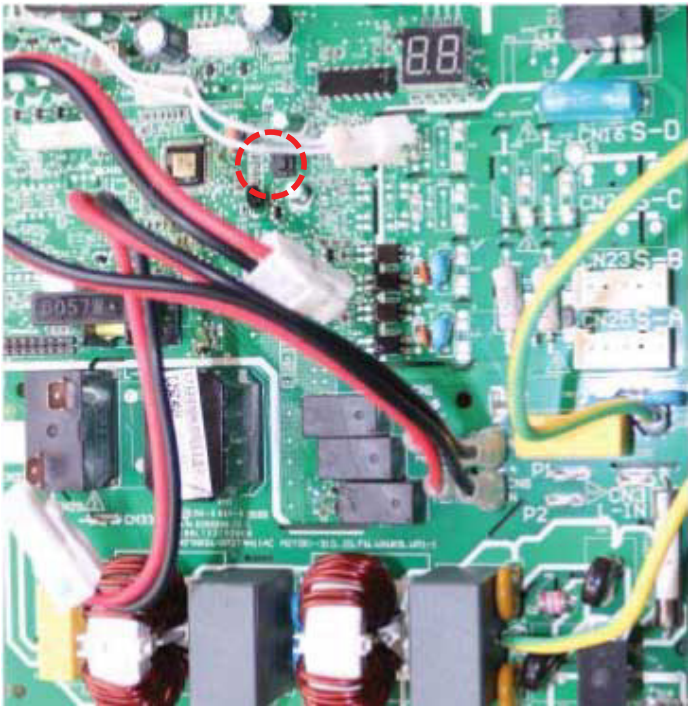


Fig. 44 — Main Board

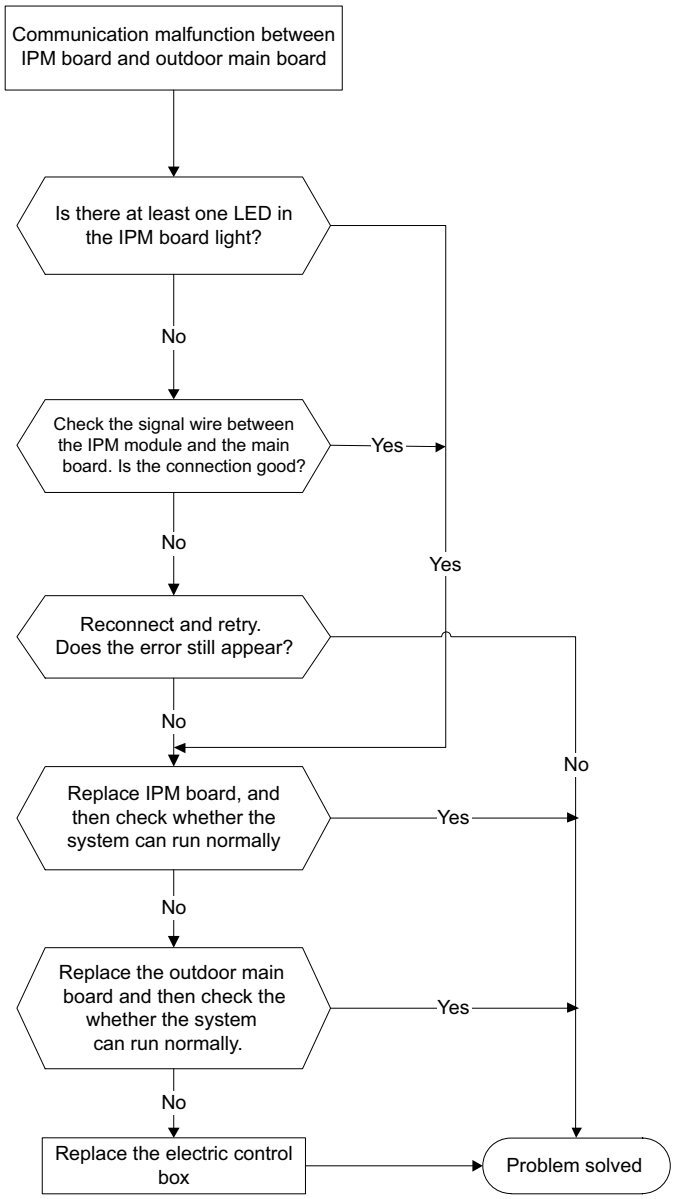
PIC4: Check the POINT button. Press one time to determine how many indoor units are connected.

DIAGNOSIS AND SOLUTION (CONT)

E3/ PC 40 (Communication malfunction between IPM board and outdoor main control board) diagnosis

ERROR CODE	**E3/ PC 40**
MALFUNCTION DECISION CONDITIONS	PCB main chip does not receive feedback from IPM module during 60 seconds.
SUPPOSED CAUSES	Wiring mistake PCB faulty

Troubleshooting



E3/ PC 40 (Communication malfunction between IPM board and outdoor main control board) diagnosis (Cont)

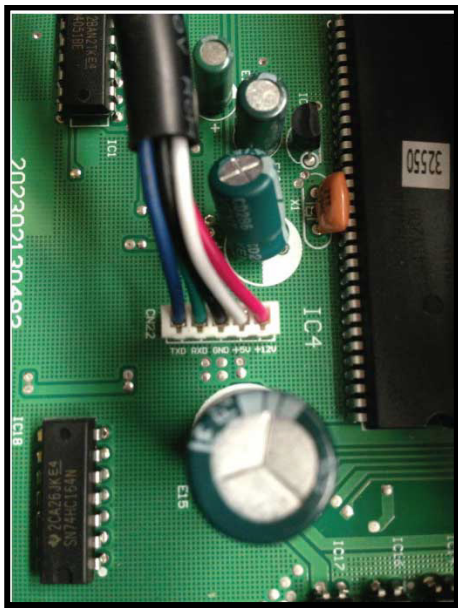


Fig. 45 — E3/ PC 40

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

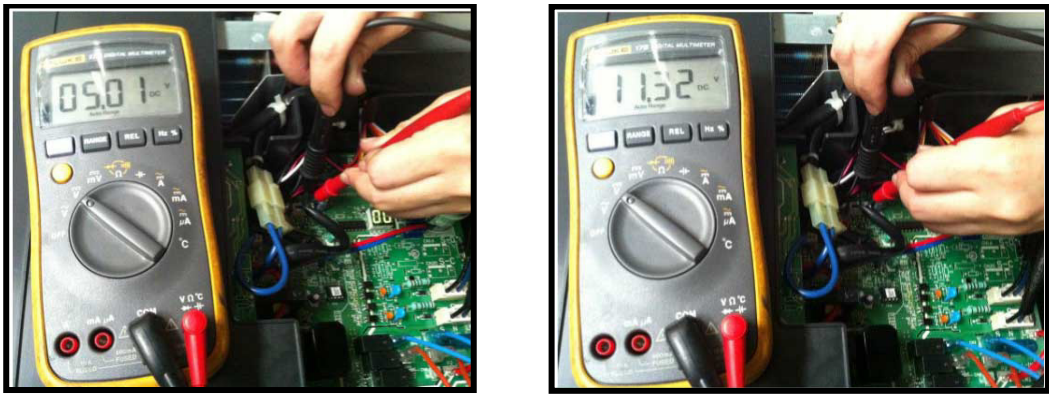


Fig. 46 — E3/ PC 40

DIAGNOSIS AND SOLUTION (CONT)

E4/EC 50 (Outdoor temperature sensor (coil sensor T3,ambient sensor T4, Compressor discharge sensor T5，indoor coil outlet pipe sensor T2B) malfunction) diagnosis and solution

F1/F2/F3/F4/F5 (No.A,B,C,D,E Indoor unit coil outlet temp. sensor malfunction) diagnosis and solution

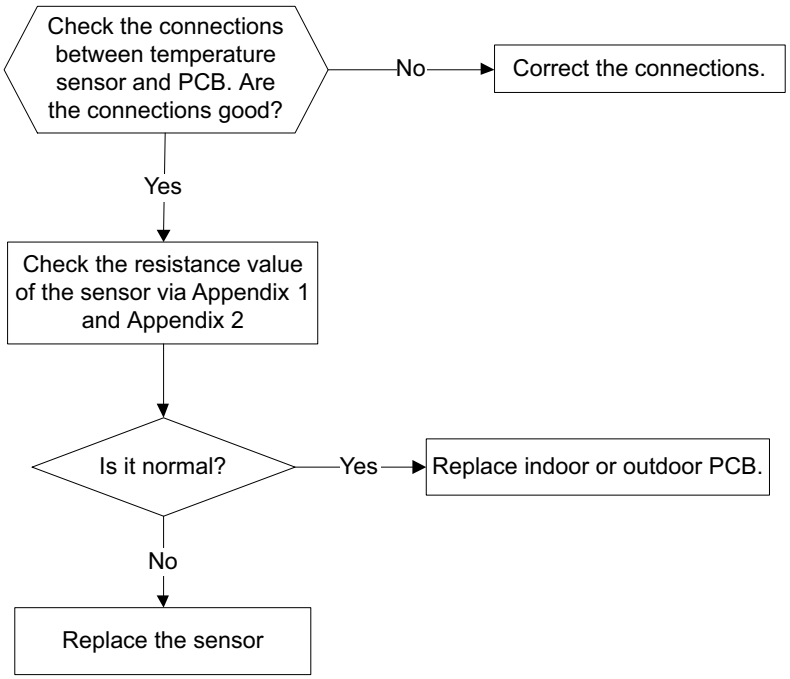
Outdoor room temperature sensor T4 is in open circuit or has short circuited (EC 53)

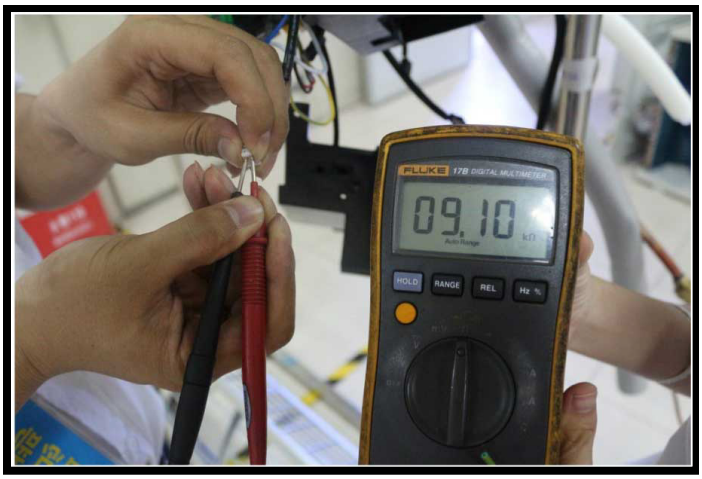
Compressor discharge temperature sensor T5 is in open circuit or has short circuited (EC 54)

Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited (EC 56)

ERROR CODE	**E4/F1/F2/F3/F4/F5/ EC 52/EC 53/EC 54/EC 56/EC 50**
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.
SUPPOSED CAUSES	Wiring mistake Faulty Sensor PCB faulty

Troubleshooting



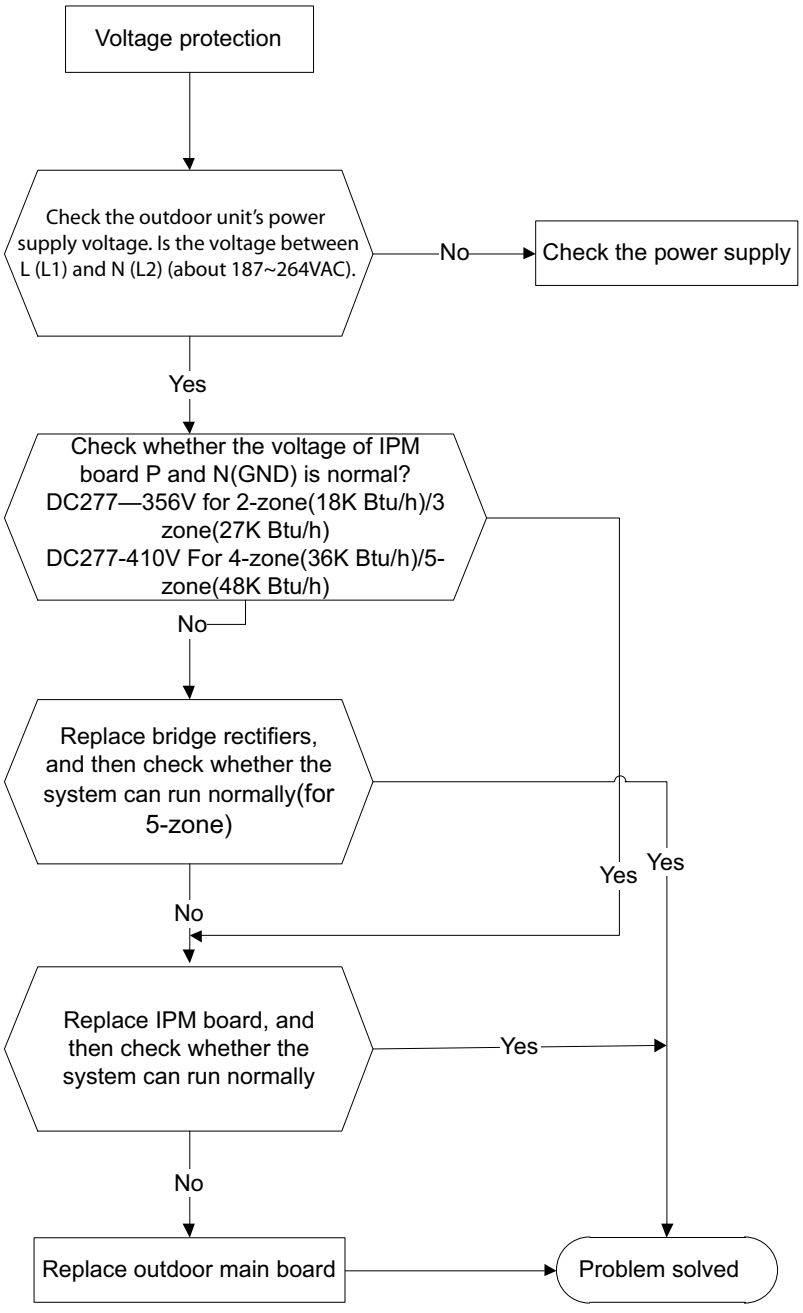


DIAGNOSIS AND SOLUTION (CONT)

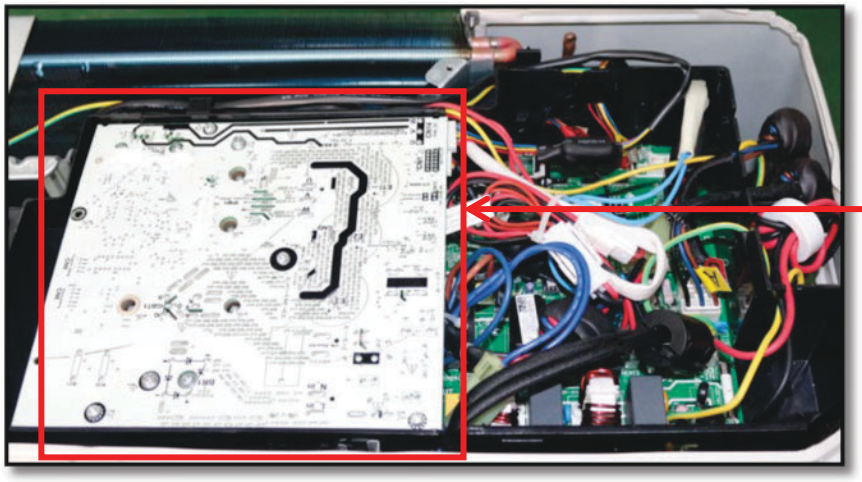
E5/ PC 10/PC 11/PC 12 (Over-voltage or under-voltage protection) diagnosis and solution

ERROR CODE	E5/ PC 10/PC 11/PC 12
MALFUNCTION DECISION CONDITIONS	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
SUPPOSED CAUSES	Wiring mistake Faulty Sensor PCB faulty

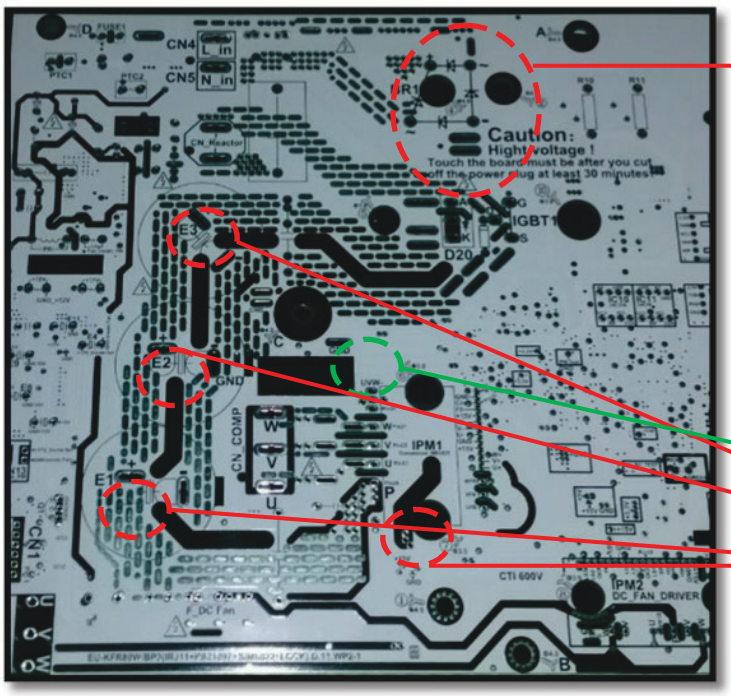
Troubleshooting



E5/ PC 10/PC 11/PC 12 (Over-voltage or under-voltage protection) diagnosis and solution (Cont)



IPM board (for 2-zone /3-zone)



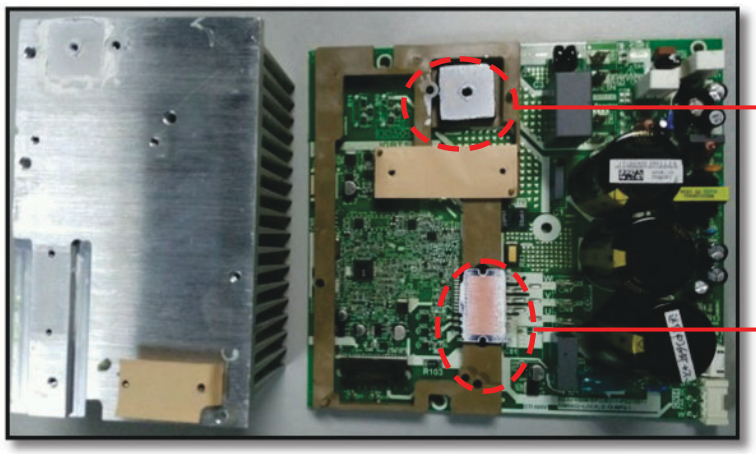
Bridge rectifier (for 2-zone/3-zone)

Remark:

Measure the DC voltage between + and - port. The normal value should be 190V~250V.

P(or E1/E2/E3)-N(GND)

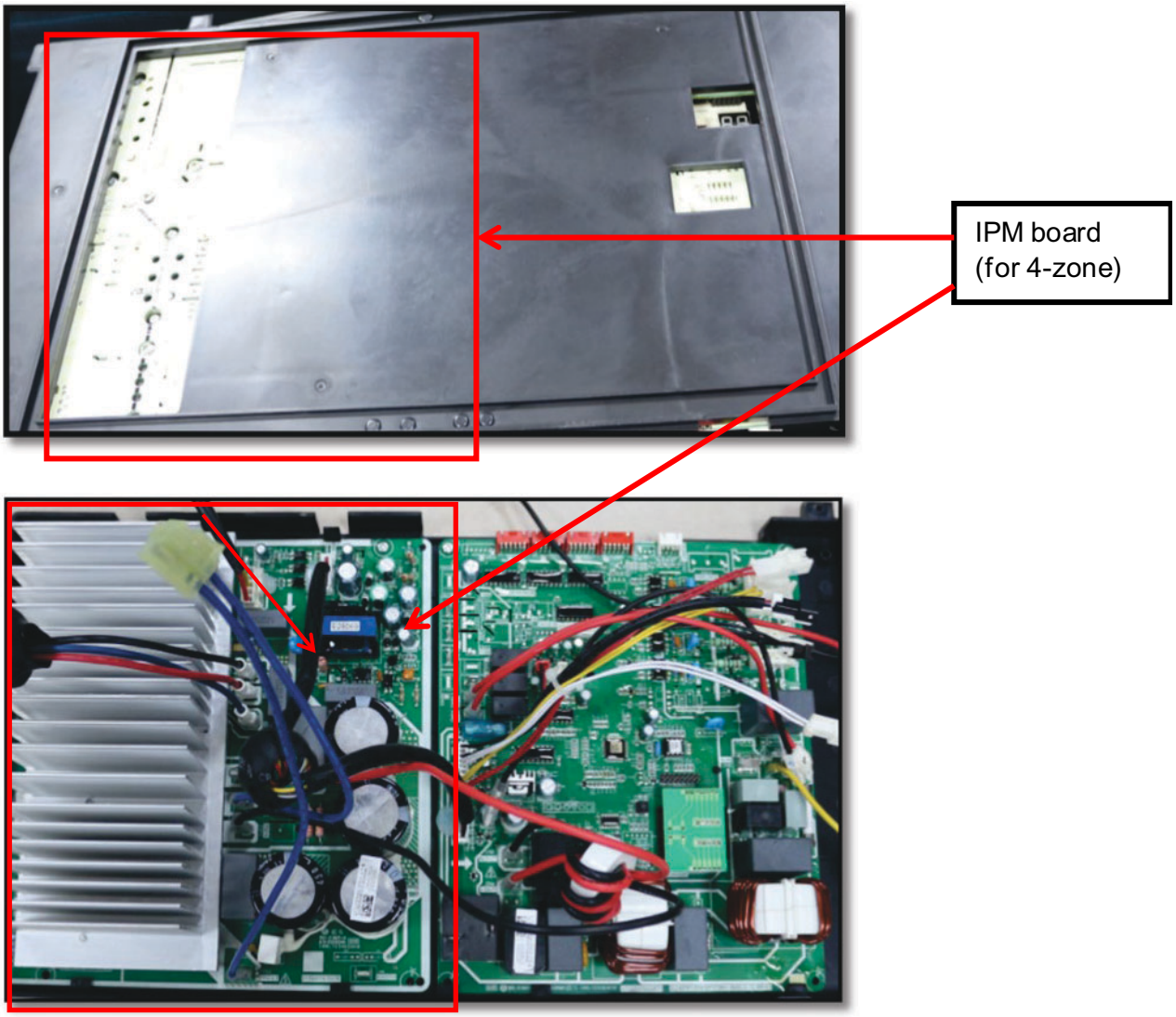
(for 2-zone/3-zone)



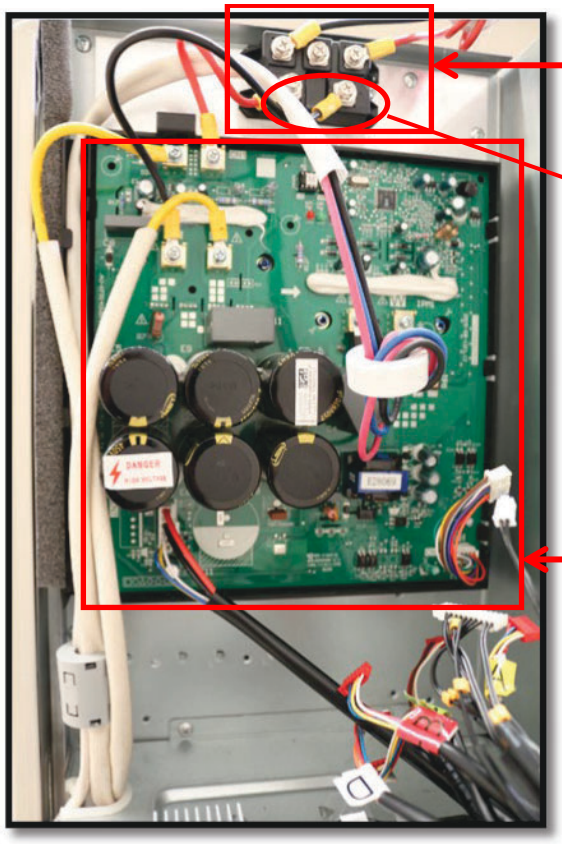
Bridge rectifier (for 2-zone/3-zone)

IPM Module (for 2-zone/3-zone)

E5/ PC 10/PC 11/PC 12 (Over-voltage or under-voltage protection) diagnosis and solution (Cont)



E5/ PC 10/PC 11/PC 12 (Over-voltage or under-voltage protection) diagnosis and solution (Cont)



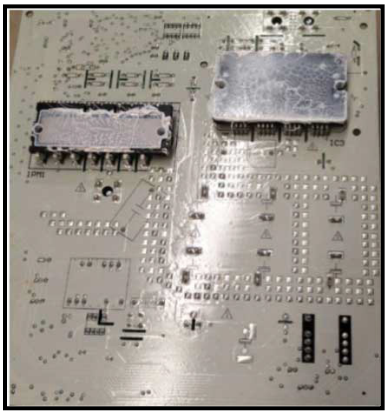
Bridge rectifier (for 5-zone)

Remark:

Measure the DC voltage between + and - port. The normal value should be 190V~250V.

IPM board (for 5-zone)

IPM Module for 5 - zone

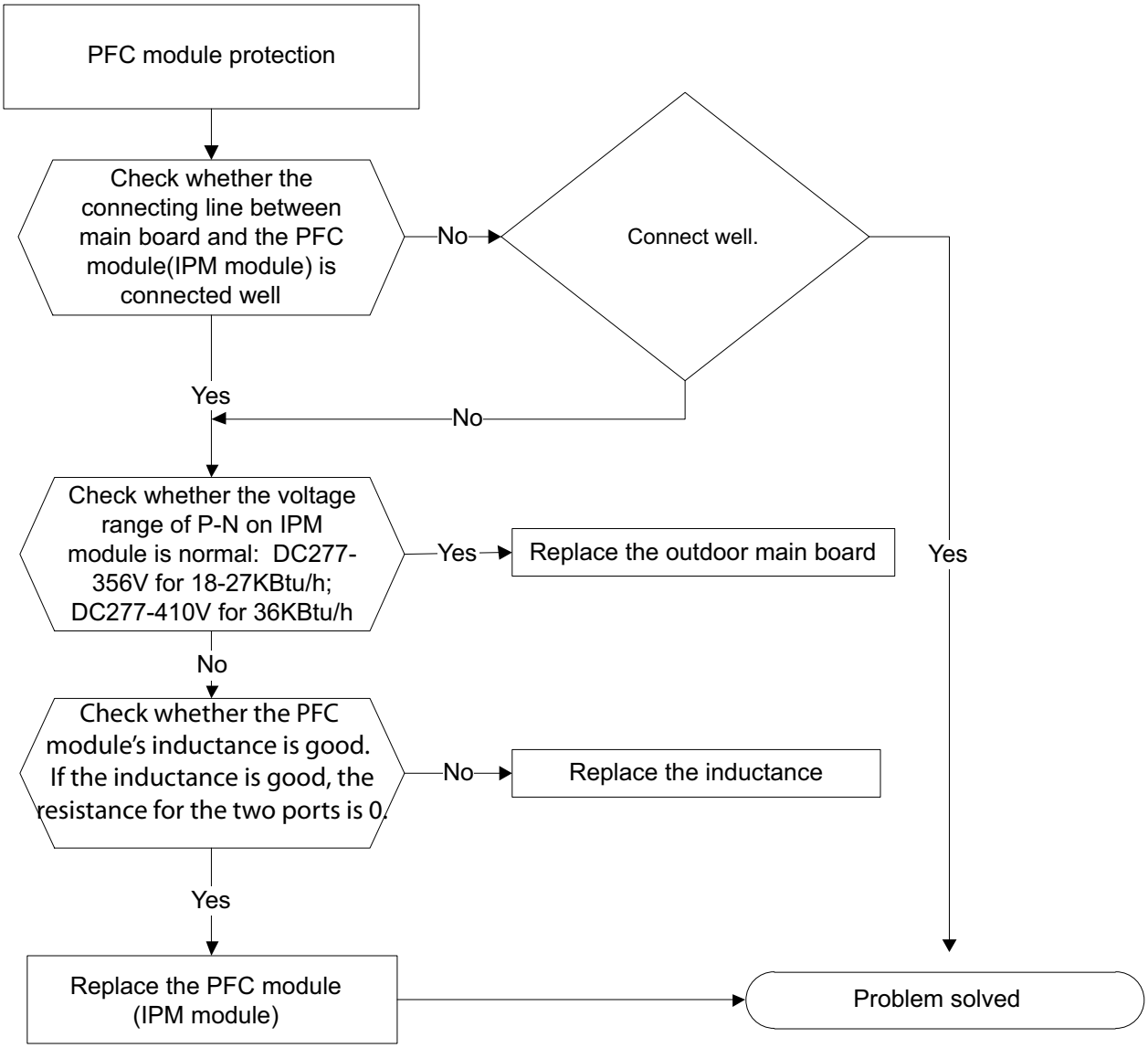


DIAGNOSIS AND SOLUTION (CONT)

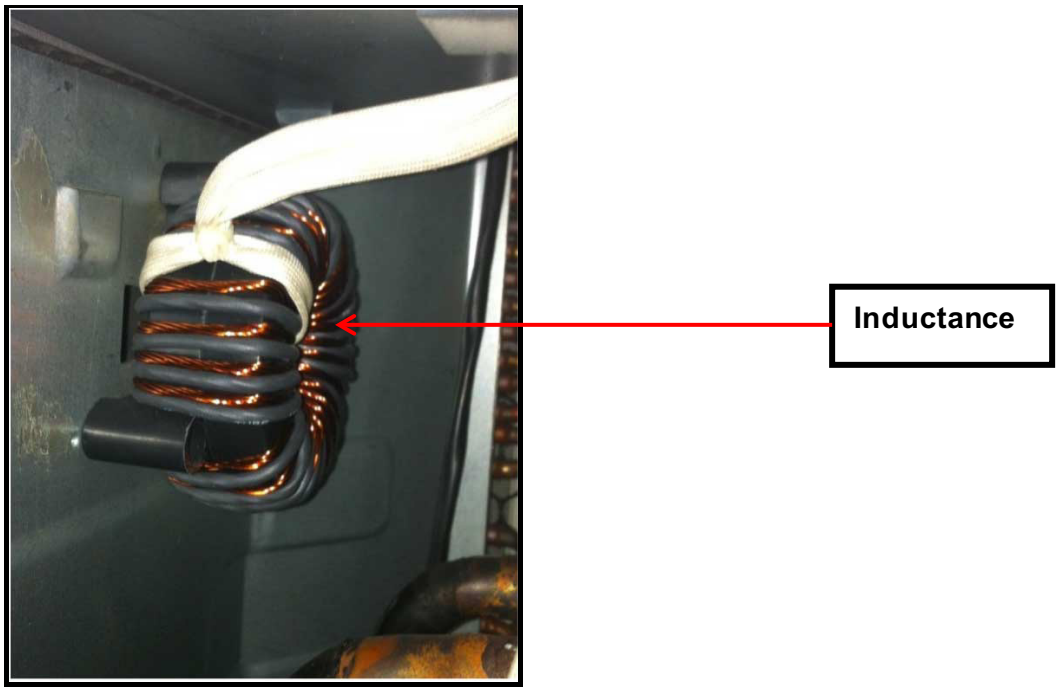
E6/ PC 0F (PFC module protection) error diagnosis and solution

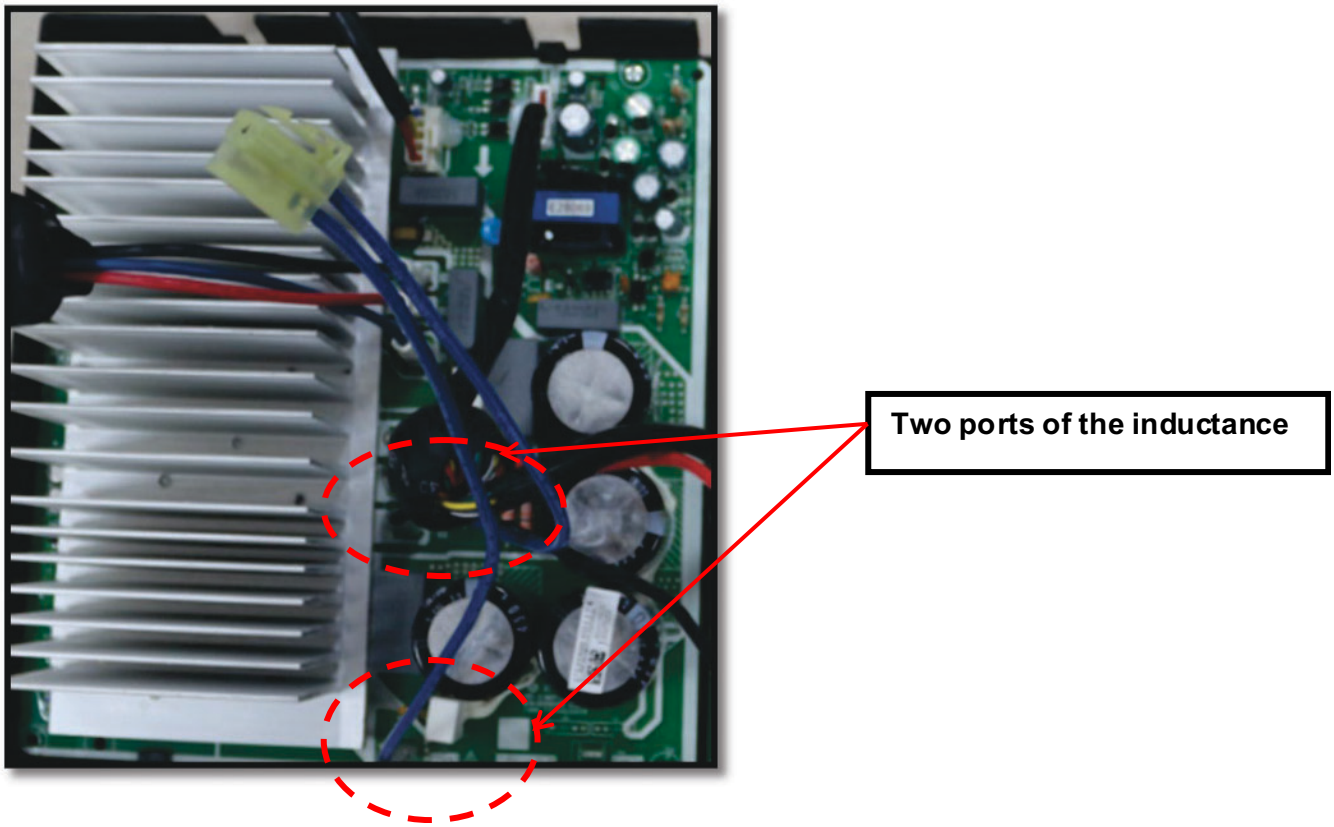
ERROR CODE	E6/ PC 0F
MALFUNCTION DECISION CONDITIONS	When the voltage signal that PFC sends to main control board is abnormal, the display LED displays **E6** and the unit turns off.
SUPPOSED CAUSES	Wiring mistake Faulty inductance of PFC module PCB module malfunction

Troubleshooting



E6/ PC 0F (PFC module protection) error diagnosis and solution (cont)



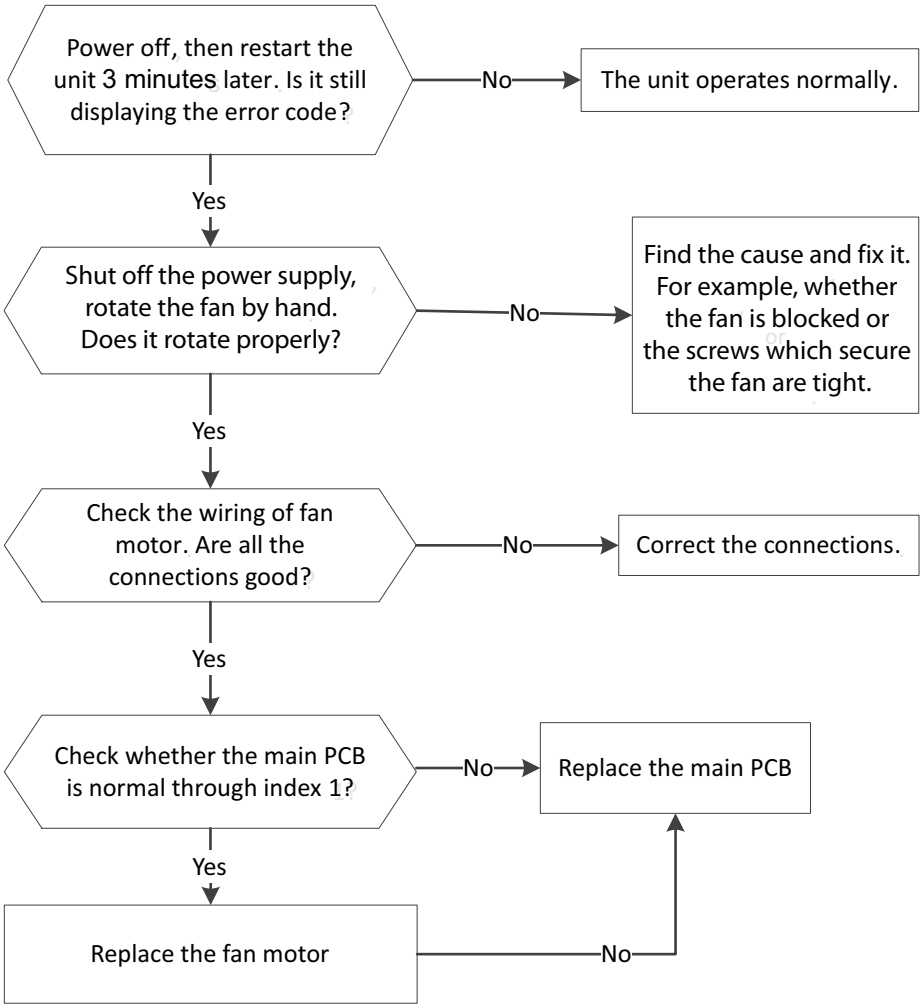


DIAGNOSIS AND SOLUTION (CONT)

E8/ EC 07 (Outdoor fan speed malfunction)/ EC 71(Over current failure of outdoor DC fan motor) diagnosis and solution

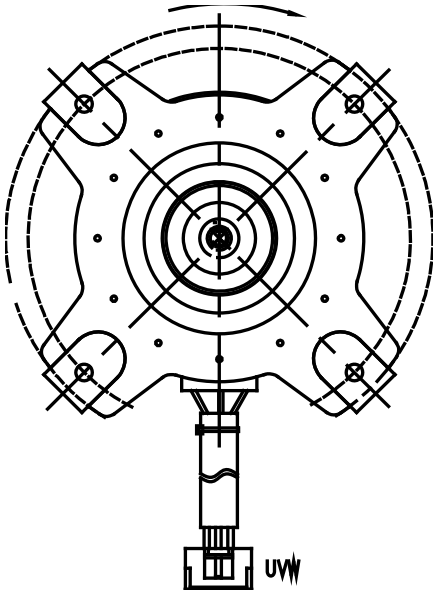
ERROR CODE	E8/ EC 07/ EC 71
MALFUNCTION DECISION CONDITIONS	When outdoor fan speed remains too low (300RPM) or too high (2400RPM) for a certain time, the unit will stop and the LED displays the failure.
SUPPOSED CAUSES	Wiring mistake Faulty fan assembly Faulty fan motor Faulty PCB

Troubleshooting



DC Fan Motor (Control Chip is in PCB)

Release the UVW connector. Measure the U-V, U-W, and V-W resistance. If the resistances are not equal to each other, the fan motor may be experiencing problems and needs to be replaced. Otherwise, the PCB must have an issue and needs to be replaced.

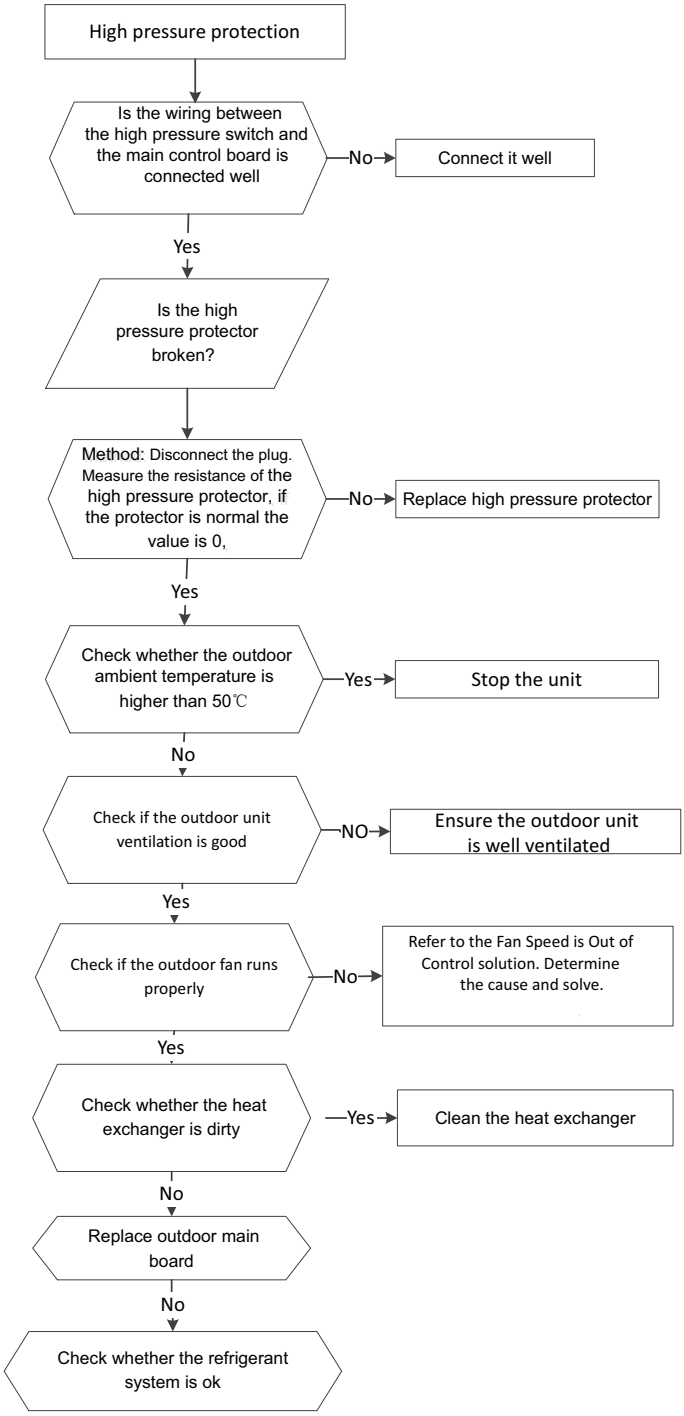


DIAGNOSIS AND SOLUTION (CONT)

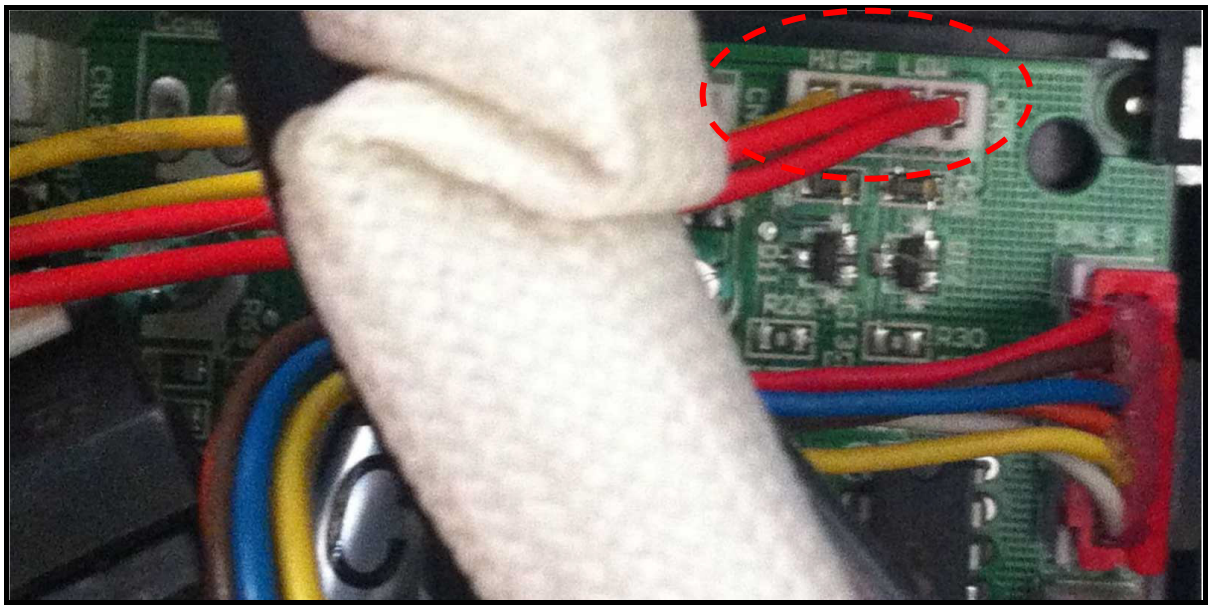
P1/PC 30 (High pressure protection) diagnosis and solution

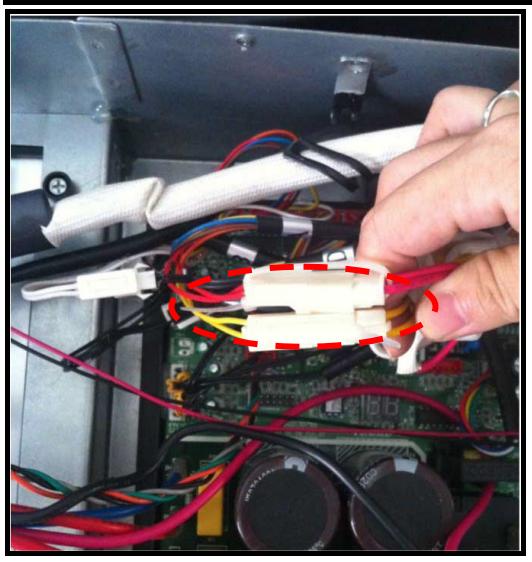
ERROR CODE	P1/PC 30
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is not 5V, the LED displays the failure.
SUPPOSED CAUSES	Wiring mistake Faulty over load protector System block Faulty Outdoor PCB

Troubleshooting



P1/PC 30 (High pressure protection) diagnosis and solution (Cont)



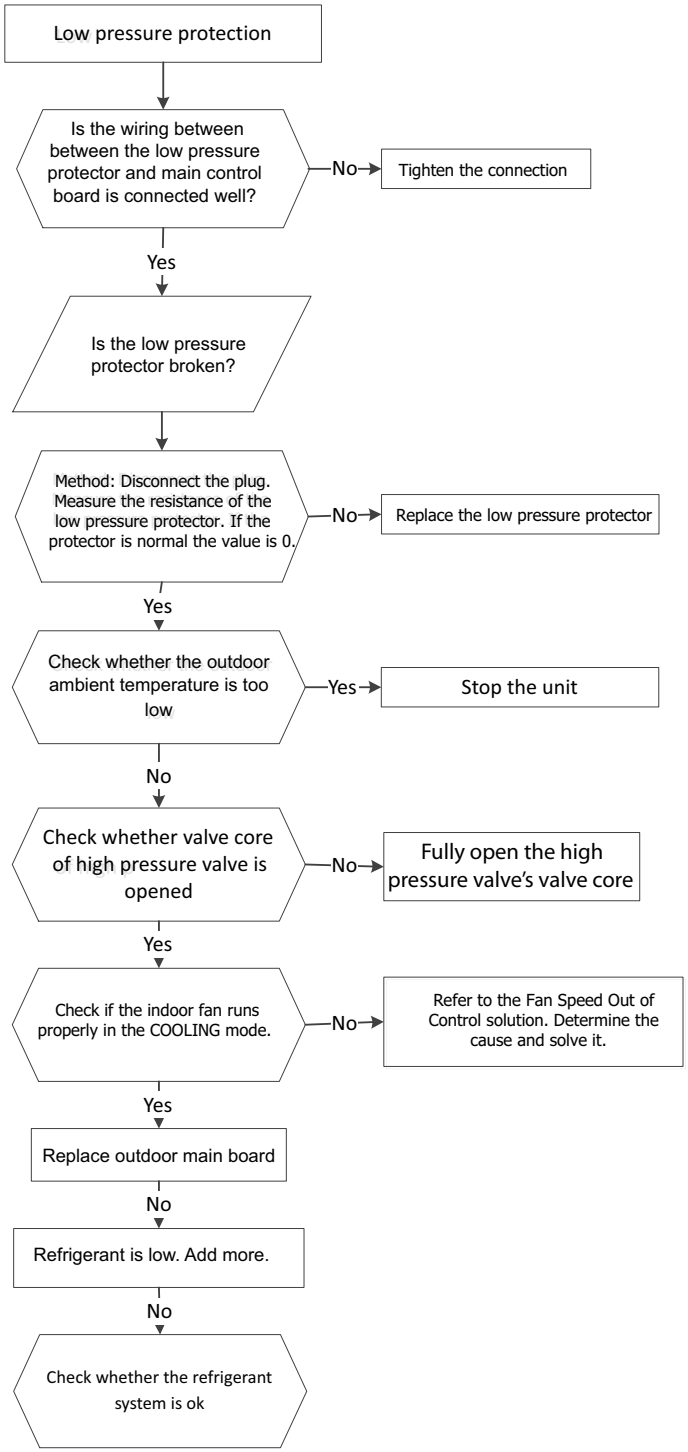


DIAGNOSIS AND SOLUTION (CONT)

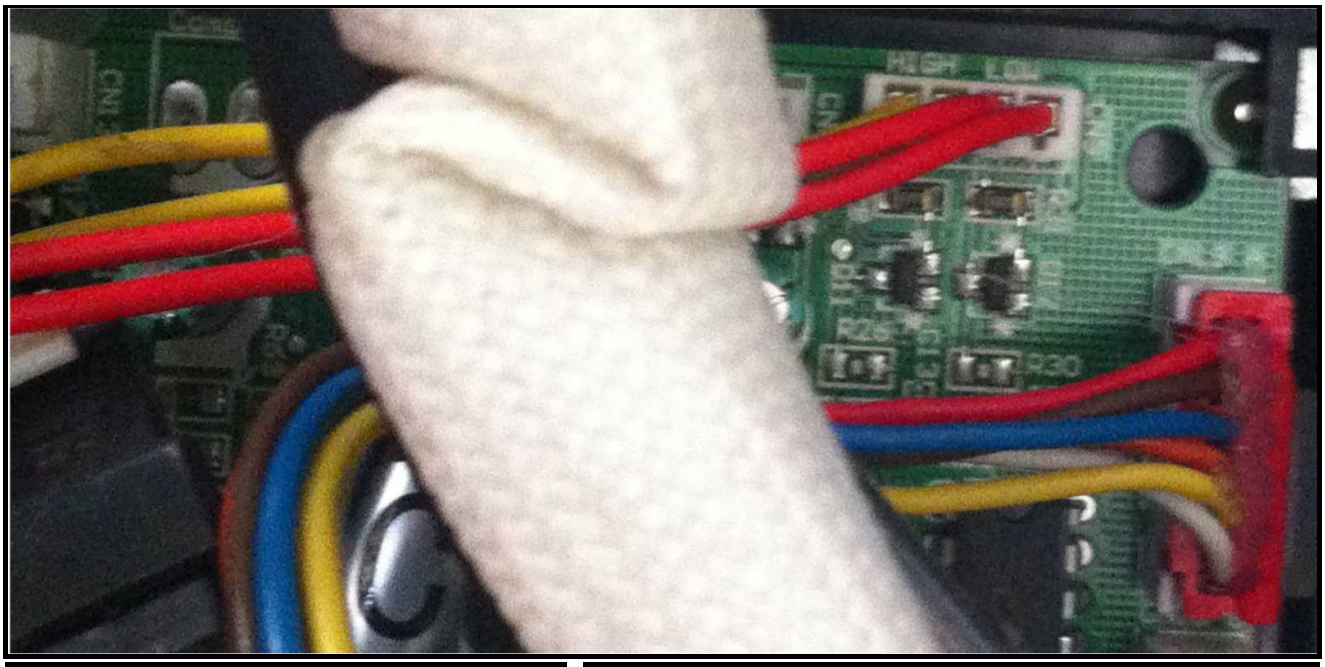
P2/PC 31 (Low pressure protection) diagnosis and solution

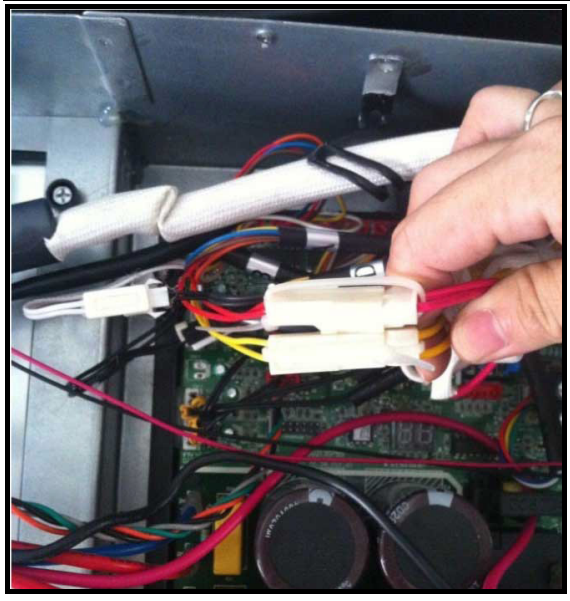
ERROR CODE	**P2/PC 31**
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is not 5V, the LED will display the failure.
SUPPOSED CAUSES	Wiring mistake Faulty overload protector System block Faulty Outdoor PCB

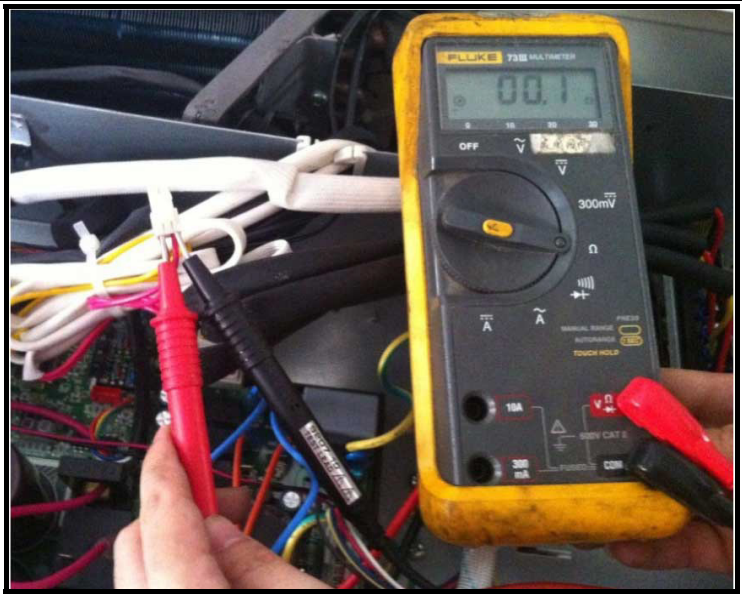
Troubleshooting



P2/PC 31 (Low pressure protection) diagnosis and solution





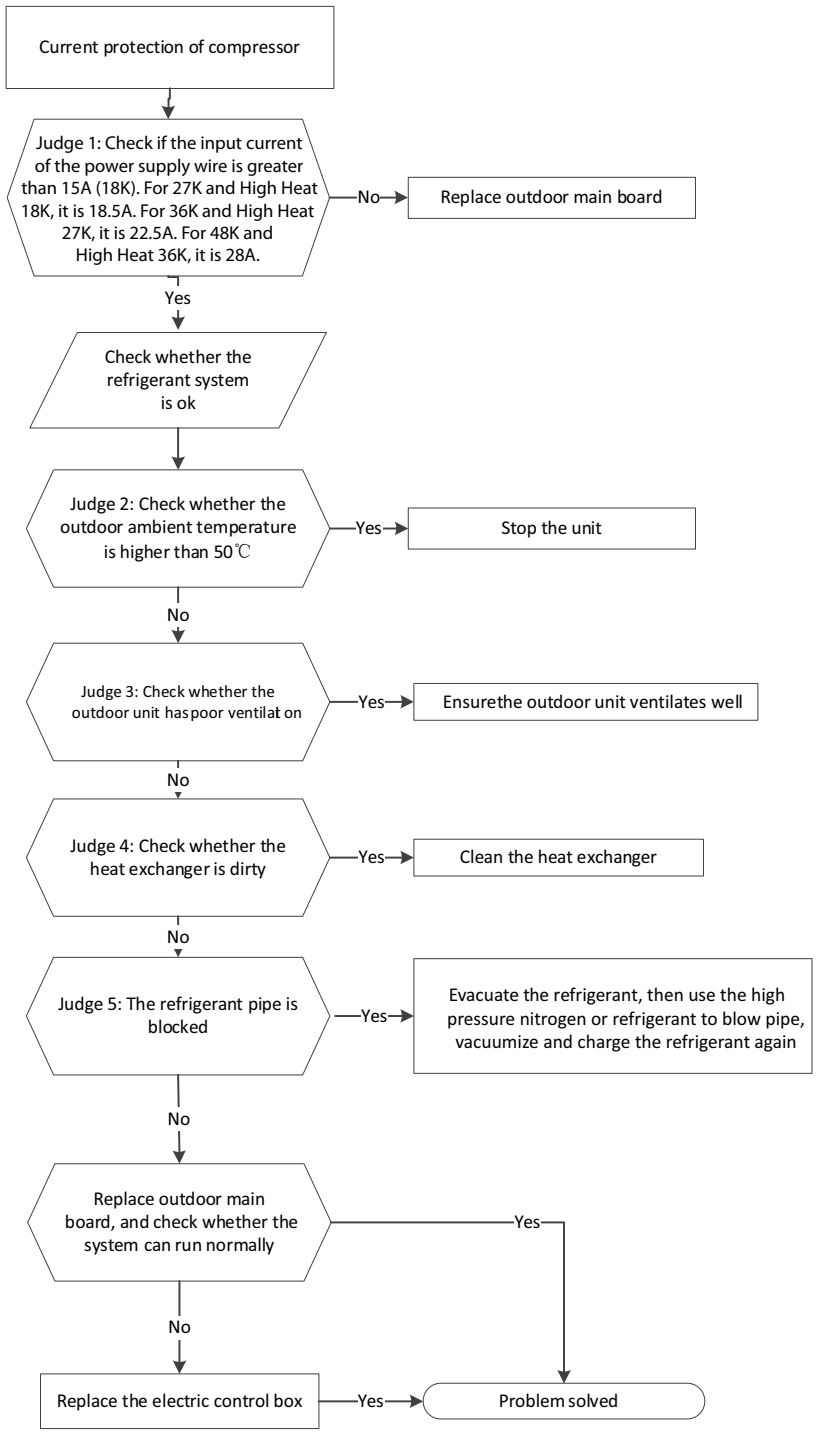


DIAGNOSIS AND SOLUTION (CONT)

P3/PC 08 (Current overload protection)/ PC 44(Outdoor unit zero speed protection)/PC 46(Compressor speed is out of control)/PC 49 (Compressor overcurrent failure) diagnosis and solution

ERROR CODE	**P3/PC 08/PC 44/PC 46/PC 49**
MALFUNCTION DECISION CONDITIONS	If the outdoor current exceeds the current limit value, the LED displays the failure.
SUPPOSED CAUSES	Wiring mistake Faulty overload protector System block Faulty Outdoor PCB

Troubleshooting



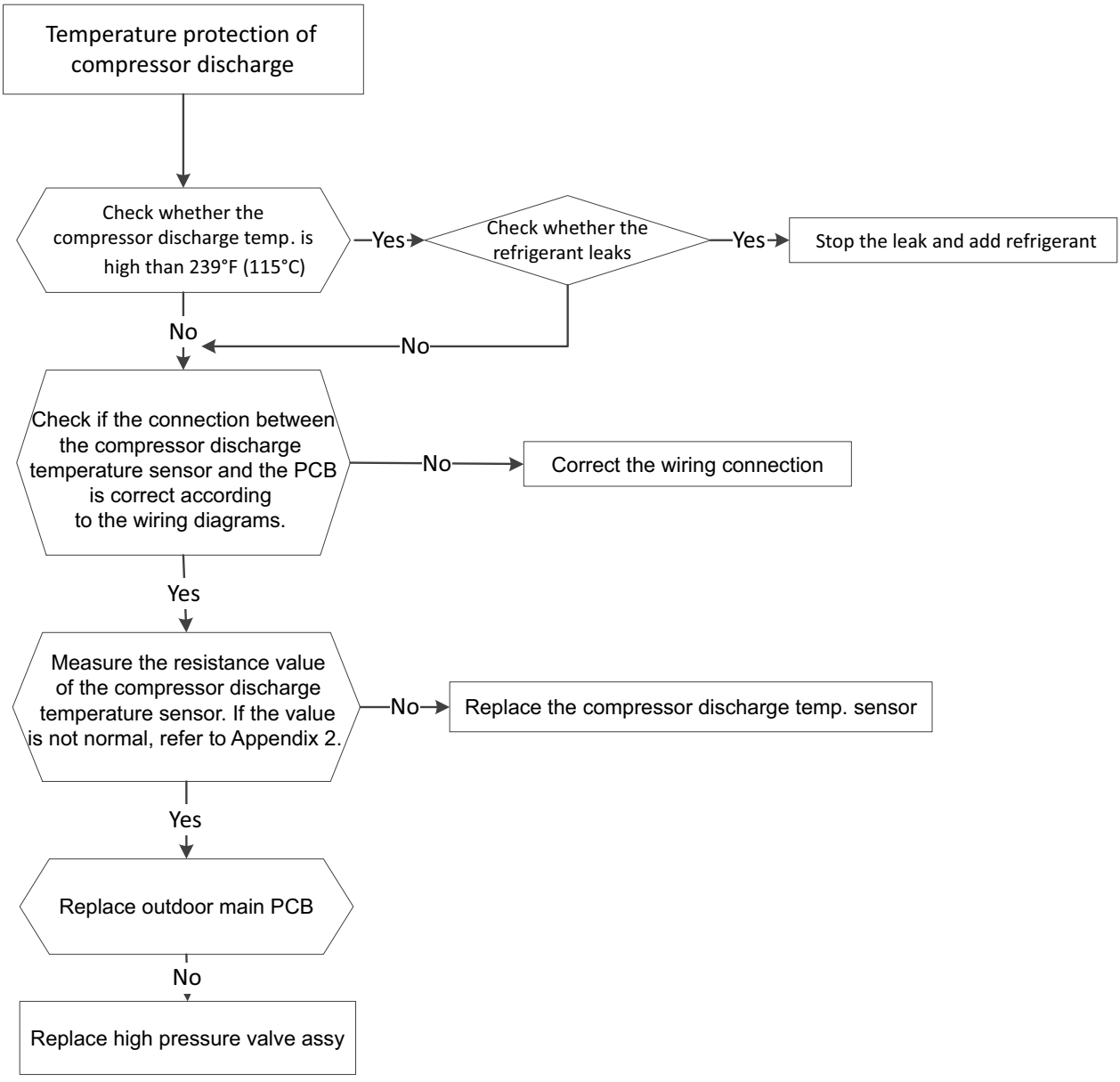
P3/PC 08 (Current overload protection)/ PC 44(Outdoor unit zero speed protection)/PC 46(Compressor speed is out of control)/PC 49(Compressor overcurrent failure) diagnosis and solution (Cont)

DIAGNOSIS AND SOLUTION (CONT)

P4/PC 06 (Temperature protection of compressor discharge) diagnosis and solution

ERROR CODE	P4/PC 06
MALFUNCTION DECISION CONDITIONS	When the compressor discharge temperature(T5) is more than 239°F (115 °C) for 10 seconds, the compressor stops and restarts until T5 is less than 194°F (90°C)
SUPPOSED CAUSES	Wiring mistake Refrigerant leak Faulty discharge temperature sensor Faulty outdoor PCB

Troubleshooting

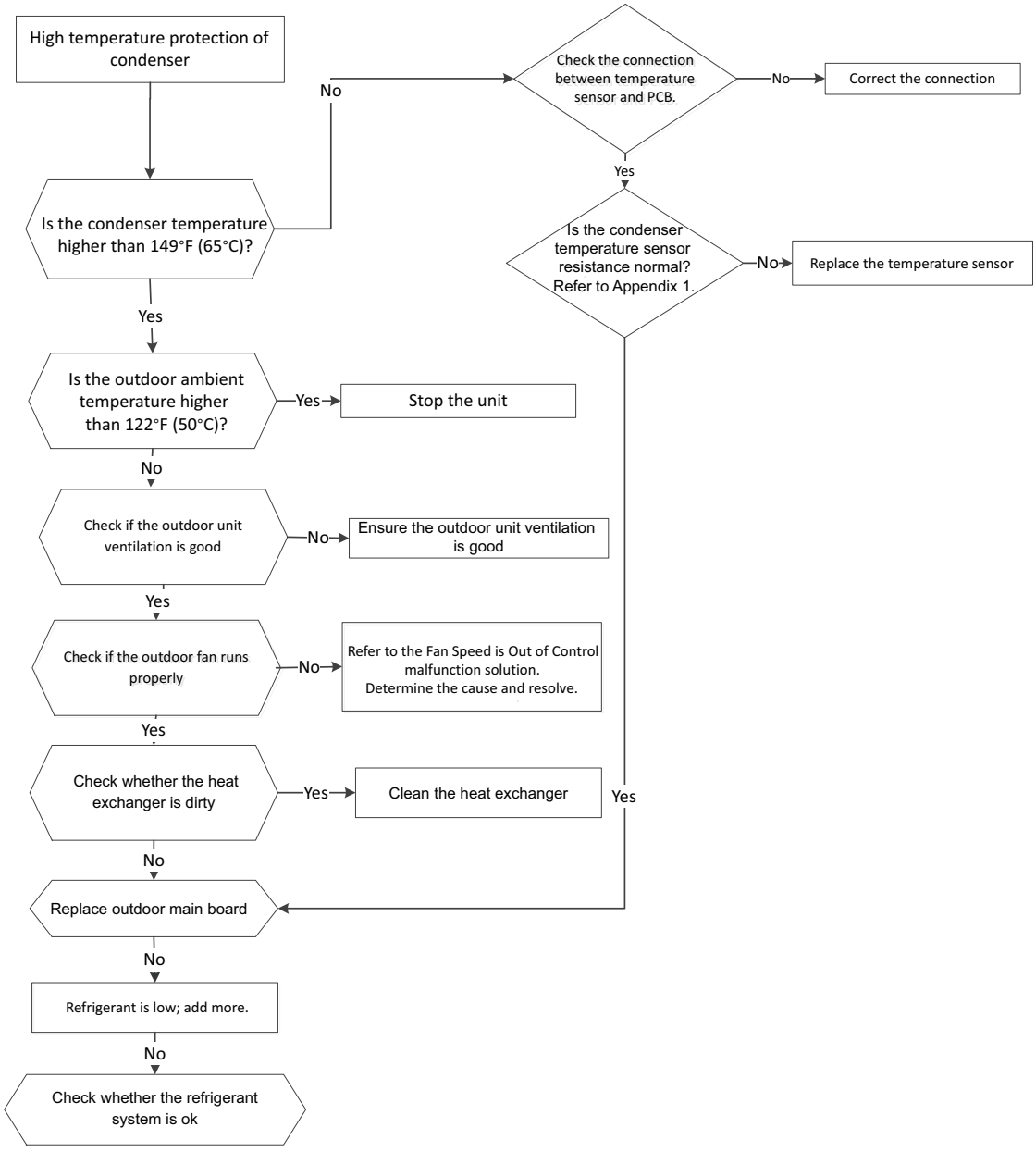


DIAGNOSIS AND SOLUTION (CONT)

P5/PC 0A (High temperature protection of condenser) diagnosis and solution

ERROR CODE	**P5/PC 0A**
MALFUNCTION DECISION CONDITIONS	When the outdoor pipe temperature is higher than 149°F(65°C), the unit stops and starts again when the outdoor pipe temperature is less than 125.6°F(52°C)
SUPPOSED CAUSES	Faulty condenser temperature sensor Heat exchanger is dirty System block

Troubleshooting

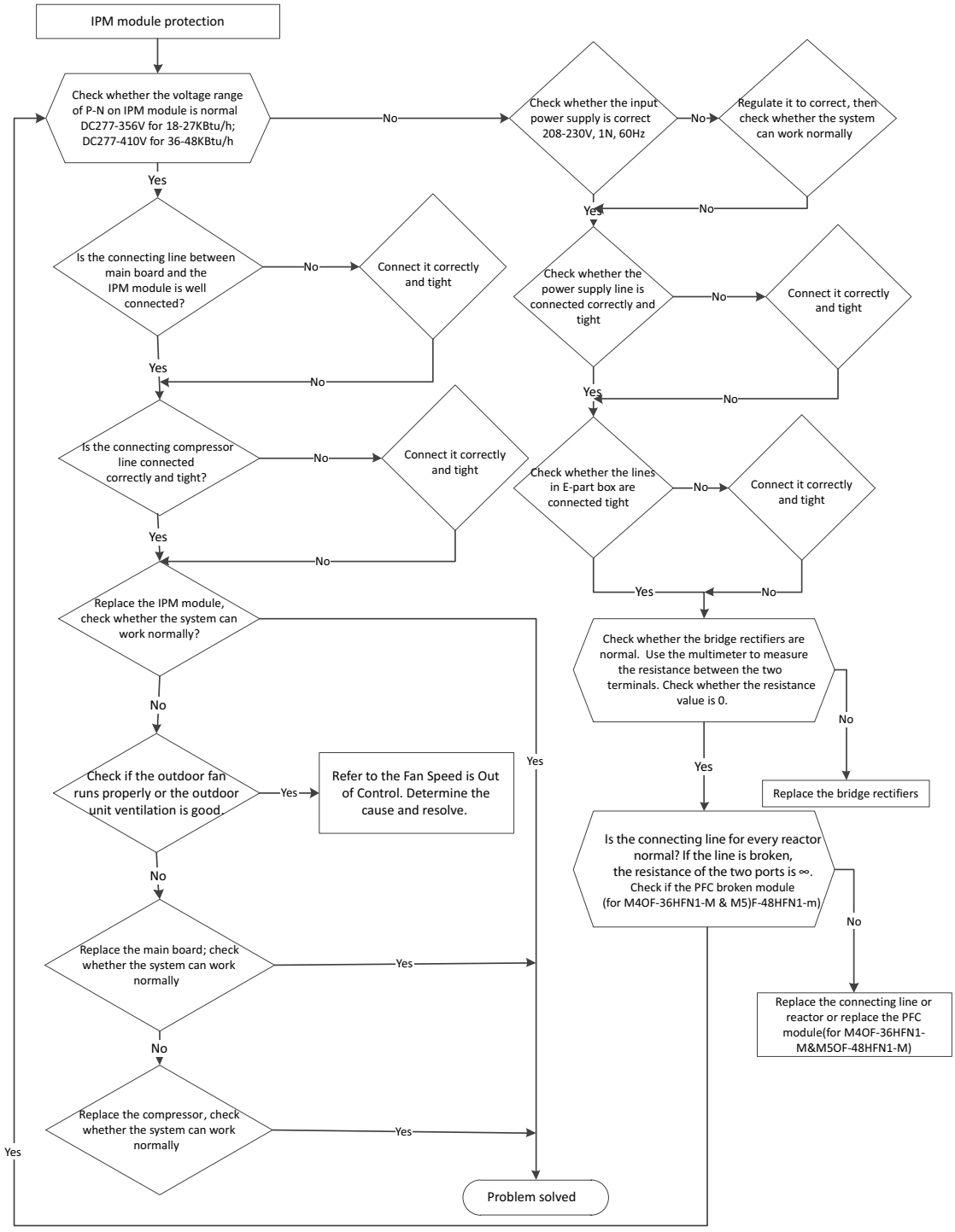


DIAGNOSIS AND SOLUTION (CONT)

P6/PC 00 (Inverter module (IPM) malfunction) diagnosis and solution

ERROR CODE	P6/PC 00
MALFUNCTION DECISION CONDITIONS	When the voltage signal that the IPM sends to the compressor drive chip is abnormal, the display LED displays **P6** and unit turns off.
SUPPOSED CAUSES	Wiring mistake IPM malfunction Faulty outdoor fan assembly Compressor malfunction Faulty Outdoor PCB

Troubleshooting

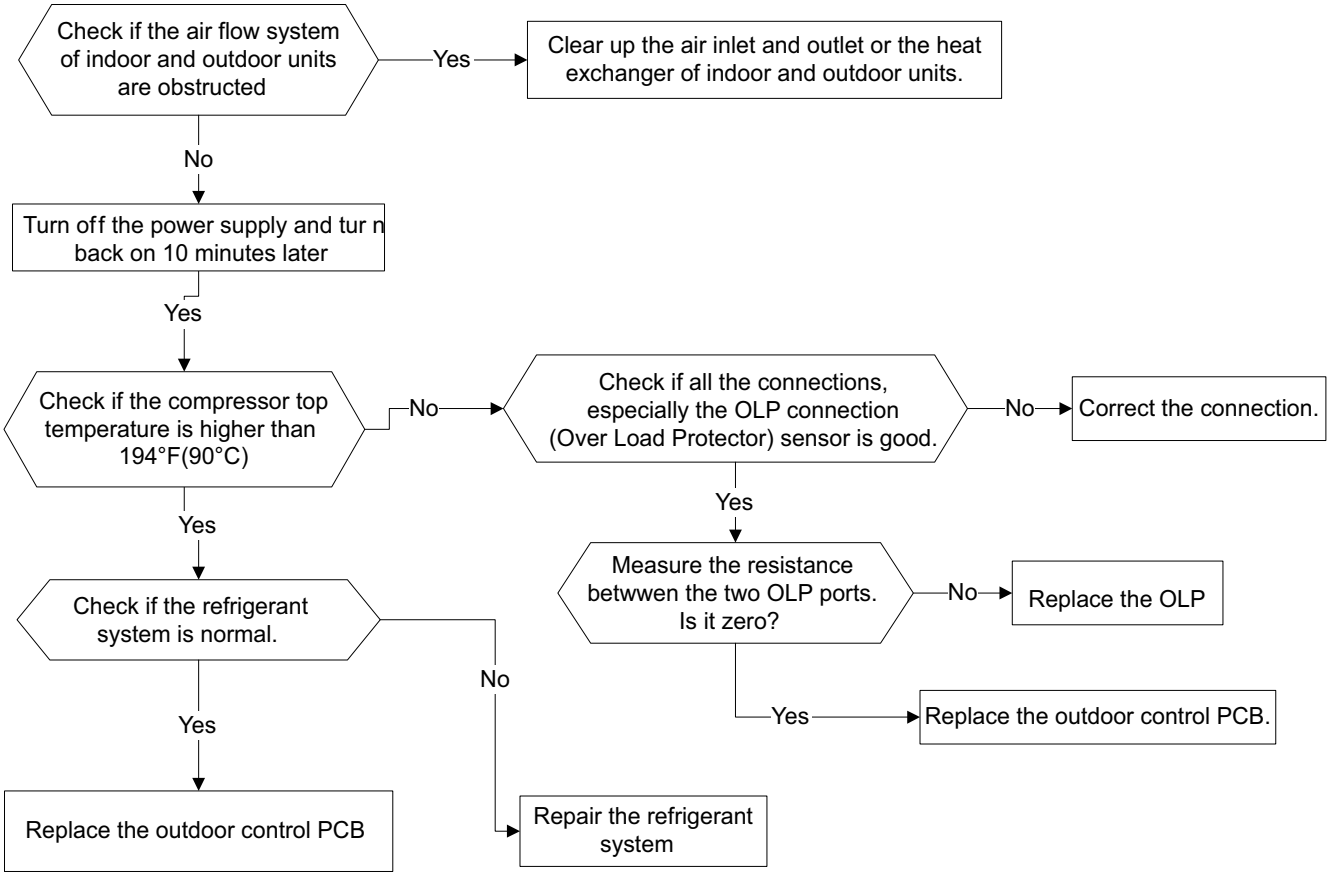


DIAGNOSIS AND SOLUTION (CONT)

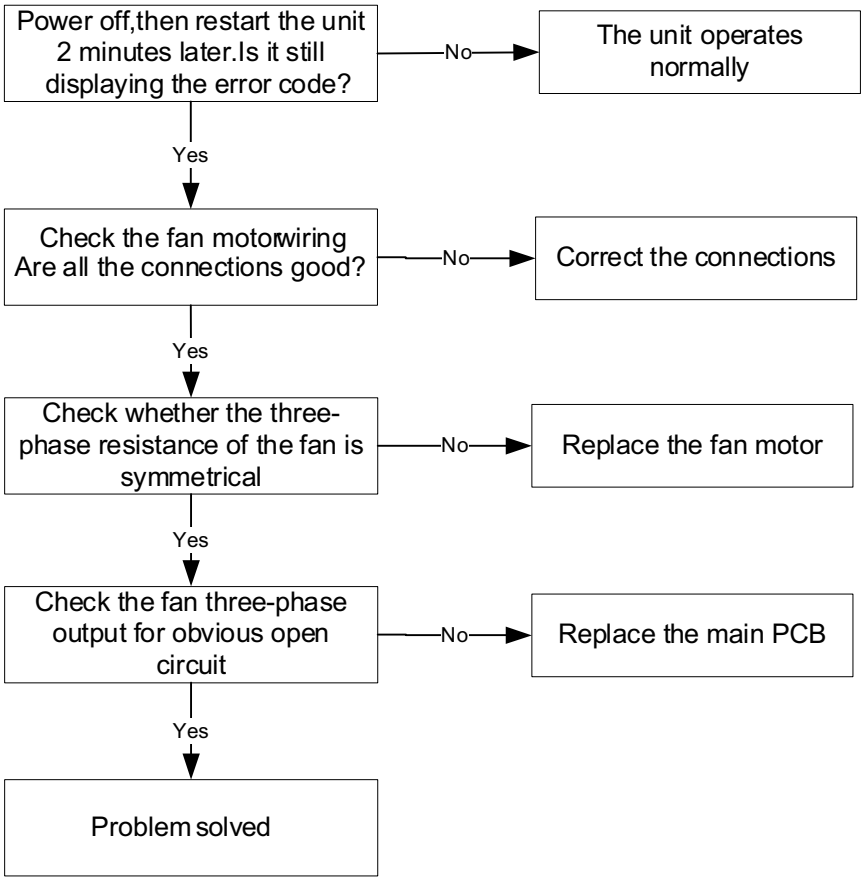
High temperature protection of compressor top (IDU P2/ODU P0/PC 02)

ERROR CODE	**P2/ODU P0/PC 02**
MALFUNCTION DECISION CONDITIONS	If the sampling voltage is not 5V, the LED displays the failure.
SUPPOSED CAUSES	Wiring mistake Faulty overload protector System leak or block Faulty PCB

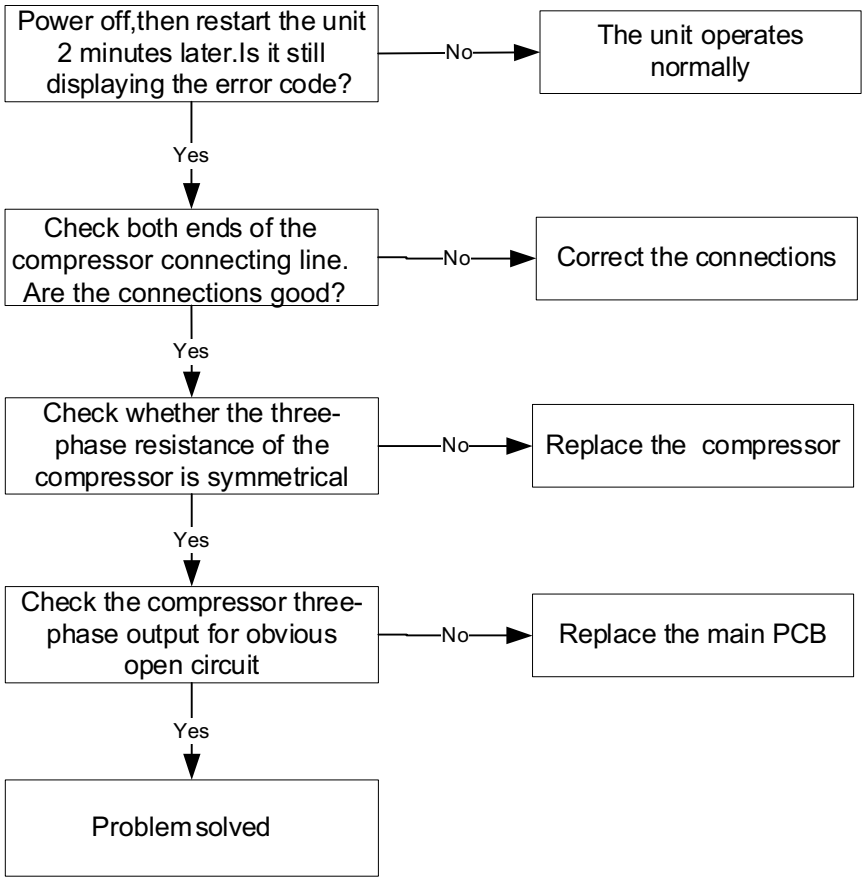
Troubleshooting



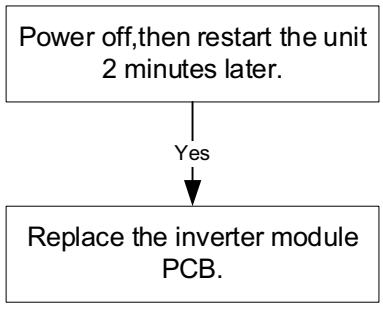
Lack phase failure of outdoor DC fan motor (EC72)



Outdoor compressor lack phase protection (PC43)



Outdoor unit IR chip drive failure (PC45)

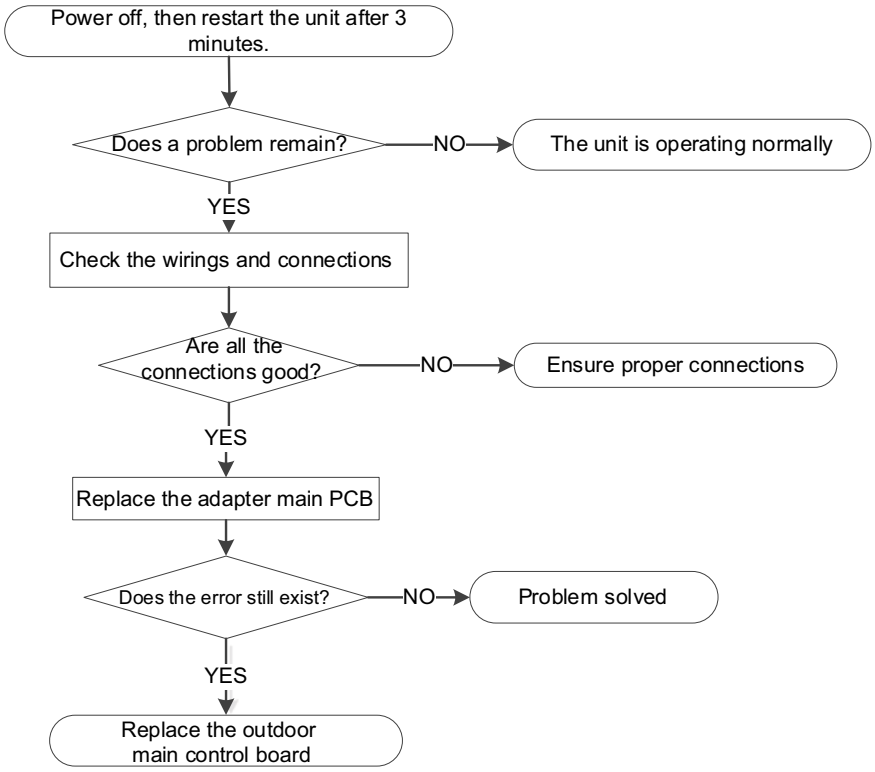


DIAGNOSIS AND SOLUTION (CONT)

Communication malfunction between adapter board and outdoor main control board (ODU Ed)

ERROR CODE	**P2/ODU P0/PC 02**
MALFUNCTION DECISION CONDITIONS	If outdoor PCB does not receive feedback from adapter board
SUPPOSED CAUSES	Wiring mistake Faulty PCB

Troubleshooting



Main Parts

1. Temperature Sensor Checking
   Disconnect the temperature sensor from PCB, measure the resistance value with a tester.

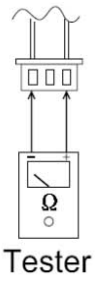


Fig. 47 — Tester

Temperature Sensors.
Room temp.(T1) sensor,
Indoor coil temp.(T2) sensor,
Outdoor coil temp.(T3) sensor,
Outdoor ambient temp.(T4) sensor,
Compressor discharge temp.(T5) sensor.
Measure the resistance value of each winding by using the multi-meter.

APPENDICES

Appendix 1

Table 28 — Temperature Sensor Resistance Value (C-K)

°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

Appendix 2

Table 29 — Unit C Discharge Temperature Sensor (°C-K)

°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			

Appendix 3

Table 30 — Appendix 3

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

2. Compressor Check
   Measure the resistance value of each winding by using the tester.

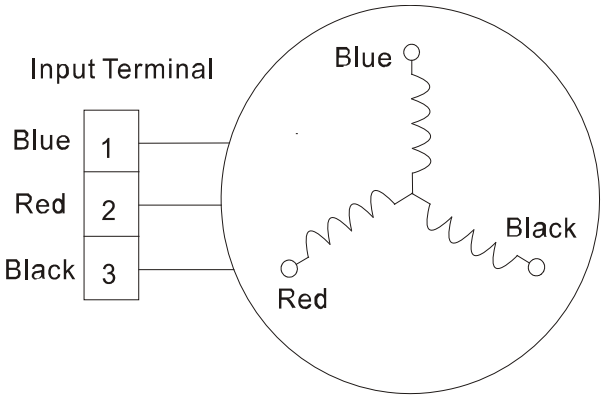


Fig. 48 — Compressor Check

Table 31 — Compressor Check

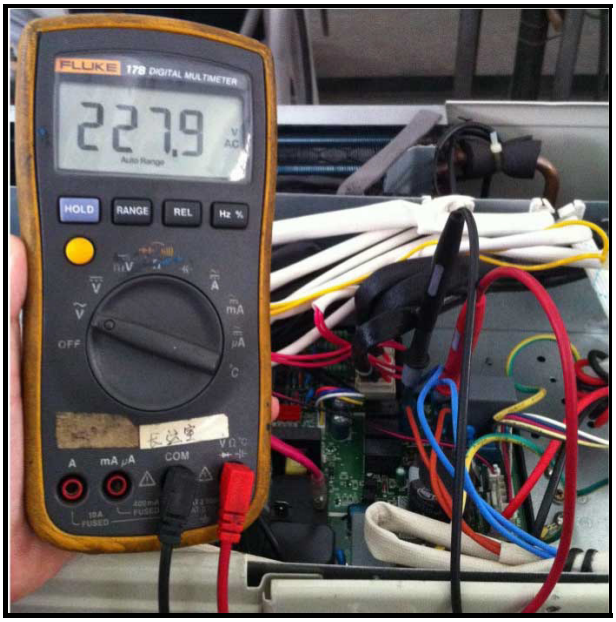
Position	RESISTANCE VALUE						
	ATM150D23UFZ	ATF235D22UMT	ATF250D22UMT	ATF310D43UMT	ATQ360D1UMU	ATQ420D1UMU	EAPQ420D1UMUA
Blue - Red	1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω	0.38Ω	0.1Ω
Blue - Black							
Red - Blue							

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

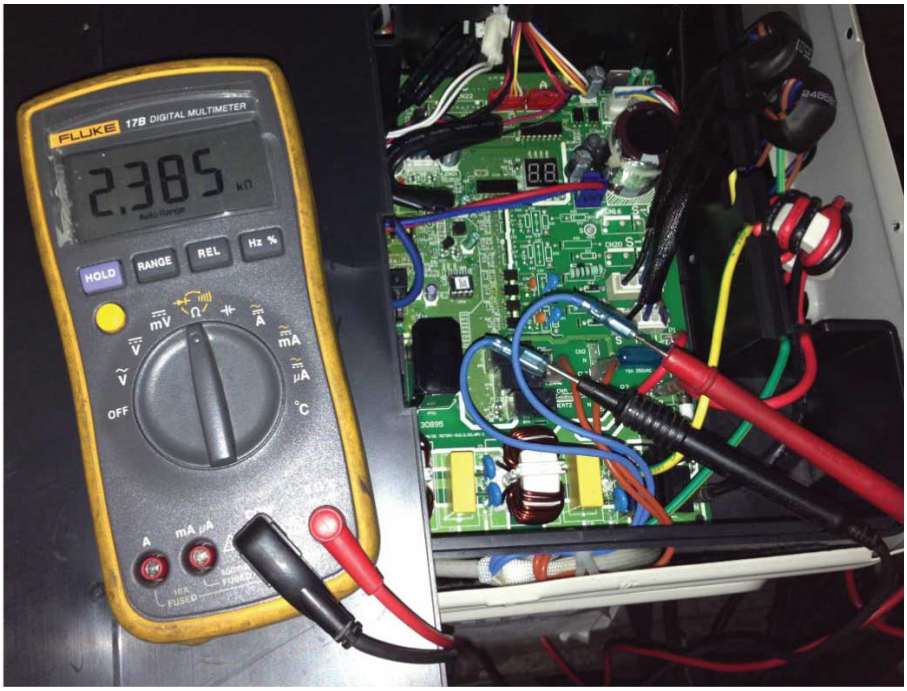
Table 32 — IPM Continuity Check

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		

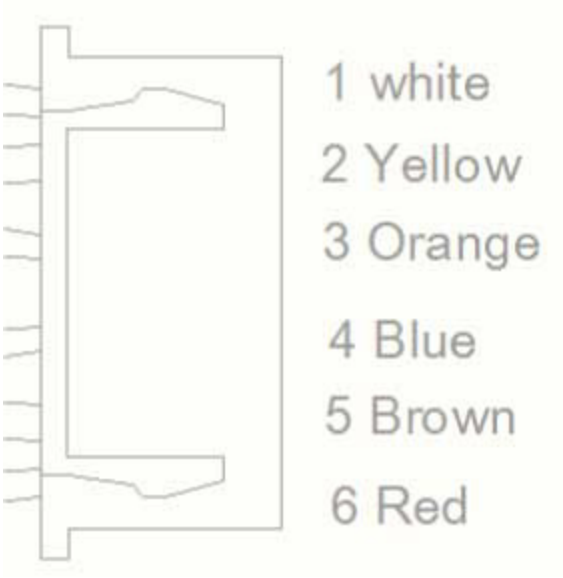
4. 4-Way Valve
   a. Power on, use a digital tester to measure the voltage, when the unit operates in the **COOLING** mode, it is 0V. When the unit operates in the **HEATNG** mode, it is about 230VAC. If the value of the voltage is not in the range, the PCB is faulty and needs to be replaced.

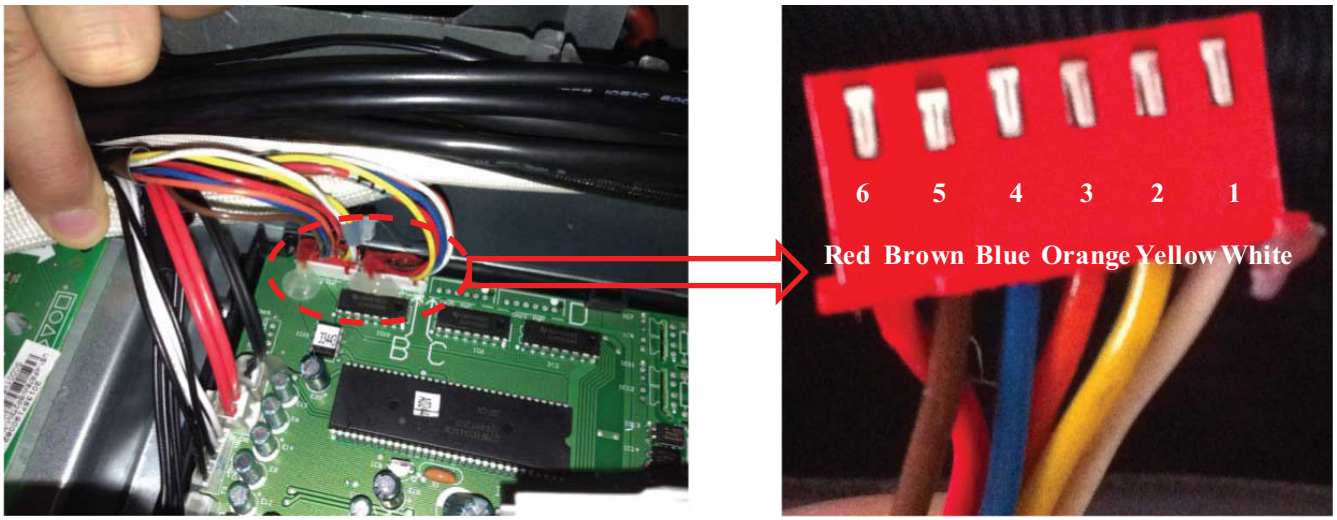


   b. Turn off the power, use a digital tester to measure the resistance. The value should be 1.8~2.5 KÙ.



5. EXV Check: Disconnect the Connectors.

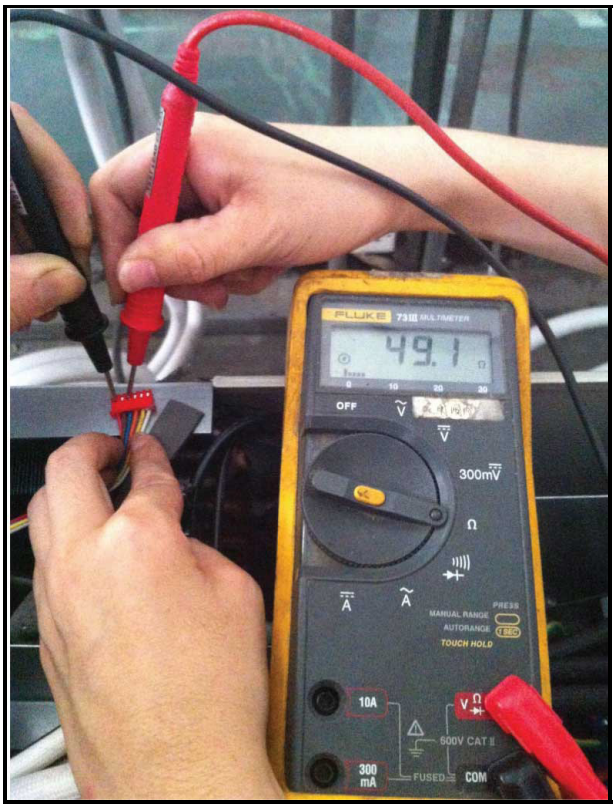


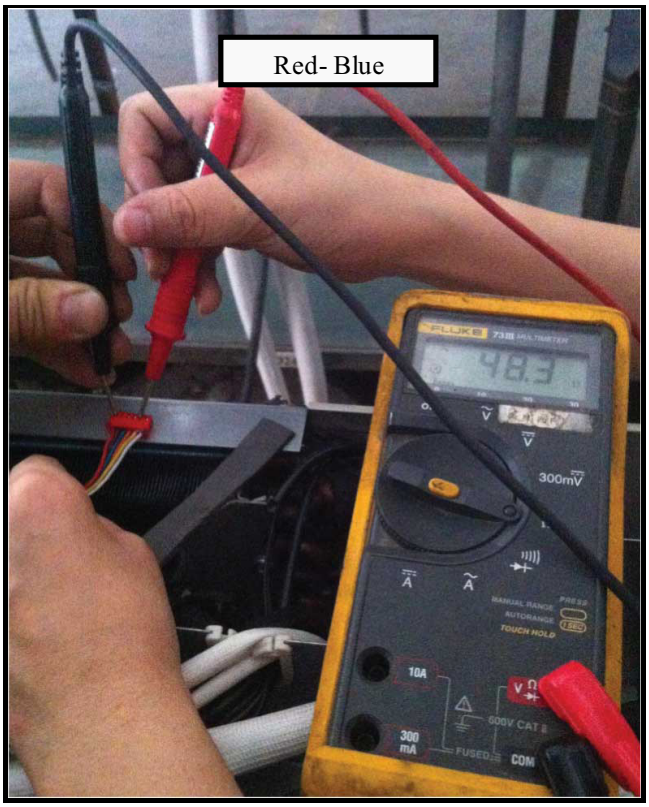


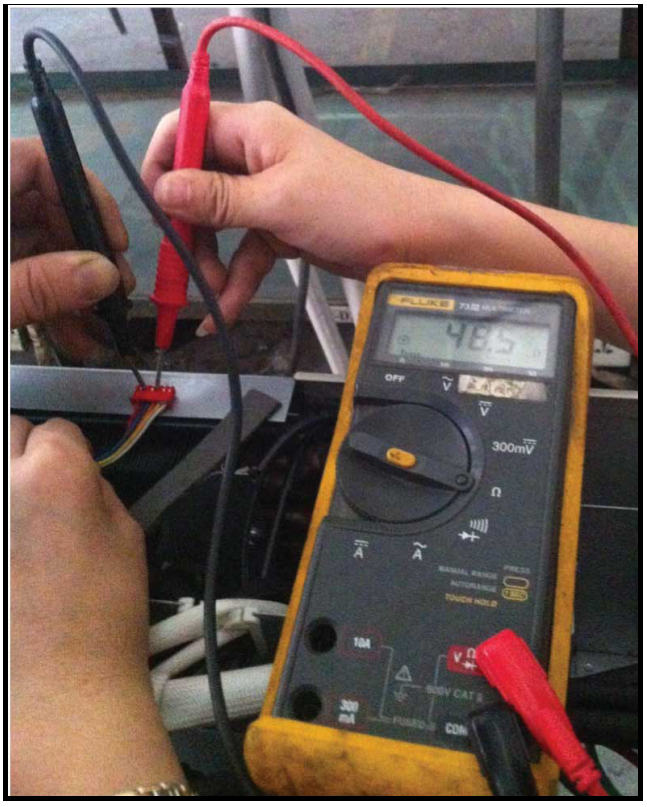
Resistance to EXV Coil

Table 33 — Resistance to EXV Coil

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

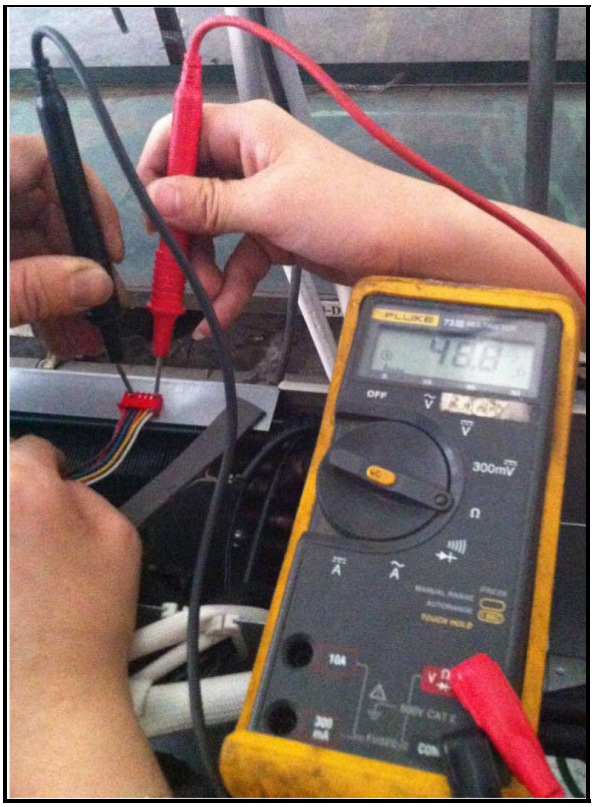

FLUKE
49.1
OFF
300mV
Ω
MANUAL RANGE
AUTORANGE
TOUCH HOLD
10A
600V CAT II
300 mA
FUSED
COM


Red- Blue
FLUKE
48.3
300mV
TOUCH HOLD
10A
600V CAT II
300 mA
FUSED
COM



KEY:

- **Brown - Orange**
- **Red-Yellow**

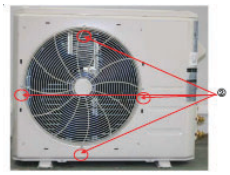
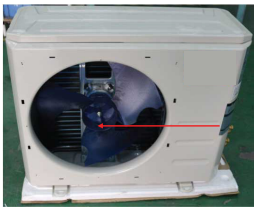
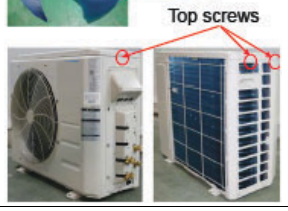
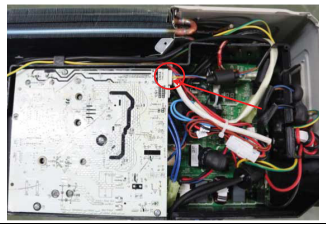
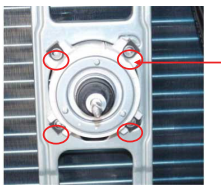


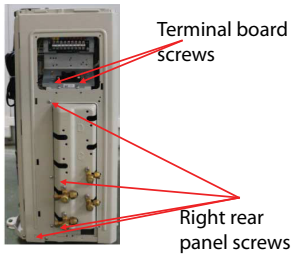
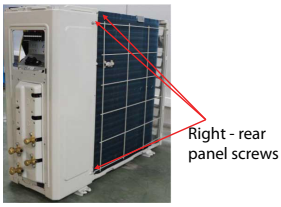
KEY:

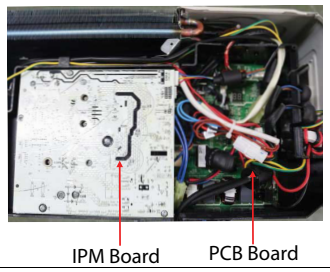
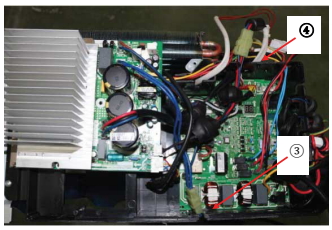
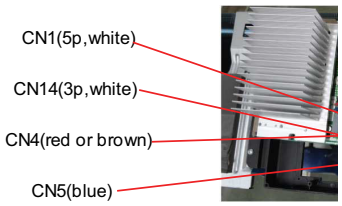
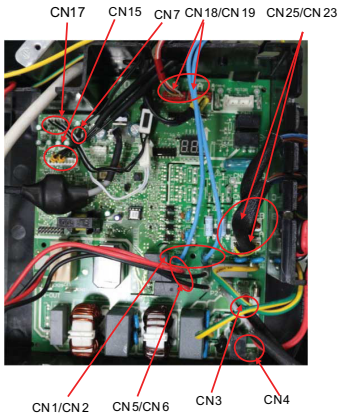
- **Brown - White**

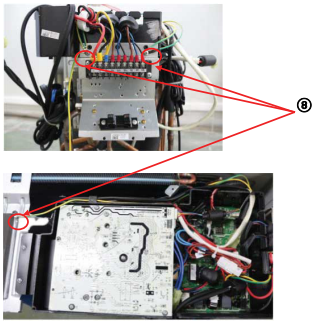
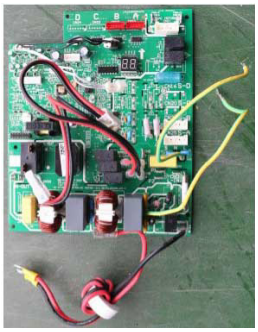
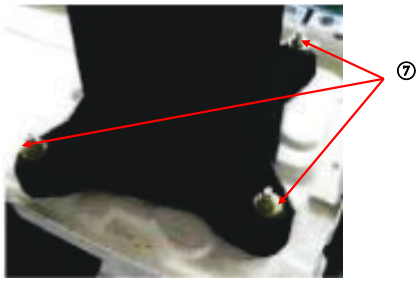
DISASSEMBLY INSTRUCTIONS

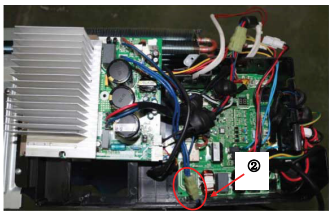
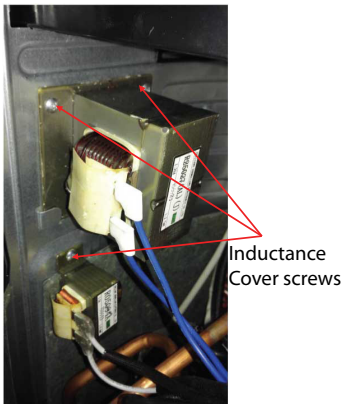
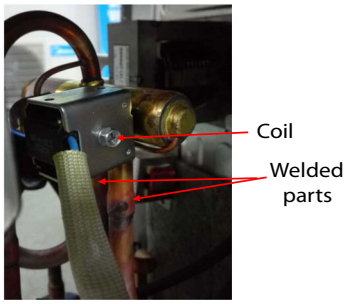
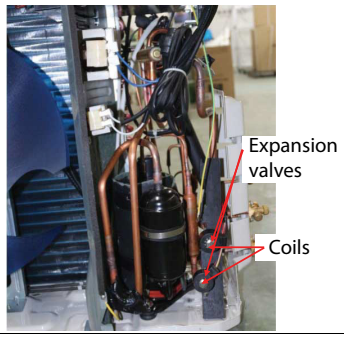
This section is for reference, the images may differ from your actual unit.

N0.	PART NAME	PROCEDURES	REMARKS
1	FAN ASSEMBLY	REMOVE THE FAN	
		1. Turn off the air conditioner. 2. Turn off the power breaker. 3. Remove the 4 screws of the air outlet grille. 4. Remove the hex nut securing the fan. 5. Remove the fan.	 
		6. Remove the top cover screws. 7. Remove the top cover.	 
		8. Remove the electrical control box cover.	
		9. Disconnect the fan motor connector CN14 (3p,white) from the IPM board.	
		10. Remove the fan motor after unfastening four fixing screws.	

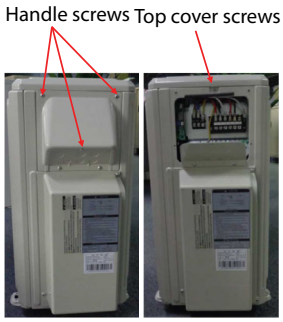
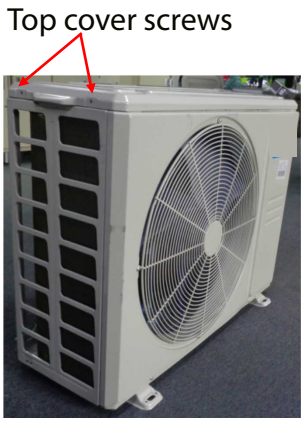
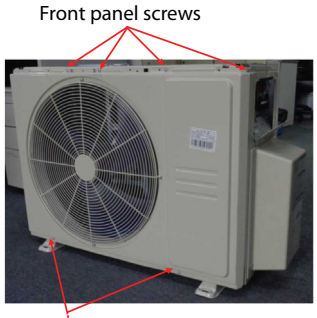
2	PANEL PLATE	REMOVE THE PANEL PLATE	
		1. Remove the 6 front panel screws. 2. Remove the front panel.	
		3. Remove the 4 handle screws. 4. Remove the handle.	 
		5. Remove the two screws of the terminal board and seven screws of the right-rear panel. 6. Remove the right-rear panel.	 

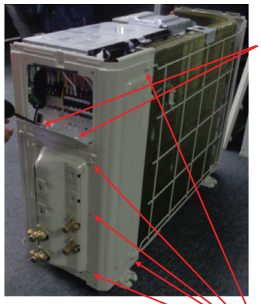
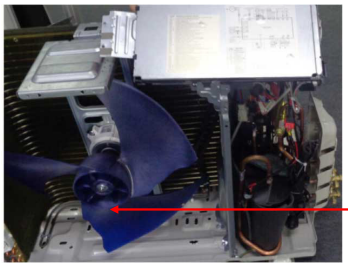
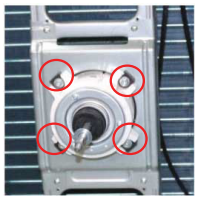
3	ELECTRICAL PARTS	REMOVE ELECTRICAL PARTS	
		1. Perform the steps from sections 1 and 2. 2. Remove the four screws securing the IPM board.	
		3. Loosen the reactor connector. 4. Loosen the compressor connector.	
		5. Disconnect the 3 connection wires and connectors between the IPM and main control PCB.	
		6. Remove the IPM board. 7. Disconnect the connectors and wires connected to the PCB and other parts. **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)	 

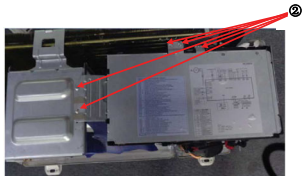
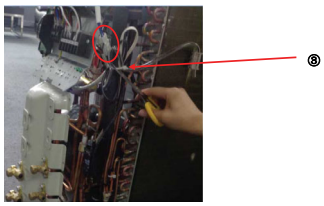
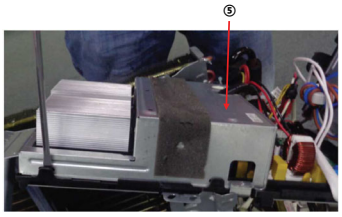
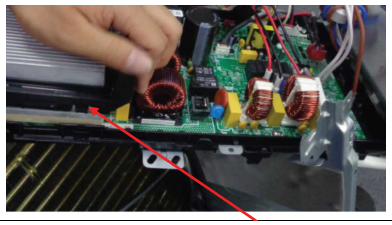
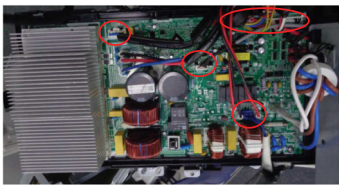
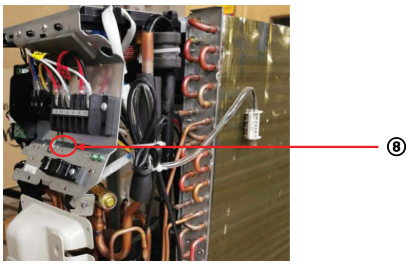
		8. Disconnect the grounding wire (yellow-green) after removing the handle and the right-rear panel. 9. Remove the PCB board.	 
4	**COMPRESSOR**	**REMOVE THE COMPRESSOR**	
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical control box cover. 3. Extract refrigerant gas. 4. Remove the sound insulation material and crankcase heating cable. 5. Remove the compressor's terminal cover and disconnect the crankcase electric heater wires and the compressor from the terminal. 6. Remove the discharge pipe and suction pipe with a burner. 7. Remove the hex nuts and washers securing the compressor to the bottom plate. 8. Lift the compressor.	 

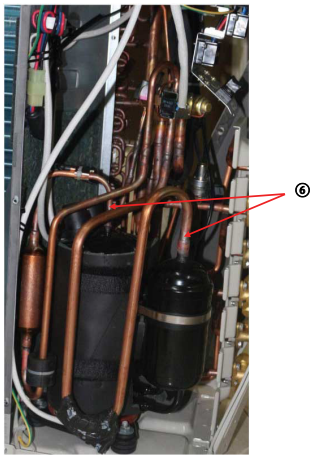
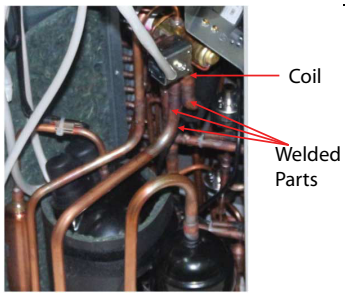
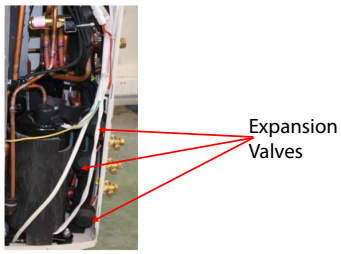
5	REACTOR	REMOVE THE REACTOR	
		1. Perform the steps from section 2. 2. Loosen the connector between the IPM and reactor.	
		3. Remove the reactor's 2 screws. 4. Remove the reactor.	
6	4-WAY VALVE	REMOVE THE 4-WAY VALVE	
		1. Perform the steps from section 2. 2. Extract the refrigerant gas. 3. Remove the electrical parts from section 3. 4. Remove the coil screw. 5. Remove the coil. 6. Detach the welded parts of the 4-way valve and pipe.	
7	EXPANSION VALVE	REMOVE THE EXPANSION VALVE	
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical parts (see section 3). 3. Remove the coils. 4. Detach the welded parts of the expansion valves and pipes.	

DISASSEMBLY INSTRUCTIONS

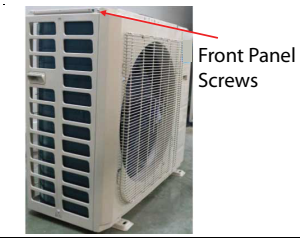
No.	PART NAME	PROCEDURES	REMARKS
1	PANEL PLATE	REMOVE THE PANEL PLATE	
		1. Turn off the air conditioner. 2. Turn off the power breaker. 3. Remove the 3 handle screws. 4. Remove the handle. 5. Remove the top cover screws and remove the top cover.	 
		6. Remove the 7 front panel screws, and remove the front panel.	 

		7. Remove the screws of water collector, and remove the water collector. (3 screws)	 Water Collector screws
		8. Remove the terminal board's two screws and the right side panel's 9 screws. 9. Remove the right side panel.	 Terminal board screws Right side board screws 
2	**FAN ASSEMBLY**	**REMOVE THE FAN ASSEMBLY**	
		1. Remove the top cover, right side panel and front panel from section 1, steps 1-9. 2. Remove the hex nut fixing the fan. 3. Remove the fan.	 ②
		4. Loosen the 4 screws. 5. Remove the fan motor.	

3	ELECTRICAL PARTS	REMOVE ELECTRICAL PARTS	REMARKS
		1. Perform the steps from section 1. 2. Remove the 5 screws from the electrical control box cover. Remove the cover.	
		3. Cut the ribbon and disconnect the 4-way valve connector CN38 (2p,blue).	
		4. Turn over the main board. 5. Remove the electronic installing box subassembly (4 hooks).	
		6. Remove the electronic control box support.	
		7. Disconnect the connectors and wires connected to the PCB and other parts.	
		8. Disconnect the grounding wire (yellow-green) after removing the handle and the right-rear panel.	
		9. Remove the PCB board.	

4	COMPRESSOR	HOW TO REMOVE THE COMPRESSOR	REMARKS
		1. Perform the steps from sections 1, 2 and 3. 2. Remove the electrical control box and partition plate. 3. Extract the refrigerant gas. 4. Remove the sound insulation material and crankcase heating cable. 5. Remove the compressor's terminal cover and disconnect the wires of the compressor thermo and the compressor from the terminal. 6. Remove the discharge pipe.and suction pipe with a burner. 7. Remove the hex nuts and washers securing the compressor to the bottom plate. 8. Lift the compressor.	 
5	**4-WAY VALVE**	**REMOVE THE 4-WAY VALVE**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Extract the refrigerant gas. 3. Perform the steps (remove the electrical parts) from section 3. 4. Remove the coil screw and remove the coil. 5. Detach the welded parts of 4-way valve and pipe.	
6	**EXPANSION VALVE**	**REMOVE THE EXMPANSION VALVE**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Perform the steps (remove the electrical parts) from section 3. 3. Remove the coils. 4. Detach the welded parts of the expansion valves and pipes.	

DISASSEMBLY INSTRUCTIONS (CONT)

<table>
<tr><th>N0.</th><th>PART NAME</th><th>PROCEDURES</th><th>REMARKS</th></tr>
<tr><td>1</td><td>PANEL PLATE</td><td>REMOVE THE PANEL PLATE</td><td rowspan="2"> 
</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>1. Turn off the air conditioner.
2. Turn off the power breaker.
3. Remove the 4 handle screws, then remove the handle.
4. Remove the 4 top cover screws, then remove the top cover.
5. Remove the 1 right front side panel screw, then remove the right front side panel.
6. Remove the 8 front panel screws, then remove the front panel.</td></tr>
<tr><td>7. Remove the 2 screws of the terminal board, the water collector screws and 15 screws of the right-rear panel, then remove the right-rear panel.</td><td> 
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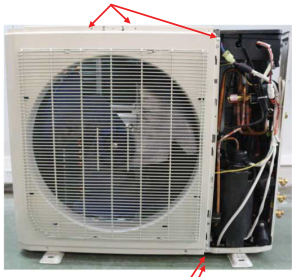
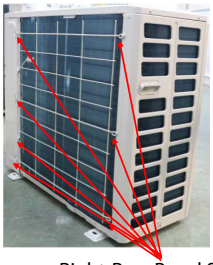
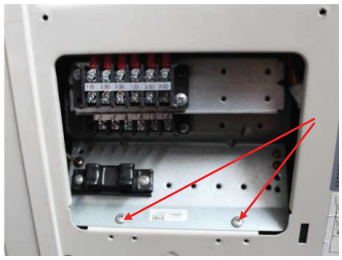
Front Panel Screws



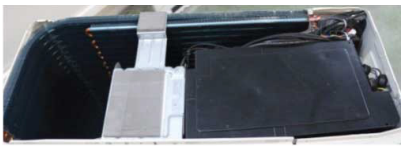
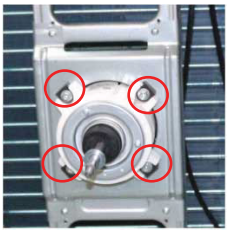
Front Panel Screws

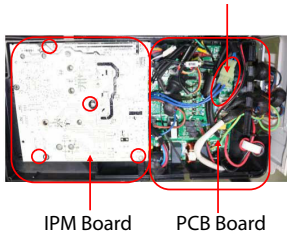
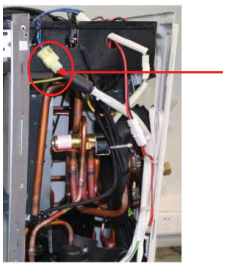
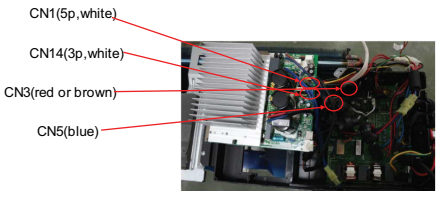
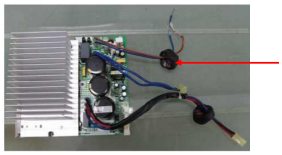
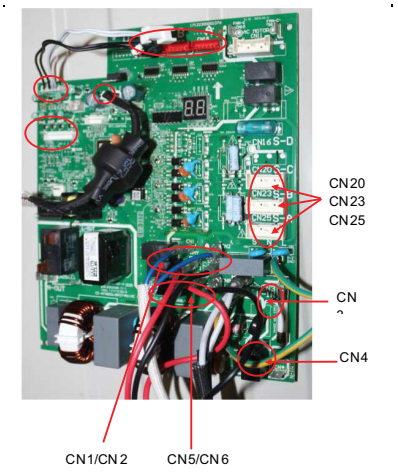
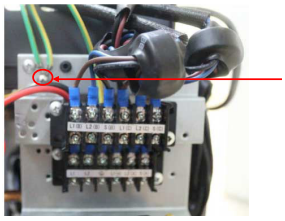


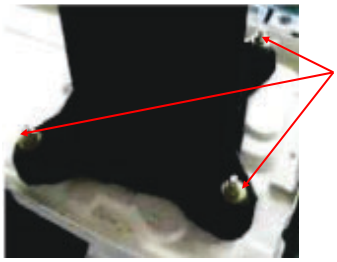
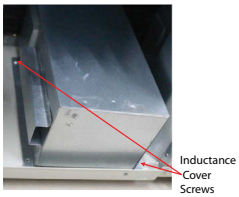
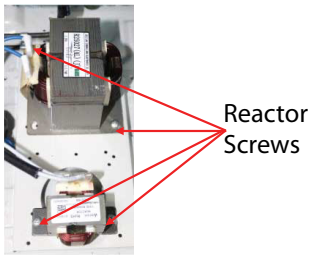
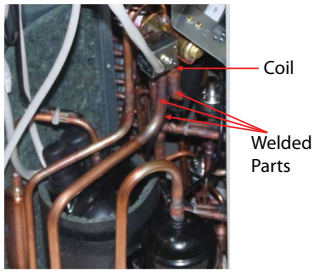
Right-Rear Panel Screws

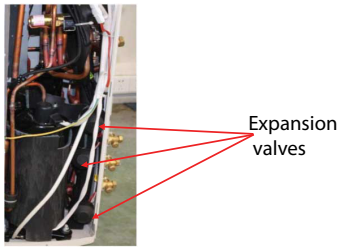


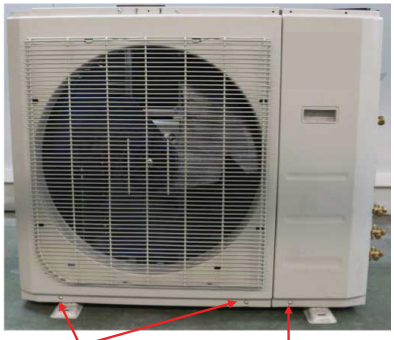
Terminal Board Screws

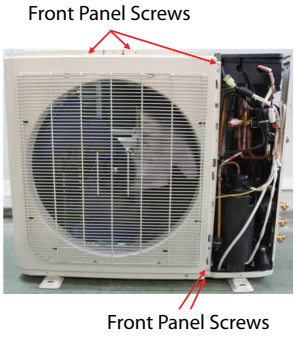
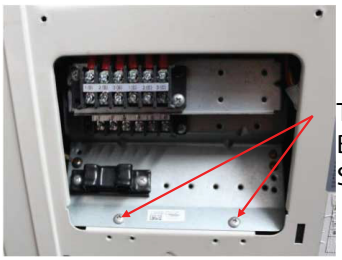
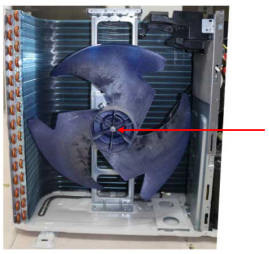
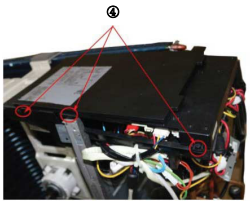
2	FAN ASSEMBLY	REMOVE THE FAN ASSEMBLY	REMARKS
		1. Remove the top cover, the right front side panel and front panel as shown in section 1, steps 1-4. 2. Remove the hex nut securing the fan. 3. Remove the fan, 4. Remove the electrical control box cover. 5. Disconnect the fan motor connector **CN14(5p,white)** from the IPM board. 6. Remove the 4 screws, then remove the fan.	   

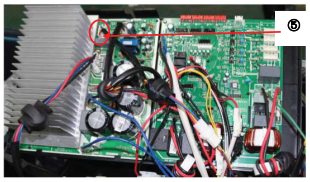
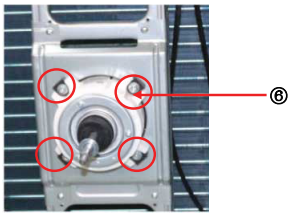
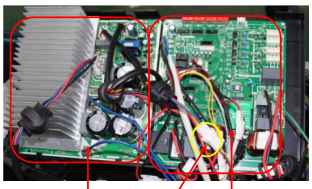
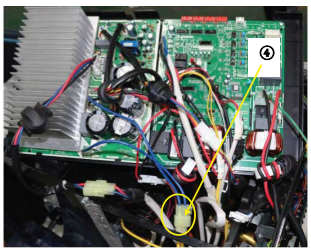
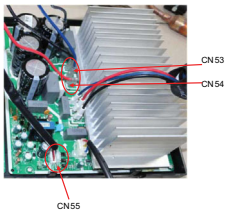
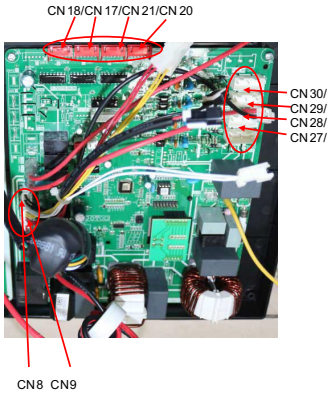
3	ELECTRICAL PARTS	REMOVE ELECTRICAL PARTS	REMARKS
		1. Perform the steps from sections 1 and 2. 2. Remove the 4 screws securing the IPM board. 3. Unfasten the reactor connector. 4. Unfasten the compressor connector. 5. Disconnect the following three pieces of connection wires and connectors between IPM and PCB.	  
		6. Remove the IPM Board 7. Disconnect the connectors and wires connected from the PCB and 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) 8. Disconnect the grounding wire (yellow-green) after removing the handle and the right-rear panel. 9. Remove the PCB board.	  

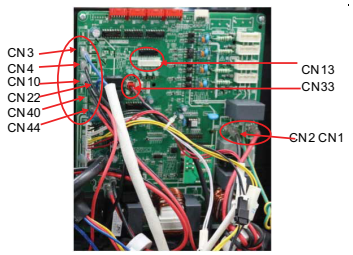
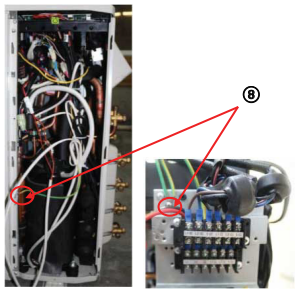
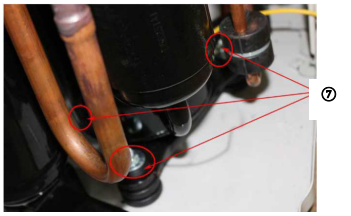
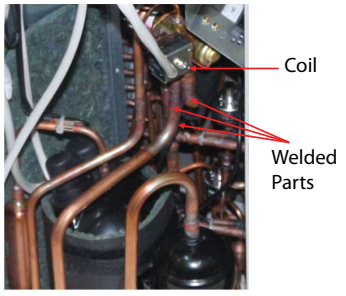
4	COMPRESSOR	REMOVE THE COMPRESSOR	REMARKS
		1. Perform the steps from sections 1, 2, and 3. 2. Remove the electrical control box and the partition plate. 3. Extract the refrigerant gas. 4. Remove the sound insulation material and crankcase heating cable. 5. Remove the compressor terminal cover, and disconnect the compressor thermo wires and compressor from the terminal. 6. Remove the discharge pipe and suction pipe with a burner. 7. Remove the hex nuts and washers securing the compressor to the bottom plate 8. Lift the compressor.	 
5	**REACTOR**	**REMOVE THE REACTOR**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Loosen the connector between the IPM and reactor. 3. Remove 2 screws of the inductance cover, then remove the inductance cover. 4. Disconnect two pieces of wires connected from the inductance cover. 5. Remove the 4 reactor screws, then remove the reactor.	 
6	**4-WAY VALVE**	**REMOVE THE 4-WAY VALVE**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Extract the refrigerant gas. 3. Remove the electrical parts as described in section 3. 4. Remove the coil screw, then remove the coil. 5. Detach the welded parts of the 4-way valve and pipe.	

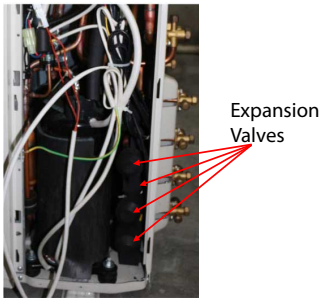
7	EXPANSION VALVE	REMOVE THE EXPANSION VALVE	REMARKS
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical parts as described in section 3. 3. Remove the coils. 4. Detach the expansion valves' and the pipes' welded parts.	

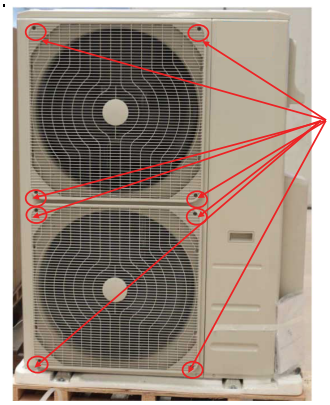
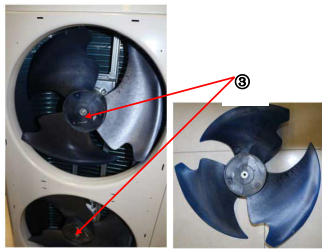
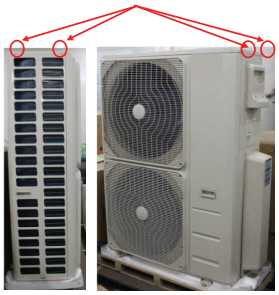
N0.	PART NAME	PROCEDURES	REMARKS
1	PANEL PLATE	REMOVE THE PANEL PLATE	
		1. Turn off the air conditioner. 2. Turn off the power breaker. 3. Remove the 4 handle screws, then remove the handle. 4. Remove the 4 top cover screws, then remove the top cover. 5. Remove the 1 right front side panel screw, then remove the right front side panel. 6. Remove the 8 front panel screws, then remove the front panel.	   

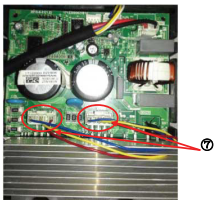
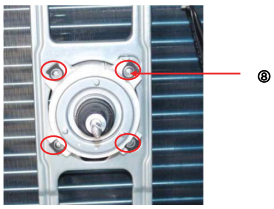
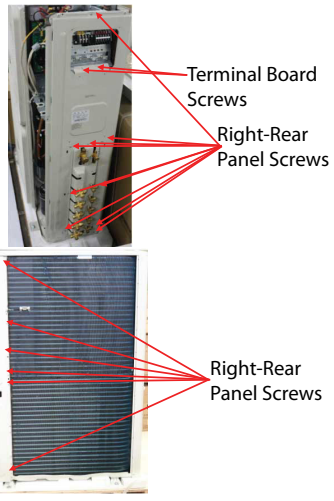
		7. Remove the 2 screws from the terminal board, water collector screw and 15 right-rear panel screws, then remove the right-rear panel.	
			 
2	**FAN ASSEMBLY**	**REMOVE THE FAN ASSEMBLY**	**REMARKS**
		1. Remove the top cover, right front side panel and front panel found in section 1 (steps 1-4). 2. Remove the hex nut securing the fan.	
		3. Remove the fan. 4. Loosen the hooks and remove the screws, then open the electronic control box.	

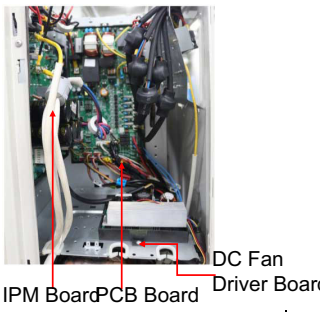
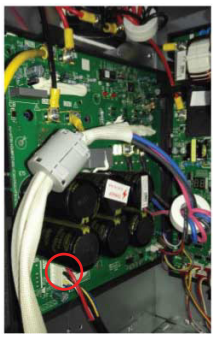
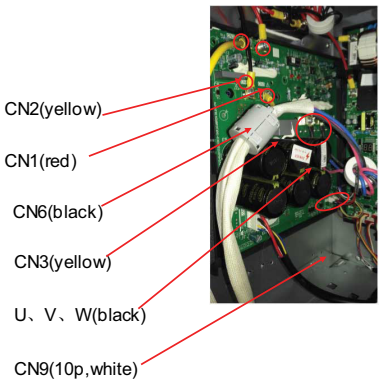
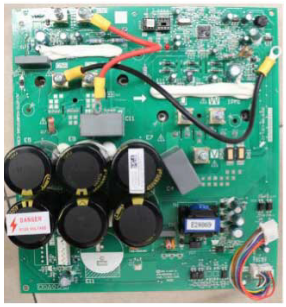
		5. Disconnect the fan motor connector CN19(3p,white) from the driver board. 6. Loosen four fixing screws and remove the fan motor.	 
3	**ELECTRICAL PARTS**	**REMOVE THE ELECTRICAL PARTS**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Loosen the reactor connector. 3. Loosen the compressor connector. 4. Loosen the PFC Inductor connector.	 
		5. Disconnect the following 3 pieces of connection wires and connectors between the driver board and the PCB. **CN55-CN7(7p,white)** **CN54-CN6(red)** **CN53-CN5(black)** 6. Remove the securing screws, then move the driver board. 7. Disconnect the connectors and wires connected from the 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)**	 

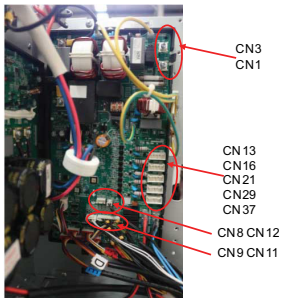
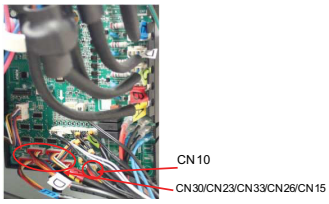
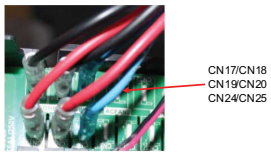
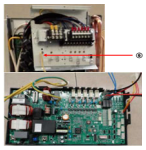
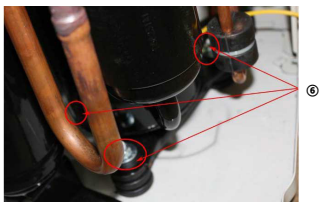
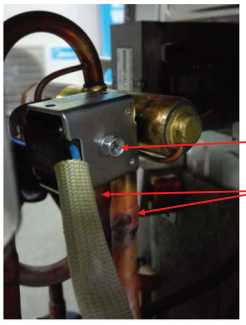
		8. Disconnect the ground wire (yellow-green) after removing the right-rear panel. 9. Remove the PCB card.	 
4	**COMPRESSOR**	**REMOVE THE COMPRESSOR**	**REMARKS**
		1. Perform the steps from sections 1, 2 and 3. 2. Remove the electrical control box and partition plate. 3. Extract the refrigerant gas. 4. Remove the sound insulation material and crankcase heating cable. 5. Remove the compressor's terminal cover, and disconnect the compressor thermo wires and compressor from the terminal. 6. Remove the discharge pipe and suction pipe with a burner.	
		7. Remove the hex nuts and washers fixing the compressor to bottom plate. 8. Lift the compressor.	
5	**4-WAY VALVE**	**REMOVE THE 4-WAY VALVE**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Extract the refrigerant gas. 3. Remove the electrical parts as described in section 3. 4. Remove the coil screw, then remove the coil. 5. Detach the welded parts of the 4-way valve and pipe.	

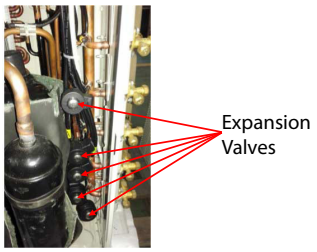
6	EXPANSION VALVE	REMOVE THE EXPANSION VALVE	REMARKS
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical parts as described in section 3. 3. Remove the coils. 4. Detach the welded parts from the expansion valves and pipes.	

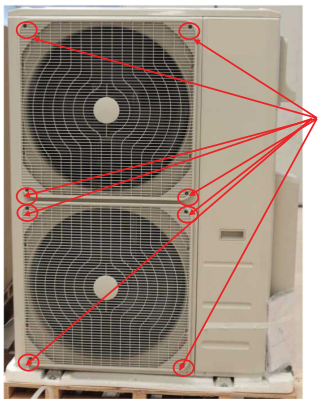
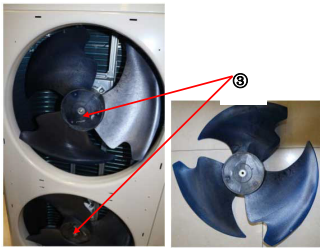
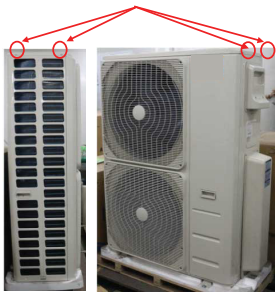
No.	PART NAME	PROCEDURES	REMARKS
1	FAN ASSEMBLY	REMOVE THE FAN ASSEMBLY	
		1. Turn off the air conditioner. Turn off the power breaker. 2. Remove the 8 air outlet grille screws. 3. Remove the hex nut securing the fan. 4. Remove the fan.	 
		5. Remove the 4 top cover screws, then remove the top cover.	Top Screws 

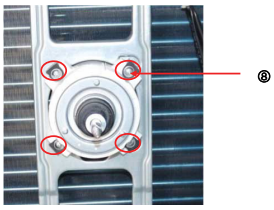
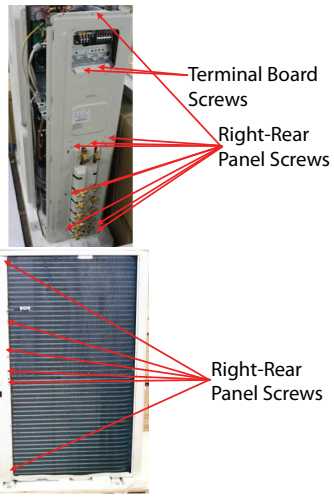
		6. Remove the 1 front side panel screw, then remove the front side panel.	
		7. Disconnect the fan motor connectors FAN1(3p,white) and FAN2(3p,white) from the DC motor driver board.	
		8. Remove the fan motor after unfastening fixing screws.	
2	**PANEL PLATE**	**REMOVE THE PANEL PLATE**	**REMARKS**
		1. Remove the 2 handle screws and the 2 water collector screws. 2. Remove the 2 terminal board screws and 15 right-rear panel screws, then remove the right-rear panel.	
			

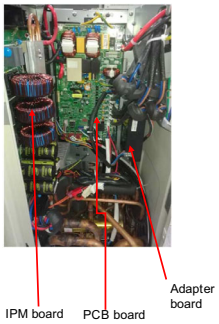
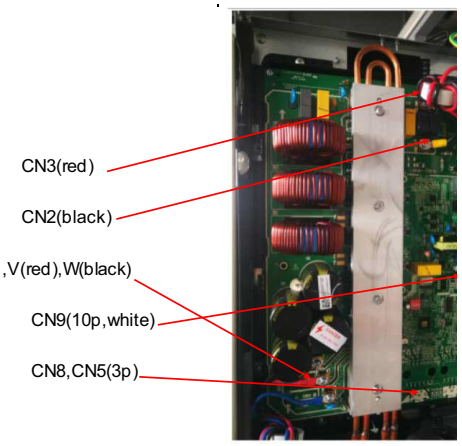
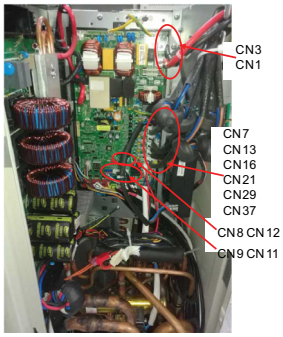
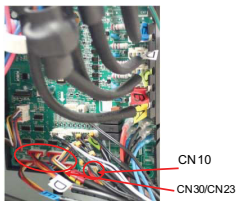
3	ELECTRICAL PARTS	REMOVE THE ELECTRICAL PARTS	REMARKS
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Disconnect the fan motor connector(5p,white) from the IPM board.	 
		3. Disconnect following 8 pieces of connection wires and connectors between the IPM and other parts.	
		4. Remove the screws then remove the IPM board.	

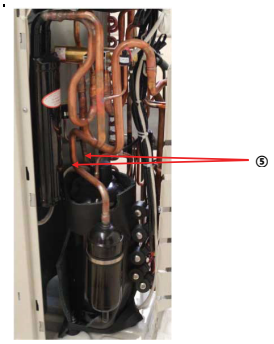
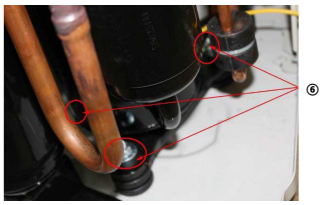
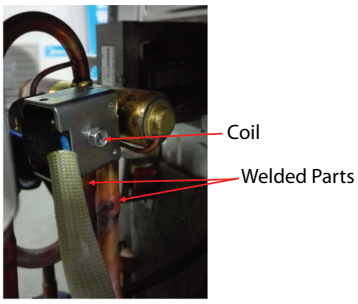
		5. Disconnect the connectors and wires connected from PCB and other parts. **Connectors:** **CN8: Discharge temperature sensor (2p,white)** **CN12 Heatsink temperature sensor(2p,red)** **CN9:T3/T4 temperature sensor (2p/2p,white)** **CN11:T2B-A,B,C,D,E temperature sensor (2p/2p/2p/2p/2p,white)** **CN15/CN23/CN26/CN30/CN33: Electronic expansion valve (6p/6p/6p/6p/6p,red)** **CN37/CN29/CN21/CN16/CN13: S-A,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)**	  
		6. Disconnect the grounding wire (yellow-green) after removing the handle. 7. Remove the PCB board.	
4	**COMPRESSOR**	**REMOVE THE COMPRESSOR**	**REMARKS**
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Extract the refrigerant gas. 3. Remove the sound insulation material and crankcase heating cable. 4. Remove the compressor's terminal cover, and disconnect the crankcase electric heater wires and the compressor from the terminal. 5. Remove the discharge pipe and the suction pipe with a burner. 6. Remove the hex nuts and washers securing the compressor to the bottom plate. 7. Lift the compressor.	 
5	**4-WAY VALVE**	**REMOVE THE 4-WAY VALVE**	**REMARKS**
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Extract refrigerant gas. 3. Remove the electrical parts as described in section 3. 4. Remove the coil screw, then remove the coil. 5. Detach the welded parts of the 4-way valve and the pipe.	

6	EXPANSION VALVE	REMOVE THE EXPANSION VALVE	REMARKS
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical parts as described in section 3. 3. Remove the coil. 4. Detach the welded parts of the expansion valves and pipes.	

No.	PART NAME	PROCEDURES	REMARKS
1	FAN ASSEMBLY	REMOVE THE FAN ASSEMBLY	
		1. Turn off the air conditioner. Turn off the power breaker. 2. Remove the 8 air outlet grille screws. 3. Remove the hex nut securing the fan. 4. Remove the fan.	 
		5. Remove the 4 top cover screws, then remove the top cover.	Top Screws 

		6. Remove the 1 front side panel screw, then remove the front side panel.	
		7. Disconnect the fan motor connectors FAN1(3p,white) and FAN2(3p,white) from DC motor driver board. 8. Remove the fan motor after loosening the screws.	
2	**PANEL PLATE**	**REMOVE THE PANEL PLATE**	**REMARKS**
		1. Remove the 2 handle screws and the 2 water collector screws. 2. Remove the 2 terminal board screws and 15 right-rear panel screws, then remove the right-rear panel.	
			

3	ELECTRICAL PARTS	REMOVE THE ELECTRICAL PARTS	REMARKS
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Disconnect the fan motor connector(5p,white) from the IPM board.	
		3. Disconnect the following 6 pieces of connection wires and connectors between the IPM and other parts.	
		4. Remove the 4 screws, loosen the 4 hooks then remove the IPM board.	
		5. Disconnect the connectors and wires connected from PCB and other parts. **Connectors:** **CN8: Discharge temperature sensor (2p,white)** **CN12T Heatsink 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/CN7: S-A,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)**	

4	COMPRESSOR	REMOVE THE COMPRESSOR	REMARKS
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Extract the refrigerant gas. 3. Remove the sound insulation material and crankcase heating cable. 4. Remove the compressor's terminal cover, and disconnect the crankcase electric heater wires and the compressor from the terminal. 5. Remove the discharge pipe and the suction pipe with a burner. 6. Remove the hex nuts and washers securing the compressor to the bottom plate. 7. Lift the compressor.	 
5	**4-WAY VALVE**	**REMOVE THE 4-WAY VALVE**	**REMARKS**
		1. Perform the steps from section 1, steps 5-6 and section 2. 2. Extract refrigerant gas. 3. Remove the electrical parts as described in section 3. 4. Remove the coil screw, then remove the coil. 5. Detach the welded parts of the 4-way valve and the pipe.	
6	**EXPANSION VALVE**	**REMOVE THE EXPANSION VALVE**	**REMARKS**
		1. Perform the steps from sections 1 and 2. 2. Remove the electrical parts as described in section 3. 3. Remove the coil. 4. Detach the welded parts of the expansion valves and pipes.