DLCMRA

SERVICE MANUAL

Multi−Zone Outdoor Unit Ductless System − Sizes 18, 27, 36, and 48

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 cleaning coils. 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 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 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

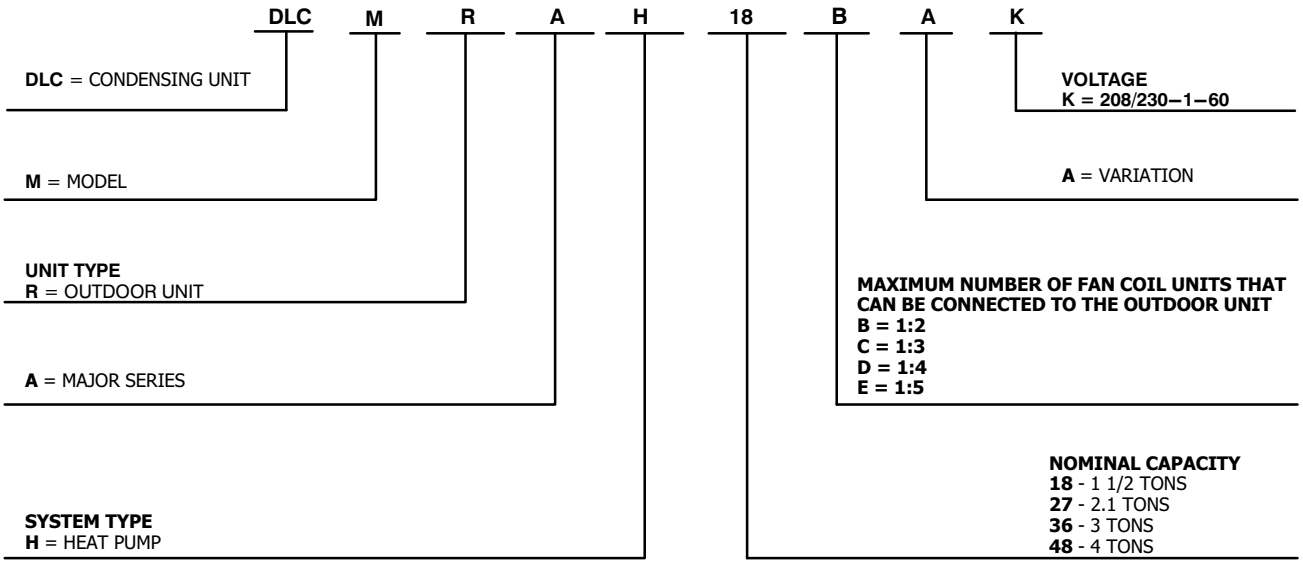
This Service Manual provides the necessary information to service, repair, and maintain the multi−zone family of heat pumps. Section 2 of this manual has an appendix with data required to perform troubleshooting. Use the Table of Contents to locate a desired topic.

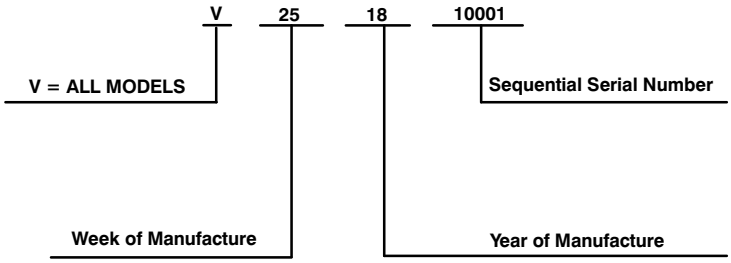
MODEL/SERIAL NUMBER NOMENCLATURES

Table 1—Unit Sizes

SYSTEM TONS	kBTUh	VOLTAGE – PHASE	OUTDOOR MODEL
1.5	18	208/230–1	DLCMRAH18BAK
2.1	27	208/230–1	DLCMRAH27CAK
3	36	208/230–1	DLCMRAH36DAK
4	48	208/230–1	DLCMRAH48EAK

OUTDOOR UNIT





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.

SPECIFICATIONS − OUTDOOR

Table 2—Heat Pump

System	Size		**18**	**27**	**36**	**48**
	Outdoor Model		DLCMRAH18BAK	DLCMRAH27CAK	DLCMRAH36DAK	DLCMRAH48EAK
	Max Number of Zones		2	3	4	5
Performance (Non−Ducted)	Energy Star		YES	NO	NO	NO
	Cooling System Tons		1.4	2.3	3.0	4.0
	Cooling Rated Capacity	Btu/h	17,000	27,000	36,000	48,000
	Cooling Cap. Range Min − Max	Btu/h	5810~21940	7880~33510	8090~41470	8560~53160
	SEER		21.1	20.4	21.4	20.5
	EER		12.5	11.5	10.5	11
	Heating Rated Capacity (47°F)	Btu/h	18,000	27,000	36,000	48,000
	Heating Rated Capacity (17°F)	Btu/h	11,600	17,800	23,600	30,400
	Heating Maximum Capacity (5°F)	Btu/h	13,800	22,700	26,200	37,900
	Heating Cap. Range Min − Max	Btu/h	5760~24480	6010~36180	6350~41950	7210~55820
	HSPF		9.7	10.8	10.2	10.2
	COP (47°F)	W/W	3.5	4.0	3.7	3.5
	COP (17°F)	W/W	2.3	2.6	2.4	2.2
	COP (5°F)	W/W	2.7	3.4	2.7	2.8
Performance (Combination Ducted and Non−Ducted)	Energy Star		NO	NO	NO	NO
	Cooling System Tons		1.5	2.3	3.0	4.0
	Cooling Rated Capacity	Btu/h	17,500	27,000	36,000	48,000
	Cooling Cap. Range Min − Max	Btu/h	5795~20708	7765~31955	8060~39990	8510~52580
	SEER		19.8	19.5	19.7	19.1
	EER		12.2	11.3	10.3	10.6
	Heating Rated Capacity (47°F)	Btu/h	18,250	27,000	36,000	49,000
	Heating Rated Capacity (17°F)	Btu/h	11,500	17,000	23,200	31,700
	Heating Maximum Capacity (5°F)	Btu/h	14,100	21,850	27,300	37,350
	Heating Cap. Range Min − Max	Btu/h	5650~24365	5980~36190	6275~42305	7045~54935
	HSPF		9.6	9.9	10.0	10.2
	COP (47°F)	W/W	3.7	3.8	3.5	3.5
	COP (17°F)	W/W	2.5	2.4	2.2	2.4
	COP (5°F)	W/W	2.4	3.0	2.6	2.3
Performance (Ducted)	Energy Star		NO	NO	NO	NO
	Cooling System Tons		1.5	2.3	3.0	4.0
	Cooling Rated Capacity	Btu/h	18,000	27,000	36,000	48,000
	Cooling Cap. Range Min − Max	Btu/h	5780~19476	7650~30400	8030~38510	8460~52000
	SEER		18.4	18.5	17.9	17.6
	EER		11.8	11	10	10.1
	Heating Rated Capacity (47°F)	Btu/h	18,500	27,000	36,000	50,000
	Heating Rated Capacity (17°F)	Btu/h	11,400	16,200	22,800	33,000
	Heating Maximum Capacity (5°F)	Btu/h	14,400	21,000	28,400	36,800
	Heating Cap. Range Min − Max	Btu/h	5539~24249	5950~36200	6200~42660	6880~54050
	HSPF		9.4	9.0	9.7	10.1
	COP (47°F)	W/W	3.8	3.5	3.2	3.4
	COP (17°F)	W/W	2.7	2.1	2.0	2.6
	COP (5°F)	W/W	2.1	2.7	2.5	1.8
Operating Range	Cooling Outdoor DB Min − Max	°F (°C)	−13~122 (−25~50)	−13~122 (−25~50)	−13~122 (−25~50)	−13~122 (−25~50)
	Heating Outdoor DB Min − Max	°F (°C)	−22~86 (−30~30)	−22~86 (−30~30)	−22~86 (−30~30)	−22~86 (−30~30)
Piping	Total Piping Length	ft (m)	131 (40)	197 (60)	263 (80)	328 (100)
	Piping to furthest FCU	ft (m)	82 (25)	98 (30)	115 (35)	115 (35)
	Drop (OD above ID)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)
	Lift (OD below ID)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)
	Pipe Connection Size − Liquid	in (mm)	1/4*2 (6.35*2)	1/4*3 (6.35*3)	1/4*4 (6.35*4)	1/4*5 (6.35*5)
	Pipe Connection Size − Suction	in (mm)	3/8*2 (9.52*2)	3/8*3 (9.52*3)	1/2 *1+ 3/8*3 (12.7*1+9.52*3)	1/2 *2+ 3/8*3 (12.7*2+9.52*3)
Refrigerant	Type		R410A	R410A	R410A	R410A
	Charge	lbs (kg)	4.41 (2.0)	6.17(2.8)	6.61 (3.0)	10.13 (4.6)
	Metering Device		EEV	EEV	EEV	EEV
Outdoor Coil	Face Area	Sq. Ft.	6.0	8.8	8.8	14.4
	No. Rows		2	2	2	2
	Fins per inch		18	20	20	18
	Circuits		4	6	6	8

SPECIFICATIONS − OUTDOOR (CONT.)

System	Size	V/Ph/Hz	18	27	36	48
Electrical	Voltage, Phase, Cycle	V/Ph/Hz	208/230−1−60	208/230−1−60	208/230−1−60	208/230−1−60
	Power Supply		Indoor unit powered from outdoor unit			
	MCA	A.	18	25	30	35
	MOCP − Fuse Rating	A.	25	35	45	50
Compressor	Type		Rotary Inverter	Rotary Inverter	Rotary Inverter	Rotary Inverter
	Model		ATM150D23UFZ	ATF235D22UMT	ATF310D43UMT	ATQ360D1UMU
	Oil Type		ESTER OIL VG74	ESTER OIL VG74	ESTER OIL VG74	ESTER OIL VG74
	Oil Charge	Fl. Oz.	17.64	23.58	35.27	49.38
	Rated Current	RLA	10	15	19	21
Outdoor Unit	Unit Width	in (mm)	37.31 (948)	41.22 (1047)	41.22 (1047)	41.15 (1045)
	Unit Height	in (mm)	27.64 (702)	31.88 (810)	31.88 (810)	52.48 (1333)
	Unit Depth	in (mm)	14.82 (376)	17.91 (455)	17.91 (455)	17.63 (448)
	Net Weight	lbs (kg)	105.8 (48)	149.9 (68)	156.5 (71)	223.8 (101.5)
	Airflow	CFM	1,390	2,130	2,130	4,500
	Sound Pressure	dB(A)	62.4	63.4	62.3	64

DIMENSIONS

Table 3—Dimensions

UNIT SIZE		18	27	36	48
Height	in (mm)	27.6 (703)	31.89 (810)	31.89 (810)	52.48 (1333)
Width	in (mm)	33.27 (845)	37.24 (946)	37.24 (946)	41.14 (1045)
Depth	in (mm)	13.19 (335)	15.20 (386)	15.20 (386)	14.96 (380)
Weight−Net	lbs (kg)	105.8 (48)	149.9 (68)	156.5 (71)	223.8 (101.5)

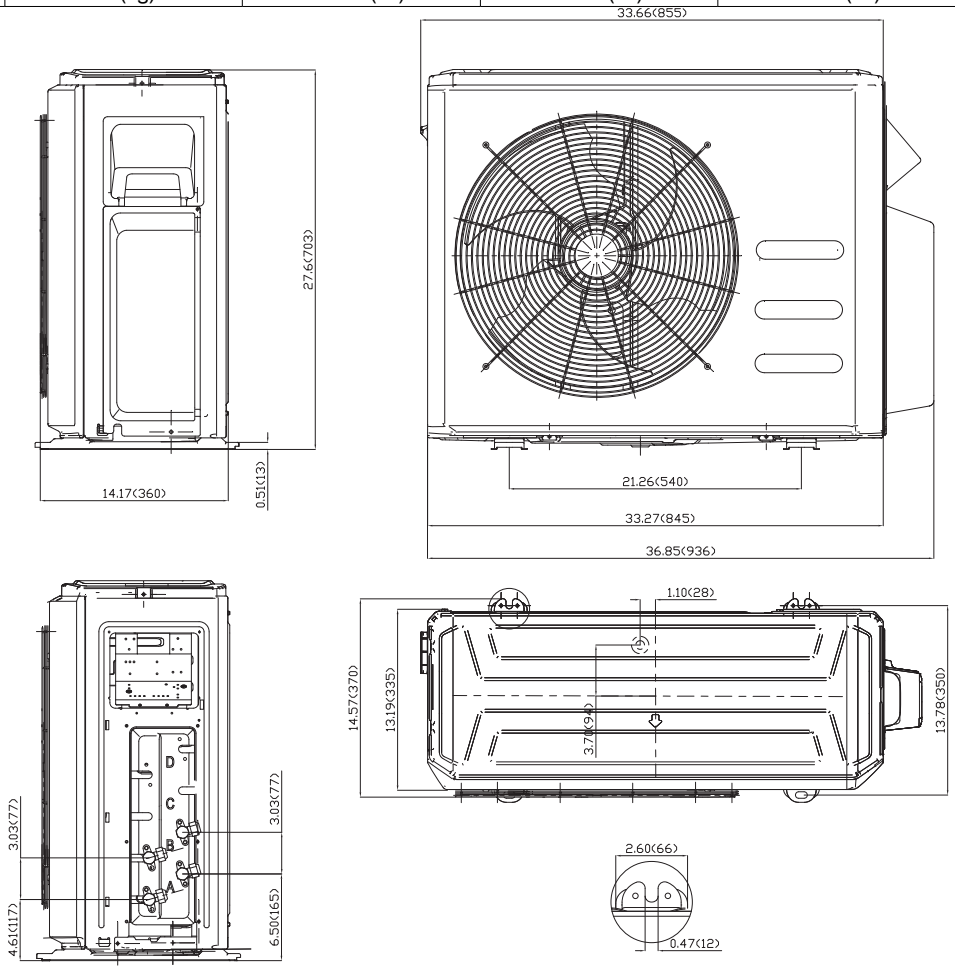


Fig. 1 − Outdoor Dimensions Size 18

NOTE: **Master valves are not available on the size 18 unit.**

DIMENSIONS (CONTINUED)

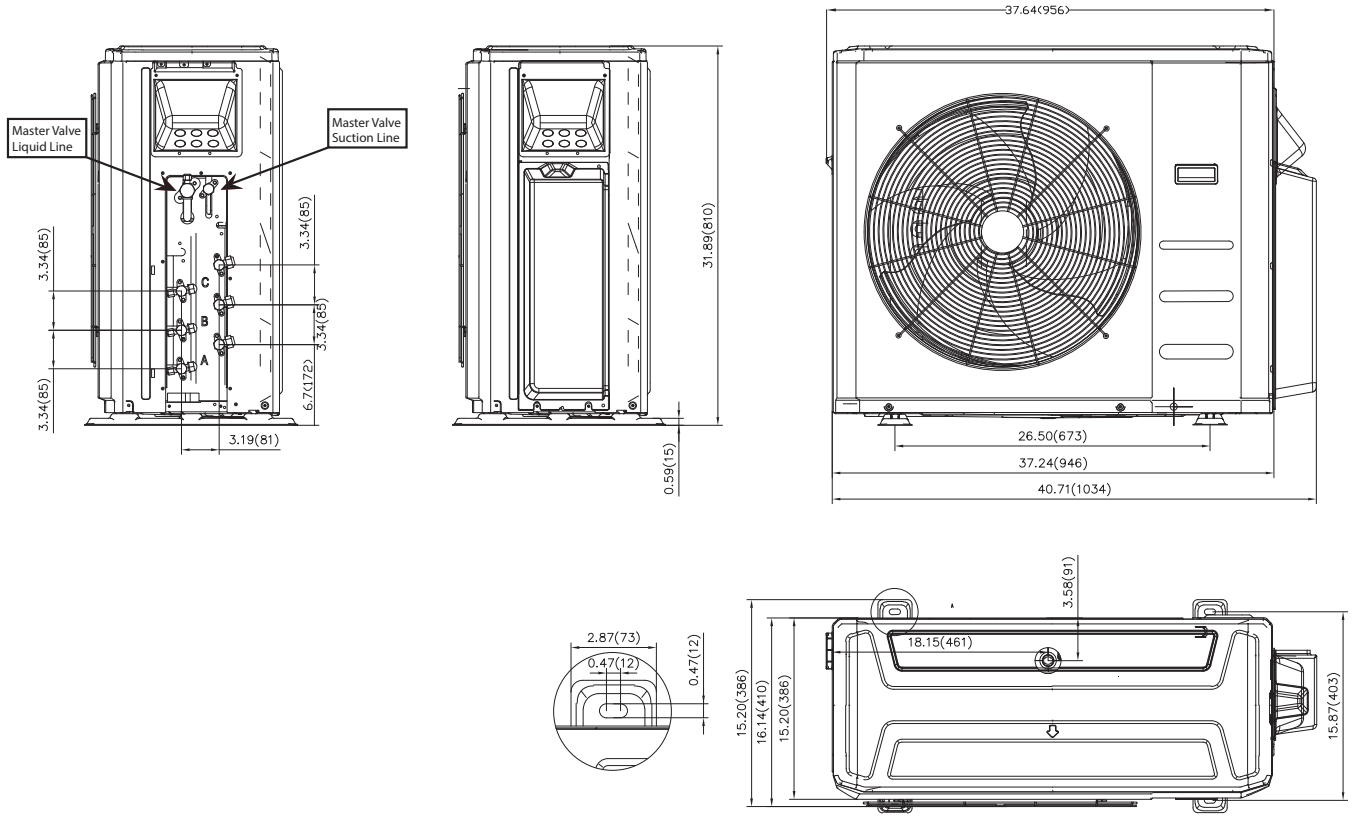


Fig. 2 – Outdoor Dimensions Size 27

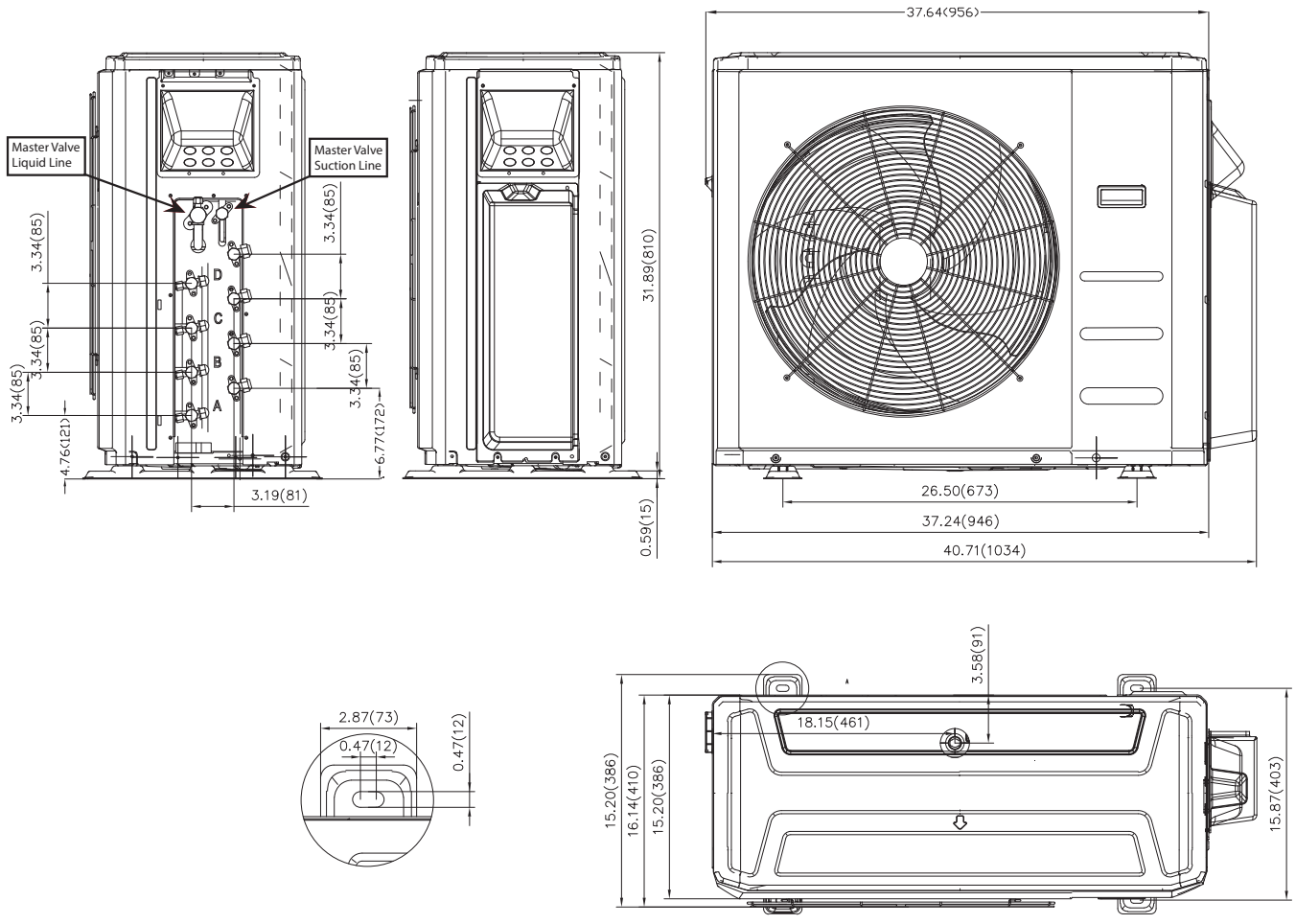


Fig. 3 – Outdoor Dimensions Size 36

DIMENSIONS (CONTINUED)

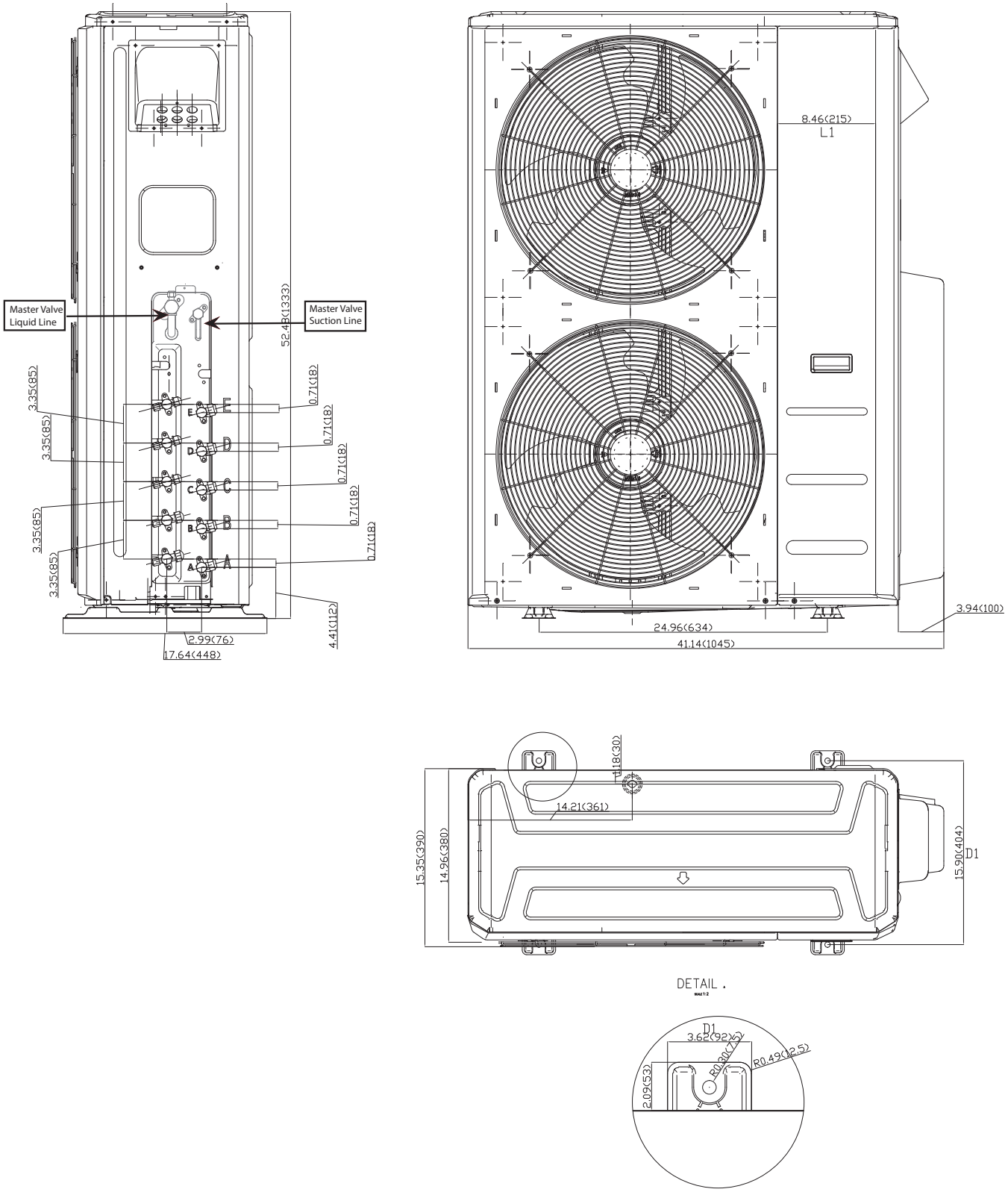


Fig. 4 – Outdoor Dimensions Size 48

CLEARANCES

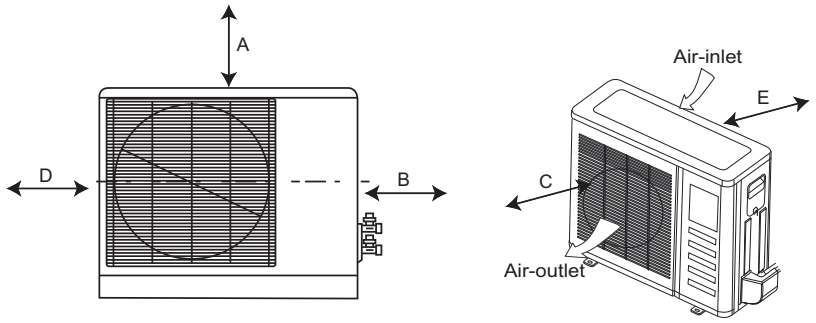


Fig. 5 – Clearances Outdoor

Table 4—Clearance Dimensions

UNIT	MINIMUM VALUE – in. (mm)
A	24 (609)
B	24 (609)
C	24 (609)
D	4 (101)
E	6 (152)

NOTE: Outdoor Unit must be mounted at least 2in (50mm) above the maximum anticipated snow depth.

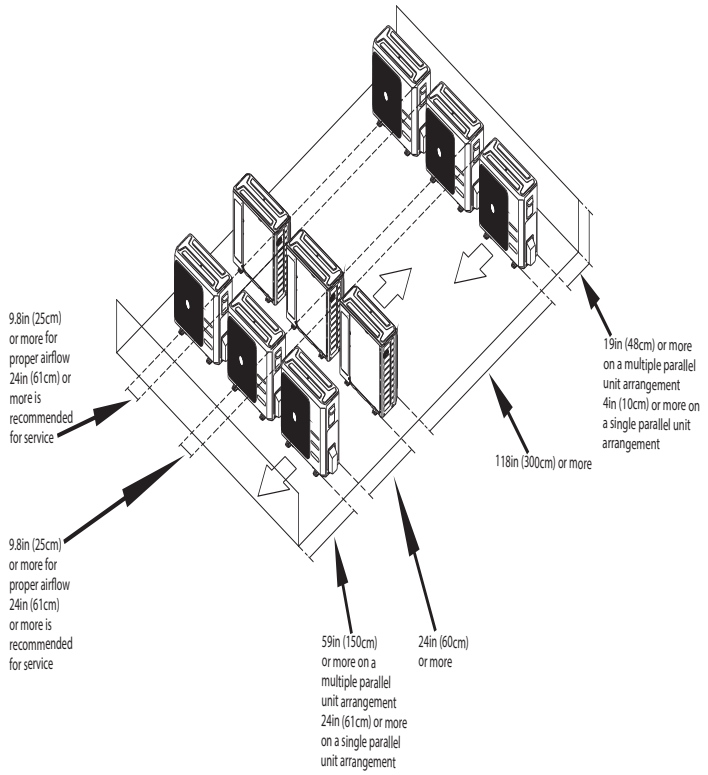


Fig. 6 – Clearances for multiple units

ELECTRICAL DATA

Table 5—ELECTRICAL DATA

UNIT SIZE	SYSTEM VOLTAGE	OPERATING VOLTAGE	COMPRESSOR	OUTDOOR FAN			MCA	MOCP
	VOLT / PHASE / HZ	MAX / MIN*	RLA	FLA	HP	W		
18	208-230/1/60	253 / 187	10	0.74	0.07	50	18	25
27			15	0.9	0.16	120	25	35
36			19	1.3	0.16	120	30	45
48			21	1.0x2	0.11	85	35	50

*Permissible limits of the voltage range at which the unit will operate satisfactorily.

LEGEND

FLA – Full Load Amps
MCA – Minimum Circuit Amps
MOCP – Maximum Over Current Protection
RLA – Rated Load Amps

WIRING

All wires must be sized per NEC (National Electrical Code) or CEC (Canadian Electrical Code) and local codes. Use Electrical Data table MCA (minimum circuit amps) and MOCP (maximum over current protection) to correctly size the wires and the disconnect fuse or breakers respectively.

Recommended Connection Method for Power and Communication Wiring:

The main power is supplied to the outdoor unit. The field supplied 14/3 stranded wire with ground with a 600 volt insulation rating, power/communication wiring from the outdoor unit to indoor unit consists of four (4) wires and provides the power for the indoor unit. Two wires are line voltage AC power, one is communication wiring (S) and the other is a ground wire. Wiring between indoor and outdoor unit is polarity sensitive. The use of BX wire is NOT recommended.

If installed in a high Electromagnetic field (EMF) area and communication issues exists, a 14/2 stranded shielded wire can be used to replace L2 and (S) between outdoor unit and indoor unit landing the shield onto ground in the outdoor unit only.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

Wires should be sized based on NEC and local codes.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

Be sure to comply with local codes while running wire from the indoor unit to the outdoor unit.

Every wire must be connected firmly. Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Ensure all wiring is tightly connected.

No wire should touch the refrigerant tubing, compressor or any moving parts.

Disconnecting means must be provided and shall be located within sight and readily accessible from the air conditioner.

Connecting cable with conduit shall be routed through the hole in the conduit panel.

Control System

The Outdoor Multi−zone Ductless unit is equipped with a microprocessor control to operate the system and give optimum levels of comfort and operating efficiency. There are microprocessor boards and thermistors located in both the indoor and outdoor units. The thermistors monitor the system operation and control the operating mode.

Sequence of Operation

NOTE: **Simultaneous heating and cooling is not allowed.**

The Heating Mode is the priority in the system and controls the mode of operation for the rest of the indoor units connected to the same outdoor unit. If any unit in the system is set into Heating Mode the system switches to Heat. If any unit is setup in **COOLING**, while any unit in the system is setup as Heating, the ones on **COOLING** would enter in conflict mode and an error message would appear on the units set as **COOLING**.

All units must be set in cooling or fan mode for the system to cool. When a unit is set to **COOL**, **HEAT** or the **DRY** mode, the electronic expansion valve is first initialized (closed) and then is opened to a preset position.

Superheat heating for each fan coil (the ones that are energized) is monitored and the position of the electronic expansion valve is adjusted to ensure that each fan coil gets the appropriate amount of refrigerant to maintain the required superheat. In the **COOLING** mode, after the set point is satisfied, the electronic expansion valve remains open for a specified time to ensure the system pressures equalize. In the **HEATING** mode, after the set point is satisfied, the electronic expansion valve remains open to ensure proper oil flow back and keep low pressure.

When the system is set for **COOL**, **HEAT** or **DRY** mode, the compressor speed is varied by comparing the indoor air temperature with the set point and continuously adjusting the compressor speed (to keep the compressor running as long as possible) in an effort to maintain the greatest comfort possible.

The indoor fan can run in either the **MANUAL** or **AUTO** mode. When the fan is runs in the **AUTO** mode, the speed is determined by comparing the room temperature to the set point.

For High Walls and Floor Consoles Fan Coils, when the set point is satisfied, the fan speed is reduced. For Cassettes and Ducted Fan Coils when the set point is satisfied, the fan continues to run. The Fan Coils are not de−energized.

When the unit goes through the defrost cycle, the indoor fans are de−energized and the refrigerant is circulated through all the fan coils (even if they were off or on standby before the defrost cycle) to maximize the heat transfer surface area available for defrost operation.

⚠ WARNING

AUTO mode is recommended to be used on single zone applications **ONLY**, it is NOT recommended to be used on Multi−zone Applications.

Using AUTO changeover on Multi−zone applications could set an indoor unit on Standby, indicated as (−−) on the display, turning off this indoor unit until all the indoor units are on the same Mode (Cooling or Heating).

HEATING Mode is the priority in the system.

Simultaneous HEATING and COOLING is not allowed.

CONNECTION DIAGRAMS

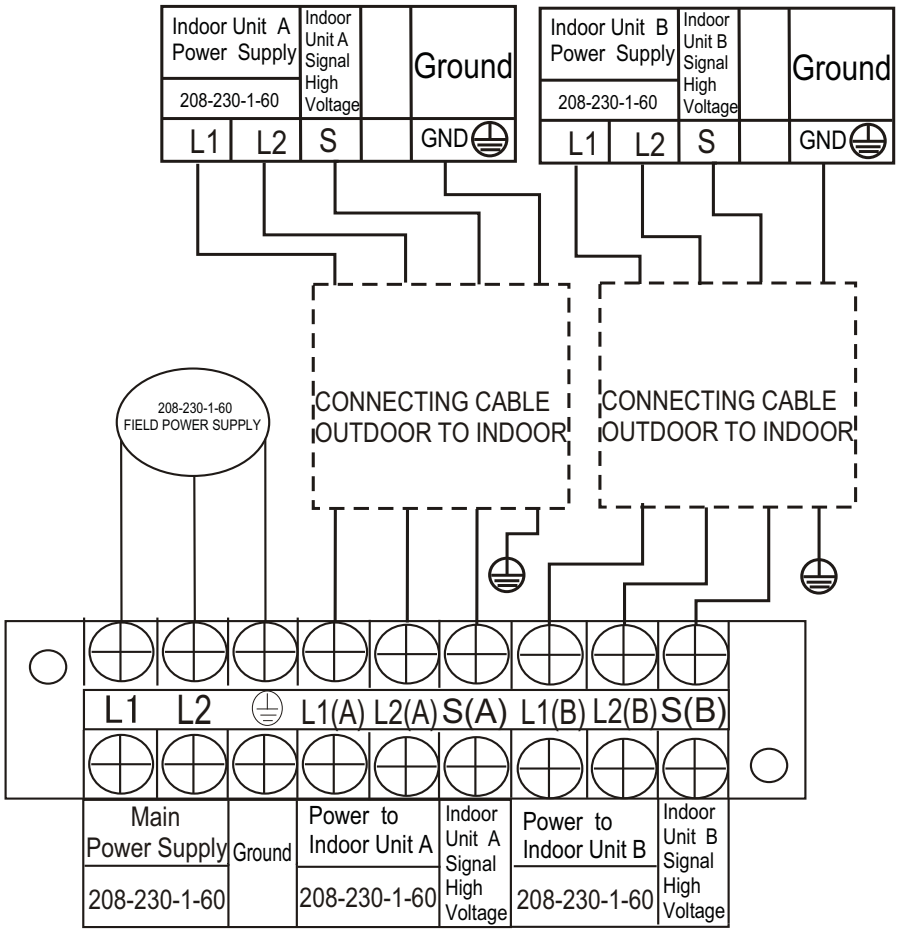


Fig. 7 – Connection Diagram Size 18K 2 Zone

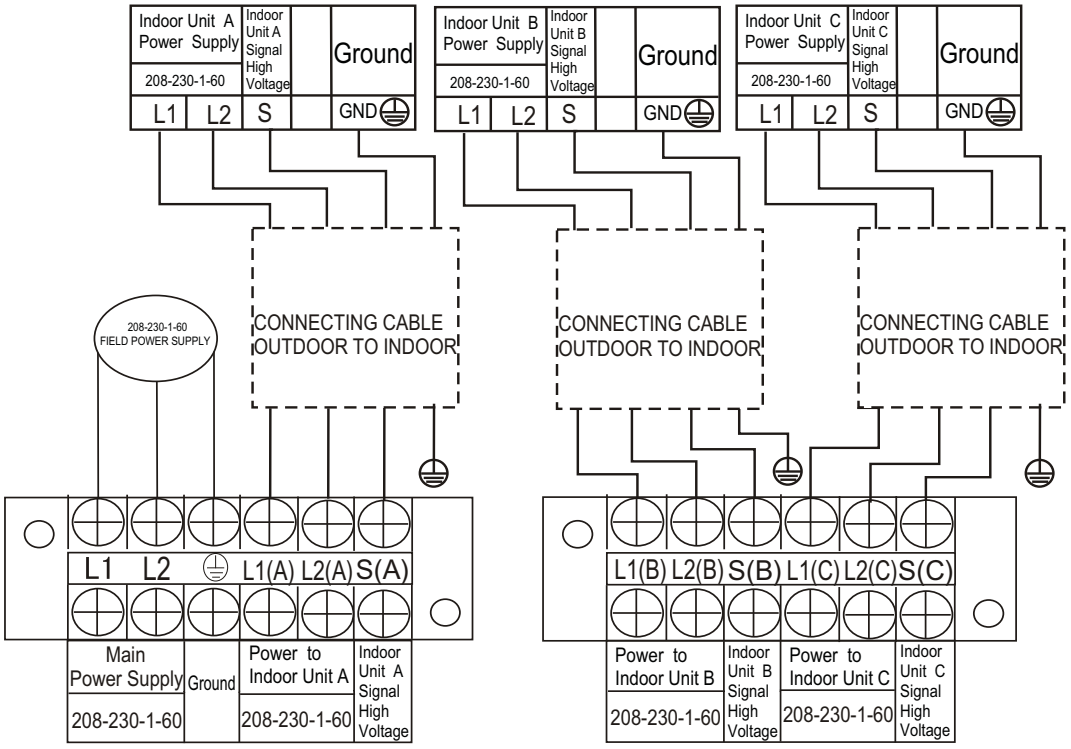


Fig. 8 – Connection Diagram Size 27K 3 Zone

CONNECTION DIAGRAMS (CONT)

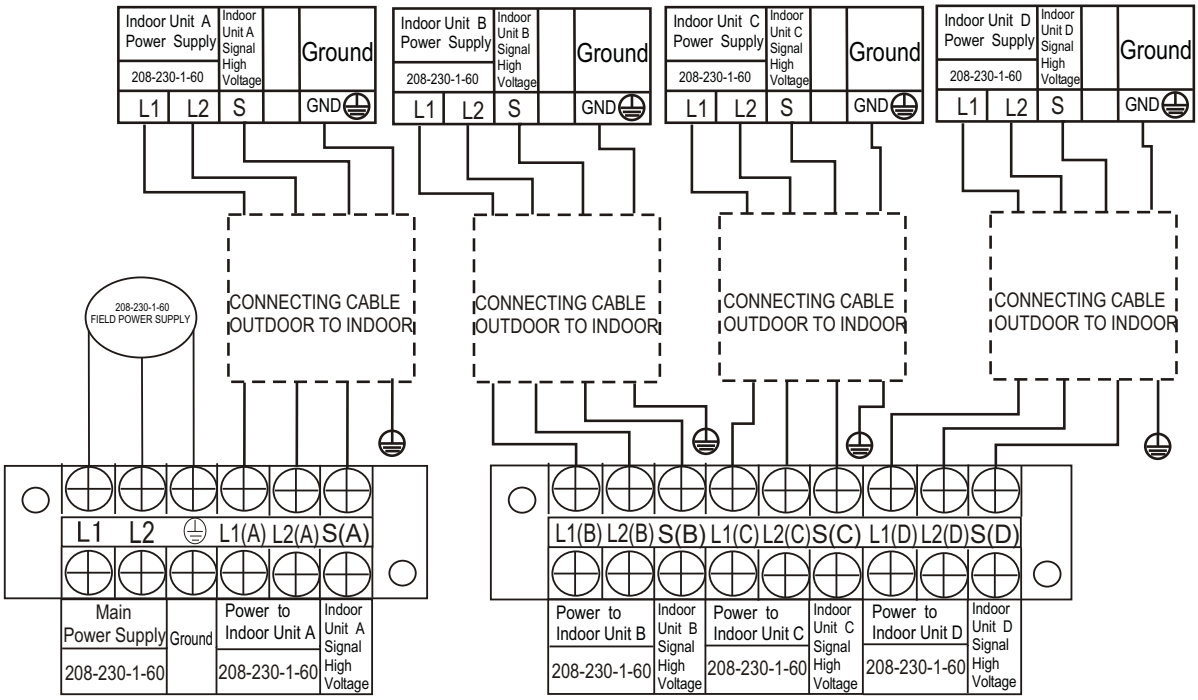


Fig. 9 – Connection Diagram Size 36K 4 Zone

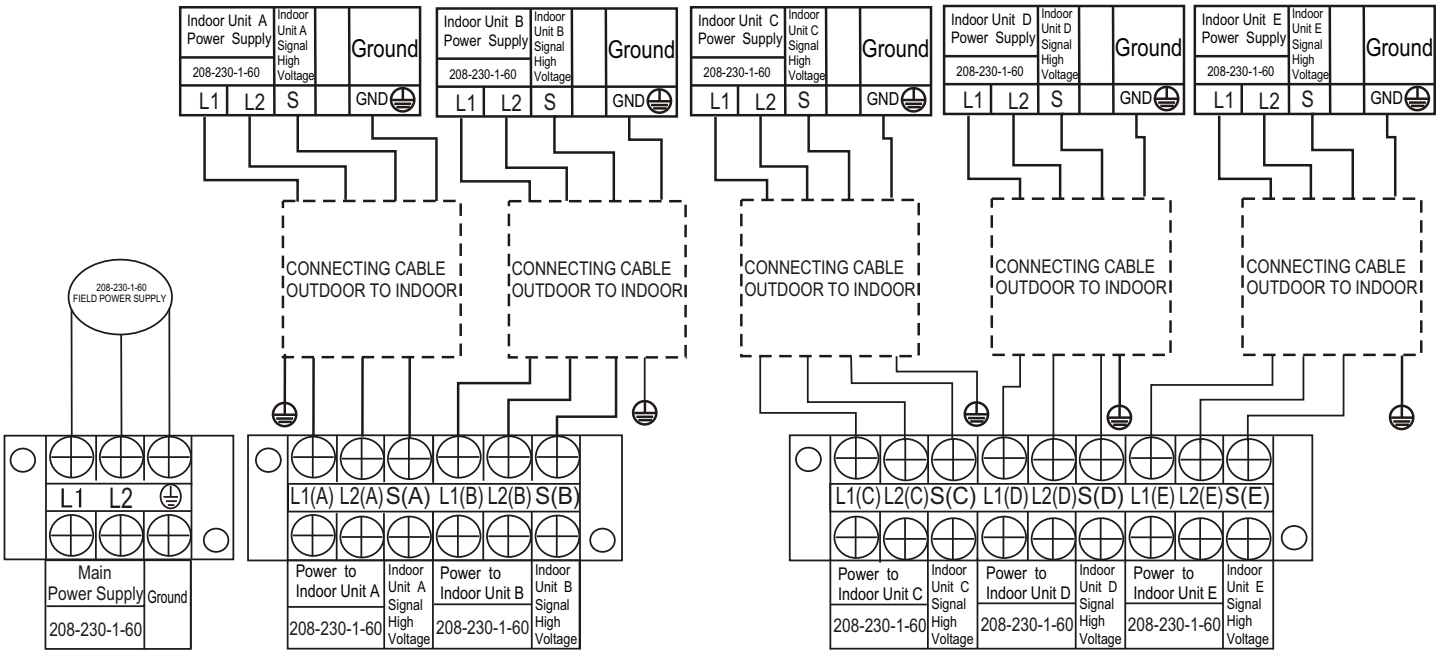


Fig. 10 – Connection Diagram Size 48K 5 Zone

WIRING DIAGRAMS

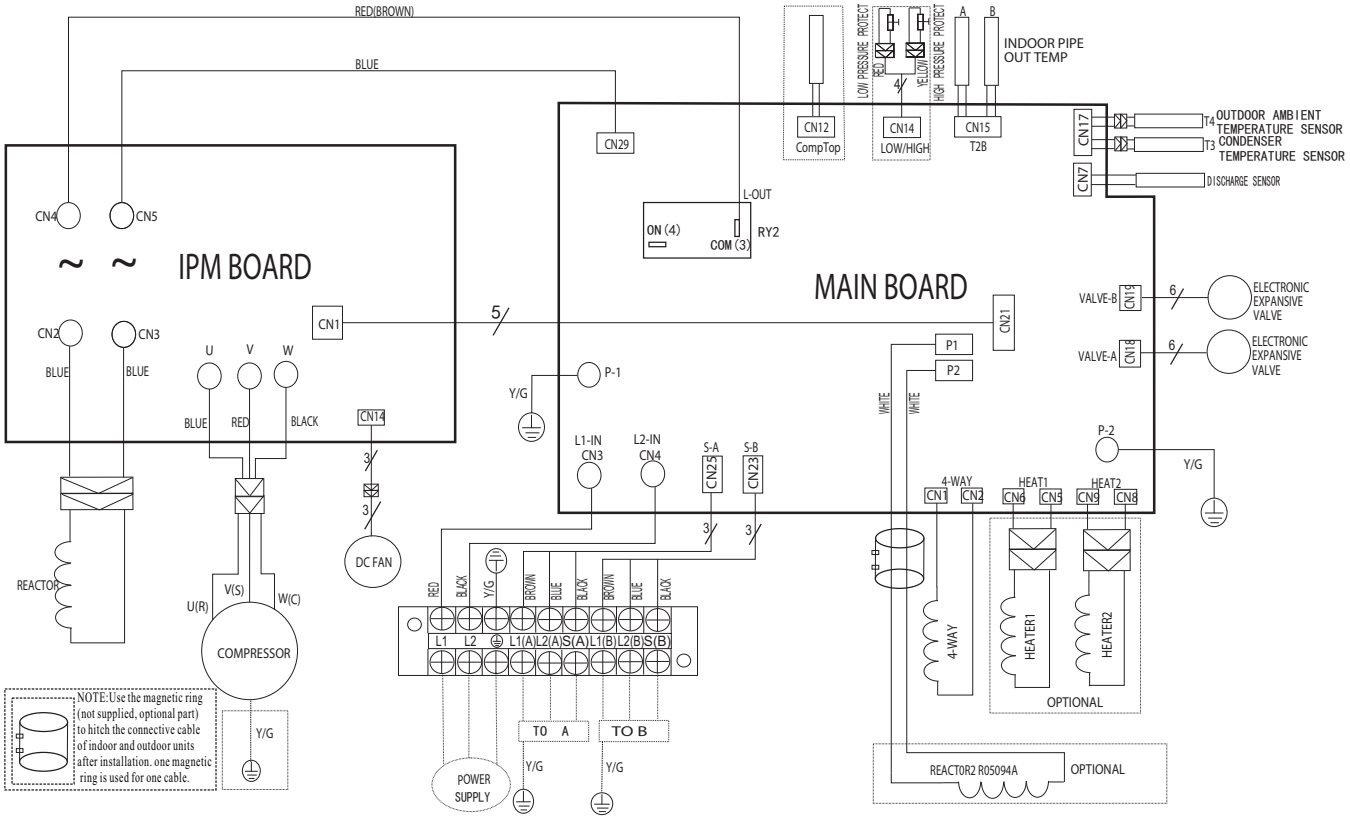


Fig. 11 – Wiring Diagram 18K − 2 Zone

Table 6—Outdoor Unit Main Board

CODE	PART NAME
CN3~CN4	Input: 230VAC High voltage
CN23,CN25	Output: Pin1 (Connection of the high voltage)−−−"S"Pin2~Pin3 (230VAC High voltage)−−−"L1 & L2"
P1~P2	Output: Connection of the REACTOR
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	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)−Cond. and Ambient 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 Switches
CN12	Input: Pin1 (0−5VDC), Pin2 (5VDC)−−Compressor Temp
CN29~L−OUT	Output: 230VAC High voltage−−to IPM Board
CN 21	Connect to IPM BOARD

Table 7—Outdoor Unit IPM Board

CODE	PART NAME
CN4~CN5	Input: 230VAC High voltage−−−from the Main Board
CN2~CN3	Output: Connection of the REACTOR
U~V~W	Connection to compressor voltage among phases 0~200VAC
CN14	Connection to DC FAN
CN1	Connection to MAIN BOARD

WIRING DIAGRAMS (CONT)

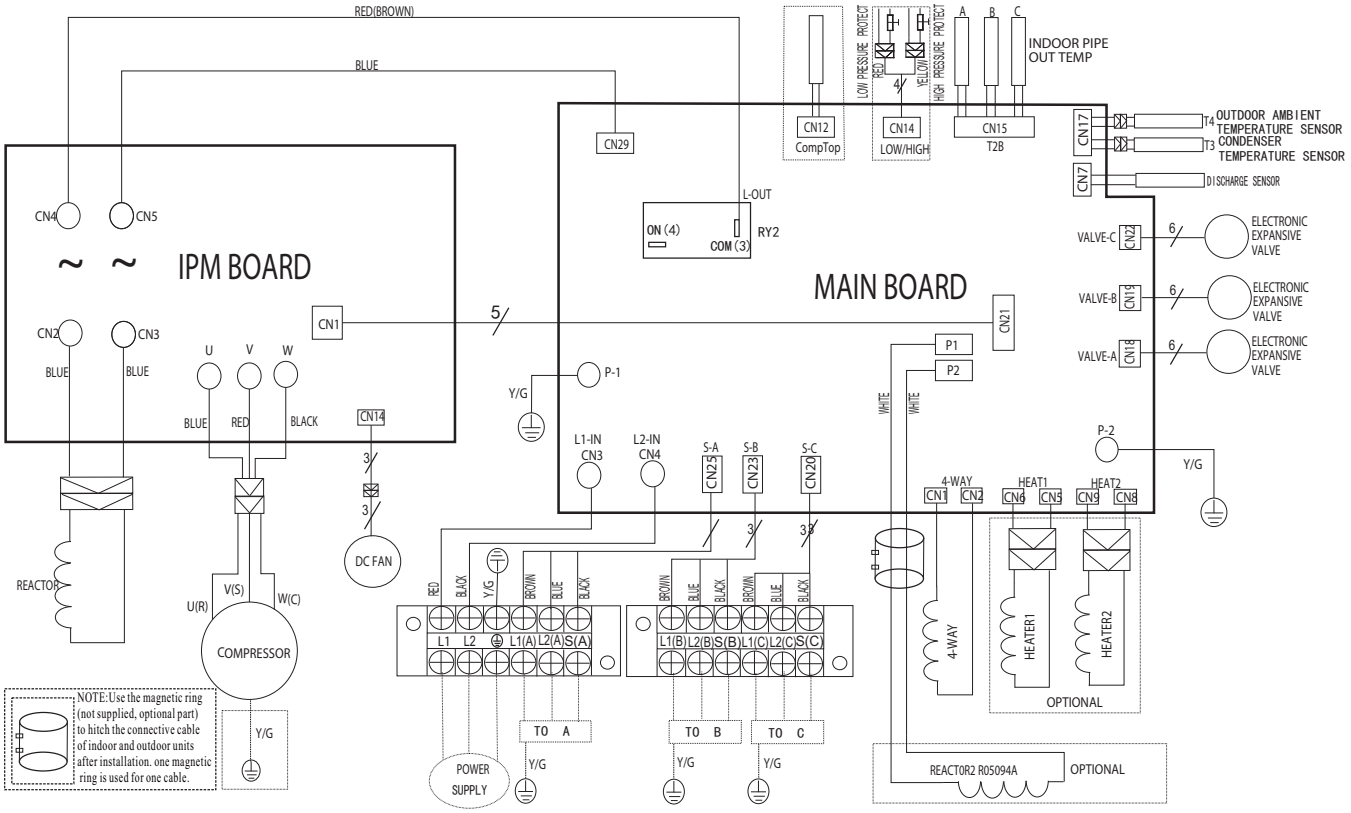


Fig. 12 – Wiring Diagrams 27K − 3 Zone Max

Table 8—27K − 3 Zone Max

OUTDOOR UNIT MAIN BOARD	
CODE	**PART NAME**
CN3~CN4	Input: 230VAC High voltage
CN20,CN23,CN25	Output: Pin1 (Connection of the high voltage)−−−"S" Signal Pin2~Pin3 (230VAC High voltage)−−−IDU Power
P1~P2	Output: Connection of the REACTOR
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 Temp
CN17	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0−5VDC)−Conditioner and Ambient 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 (0−5VDC), Pin2 (5VDC)−−−Compressor Temp
CN29~L−OUT	Output: 230VAC High voltage to IPM Board
Cn21	Connect to the IPM BOARD

Table 9—27K − 3 Zone Max

OUTDOOR UNIT IPM BOARD	
CODE	**PART NAME**
CN4~CN5	Input: 230VAC High voltage
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)

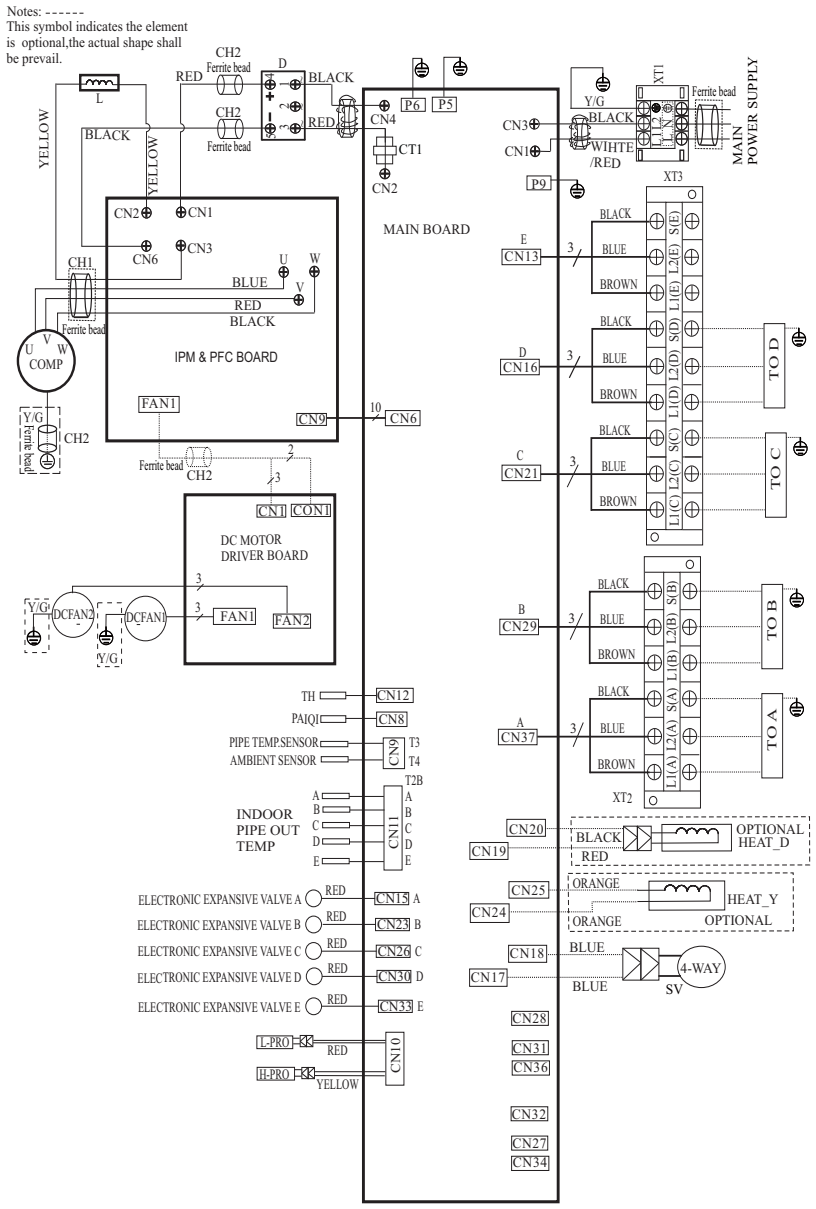


Fig. 13 – Wiring Diagrams 36K − 4 Zone Max

Table 10—36K − 4 Zone Max

OUTDOOR UNIT MAIN BOARD	
CODE	**PART NAME**
CN1~CN2	Input: 230VAC High voltage
CN5~CN6	Output: 230VAC High voltage
P−1	Connection to the earth
CN10~CN44	Output: 230VAC High voltage Chassis Crankcase Heater
CN4~CN40	Output: 230VAC High voltage Compressor Crankcase Heater
CN3~CN22	Output:230VAC High voltage
CN17~CN21	Output: Pin1−Pin4: Pulse waveform (0−12VDC), Pin5, Pin6 (12VDC)
CN7	Output: Pin1 (12VDC), Pin2 (5VDC), Pin3 (EARTH)
CN27~CN30	Output: Pin 2~Pin 3 (230VAC High voltage) − IDU Power & "S"
CN13	Pin1, Pin3, Pin5, Pin7, Pin9 (5VDC); Pin2, Pin4, Pin6, Pin8, Pin10 (0−5VDC)
CN33	Input: Pin1 (0−5VDC), Pin2 (5VDC) − Discharge Temp
CN8	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0−5VDC) T3 & T4
CN9	Input: Pin2, Pin4 (0VDC), Pin1, Pin3 (0−5VDC) H/L Pressure Switches

WIRING DIAGRAMS (CONT)

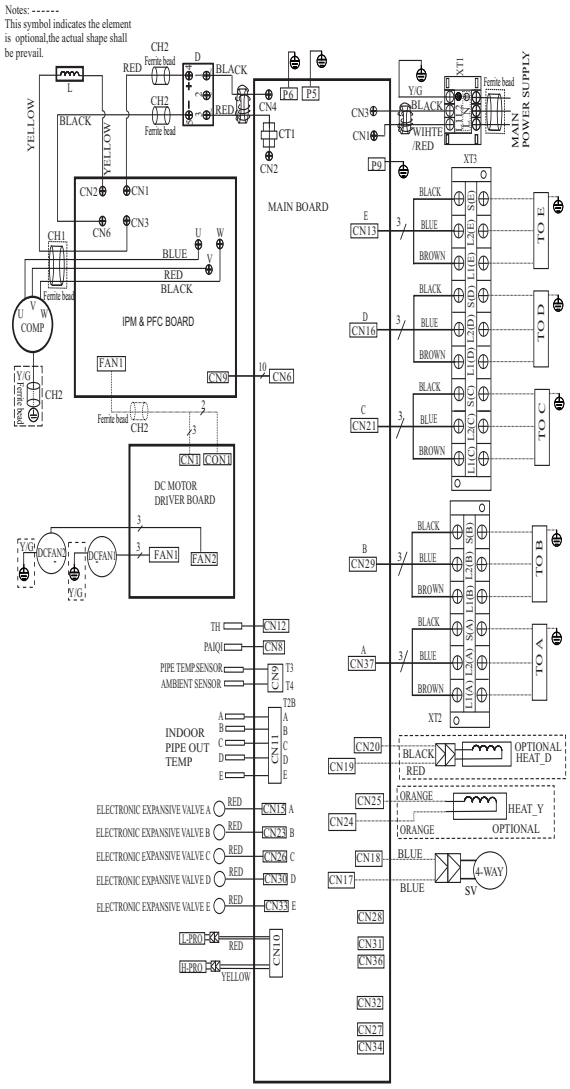


Fig. 14 – Wiring Diagrams 48K − 5 Zone Max

Table 11—48K − 5 Zone Max

OUTDOOR UNIT MAIN BOARD	
CODE	**PART NAME**
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
CN22	Output:−24VDC−24VDC
CN17~CN18	Output: 230VAC High voltage to 4 way valve
CN19~CN20	Output: 230VAC High voltage Compressor Crankcase Heater
CN24~CN25	Output: 230VAC High voltage Chassis Crankcase Heater
CN11	Input: Pin1, Pin3, Pin5, Pin7, Pin9 (5VDC) Pin2, Pin4, Pin6, Pin8, Pin10 (0−5VDC) indoor pipe out sensor
CN12	Input: Pin1 (0−5VDC), Pin2 (5VDC) Heatsink Temperature Sensor
CN8	Input: Pin1 (0−5VDC), Pin2 (5VDC) Compressor top sensor (PAIQI)
CN9	Input: Pin3, Pin4 (5VDC), Pin2 (0VDC), Pin1, Pin5 (0−5VDC) Pipe sensor and ambient sensor
CN15,CN23,CN26 CN30,CN33	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

WIRING DIAGRAMS (CONT)

Table 12—48K − 5 Zone Max

OUTDOOR UNIT PFC and IPM BOARD	
CODE	**PART NAME**
CN1~CN6	Output: 224−380VDC High voltage
CN2~CN6	Output: 224−380VDC High voltage
CN3~CN6	Output: 224−380VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC
CN9	Communication: Pin1−Pin6: Pulse waveform (0−5VDC), Pin7, Pin9 (0VDC), Pin8 (0−5VDC), Pin10 (5VDC) to the main board
FAN1	Output: Pin1~Pin2: High voltage (224−380VDC) ,Pin4 (0−15VDC) Pin5 (0−5.6VDC), Pin6: Pulse waveform (0−15VDC) to drive board

Table 13—48K − 5 Zone Max

OUTDOOR UNIT DC MOTOR DRIVER BOARD	
CODE	**PART NAME**
CON1	Output: Pin1~Pin2: High voltage (224−380VDC)
CN1	Input: Pin4: Pulse waveform (0−15VDC), Pin3 (0−6.5VDC) Pin2 (0VDC),Pin1 (15VDC)
FAN1	Pin1−Pin3:Connect to FAN voltage among phases 0~200VAC
FAN2	Pin1−Pin3:Connect to FAN voltage among phases 0~200VAC

Table 14—48K − 5 Zone Max

CODE	**PART NAME**
COMP	COMPRESSOR
CAP1,CAP2	FAN MOTOR CAPACITOR
CT1	AC CURRENT DETECTOR
D	DIODE MODULE
EEV	ELECTRONIC EXPANSION VALVE
FM1, FM2	OUTDOOR DC FAN
FAN1,FAN2	OUTDOOR AC FAN
HEAT	CRANKCASE HEATING
H−PRO	HIGH PRESSURE SWITCH
L	PFC INDUCTOR
L−PRO	LOW PRESSURE SWITCH
KM	AC CONTACTOR
SV	4−WAY VALVE
TP	EXHAUST TEMPERATURE SENSOR
T3	CONDENSER TEMPERATURE SENSOR
T4	OUTDOOR AMBIENT TEMPERATURE SENSOR
TH	HEATSINK TEMPERATURE SENSOR
PAIQI	COMPRESSOR TOP SENSOR (GAS PIPE)
CH 1, CH 2, CH 3	FERRITE BEAD

REFRIGERATION CYCLE DIAGRAMS

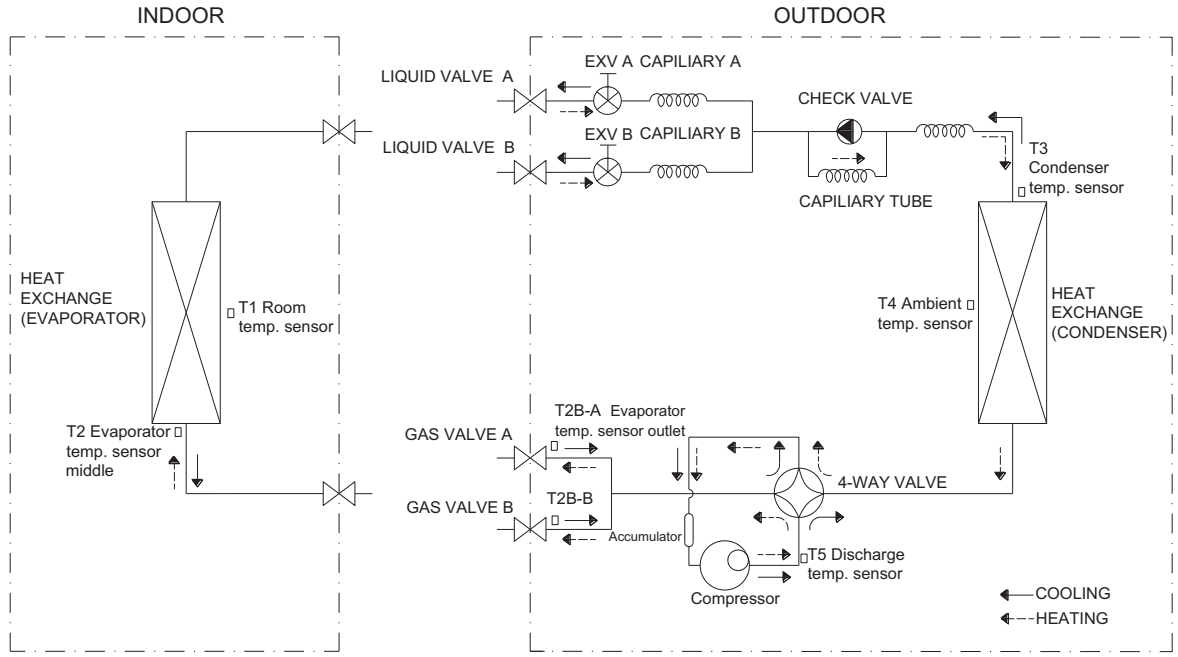


Fig. 15 – Refrigeration Cycle Diagram Size 18

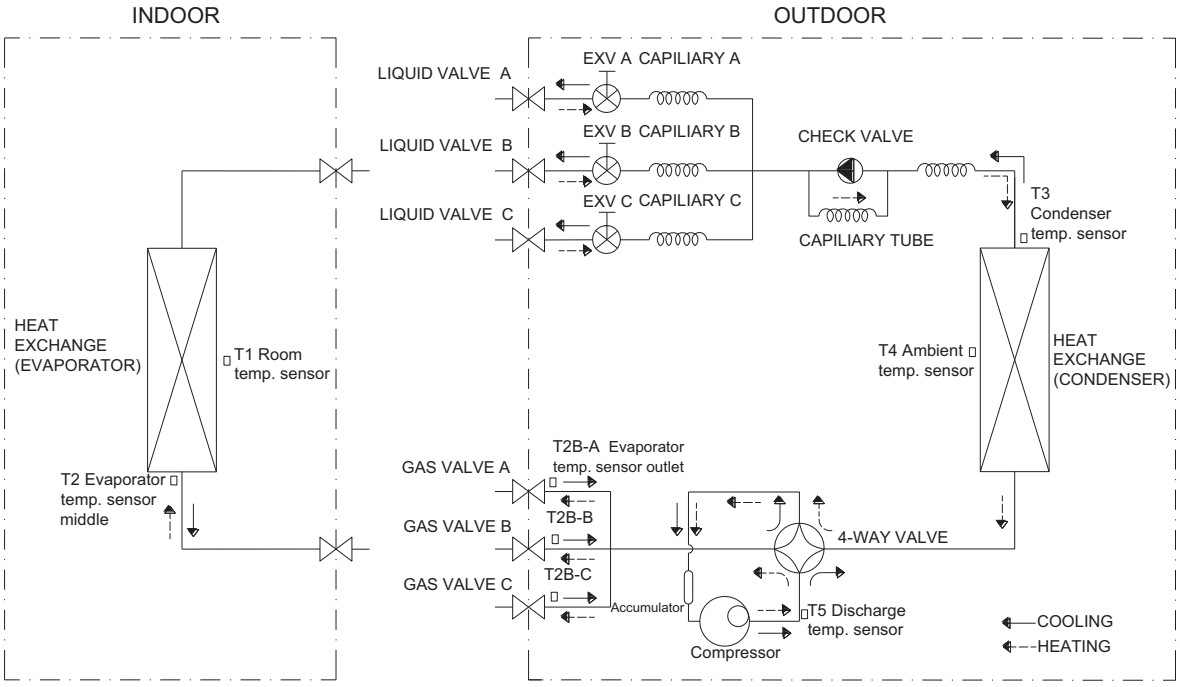


Fig. 16 – Refrigeration Cycle Diagram Size 27

REFRIGERATION CYCLE DIAGRAMS (CONT)

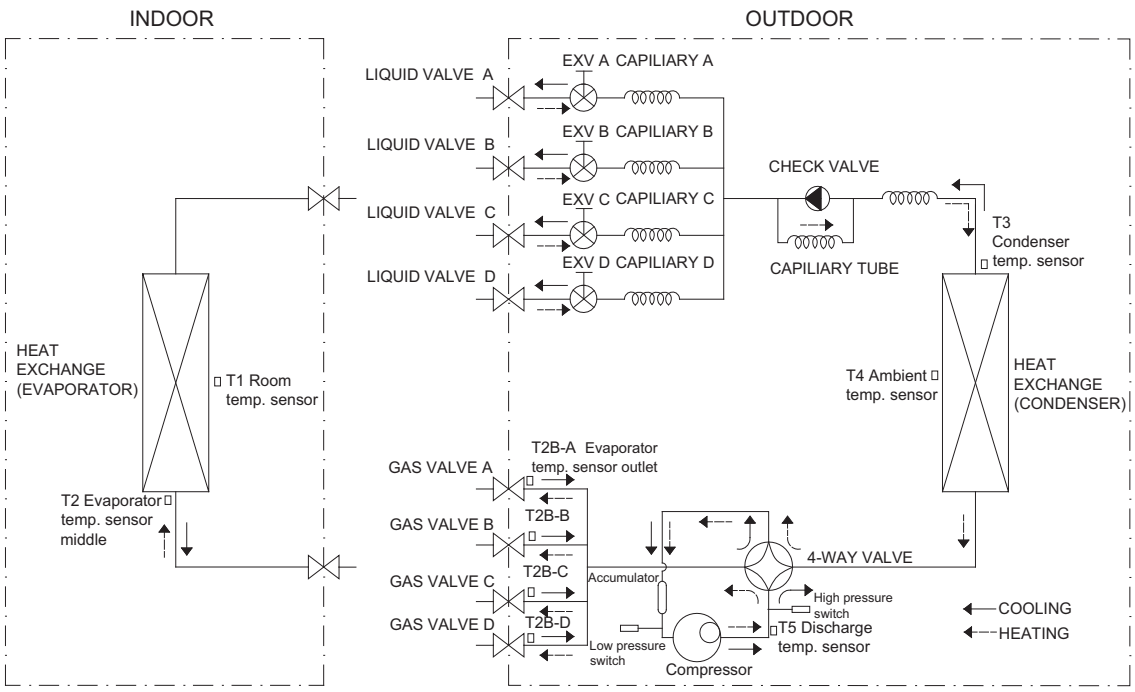


Fig. 17 – Refrigeration Cycle Diagram Sizes 36

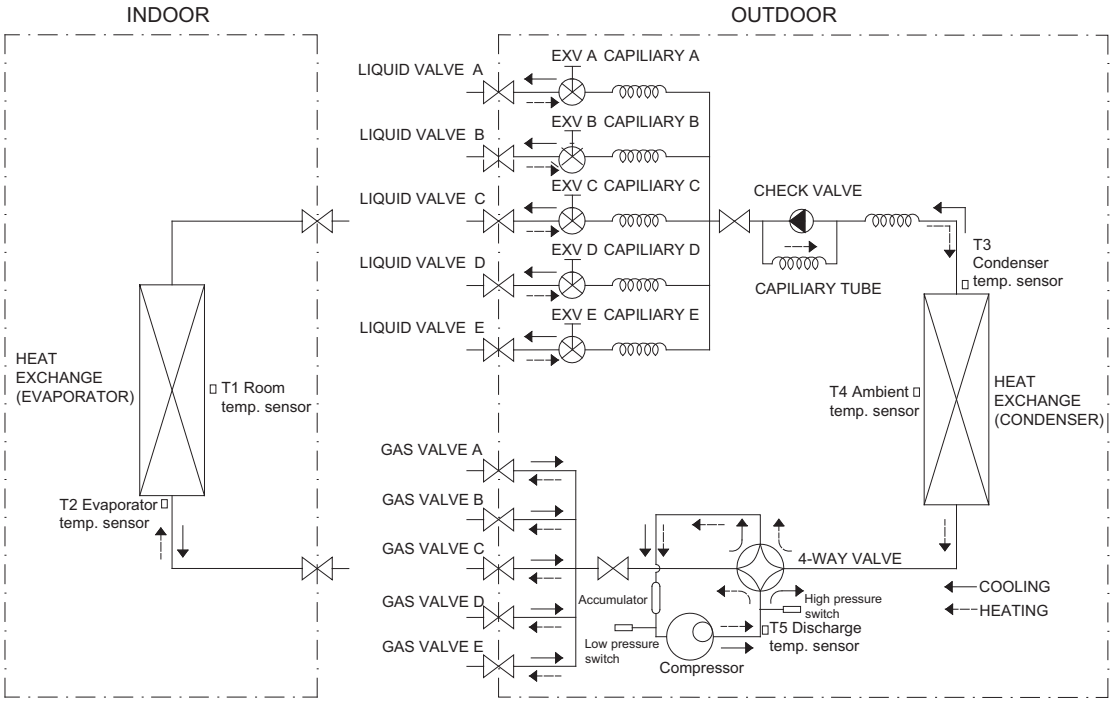


Fig. 18 – Refrigeration Cycle Diagram Size 48

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 Long Line Application section on this page for proper charge adjustments.
2. 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 36−in (914 mm) should be buried. Provide a minimum 6−in (152 mm) vertical rise to the service valves to prevent refrigerant migration.
4. Both lines must be insulated. Use a minimum of 1/2−in. (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 that vibration or noise is not transmitted into the structure.

IMPORTANT: Both refrigerant lines must be insulated separately.

The following maximum lengths are allowed:

Table 15—Piping and Refrigerant

SYSTEM SIZE			18K	27K	36K	48K
Piping	Min. Piping Length per each indoor unit	ft. (m)	10 (3)	10 (3)	10 (3)	10 (3)
	Standard Piping Length per each indoor unit	ft. (m)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)
	Max. outdoor−indoor height difference (OU higher than IU)	ft. (m)	49(15)	49(15)	49(15)	65(20)
	Max. outdoor−indoor height difference (IU higher than OU)	ft. (m)	49(15)	49(15)	49(15)	65(20)
	Max. height different between indoor units	ft. (m)	32 (10)	32 (10)	32 (10)	32 (10)
	Max. Length per each indoor unit	ft. (m)	82 (25)	98 (30)	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)	123 (37.5)
	Total Maximum Piping Length per system	ft. (m)	131(40)	197(60)	263(80)	328(100)
	Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16 (15)	0.16 (15)	0.16 (15)	0.16 (15)
	Suction Pipe (size – connection type)	in	3/8*2	3/8*3	1/2 *1+ 3/8*3	1/2 *2+ 3/8*3
		(mm)	9.52*2	9.52*3	12.7*1+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*5
		(mm)	6.35*2	6.35*3	6.35*4	6.35*5
Refrigerant	Refrigerant Type		R410A	R410A	R410A	R410A
	Heat Pump Models Charge Amount	Lbs (kg)	4.41 (2.0)	6.17(2.8)	6.61 (3.0)	10.13 (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," see Additional Refrigerant Charge (Table 11).**

Long Line Applications:

1. No change in line sizing is required.
2. Add refrigerant per Table 16.

Table 16—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)
27	3	98.76 (2.8)	74 (22.5)	0.16 (15)	197 (60)
36	4	105.82 (3.0)	98 (30)	0.16 (15)	263 (80)
48	5	162.26 (4.6)	123 (37.5)	0.16 (15)	328 (100)

Additional Refrigerant Calculation

Sum Total Liquid Pipe ft. (m) – Additional Charge Required After ft. (m.) x Additional Charge oz./ft. (g/m) 0.16 (15)

NOTES:

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. 19).
2. Connect charge hose to vacuum pump.
3. Fully open the low side of manifold gage (see Fig. 20).
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 as specified in the *ADDITIONAL REFRIGERANT CHARGE* (Table 11) in this document.
8. Disconnect the charge hose from charge connection of the low side service valve.
9. Securely tighten caps of service valves.

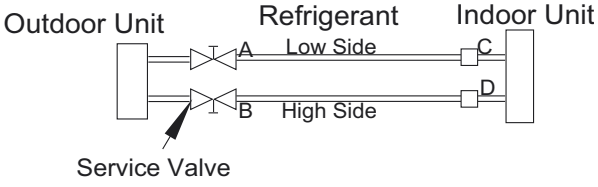


Fig. 19 – Service Valve

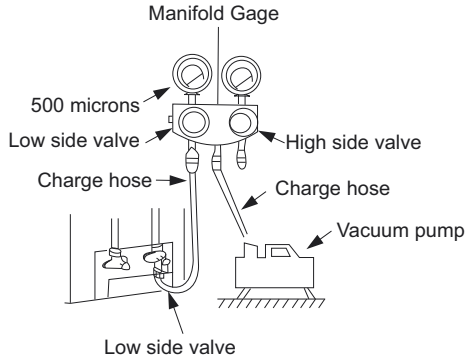


Fig. 20 – Manifold

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 ensuring a system is free of air and liquid water (see Fig. 21).

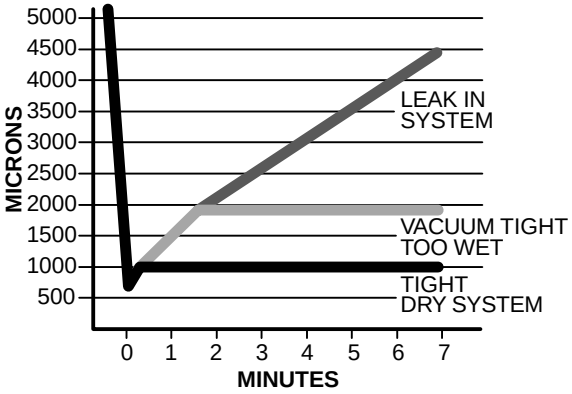


Fig. 21 – Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 22 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 1hour. 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.

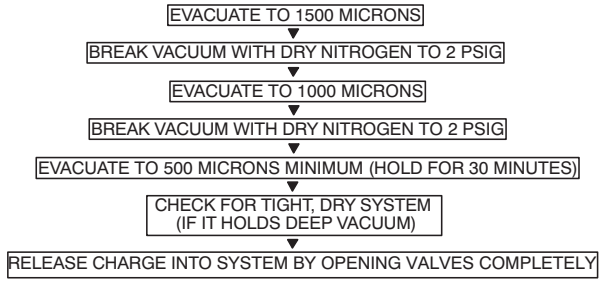


Fig. 22 – Triple Evacuation Method

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: Middle 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: 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 (110°C), 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 an 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

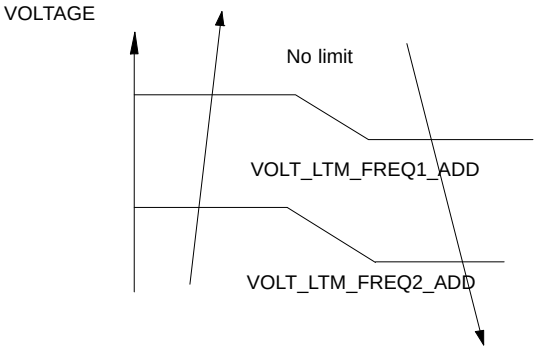


Fig. 23 — Low Voltage Protection

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.

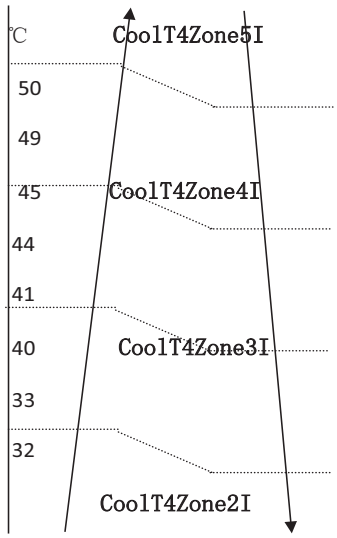


Fig. 24 — Cooling Mode

Table 17— Cooling Mode

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

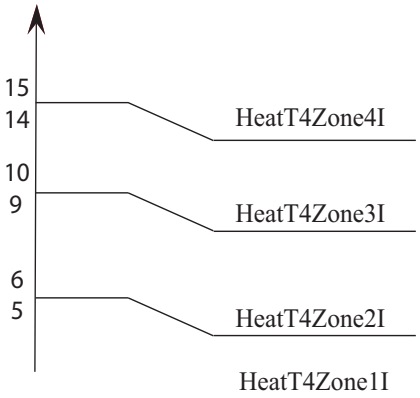


Fig. 25 — Heating Mode

Table 18—Heating Mode

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

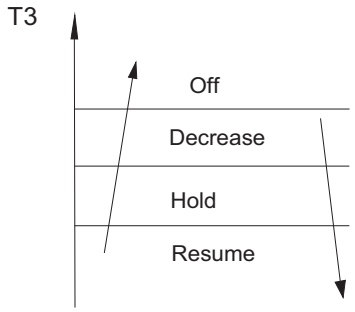


Fig. 26 – High Condenser Coil Temperature Protection

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:

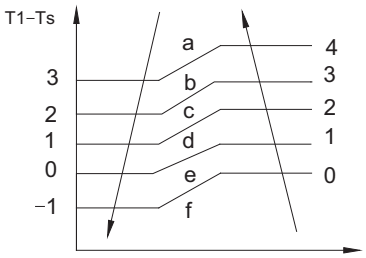


Fig. 27 – Cooling Mode

Table 19—Cooling Mode

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

Table 20—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 21 and the final capacity request to confirm the operating frequency.

Table 21—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.

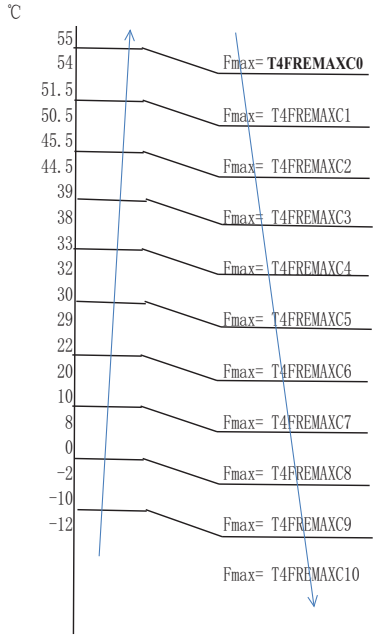


Fig. 28 – Maximum Running Frequency

Heating Mode

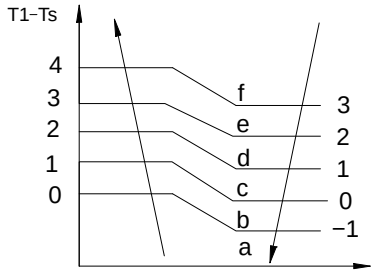


Fig. 29 – Heating Mode

Table 22—Heating Mode

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

Table 23—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).**

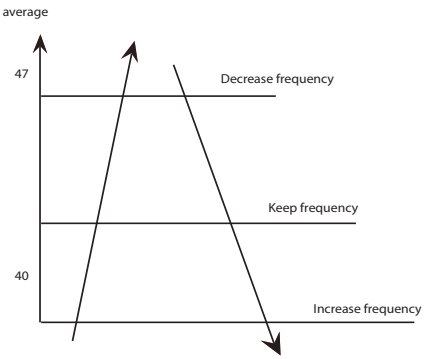


Fig. 30 – T2 Average

Use Table 24 and the final capacity request to confirm the operating frequency.

Table 24—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.

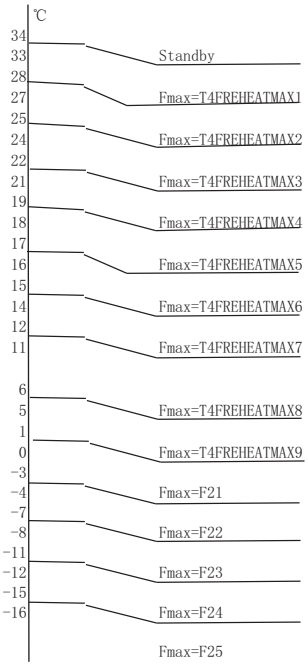


Fig. 31 – T2 Average

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<−24C for 3 minutes.
4. If the compressor cumulative running time reaches 120 minutes and T3<−15℃.

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℃

−−−−T3 remains at TCDE2℃ or above for 80 seconds

−−−−Unit runs for ten consecutive minutes in Defrosting mode

Defrosting Action

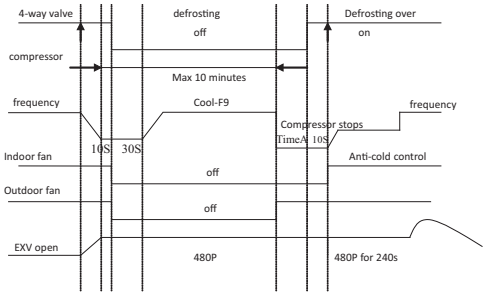


Fig. 32 – Defrosting Action

End Frosting Condition

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

1. T3 > TempQuitDefrost_ADD ℃
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.

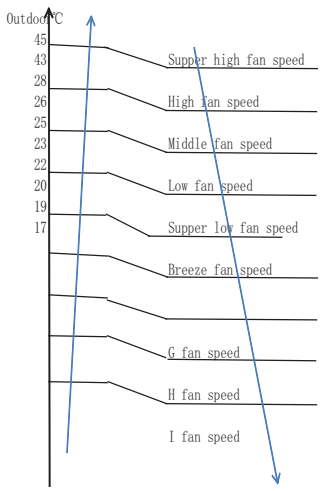


Fig. 33 – Cooling Mode

When low ambient cooling is in effect:

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

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

When T3≥100.4℉ (38℃) or when T4≥68℉ (20℃), the outdoor fan chooses a speed according to T4 again.

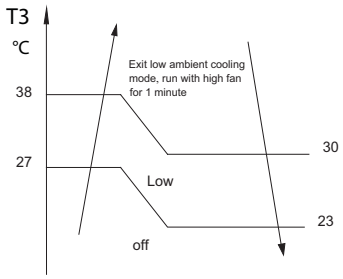


Fig. 34 – Cooling Mode

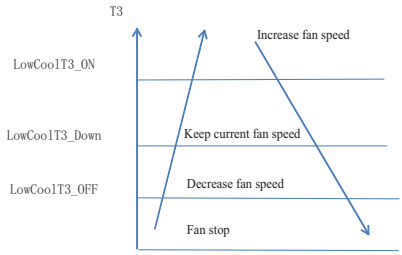


Fig. 35 – Cooling Mode

Heating Mode

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

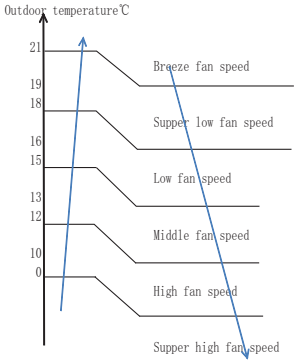


Fig. 36 – Heating Mode

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 will close 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

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

<<The following paragraph makes no sense to me>>

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 Defrosting 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 v**a**lve 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 that may arise.

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. The indoor diagnostic display is a combination of flashing LED's on the display panel on the front of the unit. If possible always check the diagnostic codes displayed on the indoor unit first.

The diagnostic codes for the indoor and outdoor units are listed in the appendix.

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 main power before reinstalling the board to avoid shock hazard and board damage.

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

Diagnostic Guides

Table 25—Outdoor Unit Error Display

OUTDOOR UNIT DISPLAY	LED STATUS	INDOOR UNIT DISPLAY
E0	Outdoor EEPROM malfunction	F4
E2	Communication malfunction between indoor and outdoor units	E1
E3	Communication malfunction between IPM board and outdoor main board	— —
E4	Open or short circuit of outdoor temperature sensor (T3、T4、T5、T2B)	F2/F1/F3/F6
E5	Voltage protection	P1
E6	PFC module protection	— —
E8	Outdoor fan speed has been out of control (Only for DC fan motor models)	F5
E9	Wrong wiring connection of 24K indoor unit	— —
F1	No A Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
F2	No B Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
F3	No C Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
F4	No D Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
F5	No E Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
F6	No F Indoor unit coil outlet temp. sensor or connector of sensor is defective	— —
P0	Temperature protection of compressor top	P2
P1	High pressure protection	P2
P2	Low pressure protection	P2
P3	Current protection of compressor	F0
P4	Temperature protection of compressor discharge	— —
P5	High temperature protection of condenser	— —
P6	IPM module protection	P0
LP	Low ambient temperature protection	— —

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 shows the following codes each time the SW1 is pushed.

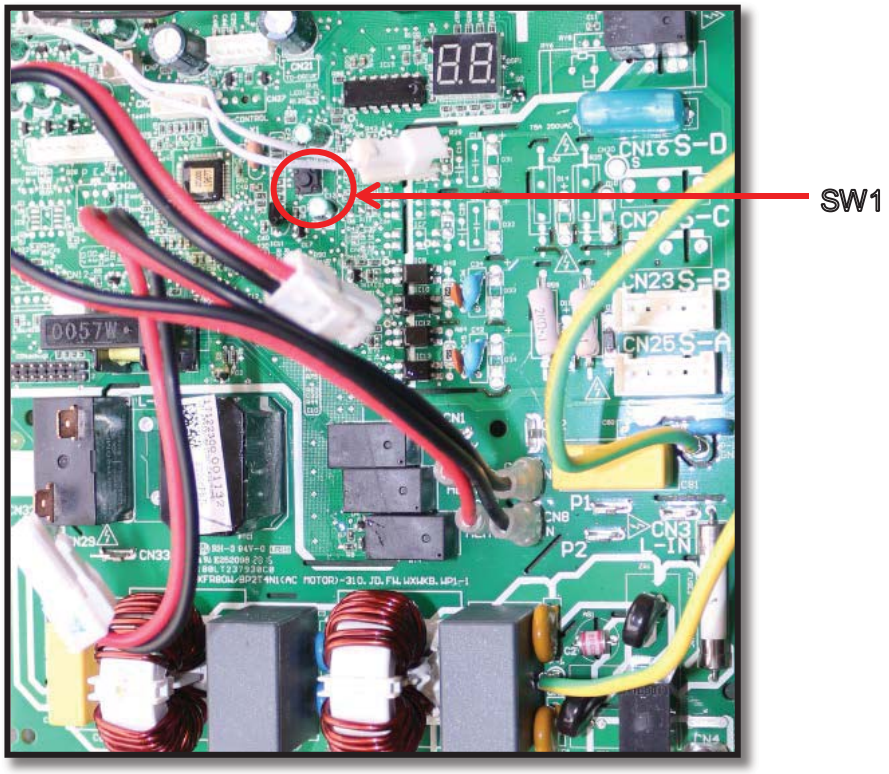


Fig. 37 – Outdoor PCB

OUTDOOR UNIT DISPLAY (CONT)

Table 26—Outdoor PCB

No. of Presses	Display	Remark		
0	Normal Display	Displays running frequency, running state, or malfunction code		
1	Quantity of indoor units with working connection	**Actual Data**		
		Display	**Number of Indoor Units**	
		1	1	
		2	2	
		3	3	
		4	4	
2	Outdoor unit running mode code	Off: 0, Fan only: 1, Cooling: 2, Heating: 3, Forced cooling: 4. Forced defrost:A		
3	Indoor unit A capacity	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 (T_{2B}A)	If the temperature is lower than −9 ℃, the digital display shows "−9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "−−"		
18	Indoor unit B evaporator outlet temperature (T_{2B}B)			
19	Indoor unit C evaporator outlet temperature (T_{2B}C)			
20	Indoor unit D evaporator outlet temperature (T_{2B}D)			
21	Indoor unit E evaporator outlet temperature (T_{2B}E)			
22	Indoor unit A room temperature (T_1A)	If the temperature is lower than 0 ℃, the digital display shows "0." If the temperature is higher than 50 ℃, the digital display shows "50." If the indoor unit is not connected, the digital display shows: "−−"		
23	Indoor unit B room temperature (T_1B)			
24	Indoor unit C room temperature (T_1C)			
25	Indoor unit D room temperature (T_1D)			
26	Indoor unit E room temperature (T_1E)			
27	Indoor unit A evaporator temperature (T_2A)	If the temperature is lower than −9 ℃, the digital display shows "−9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "−−"		
28	Indoor unit B evaporator temperature (T_2B)			
29	Indoor unit C evaporator temperature (T_2C)			
30	Indoor unit D evaporator temperature (T_2D)			
31	Indoor unit E evaporator temperature (T_2E)			
32	Condenser pipe temperature (T3)			
33	Outdoor ambient temperature (T4)			
34	Compressor discharge temperature (TP)	The display value is between 30–129 ℃. If the temperature is lower than 30 ℃, the digital display shows "30." If the temperature is higher than 99 ℃, the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 105 ℃.		
35	AD value of current	The display value is a hex number. For example, the digital display tube shows "Cd", it means AD value is 205.		
36	AD value of voltage			
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 (T_{2B}F)			
49	F indoor unit room temperature (T_1F)			
50	F indoor unit evaporator temperature (T_2F)			
51	EXV open angle for F indoor unit			

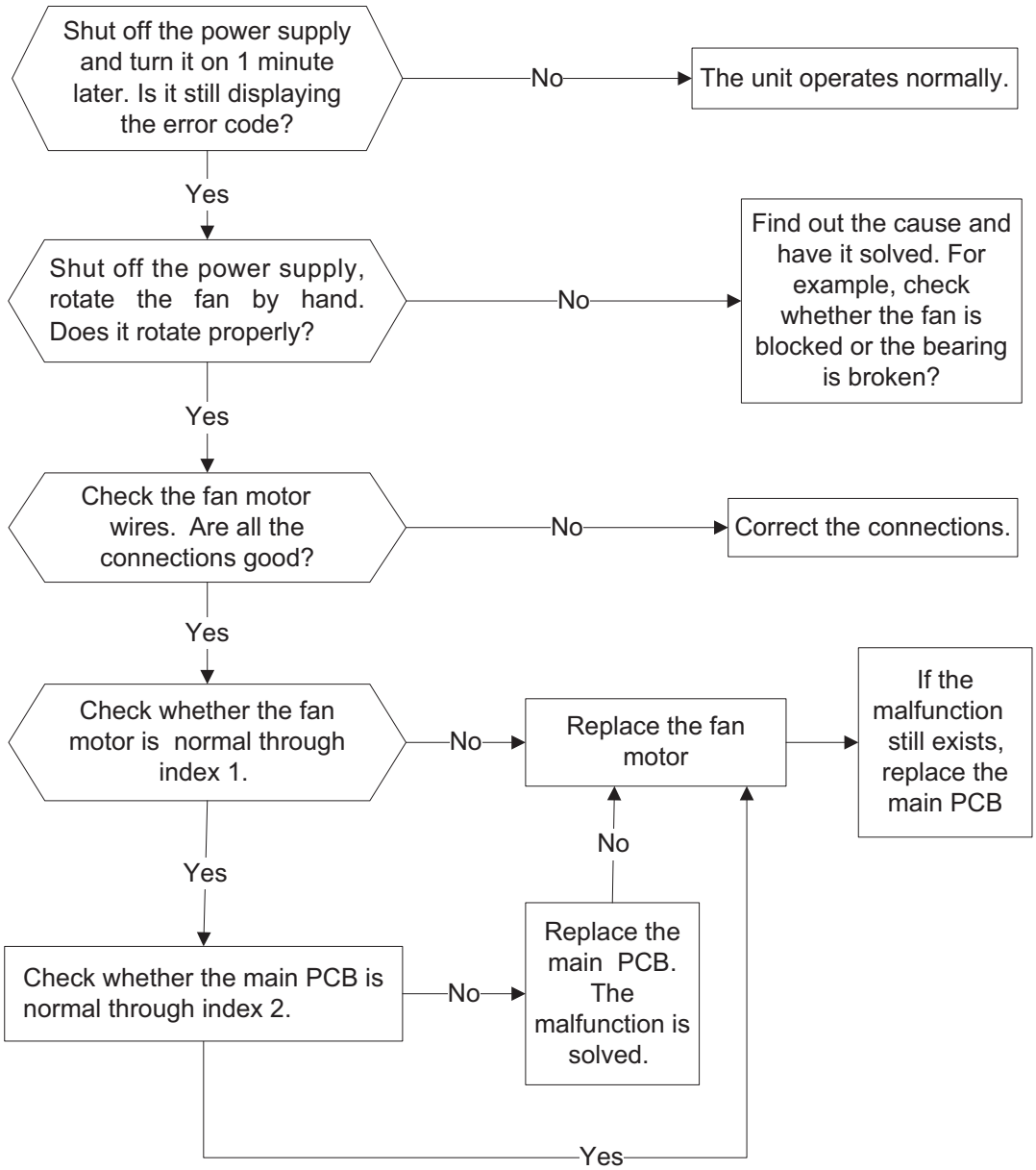
DIAGNOSIS AND SOLUTION

Indoor fan speed has been out of control

Table 27—Diagnosis and Solution

Malfunction decision conditions	When the indoor fan speed remains low (300RPM) for certain period of time, the unit stops and the LED displays the failure.
Probable causes	• Wiring mistake • Fan assembly faulty • Fan motor faulty • PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

Indoor units mode conflict

Table 28—Diagnosis and Solution

Error Code	P5 (old model) or — (new model)
Malfunction decision conditions	The indoor units cannot operate the Cooling mode and Heating mode at the same time. The Heating mode has the priority.
Probable causes	• Suppose indoor unit A is operating under the Cooling or Fan mode, and indoor unit B is set to the Heating mode, then unit A turns off and unit B operates in the Heating mode. • Suppose indoor unit A is operating in the Heating mode, and indoor unit B is set to the Cooling or Fan mode, then unit B enters the Standby mode and unit A will not change its operation.

Table 29—Mode Conflict

	COOLING MODE	HEATING MODE	FAN	OFF
Cooling Mode	No	Yes	No	No
Heating Mode	Yes	No	Yes	No
Fan	No	Yes	No	No
Off	No	No	No	No

- **No**: No mode conflict
- **Yes**: Mode conflict

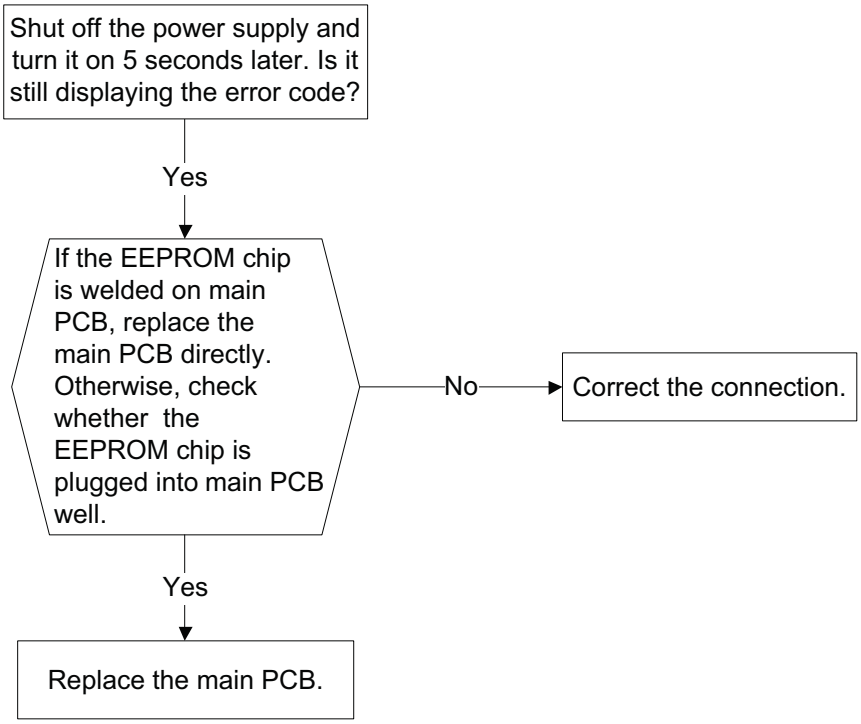
DIAGNOSIS AND SOLUTION (CONT)

EO EEPROM parameter error

Table 30—Diagnosis and Solution

Error Code	E0/F4
Malfunction decision conditions	Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip
Probable causes	• Installation mistake • PCB faulty

Troubleshooting:



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

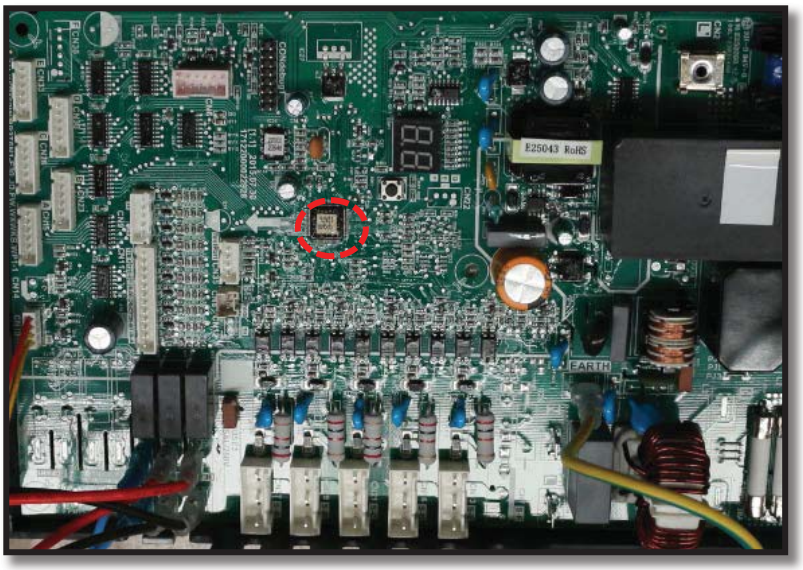


Fig. 38 – EEPROM Chip

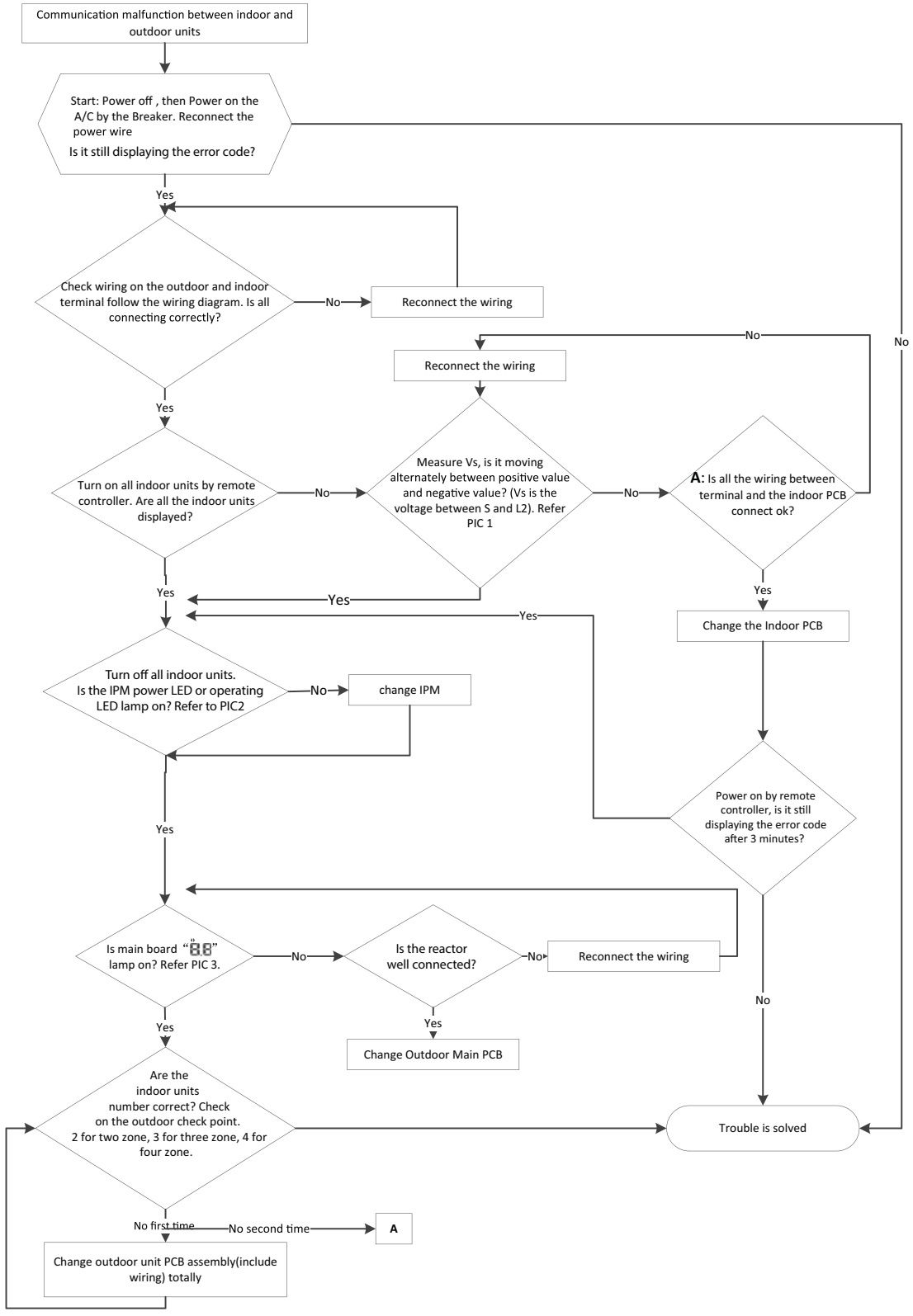
DIAGNOSIS AND SOLUTION (CONT)

E2 error (Communication malfunction between the indoor and outdoor units)

Table 31—Diagnosis and Solution

Error Code	E2/E1
Malfunction decision conditions	Indoor unit does not receive feedback from the outdoor unit during 120 seconds or the outdoor unit does not receive feedback from any indoor unit during 180 seconds.
Probable causes	• Wiring mistake • Indoor or outdoor PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

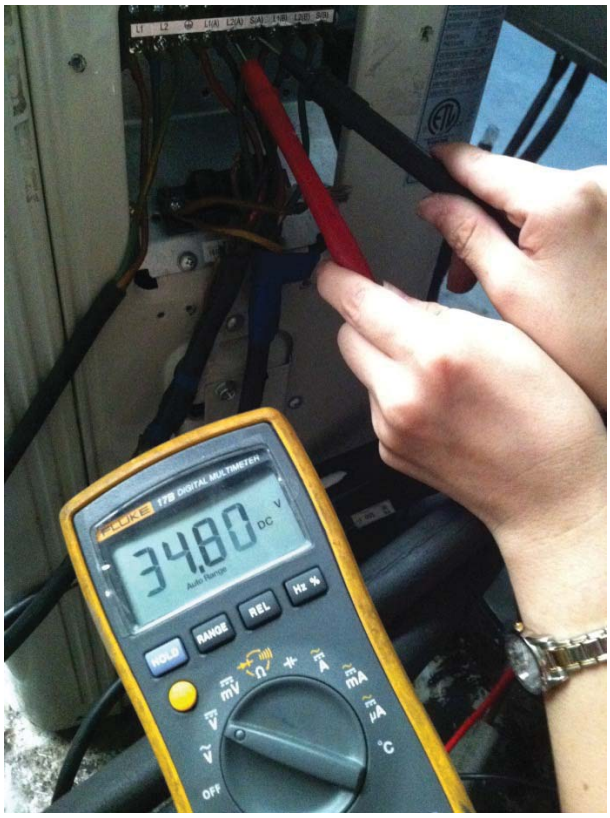


Fig. 39 – Test the DC voltage

Use a multimeter to test the DC voltage between the L2 port and S port of the outdoor unit. The red pin of the multimeter connects with the L2 port while the black pin is for the S port. When AC is running normally, the voltage will move alternately between positive and negative values.

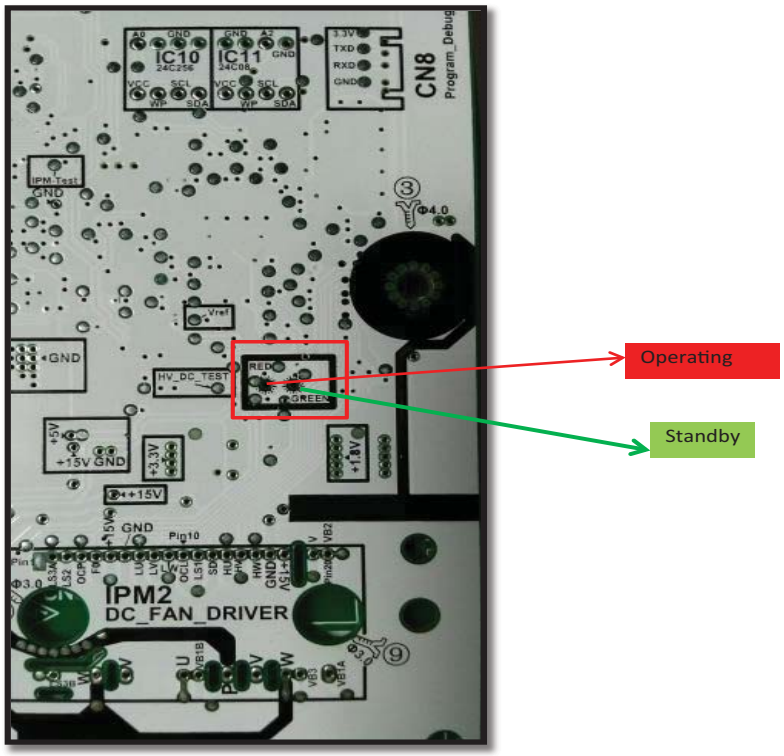
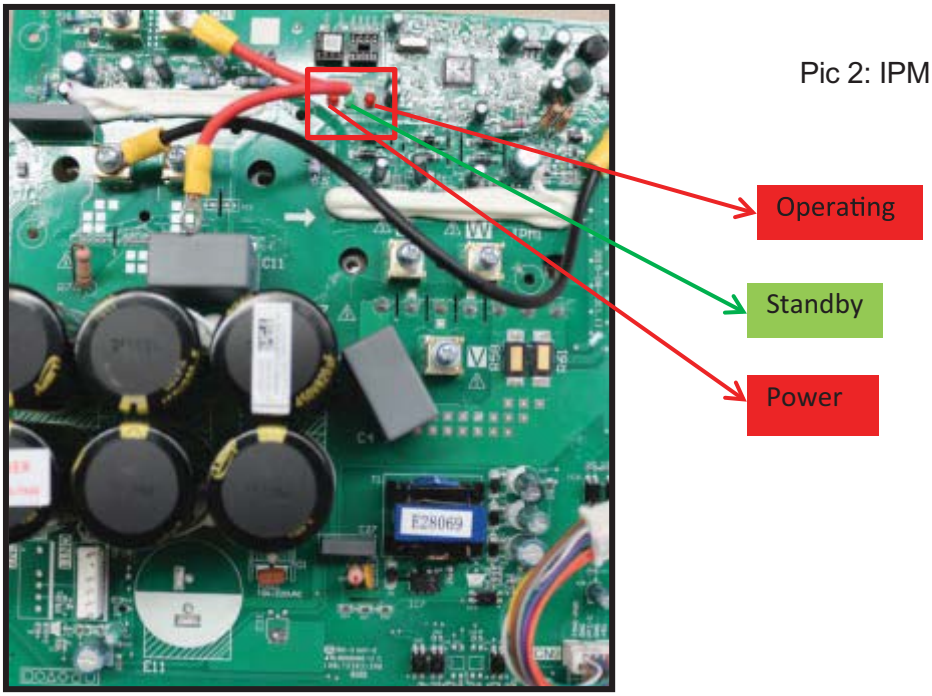


Fig. 40 – IPM (For dual/tri-zone)



Pic 2: IPM (For four or five zone)

Fig. 41 – IPM for four or five zone

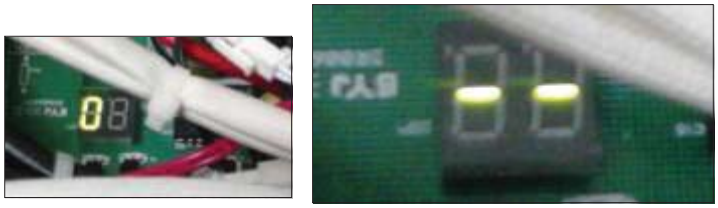


Fig. 42 – Main Board

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

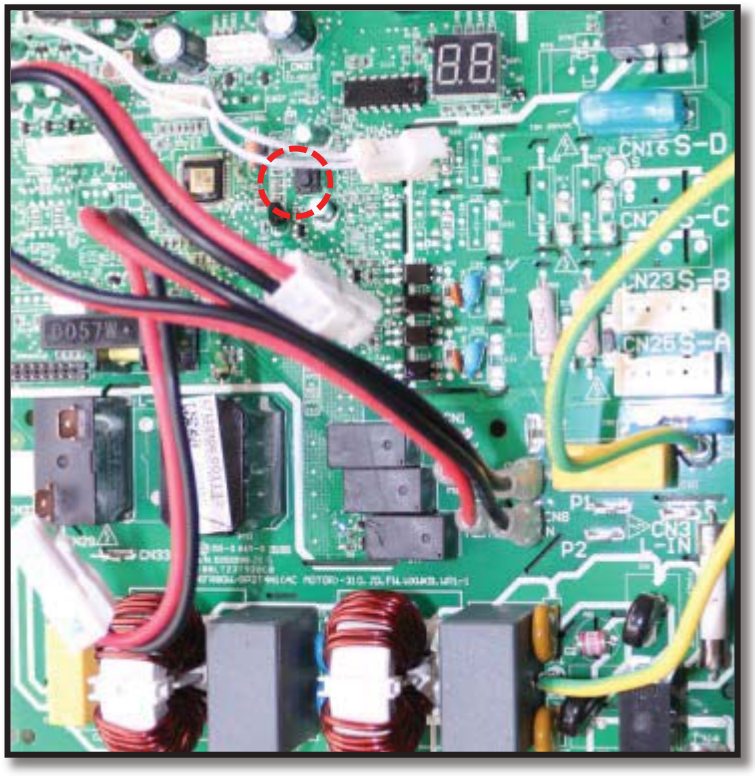


Fig. 43 – Main Board

Check the point button. Press one time to determine how many indoor units are connected.

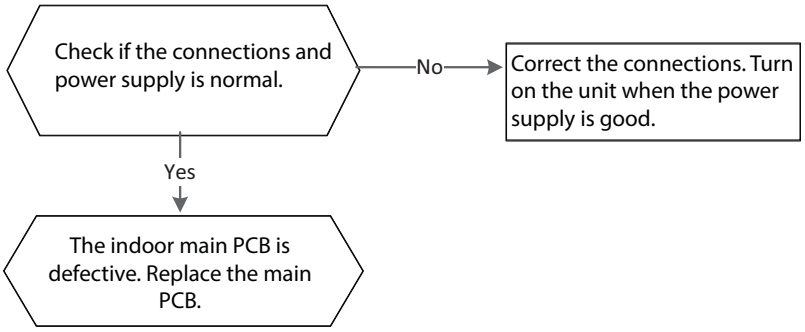
DIAGNOSIS AND SOLUTION (CONT)

Zero Crossing Detection Error Diagnosis and Solution

Table 32—Diagnosis and Solution

Error Code	E2
Malfunction decision conditions	When PCB does not receive zero crossing signal feedback for four minutes or the zero crossing signal interval is abnormal.
Probable causes	• Connection mistake • PCB faulty

Troubleshooting:

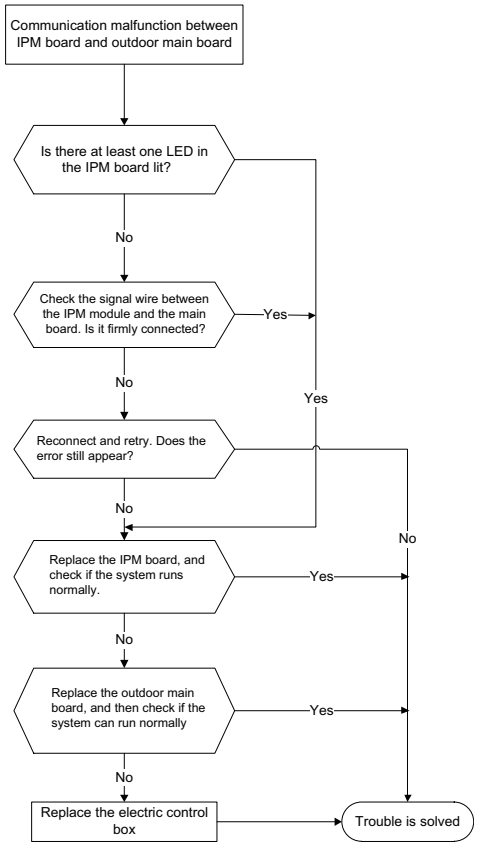


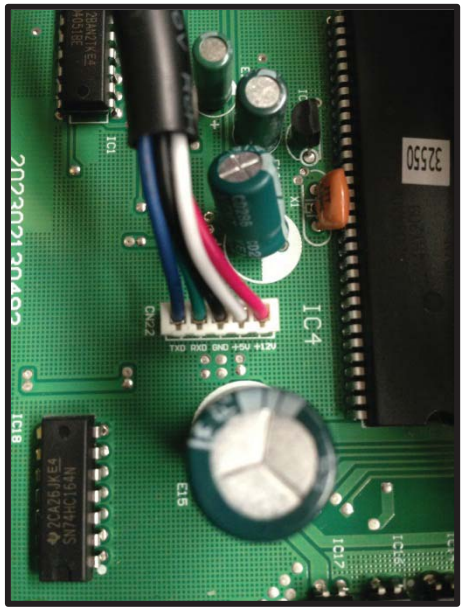
E3 (Communication malfunction between IPM board and outdoor main board) error diagnosis

Table 33—Diagnosis and Solution

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

Troubleshooting

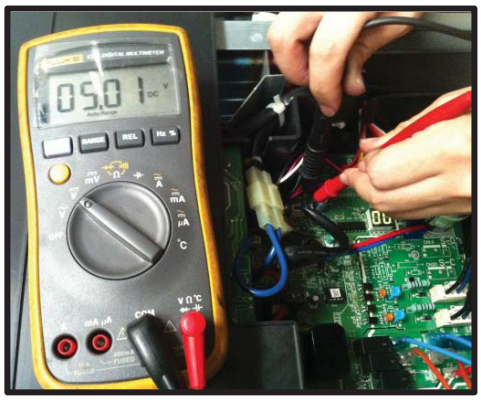




Remark:

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

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



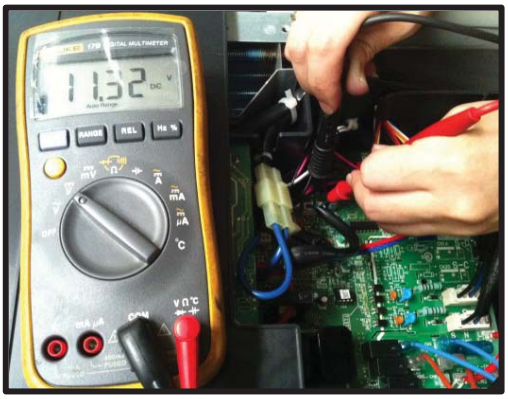


Fig. 44 – Test the DC Voltage

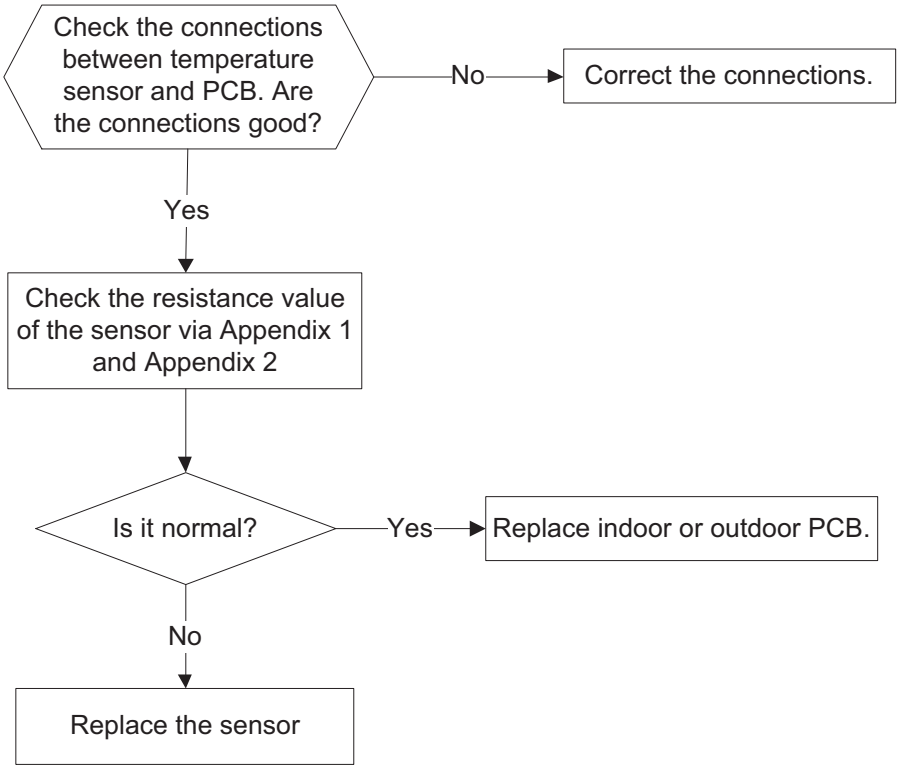
DIAGNOSIS AND SOLUTION (CONT)

E4 (open or short circuit of outdoor temperature sensor) diagnosis and solution F1/F2/F3/F4/F5 (open or short circuit of indoor coil temperature sensor) diagnosis and solution

Table 34—Diagnosis and Solution

Error Code	**E4/F1/F2/F3/F4/F5/F6**
Malfunction decision conditions	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure.
Probable causes	• Wiring mistake • Sensor faulty • PCB faulty

Troubleshooting



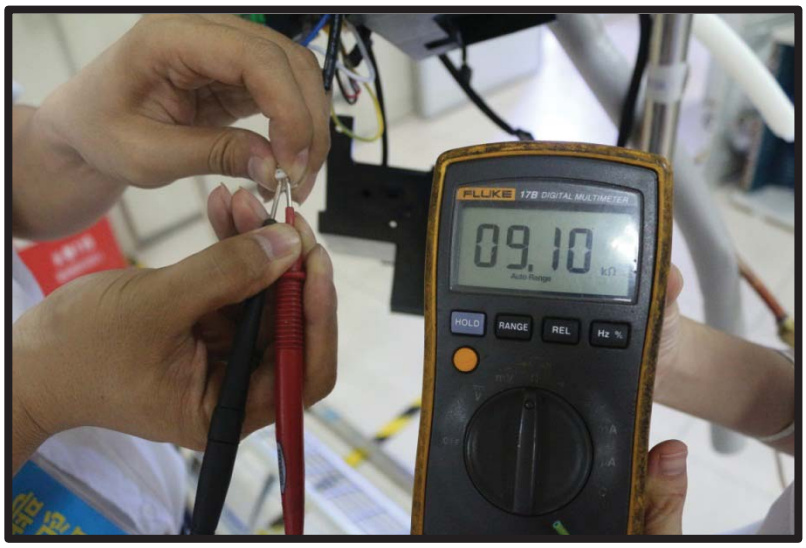


Fig. 45 – Check the Sensor Value

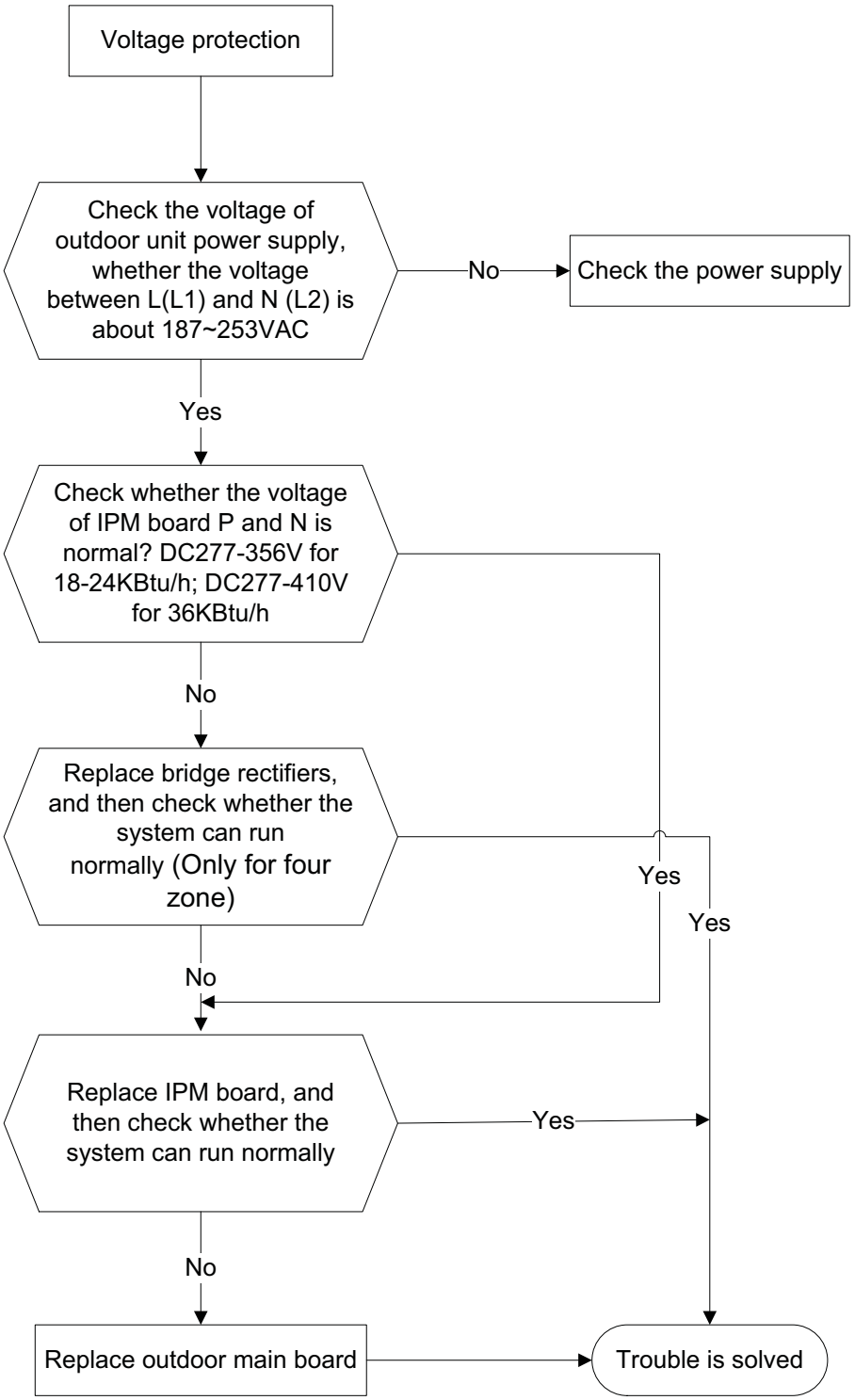
DIAGNOSIS AND SOLUTION (CONT)

E5 (Voltage protection) error

Table 35—Diagnosis and Solution

Error Code	E5
Malfunction decision conditions	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
Probable causes	• Power supply problems • System leakage or block • PCB faulty

Troubleshooting



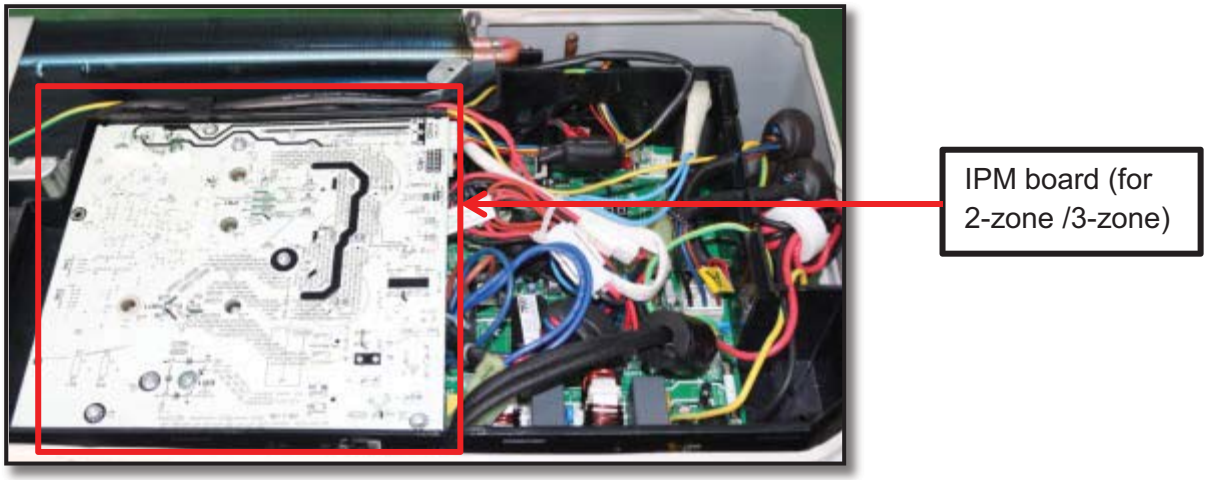


Fig. 46 – IPM Board (for 2−zone/3−zone)

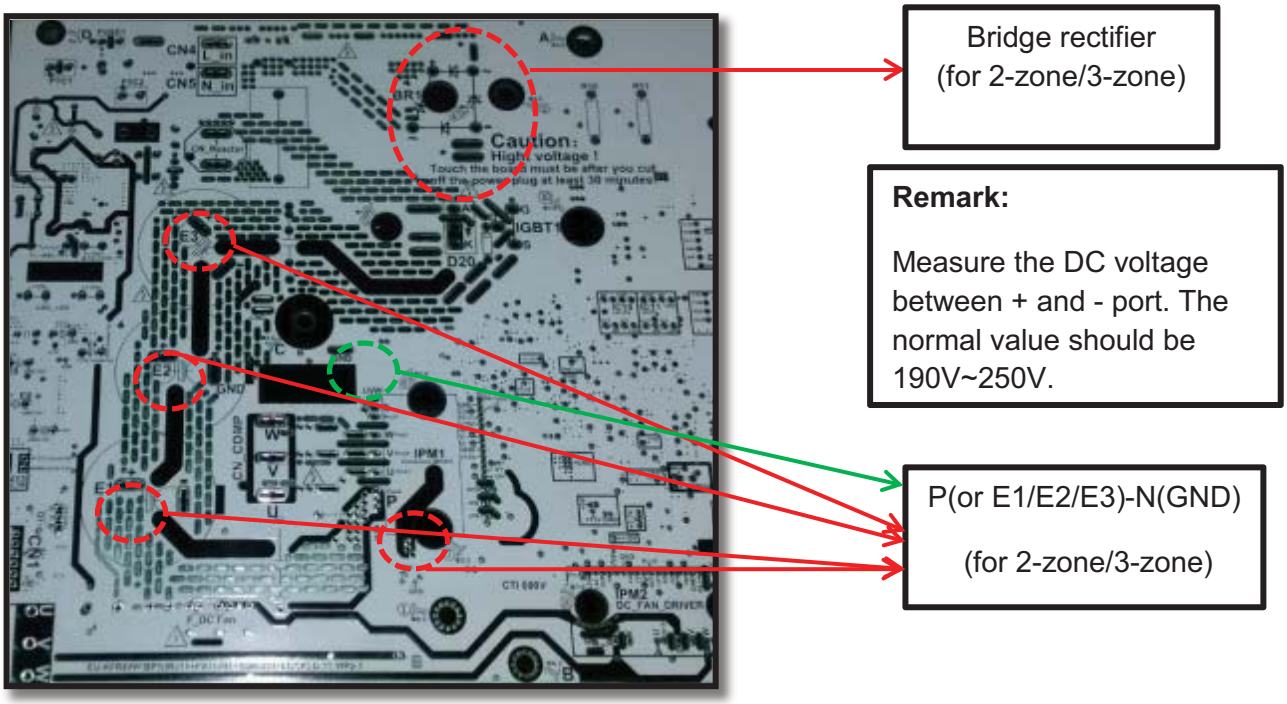


Fig. 47 – Bridge rectifier (for 2−zone/3−zone)

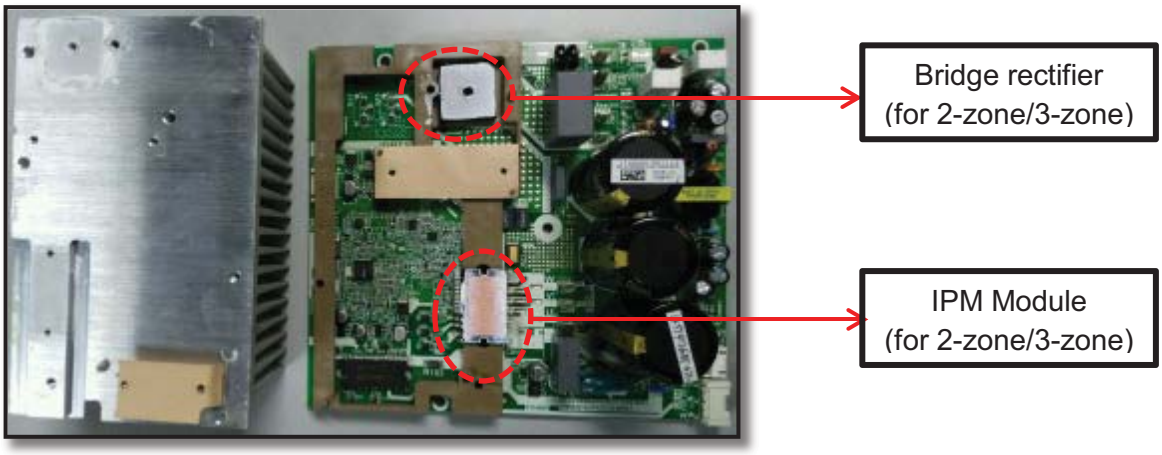


Fig. 48 – Bridge Rectifier (for 2−zone/3−zone) and IPM Module (for 2−zone/3−zone)

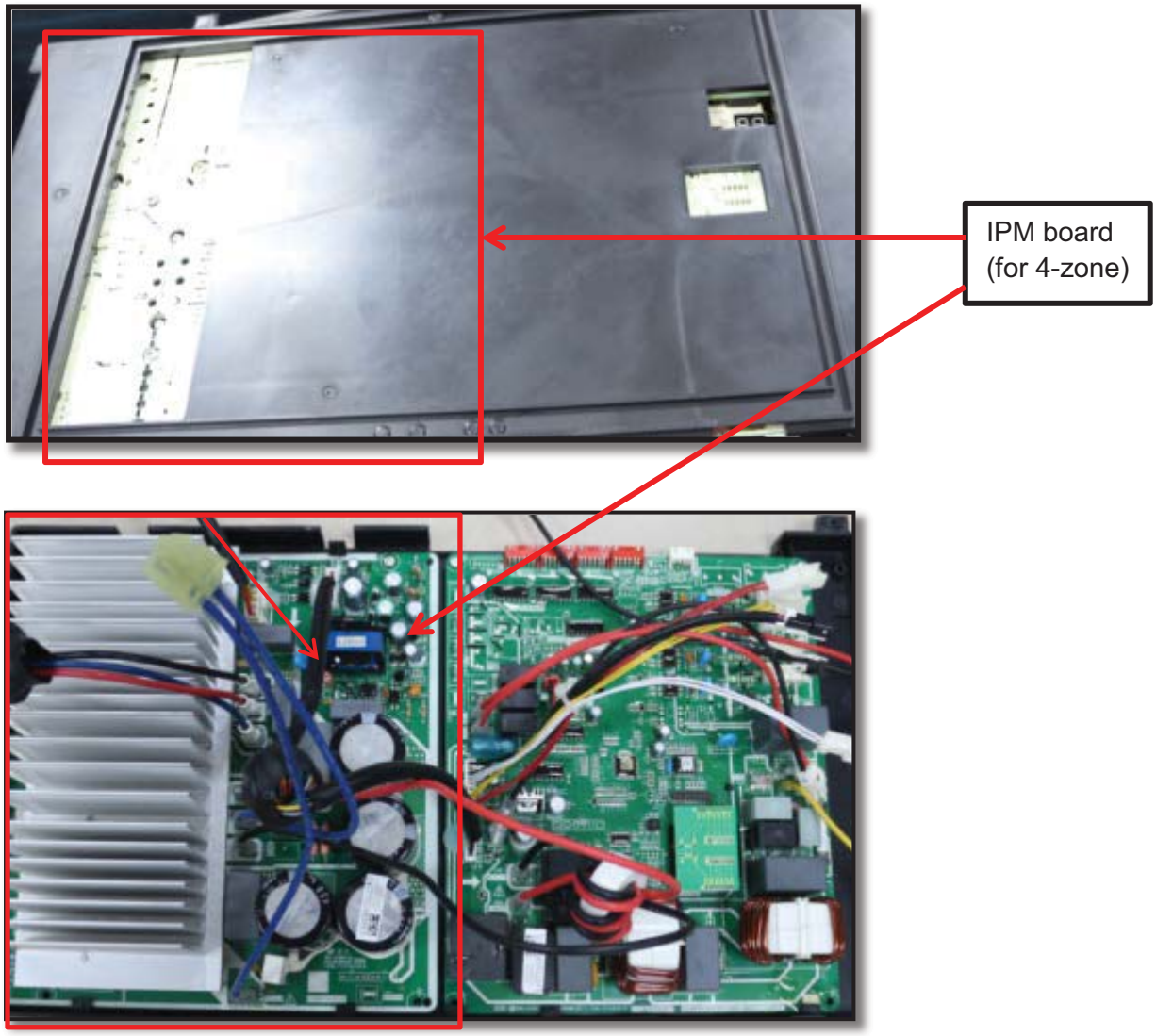


Fig. 49 – IPM Board (for 4−zone)

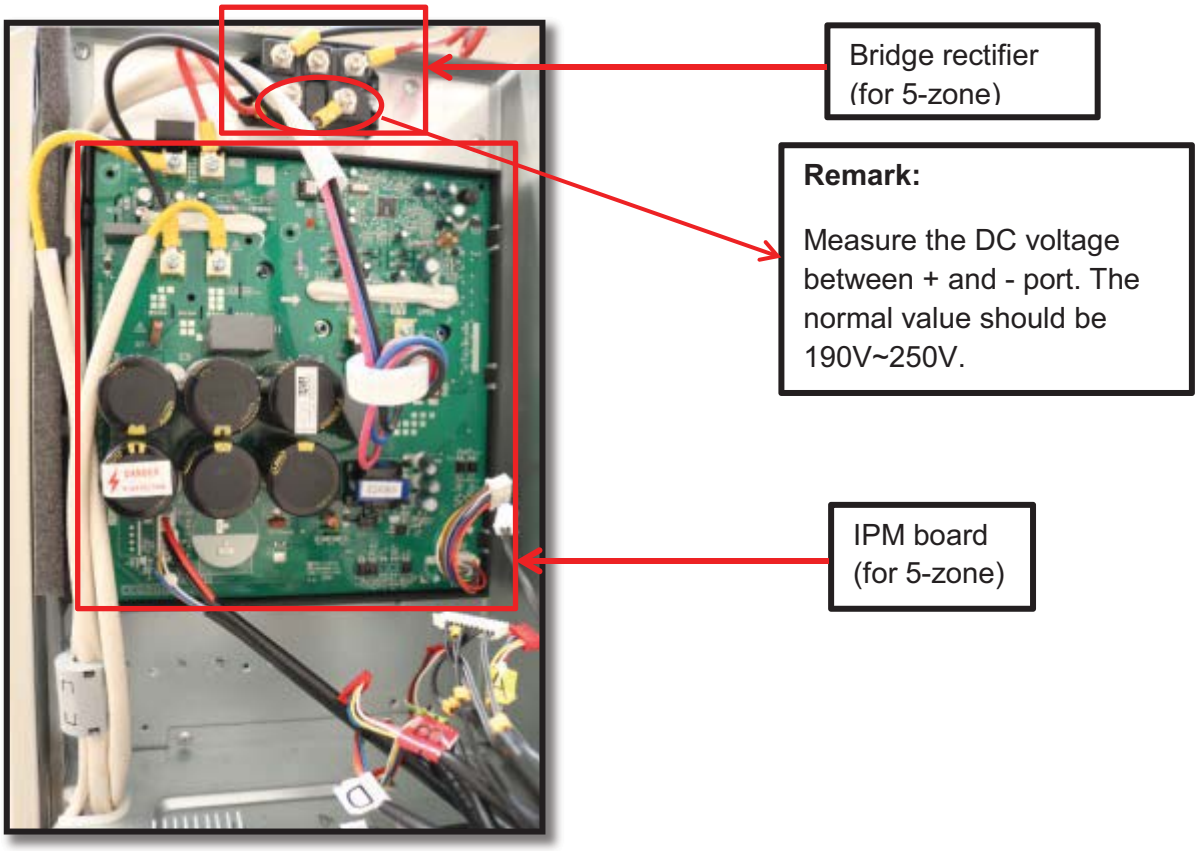


Fig. 50 – Bridge Rectifier (for 5−zone)

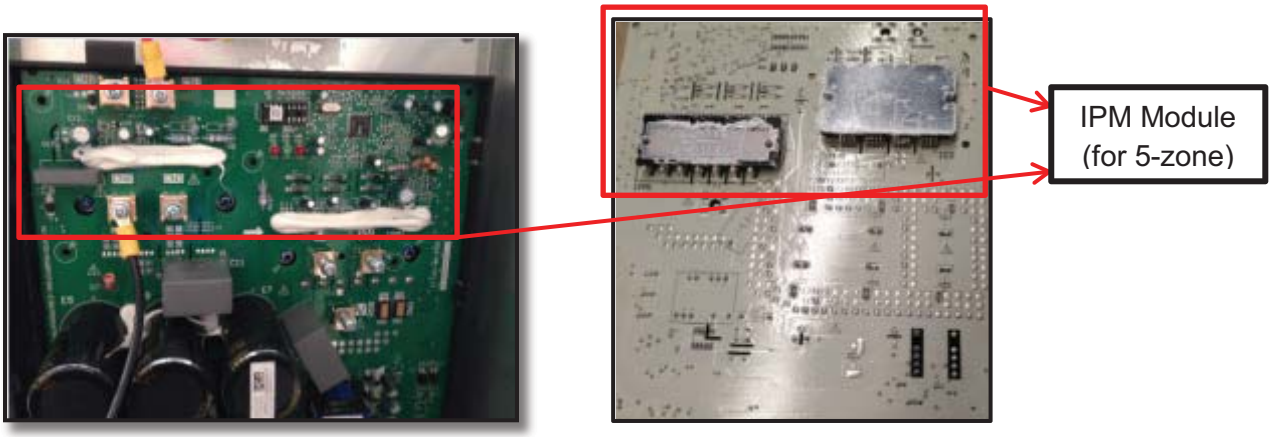


Fig. 51 – IPM Module (for 5 − zone)

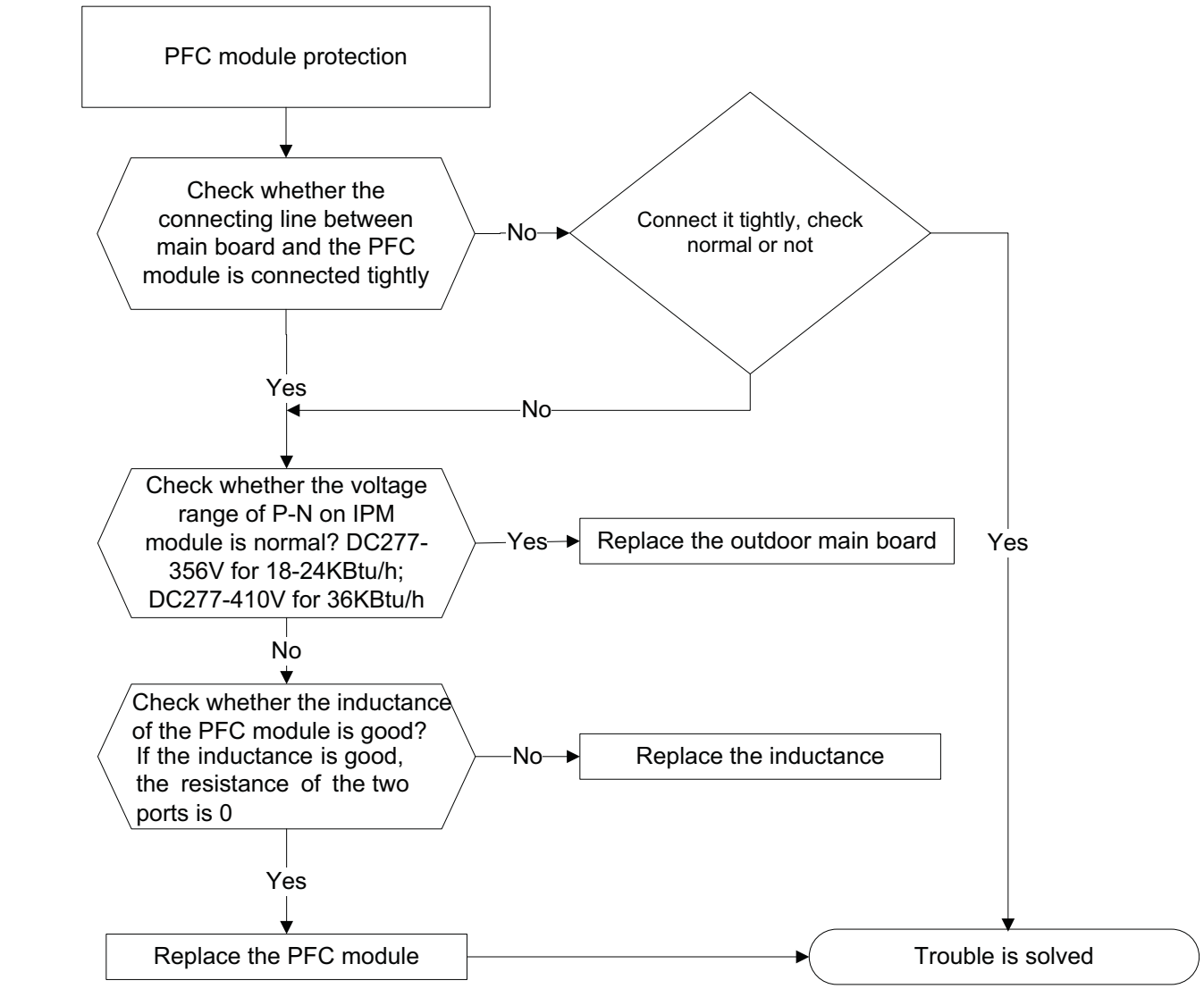
DIAGNOSIS AND SOLUTION (CONT)

E6 (PFC module protection) error diagnosis and solution

Table 36—Diagnosis and Solution

Error Code	E6
Malfunction decision conditions	When the voltage signal that PFC sends to main control board is abnormal, the display LED displays “E6” and the AC turns off.
Probable causes	• Wiring mistake • Outdoor PCB faulty • Inductance of PFC module faulty • PFC module malfunction

Troubleshooting



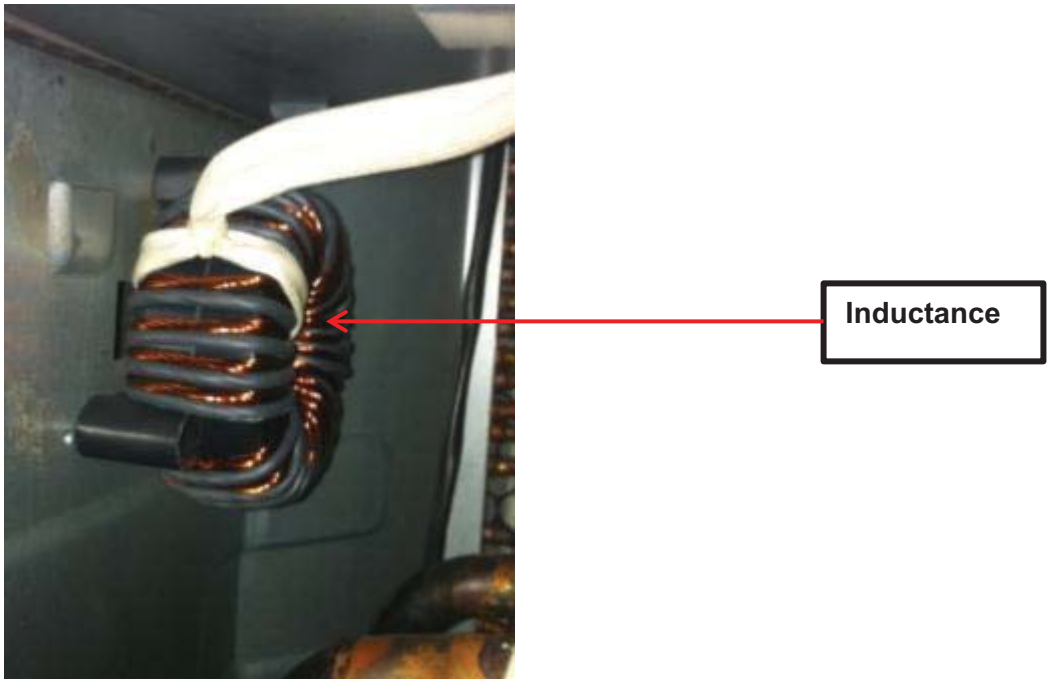


Fig. 52 – Inductance

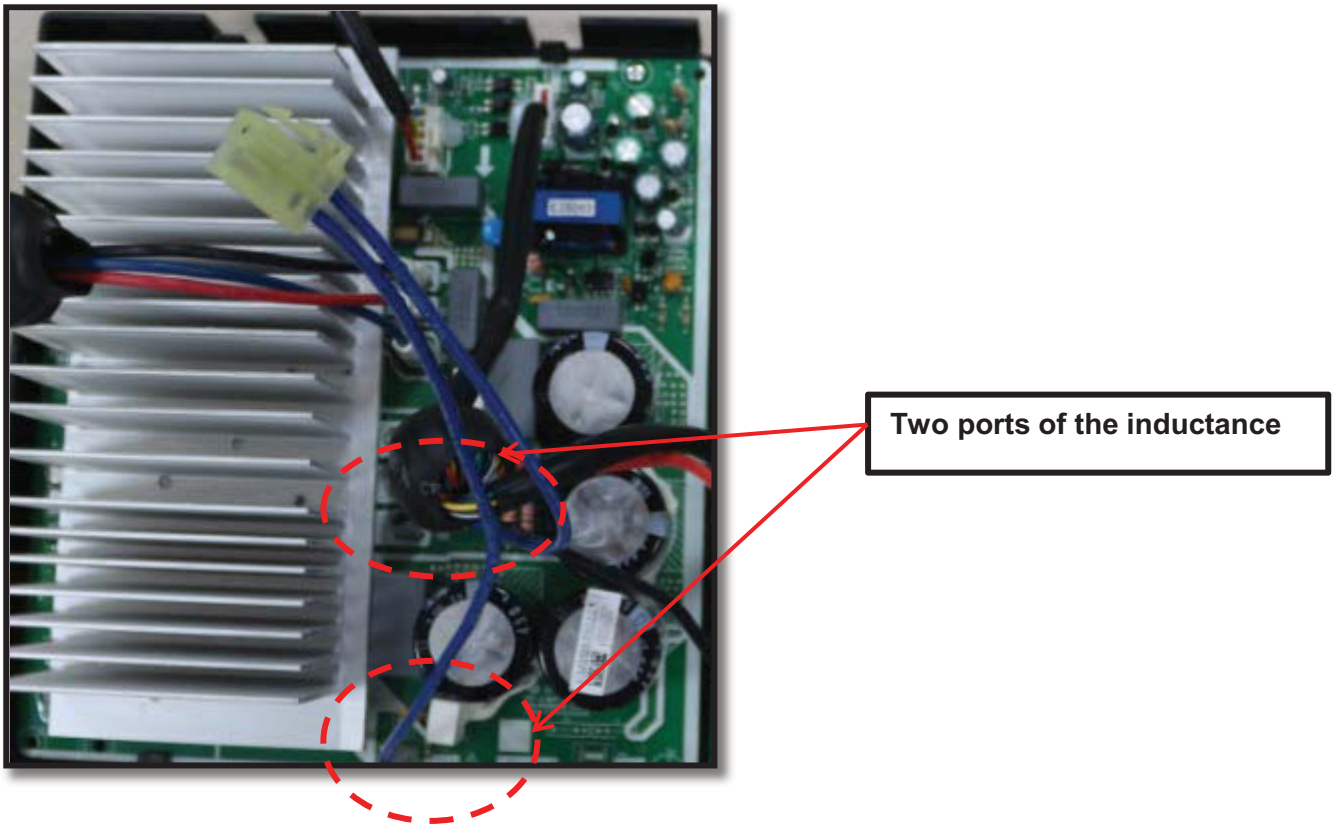


Fig. 53 – Inductance

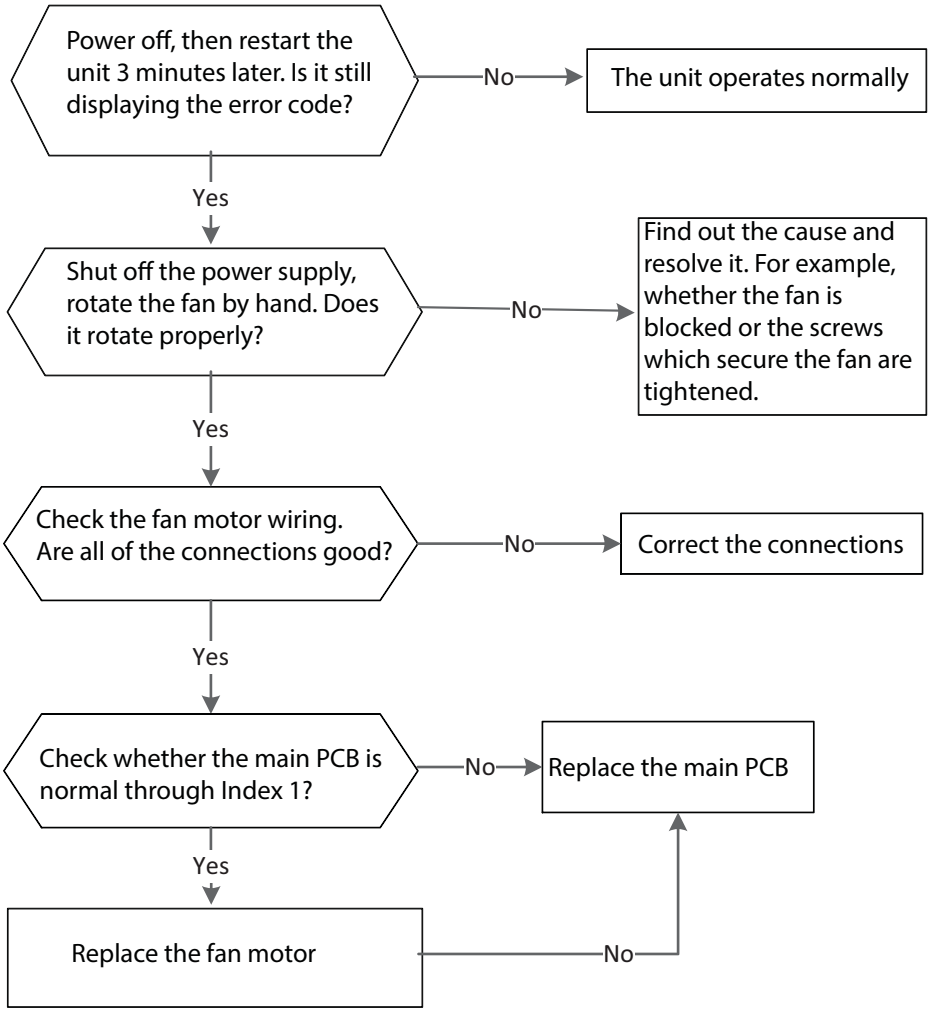
DIAGNOSIS AND SOLUTION (CONT)

E8 − Outdoor fan speed has been out of control

Table 37—Diagnosis and Solution

Error Code	E8
Malfunction decision conditions	When the outdoor fan speed stays too low (300RPM) or too high (2400RPM) for certain time, the unit stops and the LED displays the failure.
Probable causes	• Wiring mistake • Fan assembly faulty • Fan motor faulty • PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

Index 1:

DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1−pin3, pin4−pin3 in fan motor connector. If the value of the voltage is not in the range showing in the table below, the PCB needs to be replaced.

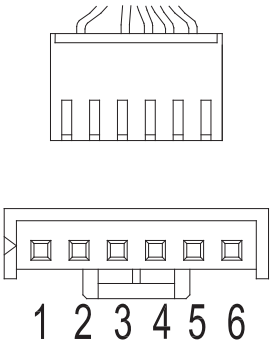


Fig. 54 – DC Fan Motor

Table 38—DC Motor Voltage Input and Output

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

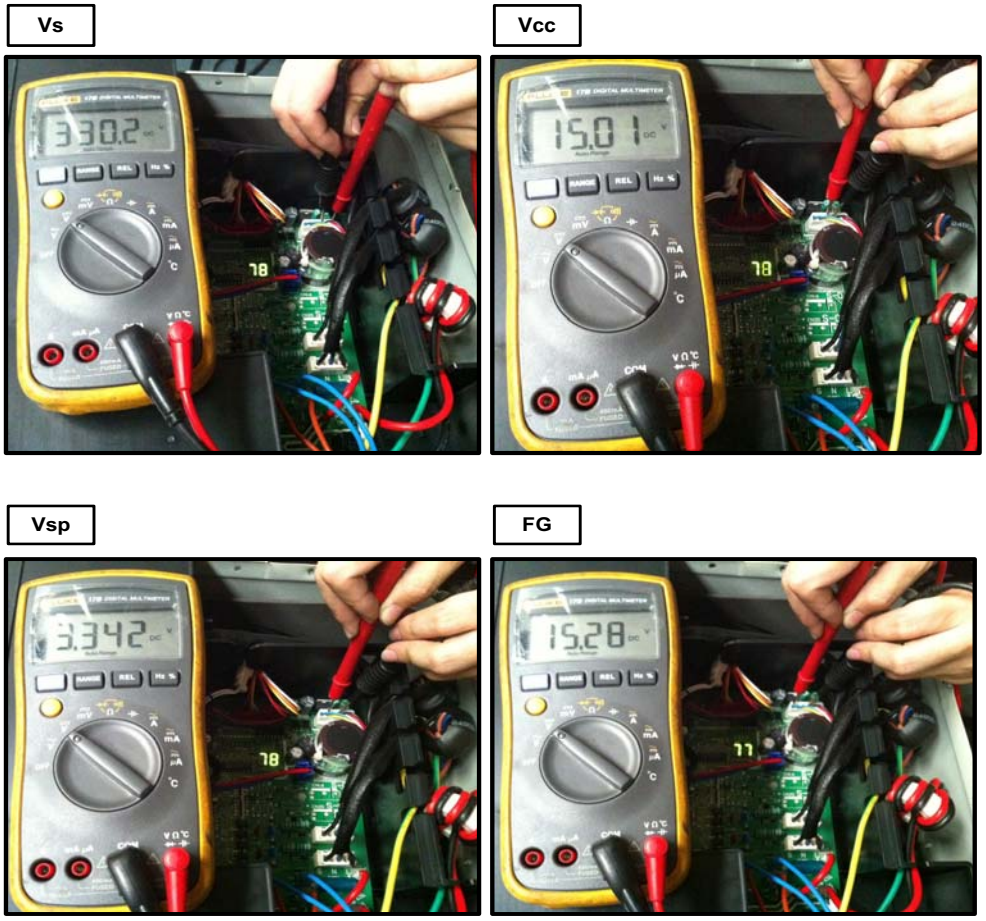


Fig. 55 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P0 (Temperature protection of compressor top) error

Table 39—Diagnosis and Solution

Error Code	**P0**
Malfunction decision conditions	If the sampling voltage is not 5V, the LED displays the failure.
Probable causes	• Wiring mistake • Over load protector faulty • System block • Outdoor PCB faulty

Troubleshooting

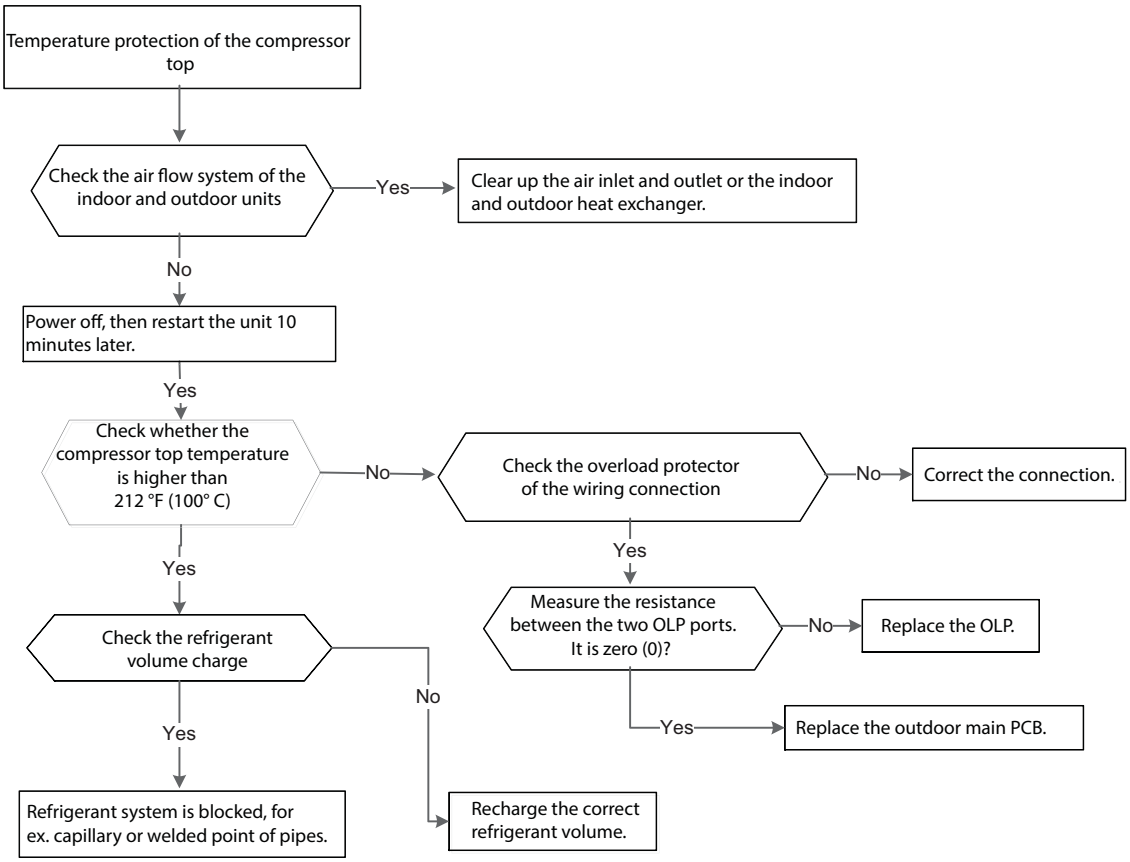


Fig. 56 – Test the voltage

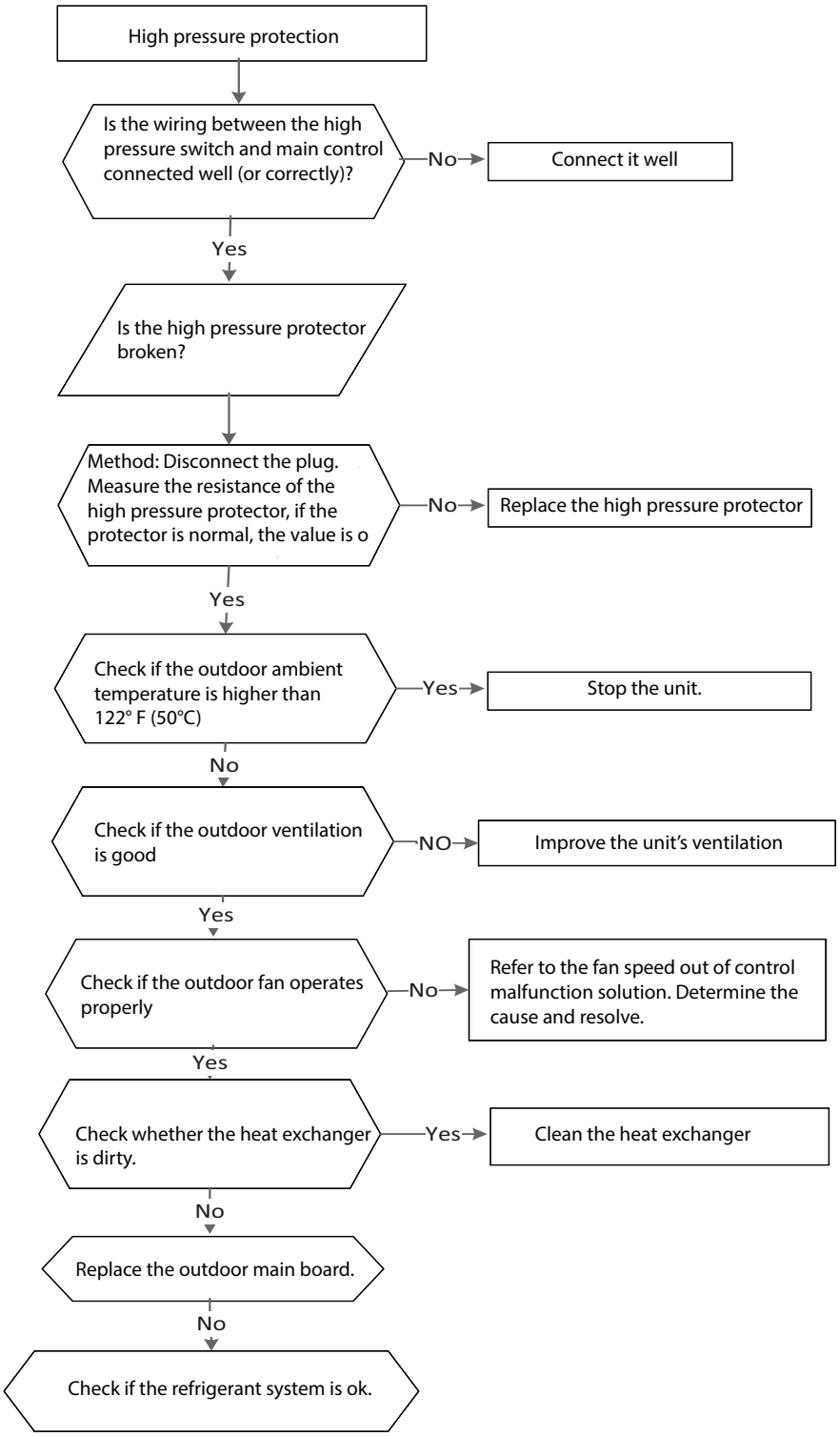
DIAGNOSIS AND SOLUTION (CONT)

P1 (High pressure protection) error

Table 40—Diagnosis and Solution

Error Code	**P1**
Malfunction decision conditions	If the sampling voltage is not 5V, the LED displays the failure.
Probable causes	• Wiring mistake • Over load protector faulty • System block • Outdoor PCB faulty

Troubleshooting



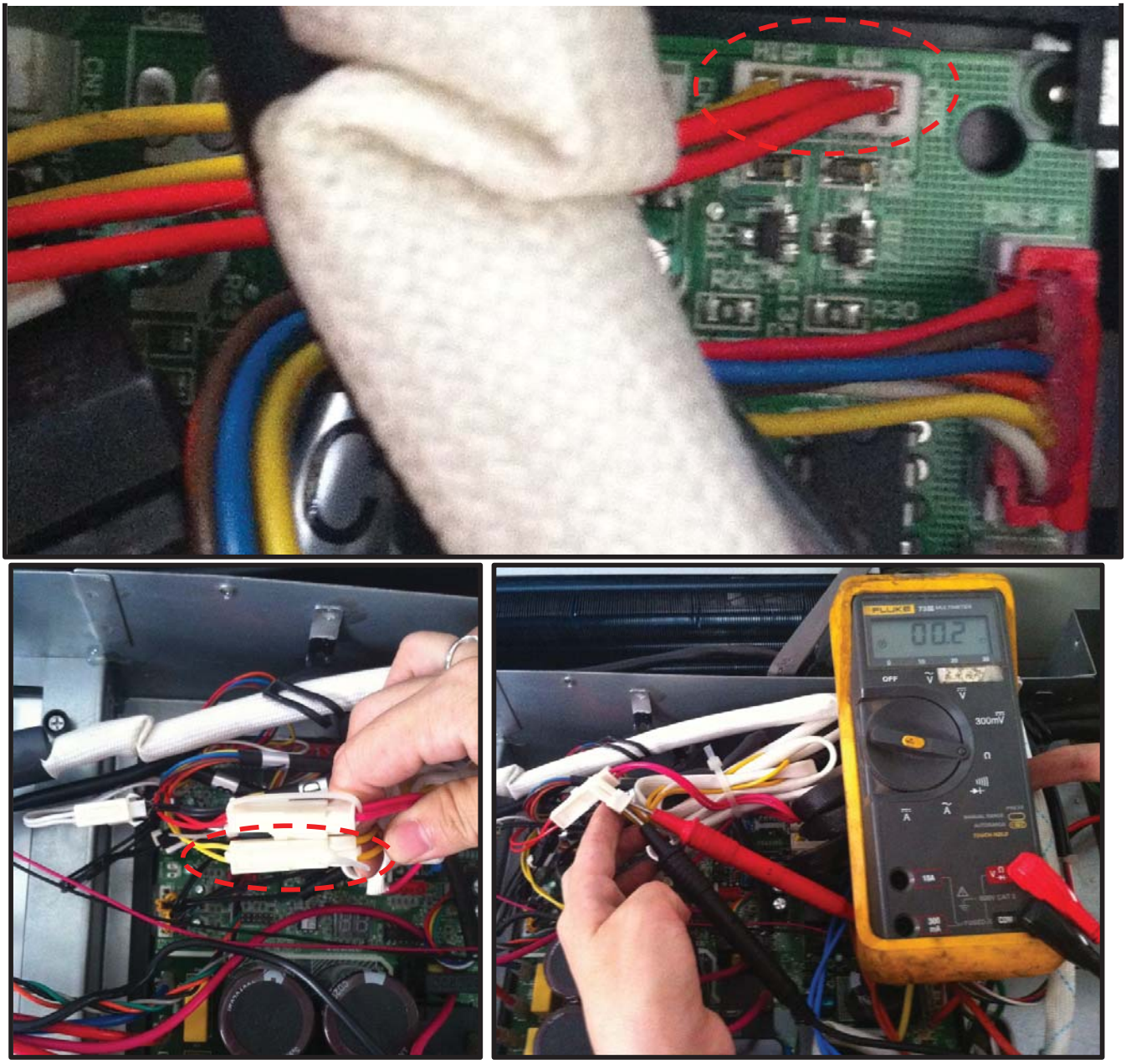


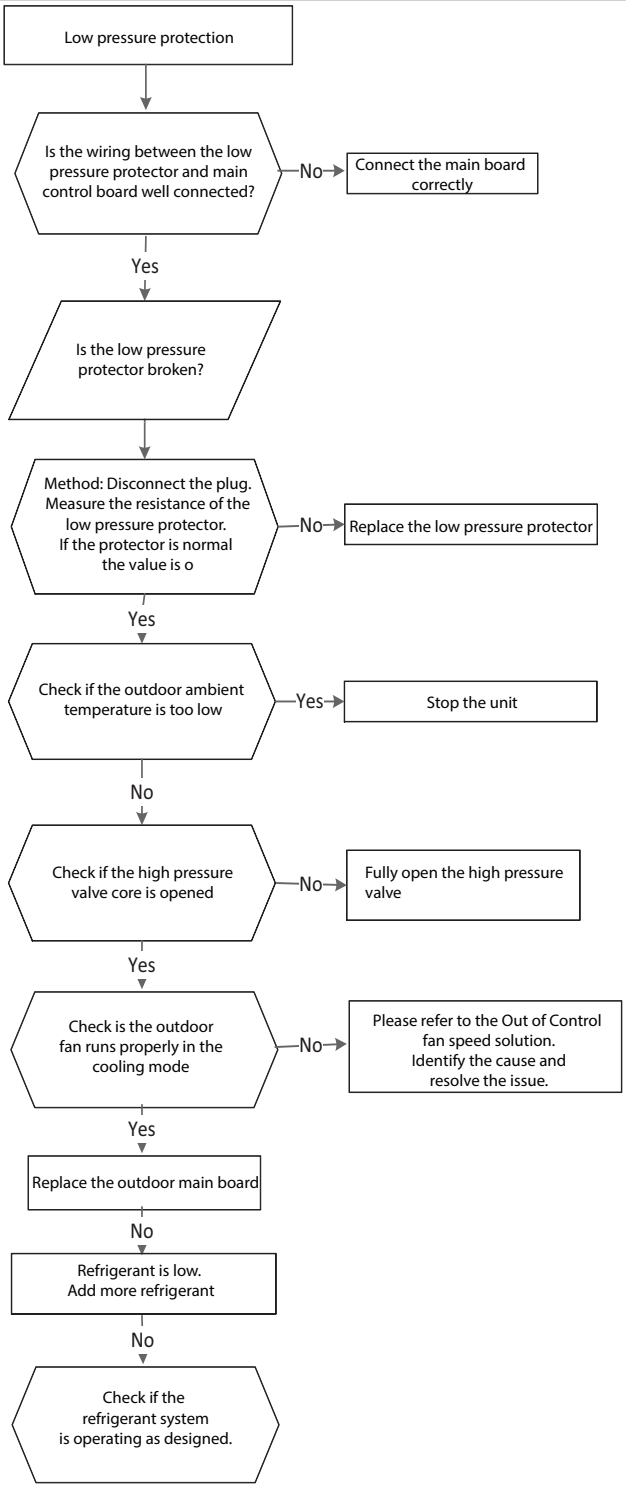
Fig. 57 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P2 (Low pressure protection) error

Table 41—Diagnosis and Solution

Error Code	**P2**
Malfunction decision conditions	If the sampling voltage is not 5V, the LED displays the failure.
Probable causes	• Wiring mistake • Over load protector faulty • System block • Outdoor PCB faulty



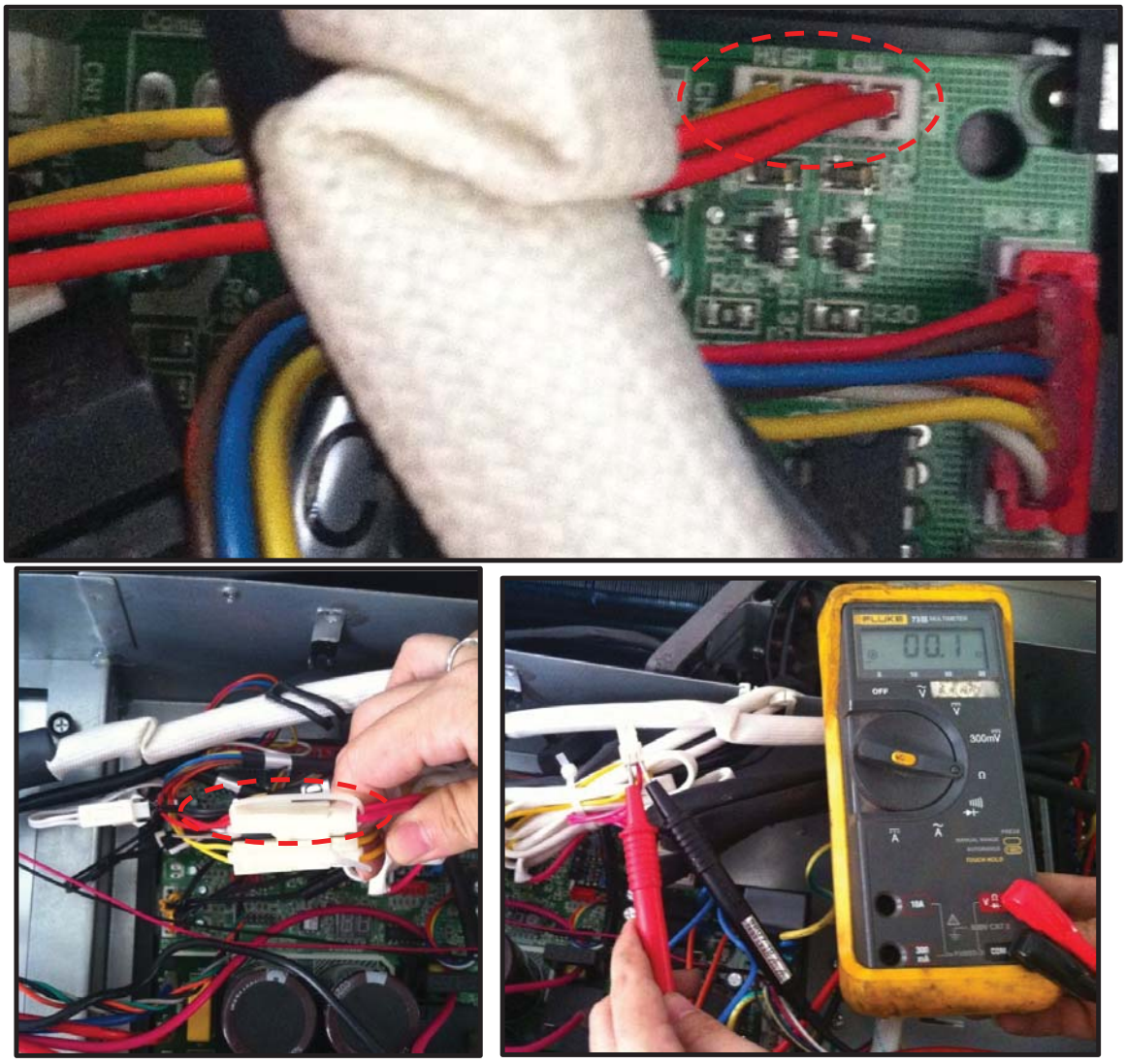


Fig. 58 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P3 (Current protection of compressor) error

Table 42—Diagnosis and Solution

Error Code	**P3**
Malfunction decision conditions	If the outdoor current exceeds the current limit value, the LED displays the failure.
Probable causes	• Wiring mistake • Over load protector faulty • System block • Outdoor PCB faulty

Troubleshooting

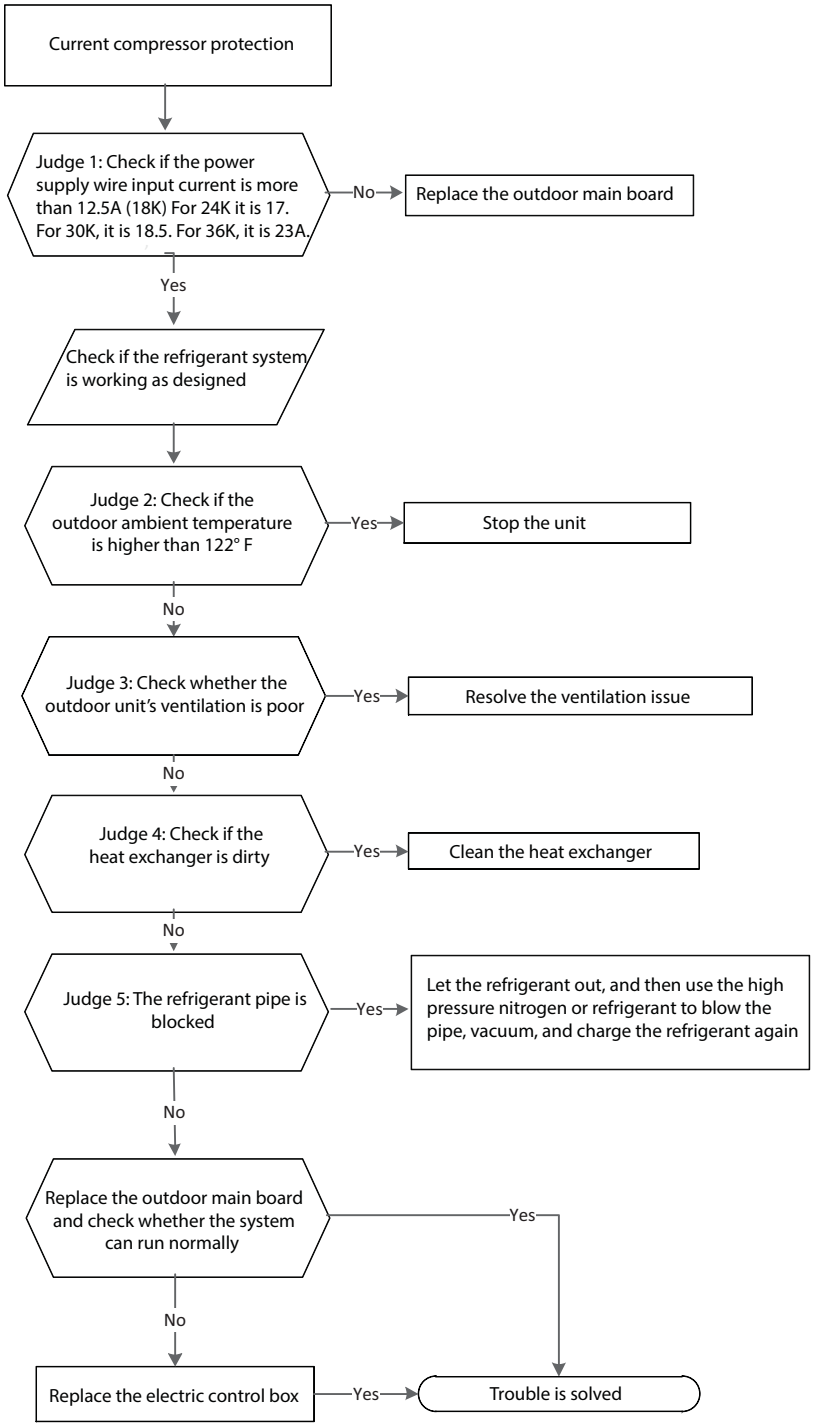


Fig. 59 – Test the voltage

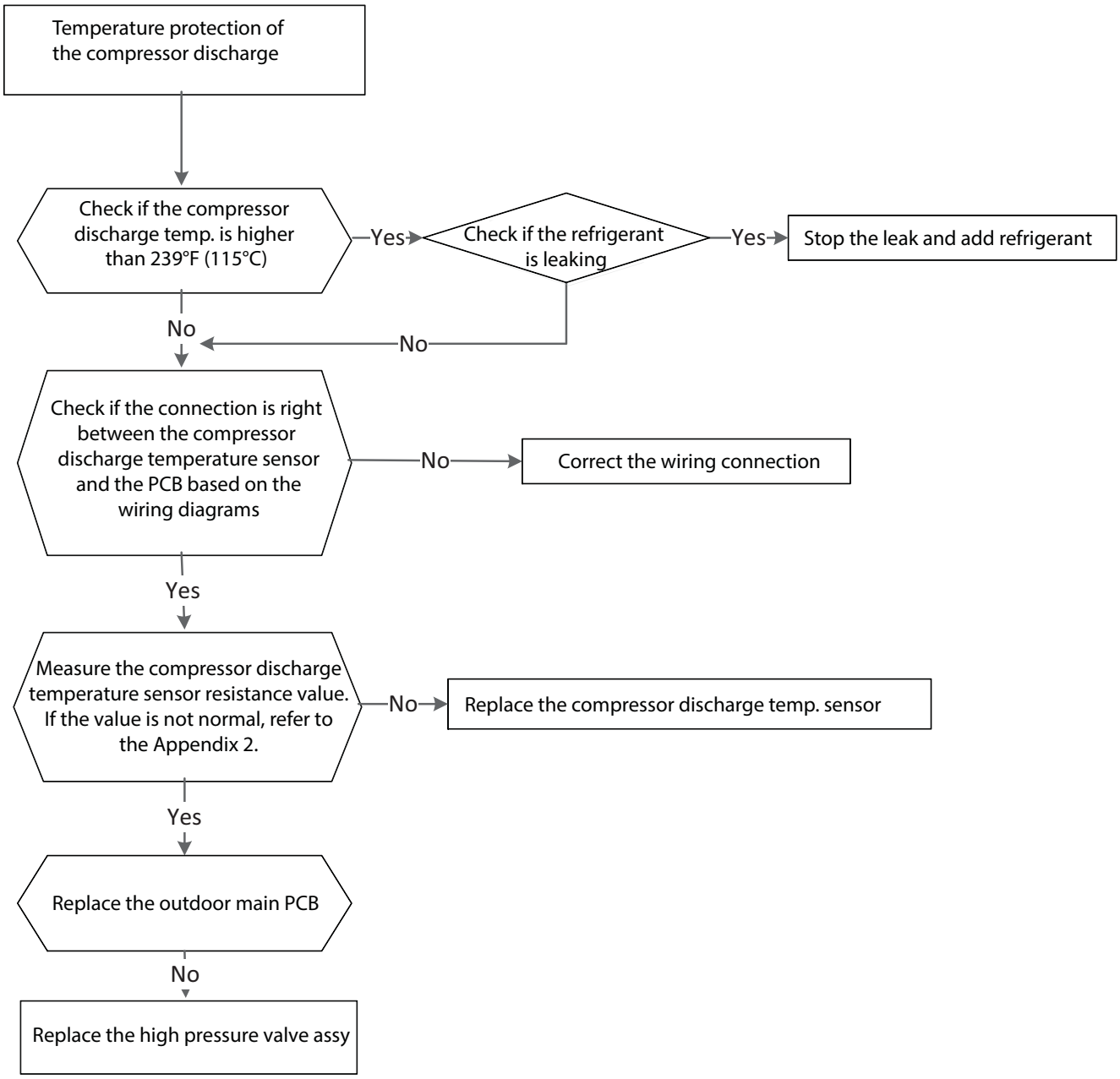
DIAGNOSIS AND SOLUTION (CONT)

P4 (Temperature protection of compressor discharge) error

Table 43—Diagnosis and Solution

Error Code	P4
Malfunction decision conditions	When the compressor discharge temperature (T5) is more than 239°F for ten seconds, the compressor stops and restarts when T5 is less than 194°F.
Probable causes	• Refrigerant leakage • Wiring mistake • The discharge temperature sensor faulty • Outdoor PCB faulty

Troubleshooting



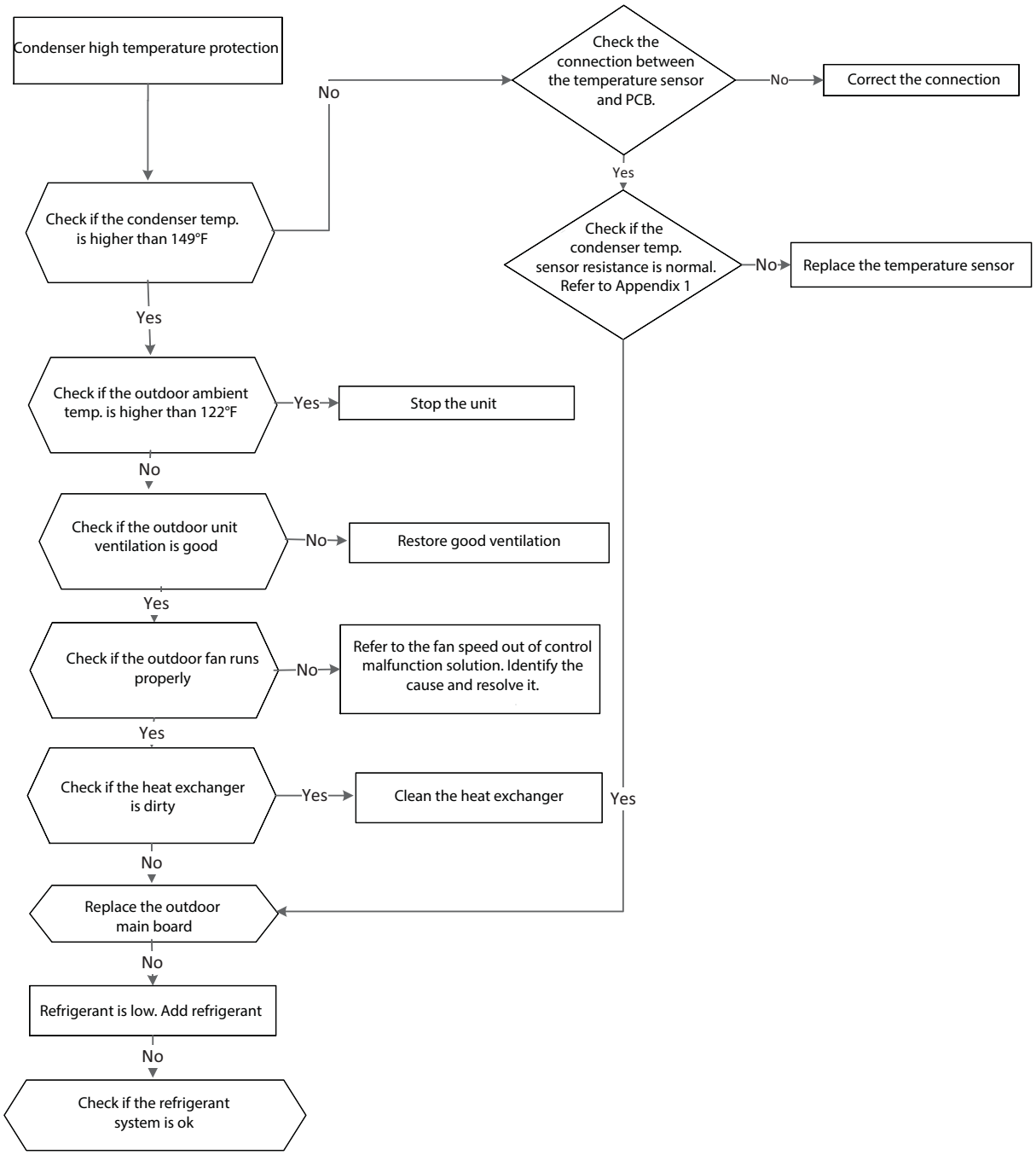
DIAGNOSIS AND SOLUTION (CONT)

P5 (High temperature protection of condenser) error

Table 44—Diagnosis and Solution

Error Code	**P5**
Malfunction decision conditions	When the outdoor pipe temperature is more than 149°F, the unit stops, and unit runs again when the outdoor pipe temperature is less than 125°F.
Probable causes	• The condenser temperature sensor faulty • Heat exchanger dirty • System block

Troubleshooting



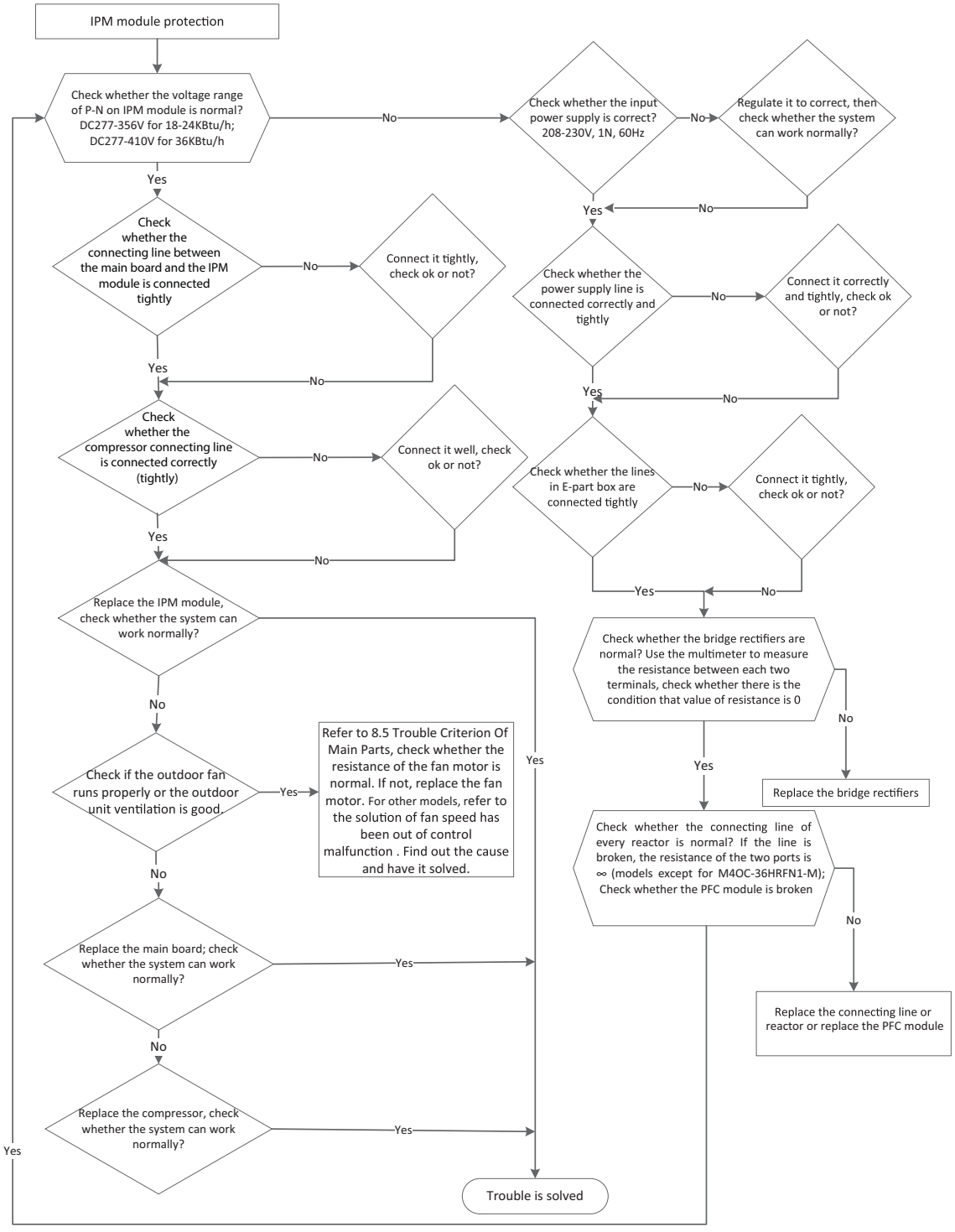
DIAGNOSIS AND SOLUTION (CONT)

P6 (IPM module protection) error

Table 45—Diagnosis and Solution

Error Code	**P6**
Malfunction decision conditions	When the voltage signal that IPM send to compressor drive chip is abnormal, the display LED shows “P6” and the AC turns off.
Probable causes	• Wiring mistake • IPM malfunction • Outdoor fan ass’y faulty • Compressor malfunction • Outdoor PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

The cooling operation or heating operation does not operate

Probable cause:

4−way valve faulty

Check the 4−way valve. See *4−Way Valve* for more information.

When cooling, the heat exchanger of the non−operating indoor unit frosts. When heating, the non−operating indoor unit gets warm.

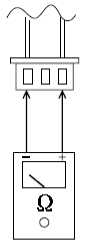
Probable causes:

- EXV faulty
- Wire and tubing connected in reverse

Check the EXV.

Temperature Sensor Checking

Disconnect the temperature sensor from PCB, and measure the resistance value with a tester.



Tester

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

APPENDIX 1

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

Table 46—Temperature Sensor Resistance Value (°C−K)

APPENDIX 2

Table 47—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 48—°C and °F

°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

Compressor Check

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

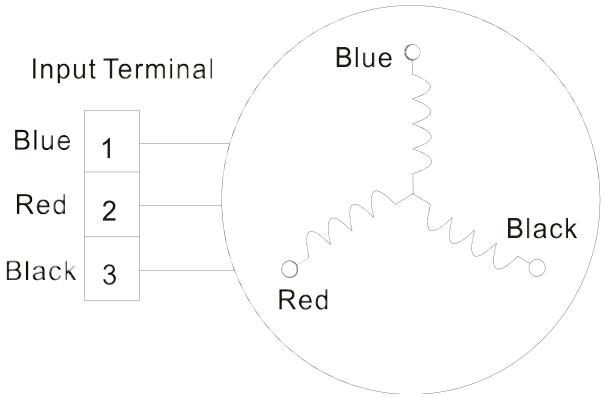


Fig. 60 – Measure the Resistance

Table 49—Compressor Check

POSITION	RESISTANCE VALUE				
COMPRESSOR	ATM150D23UFZ	ATF235D22UMT	ATF250D22UMT	ATF310D43UMT	ATQ360D1UMU
BLUE – RED	1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω

Fig. 61 – Test the voltage

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 50—IPM Continuity Check

Digital Tester		Normal Resistance Value	Digital Tester		Normal Resistance Value
(+)Red	(−)Black		(+)Red	(−)Black	
P	N	∞ (Several MΩ)	U	N	∞ (Several MΩ)
	U		V		
	V		W		
	W		(+)Red		

AC Fan Motor

Use the tester to measure the resistance value of each winding.

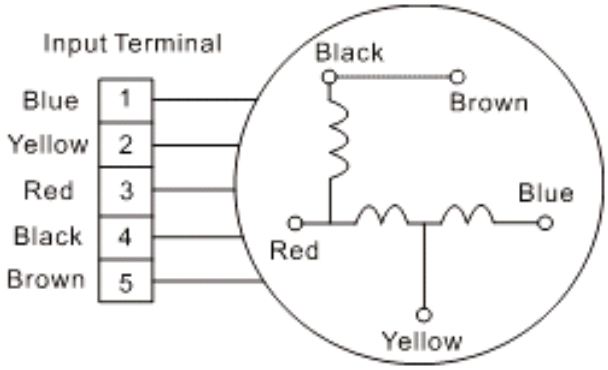


Table 51—Resistance Value

Position	Resistance Value			
	RPG20B		RPG28H	
Black – Red	381Ω±8% (68 °F)	342Ω±8% (68 °F)	183.6Ω±8% (68 °F)	180Ω±8% (68 °F)
White – Black	267Ω±8% (68 °F)	253Ω±8% (68 °F)	206Ω±8% (68 °F)	190Ω±8% (68 °F)

Use the tester to measure the resistance value of each winding.

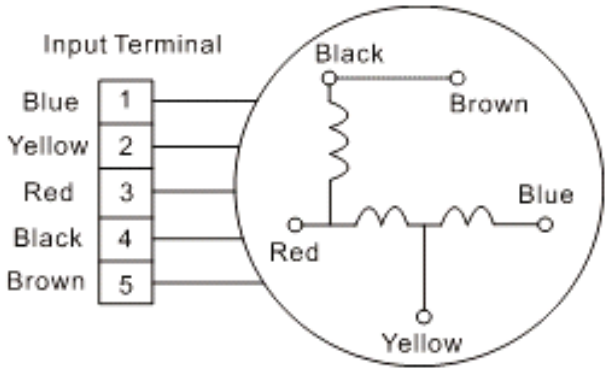


Table 52—Resistance Value

Position	Resistance Value						
	YDK70−6FB	YDK180−8GB	YSK27−4G	YSK68−4B	YDK45−6B	YSK25−6L	YDK53−6FB(B)
Black− Red	56Ω±8% (68°F)	24.5Ω±8% (68°F)	317Ω±8% (68°F)	145Ω±8% (68°F)	345Ω±8% (68°F)	627Ω±8% (68°F)	88.5Ω±8% (68°F)
Red− Yellow	76Ω±8% (68°F)	19Ω±8% (68°F)	252Ω±8% (68°F)	88Ω±8% (68°F)	150Ω±8% (68°F)	374.3Ω±8% (68°F)	138Ω±8% (68°F)
Yellow− Blue	76Ω±8% (68°F)	19Ω±8% (68°F)	252Ω±8% (68°F)	88Ω±8% (68°F)	150Ω±8% (68°F)	374.3Ω±8% (68°F)	138Ω±8% (68°F)

4−Way Valve

1. Power on. Use a digital tester to measure the voltage. When the unit operates in cooling, it is 0V. When the unit operates in the Heating mode, it is about 230VAC. If the value of the voltage is not in the range, the PCB needs to be replaced.

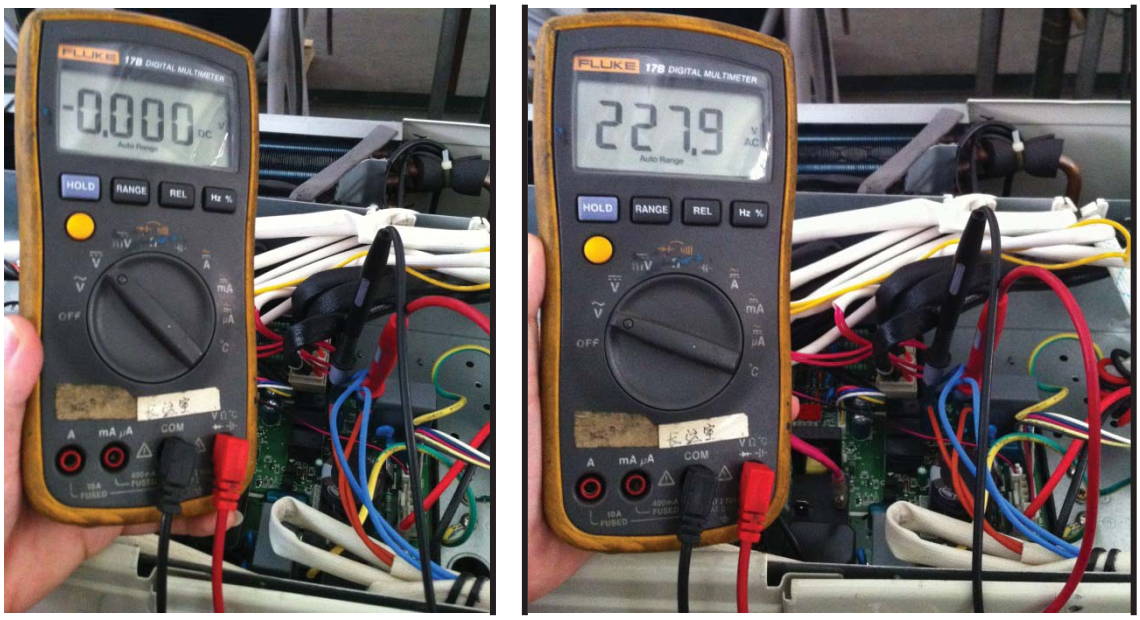


Fig. 62 — Test the voltage

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

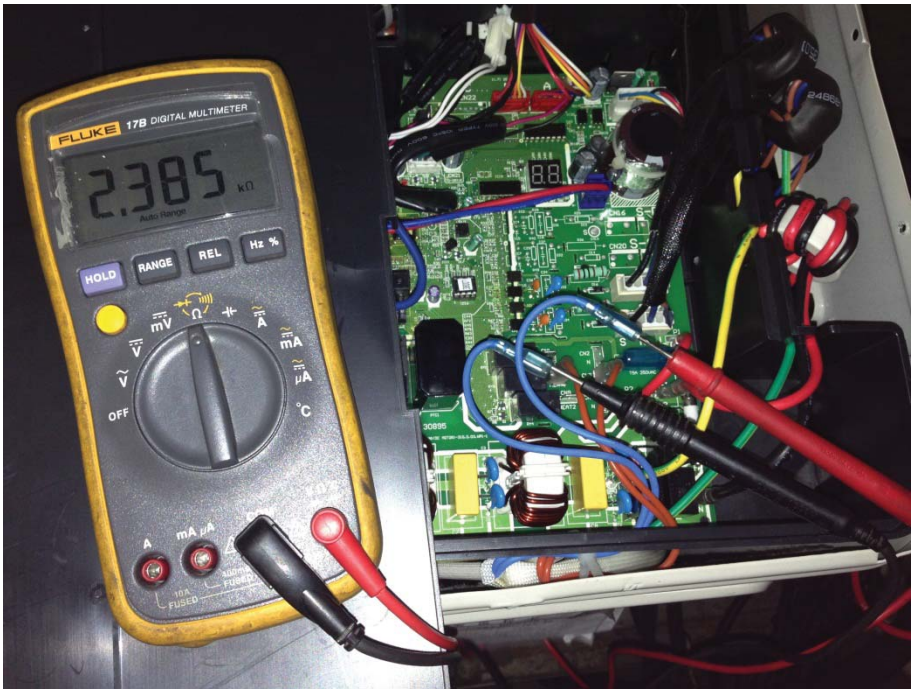


Fig. 63 — Test the Resistance

EXV Check

1. Disconnect the connectors.

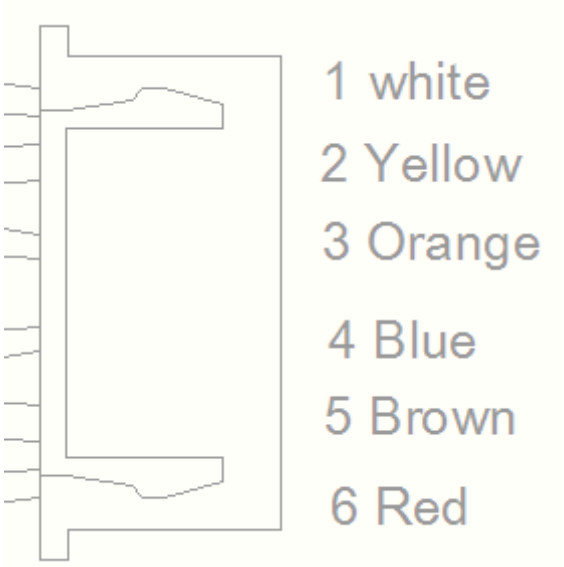


Fig. 64 – Disconnect the connectors

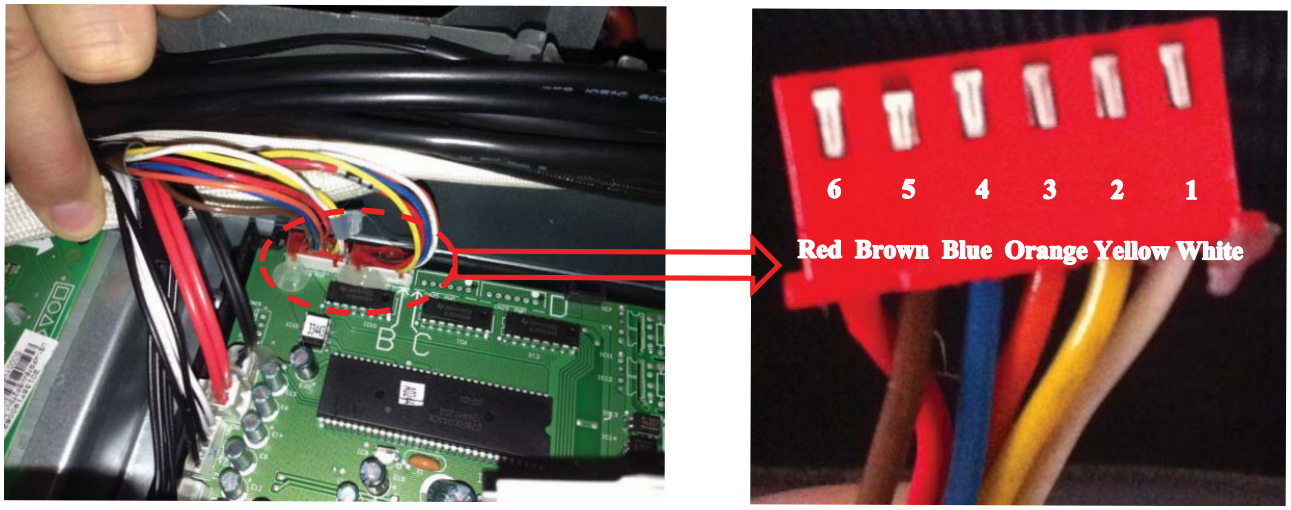
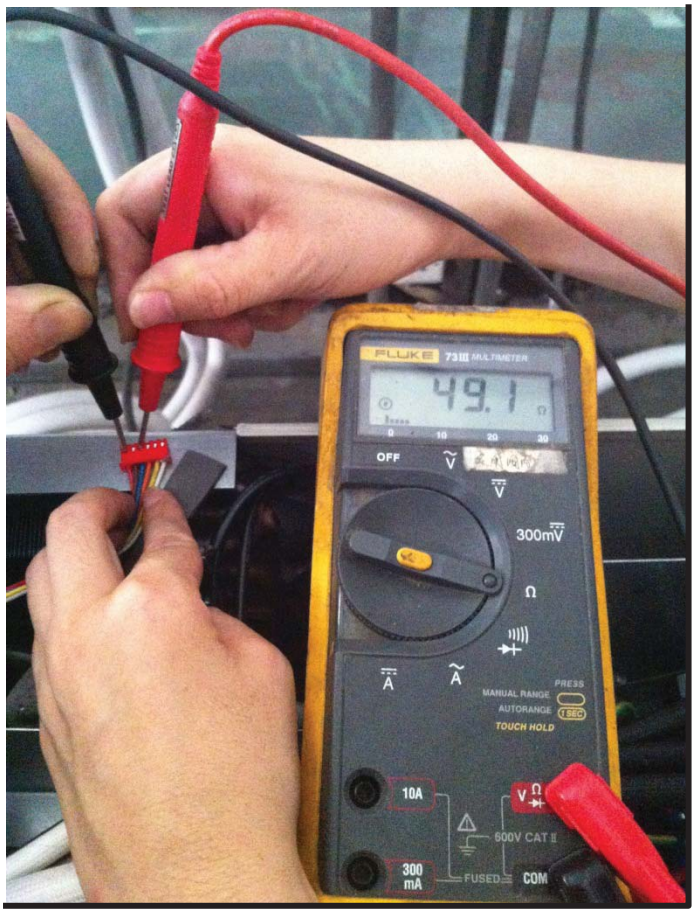


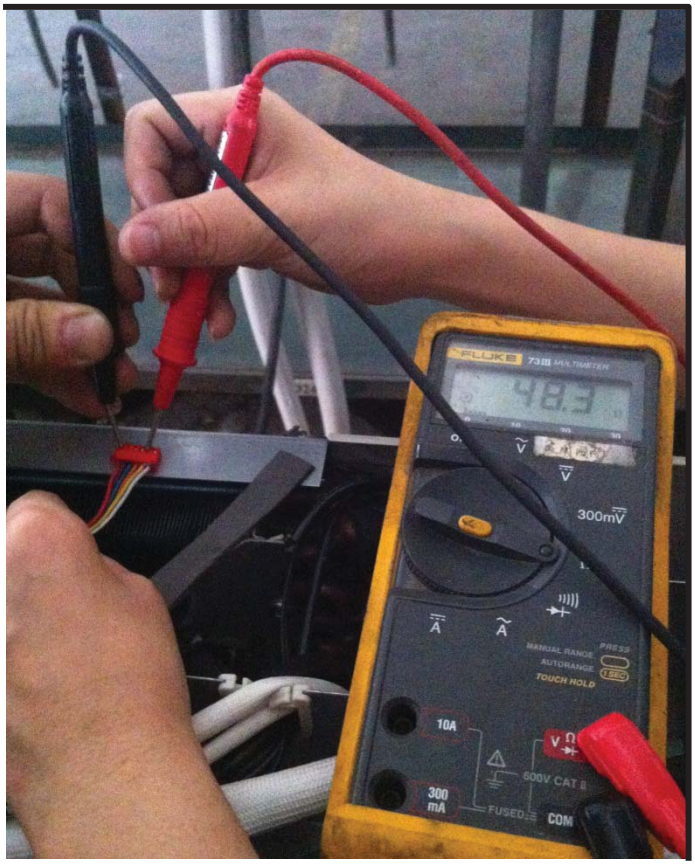
Table 53—Resistance to EXV Coil

LEAD WIRE COLOR	NORMAL VALUE
Red – Blue	About 50Ω
Red – Yellow	
Brown – Orange	
Brown – White	

EXV Check (CONT)

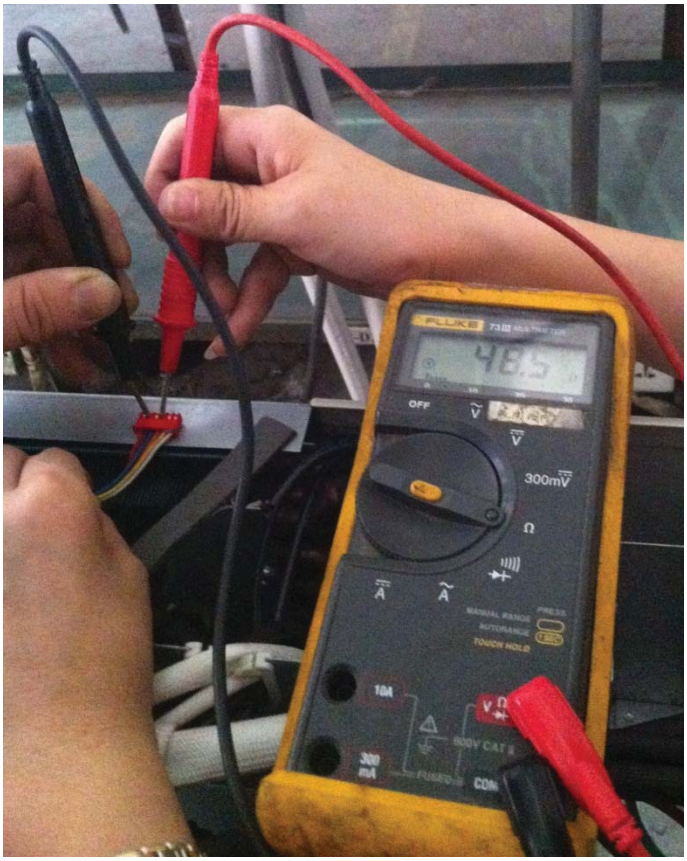


Red- Blue

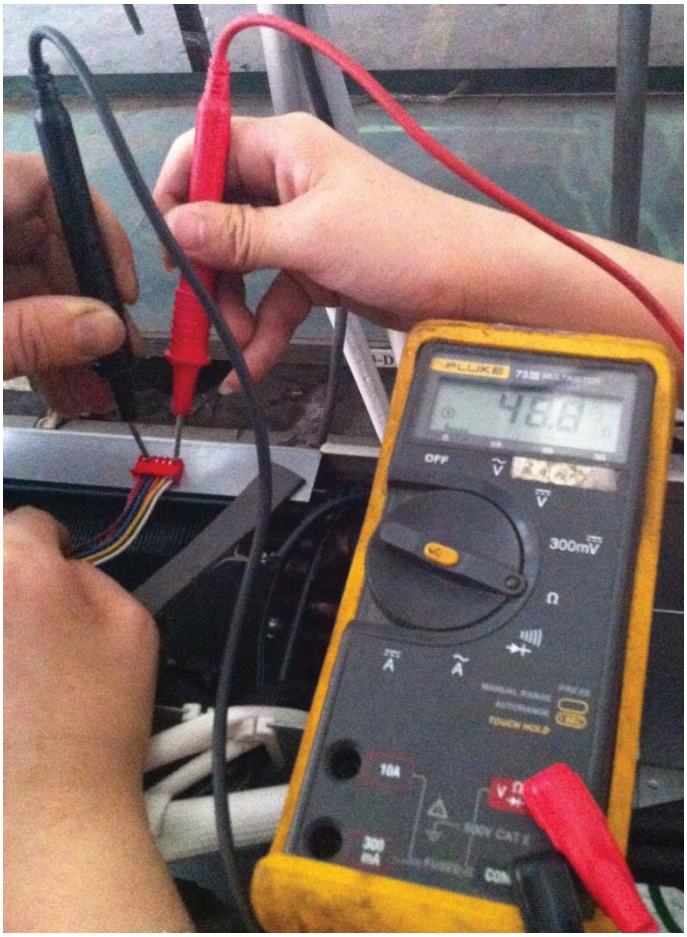


Red - Yellow

EXV Check (CONT)



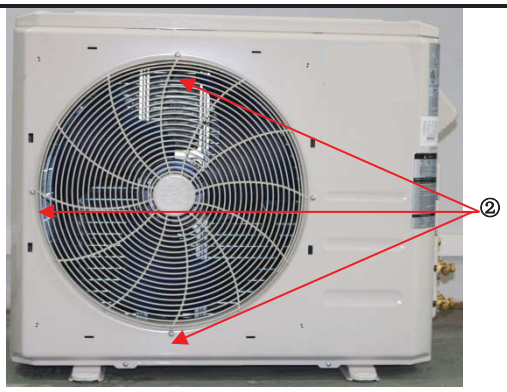
Brown-Orange



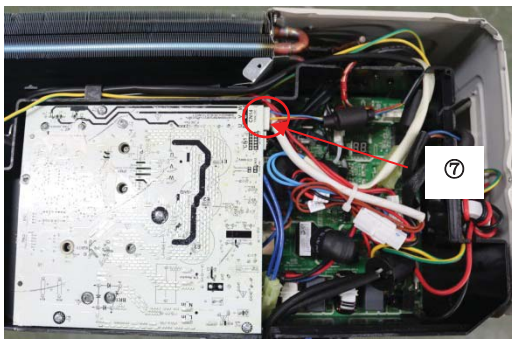
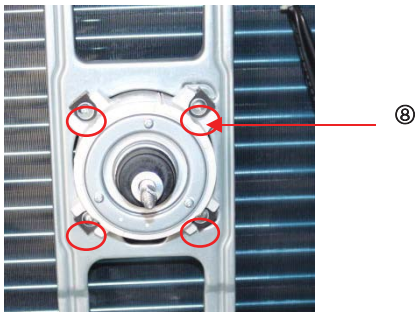
Brown-White

DISASSEMBLY INSTRUCTIONS SIZE 18

NOTE: This section is for reference and the photos may have differ slightly from your unit.

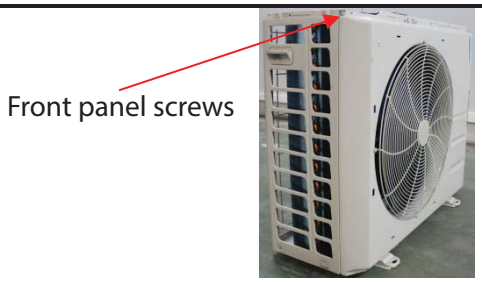
No.	Part name	Procedures	Remarks
1	Fan assembly	How to remove the fan assembly. 1) Turn off the air conditioner and turn off the power breaker. 2) Remove the screws of air outlet grille (4 screws). 3) Remove hex nut securing the fan. 4) Remove the fan. 5) Remove the top cover screws, and remove the top cover. (3 screws)	   

DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

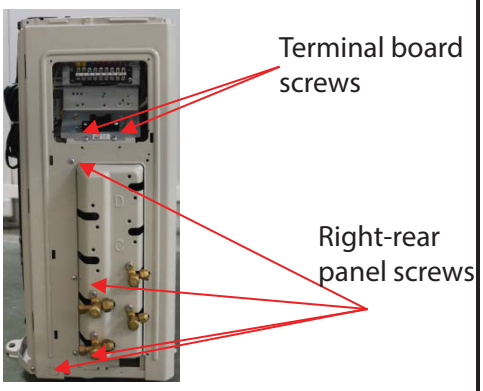
		6) Remove the electrical control box cover. 7) Disconnect the fan motor connector CN14 (3p, white) from the IPM board. 8) Remove the fan motor after unfastening the four screws.	  
2	Panel plate	How to remove the panel plate. 1) Remove the front panel screws then remove the front panel (6 screws).	

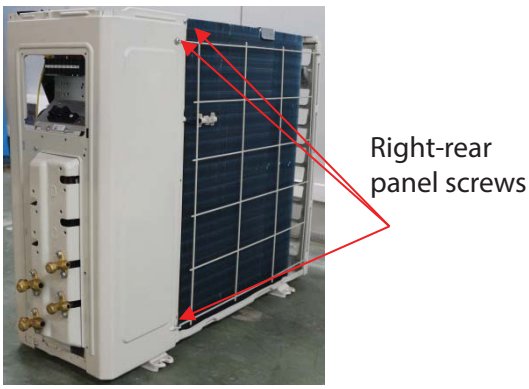
DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

2) Remove the big handle screws, and remove the big handle (4 screws).

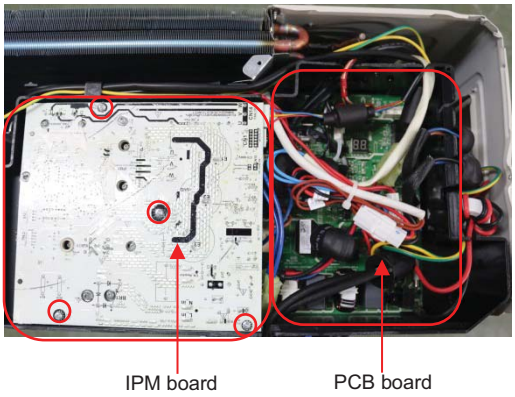
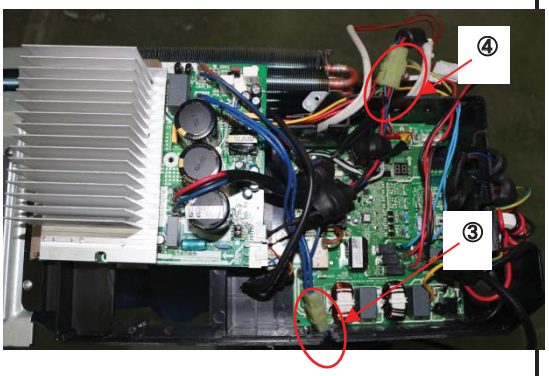
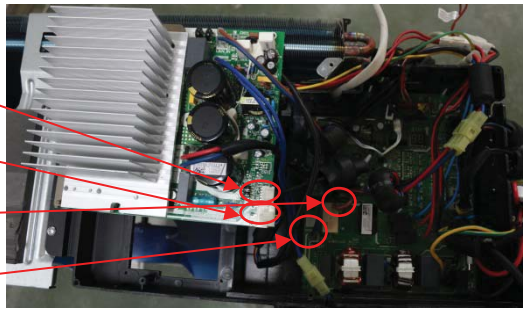
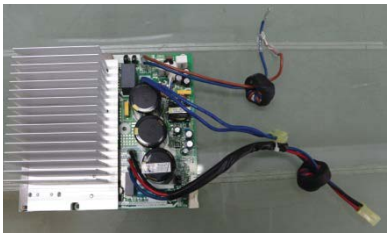


3) Remove the terminal board screws (2) and the right-rear panel screws (7), then remove the right rear panel.





DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

3	Electrical parts	How to remove the electrical parts. 1) Complete the steps in sections 1 & 2. 2) Remove the four (4) screws securing the IPM board. 3) Unfasten the reactor connector. 4) Unfasten the compressor connector. 5) Disconnect the following three (3) connection wires and connectors between the IPM and the main control PCB: CN1(5p,white) CN14(3p,white) CN4(red or brown) CN5(blue) 6) Remove the IPM board. 7) Disconnect the connectors and wires connected from PCB and other parts.	   

DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

Connectors:

CN17:T3/T4 temperature sensor (2p/2p,white)

CN7: Discharge temperature (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)

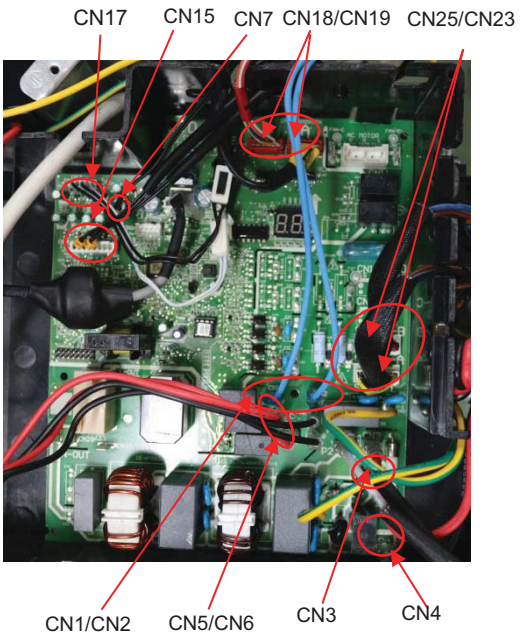
CN5/CN6: Crankcase heating cable (red-red)

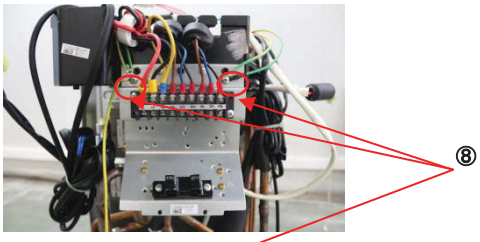
CN3:L-IN (red)

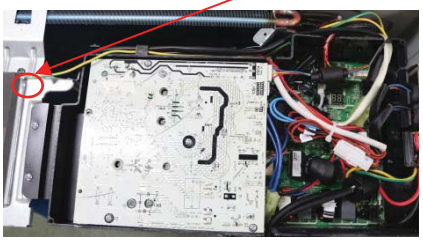
CN4:N-IN (black)

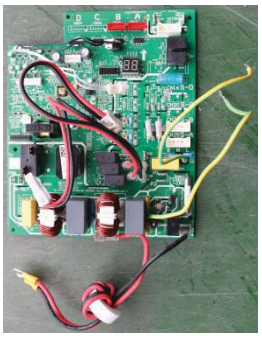
8) Disconnect the grounding wire (yellow-green) after removing the big handle and the right-rear panel.

9) Remove the PCB board.

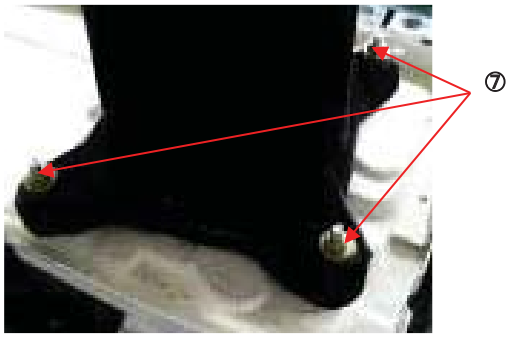




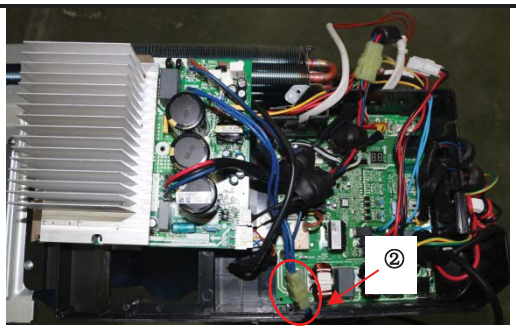
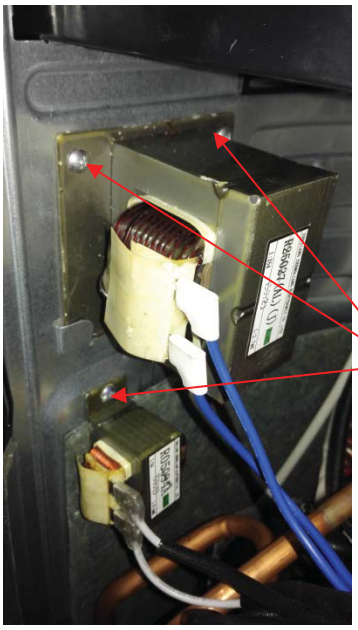
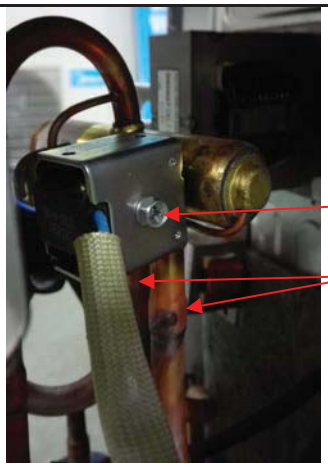




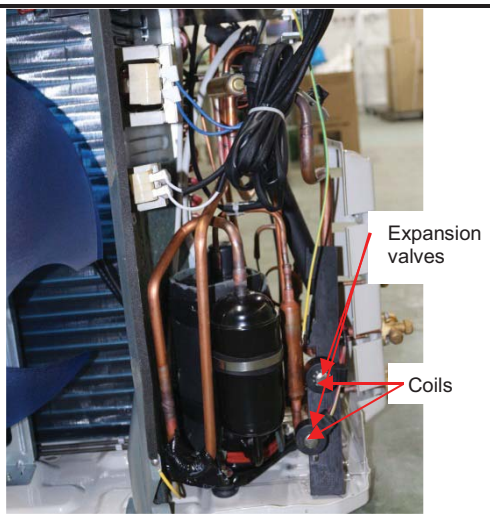
DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

4	Compressor	How to remove the compressor. 1) Complete steps in section 1 & 2. 2) Remove the electrical control box cover. 3) Extract the refrigerant gas. 4) Remove the sound insulation material and crankcase heating cable. 5) Remove the compressor terminal cover and disconnect the crankcase electric heater 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.	 

DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

5	Reactor	How to remove the reactor 1) Complete steps in section 2. 2) Unfasten the connector between the IPM and the reactor. 3) Remove the reactor's three (3) screws and remove the reactor.	 
6	The 4-way valve	How to remove the 4-way valve 1) Complete steps in section 2. 2) Extract the refrigerant gas. 3) Remove the electrical parts (see section 3). 4) Remove the screw securing the coil and remove the coil. 5) Detach the welded parts of the 4-way valve and pipe.	

DISASSEMBLY INSTRUCTIONS SIZE 18 (CONT)

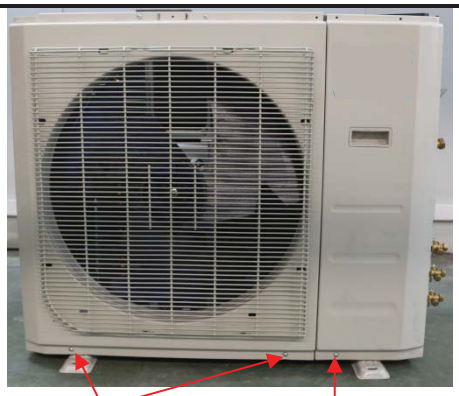
7	The expansion valve	How to remove the expansion valve 1) Complete the steps in sections 1 & 2. 2) Remove the electrical parts from section 3. 3) Remove the coils. 4) Detach the welded parts of the expansion valves and pipes.	

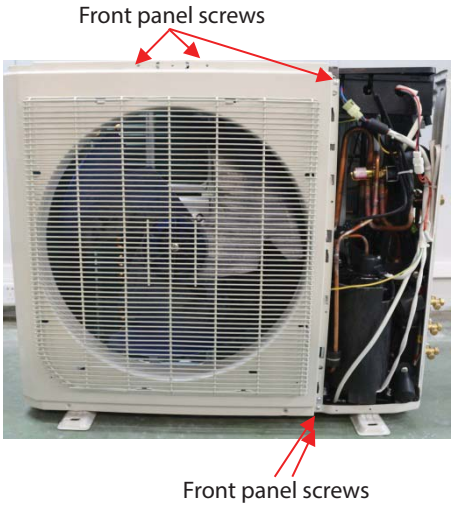
DISASSEMBLY INSTRUCTIONS SIZE 27

No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate. 1) Turn off the air conditioner. Turn off the power breaker. 2) Remove the big handle screws (4), then remove the big handle. 3) Remove the top cover screws and remove the top cover. 4) Remove the right-front side panel screws and remove the right front side panel (1 screws). 5) Remove the front panel screws (8) and remove the front panel.	Big handle screws Top cover screws  Top cover screws 

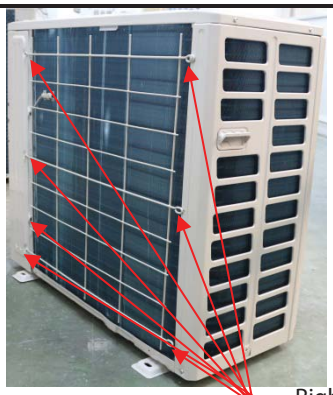
DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

6) Remove the terminal board screws (2), the water collector screws, and the right-rear panel screws (15) and then remove the right-rear panel.

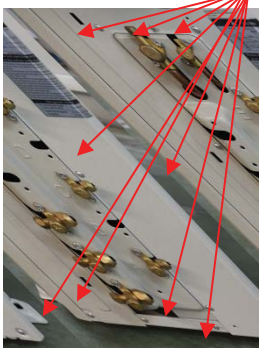


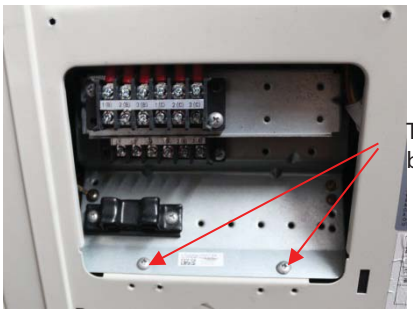


DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)



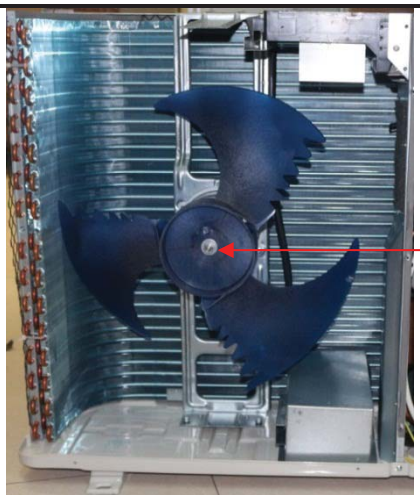
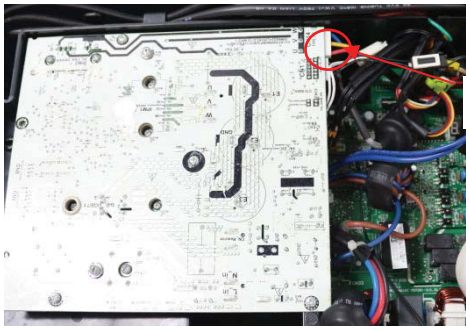
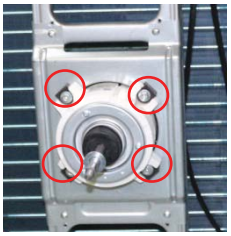
Right-rear panel screws



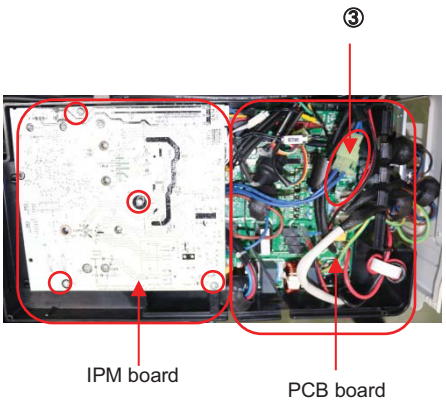
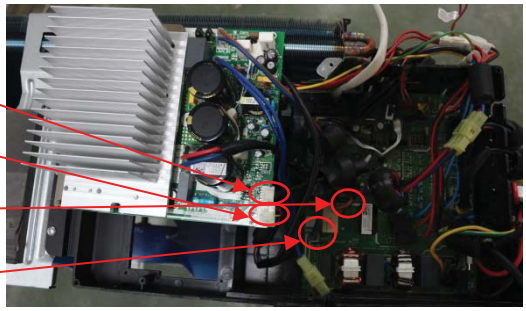
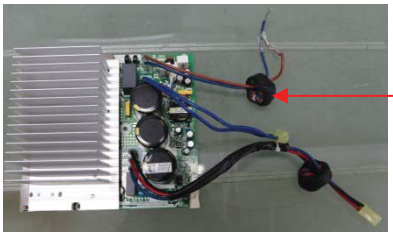


Terminal board screws

DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

2	Fan assembly	How to remove the fan assembly. 1) Remove the top cover, right front side panel and the front panel (see section 1, steps 1 - 4). 2) Remove the hex nut securing the fan. 3) Remove the fan. 4) Remove the electrical control box. 5) Disconnect the fan motor connector CN14 (5p,white) from the IPM board. 6) Remove the four screws securing the fan motor then remove the fan motor.	   

DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

3	Electrical parts	How to remove the electrical parts. 1) Complete the steps in sections 1 & 2. 2) Remove the four screws (4) securing the IPM board. 3) Unfasten the reactor connector. 4) Unfasten the compressor connector. 5) Disconnect the following connection wires and connectors between the IPM and the PCB: 6) Remove the IPM board.	   

DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

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)

CN12:Ttop 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)

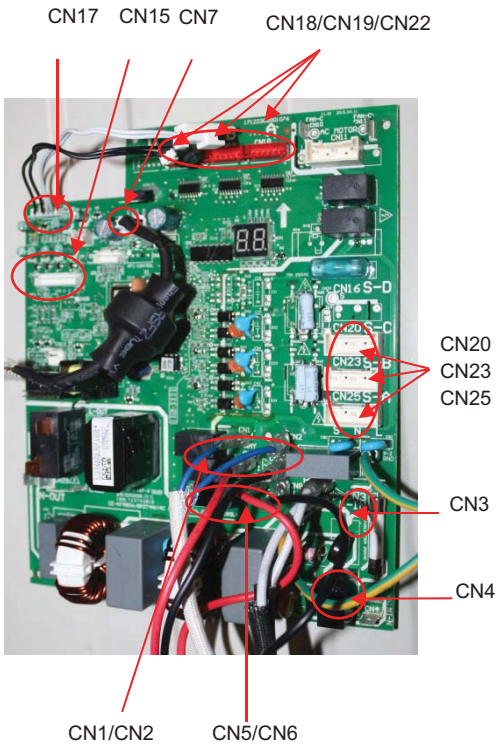
Wires:

CN1/CN2: 4-way valve (blue-blue)

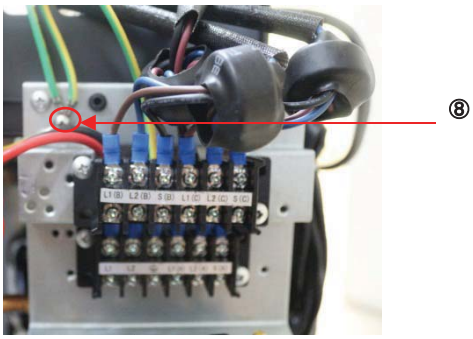
CN5/CN6: Crankcase heating cable (red-red)

CN3:L1-IN (red)

CN4:L2-IN (black)

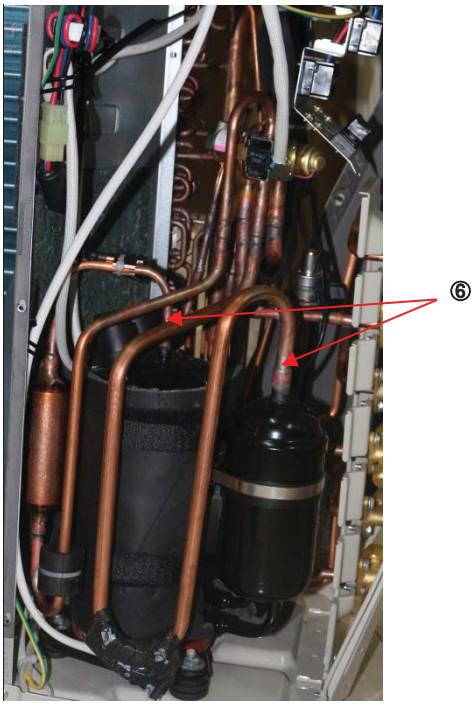
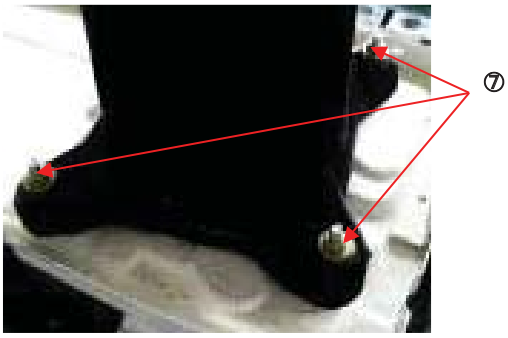


8) Disconnect the grounding wire (yellow-green) after removing the big handle and the right-rear panel.

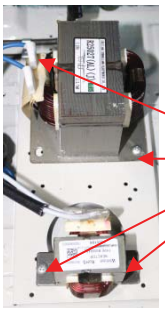
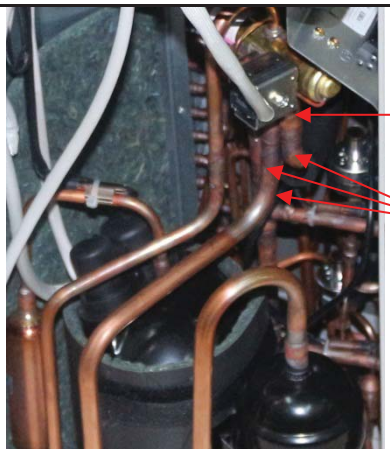


9) Remove the PCB board.

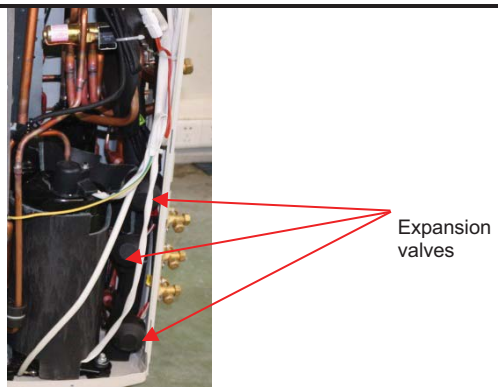
DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

4	Compressor	How to remove the compressor 1) Complete steps in 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 terminal cover, the compressor thermo disconnect wires and the compressor from the terminal. 6) Remove the discharge pipe and the suction pipe with a burner. 7) Remove the hex nuts and washers securing the compressor to the bottom plate. 8) Lift the compressor.	 

DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

5	Reactor	How to remove the reactor 1) Compete the steps in sections 1 & 2. 2) Unfasten the connector between the IPM and the reactor. 3) Remove the inductance cover screws (2) then remove the inductance cover. 4) Disconnect the two wires connected to the inductance cover. 5) Remove the four (4) reactor screws, then remove the reactor.	 
6	The 4-way valve	How to remove the 4-way valve 1) Complete the steps in sections 1 and 2. 2) Extract the refrigerant gas. 3) Remove the electrical parts (see section 3). 4) Remove the screw securing the coil then remove the coil. 5) Detach the welded parts of the 4-way valve and pipe.	

DISASSEMBLY INSTRUCTIONS SIZE 27 (CONT)

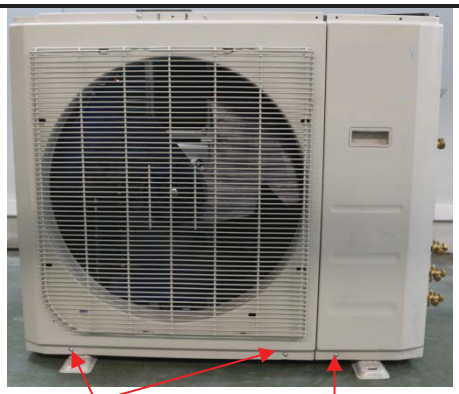
7	The expansion valve	How to remove the expansion valve 1) Complete steps in sections 1 and 2. 2) Remove the electrical parts (see section 3). 3) Remove the coils. 4) Detach the welded parts of the expansion valves and the pipes.	

DISASSEMBLY INSTRUCTIONS SIZES 30 − 36

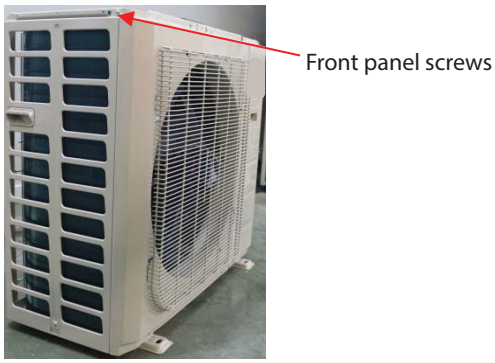
No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate. 1) Turn off the air conditioner. Turn off the power breaker. 2) Remove the big handle screws. 3) Remove the top cover screws and then remove the top cover (4 screws). 4) Remove the right front side panel screws, and then remove the right front side panel (1 screw).	 

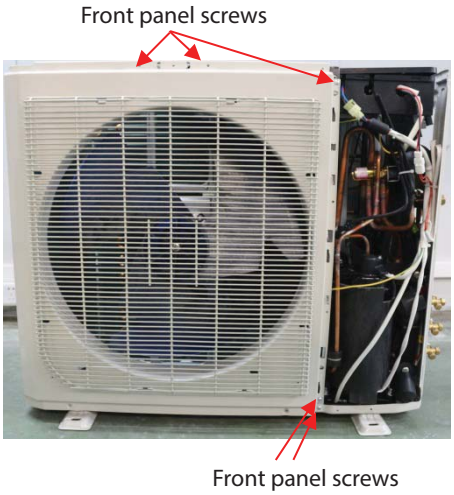
DISASSEMBLY INSTRUCTIONS SIZES 30 − 36 (CONT)

5) Remove the front panel screws (8) and remove the front panel.

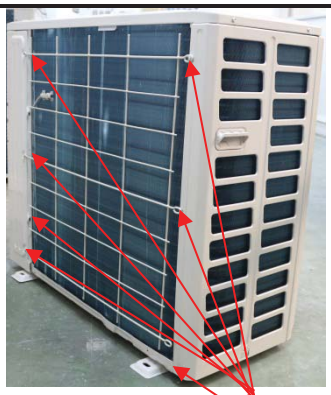
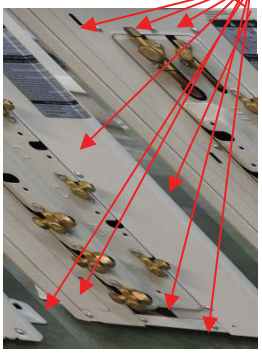
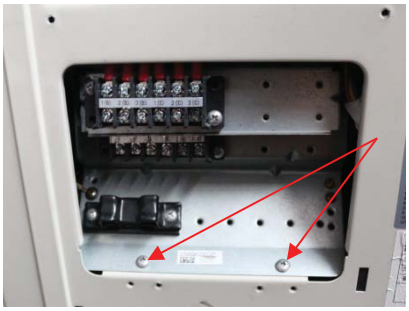
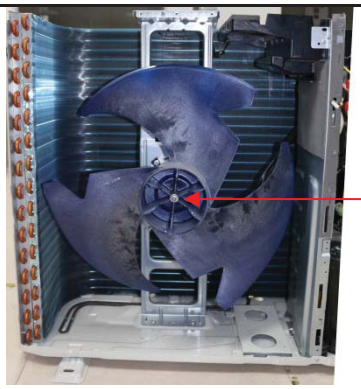


6) Remove the terminal board screws (2), the water collector screws, and the right-rear panel screws (15), and then remove the right-rear panel.

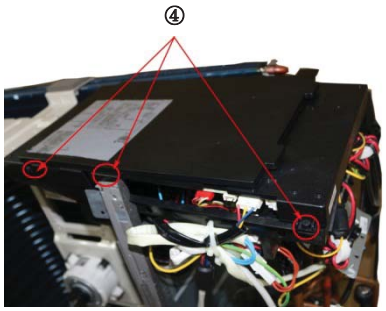
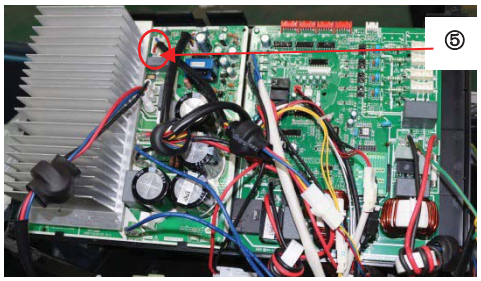
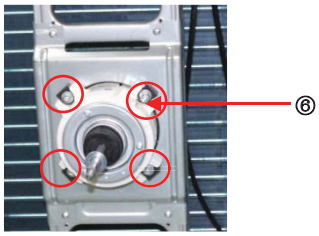
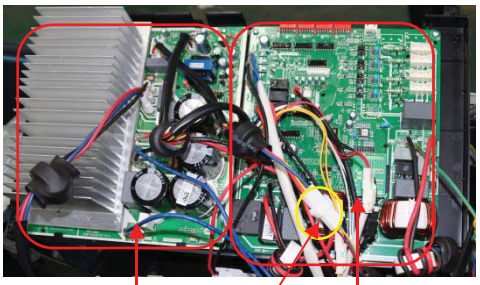




DISASSEMBLY INSTRUCTIONS SIZES 30 − 36 (CONT)

			 Right-rear panel screws   Terminal board screws
2	Fan assembly	How to remove the fan assembly 1) Remove the top cover, right front side panel and the front panel from section 1 steps 1-4. 2) Remove the hex nut securing the fan.	 ②

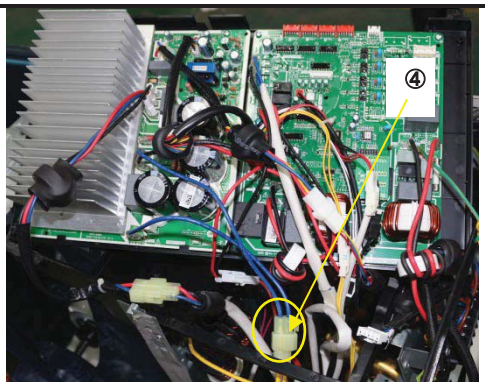
DISASSEMBLY INSTRUCTIONS SIZES 30 − 36 (CONT)

		3) Remove the fan. 4) Undo the hooks, remove the screws, and then open the electrical control box. 5) Disconnect the fan motor connector CN19(3P, white) from the driver board. 6) Remove the screws (4) and then remove the fan motor.	  
3	Electrical parts	How to remove the electrical parts. 1) Complete steps of sections 1 and 2. 2) Remove the connector. 3) Remove the compressor connector. 4) Remove the PFC inductor connector.	

DISASSEMBLY INSTRUCTIONS SIZE 30 − 36 (CONT)

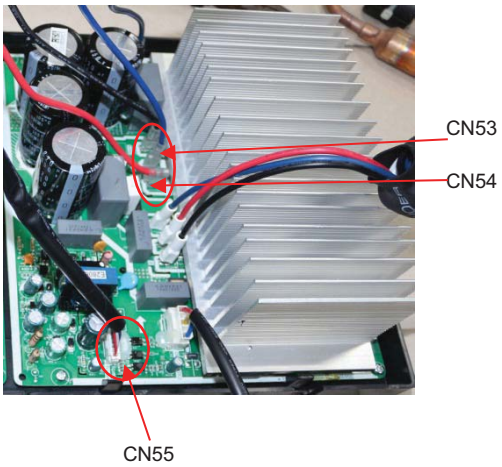
5) Disconnect the following three connection wires between the driver board and PCB.

CN55-CN7(7p,white)
CN54-CN6(red)
CN53-CN5(black)



6) Remove the screws then remove the driver board.

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



Connectors:

CN8:T3/T4 temperature sensor (2p/2p,white)

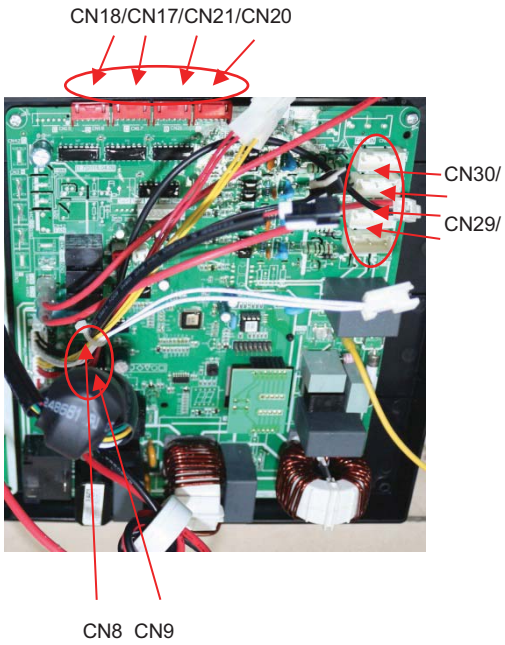
CN33: Discharge temperature sensor (2p,white)

CN13:T2B-A,B,C,D temperature sensor (2p/2p/2p/2p,white)

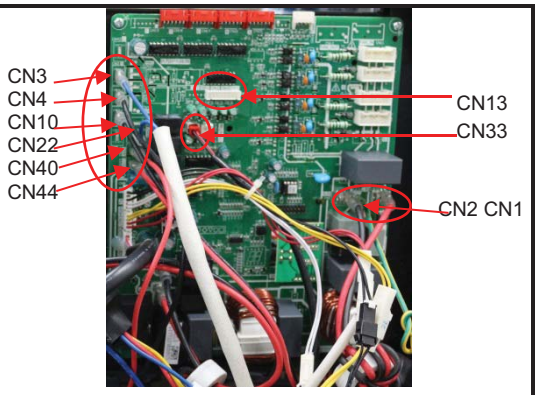
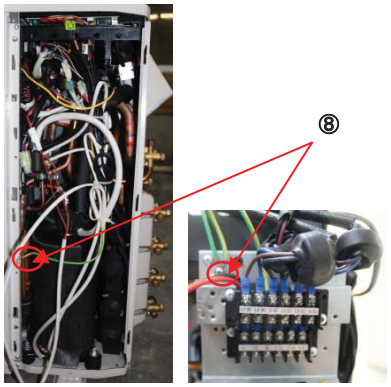
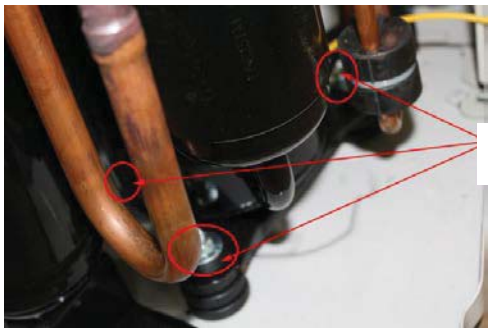
CN18/CN17/CN21/CN20: Electronic expansion valve A,B,C,D (6p/6p/6p,red/red/red)

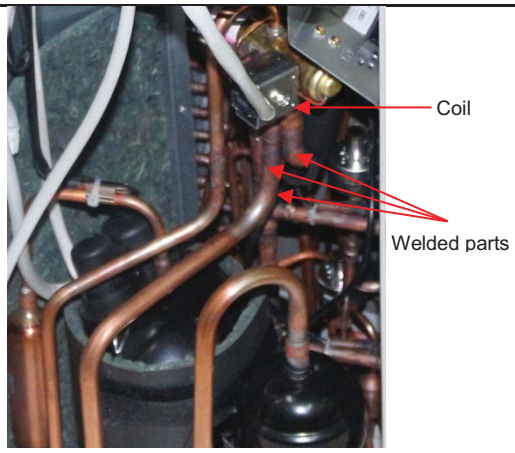
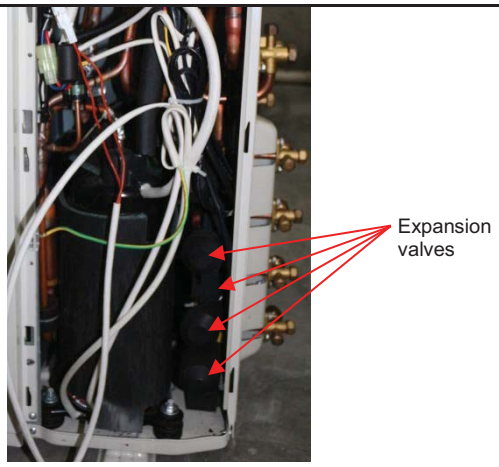
CN30/CN29/CN28/CN27: S-A,S-B,S-C,S-D (3p/3p/3p/3p,white)

CN9: High and low pressure switch (2p/2p, white)

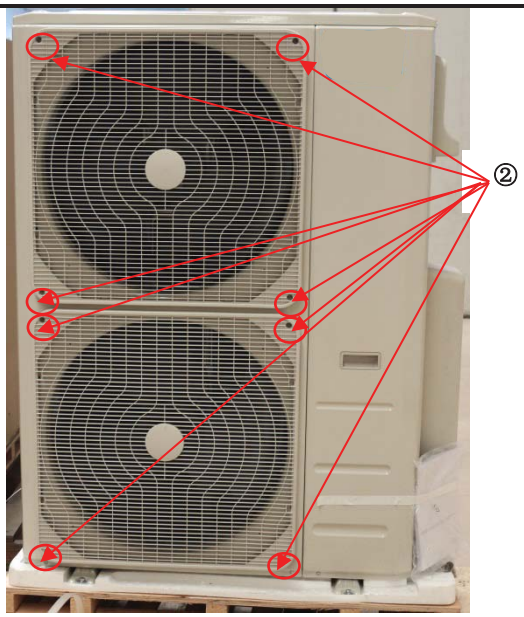
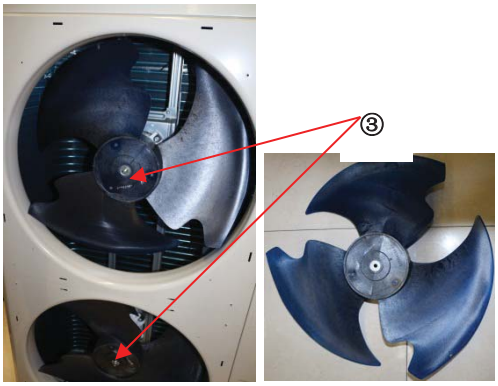
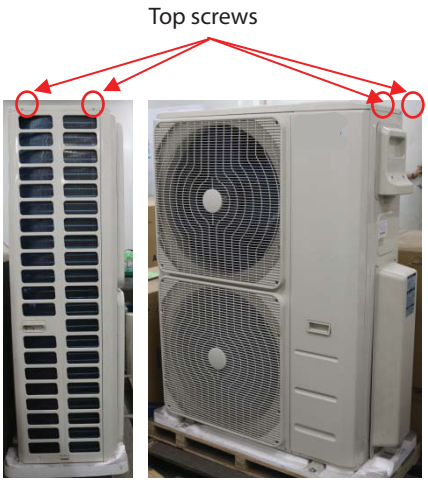


DISASSEMBLY INSTRUCTIONS SIZES 30 − 36 (CONT)

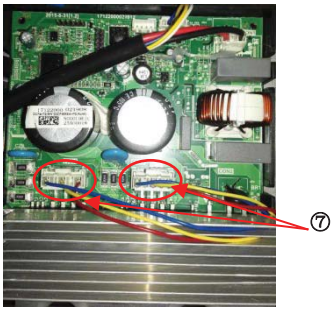
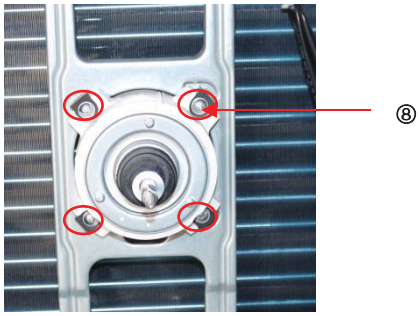
		Wires: CN3/CN22: 4-way valve (blue-blue) CN4/CN40: Crankcase heating cable (black-red) CN10/CN44: Crankcase heating cable (black-red) CN1:L1-IN (red) CN2:L2-IN (black) 8) Disconnect the grounding wire (yellow-green) after removing the right-rear panel. 9) Remove the PCB board.	 
4	Compressor	How to remove the compressor. 1) Complete the steps in 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 the crankcase heating cable. 5) Remove the compressor terminal cover, disconnect the compressor thermo wires, and disconnect 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	The 4-way valve	How to remove the 4-way valve 1) Perform work of item 1,2. 2) Extract the refrigerant gas. 3) Remove the electrical parts (see section 3). 4) Remove the coil screw and remove the coil. 5) Detach the welded parts of the 4-way valve and pipe.	
6	The expansion valve	How to remove the expansion valve 1) Complete the steps of 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 the pipes.	

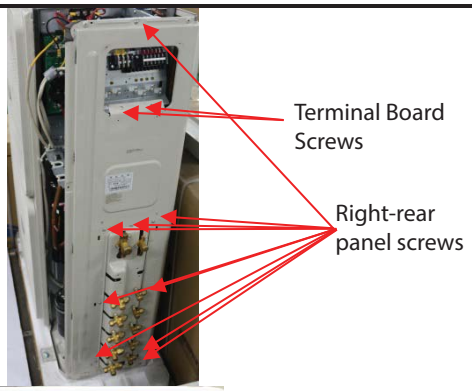
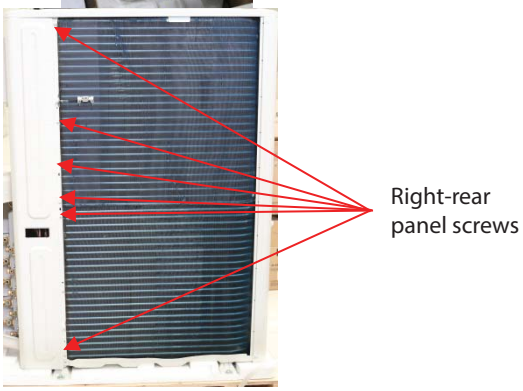
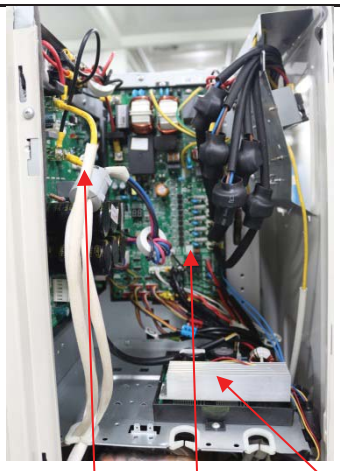
DISASSEMBLY INSTRUCTIONS SIZE 48

No	Part name	Procedures	Remarks
1	Fan assembly	How to remove the fan assembly. 1) Turn off the air conditioner. Turn off the power breaker. 2) Remove the air outlet grille screws (8).	
		3) Remove the hex nut securing the fan. 4) Remove the fan.	
		5) Remove the top screws (4) and then remove the top cover.	

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

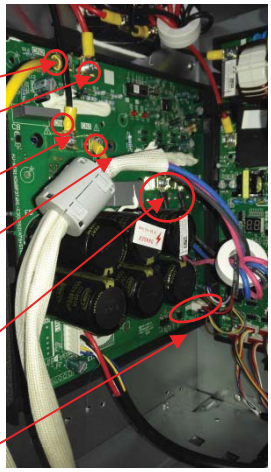
		6) Remove the front side panel screw (1), and then remove the front side panel.	
		7) Disconnect the fan motor connectors FAN1(3p,white) and FAN2(3p,white) from the DC motor driver board.	
		8) Remove the fan screws and remove the fan motor.	
2	Panel plate	How to remove the panel plate. 1) Remove the big handle screws (2), then remove the big handle and the water collector.	

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

		2) Remove the terminal board screws (2) and the right-rear panel screws (15) and then remove the right-rear panel.	 
3	Electrical parts	How to remove the electrical parts. 1) Complete steps 5 and 6 from section 1 and all the steps from section 2. 2) Disconnect the fan motor connector (5p,white) from the IPM board.	 

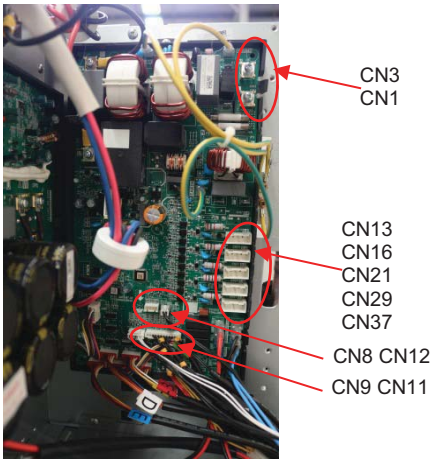
DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

3) Disconnect the following connection wires and connectors between the IPM and the other parts.



4) Remove the screws and then remove the IPM board.

5) Disconnect the connectors and wires connected from the PCB and the other parts.



Connectors:

CN8: Discharge temperature sensor (2p,white)

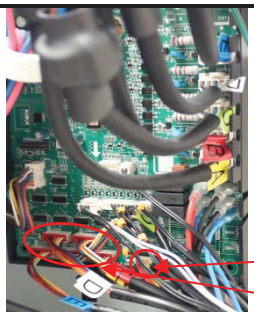
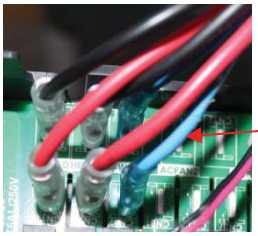
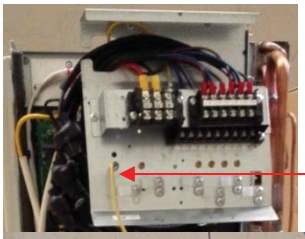
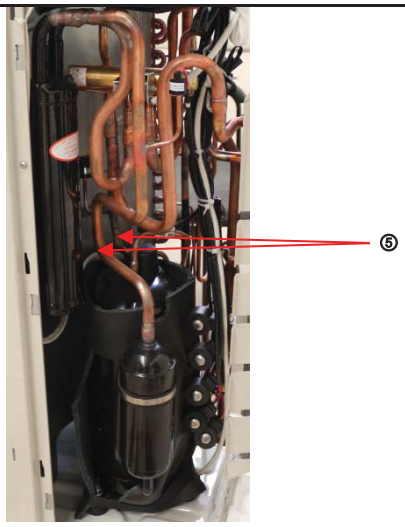
CN12：Heatsink temperature sensor(2p,red)

CN9:T3/T4 temperature sensor (2p/2p,white)

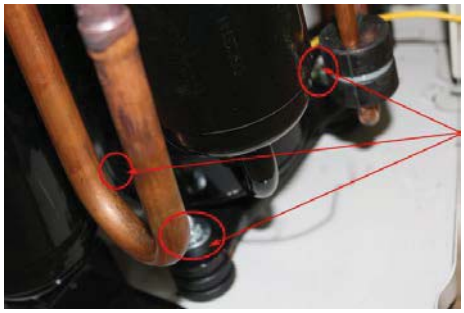
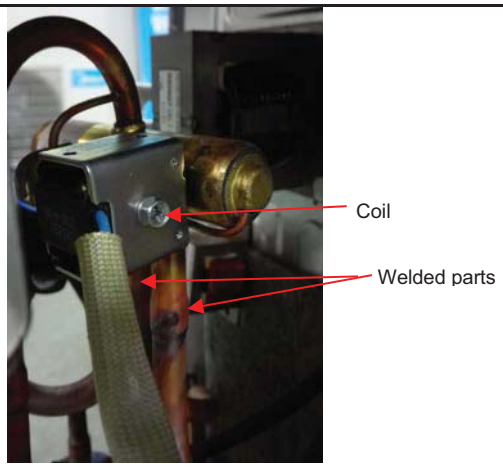
CN11:T2B-A,B,C,D,E temperature sensor (2p/2p/2p/2p/2p,white)

CN15/CN23/CN26/CN30/CN33: Electronic expansion valve (6p/6p/6p/6p/6p,red)

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

		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 big handle. 7) Remove the PCB board.	   
4	Compressor	How to remove the compressor 1) Complete steps 5 and 6 in section 1 and all the steps in section 2. 2) Extract the refrigerant gas. 3) Remove the sound insulation material and the crankcase heating cable. 4) Remove the compressor terminal cover disconnect the crankcase electric heater wires and compressor from the terminal.	

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

		5) Remove the discharge pipe and suction pipe with a burner. 6) Remove the hex nuts and washers securing the compressor to the bottom plate. 7) Lift the compressor.	
5	The 4-way valve	How to remove the 4-way valve 1) Complete steps 5 and 6 from section 1 and all the steps from section 2. 2) Extract the refrigerant gas. 3) Remove the electrical parts (see section 3) 4) Remove the coil screw and remove the coil. 5) Detach the welded parts of the 4-way valve and pipe.	

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

6	The expansion valve	How to remove the expansion valve 1) Complete the steps in sections 1 and 2. 2) Remove the electrical parts (see section 3). 3) Remove the coil. 4) Detach the welded parts of the expansion valves and the pipes.