538TR
Multi−Zone Ductless System
Sizes 18, 27, 36 and 48

bryant®

Service Manual

TABLE OF CONTENTS

SAFETY CONSIDERATIONS

Installing, starting up, and servicing air−conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start−up, and service this equipment.

Untrained personnel can perform basic maintenance functions such as 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

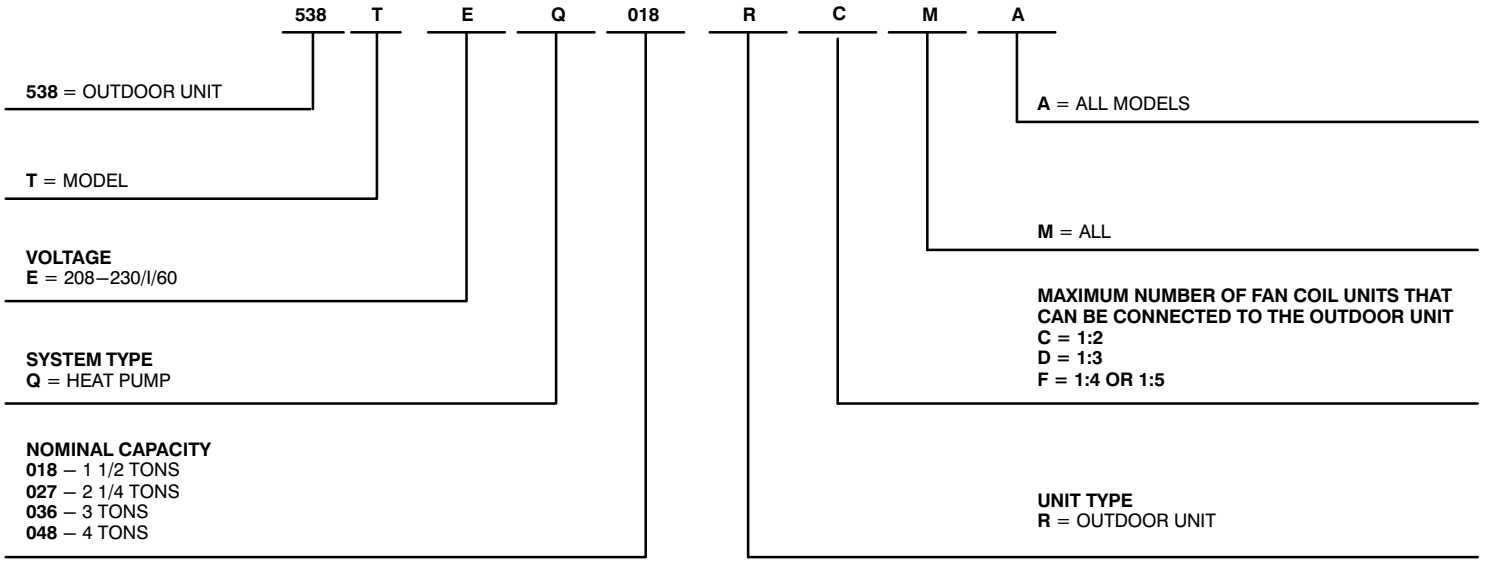
This Service Manual provides the necessary information to service, repair, and maintain the multi−zone family of heat pumps. Section 2 of this manual has an appendix with data required to perform troubleshooting. Use the Table of Contents to locate a desired topic.

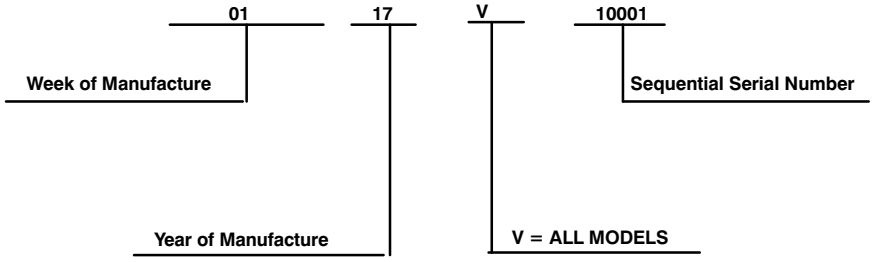
MODEL / SERIAL NUMBER NOMENCLATURES

Table 1—Model Numbers

Size	Voltage	Outdoor Model
18	208−230/1/60	538TEQ018RCMA
27		538TEQ027RDMA
36		538TEQ036RFMA
48		538TEQ048RFMA

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.

PHYSICAL DATA

Table 2—Physical Data

HEAT PUMP						
System	**Size**		**18**	**27**	**36**	**48**
	Outdoor Model		538TEQ018RCMA	538TEQ027RDMA	538TEQ036RFMA	538TEQ048RFMA
	Max Number of Zones		2	3	4	5
Performance Non−Ducted	Energy Star		YES	YES	NO	YES
	Cooling System Tons		1.5	2.1	3.0	3.5
	Cooling Rated Capacity	Btu/h	18,000	25,000	36,000	42,000
	Cooling Cap. Range Min − Max	Btu/h	8,500~20,000	9,000~30,000	9,500~37,000	10,000~50,000
	SEER		21	22	18	20
	EER		12.5	12.5	8.8	12.5
	Heating Rated Capacity (47°F)	Btu/h	18,500	32,000	36,000	49,000
	Heating Cap. Range Min − Max	Btu/h	9,000~22,000	9,500~32,000	10,000~39,000	10,500~55,000
	HSPF		9.6	9.6	10.0	10.0
	COP	W/W	3.7	3.5	3.4	3.4
Performance Combination Ducted and Non−Ducted	Energy Star		YES	NO	NO	NO
	Cooling System Tons		1.5	2.2	2.9	3.5
	Cooling Rated Capacity	Btu/h	17,500	26,000	35,000	42,000
	Cooling Cap. Range Min − Max	Btu/h	8,500~20,000	9,000~30,000	9,500~36,500	10,000~50,000
	SEER		19.5	19.25	16.5	19
	EER		12.5	11	8.5	11.75
	Heating Rated Capacity (47°F)	Btu/h	18,250	32,000	36,000	50,000
	Heating Cap. Range Min − Max	Btu/h	9,000~22,000	9,500~32,000	10,000~39,000	10,500~55,000
	HSPF		9.1	9.2	9.7	9.8
	COP	W/W	3.7	3.5	3.4	3.4
Performance Ducted	Energy Star		YES	NO	NO	NO
	Cooling System Tons		1.4	2.3	2.8	3.5
	Cooling Rated Capacity	Btu/h	17,000	27,000	34,000	42,000
	Cooling Cap. Range Min − Max	Btu/h	8,500~20,000	9,000~30,000	9,500~36,000	10,000~5,0000
	SEER		18	16.5	15	18
	EER		12.5	9.5	8.2	11
	Heating Rated Capacity (47°F)	Btu/h	18,000	32,000	36,000	51,000
	Heating Cap. Range Min − Max	Btu/h	9,000~22,000	9,500~32,000	10,000~39,000	10,500~55,000
	HSPF		8.5	8.8	9.3	9.5
	COP	W/W	3.7	3.5	3.3	3.4
Operating Range	Cooling Outdoor DB Min − Max	°F(°C)	−4~122 (−20~50)	−4~122 (−20~50)	−4~122 (−20~50)	−4~122 (−20~50)
	Heating Outdoor DB Min − Max	°F(°C)	−4~86 (−20~30)	−4~86 (−20~30)	−4~86 (−20~30)	−4~86 (−20~30)
Piping	Total Piping Length	ft (m)	98 (30)	147 (45)	196 (60)	245 (75)
	Piping to furthest FCU	ft (m)	98 (30)	98 (30)	98 (30)	98 (30)
	Drop (OD above ID)	ft (m)	32 (10)	32 (10)	32 (10)	32 (10)
	Lift (OD below ID)	ft (m)	49 (15)	49 (15)	49 (15)	49 (15)
	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 (9.52*2)	3/8 (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)	4.19 (1.9)	6.17 (2.8)	7.94 (3.6)	10.14 (4.6)
	Metering Device		EEV	EEV	EEV	EEV
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.	15	19	27	29
	MOCP − Fuse Rating	A.	20	25	40	50
Compressor	Type		Rotary Inverter	Rotary Inverter	Rotary Inverter	Rotary Inverter
	Model		DA150S1C−20FZ	DA250S2C−30MT	TNB306FPGMC−L	MNB36FAAMC−L
	Oil Type		ESTER OIL VG74	ESTER OIL VG74	FV50S	FV50S
	Oil Charge	Fl. Oz.	16.9	27.7	36.2	47.3
	Rated Current	RLA	10	12.3	22	22
Outdoor	Unit Width	in (mm)	33.27 (845)	37.20 (945)	37.20 (945)	53.9 (938)
	Unit Height	in (mm)	27.56 (700)	31.89 (810)	31.89 (810)	36.93 (1369)
	Unit Depth	in (mm)	12.60 (320)	15.55 (395)	15.55 (395)	15.43 (392)
	Net Weight	lbs (kg)	105.82 (48)	143.29 (65)	158.72 (72)	227.72 (103.3)
	Airflow	CFM	1,390	2,130	2,130	3,500
	Sound Pressure	dB(A)	60	63	63	64

DIMENSIONS

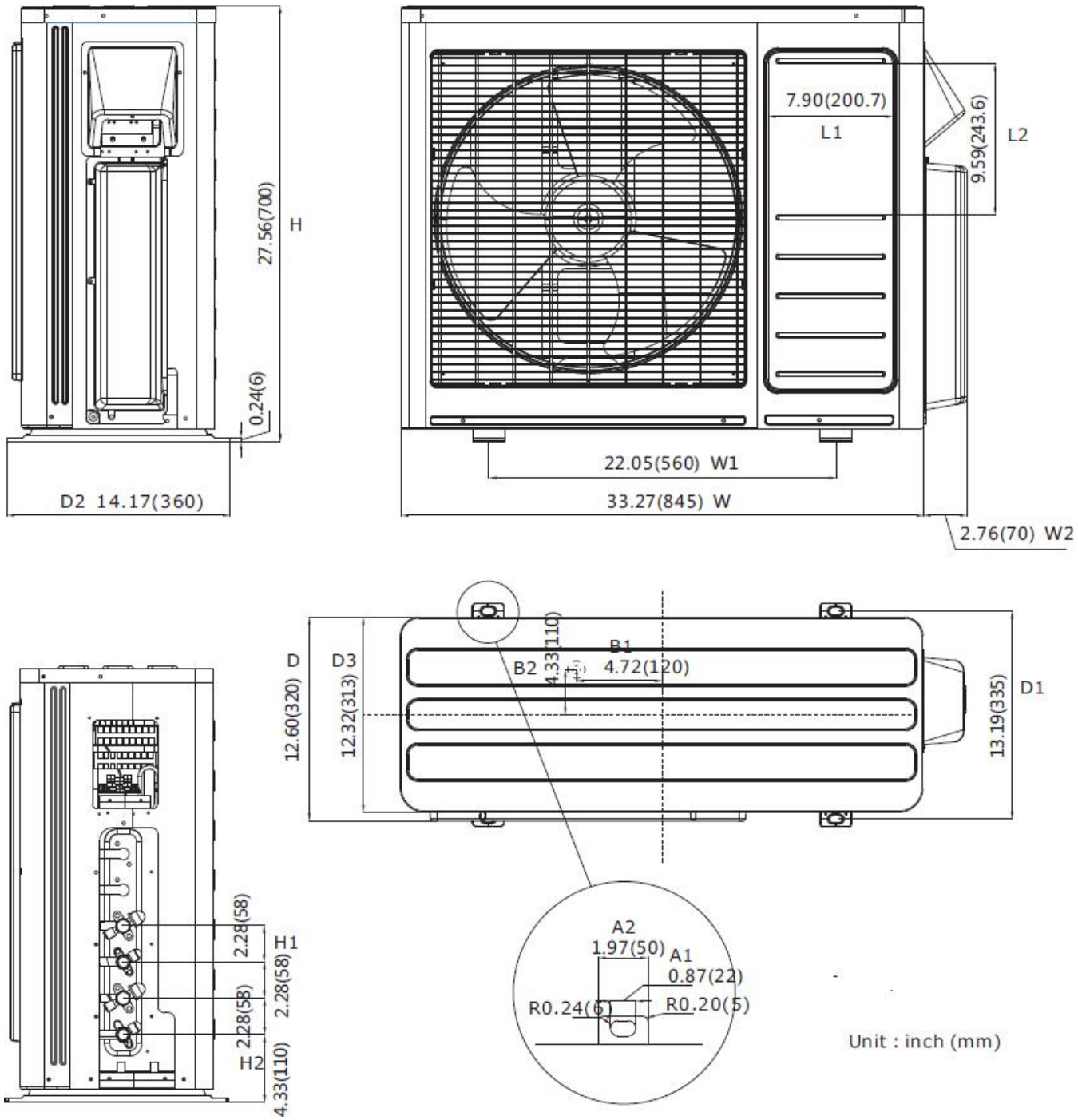


Fig. 1 – Outdoor Dimensions Size 18

Table 3—Dimensions Size 18

UNIT SIZE		18
Height	in (mm)	27.56(700)
Width	in (mm)	33.27(845)
Depth	in (mm)	12.60(320)
Weight – Net	lbs (kg)	114.63(52)

DIMENSIONS − (CONTINUED)

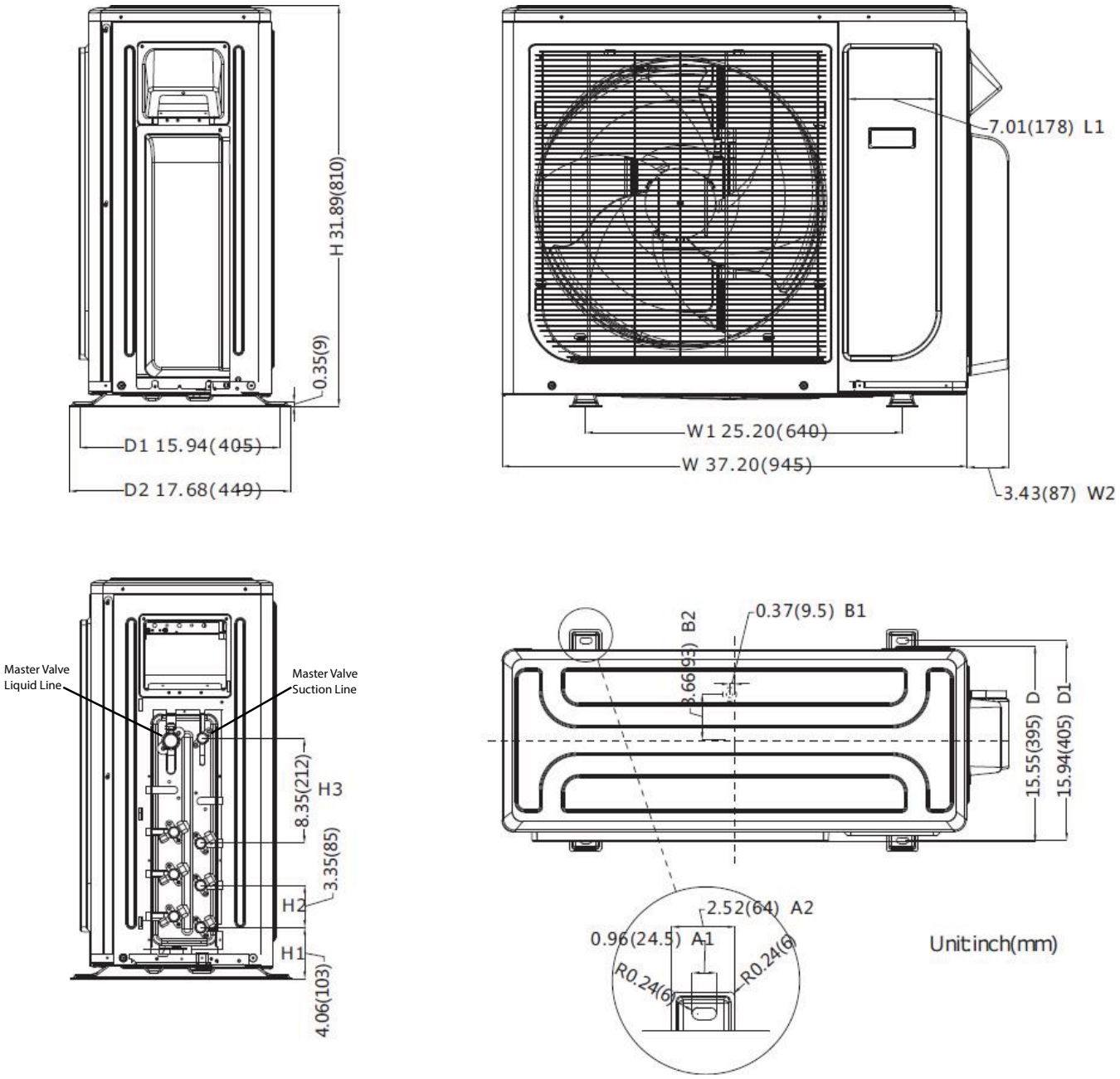


Fig. 2 – Outdoor Dimensions Size 27

Table 4—Dimensions Size 27

UNIT SIZE		27
Height	in (mm)	31.89(810)
Width	in (mm)	37.20(945)
Depth	in (mm)	15.55(395)
Weight – Net	lbs (kg)	154.76(70.2)

DIMENSIONS − (CONTINUED)

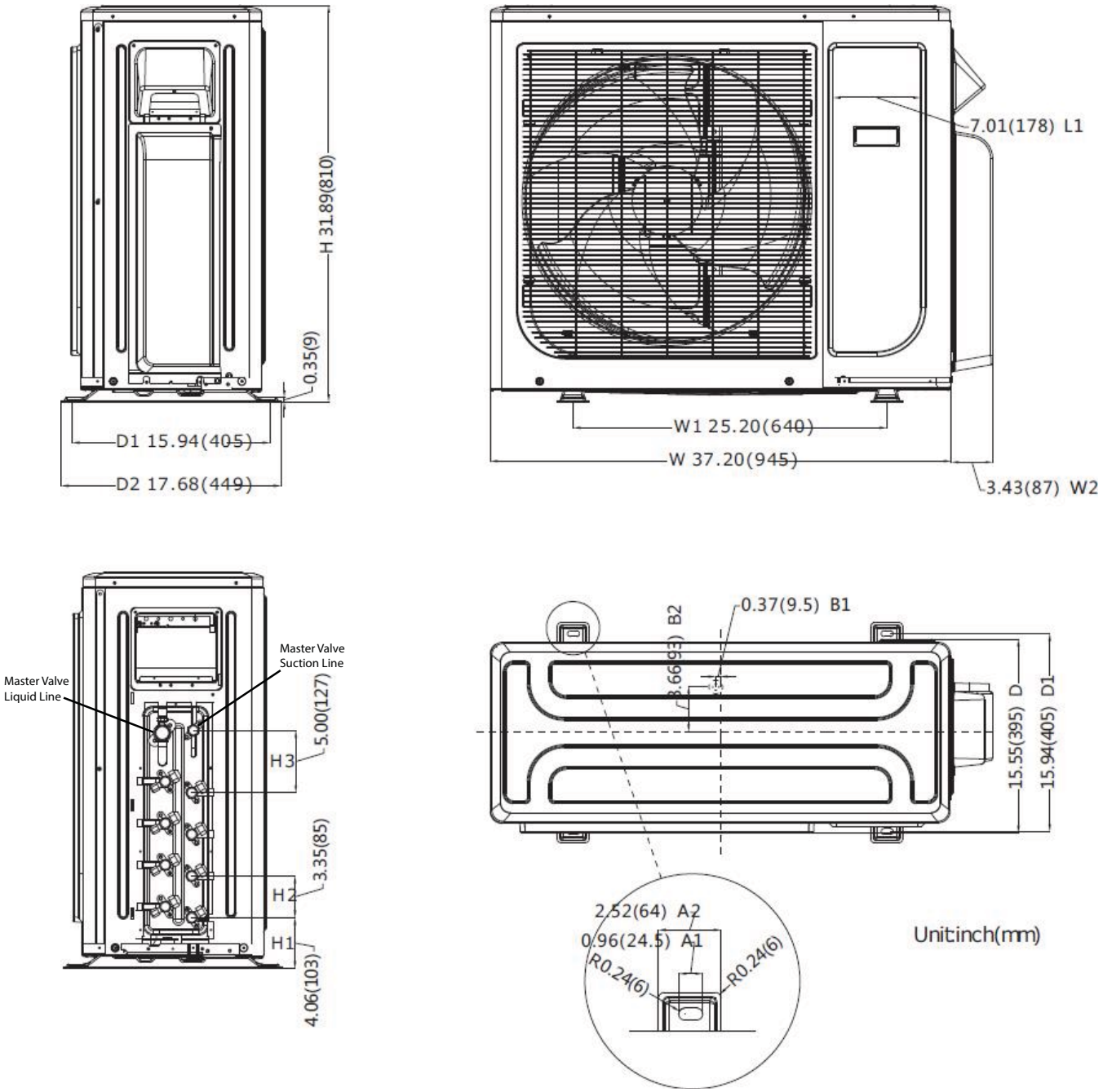


Fig. 3 – Outdoor Dimensions Size 36

Table 5—Dimensions Size 36

UNIT SIZE		36
Height	in (mm)	31.89(810)
Width	in (mm)	37.20(945)
Depth	in (mm)	15.55(395)
Weight – Net	lbs (kg)	169.75(77)

DIMENSIONS − (CONTINUED)

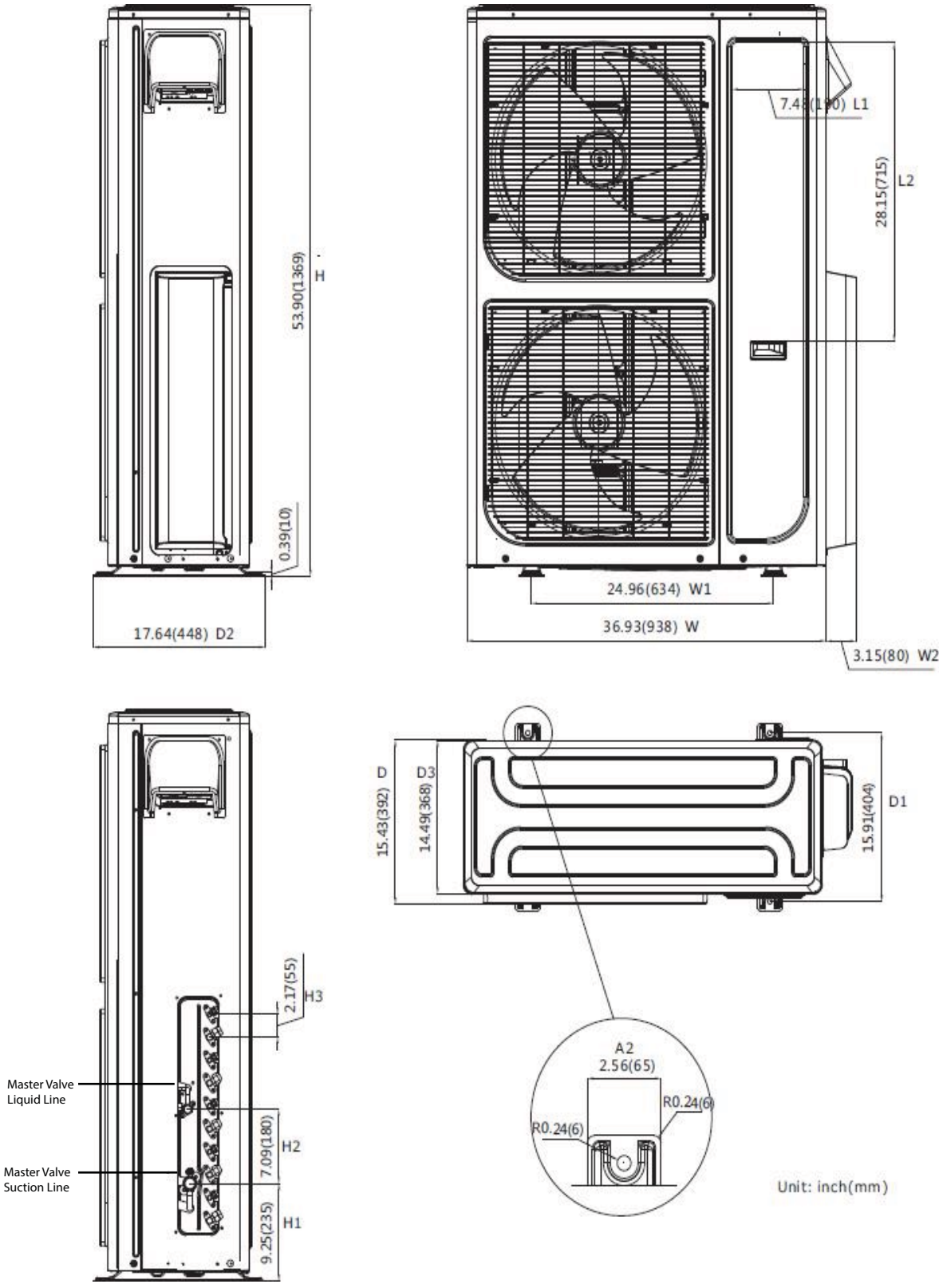


Fig. 4 – Outdoor Dimensions Size 48

Table 6—Dimensions Size 48

UNIT SIZE		48
Height	in (mm)	36.93(1369)
Width	in (mm)	53.9(938)
Depth	in (mm)	15.43(392)
Weight – Net	lbs (kg)	255.50(115.9)

CLEARANCES

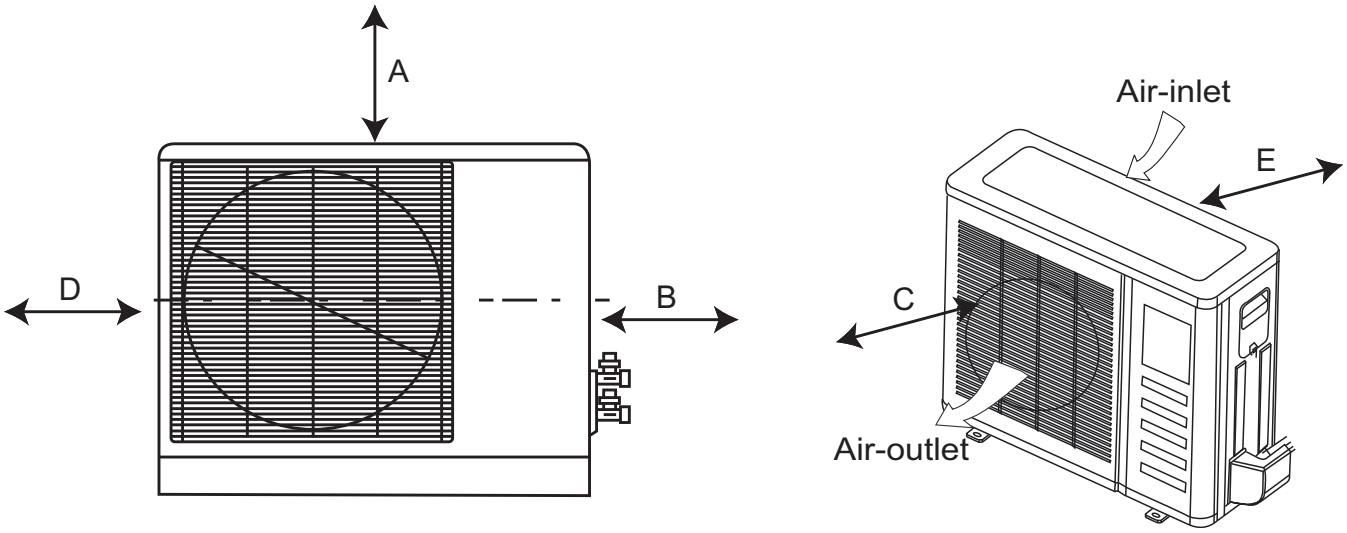


Table 7—Clearances

Table 8—Clearances

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

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

ELECTRICAL DATA

Table 9—Electrical Data

MULTI−ZONE OUTDOOR UNIT								
UNIT SIZE	SYSTEM VOLTAGE	OPERATING VOLTAGE	COMPRESSOR	OUTDOOR FAN			MCA	MAX FUSE/CB AMP
	VOLT / PHASE / HZ	MAX / MIN	RLA	FLA	HP	W		
18	208−230/1/60	253 / 187	9.7	3	0.16	50	15	20
27			8.85	3	0.16	120	19	25
36			13.4	3	0.16	120	27	40
48			13.5	3	0.11	85	29	50

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

LEGEND

FLA − Full Load Amps

MCA − Minimum Circuit Amps

RLA − Rated Load Amps

WIRING

All wires must be sized per NEC (National Electrical Code) or CEC (Canadian Electrical Code) and local codes. Use the 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.

Per the caution note, only stranded copper conductors with a 600 volt rating and double insulated copper wire must be used. The use of BX cable is not recommended.

Recommended Connection Method for Power and Communication Wiring −

Power and Communication Wiring:

The main power is supplied to the outdoor unit. The field supplied 14/3 power/communication wiring from the outdoor unit to the indoor unit consists of four (4) wires and provides the power for the indoor unit. Two wires are high voltage AC power, one is communication wiring and the other is a ground wire.

Recommended Connection Method for Power and Communication Wiring (To minimize communication wiring interference)

Power Wiring:

The main power is supplied to the outdoor unit. The field supplied power wiring from the outdoor unit to the indoor unit consists of three (3) wires and provides the power for the indoor unit. Two wires are high voltage AC power and one is a ground wire. To minimize voltage drop, the factory recommended wire size is 14/2 stranded with a ground.

Communication Wiring:

A separate shielded stranded copper conductor only, with a 600 volt rating and double insulated copper wire, must be used as the communication wire from the outdoor unit to the indoor unit. Please use a separate shielded 16GA stranded control wire.

⚠ 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.
- Use copper conductors only with a minimum 600 volt rating and double insulated copper wire.

⚠ 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 cause a unit malfunction.
- No wire should be allowed to touch the refrigerant tubing, compressor or any moving parts.
- Disconnecting means must be provided and be located within sight and readily accessible from the air conditioner.
- Connecting cable with conduit shall be routed through a hole in the conduit panel.

CONNECTION DIAGRAMS

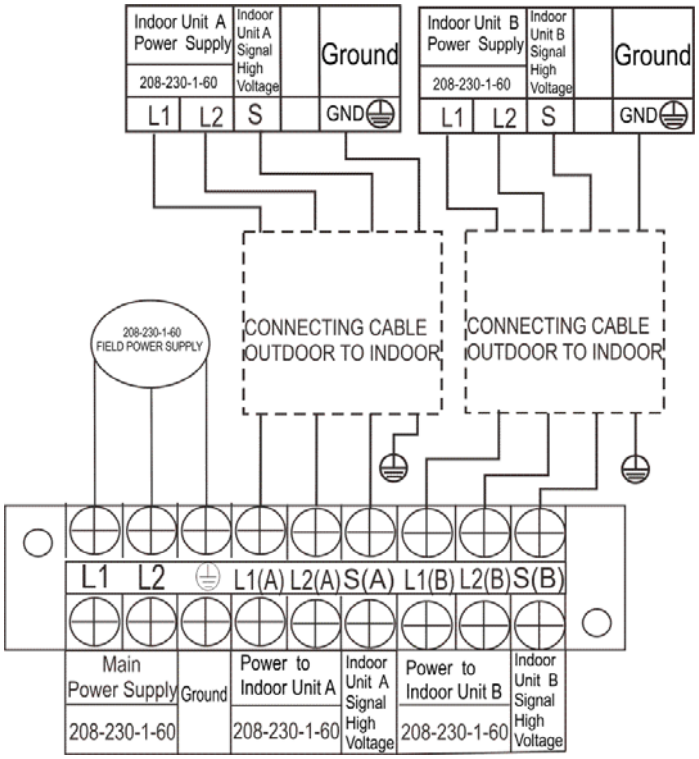


Fig. 5 – 18K

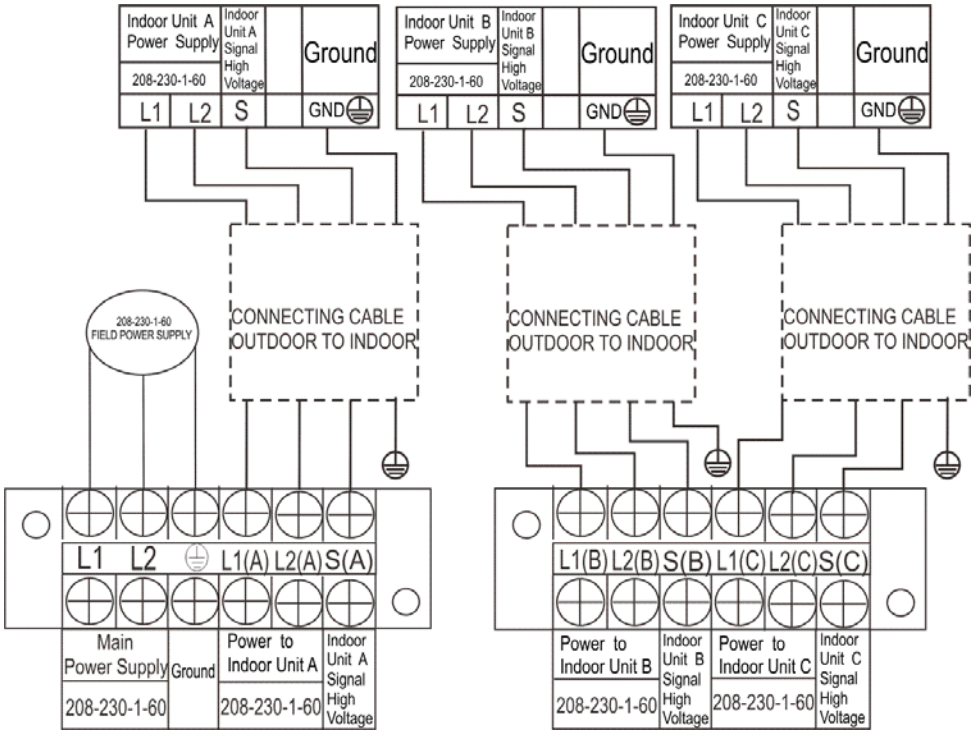


Fig. 6 – 27K

CONNECTION DIAGRAMS (CONT)

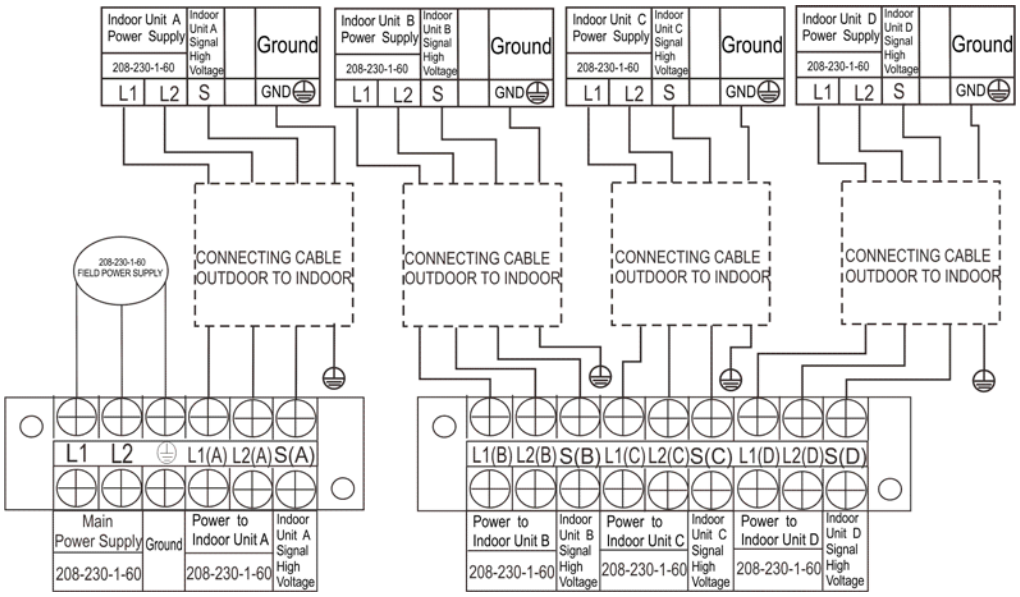


Fig. 7 – 36K

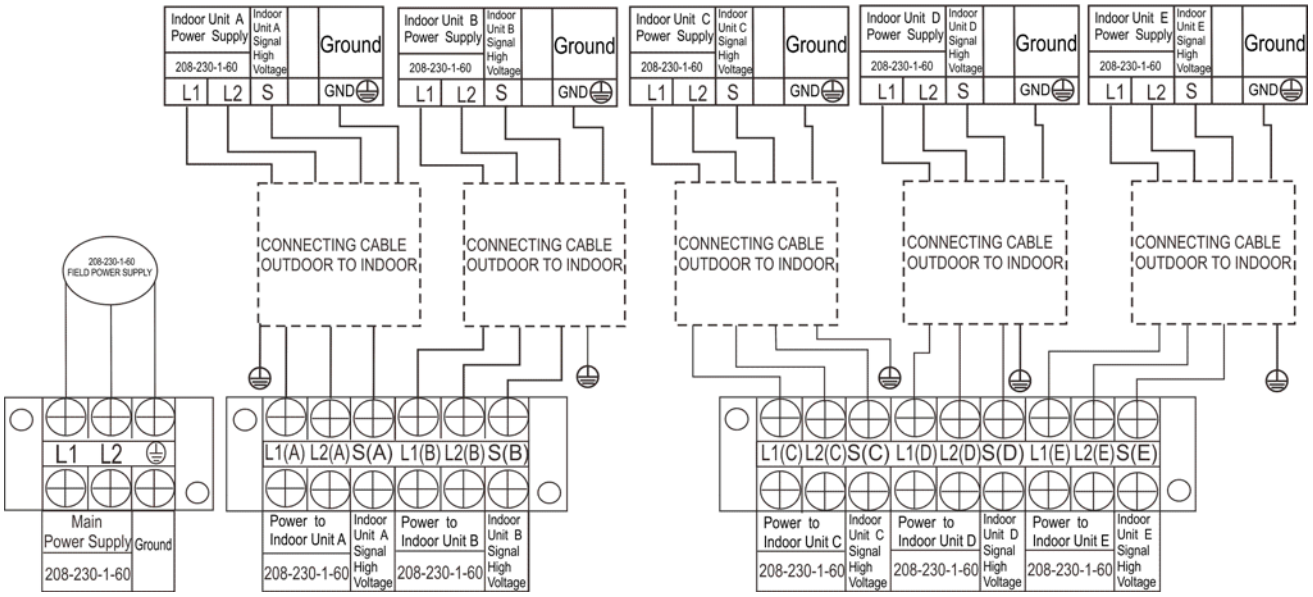


Fig. 8 – 48K

Notes:

1. Do not use thermostat wire for any connection between indoor and outdoor units.
2. All connections between indoor and outdoor units must be as shown. **The connections are sensitive to polarity and will result in a fault code.**

WIRING DIAGRAMS

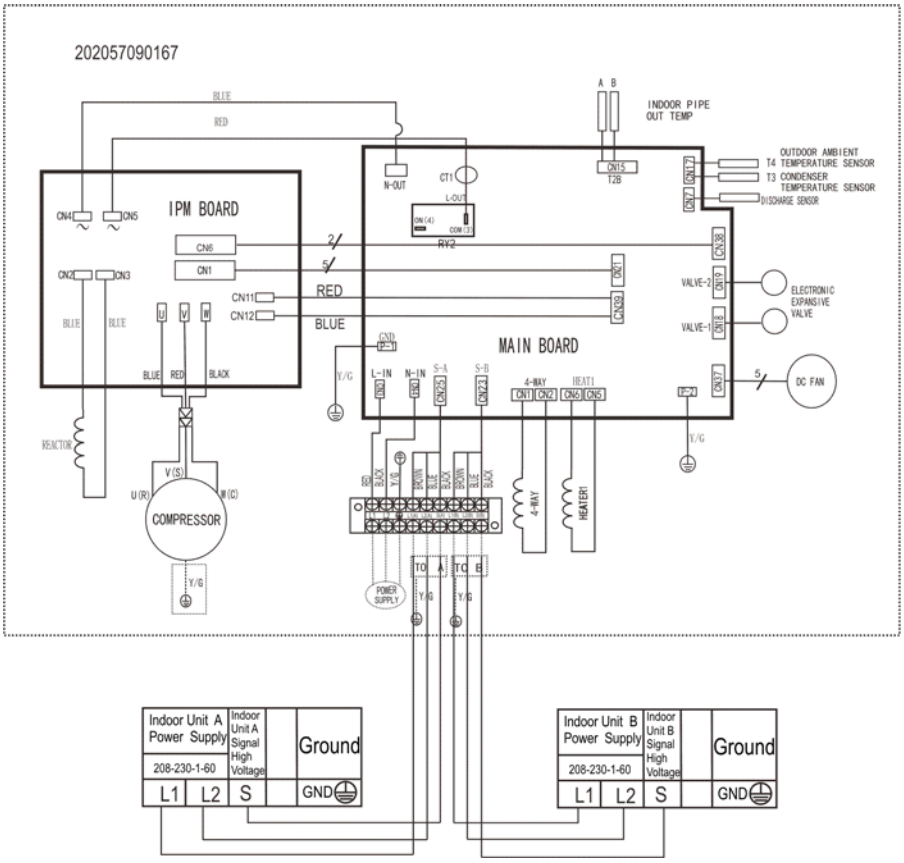


Fig. 9 – Wiring Diagrams 18K

Table 10—Unit Control Board Size 18

CODE	PART NAME
CN18/CN19/CN22	Output: Pin5&6(12V) Pin1−Pin4:Pulse waveform,(0−12V)
CN17	Input: Pin3~4 (5V) Pin2(0V),Pin1,Pin5(0−5V)
CN7	Input: Pin1 (0−5V) Pin2(5V)
CN1~CN2，CN5~CN6	Output: CN1~CN2，CN5~CN6（230VAC High voltage）
P1~P2	Output: Connection of the high voltage
CN3~CN4	Input:230VAC High voltage
CN14	Input：Pin1,Pin3(0V)，Pin2,Pin4（0~5V）
P−1,P−2	Connection to the earth
CN20,CN23,CN25	Output: Pin1（Connection of the high voltage），Pin2~Pin3 （230VAC High voltage）
CN15	Input: Pin1,Pin3,Pin5(5V)，Pin2,Pin4,Pin6（0~5V）
CN37	Output: Pulse(0−320VDC) for DC FAN
CN38	Input: Pin1~Pin2（17VDC）
N−OUT~L−OUT	Output: 230VAC High voltage
CN21	Input: Pin1~Pin3（12VDC），Pin2~Pin3（5VDC），Pin4~Pin3（0~5VDC），Pin5~Pin3（0~5VDC）
CN39	Input: 270~370VDC High voltage
OUTDOOR UNIT IPM BOARD	
CN4~CN5	Output: 230VAC High voltage
CN2,CN3	Connect to Reactor, (270~370VDC)
CN6	Output: Pin1~Pin2（17VDC）
CN1	Output:Pin1~Pin3（12VDC)，Pin2~Pin3（5VDC），Pin4~Pin3（0~5VDC），Pin5~Pin3（0~5VDC），
CN11~CN12	Output: 270~370VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC

WIRING DIAGRAMS (CONT)

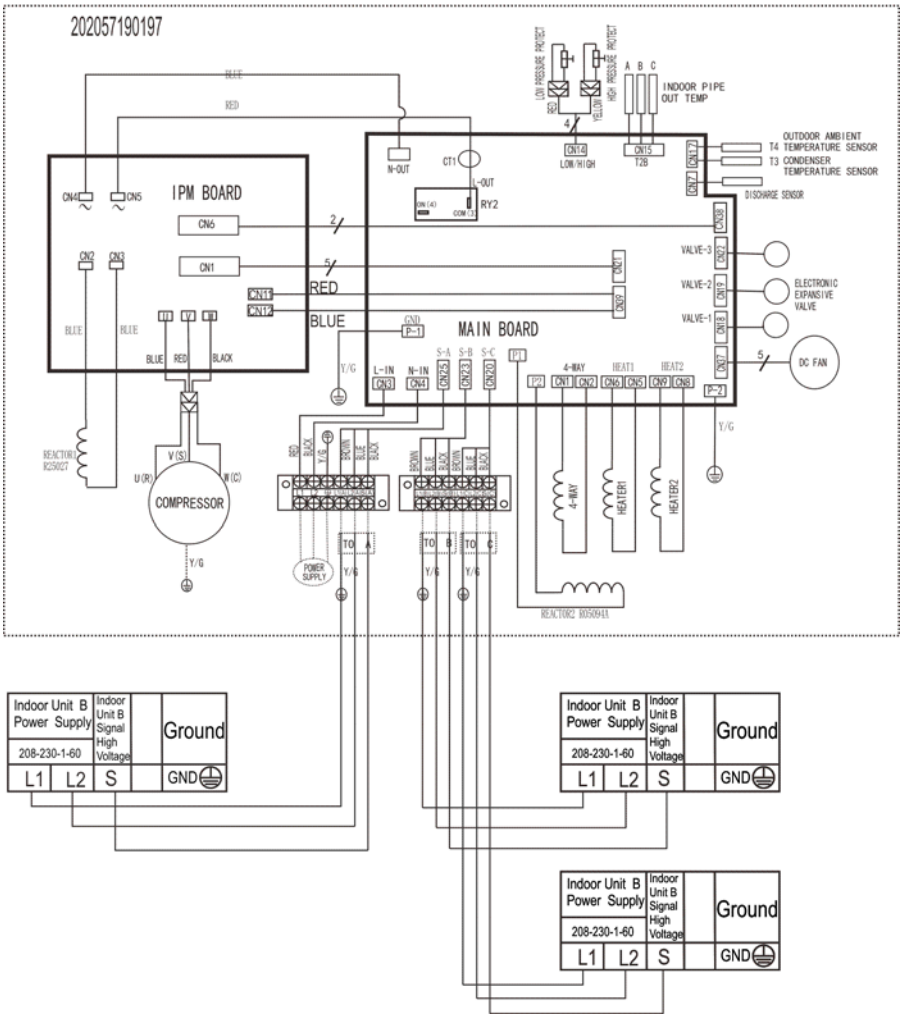
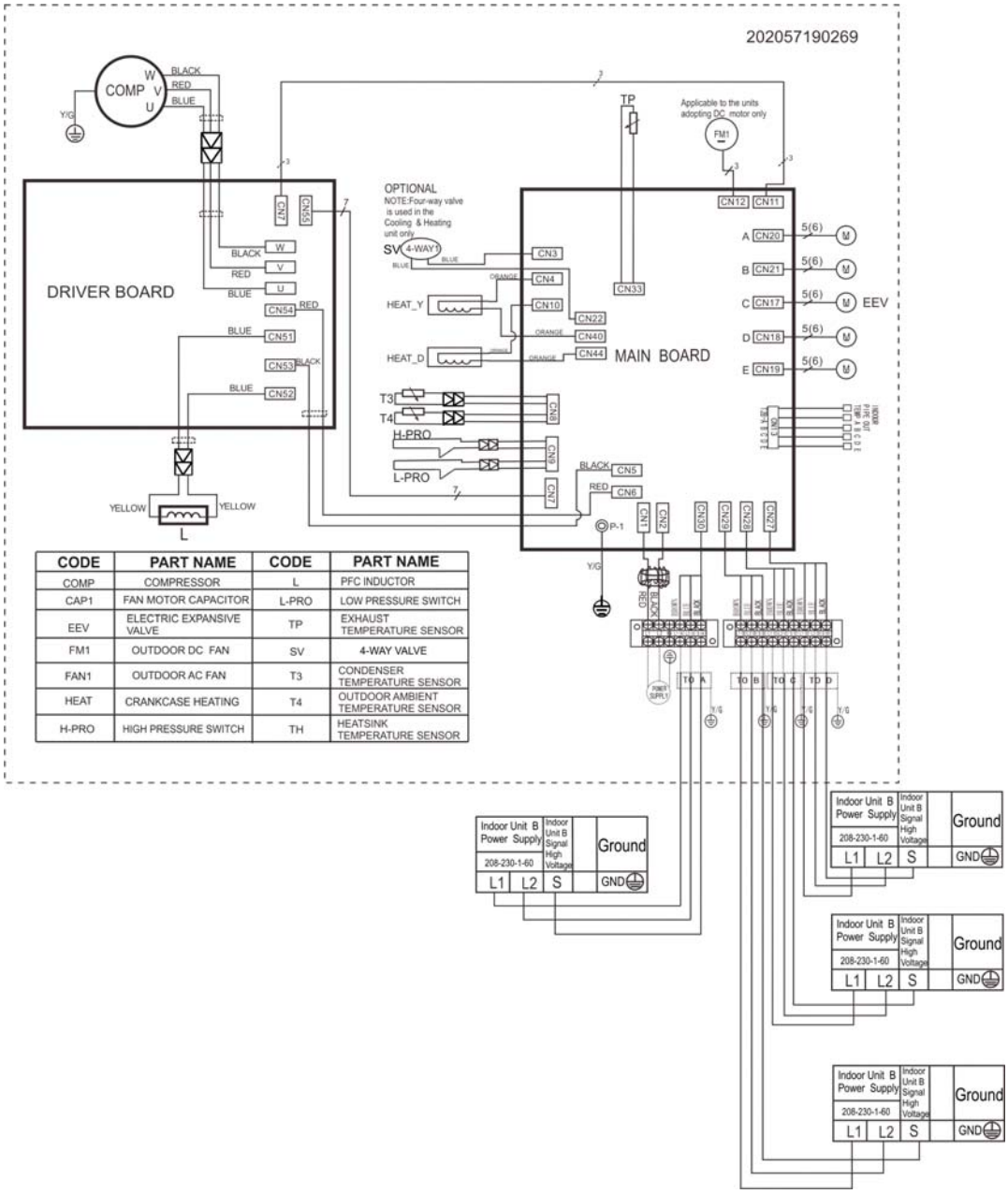


Fig. 10 – Wiring Diagrams 27K

Table 11—Unit Control Board Size 27

CODE	PART NAME
CN18/CN19/CN22	Output:Pin5&6(12V) Pin1−Pin4:Pulse waveform,(0−12V)
CN17	Input:Pin3~4 (5V) Pin2(0V),Pin1,Pin5(0−5V)
CN7	Input:Pin1 (0−5V) Pin2(5V)
CN1～CN2，CN5～CN6	Output: CN1～CN2，CN5～CN6（230VAC High voltage）
P1～P2	Output: Connection of the high voltage
CN3～CN4	Input:230VAC High voltage
CN14	Input：Pin1,Pin3(0V)，Pin2,Pin4（0～5V）
P−1,P−2	Connection to the earth
CN20,CN23,CN25	Output: Pin1（Connection of the high voltage），Pin2～Pin3（230VAC High voltage）
CN15	Input: Pin1,Pin3,Pin5(5V)，Pin2,Pin4,Pin6（0～5V）
CN37	Output: Pulse(0−320VDC) for DC FAN
CN38	Input: Pin1～Pin2（17VDC）
N−OUT~L−OUT	Output: 230VAC High voltage
CN21	input:Pin1～Pin3（12VDC），Pin2～Pin3（5VDC），Pin4～Pin3（0～5VDC），Pin5～Pin3（0～5VDC）
CN39	Input: 270～370VDC High voltage
OUTDOOR UNIT IPM BOARD	
CN4～CN5	Output: 230VAC High voltage
CN2,CN3	Connect to Reactor, (270～370VDC)
CN6	Output: Pin1～Pin2（17VDC）
CN1	Output:Pin1～Pin3（12VDC），Pin2～Pin3（5VDC），Pin4～Pin3（0～5VDC），Pin5～Pin3（0～5VDC）
CN11～CN12	Output: 270～370VDC High voltage
U～V～W	Connect to compressor voltage among phases 0～200VAC

WIRING DIAGRAMS (CONT)



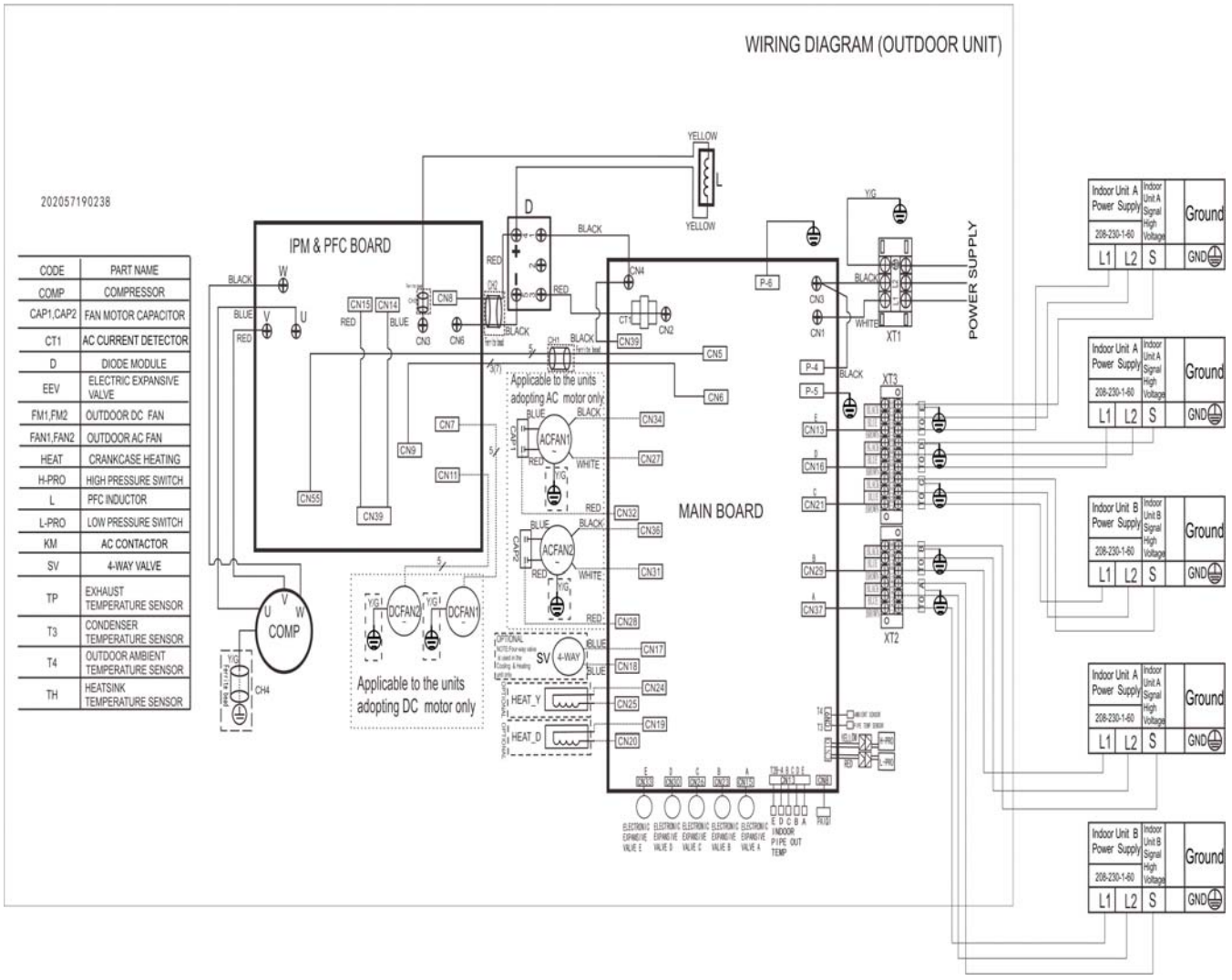
CODE	PART NAME	CODE	PART NAME
COMP	COMPRESSOR	L	PFC INDUCTOR
CAP1	FAN MOTOR CAPACITOR	L-PRO	LOW PRESSURE SWITCH
EEV	ELECTRIC EXPANSIVE VALVE	TP	EXHAUST TEMPERATURE SENSOR
FM1	OUTDOOR DC FAN	SV	4-WAY VALVE
FAN1	OUTDOOR AC FAN	T3	CONDENSER TEMPERATURE SENSOR
HEAT	CRANKCASE HEATING	T4	OUTDOOR AMBIENT TEMPERATURE SENSOR
H-PRO	HIGH PRESSURE SWITCH	TH	HEATSINK TEMPERATURE SENSOR

Fig. 11 – Wiring Diagram 36K

Table 12—Unit Control Board Size 36

CODE	PART NAME
CN17/CN18/CN19/CN20/CN21	Output:Pin5&6 (12V) Pin1−Pin4:Pulse waveform,(0−12V)
CN8	Input:Pin3~4 (5V) Pin2 (0V),Pin1,Pin5 (0−5V)
CN33	Input:Pin1 (0−5V) Pin2 (5V)
CN4~CN40,CN10~CN44	Output: CN4~CN40, CN10~CN44 (230VAC High voltage)
CN3~CN22	Output: High voltage for 4−way control
CN1~CN2	Input: 230VAC High voltage
CN9	Input; Pin1,Pin3 (0V), Pin2,Pin4 (0~5V)
P−1	Connection to the earth
CN27,CN28,CN29,CN30	Output: Pin1 (Connection of the high voltage), Pin2~Pin3 (230VAC High voltage)
CN13	Input: Pin1, Pin3, Pin5 (5V),Pin2, Pin4, Pin6 (0~5V)
CN12	Output: Pulse (0−200VAC) for DC FAN
CN11	Output: Pulse (0−200VAC) for DC FAN
CN5~CN6	Output: 230VAC High voltage
CN7	Input:Pin1~ Pin3 (12VDC),Pin2~ Pin3 (5VDC), Pin4~ Pin3 (0~ 5VDC), Pin5~ Pin3 (0~ 5VDC), Pin6~ Pin3 (0~ 5VDC), Pin7~ Pin3 (0~ 5VDC)
OUTDOOR UNIT IPM BOARD	
CN4~CN5	Output: 230VAC High voltage
CN2,CN3	Connect to Reactor, (270~370VDC)
CN6	Output: Pin1~Pin2（17VDC）
CN1	Output: Pin1~Pin3（12VDC）, Pin2~Pin3（5VDC）, Pin4~Pin3（0~5VDC）, Pin5~Pin3（0~5VDC）,
CN11~CN12	Output: 270~370VDC High voltage
U~V~W	Connect to compressor voltage among phases 0~200VAC

WIRING DIAGRAMS (CONT)



CODE	PART NAME
COMP	COMPRESSOR
CAP1,CAP2	FAN MOTOR CAPACITOR
CT1	AC CURRENT DETECTOR
D	DIODE MODULE
EEV	ELECTRIC EXPANSIVE 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

Fig. 12 – Wiring Diagrams 48K

Table 13—Unit Control Board Size 48K

CODE	PART NAME
CN1, CN3、P−1	Power input: 230V AC
CN2, CN4	Output: Power output for DRIVER BOARD (230V AC)
CN5	Input: Communication Main board and IPM Board, Pin1 (5V DC)
CN6	Input: DC FAN motor1 and DC FAN motor 2 control, (Pin7 5V DC)
CN8, CN9	Input: Temperature sensor (5V DC)
CN10	Input: Pressure test (5V DC)
CN13	Input: Indoor pipe Temperature sensor, Pin1&Pin3&Pin5&Pin7&Pin9&Pin11 (5V DC)
CN15, CN23, CN26, CN30, CN33	Output: PMV control，Pin5 (12V DC), Pin6 (12V DC)
CN17, CN18	Output: High voltage for 4−way(SV) control (230V AC)
CN19, CN20	Output: High voltage for HEAT_D control (230V AC)
CN13, CN16, CN21, CN29, CN37	Output: Communication to indoor unit, Pin2 and Pin3 (230V AC), Pin1 (S, connection to high voltage)
CN24, CN25	Output: High voltage for HEAT_Y control(230V AC)
CN27、CN32、CN34，CN28、CN31、CN36	Output: Power output for AC FAN motor1 and AC FAN motor2 (230V AC)
CN39	Output: L2 for AC FAN、SV and HEAT, High voltage (AC)
P−5, P−6	Connection to the earth
OUTDOOR UNIT IPM BOARD	
U V W	Output: Pulse (0−380VDC) for COMPRESSOR
CN3	Output: Connect PFC Inductance, high DC voltage
CN6, CN8	Input: Power input for DRIVER BOARD (200−320V DC)
CN7, CN11	Output: DC FAN motor1 and DC FAN motor2 control (Pin1 310V or 380V DC)
CN9	Output: Communication Main board and IPM Board Pin7(5V DC)
CN55	Output: Communication IPM Board and Main board Pin1(12V DC)
CN14、CN15−−CN39,	Output: High DC voltage (310V or 380V DC)

REFRIGERATION CYCLE DIAGRAMS

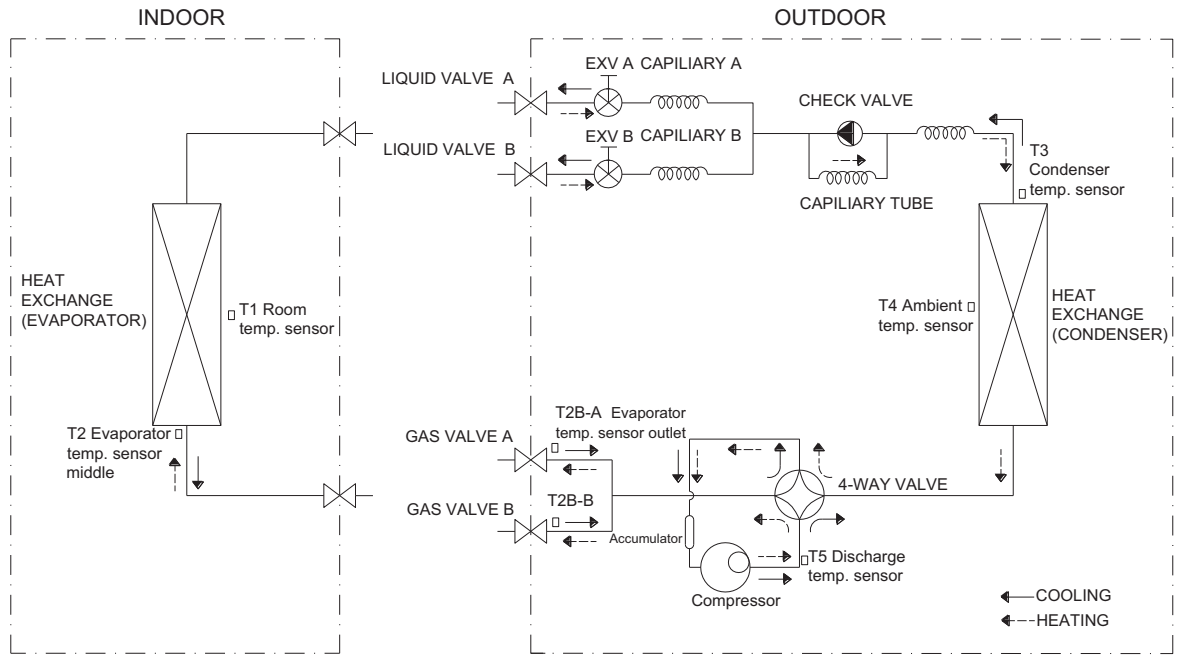


Fig. 13 – Refrigeration Cycle Diagram Size 18

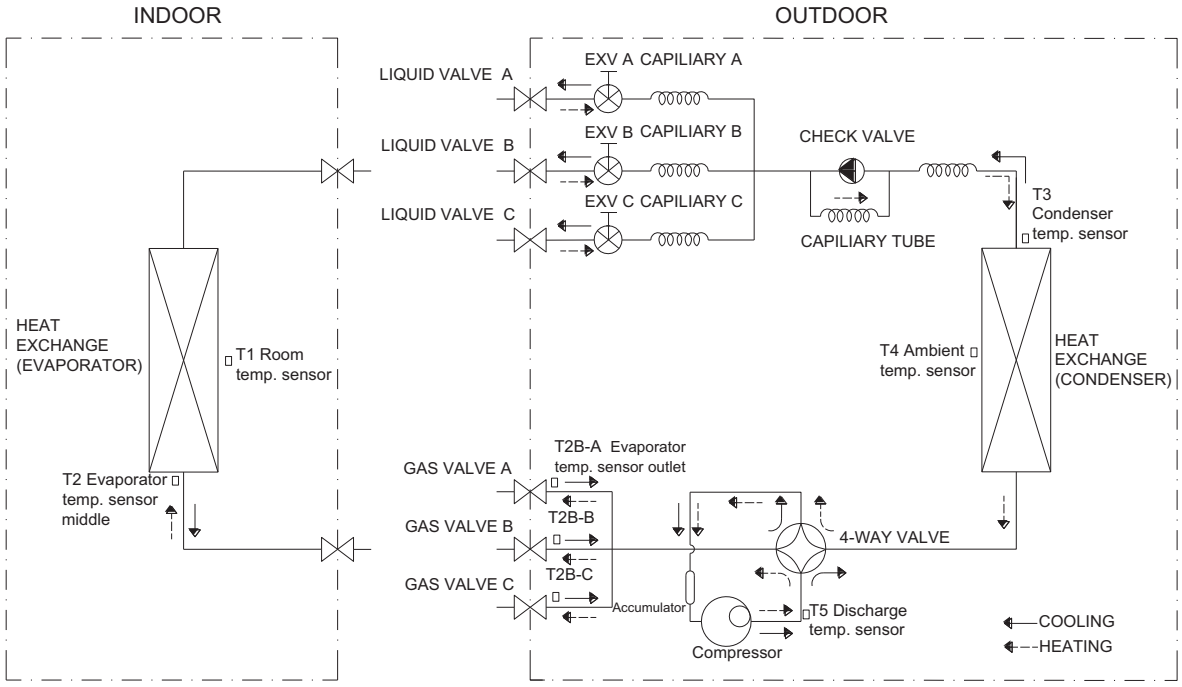


Fig. 14 – Refrigeration Cycle Diagram Size 27

REFRIGERATION CYCLE DIAGRAMS (CONT)

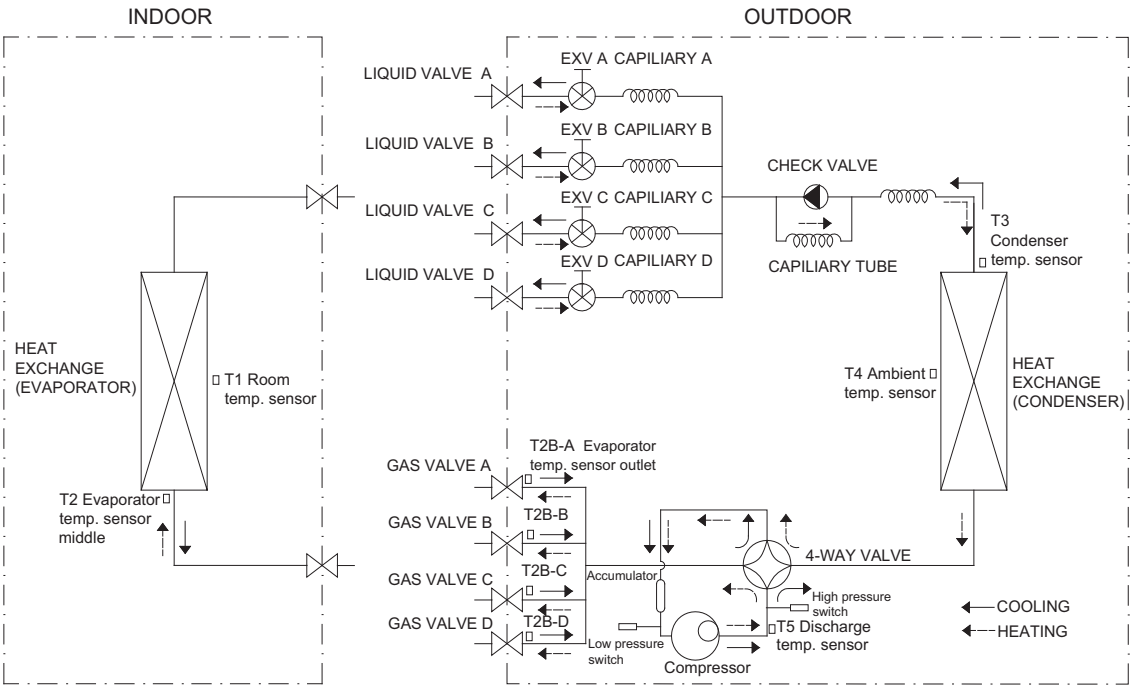


Fig. 15 – Refrigeration Cycle Diagram Sizes 36

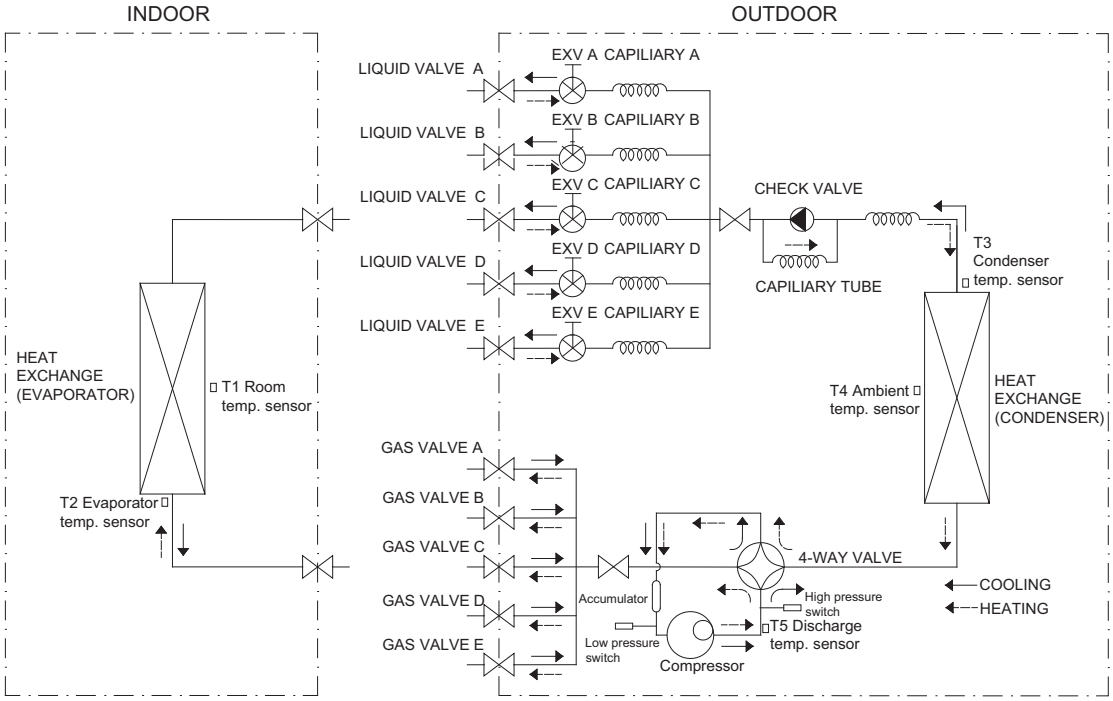


Fig. 16 – Refrigeration Cycle Diagram Size 48

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 25ft. (7.6m). For runs over 25 ft. (7.6m), consult long−line section on this page for proper charge adjustments.

2 Minimum refrigerant line length between the indoor and outdoor units is 10ft. (3m).

3 Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36−in. (914mm) should be buried. Provide a minimum 6−in. (152mm) vertical rise to the service valves to prevent refrigerant migration.

4 Both lines must be insulated. Use a minimum of 1/2−in. (12.7mm) 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 14—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)	32(10)	32(10)	32(10)	32(10)
	Max. outdoor−indoor height difference (IU higher than OU)	ft (m)	49(15)	49(15)	49(15)	49(15)
	Max. height different between indoor units	ft (m)	32(10)	32(10)	32(10)	32(10)
	Max. Length per each indoor unit	ft (m)	66(20)	82(25)	98(30)	98(30)
	Max. Piping Length with no additional refrigerant charge per System (Standard Piping length x No. of Zones)	ft (m)	49(15)	74(22.5)	98(30)	123(37.5)
	Total Maximum Piping Length per system	Ft. (m)	98(30)	147(45)	196(60)	245(75)
	Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16(15)	0.16(15)	0.16(15)	0.16(15)
	Gas Pipe Size	in (mm)	3/8*2 (9.52*2)	3/8*2 (9.52*3)	1/2 *1 (12.7*1) + 3/8*3 (9.5*3)	1/2 *2 (12.7*2) + 3/8*3 (9.5*3)
Refrigerant	Liquid Pipe Size	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)
	Refrigerant Type		R410A	R410A	R410A	R410A
	Charge Amount	Lbs (kg)	4.19 (1.9)	6.17 (2.8)	7.94 (3.6)	10.14 (4.6)

NOTE: **The refrigerant charge included is adequate for the outdoor unit's maximum number of zones multiplied by the standard piping length per zone.**

Long Line Applications,:

1 No change in line sizing is required.

2 Add refrigerant per Table 15.

Table 15—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	67.02 (1.9)	49 (15)	0.16 (15)	98 (30)
27	3	98.76 (2.8)	74 (22.5)	0.16 (15)	147 (45)
36	4	126.98 (3.6)	98 (30)	0.16 (15)	196 (60)
48	5	162.26 (4.6)	123 (37.5)	0.16 (15)	245 (75)

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. 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. 17.).

2 Connect charge hose to vacuum pump.

3 Fully open the low side of manifold gage (see Fig. 18).

4 Start the 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. (8m) of line length. For refrigerant lines longer than 25ft. (8m), add refrigerant as specified in the *ADDITIONAL REFRIGERANT CHARGE* table in this document.

8 Disconnect charge hose from charge connection of the low side service valve.

9 Securely tighten caps of service valves.

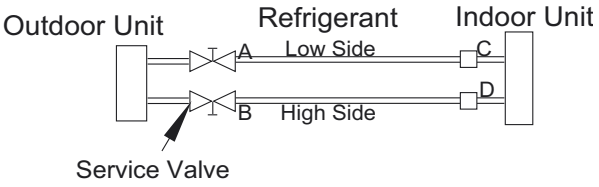


Fig. 17 – Service Valve

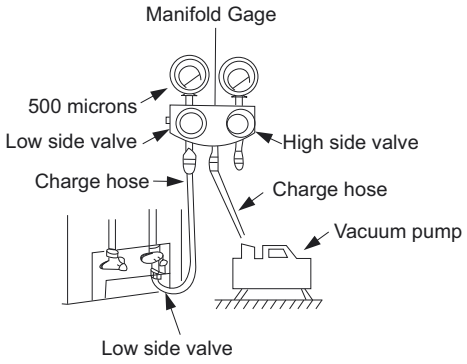


Fig. 18 – Manifold

Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water (see Fig. 19).

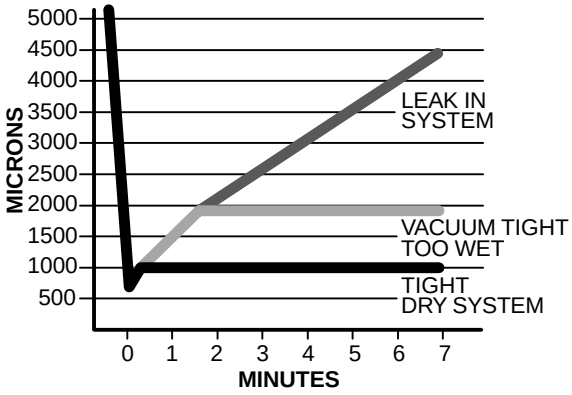


Fig. 19 – Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 20 and proceed as follows:

1 Pump system down to 500 MICRONS of mercury and allow pump to continue operating for an additional 15 minutes.

2 Close service valves and shut off vacuum pump.

3 Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.

4 Close service valve and allow system to stand for 10 minutes. During this time, dry nitrogen will be able to diffuse throughout the system absorbing moisture.

5 Repeat this procedure as indicated in Fig. 20. System will then be free of any contaminants and water vapor.

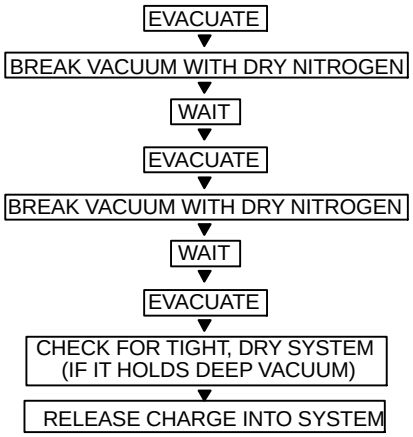


Fig. 20 – Triple Evacuation Method

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 1 minute to start up the first time. Further restarts take 3 minutes.

Compressor Discharge Temperature Protection

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

- If 215°F (102°C) ≦ T5<244°F (115°C), maintain the current frequency.
- If the temperature increases and T5 ≧ 230°F (110°C), decrease the frequency to a lower level every 2 minutes until F1.
- If T5≧239°F (115°C) for 10 seconds, the compressor stops and then restarts until T5<194°F (90°C).

Fan Speed Malfunction

If the outdoor fan speed is lower than 300RPM 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

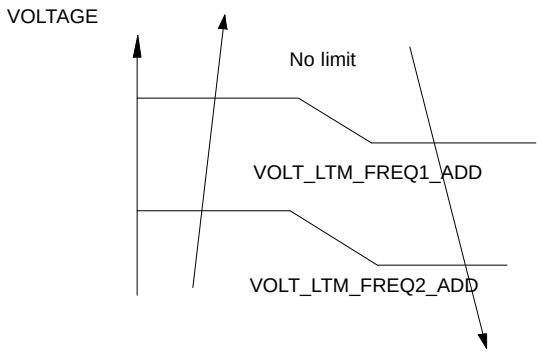


Fig. 21 – Low Voltage Protection

If these protections are triggered, the unit stops and the LED displays the failure code. The unit restarts 3 minutes after the protection mechanism turns off.

NOTE: **If the low voltage protection triggers and the voltage does not restore to normal within 3 minutes, the protection remains active even after a machine restart.**

Compressor Current Limit Protection

If the compressor current exceeds the current limit value for 10 seconds, the compressor frequency will be limited as shown in Table 16.

Cooling Mode

Table 16—Cooling Mode

Current frequency (Hz)	Current limit value(A)	Frequency limit
COOL_F16	ICOOLLMT12	Decrease the frequency to COOL_F4 and run at COOL_F4 for 3 minutes. After that, the frequency will be adjusted according to the capacity demand and rise to the upper level every 3 minutes (When the frequency>COOL_F4 via capacity demand).
COOL_F15	ICOOLLMT11	
COOL_F14	ICOOLLMT10	
COOL_F13	ICOOLLMT9	
COOL_F12	ICOOLLMT8	
COOL_F11	ICOOLLMT7	
COOL_F10	ICOOLLMT6	
COOL_F9	ICOOLLMT5	
COOL_F8	ICOOLLMT4	
COOL_F7	ICOOLLMT3	
COOL_F6	ICOOLLMT2	
COOL_F5	ICOOLLMT1	
If the current frequency is lower than COOL_F4, the frequency will not be limited. After 10s of the compressor start, if the current>ICOOL, the AC will display the failure for 30 seconds and stop. The AC will restart 3 minutes later.		

Heating Mode

Table 17—Heating Mode

Current frequency (Hz)	Current limit value(A)	Frequency limit
HEAT_F16	IHEATLMT12	Decrease the frequency to HEAT_F4 and run at HEAT_F4 for 3 minutes. After that, the frequency will be adjusted according to the capacity demand and rise to the upper level every 3 minutes (When the frequency>Heat_F4 via capacity demand).
HEAT_F15	IHEATLMT11	
HEAT_F14	IHEATLMT10	
HEAT_F13	IHEATLMT9	
HEAT_F12	IHEATLMT8	
HEAT_F11	IHEATLMT7	
HEAT_F10	IHEATLMT6	
HEAT_F9	IHEATLMT5	
HEAT_F8	IHEATLMT4	
HEAT_F7	IHEATLMT3	
HEAT_F6	IHEATLMT2	
HEAT_F5	IHEATLMT1	
If the current frequency is lower than HEAT_F4, the frequency will not be limited. After 10s of the compressor start, if the current>IHEAT, the AC will display the failure for 30 seconds and stop. The AC will restart 3 minutes later.		

Indoor / Outdoor Units Communication Protection

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

High Condenser Coil Temperature Protection

When T3>149°F (65°C) for 3 seconds, the compressor stops while the indoor fan and outdoor fan continues. When T3<125.6°F(52°C), the protection releases and the compressor restarts after 3 minutes.

Outdoor Unit Anti−Freezing Protection

When T2B< 32°F (0°C), the indoor unit capacity demand is zero and resumes the normal operation when T2B>50°F (10°C) and the protection time is no less than 3 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.

Compressor Preheating Functions

−−−−Preheating permitting condition:

If T4 (outdoor ambient temperature) <37.4°F(3°C) and newly powered on or if T4<37.4°F(3°C) and the compressor has stopped for over 3 hours, the compressor heating cable will work.

−−−−Preheating mode:

A weak current flow through the coil of compressor from the wiring terminal of compressor, then the compressor is heated without operation.

−−−−Preheating release condition:

If T4>41°F(5°C) or the capacity demand is not zero, preheating function will stop.

Compressor Crankcase Heater

−−−−Preheating permitting condition:

When T4<37.4°F(3°C) within 5 seconds of being plugged in, the crankcase heater will be active.

When T4<37.4°F(3°C) and the compressor is not running for 3 hours, the crankcase heater will be active.

−−−−Preheating release condition:

When T4≥ 37.4°F(5°C) or the indoor has capacity demand, the crankcase heater will stop working.

Controls and Functions

Capacity Request Calculation

Total capacity Request=Σ (Norm code x HP) /10x modify rate + correction.

Cooling Mode:

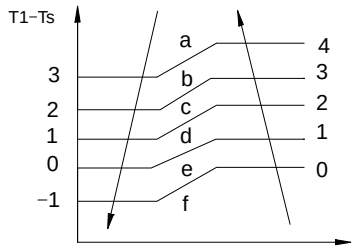


Fig. 22 – Cooling Mode

Table 18—Cooling Mode

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

Table 19—Cooling Mode

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

NOTE: The final result is an integer.

Add all the indoor capacity request together, then modify it by T4 when there is only on indoor unit.

Table 20—Outdoor Temperature (T4)

Cooling	>84.2°F (29°C)	64.4°F−84.2°F (18°C−29°C)	<62.6°F (17°C)
Modify Rate	100%	60%	40%

When there is more than one indoor unit.

Table 21—Outdoor Temperature (T4)

Cooling	>77°F (25°C)	62.6°F−77°F (17°C−25°C)	<62.6°F (17°C)
Modify Rate	100%	80%	40%

NOTE: The final result is integer.

In the low ambient **COOLING** mode, modify rate is fixed as 40%. According to the final capacity request to confirm the operating frequency (see Table 22).

Table 22—Operating Frequency

Frequency (Hz)	0	COOL_F1	COOL_F2	−−−−−	COOL_F15	COOL_F16
Amendatory Capacity Demand	0	1	2	−−−−−	15	16

Meanwhile the maximum running frequency will be adjusted according to the outdoor ambient temperature.

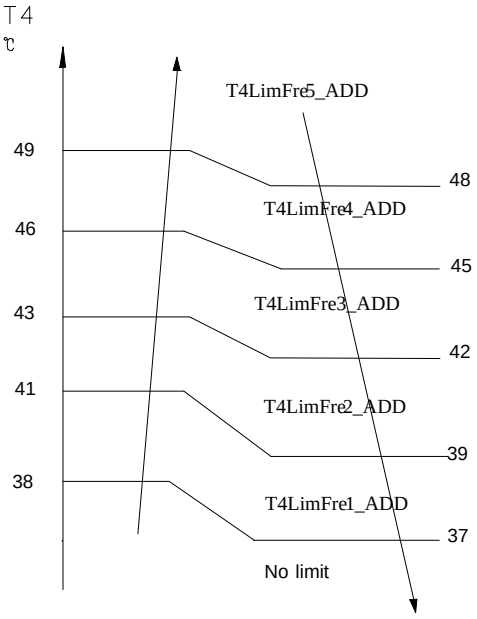


Fig. 23 – Maximum Running Frequency

Heating Mode

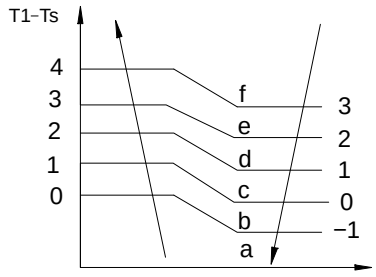


Fig. 24 – Heating Mode

Table 23—Outdoor Temperature (T4)

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

Table 24—Heating Mode

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

Add all the indoor capacity request together, then modify it by T4 when there is only one indoor unit.

Table 25—Outdoor Temperature

Heating	<32°F (0°C)	<53.6°F (12°C)	53.6°F~62.6 °F (12°C~17 °C)	≥62.6°F (17°C)
Modify Rate	120%	80%	40%	20%

When there is more than one indoor unit.

Table 26—Outdoor Temperature

Heating	<32°F (0°C)	<53.6°F (12°C)	53.6°F~62.6 °F (12°C~17 °C)	≥62.6°F (17°C)
Modify Rate	120%	100%	80%	60%

NOTE: The final result is integer.

Then modify it according to T2 average (correction):

NOTE: Average value of T2: Sum T2 value of all indoor units)/ (indoor units number)

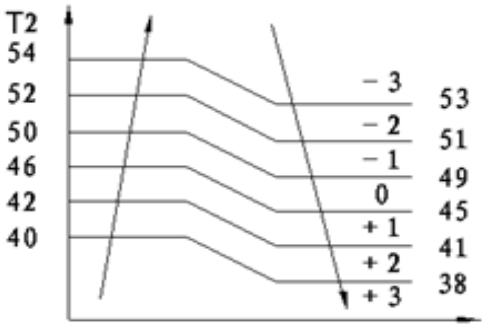


Fig. 25 – T2 Average

According to the final capacity, request to confirm the operating frequency (see Table 27).

Table 27—Operating Frequency

Frequency (Hz)	0	HEAT_F1	HEAT_F2	−−−	HEAT_F15	HEAT_F16
Amendatory Capacity Demand.	0	1	2	−−−	15	16

Heating Capacity improved in Low Ambient Heating

In the HEATING mode, when T2<T2_ExitT4LowFre_ADD, and T4<−4 °C, there is a frequency elevation:

Elevated Frequency = Recent frequency * 110%

When T2> T2_ExitT4LowFre_ADD−2 and T4>−6, the highest frequency can not exceed F17

When T2> T2_ExitT4LowFre_ADD−4 and T4>−8, the highest frequency can not exceed F18

When T2> T2_ExitT4LowFre_ADD−6 and T4>−10, the highest frequency can not exceed F19

In the other conditions, the highest frequency is F20

Defrosting Control

Defrosting Conditions

T3≤TempEnterDefrost_ADD °C and lasts for 40 minutes.

Defrosting Action

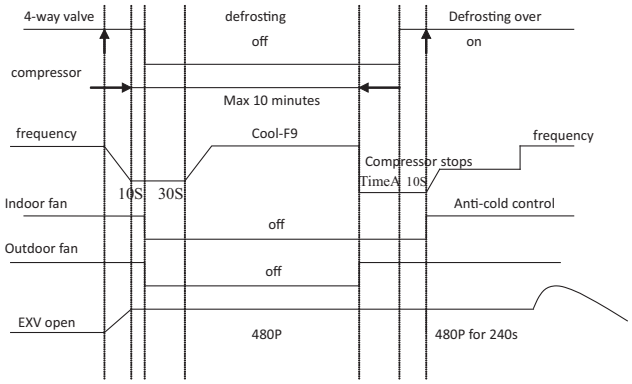


Fig. 26 – Defrosting Action

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 °C;
2 The defrosting time achieves 10 min.
3 Turn to other modes or **OFF**.

Outdoor Fan Control

COOLING Mode

Normally the system chooses the running fan speed according to ambient temperature.

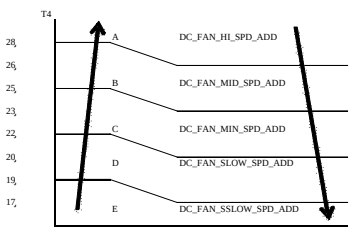


Fig. 27 – Cooling Mode

Table 28 provides an example of when the low ambient cooling is valid.

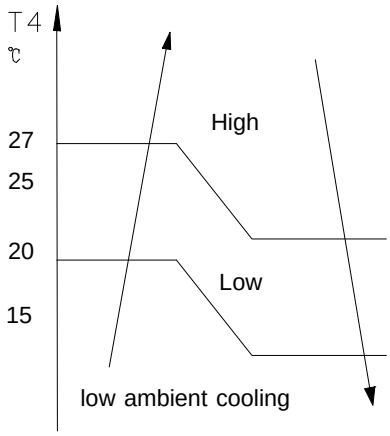


Fig. 28 – Low Ambient Cooling

Outdoor fan speed control logical (low ambient cooling)

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

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

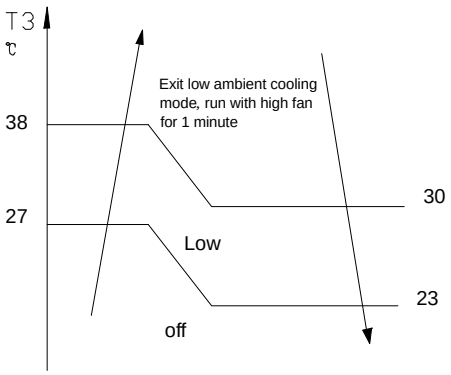


Fig. 29 – Outdoor Fan

HEATING Mode

Normally the system chooses the running fan speed according to ambient temperature.

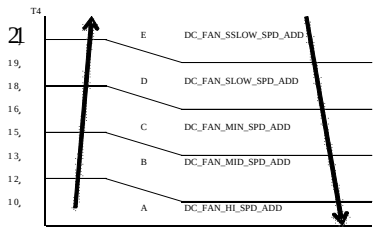


Fig. 30 – Heating Mode

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 250P, adjustment range is 100−350p. When the unit starts to work for 3 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 2 minutes.

Heating mode

The initial open angle of EXV is 250P, dependent on indoor model size, adjustment range is 100−350p. After the unit works for 3 minutes, the outdoor unit receives the indoor units' (of capacity demand) T2 information and calculates the their average. After comparing each indoor units' T2 with the average, the outdoor unit gives the following modification commands.

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

Four−way valve control

In the Heating mode, the four−way valve opens. In the 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 2 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 Next 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 board to avoid shock hazard and board damage.

Diagnostic Guides

Table 28—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
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	Low pressure protection	— —
P3	Current protection of compressor	— —
P4	Temperature protection of compressor discharge	— —
P5	High temperature protection of condenser	— —
P6	IPM module protection	P0

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.

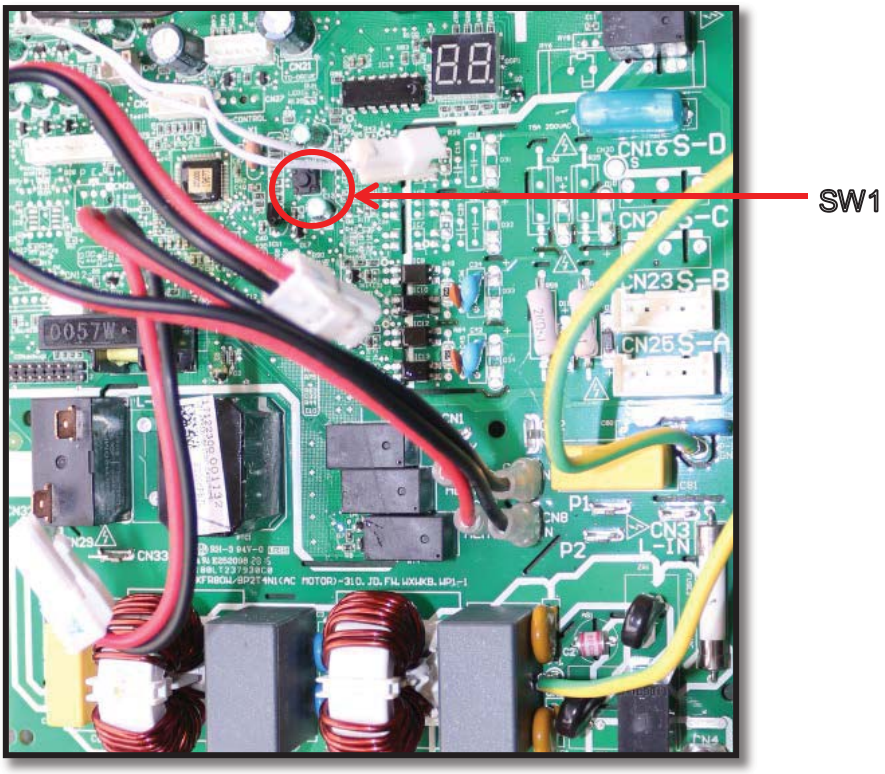


Fig. 31 – Outdoor PCB

OUTDOOR UNIT DISPLAY (CONT)

Table 29—Outdoor PCB

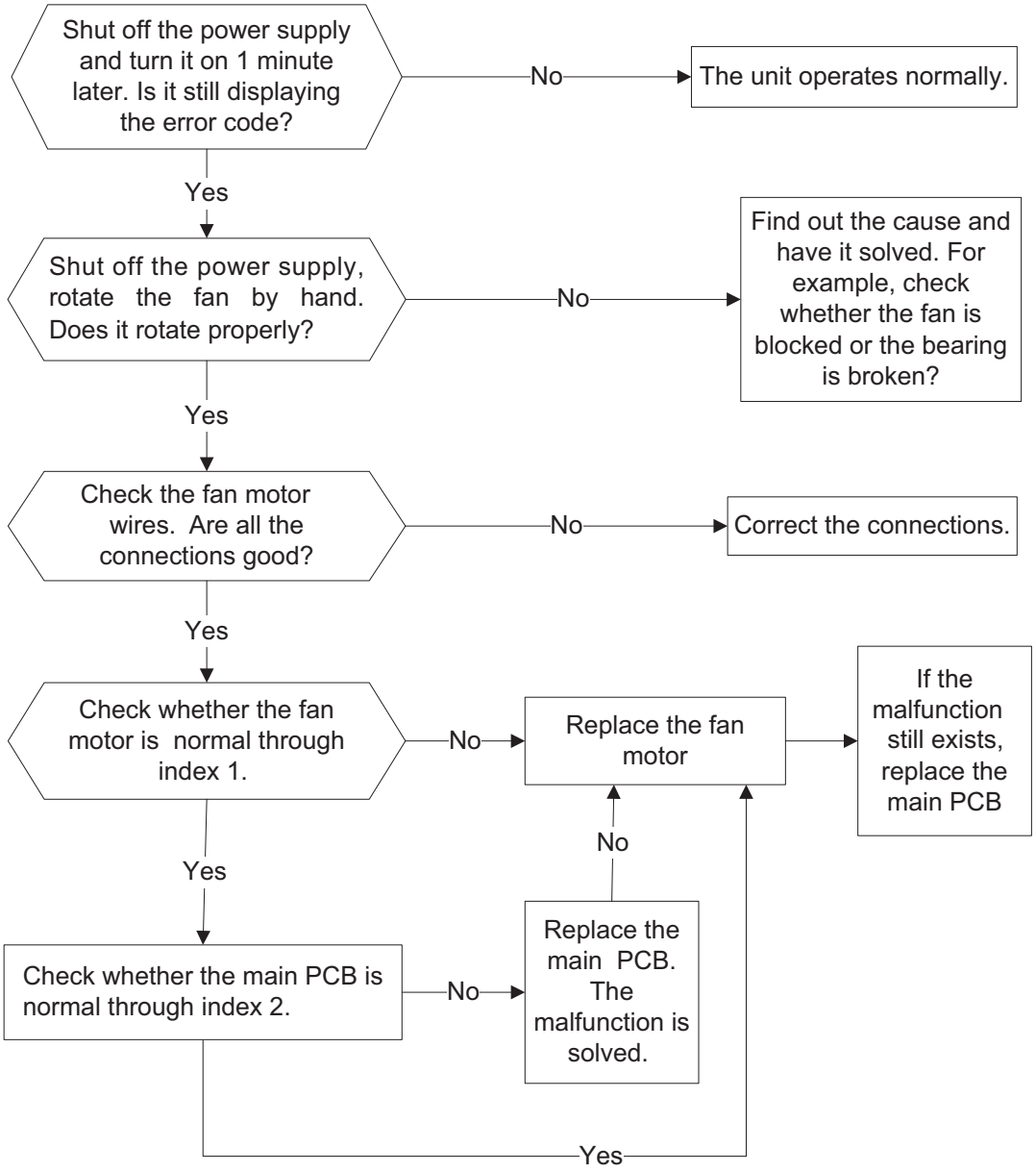
No. of Presses	Display	Remark		
0	Normal Display	Displays running frequency, running state, or malfunction code		
1	Quantity of indoor units with working connection	**Actual Data**		
		Display	**Number of Indoor Units**	
		1	1	
		2	2	
		3	3	
		4	4	
2	Outdoor unit running mode code	Off: 0, Fan only: 1, 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 15.8°F(−9°C), the digital display shows "−9." If the temperature is higher than 158°F (70°C), the digital display shows "70." If the indoor unit is not connected, the digital display shows: "——"		
18	Indoor unit B evaporator outlet temperature (T_{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 32°F (0°C), the digital display shows "0." If the temperature is higher than 122°F (50°C), the digital display shows "50." If the indoor unit is not connected, the digital display shows: "——"		
23	Indoor unit B room temperature (T_1B)			
24	Indoor unit C room temperature (T_1C)			
25	Indoor unit D room temperature (T_1D)			
26	Indoor unit E room temperature (T_1E)			
27	Indoor unit A evaporator temperature (T_2A)	If the temperature is lower than 15.8°F(−9°C), the digital display shows "−9." If the temperature is higher than 158°F (70°C), the digital display shows "70." If the indoor unit is not connected, the digital display shows: "——"		
28	Indoor unit B evaporator temperature (T_2B)			
29	Indoor unit C evaporator temperature (T_2C)			
30	Indoor unit D evaporator temperature (T_2D)			
31	Indoor unit E evaporator temperature (T_2E)			
32	Condenser pipe temperature (T3)			
33	Outdoor ambient temperature (T4)			
34	Compressor discharge temperature (TP)	The display value is between 86°F−264.2°F (30°C–129°C). If the temperature is lower than 86°F (30 ℃), the digital display shows "30." If the temperature is higher than 210.2°F (99 ℃), the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 221°F(105 °C).		
35	AD value of current	The display value is a hex number. For example, the digital display tube shows "Cd", it means AD value is 205.		
36	AD value of voltage			
37	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows "2.0", the EXV open angle is 120×4=480p.		
38	EXV open angle for B indoor unit			
39	EXV open angle for C indoor unit			
40	EXV open angle for D indoor unit			
41	EXV open angle for E indoor unit			
42	Frequency limit symbol	Bit7	Frequency limit caused by IGBT radiator	The display value is a hexadecimal number. For example, the digital display show 2A, then Bit5=1, Bit3=1, and Bit1=1. This means that a frequency limit may be caused by T4, T3, or the current.
		Bit6	Frequency limit caused by PFC	
		Bit5	Frequency limit caused by T4.	
		Bit4	Frequency limit caused by T2.	
		Bit3	Frequency limit caused by T3.	
		Bit2	Frequency limit caused by T5.	
		Bit1	Frequency limit caused by current	
		Bit0	Frequency limit caused by voltage	
43	Average value of T2	(Sum T2 value of all indoor units)/(number of indoor units in good connection)		
44	Outdoor unit fan motor state	Off: 0, High speed:1, Med speed: 2, Low speed: 3, Breeze:4, Super breeze: 5		
45	The last error or protection code	00 means No Malfunction and Protection		
46	F indoor unit capacity			
47	F indoor unit capacity demand code			
48	F indoor unit evaporator outlet temperature (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

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.
Supposed causes	• Wiring mistake • Fan assembly faulty • Fan motor faulty • PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

Indoor units mode conflict

Error Code	P5 (old 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.
Supposed 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 30—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

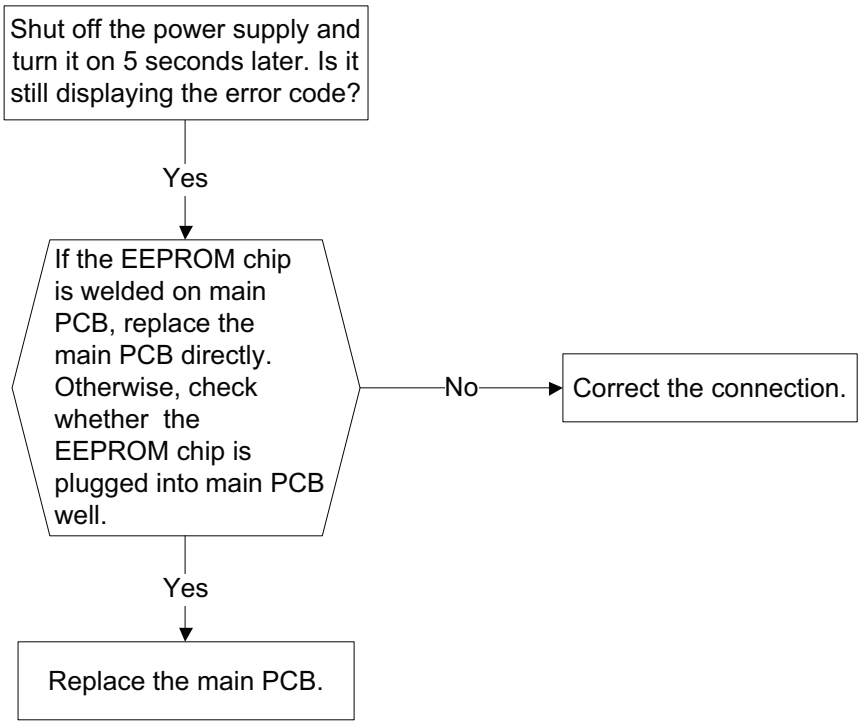
- **No**: No mode conflict
- **Yes**: Mode conflict

DIAGNOSIS AND SOLUTION (CONT)

EO EEPROM parameter error

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

Troubleshooting:



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

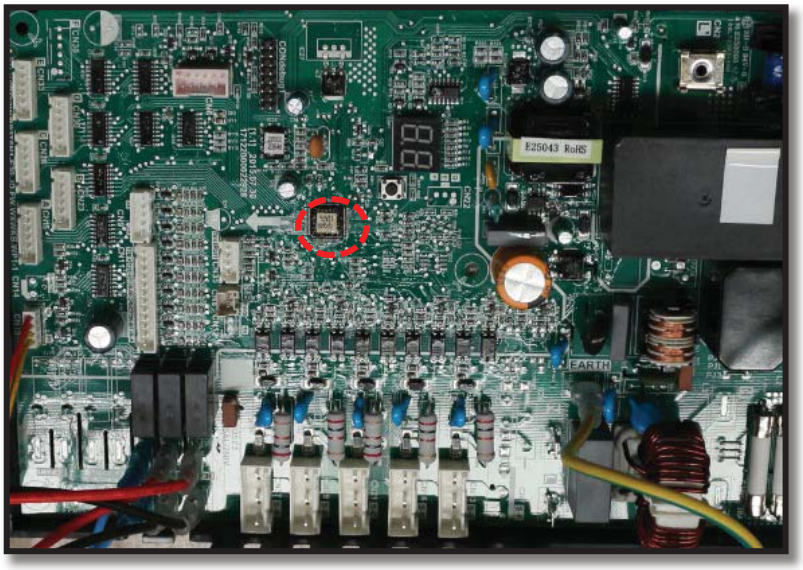


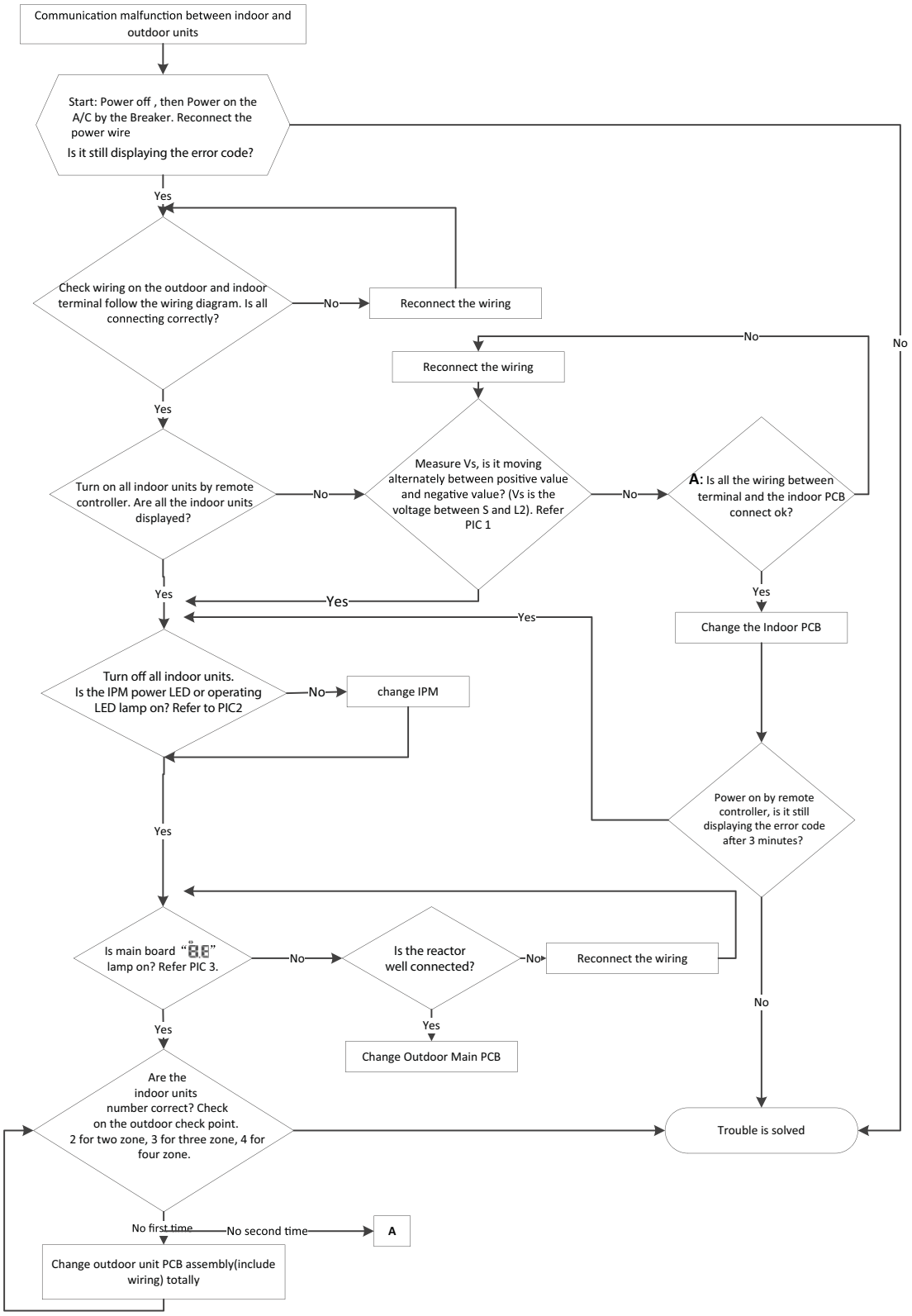
Fig. 32 – EEPROM Chip

DIAGNOSIS AND SOLUTION (CONT)

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

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.
Supposed causes	• Wiring mistake • Indoor or outdoor PCB faulty

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

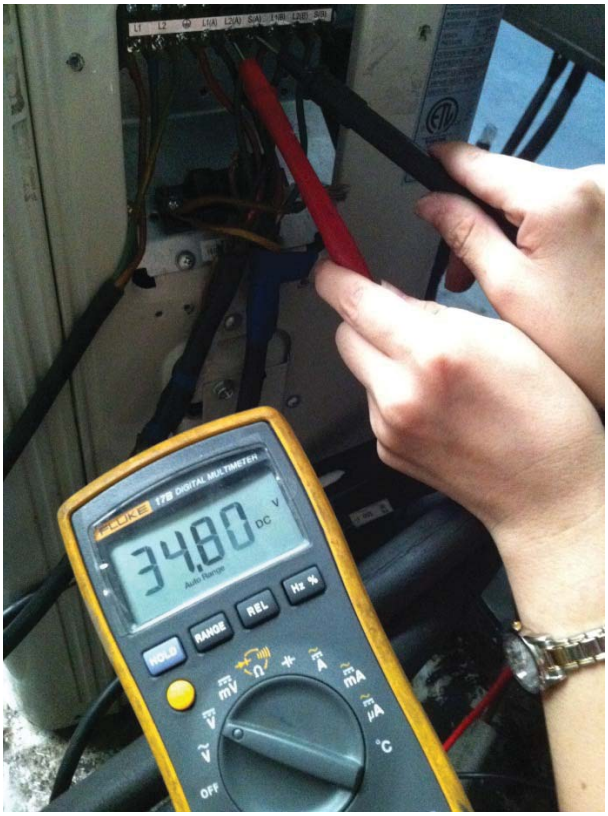
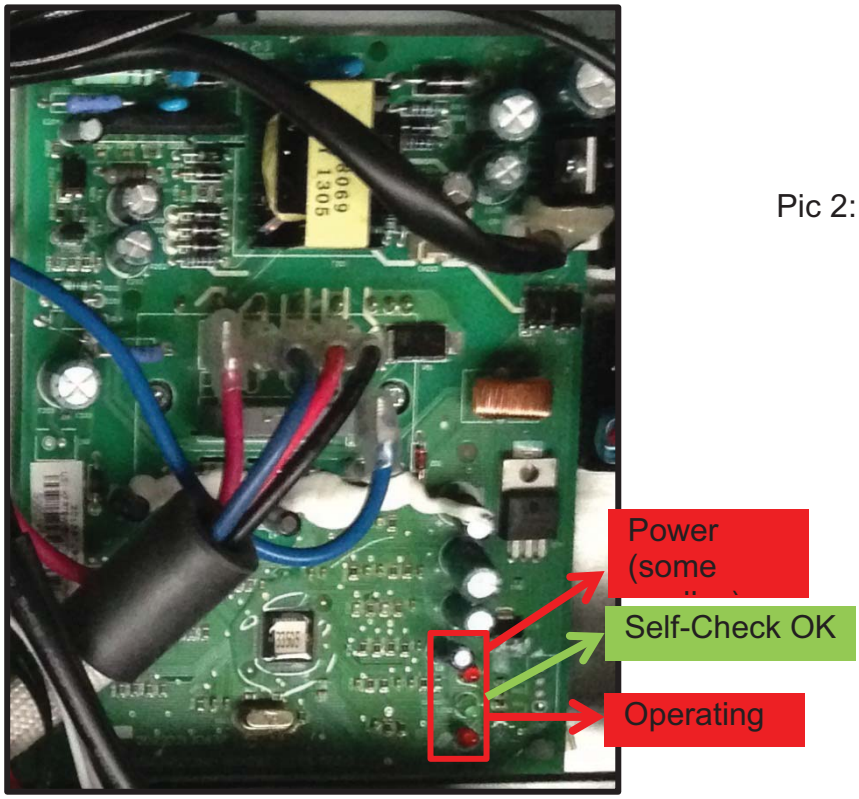


Fig. 33 – Test the DC voltage

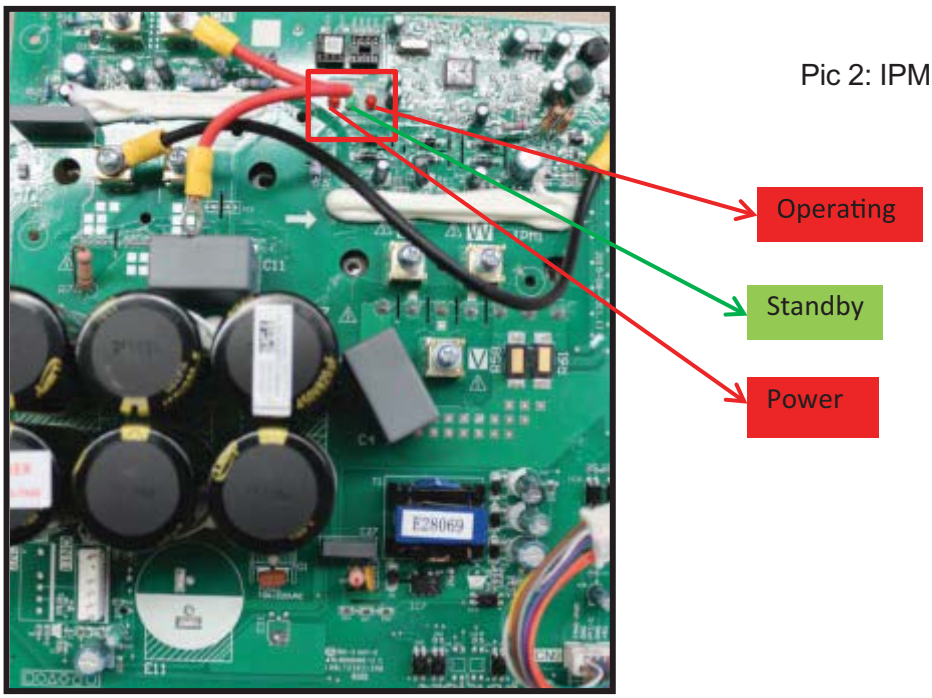
Use a multimeter to test the DC voltage between the L2 port and S port of the outdoor unit. The red pin of the multimeter connects with the L2 port while the black pin is for the S port. When the unit is running normal, the voltage moves alternately between the positive and negative values.



Pic 2: IPM (for dual/tri/qua-zone)

Fig. 34 – IPM (For dual/tri−zone)

DIAGNOSIS AND SOLUTION (CONT)



Pic 2: IPM (For four or five zone)

Fig. 35 – IPM for four or five zone

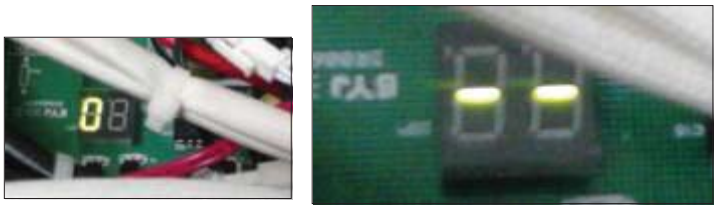


Fig. 36 – Main Board

The main board LED when power on and unit standby.

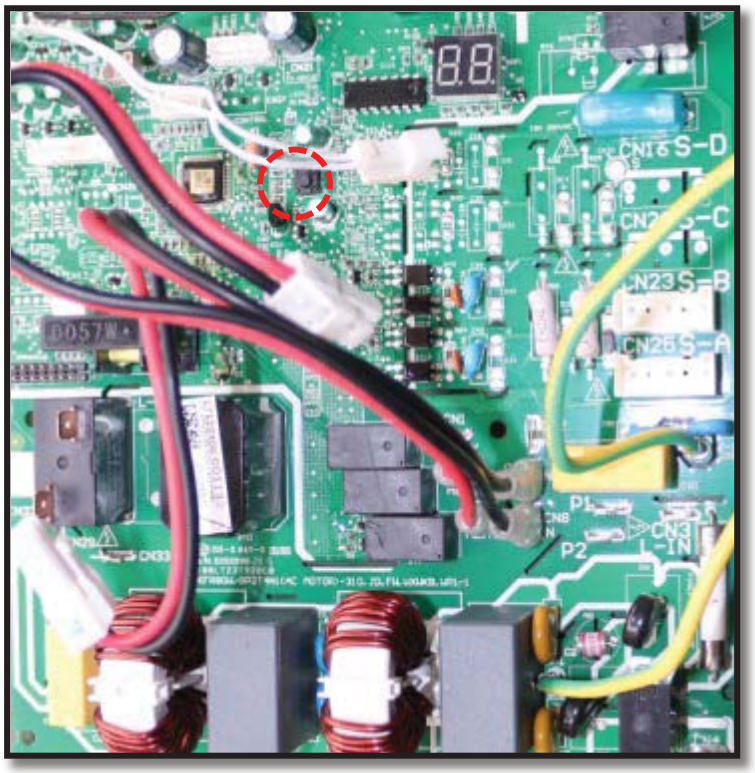


Fig. 37 – Main Board

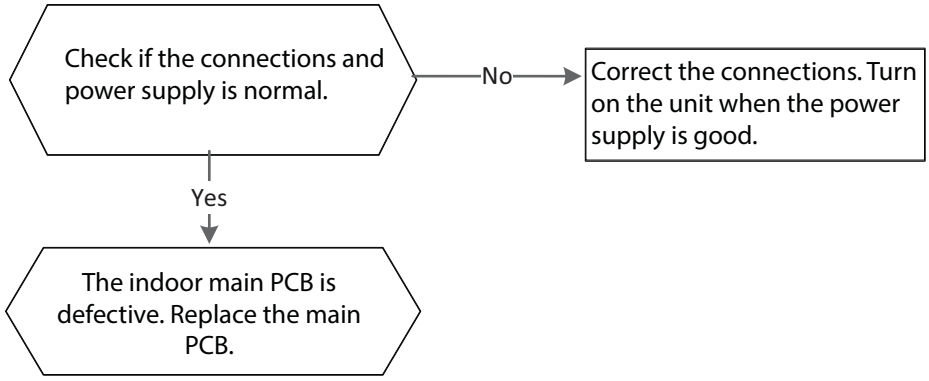
Check the point button. Press one (1) time to determine how many indoor units are connected.

DIAGNOSIS AND SOLUTION (CONT)

Zero Crossing Detection Error Diagnosis and Solution

Error Code	E2
Malfunction decision conditions	When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal interval is abnormal
Supposed causes	• Connection mistake • PCB faulty

Troubleshooting:

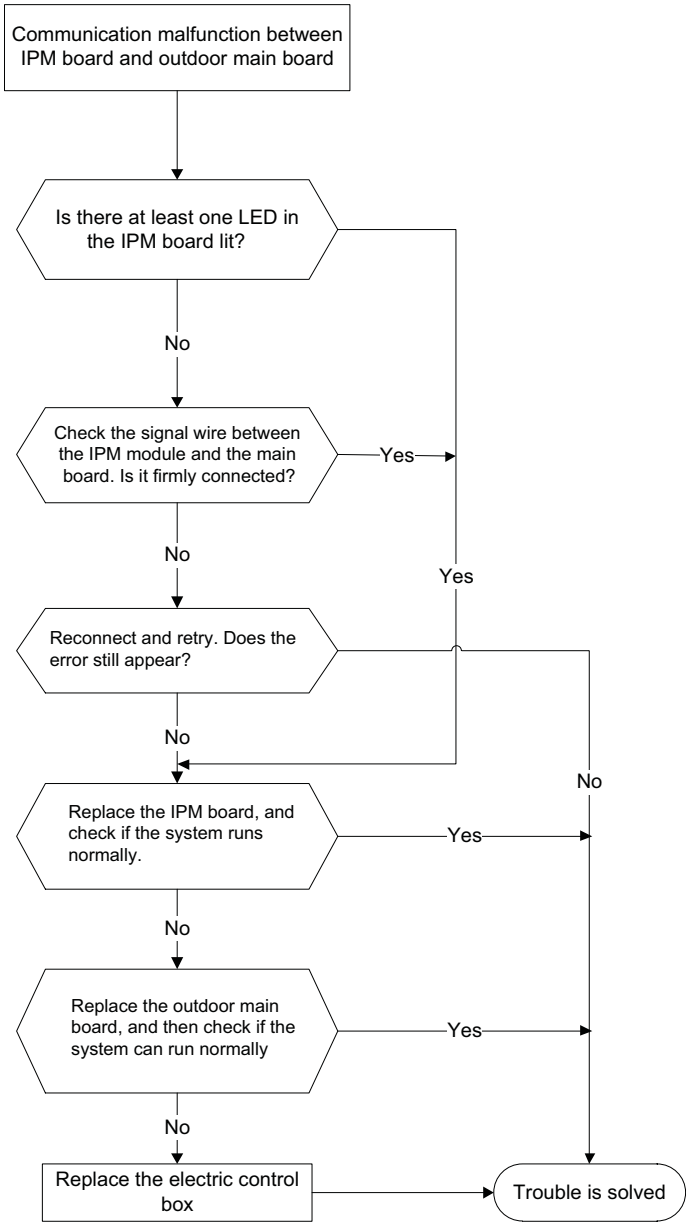


DIAGNOSIS AND SOLUTION (CONT)

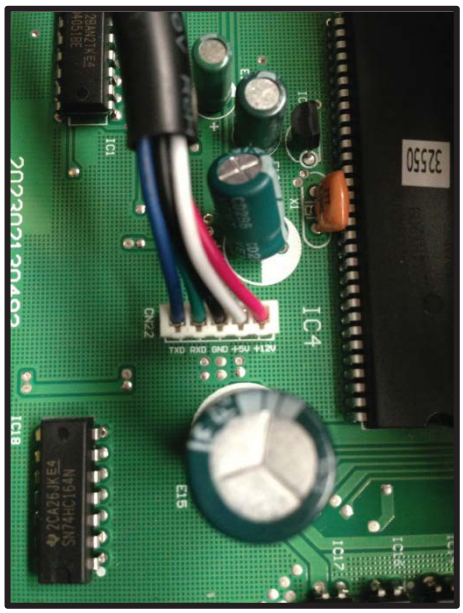
E3 (Communication malfunction between IPM board and outdoor main board) error diagnosis

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

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)



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.

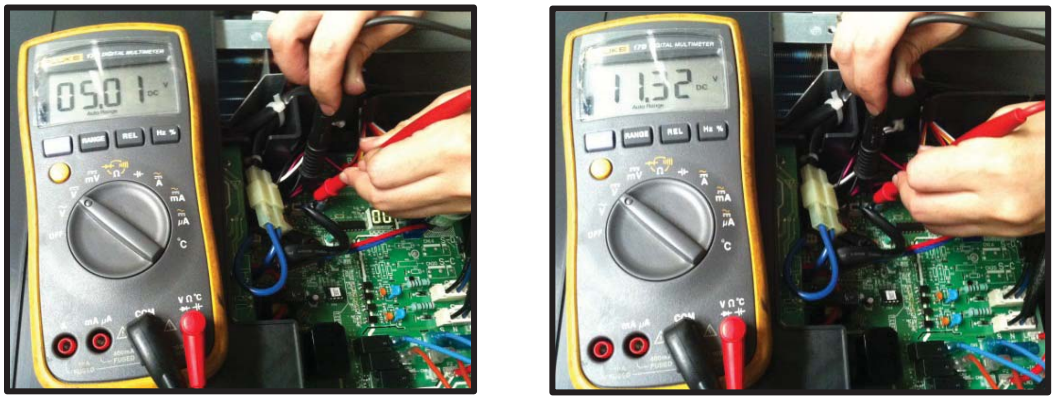


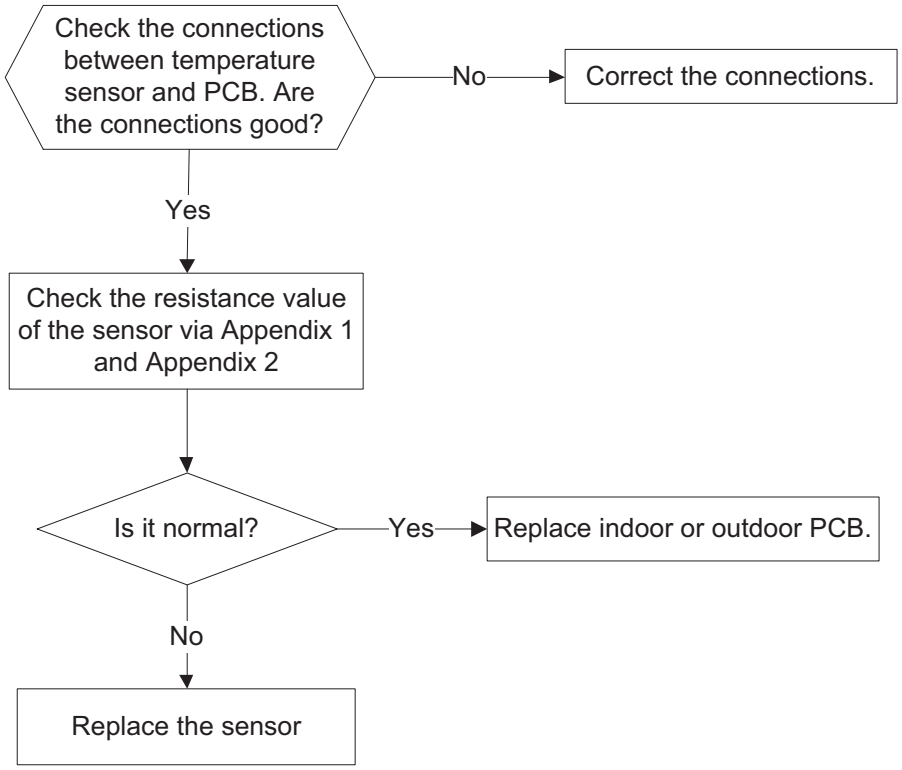
Fig. 38 – Test the DC Voltage

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

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

Troubleshooting



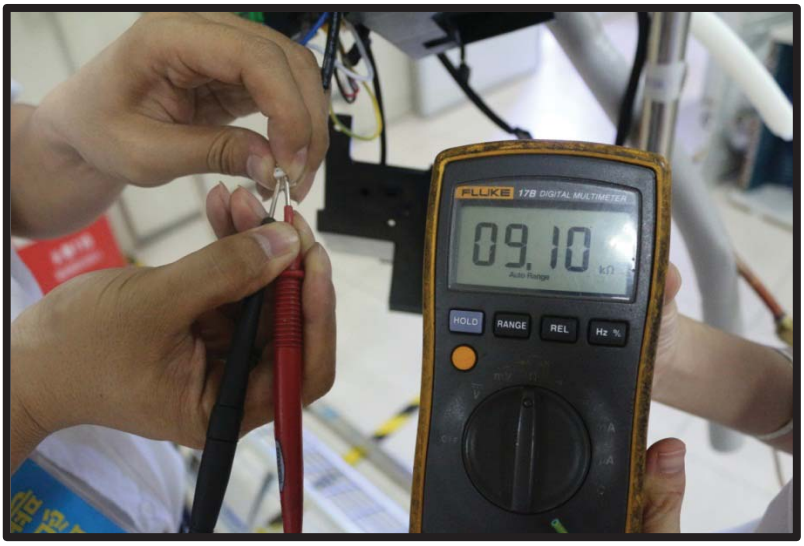


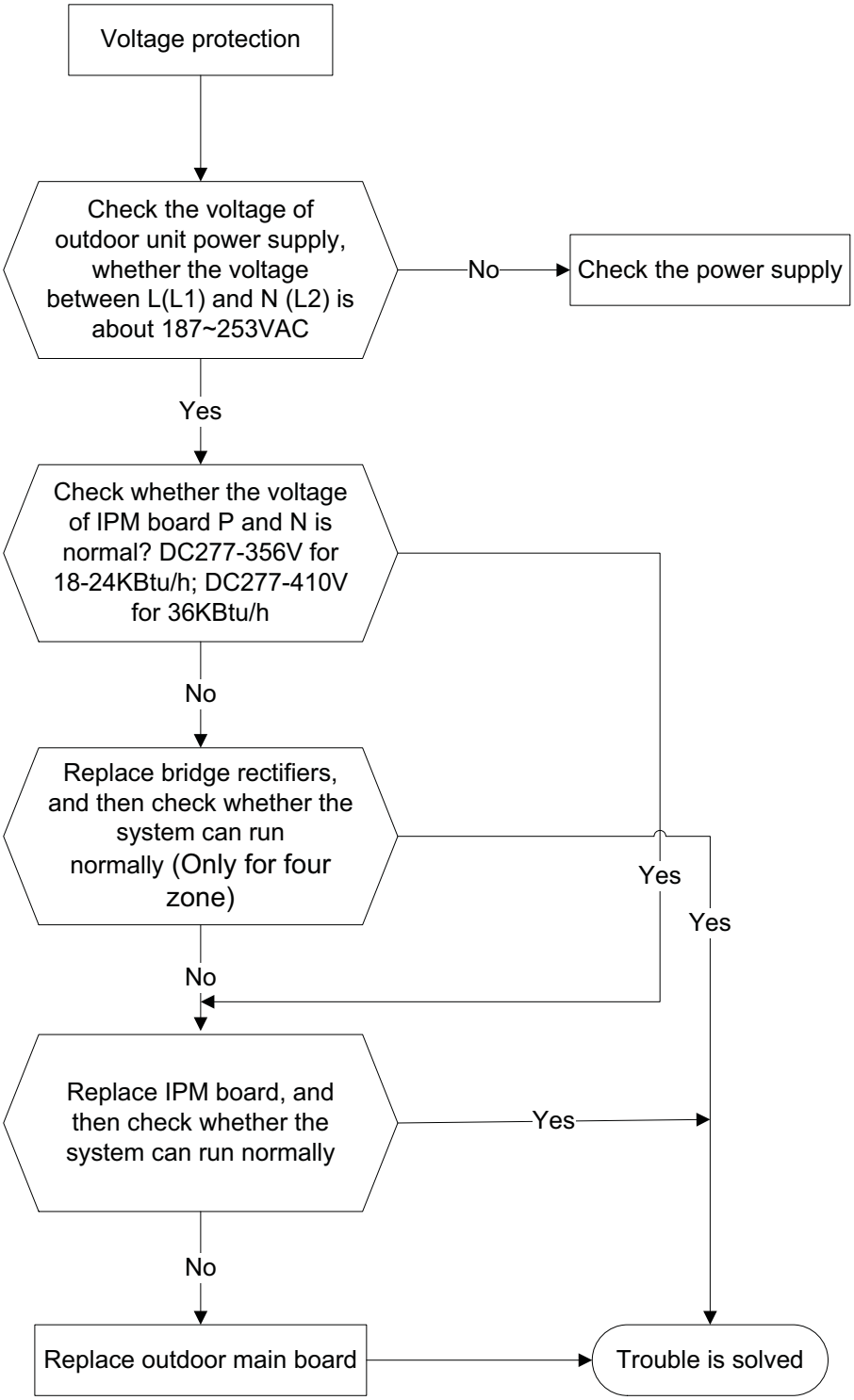
Fig. 39 – Check the Sensor Value

DIAGNOSIS AND SOLUTION (CONT)

E5 (Voltage protection) error

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

Troubleshooting



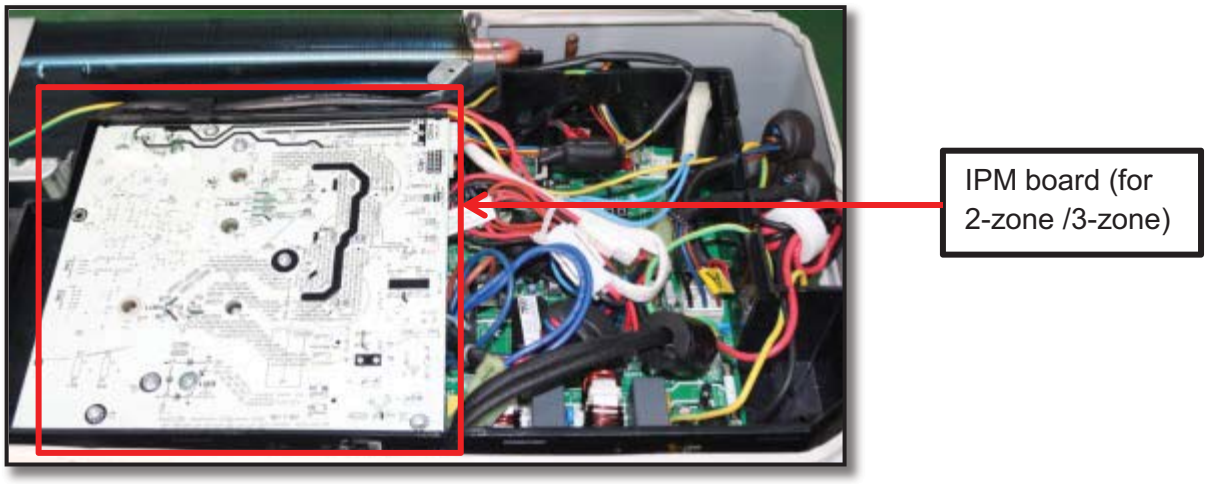


Fig. 40 – IPM Board (for 2−zone/3−zone)

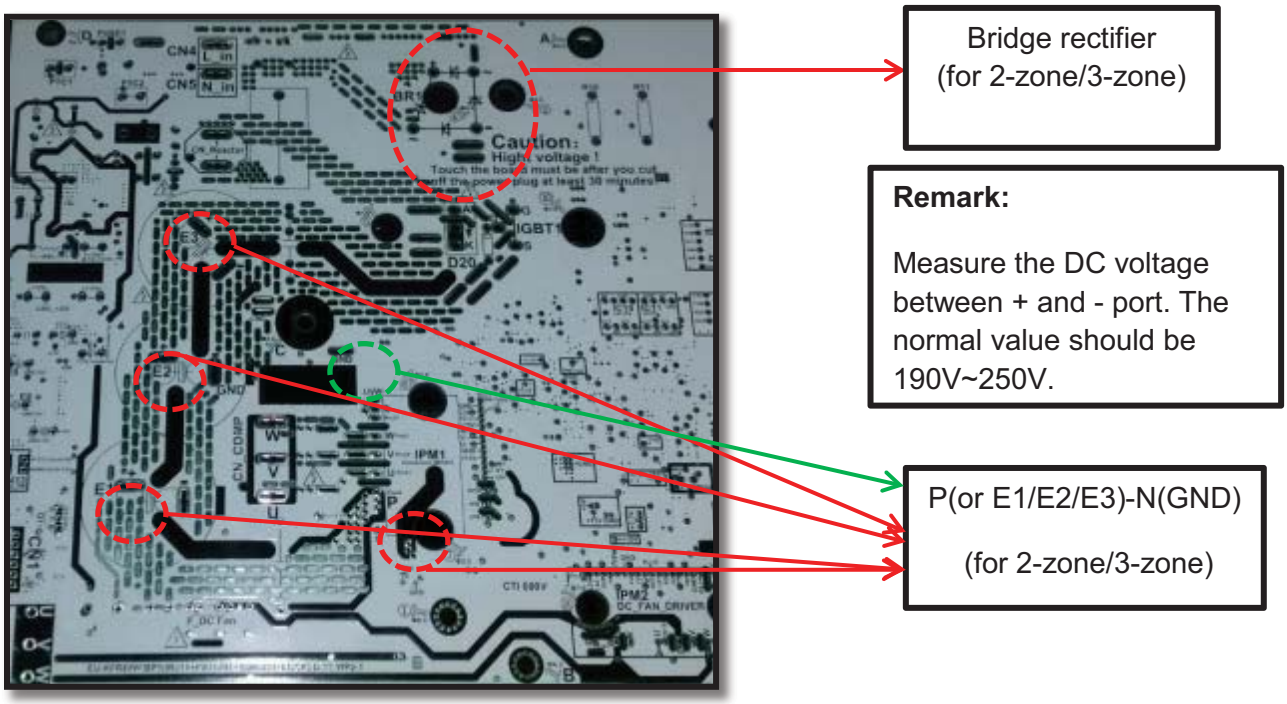


Fig. 41 – Bridge rectifier (for 2−zone/3−zone)

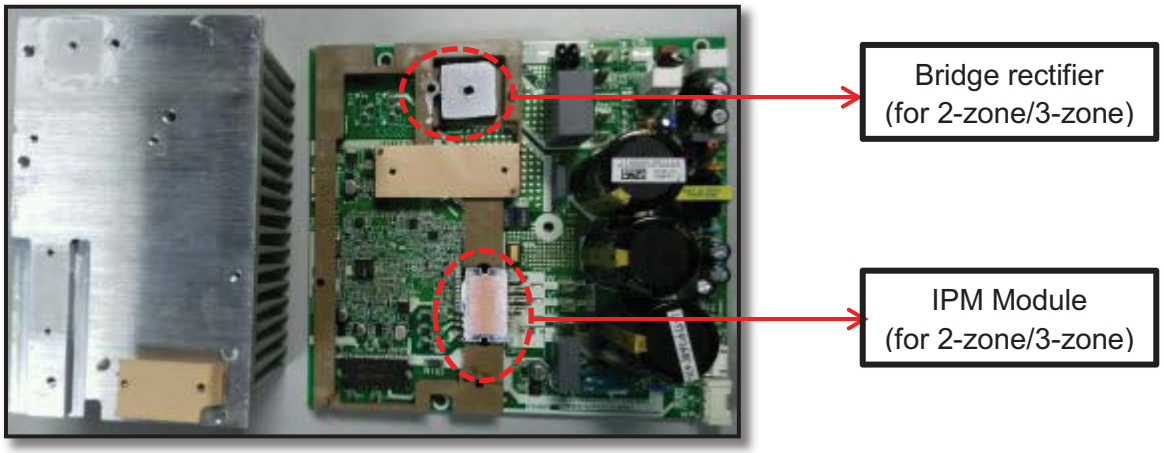


Fig. 42 – Bridge Rectifier (for 2−zone/3−zone) and IPM Module (for 2−zone/3−zone)

DIAGNOSIS AND SOLUTION (CONT)

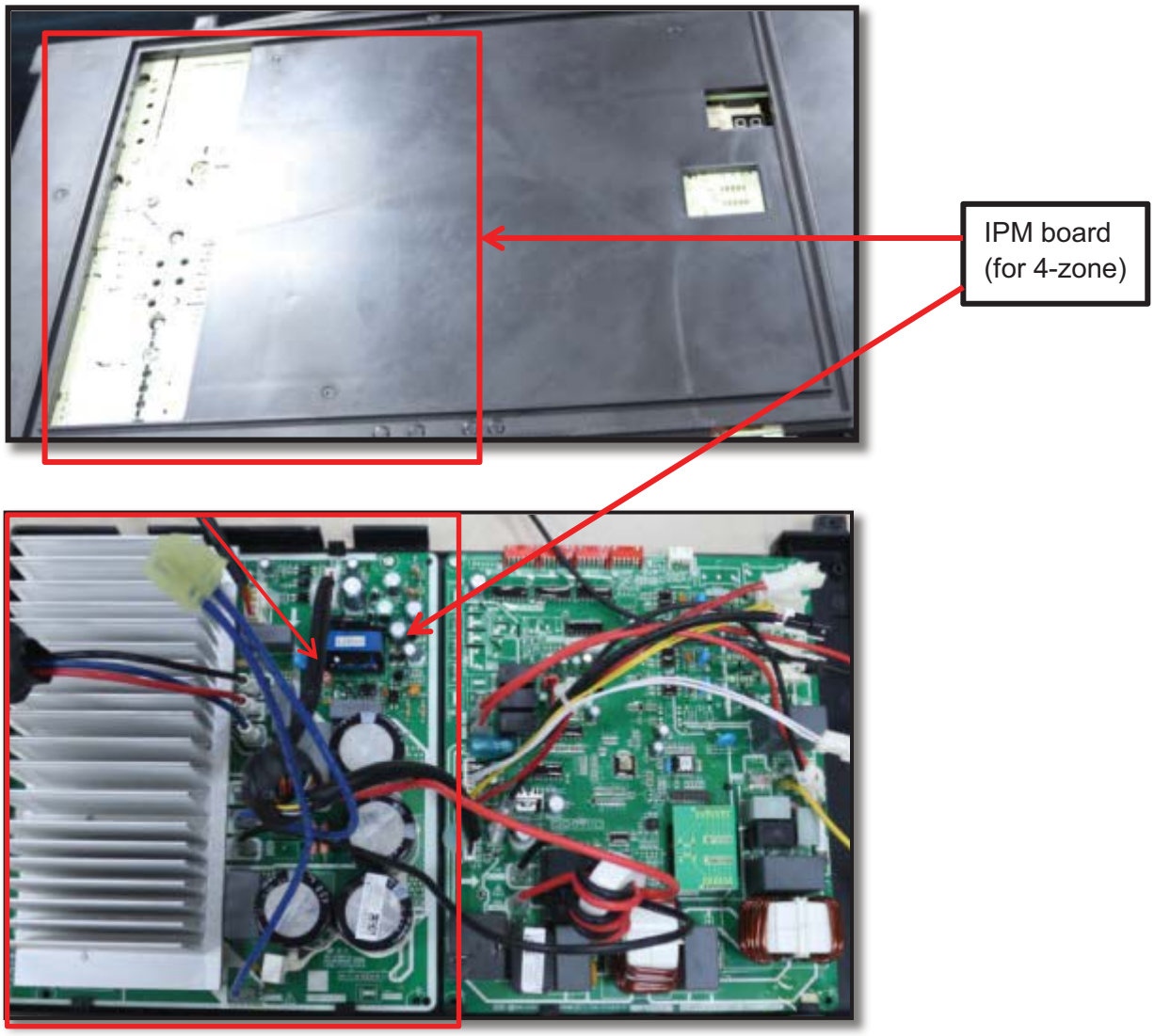


Fig. 43 – IPM Board (for 4−zone)

DIAGNOSIS AND SOLUTION (CONT)

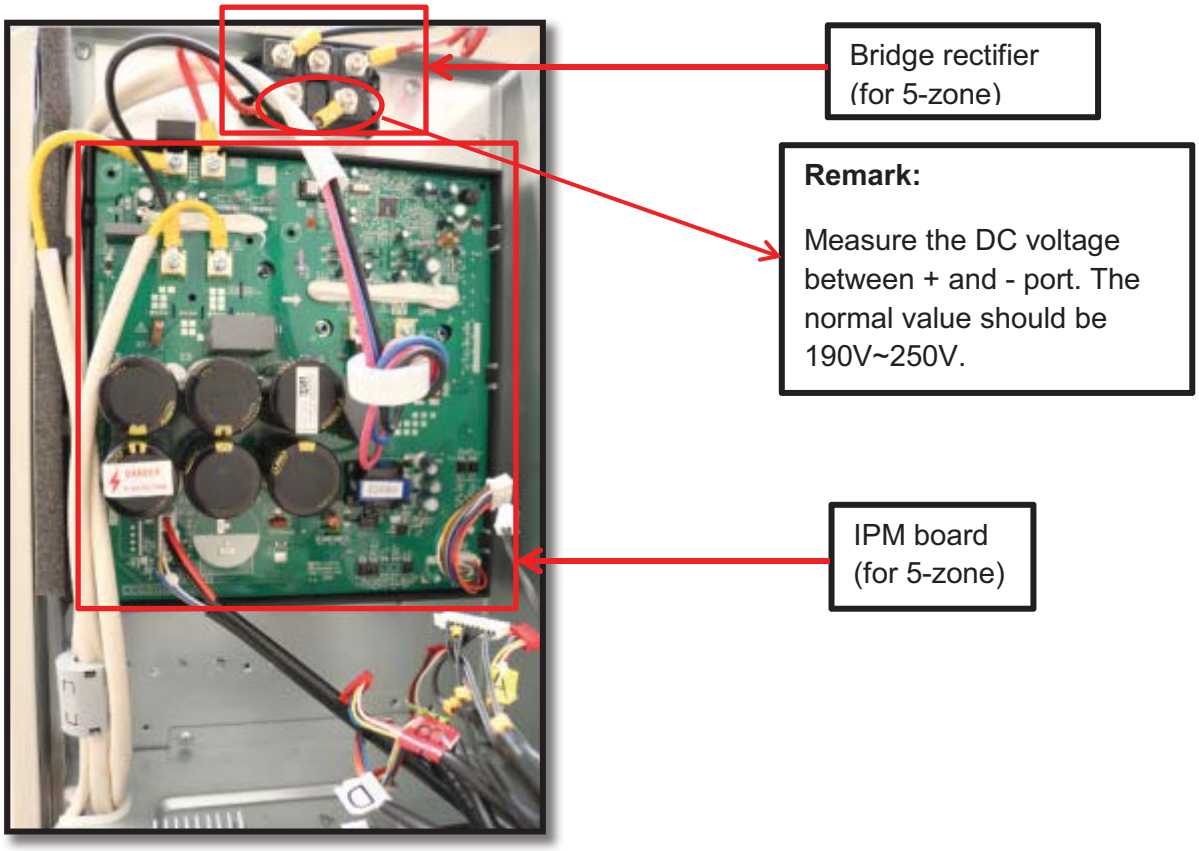


Fig. 44 – Bridge Rectifier (for 5−zone)

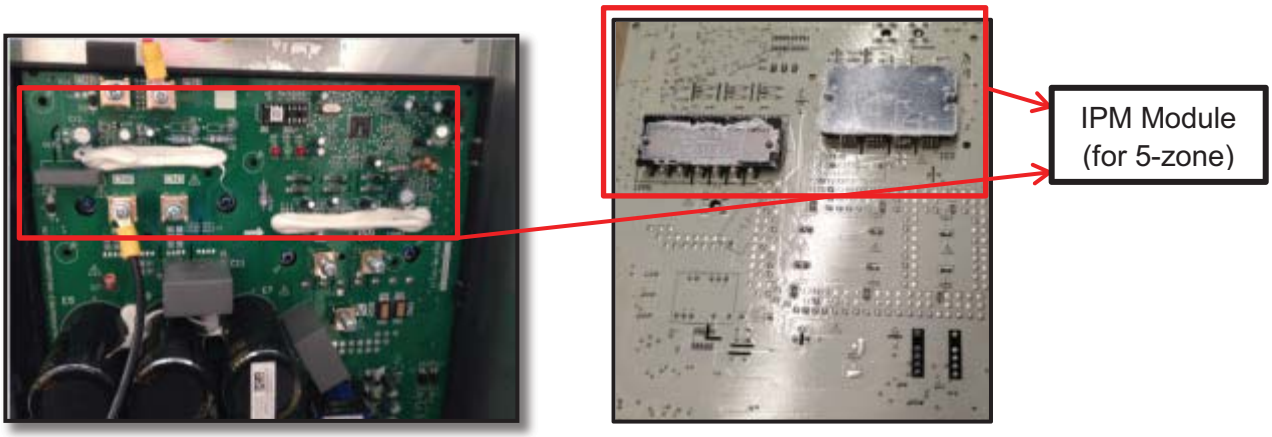


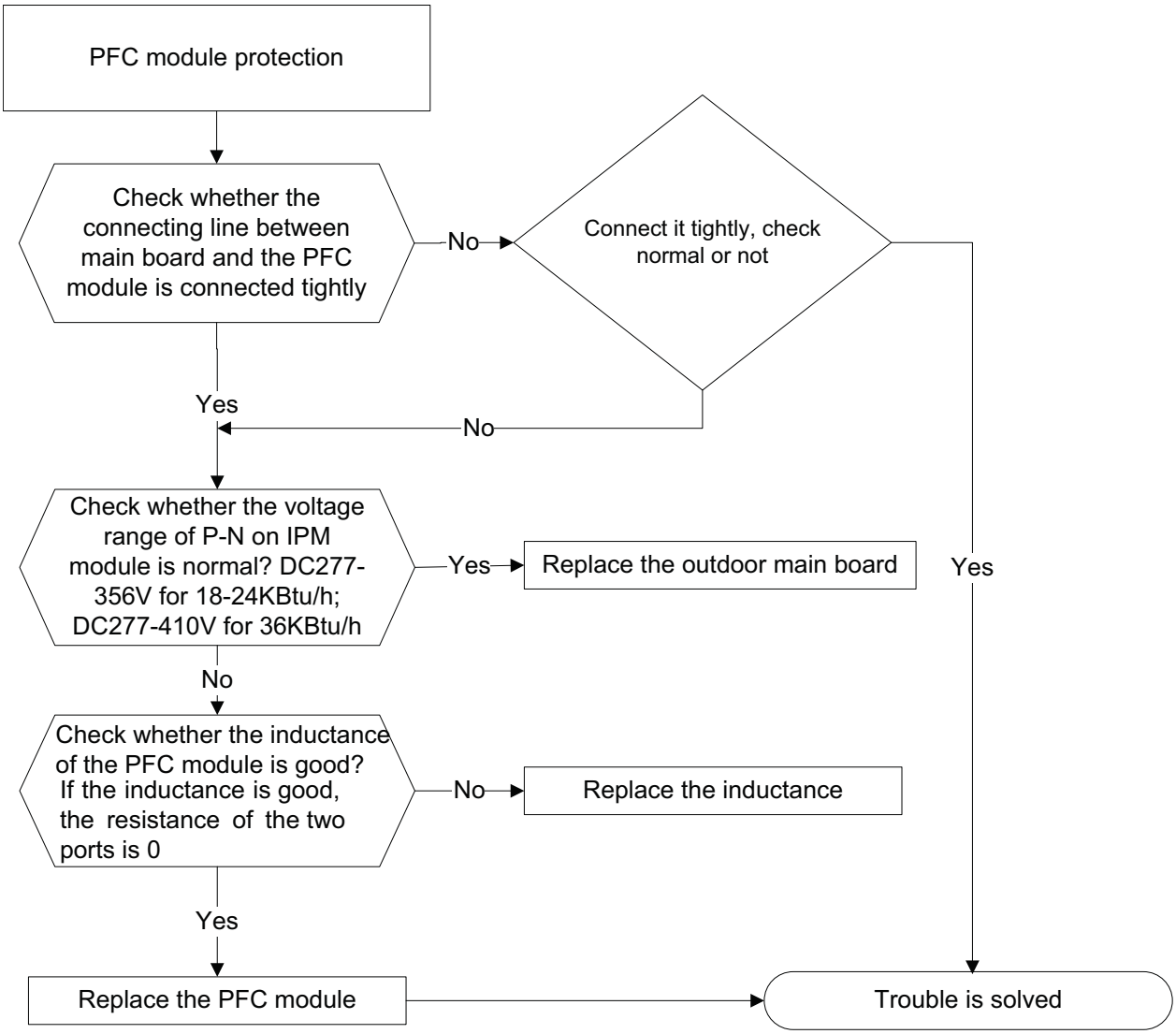
Fig. 45 – IPM Module (for 5 − zone)

DIAGNOSIS AND SOLUTION (CONT)

E6 (PFC module protection) error 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.
Supposed causes	• Wiring mistake • Outdoor PCB faulty • Inductance of PFC module faulty • PFC module malfunction

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

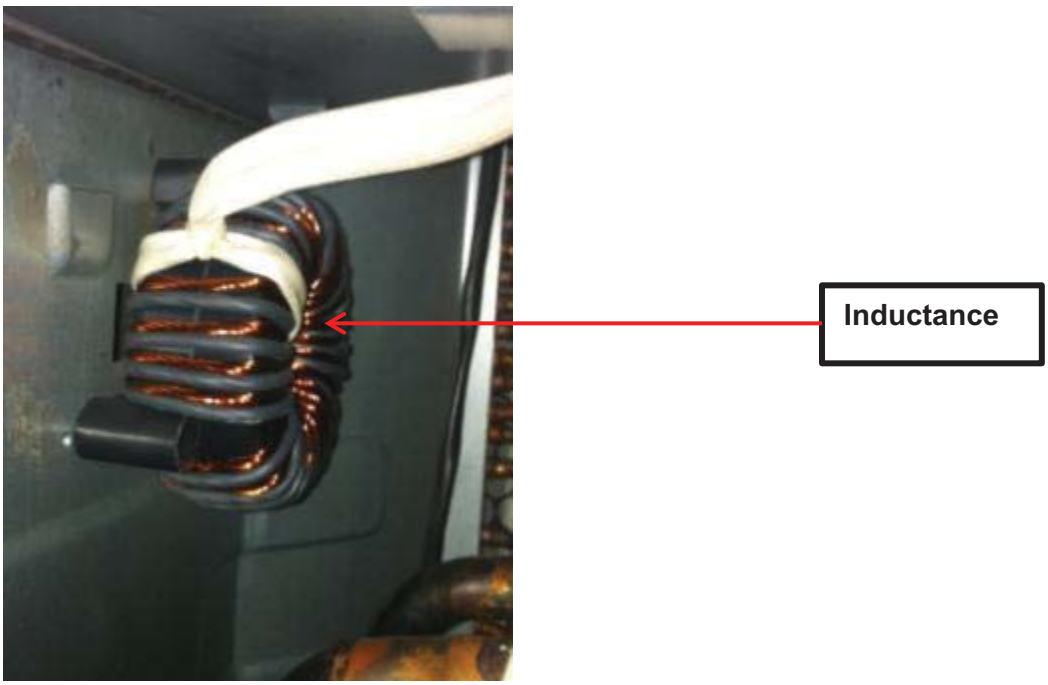


Fig. 46 – Inductance

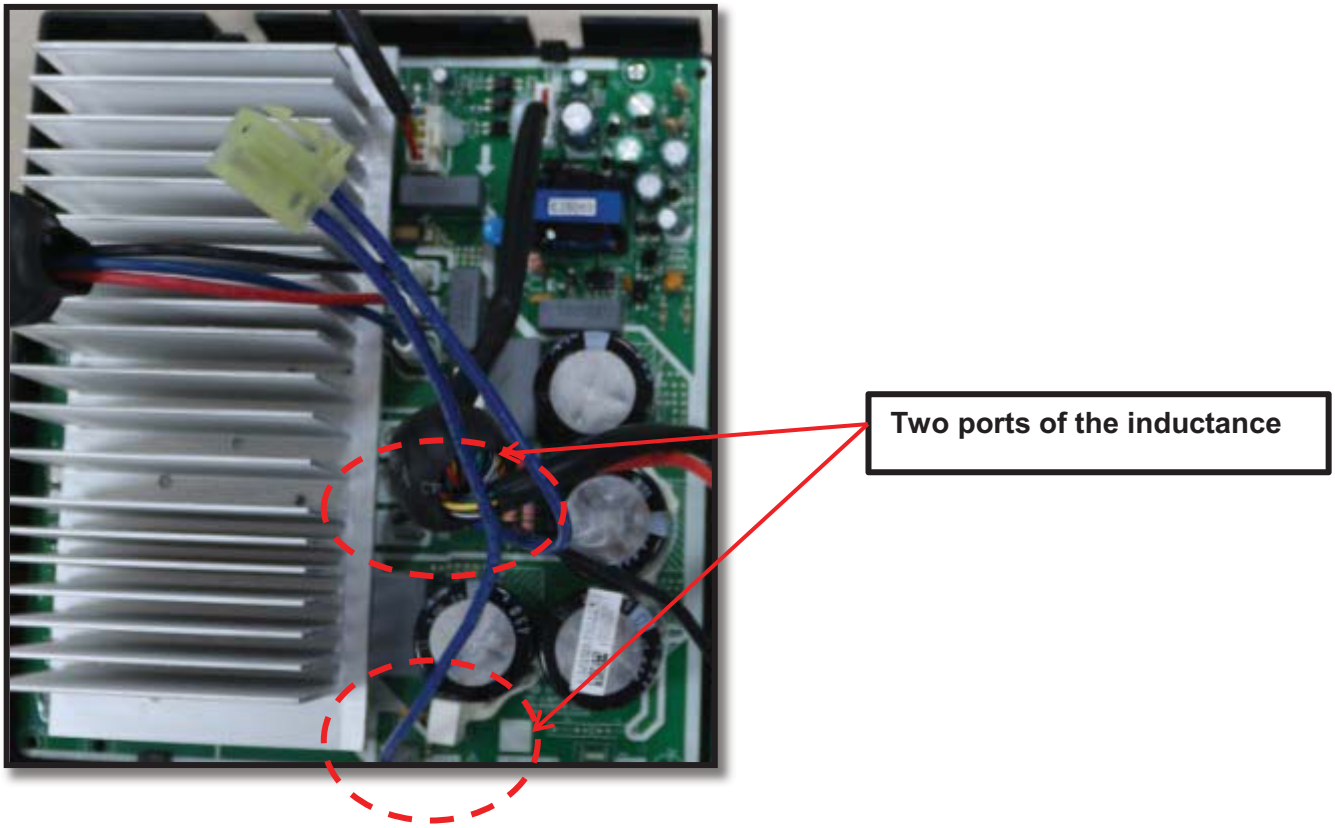


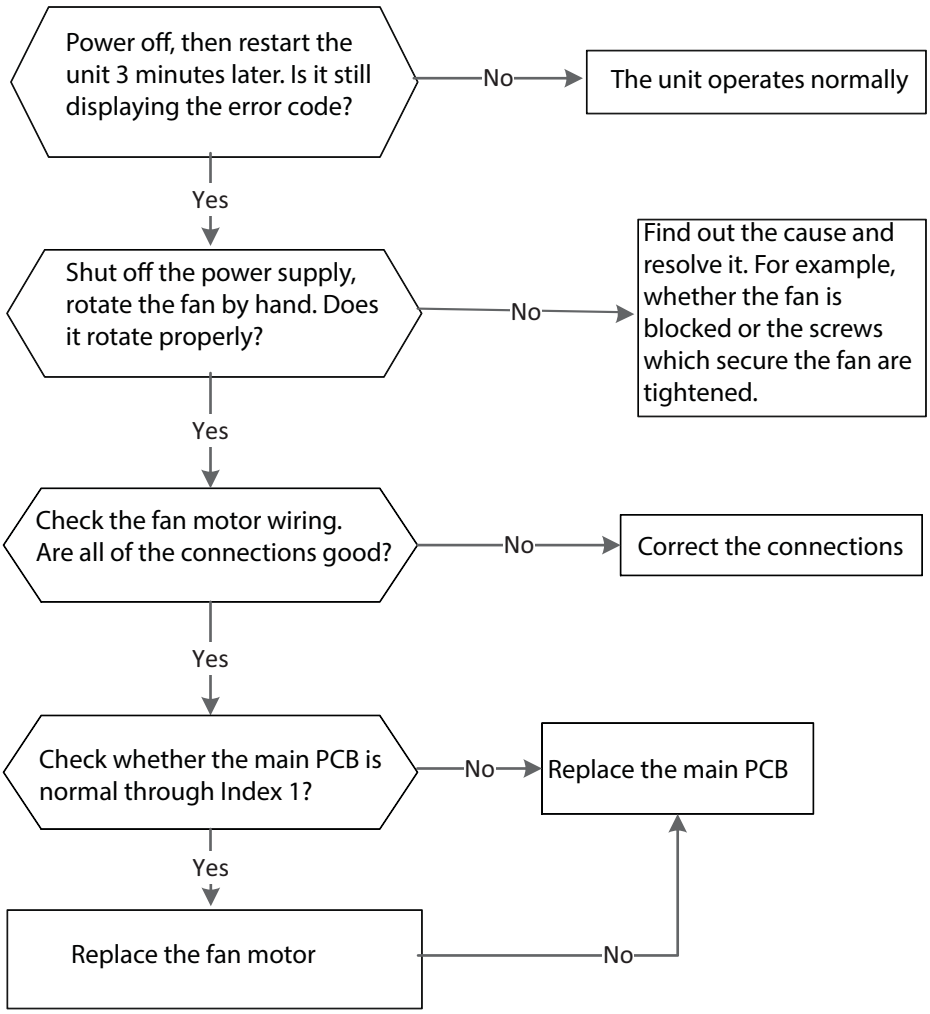
Fig. 47 – Inductance

DIAGNOSIS AND SOLUTION (CONT)

E8 − Outdoor fan speed has been out of control

Error Code	E8
Malfunction decision conditions	When outdoor fan speed keeps too low (300RPM) or too high (2400RPM) for certain time, the unit stops and the LED displays the failure.
Supposed causes	• Wiring mistake • Fan ass'y 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 below table, the PCB must have problems and need to be replaced.

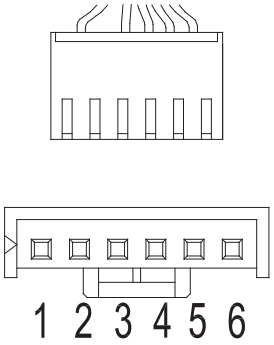


Fig. 48 – DC Fan Motor

Table 31—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

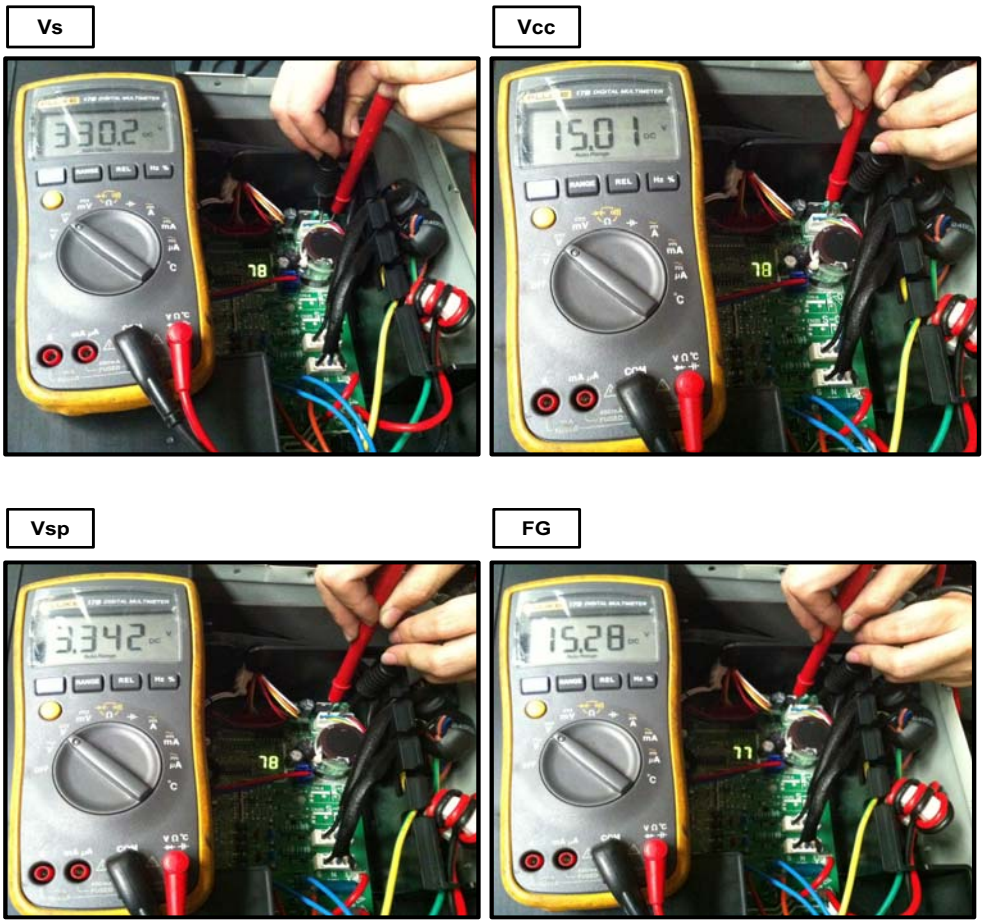


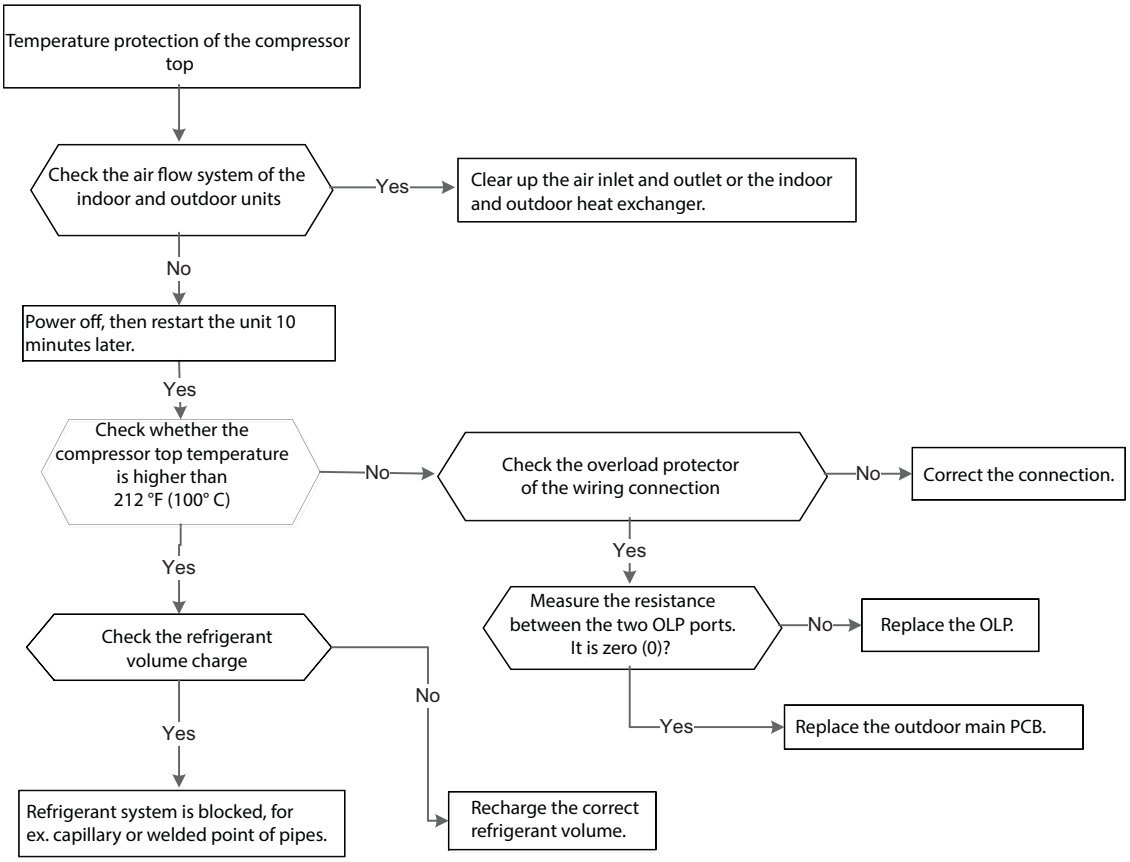
Fig. 49 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

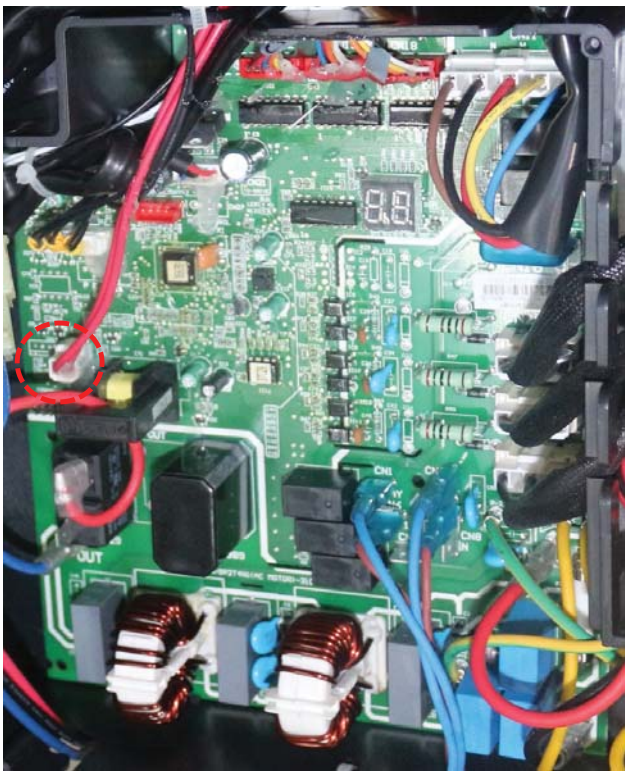
P0 (Temperature protection of compressor top) error

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

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)



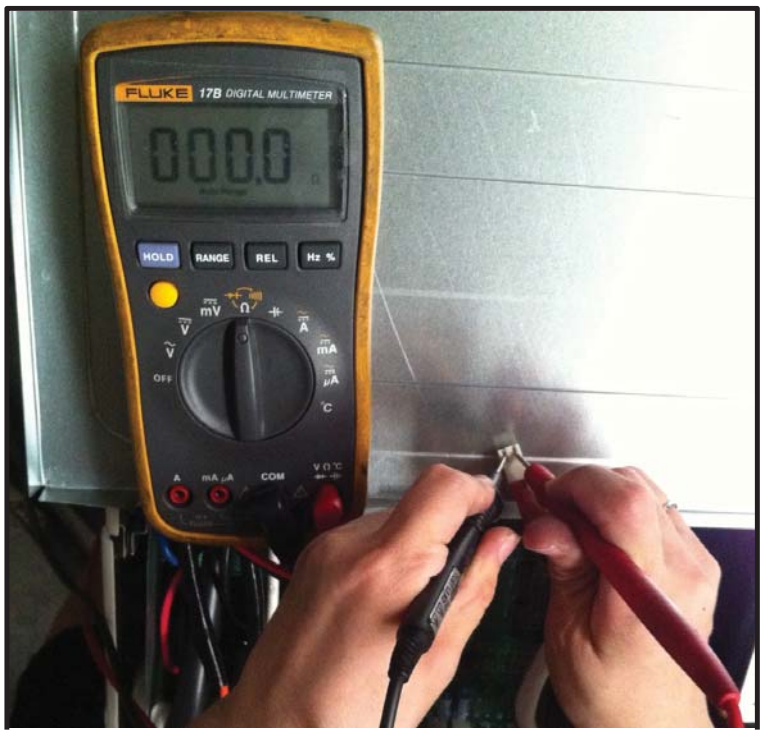


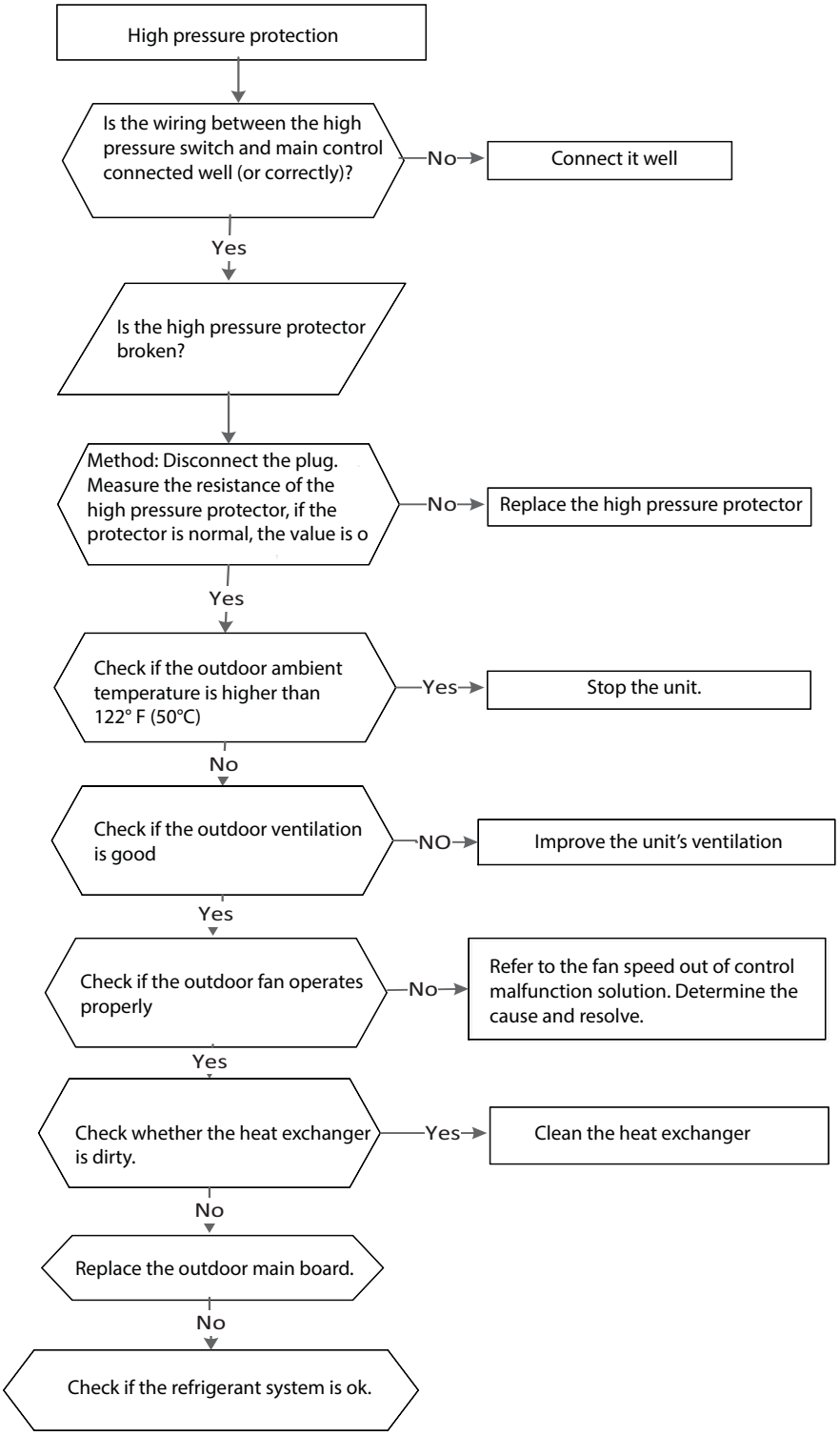
Fig. 50 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P1(High pressure protection) error

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

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

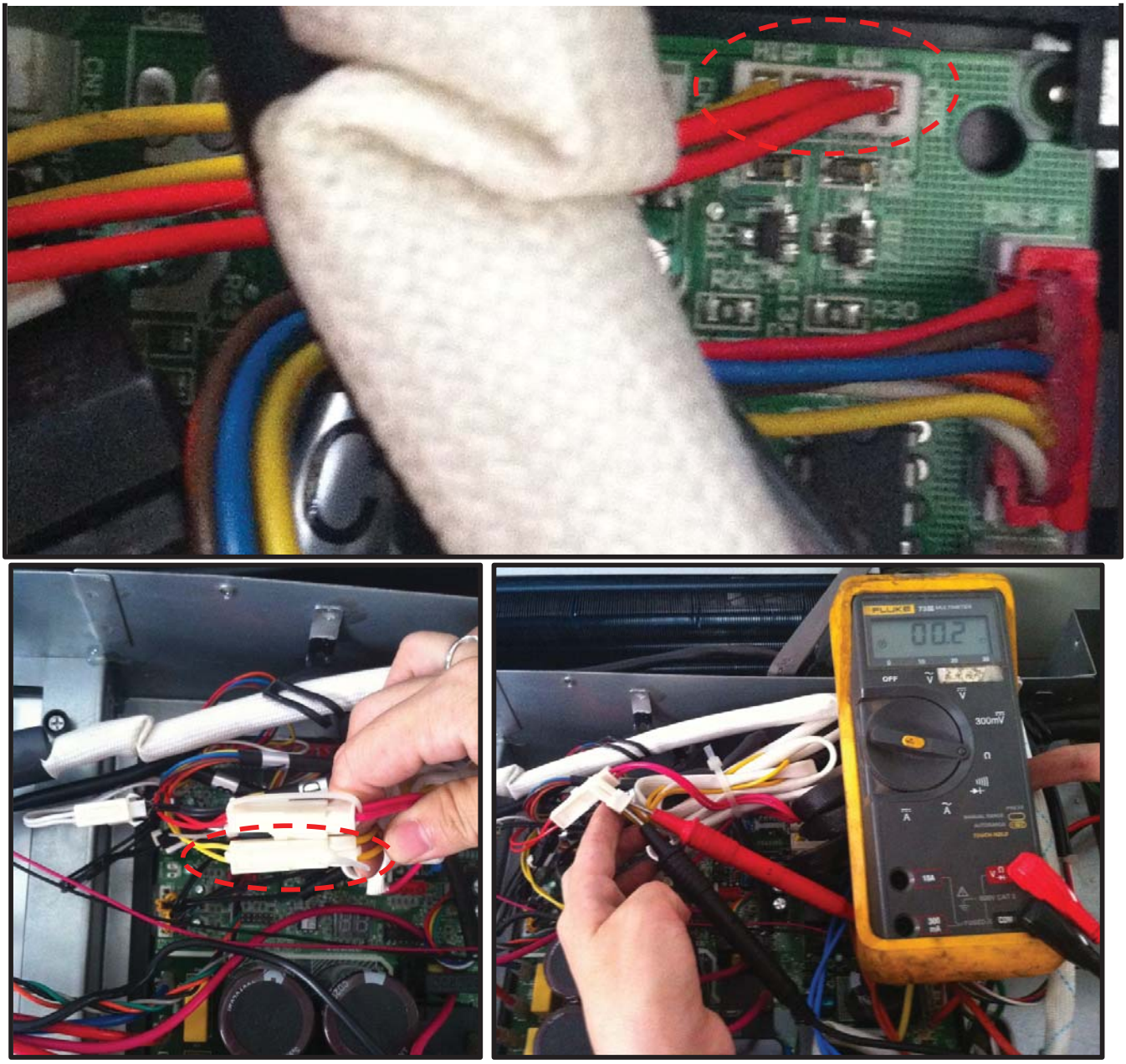
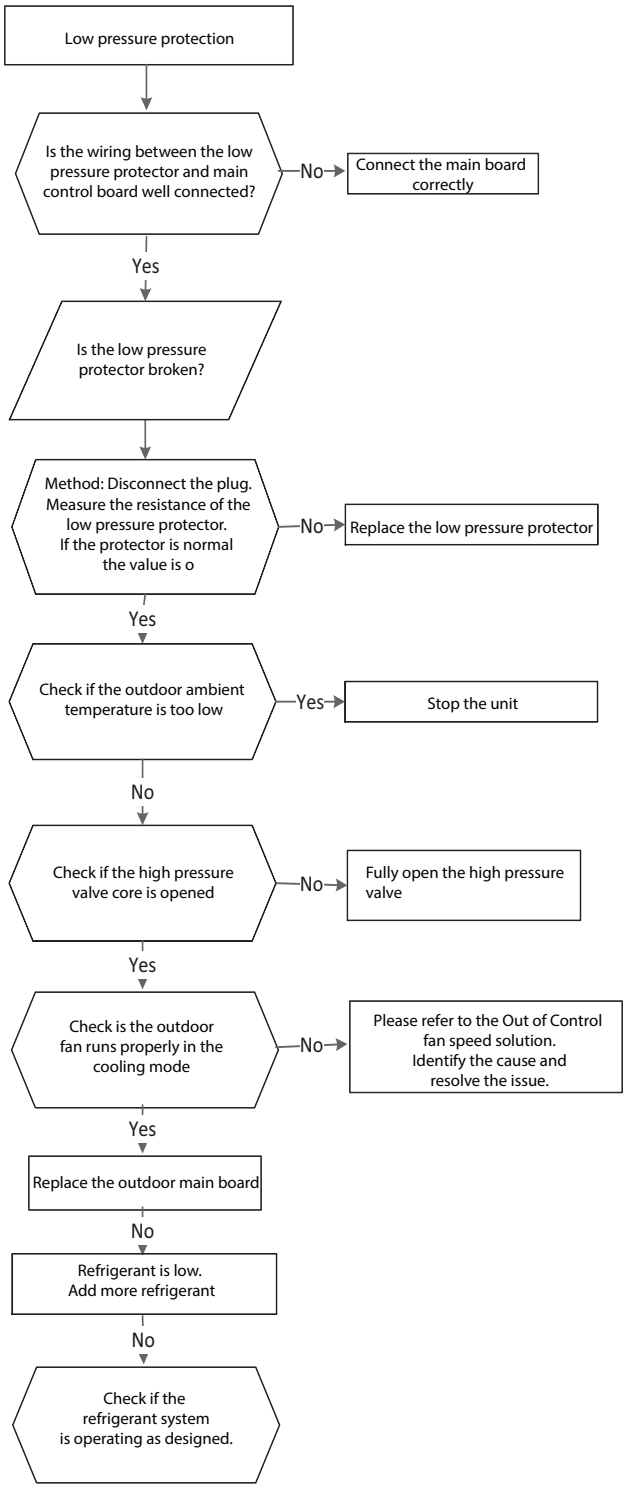


Fig. 51 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P2 (Low pressure protection) error

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



DIAGNOSIS AND SOLUTION (CONT)

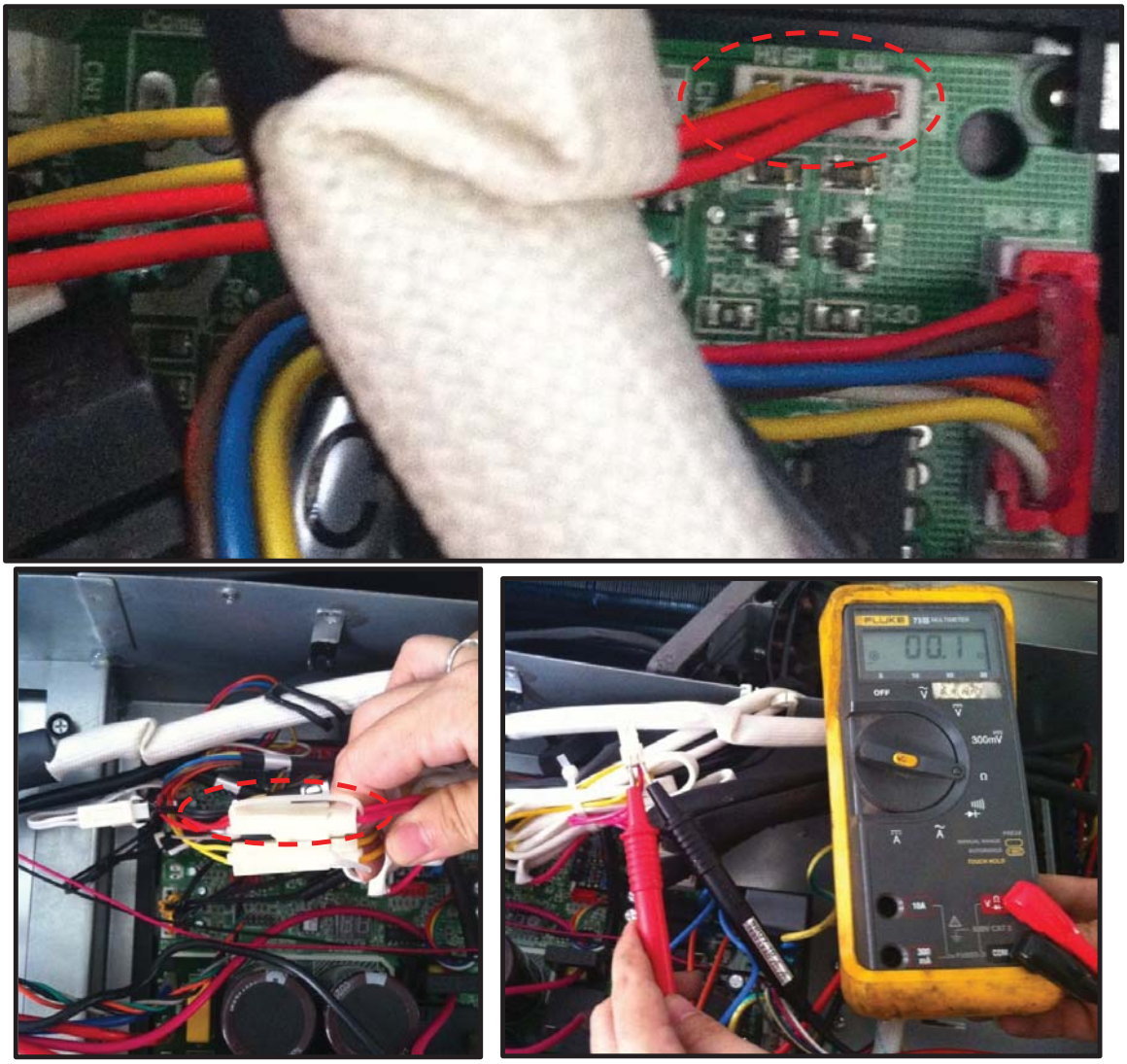


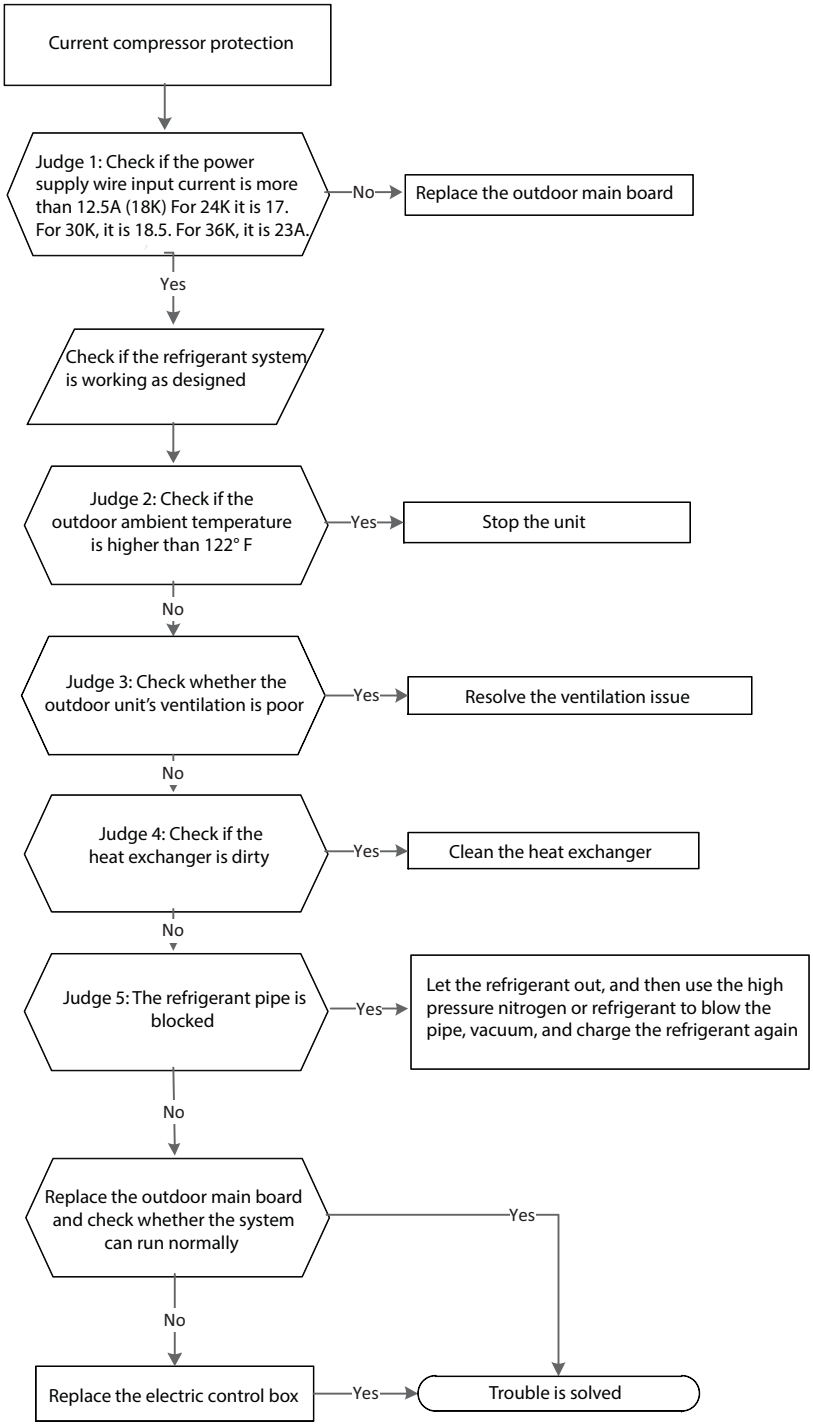
Fig. 52 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P3 (Current protection of compressor) error

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

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT)

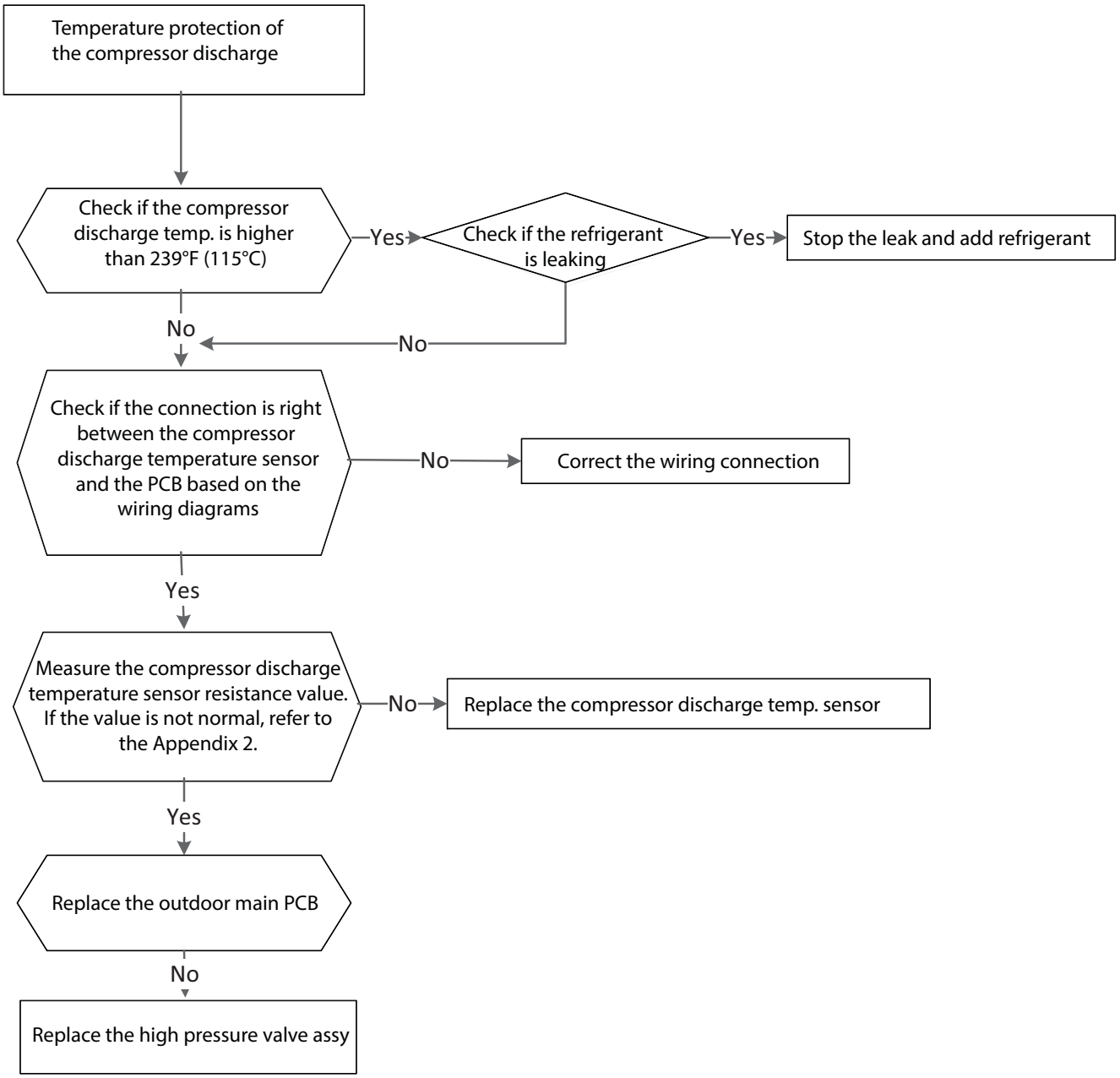
Fig. 53 – Test the voltage

DIAGNOSIS AND SOLUTION (CONT)

P4 (Temperature protection of compressor discharge) error

Error Code	P4
Malfunction decision conditions	When the compressor discharge temperature (T5) is more than 239°F for 10 seconds, the compressor stops and restarts when T5 is less than 194°F.
Supposed causes	• Refrigerant leakage • Wiring mistake • The discharge temperature sensor faulty • Outdoor PCB faulty

Troubleshooting

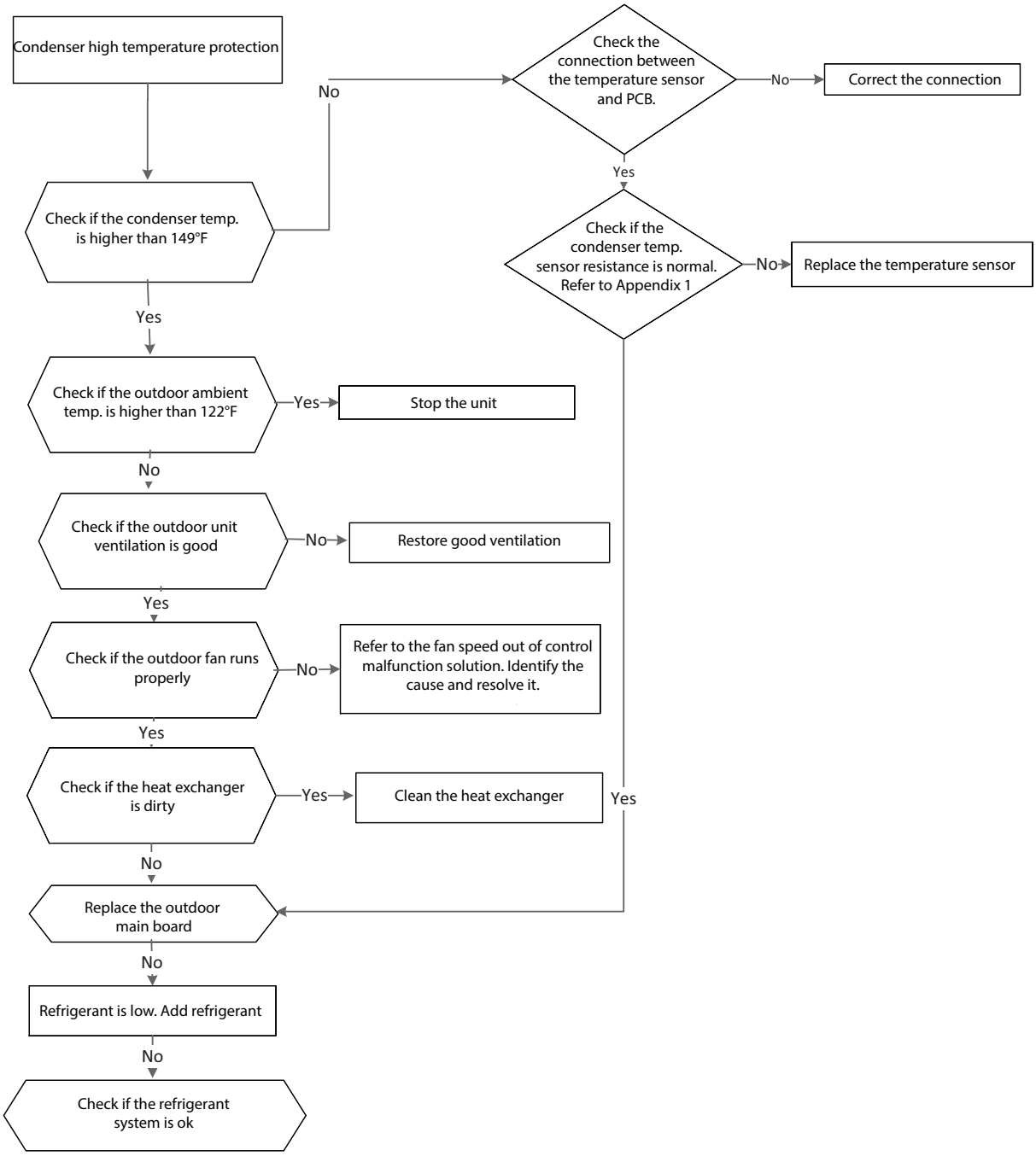


DIAGNOSIS AND SOLUTION (CONT)

P5 (High temperature protection of condenser) error

Error Code	P5
Malfunction decision conditions	When 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.
Supposed causes	• The condenser temperature sensor faulty • Heat exchanger dirty • System block

Troubleshooting

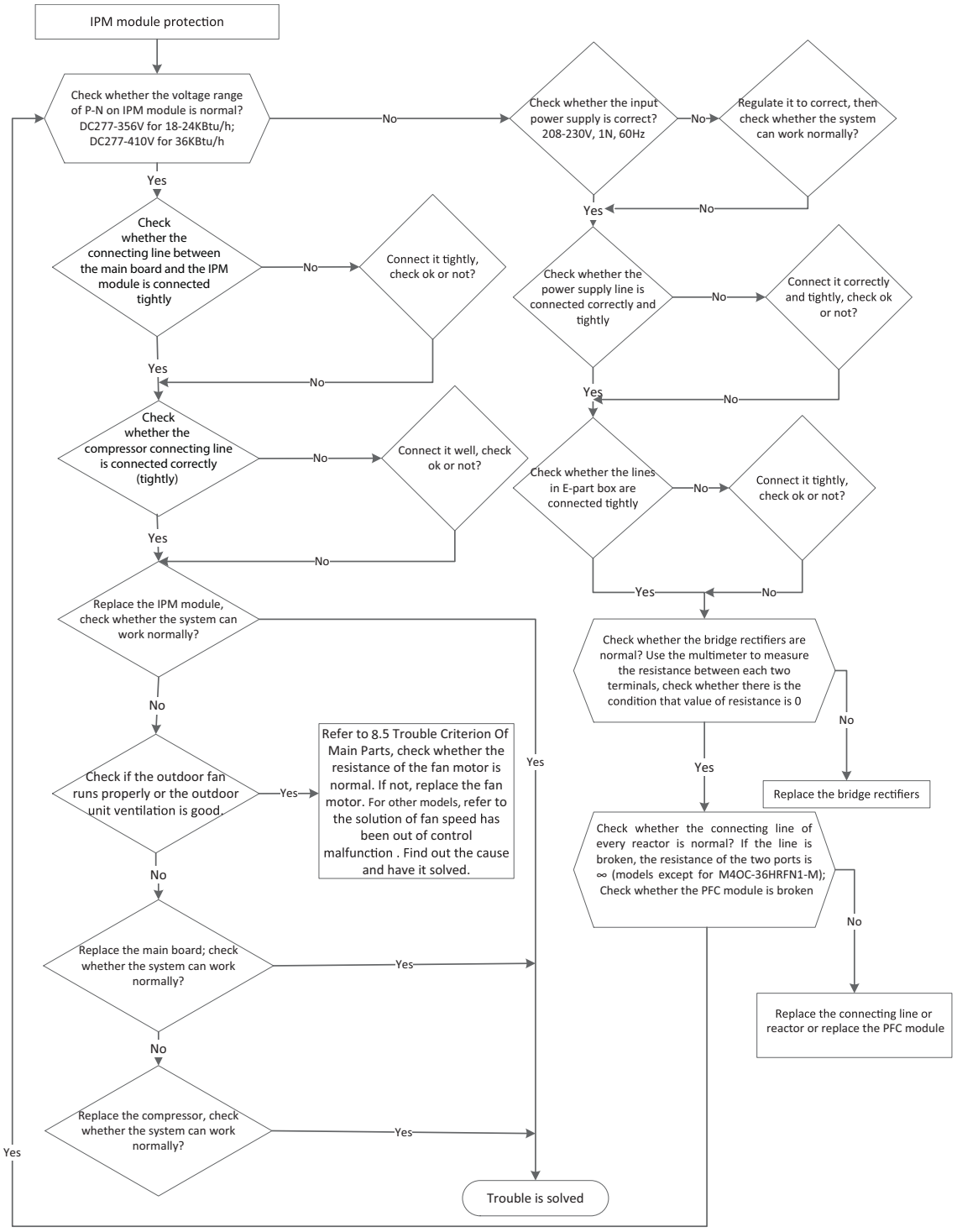


DIAGNOSIS AND SOLUTION (CONT)

P6 (IPM module protection) error

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.
Supposed 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

Supposed 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.

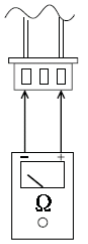
Supposed causes:

- EXV faulty
- Wire and tubing connected in reverse

Check the EXV.

Temperature Sensor Checking

Disconnect the temperature sensor from PCB, 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

Table 32—Temperature Sensor Resistance Value

°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm
−4	−20	115.266	68	20	12.6431	140	60	2.35774	212	100	0.62973
−2.2	−19	108.146	69.8	21	12.0561	141.8	61	2.27249	214	101	0.61148
−0.4	−18	101.517	71.6	22	11.5	143.6	62	2.19073	216	102	0.59386
1.4	−17	96.3423	73.4	23	10.9731	145.4	63	2.11241	217	103	0.57683
3.2	−16	89.5865	75.2	24	10.4736	147.2	64	2.03732	219	104	0.56038
5	−15	84.219	77	25	10	149	65	1.96532	221	105	0.54448
6.8	−14	79.311	78.8	26	9.55074	150.8	66	1.89627	223	106	0.52912
8.6	−13	74.536	80.6	27	9.12445	152.6	67	1.83003	225	107	0.51426
10.4	−12	70.1698	82.4	28	8.71983	154.4	68	1.76647	226	108	0.49989
12.2	−11	66.0898	84.2	29	8.33566	156.2	69	1.70547	228	109	0.486
14	−10	62.2756	86	30	7.97078	158	70	1.64691	230	110	0.47256
15.8	−9	58.7079	87.8	31	7.62411	159.8	71	1.59068	232	111	0.45957
17.6	−8	56.3694	89.6	32	7.29464	161.6	72	1.53668	234	112	0.44699
19.4	−7	52.2438	91.4	33	6.98142	163.4	73	1.48481	235	113	0.43482
21.2	−6	49.3161	93.2	34	6.68355	165.2	74	1.43498	237	114	0.42304
23	−5	46.5725	95	35	6.40021	167	75	1.38703	239	115	0.41164
24.8	−4	44	96.8	36	6.13059	168.8	76	1.34105	241	116	0.4006
26.6	−3	41.5878	98.6	37	5.87359	170.6	77	1.29078	243	117	0.38991
28.4	−2	39.8239	100.4	38	5.62961	172.4	78	1.25423	244	118	0.37956
30.2	−1	37.1988	102.2	39	5.39689	174.2	79	1.2133	246	119	0.36954
32	0	35.2024	104	40	5.17519	176	80	1.17393	248	120	0.35982
33.8	1	33.3269	105.8	41	4.96392	177.8	81	1.13604	250	121	0.35042
35.6	2	31.5635	107.6	42	4.76253	179.6	82	1.09958	252	122	0.3413
37.4	3	29.9058	109.4	43	4.5705	181.4	83	1.06448	253	123	0.33246
39.2	4	28.3459	111.2	44	4.38736	183.2	84	1.03069	255	124	0.3239
41	5	26.8778	113	45	4.21263	185	85	0.99815	257	125	0.31559
42.8	6	25.4954	114.8	46	4.04589	186.8	86	0.96681	259	126	0.30754
44.6	7	24.1932	116.6	47	3.88673	188.6	87	0.93662	261	127	0.29974
46.4	8	22.5662	118.4	48	3.73476	190.4	88	0.90753	262	128	0.29216
48.2	9	21.8094	120.2	49	3.58962	192.2	89	0.8795	264	129	0.28482
50	10	20.7184	122	50	3.45097	194	90	0.85248	266	130	0.2777
51.8	11	19.6891	123.8	51	3.31847	195.8	91	0.82643	268	131	0.27078
53.6	12	18.7177	125.6	52	3.19183	197.6	92	0.80132	270	132	0.26408
55.4	13	17.8005	127.4	53	3.07075	199.4	93	0.77709	271	133	0.25757
57.2	14	16.9341	129.2	54	2.95896	201.2	94	0.75373	273	134	0.25125
59	15	16.1156	131	55	2.84421	203	95	0.73119	275	135	0.24512
60.8	16	15.3418	132.8	56	2.73823	204.8	96	0.70944	277	136	0.23916
62.6	17	14.6181	134.6	57	2.63682	206.6	97	0.68844	279	137	0.23338
64.4	18	13.918	136.4	58	2.53973	208.4	98	0.66818	280	138	0.22776
66.2	19	13.2631	138.2	59	2.44677	210.2	99	0.64862	282	139	0.22231

APPENDIX 2

Table 33—Discharge Temperature Sensor

°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm
−4	−20	542.7	68	20	68.66	140	60	13.59	212	100	3.702
−2.2	−19	511.9	69.8	21	65.62	141.8	61	13.11	214	101	3.595
−0.4	−18	483	71.6	22	62.73	143.6	62	12.65	216	102	3.492
1.4	−17	455.9	73.4	23	59.98	145.4	63	12.21	217	103	3.392
3.2	−16	430.5	75.2	24	57.37	147.2	64	11.79	219	104	3.296
5	−15	406.7	77	25	54.89	149	65	11.38	221	105	3.203
6.8	−14	384.3	78.8	26	52.53	150.8	66	10.99	223	106	3.113
8.6	−13	363.3	80.6	27	50.28	152.6	67	10.61	225	107	3.025
10.4	−12	343.6	82.4	28	48.14	154.4	68	10.25	226	108	2.941
12.2	−11	325.1	84.2	29	46.11	156.2	69	9.902	228	109	2.86
14	−10	307.7	86	30	44.17	158	70	9.569	230	110	2.781
15.8	−9	291.3	87.8	31	42.33	159.8	71	9.248	232	111	2.704
17.6	−8	275.9	89.6	32	40.57	161.6	72	8.94	234	112	2.63
19.4	−7	261.4	91.4	33	38.89	163.4	73	8.643	235	113	2.559
21.2	−6	247.8	93.2	34	37.3	165.2	74	8.358	237	114	2.489
23	−5	234.9	95	35	35.78	167	75	8.084	239	115	2.422
24.8	−4	222.8	96.8	36	34.32	168.8	76	7.82	241	116	2.357
26.6	−3	211.4	98.6	37	32.94	170.6	77	7.566	243	117	2.294
28.4	−2	200.7	100.4	38	31.62	172.4	78	7.321	244	118	2.233
30.2	−1	190.5	102.2	39	30.36	174.2	79	7.086	246	119	2.174
32	0	180.9	104	40	29.15	176	80	6.859	248	120	2.117
33.8	1	171.9	105.8	41	28	177.8	81	6.641	250	121	2.061
35.6	2	163.3	107.6	42	26.9	179.6	82	6.43	252	122	2.007
37.4	3	155.2	109.4	43	25.86	181.4	83	6.228	253	123	1.955
39.2	4	147.6	111.2	44	24.85	183.2	84	6.033	255	124	1.905
41	5	140.4	113	45	23.89	185	85	5.844	257	125	1.856
42.8	6	133.5	114.8	46	22.89	186.8	86	5.663	259	126	1.808
44.6	7	127.1	116.6	47	22.1	188.6	87	5.488	261	127	1.762
46.4	8	121	118.4	48	21.26	190.4	88	5.32	262	128	1.717
48.2	9	115.2	120.2	49	20.46	192.2	89	5.157	264	129	1.674
50	10	109.8	122	50	19.69	194	90	5	266	130	1.632
51.8	11	104.6	123.8	51	18.96	195.8	91	4.849			
53.6	12	99.69	125.6	52	18.26	197.6	92	4.703			
55.4	13	95.05	127.4	53	17.58	199.4	93	4.562			
57.2	14	90.66	129.2	54	16.94	201.2	94	4.426			
59	15	86.49	131	55	16.32	203	95	4.294		B (25/50) = 3950K	
60.8	16	82.54	132.8	56	15.73	204.8	96	4.167			
62.6	17	78.79	134.6	57	15.16	206.6	97	4.045		R (194°F (90°C)) = 5KΩ±3%	
64.4	18	75.24	136.4	58	14.62	208.4	98	3.927			
66.2	19	71.86	138.2	59	14.09	210.2	99	3.812			

APPENDIX 3

Table 34—°C and °F

℃	10 11 12 13 14 15 16 17 18 19 20 21 22
℉	48 50 52 54 56 58 60 62 64 66 68 70 72
℃	23 24 25 26 27 28 29 30 31 32 33 34 35
℉	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.

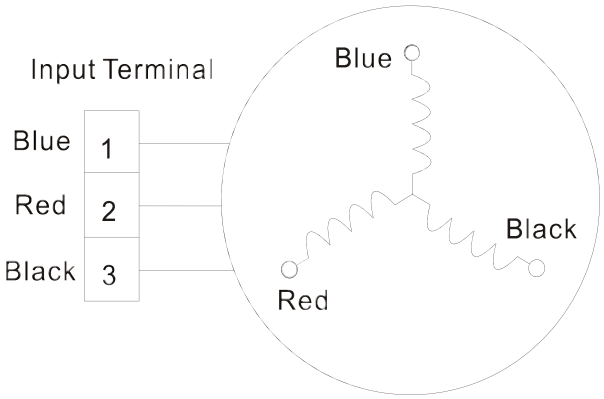


Fig. 54 – Measure the Resistance

Table 35—Compressor Check

POSITION	RESISTANCE VALUE			
	DA150S1C−20FZ	DA250S2C−30M	TNB306FPGMC−L	MNB36FAAMC−L
BLUE – RED	0.95Ω (68°F/20°C)	0.55Ω (68°F/20°C)	0.53Ω (68°F/20°C)	0.44Ω (68°F/20°C)

Fig. 55 – 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 36—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

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

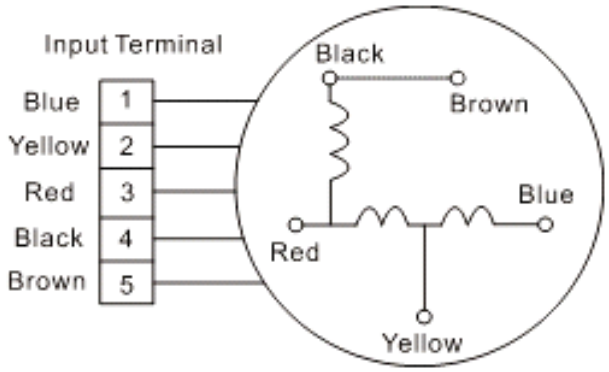


Table 37—Resistance Value

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)

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

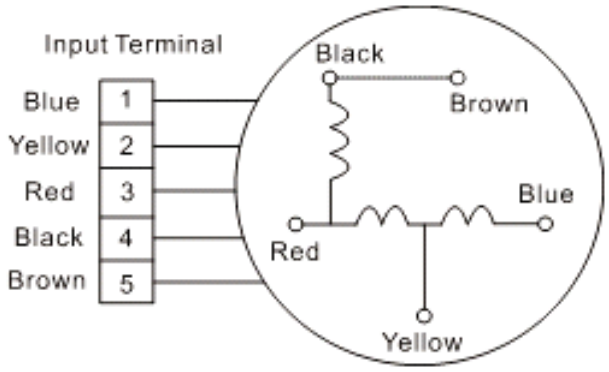


Table 38—Resistance Value

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.

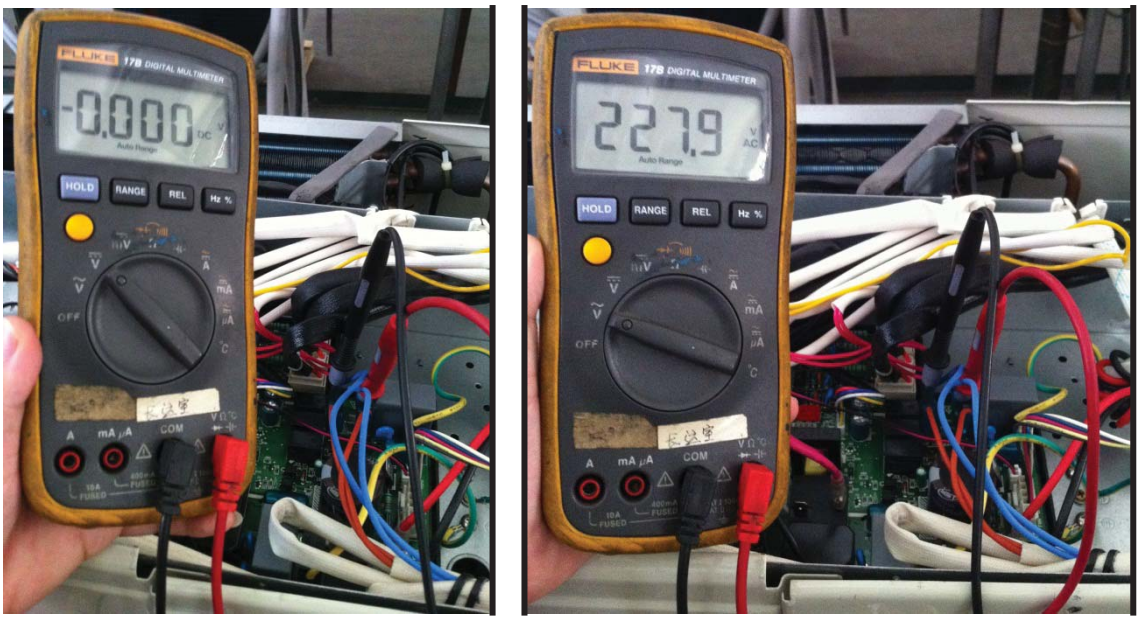


Fig. 56 – Test the voltage

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

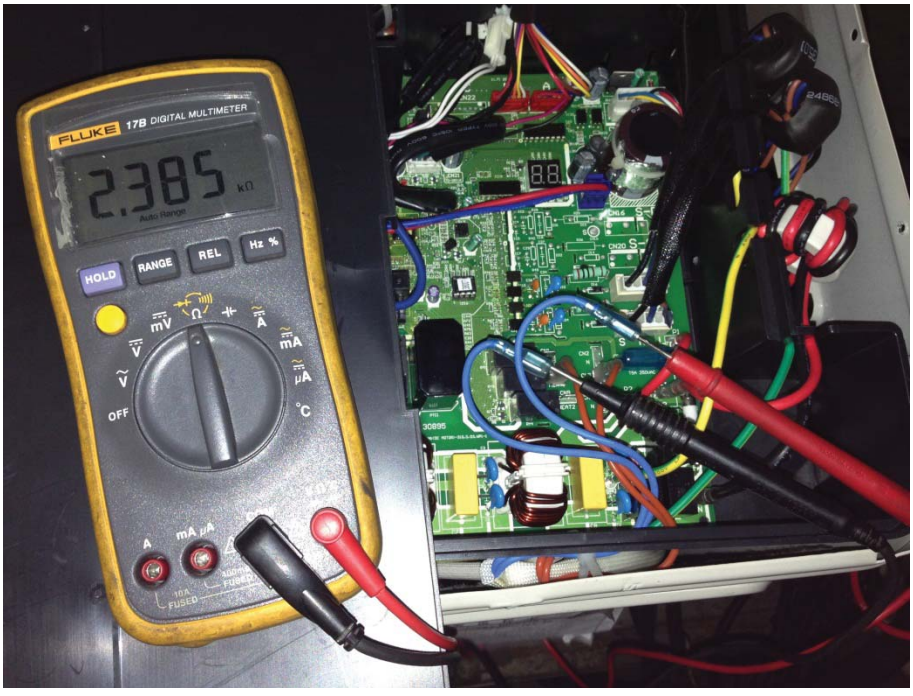


Fig. 57 – Test the Resistance

EXV Check

1 Disconnect the connectors.

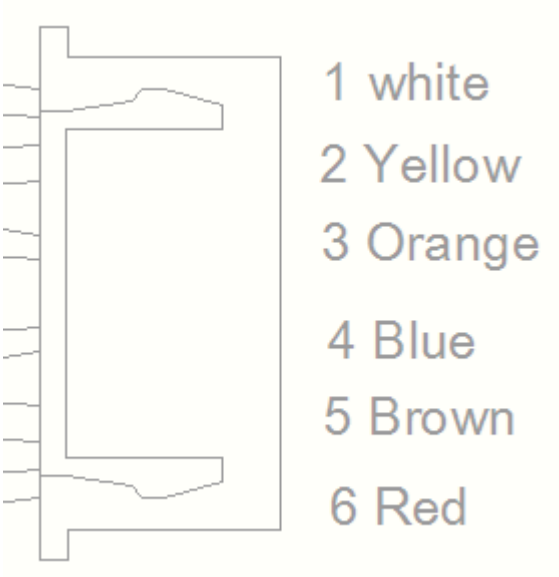


Fig. 58 – Disconnect the connectors

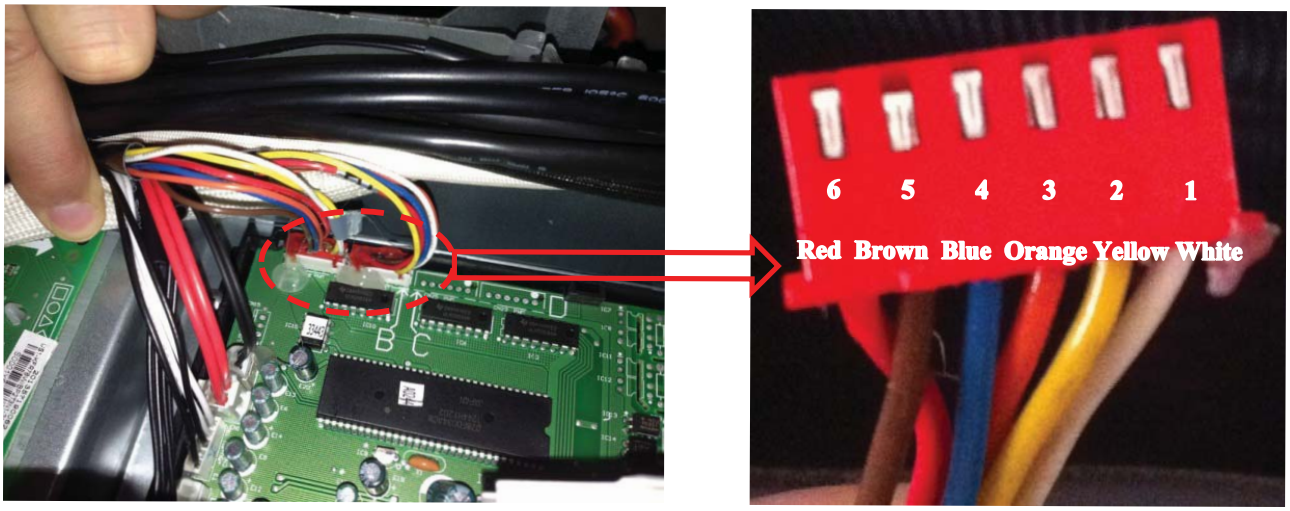
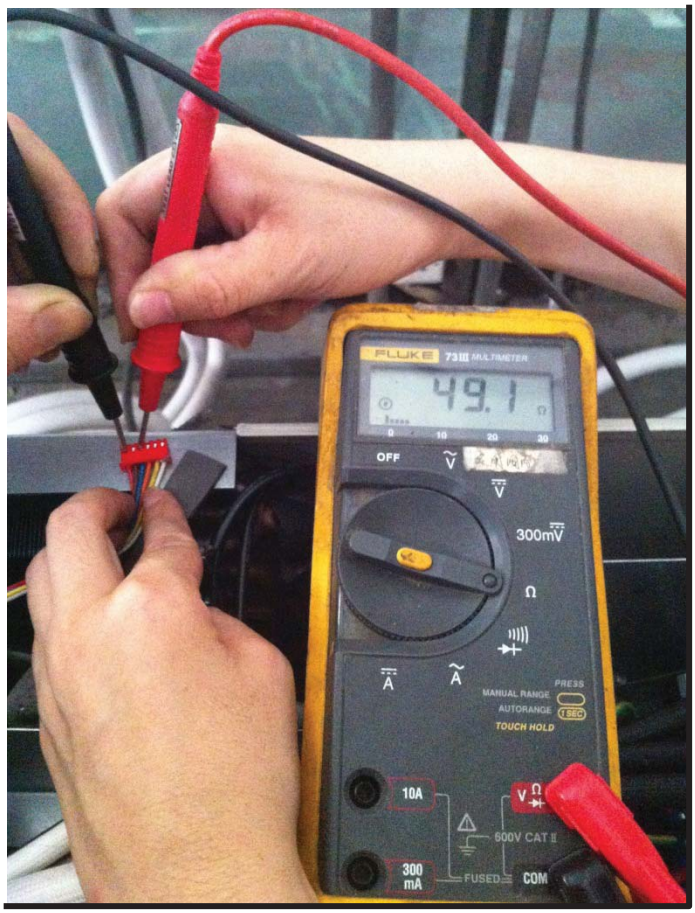


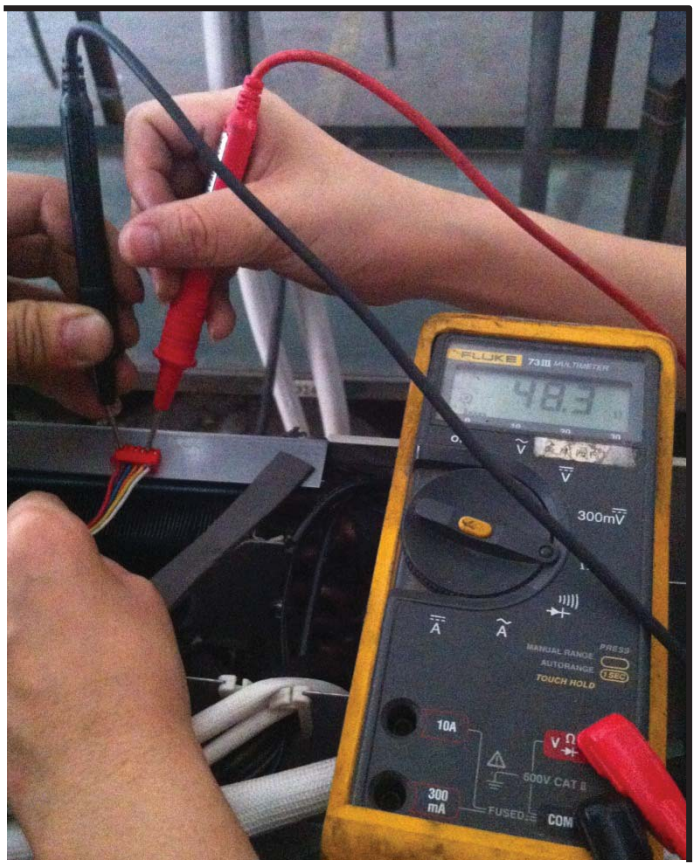
Table 39—Resistance to EXV Coil

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

EXV Check (CONT)

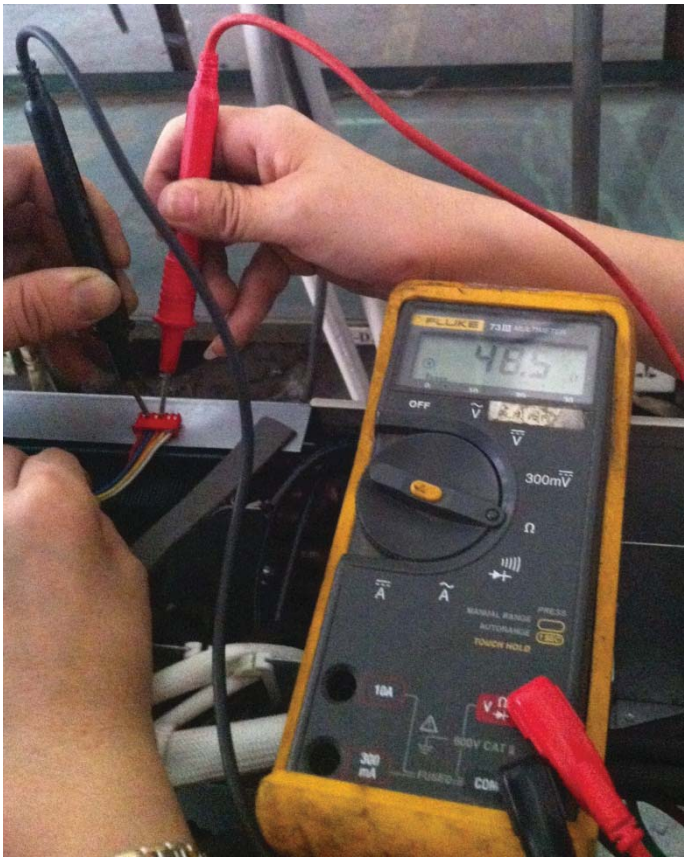


Red- Blue

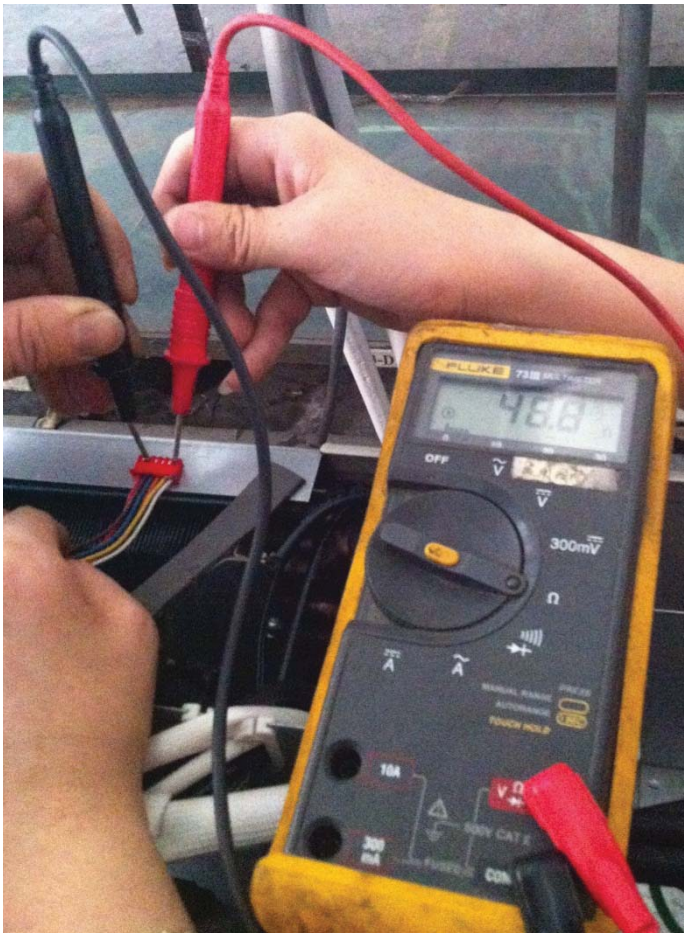


Red - Yellow

EXV Check (CONT)



Brown-Orange

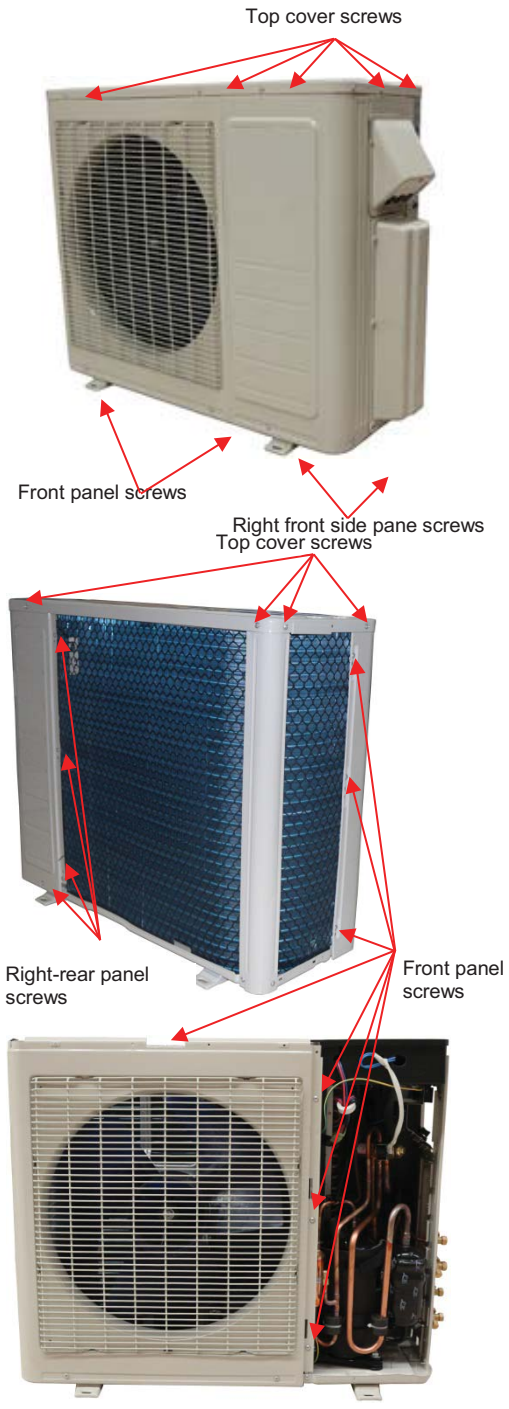


Brown-White

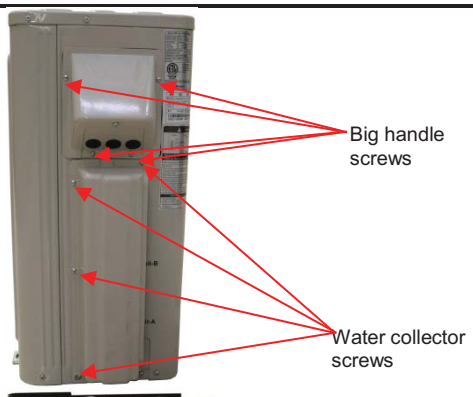
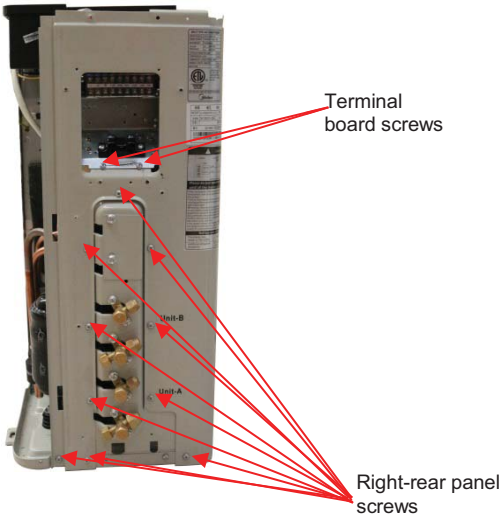
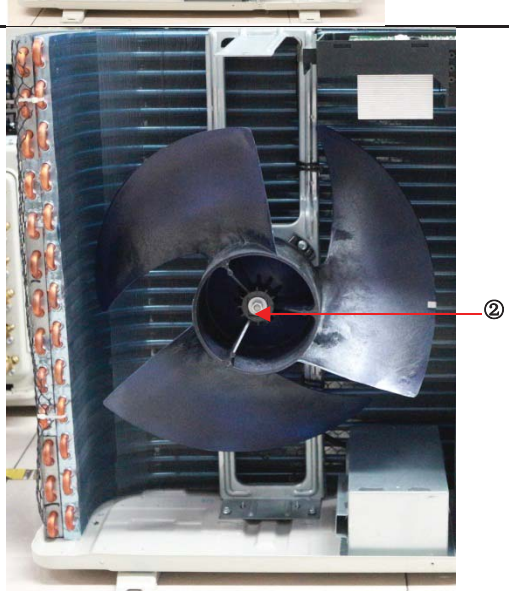
DISASSEMBLY INSTRUCTIONS

Size 18K

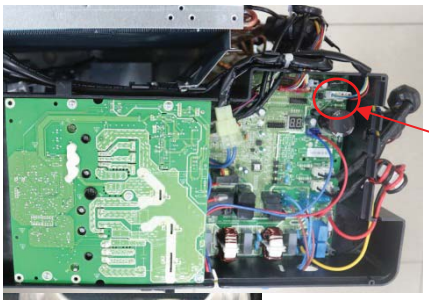
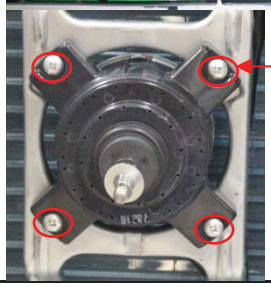
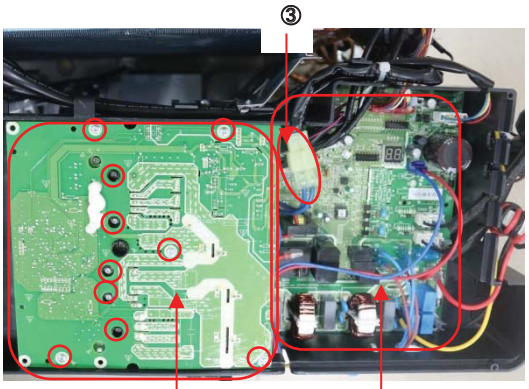
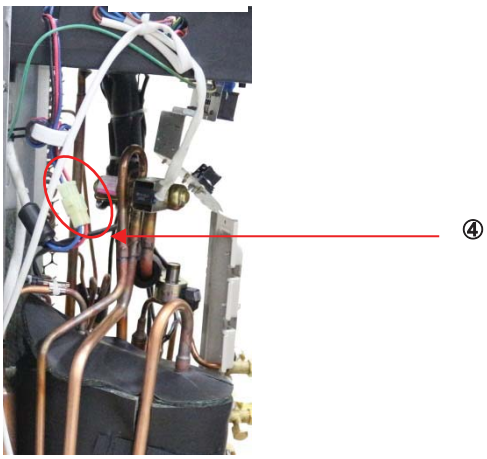
NOTE: This part is for reference, the photos may differ slightly from your machine.

No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate. 1) Stop the air conditioner and turn “OFF” the power breaker. 2) Remove the top cover screws, and remove the top cover screws (9). 3) Remove the right front side panel screws, and remove the right front side panel screws (2). 4) Remove the front panel screws, and remove the front panel screws (9).	

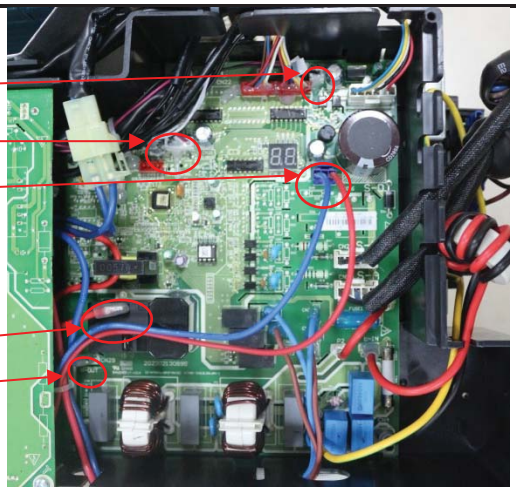
DISASSEMBLY INSTRUCTIONS (CONT)

		5) Remove the big handle screws, and remove the big handle (4 screws). 6) Remove the terminal board screws (2), the water collector screws (4) and the right-rear panel screws (14), then remove the right-rear panel.	  
2	Fan assembly	How to remove the fan assembly. 1) Remove the top cover, right front side panel and front panel (see section 1, steps 1-4). 2) Remove the hex nut securing the fan. 3) Remove the fan.	

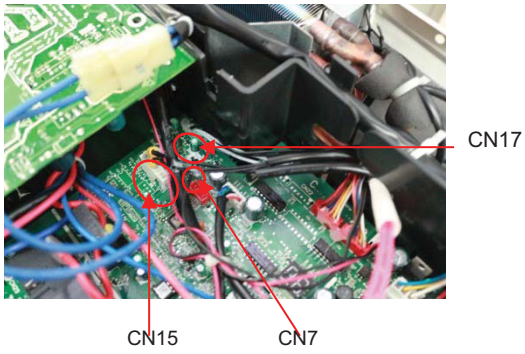
DISASSEMBLY INSTRUCTIONS (CONT)

		4) Remove the electrical control box cover. 5) Disconnect the fan motor connector CN37 (5p, white) from the PCB board. 6) Remove the fan motor after unfastening the screws (4).	  
3	Electrical parts	How to remove the electrical parts. 1) Perform the steps in sections 1 and 2. 2) Remove the screws securing the IPM board. 3) Unfasten the reactor connector. 4) Unfasten the compressor connector. 5) Disconnect the following 5 connection wires and connectors between the IPM and PCB.	 

DISASSEMBLY INSTRUCTIONS (CONT)



6) Remove the IPM board.



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

Connectors:

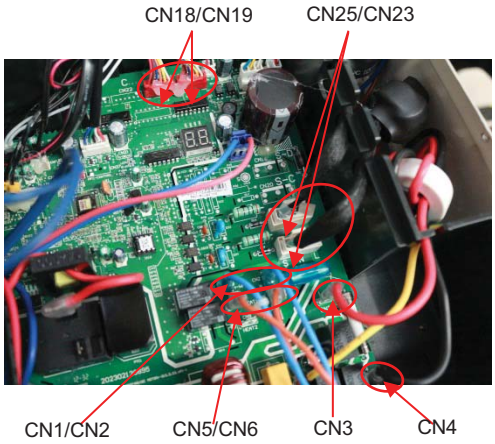
CN17:T3/T4 temp. sensor (2p/2p,white)

CN7: T discharge temp. sensor (2p,white)

CN15:T2B-A, B temp. sensor (2p/2p,white)

CN18/CN19: Electronic expansive valve A, B (6p/6p,red/red)

CN25/CN23: S-A,S-B (3p/3p,white/white)



Wires:

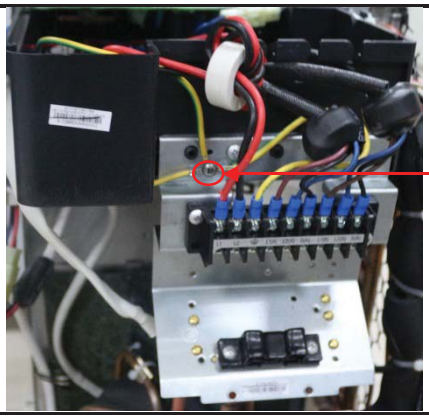
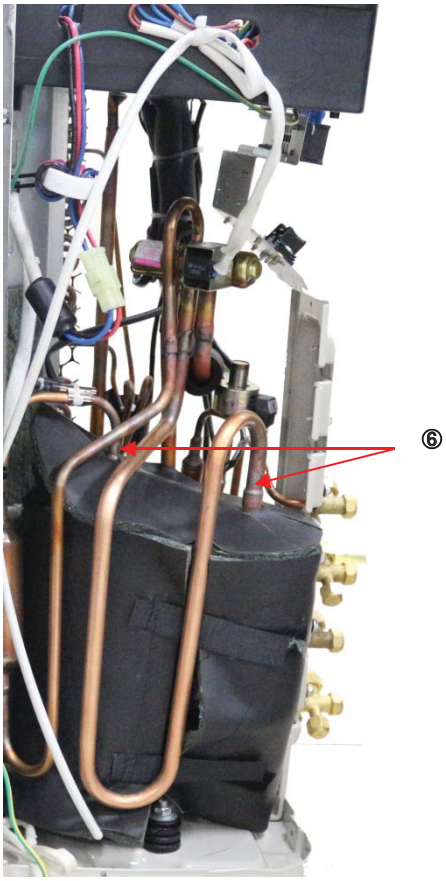
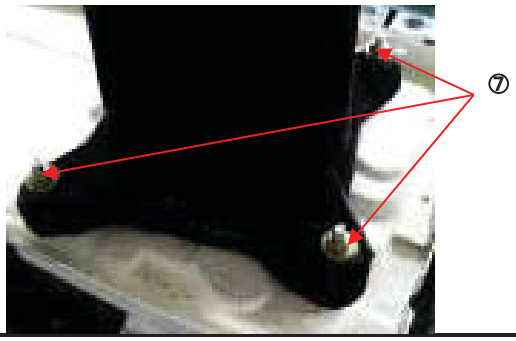
CN1/CN2: 4-way valve (blue-blue)

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

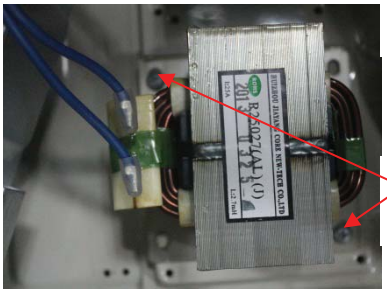
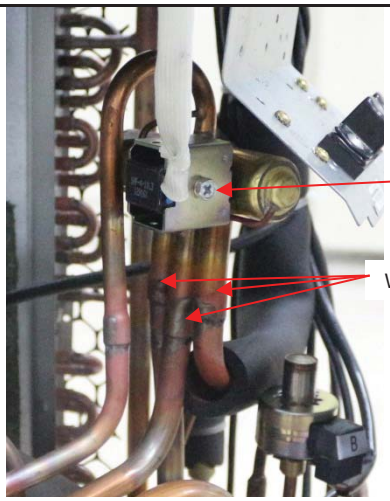
CN3:L-IN (red)

CN4:N-IN (black)

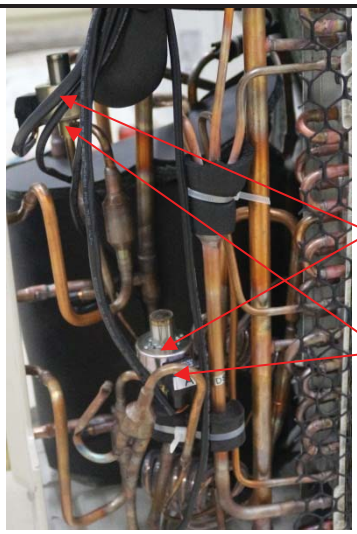
DISASSEMBLY INSTRUCTIONS (CONT)

		8) Disconnect the grounding wire (yellow-green) after removing the big handle and the right-rear panel. 9) Remove the PCB board.	
4	Compressor	How to remove the compressor. 1) Perform the 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, disconnect the compressor thermo wires and compressor from the terminal. 6) Remove the discharge and suction pipes with a burner. 7) Remove the hex nuts and washers securing the compressor to the bottom plate. 8) Lift the compressor.	 

DISASSEMBLY INSTRUCTIONS (CONT)

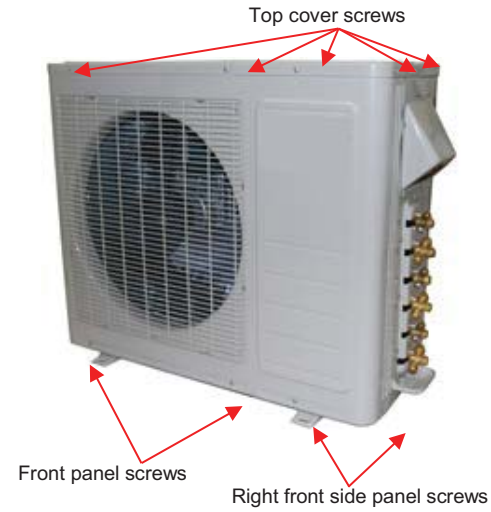
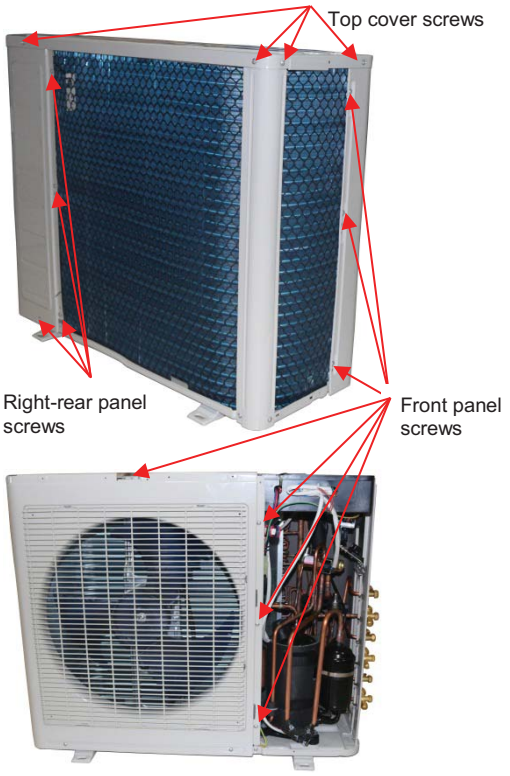
5	Reactor	How to remove the reactor 1) Complete the steps in sections 1 and 2. 2) Unfasten the connector between the IPM and reactor. 3) Remove the cover of inductance screws (2), and remove the cover of inductance 4) Disconnect the two wires connected from the cover of inductance. 5) Remove the reactor screws, and 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 from section 3. 4) Remove the coil screw and remove the coil. 5) Detach the welded parts of 4-way valve and pipe.	

DISASSEMBLY INSTRUCTIONS (CONT)

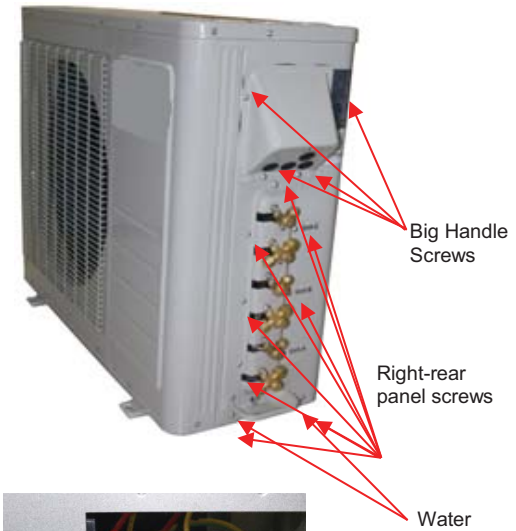
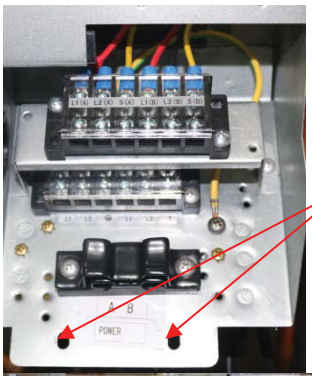
7	The expansion valve	How to remove the expansion valve 1) Complete the steps in sections 1 and 2. 2) Remove the electrical parts (see section 3). 3) Remove the coils. 4) Detach the welded parts of the expansion valves and pipes.	

DISASSEMBLY INSTRUCTIONS (CONT)

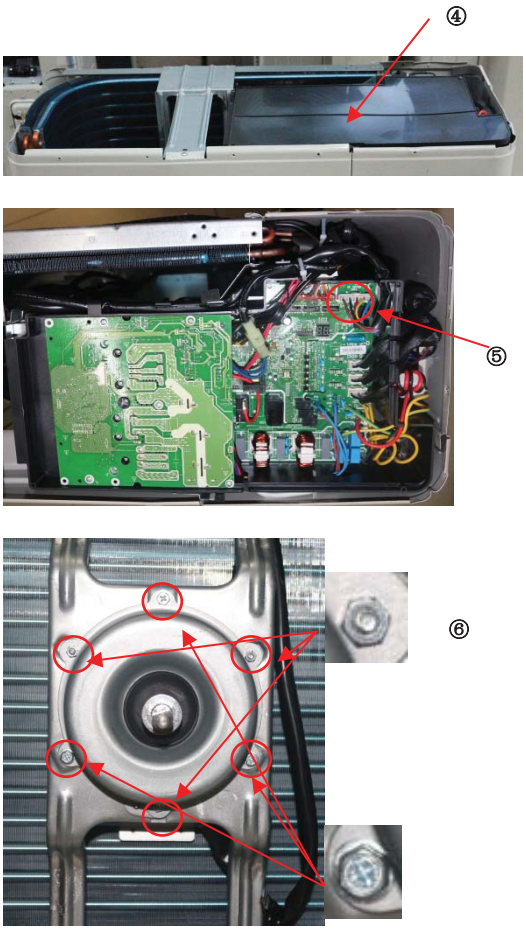
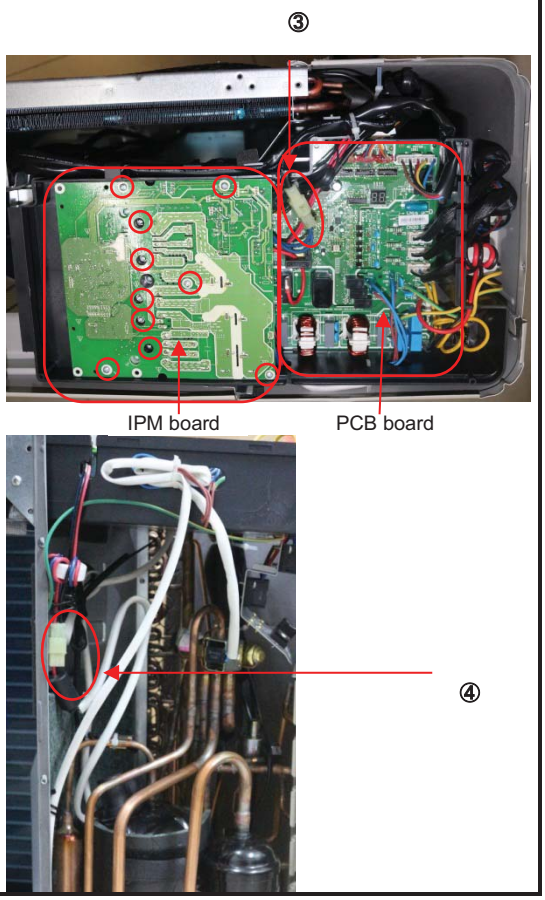
Size 27K

No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate 1) Turn off the air conditioner and turn “OFF” the power breaker. 2) Remove the screws of top cover, and remove the top cover (9 screws). 3) Remove the right front side panel screws, and remove the right front side panel (2 screws). 4) Remove the front panel screws, and remove the front panel (9 screws). 5) Remove the big handle screws, and remove the big handle (4 screws). 6) Remove two terminal board screws, water collector screws (2) right-rear panel screws (12), and remove the right-rear panel.	 

DISASSEMBLY INSTRUCTIONS (CONT)

			  
2	Fan assembly	How to remove the fan assembly. 1) Remove the top cover, right front side panel and front panel from section 1.steps 1-4. 2) Remove the hex nut securing the fan. 3) Remove the fan.	

DISASSEMBLY INSTRUCTIONS (CONT)

		4) Remove the electrical control box cover. 5) Disconnect the fan motor connector CN11 (5p, white) from the PCB board. 6) Unfasten the screws (6) then remove the fan motor. **NOTE!!: There are two kinds of screws. Please pay attention to it when installing the fan motor.**	
3	Electrical parts	How to remove the electrical parts. 1) Complete the steps in sections 1 and 2. 2) Remove the screws (10) securing the IPM board. 3) Unfasten the reactor connector. 4) Unfasten the compressor connector.	

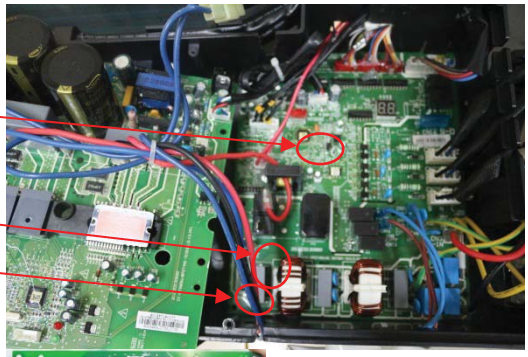
DISASSEMBLY INSTRUCTIONS (CONT)

5) Disconnect the following 3 pieces of the connection wires and connectors between the IPM and PCB.

CN21(5p,white)

L-OUT(red)

N-OUT(blue)



⑥

6) Remove the IPM board.

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

Connectors:

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

CN7: Tdischarge temp. sensor (2p,white)

CN12:Ttop temp. sensor(2p,white)

CN15:T2B-A, B, C temp. sensor (2p/2p/2p,white)

CN18/CN19/CN22: Electronic expansive

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)

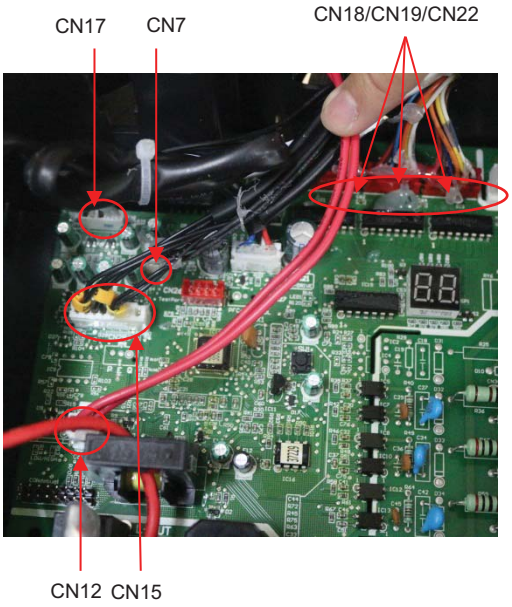
Wires:

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

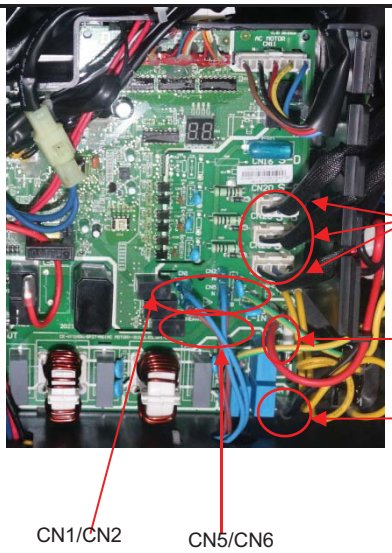
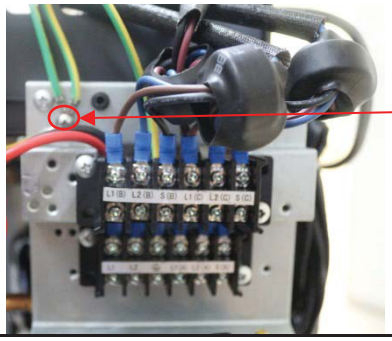
CN5/CN6: Crankcase heating cable (red-red)

CN3:L1-IN (red)

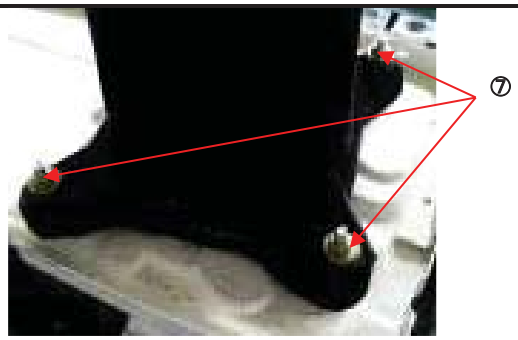
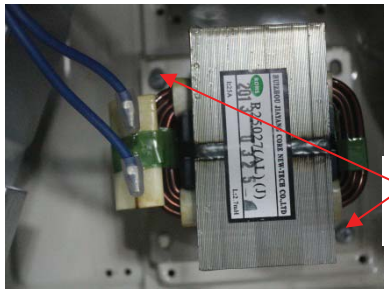
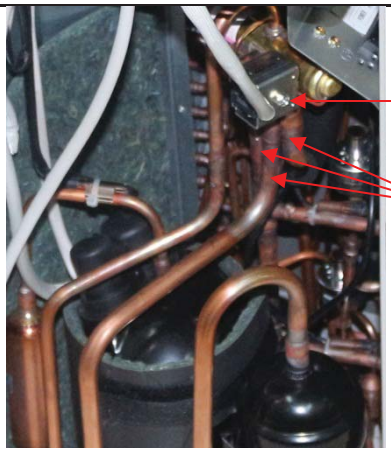
CN4:L2-IN (black)



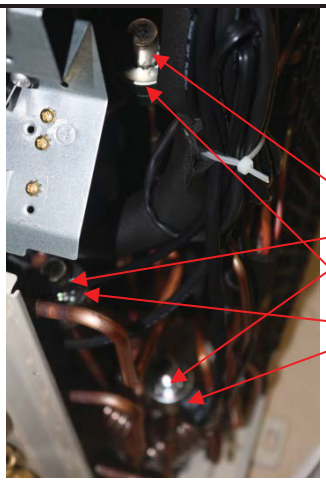
DISASSEMBLY INSTRUCTIONS (CONT)

		8) Disconnect the grounding wire (yellow-green) after removing the big handle and 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 partition plate. 3) Extract the refrigerant gas. 4) Remove the sound insulation material and crankcase heating cable. 5) Remove the compressor terminal cover and disconnect compressor thermo wires and compressor from the terminal. 6) Remove the discharge and suction pipes with a burner.	

DISASSEMBLY INSTRUCTIONS (CONT)

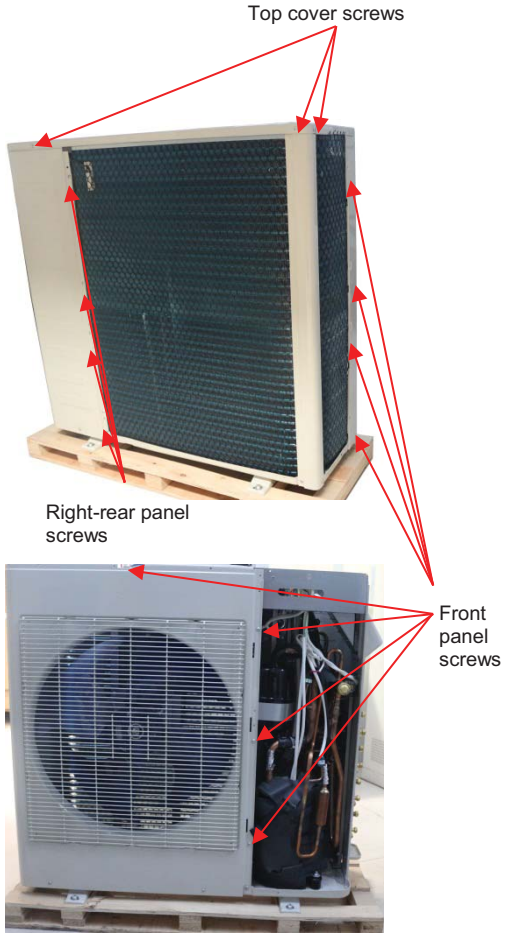
		7) Remove the hex nuts and washers securing the compressor to the bottom plate. 8) Lift the compressor.	
5	Reactor	How to remove the reactor 1) Complete the steps in sections 1 and 2. 2) Unfasten the connector between the IPM and reactor. 3) Remove the cover of inductance screws, and remove the cover of inductance. 4) Disconnect the two pieces of wires connected from the cover of inductance. 5) Remove the reactor screws (2), and remove the reactor.	 
6	The 4-way valve	How to remove the 4-way valve 1) Perform work of item 1, and 2. 2) Extract the refrigerant gas. 3) Remove the electrical parts (see section 3). 4) Remove the coil screw of then remove the coil. 5) Detach the 4-way valve's welded parts and the pipe.	

DISASSEMBLY INSTRUCTIONS (CONT)

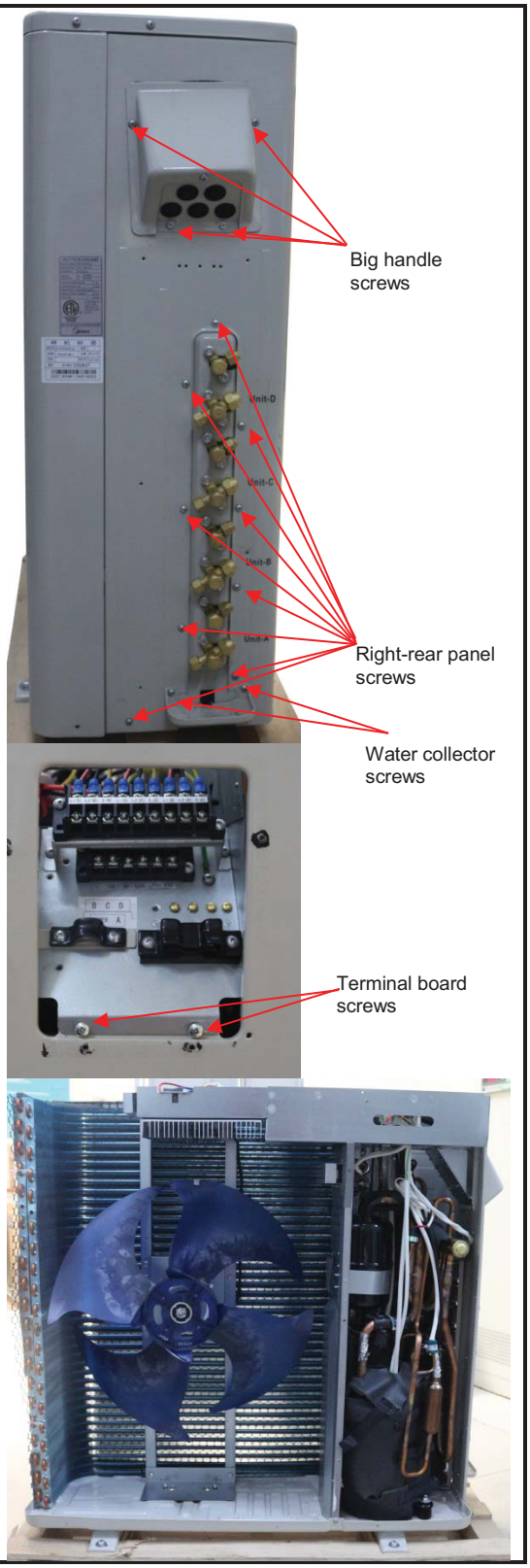
7	The expansion valve	How to remove the expansion valve 1) Complete the steps in sections 1 and 2. 2) Remove the electrical parts (see section 3). 3) Remove the coils. 4) Detach the welded parts of expansion valves and pipes.	

DISASSEMBLY INSTRUCTIONS (CONT)

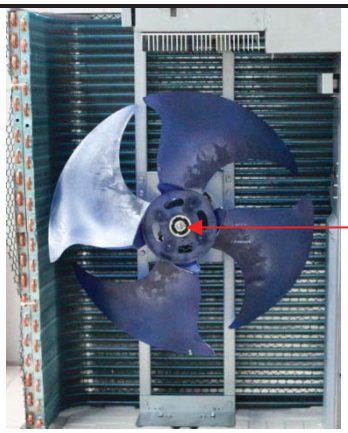
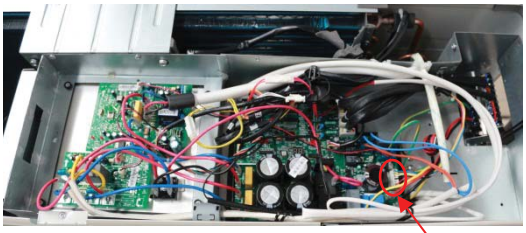
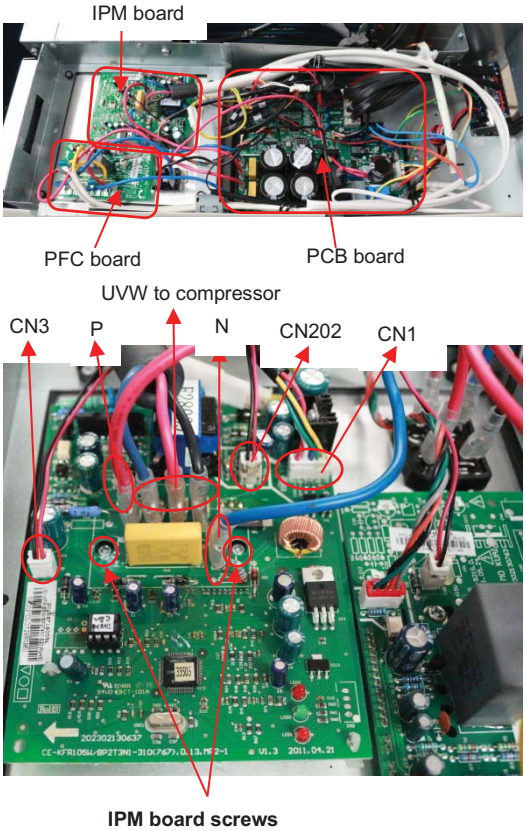
Size 36

No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate. 1) Stop the air conditioner operation and turn “OFF” the power breaker. 2) Remove the top cover screws, and remove the top cover (8 screws). 3) Remove the screws of right front side panel, and remove the right front side panel (2 screws). 4) Remove the front panel screws, and remove the front panel (10 screws). 5) Remove the big handle screws, and remove the big handle (4 screws). 6) Remove the terminal board screws (2), water collector screws (2) and right-rear panel screws (13) then remove the right-rear panel.	 

DISASSEMBLY INSTRUCTIONS (CONT)



DISASSEMBLY INSTRUCTIONS (CONT)

2	Fan assembly	How to remove the fan assembly. 1) Remove the top cover, right front side panel and 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 cover screws (5) then remove the control box cover. 5) Disconnect the fan motor connector CN25 (5p, white) on the PCB board. 6) Remove the fan motor after unfastening the screws (4).	  
3	Electrical parts	How to remove the electrical parts. 1) Complete the steps in sections 1 and 2. 2) Disconnect the following connection wires and connectors on the IPM. P: (+, red), connected to P2 on PCB. N: (-, blue), connected to P4 on PCB. UVW: (blue-red-black), connected to compressor. CN1: (5p, white), connected to CN7 on PCB. CN202:(2p, white),connected to CN8 on PFC. CN3: (2p, white), connected to CN34 on PCB. 3) Remove the IPM board screws (2) then remove the IPM board.	

DISASSEMBLY INSTRUCTIONS (CONT)

4) Disconnect the following connection wires and connectors on the PFC.

C and CN12: (yellow-yellow), connected to PFC inductance.

R and CN12: (blue-red), connected to rectifier.

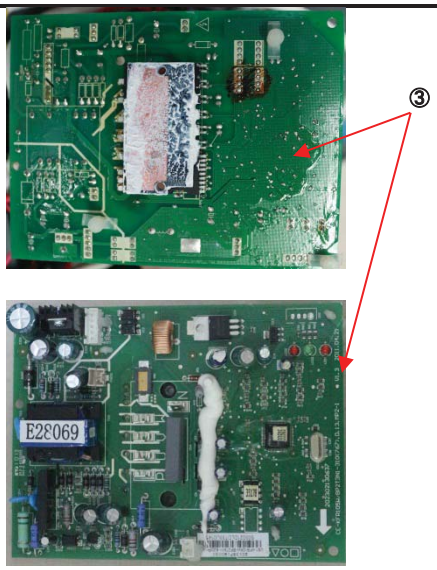
+ and - : (red-blue), connected to P1 and P3 on PCB.

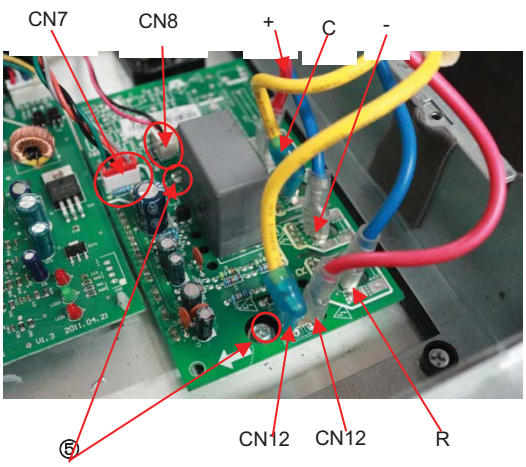
CN7: (4p,red), connected to CN11 on PCB.

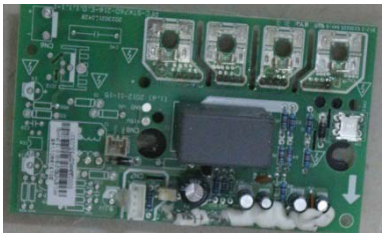
CN8: (2p, white), connected to CN202 on IPM.

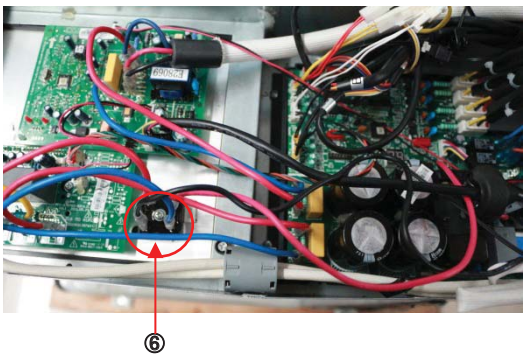
5) Remove the PFC board after removing the screws (2).

6) Disconnect the four wires (red-blue from PFC and black-red from PCB), then remove the rectifier.









DISASSEMBLY INSTRUCTIONS (CONT)

7) Disconnect following connection wires and connectors between the PCB and other components.

P4: (blue), connected to N on IPM.

P2: (red), connected to P on IPM.

P1: (red), connected to + on PFC.

P3: (blue), connected to – on PFC.

RY4: (red), connected to rectifier.

CN34: (2p, white), connected to CN3 on IPM.

CN6/CN22: (blue/blue), connected to 4 way valve.

CN3/CN40: (red/red), connected to crankcase heating cable.

CN11: (4p, red), connected to CN7 on PFC.

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

CN33: Tdischarge temp. sensor (2p, white)

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

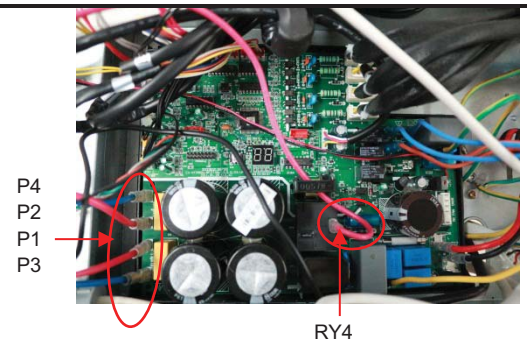
CN9: High and low pressure switch (2p/2p, white)

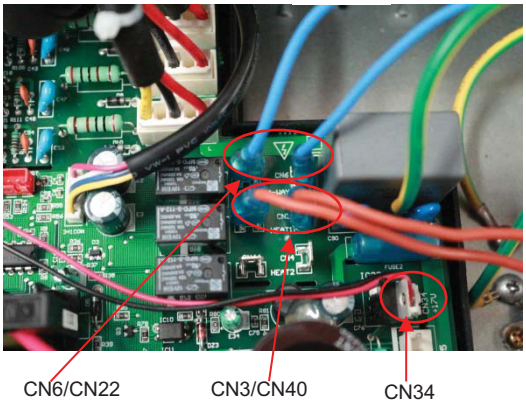
CN18/CN19/CN20/CN21: electronic expansive valve A,B,C,D (6p/6p/6p/6p,red/red/red/red)

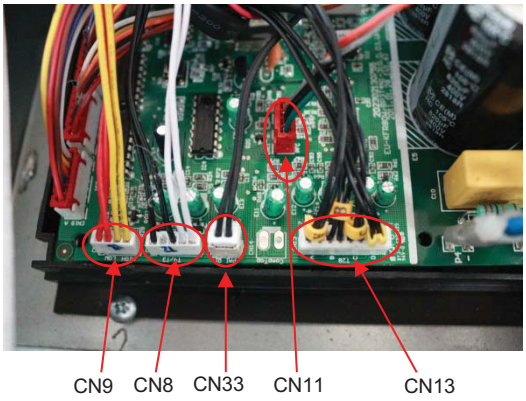
CN27/CN28/CN29/CN30: S-A,B,C,D (3p/3p/3p/3p,white/white/white/white)

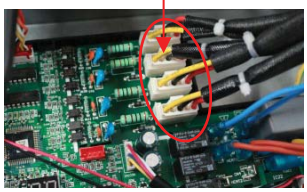
CN1-CN2: (red-black), connected to power terminal

P-1/P-2: (yellow-green/yellow-green), grounding wires of PCB.

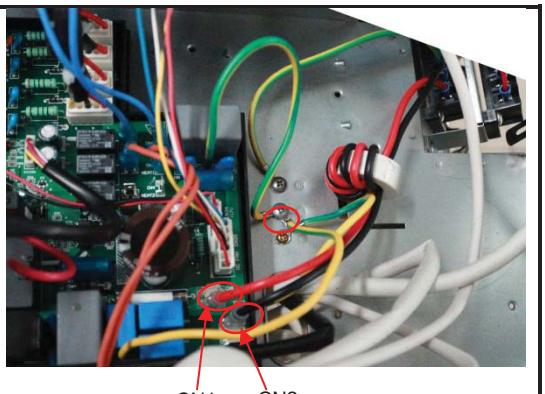
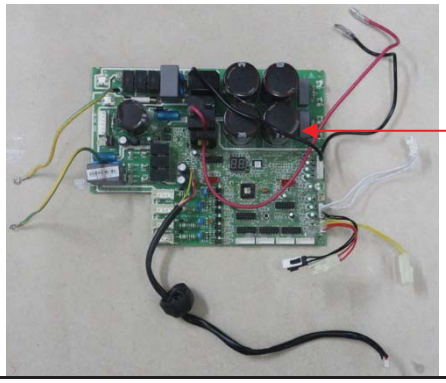




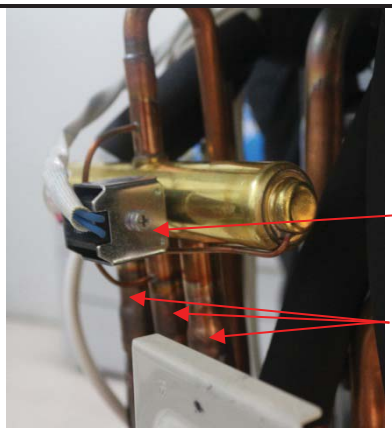
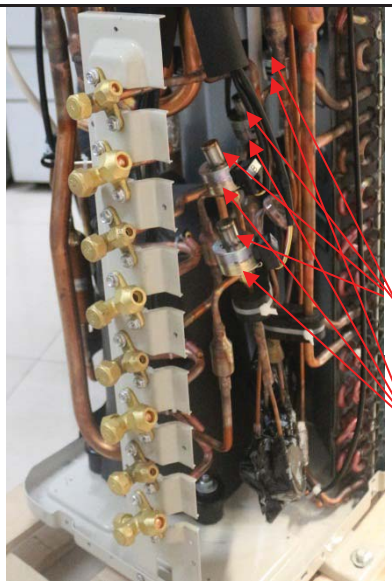




DISASSEMBLY INSTRUCTIONS (CONT)

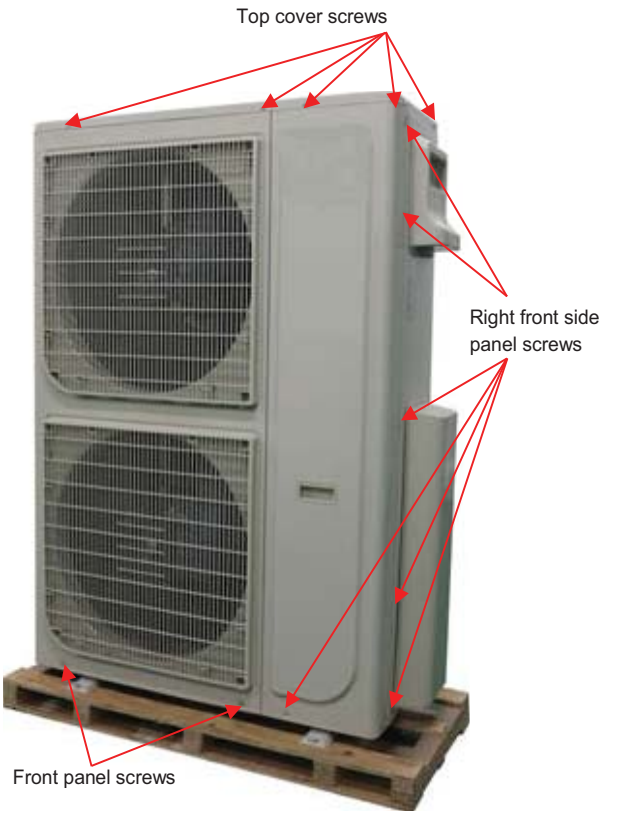
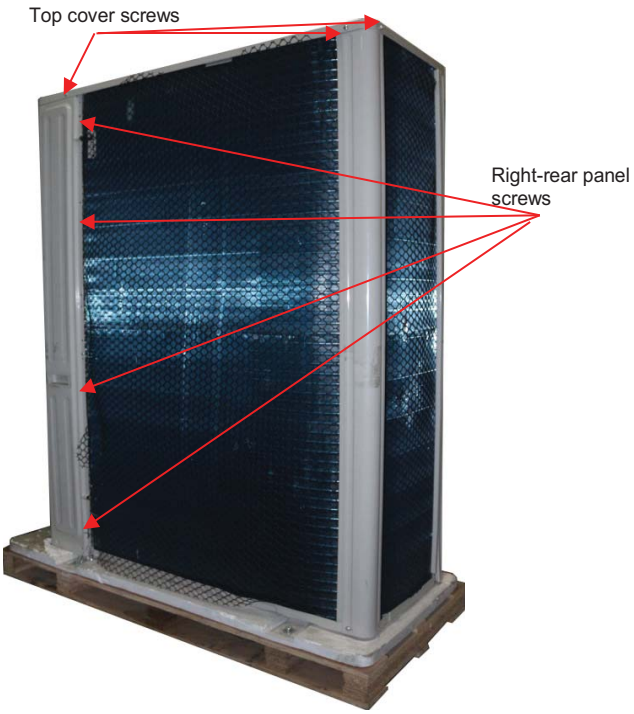
		8) Remove the PCB board.	 
4	Compressor	How to remove the compressor. 1) Complete the steps in sections 1, 2, and 3. 2) Remove the electrical control box and partition plate. 3) Extract the refrigerant gas. 4) Remove the sound insulation material and crankcase heating cable. 5) Remove the compressor's terminal cover of and disconnect the compressor thermo wires and the compressor from the terminal. 6) Remove the discharge and suction pipes with a burner. 7) Remove the hex nuts and washers securing the compressor to bottom plate. 8) Lift the compressor.	

DISASSEMBLY INSTRUCTIONS (CONT)

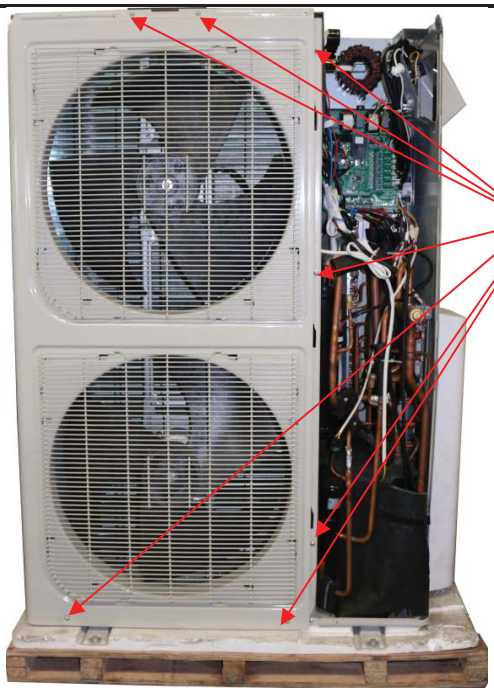
5	The 4-way valve	How to remove the 4-way valve 1) Perform work of item 1 and 2. 2) Extract refrigerant gas. 3) Remove the electrical parts from item 3. 4) Remove fixing screw of the coil, and remove the coil. 5) Detach the welded parts of 4-way valve and pipe.	
6	The expansion valve	How to remove the expansion valve 1) Complete the steps in sections 1 and 2. 2) Remove the electrical parts (see section 3). 3) Remove the coils. 4) Detach the welded parts of expansion valves and the pipes.	

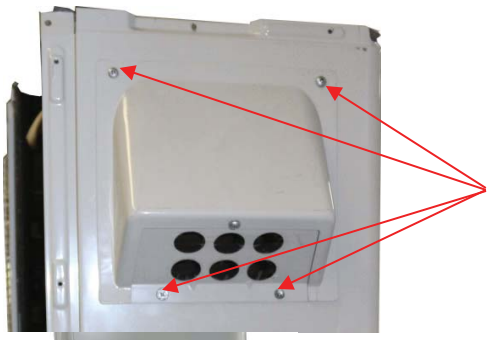
DISASSEMBLY INSTRUCTIONS (CONT)

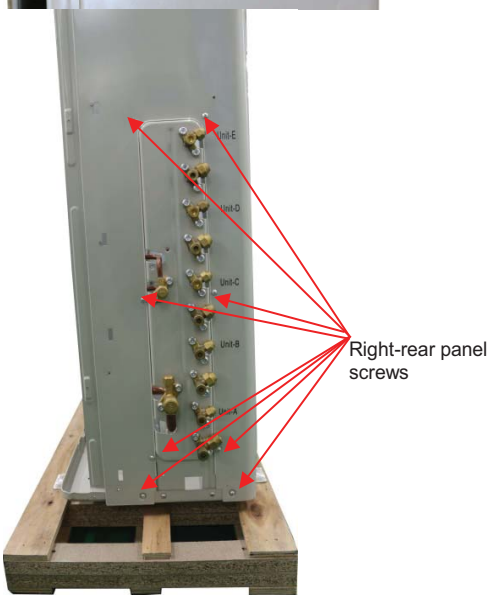
Size 48

No.	Part name	Procedures	Remarks
1	Panel plate	How to remove the panel plate. 1) Stop the air conditioner and shut off the power breaker. 2) Remove the top cover screws (8), and remove the top cover. 3) Remove the right front side panel screws (2) then remove the right front side panel. 4) Remove the front panel screws (10) then remove the front panel. 5) Remove the big handle screws (4), then remove the big handle. 6) Remove the terminal board screws (2), water collector screws (2) right-rear panel screws (13) then remove the right-rear panel.	 

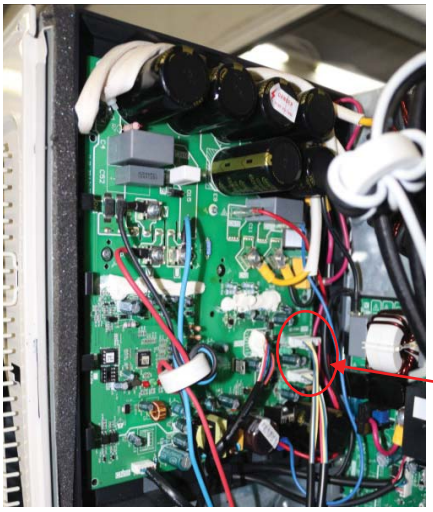
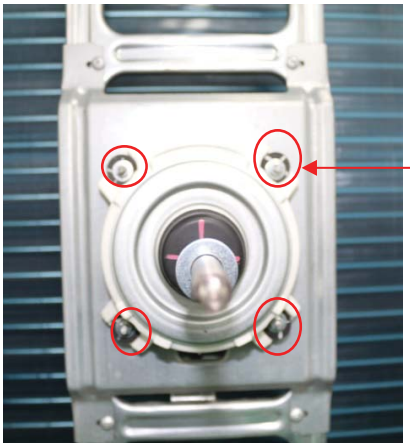
DISASSEMBLY INSTRUCTIONS (CONT)



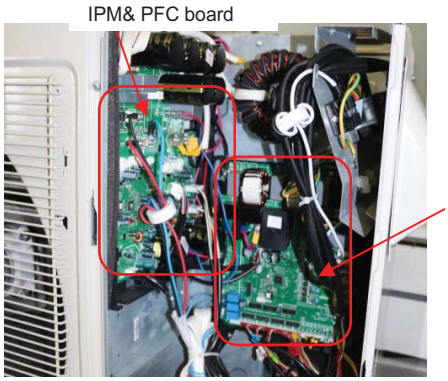
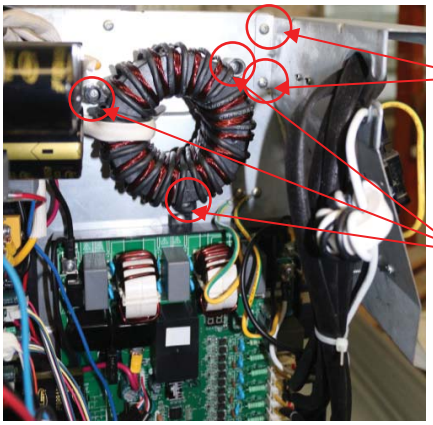
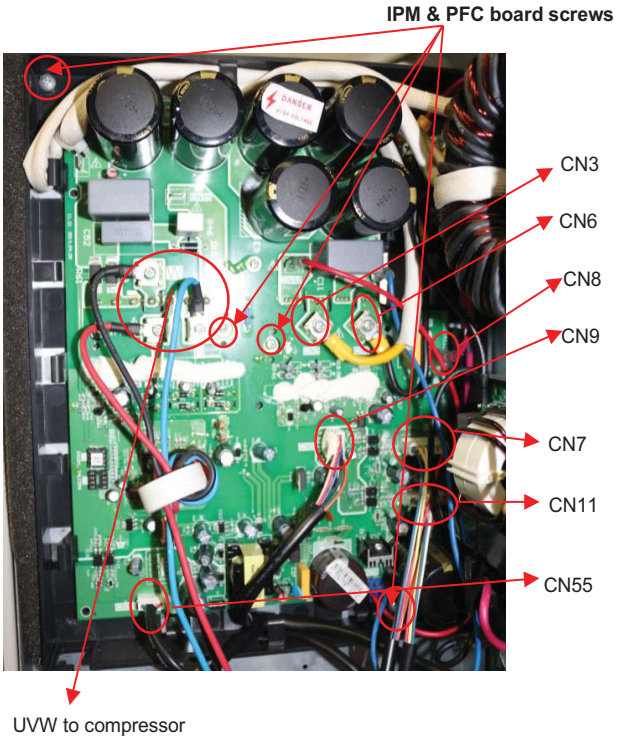




DISASSEMBLY INSTRUCTIONS (CONT)

			
2	Fan assembly	How to remove the fan assembly. 1) Remove the top cover, right front side panel and 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 cover screws (5) then remove the electrical box cover. 5) Disconnect the fan motor connector CN7 & CN11 (5p, white) on the IPM&PFC board. 6) Remove the fan motor after unfastening the screws (4).	  

DISASSEMBLY INSTRUCTIONS (CONT)

3	Electrical parts	How to remove the electrical parts. 1) Complete the steps from sections 1 and 2. 2) Remove the screws (2) to remove the terminal board. 3) Remove the screws (3) to remove the reactor. 4) Disconnect the following connection wires and connectors on the IPM & PFC board. CN8: (+, red), connect to + of rectifier. CN6: (-, black), connect to – of rectifier CN3: (yellow), connect to reactor. UVW: (blue-red-black), connected to compressor. CN55: (5p, white), connect to CN5 on PCB. CN9:(7p, white),connect to CN6 on PCB. CN7: (5p, white), connect to DC fan 1 CN11: (5p, white), connect to DC fan 2 5) Remove the IPM & PFC board assembly after removing screws (4).	  

DISASSEMBLY INSTRUCTIONS (CONT)

6) Disconnect the following connection wires and connectors on the PCB.

L and N: (white-black), power input of the PCB.

CN2 and CN4: (red-black), power supply to reactor.

CN5: (5p, white) 5VDC and 12VDC from CN55 of IPM&PFC board.

CN6: (7p, white) PFC and DC fan signal from CN9 of IPM&PFC board.

CN17, 18: (blue, blue) for 4-way valve.

CN24, 25: (red, red) for compressor heating belt.

CN15/CN23/CN26/CN30/CN33/CN38: (6p, white) for EXV of system A, B, C, D, E and F.

CN11: (12p, white) T2B sensor of system A, B, C, D, E and F

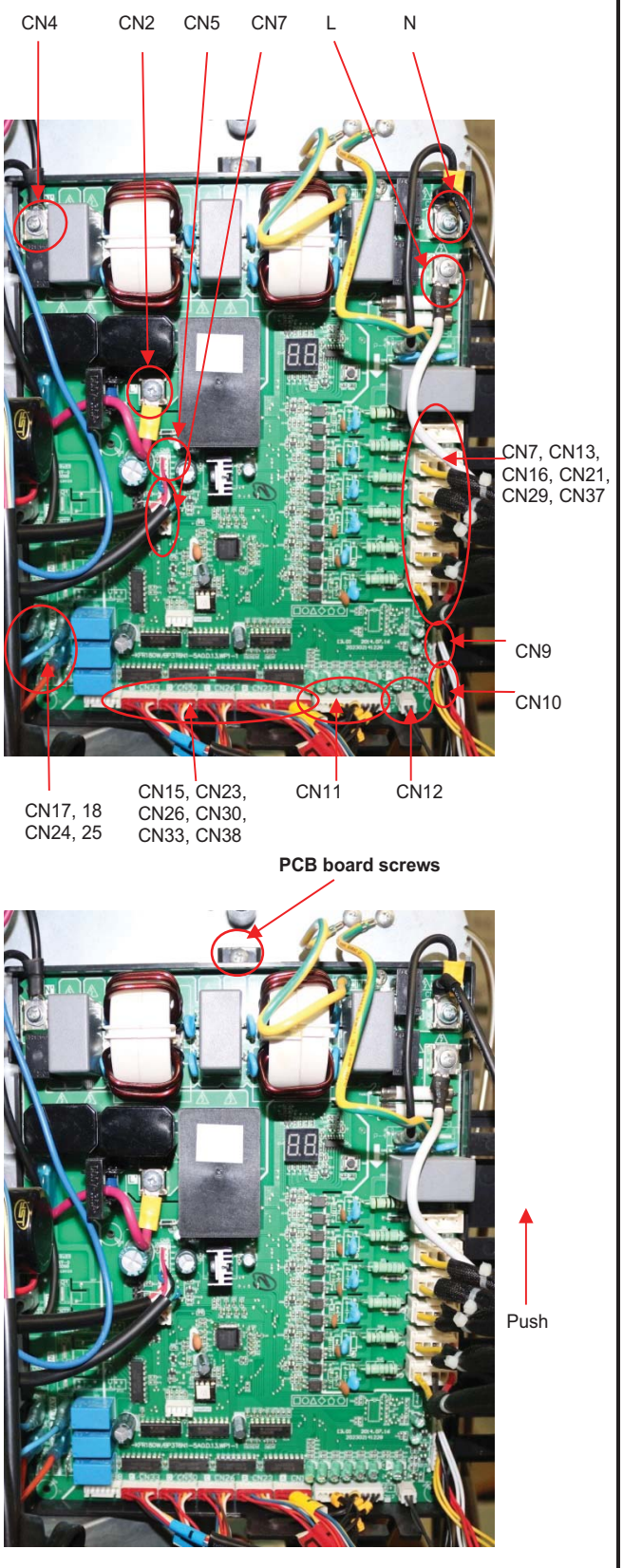
CN12: (2p, white) Tp discharge temperature sensor.

CN10: (4p, white) high-pressure (red) and low-pressure (yellow) switch

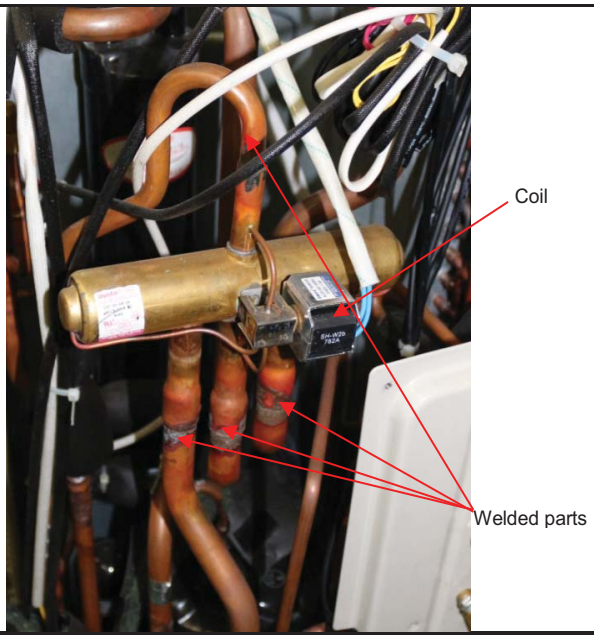
CN9: (4p, white) T3 condenser temperature and T4 ambient temperature sensor.

CN7/CN13/CN16/CN21/CN29/CN37: (3p, white) power inputs and communication wire of system A, B, C, D, E and F.

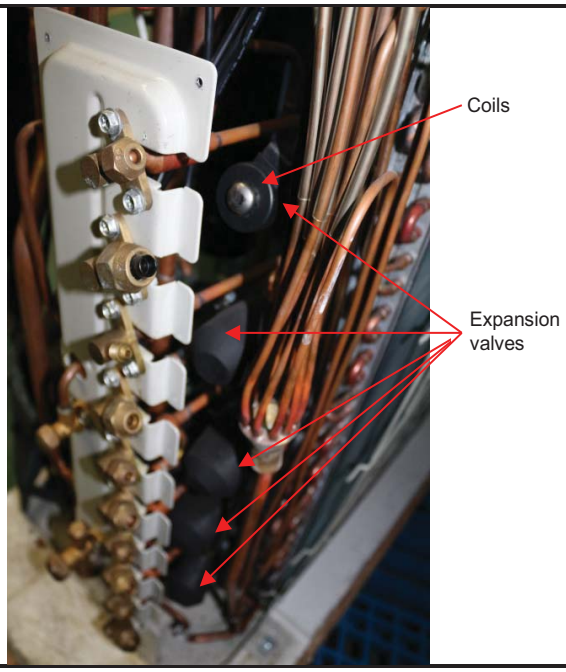
7) Remove the PCB board assembly after removing the 1 screw and pushing it upward.



DISASSEMBLY INSTRUCTIONS (CONT)

4	Compressor	How to remove the compressor. 1) Complete the 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's terminal cover and disconnect the compressor thermo wires and the compressor from the terminal. 6) Remove the discharge and suction pipes with a burner. 7) Remove the hex nuts and washers fixing the compressor to bottom plate. 8) Lift the compressor.	
5	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 coil screw of and remove the coil. 5) Detach the welded parts of 4-way valve and pipe.	

DISASSEMBLY INSTRUCTIONS (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 coils. 4) Detach the welded parts of expansion valves and pipes.	

Edition Date: 02/17

Catalog No. SM538TR—02

Replaces: **New**