ACIQ

Outdoor Unitary Ducted System - Sizes 36 to 48

Service Manual

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SAFETY CONSIDERATIONS

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

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

Untrained personnel can perform basic maintenance functions such as coil cleaning. All other operations should be performed by trained service personnel.

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

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

Read this manual thoroughly and follow all warnings or cautions included in the literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements. Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: **DANGER**, **WARNING**, and **CAUTION**.

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

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Lock out and tag switch with a suitable warning label.

⚠ WARNING

EXPLOSION HAZARD

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

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

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

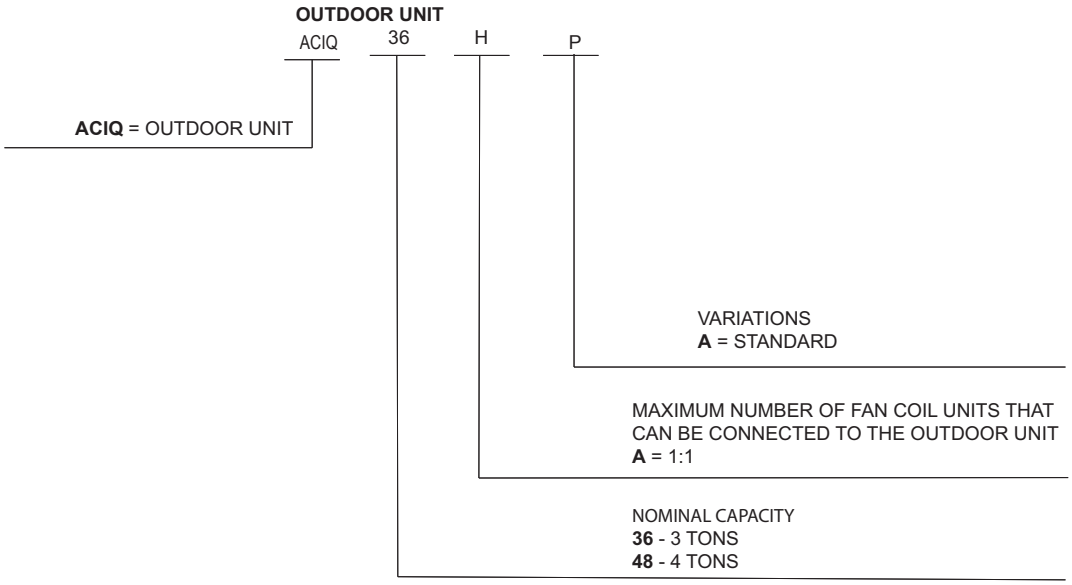
INTRODUCTION

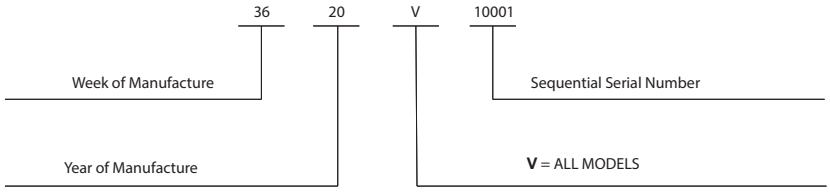
This service manual provides the necessary information to service, repair, and maintain the 38MBR family of heat pumps. This manual has an “APPENDIX” on page 62 with data required to perform troubleshooting. Use the “TABLE of CONTENTS” on page 1 to locate a desired topic.

MODEL / SERIAL NUMBER NOMENCLATURES

Table 1 —Unit Sizes

SYSTEM TONS	KBTUh	VOLTAGE-PHASE	OUTDOOR MODEL
3.00	36,000	208/230-1	ACIQ-36-HP
4.00	48,000	208/230-1	ACIQ-48-HP





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

SPECIFICATIONS

Table 2 — Specifications

SYSTEM	SIZE		36	48
	Outdoor Model		ACIQ-36-HP	ACIQ-48-HP
Electrical	Voltage, Phase, Cycle	V/Ph/Hz	208/230-1-60	208/230-1-60
	MCA	A.	30	36.5
	MOCP - Fuse Rating	A.	45	50
Operating Range	Cooling Outdoor DB Min - Max	°F (°C)	-13~122 (-25~50)	-13~122 (-25~50)
	Heating Outdoor DB Min - Max	°F (°C)	-22~86 (-30~30)	-22~86 (-30~30)
Piping	Total Piping Length	ft (m)	213 (65)	213 (65)
	Piping Lift*	ft (m)	98 (30)	98 (30)
	Pipe Connection Size - Liquid	in (mm)	3/8 (9.52)	3/8 (9.52)
	Pipe Connection Size - Suction	in (mm)	5/8 (16)	5/8 (16)
Refrigerant	Type		R410A	R410A
	Charge	lbs (kg)	7.05 (3.2)	9.92 (4.5)
	Metering Device		EEV	EEV
Outdoor Coil	Face Area	Sq. Ft.	9.0	14.8
	No. Rows		2	2
	Fins per inch		20	18
	Circuits		4	8
Compressor	Type		Rotary Inverter	Rotary Inverter
	Model		KTF310D43UMT	KTQ420D1UMU
	Oil Type		ESTER OIL VG74	ESTER OIL VG74
	Oil Charge	Fl. Oz.	33.8	47.4
	Rated Current	RLA	23.5	28.0
Outdoor	Unit Width	in (mm)	41.1 (1,045)	40.5 (1,030)
	Unit Height	in (mm)	31.9 (810)	52.4 (1,333)
	Unit Depth	in (mm)	17.9 (455)	17.6 (448)
	Net Weight	lbs (kg)	155.42 (70.5)	219.14 (99.4)
	Airflow	CFM	2,118	4,500
	Sound Pressure	dB(A)	61.7	62.9

* Condensing unit above or below the indoor unit.

DIMENSIONS

Table 3 — Dimensions

UNIT SIZE		36K	48K
Height	in (mm)	31.89 (810)	52.48 (1333)
Width	in (mm)	37.24 (946)	37.48 (952)
Depth	in (mm)	16.14 (410)	16.34 (415)
Operating Weight	lbs (kg)	155.42 (70.5)	219.14 (99.4)
Shipping Weight	lbs (kg)	166.23 (75.4)	249.12 (113)
Shipping Height	in (mm)	34.45 (885)	34.45 (885)
Shipping Width	in (mm)	42.91 (1090)	42.91 (1090)
Shipping Depth	in (mm)	19.69 (500)	19.69 (500)

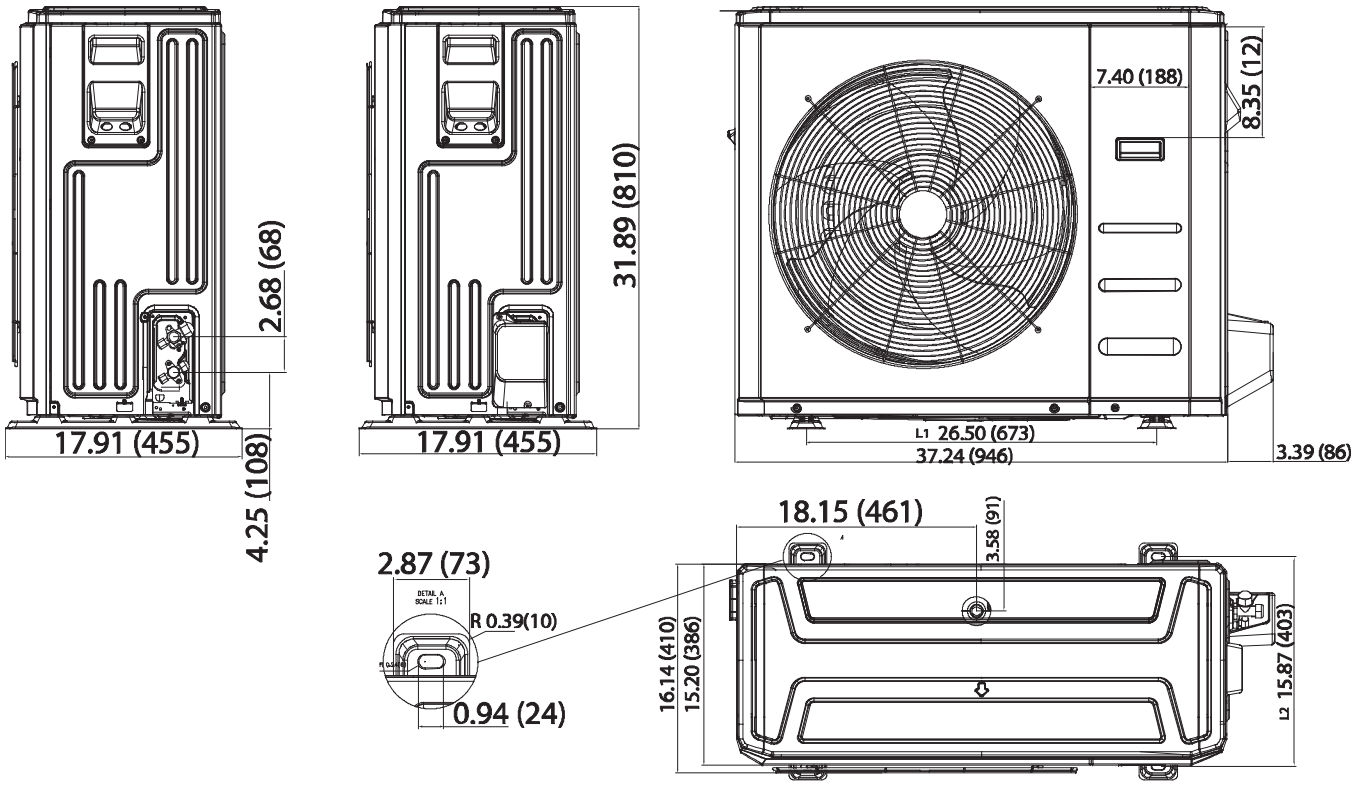


Fig. 1 — Outdoor Dimensions Size 36K

DIMENSIONS (CONT)

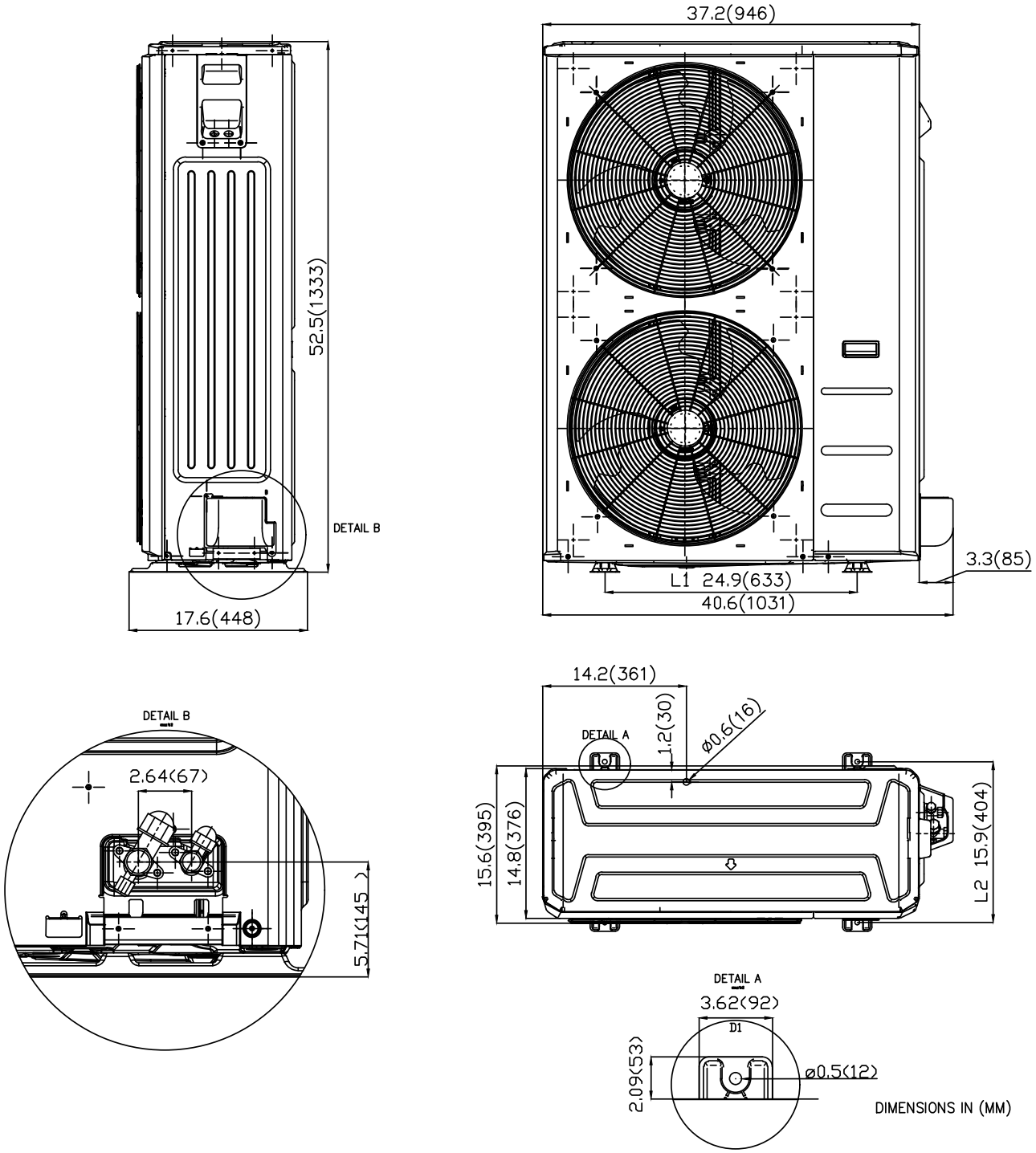


Fig. 2 — Outdoor Dimensions Size 48K

CLEARANCES

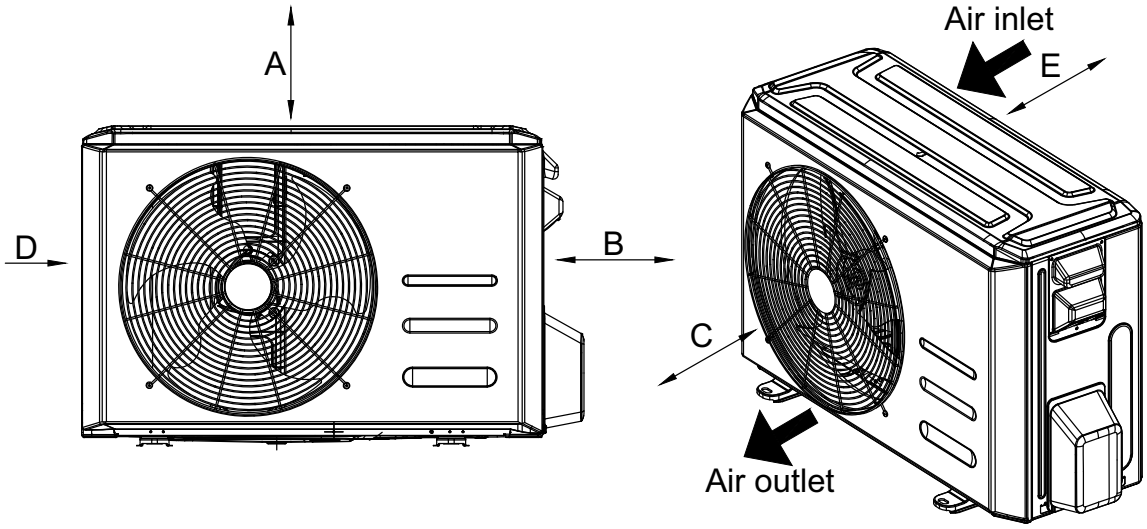


Fig. 3 — Unit Clearance

Table 4 — Unit Clearance

UNIT	MINIMUM VALUE in. (mm)
A	24 (610)
B	24 (610)
C	24 (610)
D	4 (101)
E	4 (101)

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

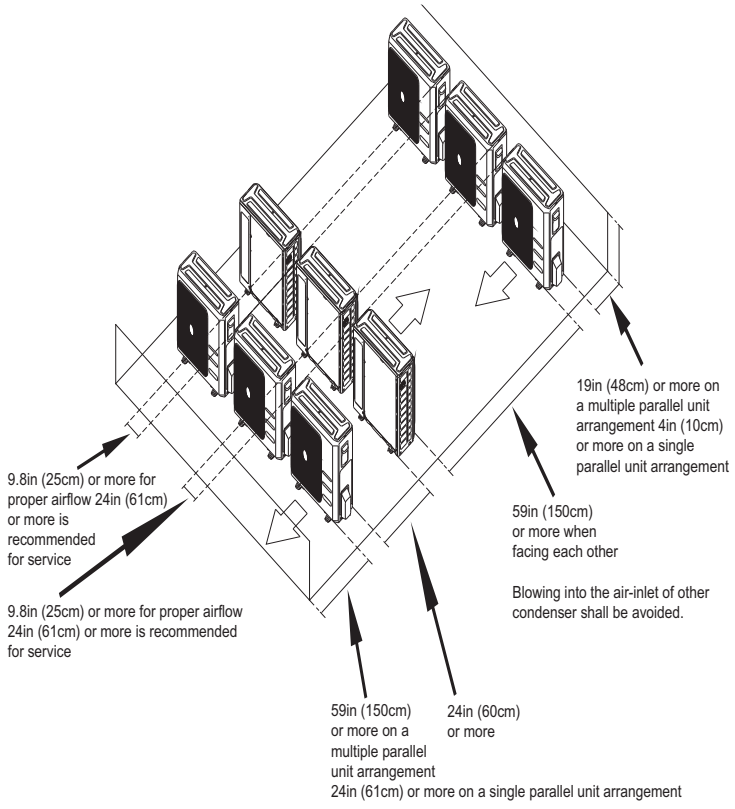


Fig. 4 — Clearances for multiple units

ELECTRICAL DATA

Table 5 — Electrical Data

OUTDOOR UNIT SIZE		36K	48K
POWER SUPPLY	Volts-PH-Hz	208/230-1-60	208/230-1-60
	Max. - Min* Oper. Voltage	253-187	253-187
	MCA	30	36.5
	Max Fuse/CB AMP	45	50
COMPRESSOR	Volts-PH-Hz	208/230-1-60	208/230-1-60
	RLA	23.5	28

*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 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.

SIZES 36-48 RECOMMENDED CONNECTION METHOD FOR POWER AND COMMUNICATION WIRING

Power and Communication 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.

Table 6 — Wiring Sizes 36-48K

CABLE	CABLE SIZE	REMARKS
Communication Cable	16AWG	2 wire stranded shielded control wire

⚠ WARNING

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation. Wires should be sized based on NEC and local codes.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation. Be sure to comply with local codes while running wire from the indoor unit to the outdoor unit. Every wire must be connected firmly. Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Ensure all wiring is tightly connected.

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

NOTE: The main power is supplied to the outdoor unit. When disconnecting the power of the outdoor unit, the indoor unit would lose power. A disconnect switch is not required on the Indoor unit side on the wiring between the Outdoor and Indoor unit. A 3 pole disconnect may be used for extra protection between the Indoor and Outdoor Unit. A separate power is required for an Auxiliary Electric Heater.

CONNECTION DIAGRAM

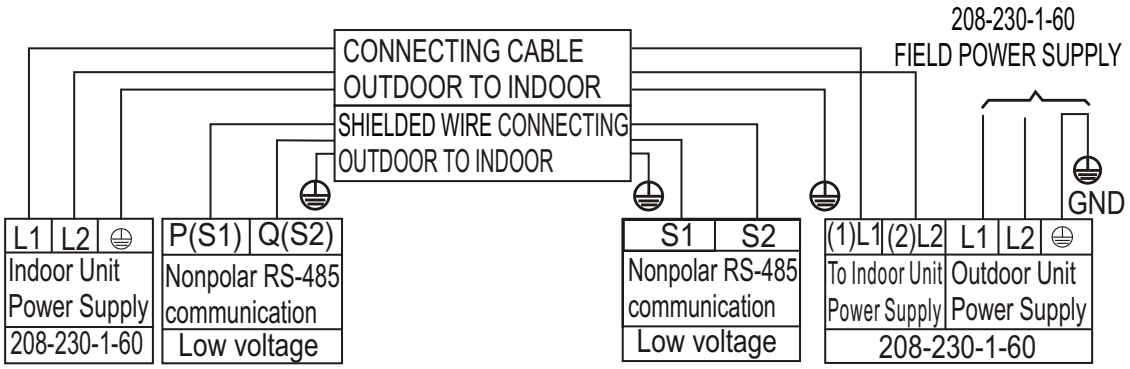


Fig. 5 — Connection Diagram sizes 36-48K

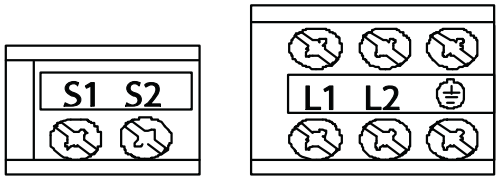


Fig. 6 — Control and Power Terminals on Indoor Unit sizes 36-48K

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 generate a fault code.

WIRING DIAGRAMS

Size 36K

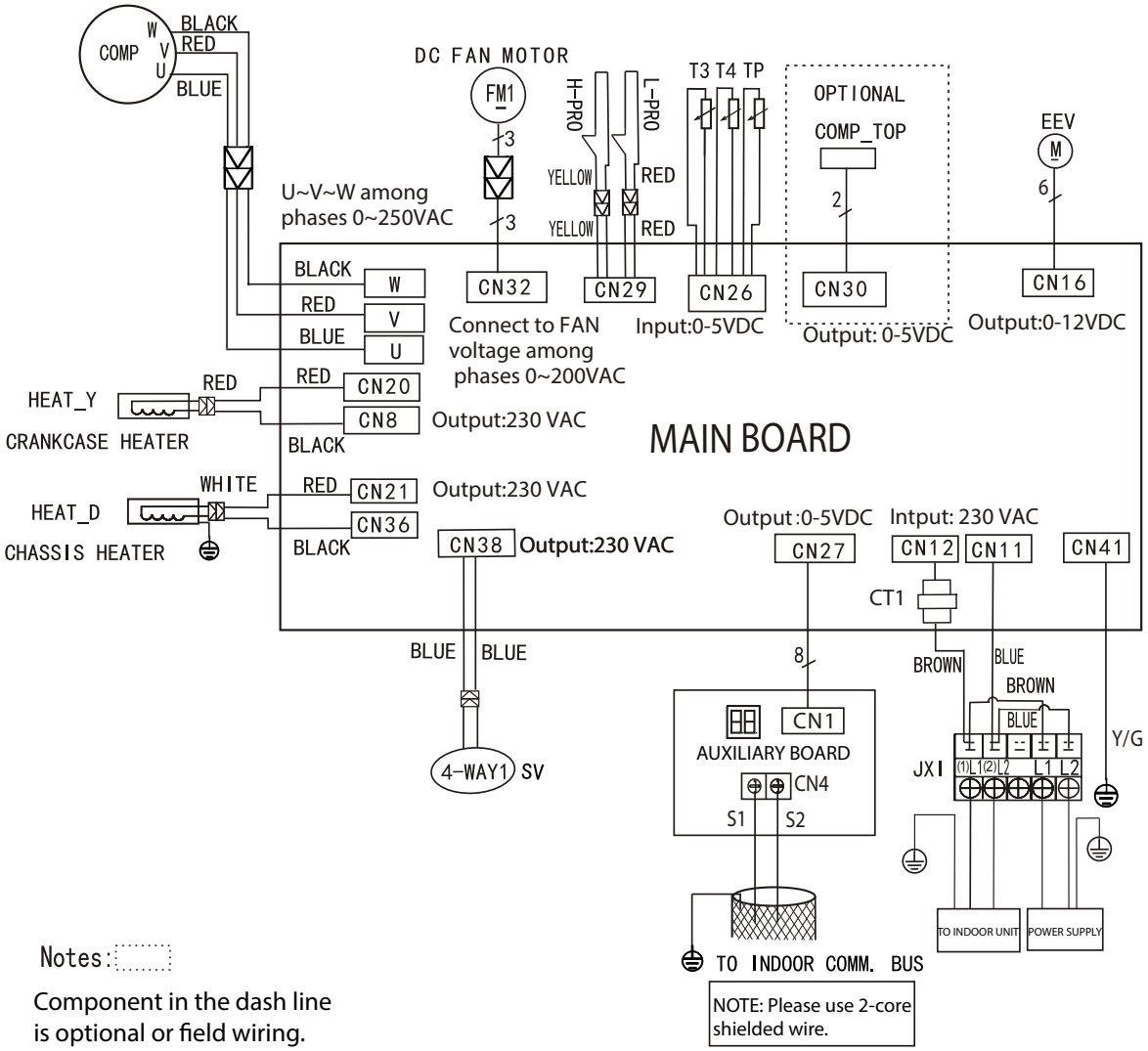


Fig. 7 — Wiring Diagram Size 36K

Table 7 — Wiring Diagram Size 36K Codes

CODE	PART NAME
JX1	Terminal Block
COMP_TOP	COMP. TOP OLP TEMP. Sensor
EEV	Electronic Expansion Valve
FM1	DC Fan Motor
COMP	Compressor
HEAT_Y	Crankcase Heater
CT1	AC Current Detector
H-PRO	High Pressure Switch
L-PRO	Low Pressure Switch
SV	Reversing Valve
TP	COMP. Discharge TEMP. Sensor
T3	COIL TEMP. Sensor
T4	Outdoor Ambient TEMP. Sensor
HEAT_D	Chassis Heater

WIRING DIAGRAMS (CONT)

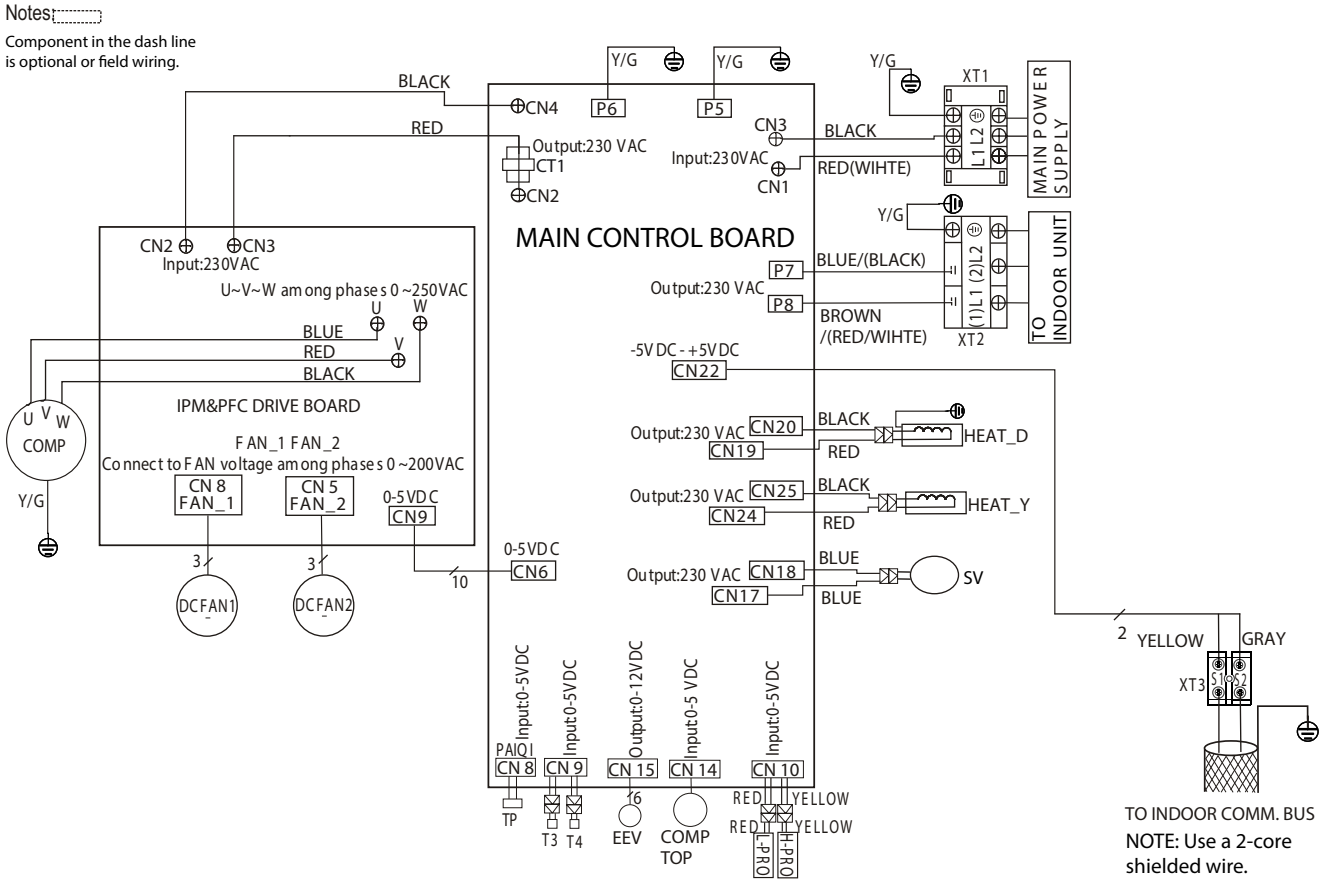


Fig. 8 — Wiring Diagram Size 48K

Table 8 — Wiring Diagram Size 48K

CODE	PART NAME
COMP	Compressor
CTI	AC Current Detector
EEV	Electronic Expansion Valve
DCFAN1	Outdoor DC Fan Motor
DCFAN2	
HEAT_D	Chassis Heater
HEAT_Y	Crankcase Heater
H-PRO	High Pressure Switch
L-PRO	Low Pressure Switch
SV	Reversing Valve
TP	Comp. Discharge Temp Sensor
T3	Coil Temp. Sensor
T4	Outdoor Ambient Temp Sensor
COMP TOP	COMP. Top OLP Temp Sensor

FAN AND MOTOR SPECIFICATIONS

Table 9 — Fan and Motor Specifications

SYSTEM SIZE			36K	48K
OUTDOOR FAN PROPELLER	Material	--	Acrylonitrile Styrene +20%GF	Acrylonitrile Styrene +20%GF
	Type	--	ZL-560*139*12-3KN	ZL-554*148*12-3KFN
	Diameter	In (mm)	22.05 (560)	21.81(554)
	Height	In (mm)	5.47(139)	5.83(148)
OUTDOOR FAN MOTOR	Model	--	ZKFN-120-8-2 (DC)	ZKFN-85-8-22-5 (DC)
	Type	--	DC	DC
	Phase	--	1	1
	FLA	A	0.6	1.178
	Insulation Class	--	E	E
	Safe Class	--	IPX4	IPX4
	Input	W	170	126
	Output	W	120	85
	Range of current	A	0.6±10%	1.036±10%
	Rated current	A	0.6	1.036
	Rated HP	HP	0.16	0.11
	Speed	rev/min	950/800/500	850/750/650
	Rated RPM	rev/min	1,150	900
	Max. input	W	170	126

REFRIGERATION CYCLE DIAGRAM

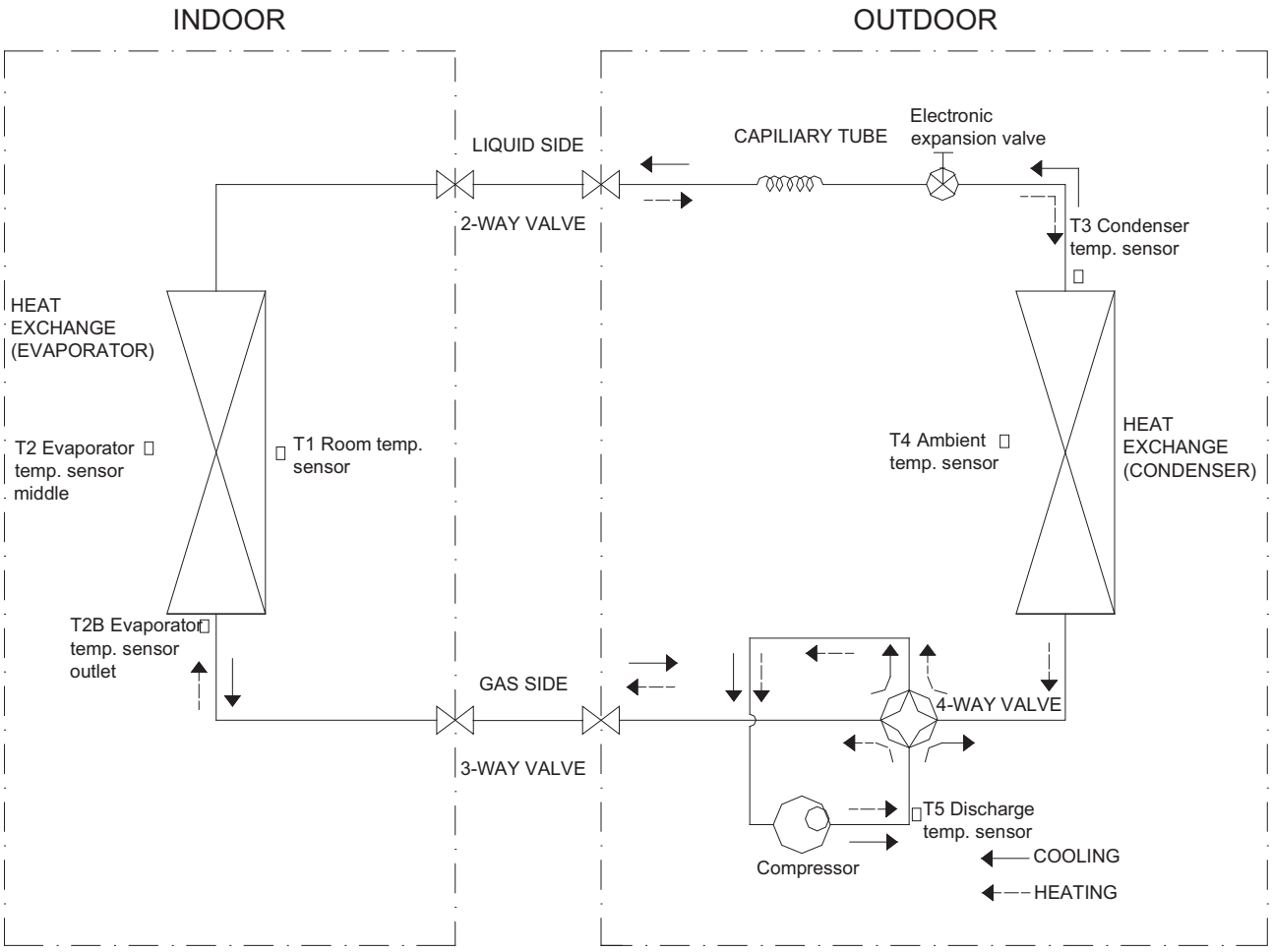


Fig. 9 — Refrigerant Cycle Diagram

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. (7.6 m). For runs over 25 ft. (7.6 m), consult the long-line applications section for the proper charge adjustments.
2. The minimum refrigerant line length between the indoor and outdoor units is 10 ft. (3 m).
3. Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36in (914 mm) should be buried. Provide a minimum 6in (152 mm) vertical rise to the service valves to prevent refrigerant migration.
4. Both lines must be insulated. Use a minimum of 1/2in. (12.7 mm) thick insulation. Closed-cell insulation is recommended in all long-line applications.
5. Special consideration should be given to isolating interconnecting tubing from the building structure. Isolate the tubing so vibration or noise is not transmitted into the structure.

IMPORTANT: Both refrigerant lines must be insulated separately.

Table 10 displays the following maximum lengths allowed.

Table 10 — Piping and Refrigerant

	SYSTEM SIZE		36K	48K
Piping	Min. Piping Length	ft (m)	10 (3)	10 (3)
	Standard Piping Length	ft (m)	25 (7.5)	25 (7.5)
	Max. outdoor - indoor height difference (OU higher than IU)	ft (m)	98 (30)	98 (30)
	Max. outdoor - indoor height difference (IU higher than OU)	ft (m)	98 (30)	98 (30)
	Max. Piping length with no additional refrigerant charge	ft (m)	25 (7.5)	25 (7.5)
	Max. Piping Length	ft (m)	213 (65)	213 (65)
	Additional refrigerant charge (between Standard - Max piping length)	Oz/ ft (g/m)	0.32 (30)	0.32 (30)
	Gas Pipe (size - connection type)	in (mm)	5/8 (16)	5/8 (16)
	Liquid Pipe (size- connection type)	in (mm)	3/8 (9.52)	3/8 (9.52)
Refrigerant	Refrigerant Type	- -	R410A	R410A
	Charge Amount	Lbs (kg)	7.05 (3.2)	9.92 (4.5)

- The charge amount listed in Table 10 is for piping runs up to 25 ft. (7.6 m).
- For piping runs greater than 25 ft. (7.6 m), add refrigerant up to the allowable length as specified in Table 11.

Long Line Applications,:

1. No change in line sizing is required.
2. Add refrigerant per Table 11.

Table 11 — Additional Charge Table Per Zone

UNIT SIZE	TOTAL LINE LENGTH FT.		ADDITIONAL CHARGE OZ/FT. (M)	
	MIN.	MAX.	>10-25 (3-8)	>25-213 (8-65)
36	10	213	None	0.43
48				

SYSTEM EVACUATION AND CHARGING

CAUTION

UNIT DAMAGE HAZARD

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

Never use the system compressor as a vacuum pump.

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

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. 10).
2. Connect charge hose to vacuum pump.
3. Fully open the low side of manifold gage (see Fig. 11).
4. Start vacuum pump
5. Evacuate using the triple evacuation method.
6. After evacuation is complete, fully close the low side of manifold gage and stop operation of vacuum pump.
7. The factory charge contained in the outdoor unit is good for up to 25ft. (8 m) of line length. For refrigerant lines longer than 25ft. (8 m), add refrigerant as specified in "Additional Charge Table Per Zone" on page 13.
8. Disconnect charge hose from charge connection of the low side service valve.
9. Securely tighten caps of service valves.

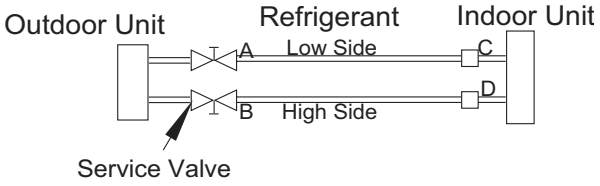


Fig. 10 — Service Valve

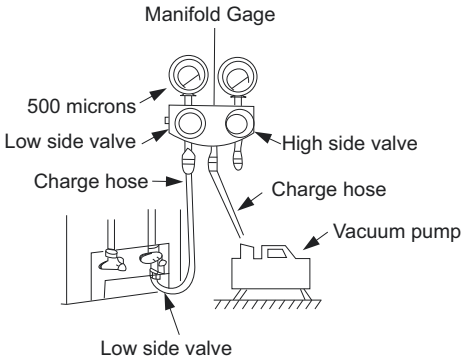


Fig. 11 — Manifold

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. 12).

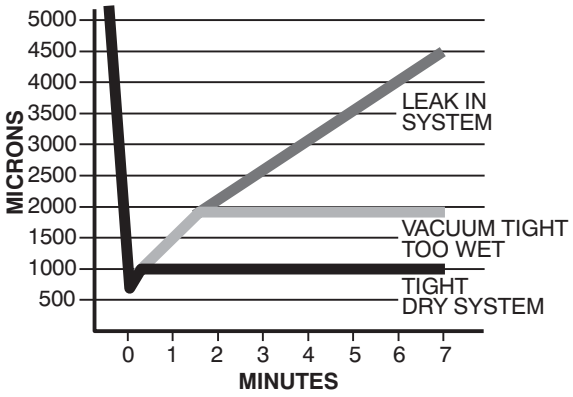


Fig. 12 — Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 13 and proceed as follows:

1. Pump system down to 500 MICRONS of mercury and allow pump to continue operating for an additional 15 minutes. Unit must maintain 500 microns or less for 30 minutes or more to ensure a dry system.
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. 13. System will then be free of any contaminants and water vapor.

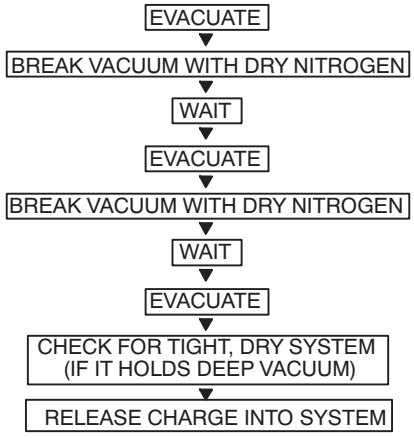


Fig. 13 — Triple Evacuation Method

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 FUNCTIONS

Abbreviation

- T1: Indoor room temperature
- T2: Coil temperature of indoor heat exchanger middle
- T2B: Coil temperature of indoor heat exchanger outlet
- T3: Coil temperature of condenser
- T4: Outdoor ambient temperature
- T5: Compressor discharge temperature
- Td: Target temperature

Main Protection

Three Minute Delay for Compressor Restart

Less than a 1 minute delay for the initial start-up and a 3 minute delay for subsequent starts.

Compressor Top Temperature Protection

The unit stops working when the compressor top temp. protector cuts off, and restarts after the compressor top temp. protector restarts.

Compressor Discharge Temperature Protection

When the compressor discharge temp. increases, the running frequency is limited per the following rules:

- Compressor discharge temp. T5>239°F(115°C) for 5s, compressor stops and restarts up until T5<194°F (90°C)
- 110<T5<239°F(115°C), decrease the frequency to the lower level every 2 minutes.
- 221°F(105°C)<T5<230°F(110°C), keep running at the current frequency.
- T5<221°F(105°C), no limit for frequency.

Fan Speed is Out of Control

When the indoor fan speed remains low (lower than 300RPM) for 50s, the indoor fan shuts off and restarts 30s later. If the protection mode engages 3 times when the fan motor restarts continuously, the unit stops and the LED displays the failure.

When the outdoor fan speed remains low (lower than 100RPM) or too high (higher than 1500RPM) for 60s, the unit stops and the LED displays the failure. The malfunction clears 30s later.

Inverter Module Protection

The inverter module has a protection function for current, voltage and temperature. If any of these protections engage, the corresponding code displays on the indoor unit and the unit stops working.

Indoor Fan Delayed Open Function

When the unit starts up, the louver is active immediately and the indoor fan opens 10s later. If the unit is running in the **HEATING** mode, the indoor fan is controlled also by the anti-cold wind function.

Compressor Preheating Functions

Preheating Permitting Condition:

If T4<37.4°F(3°C) and the machine connects to power supply newly within 5 seconds 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 compressor coil from the compressor wiring terminal, then the compressor is heated without operation.

Preheating Release Condition:

If T4=41°F(5°C) or the compressor starts running, the preheating function stops.

Condenser High Temperature T3 Protection:

- 131°F(55°C)<T3<140°F(60°C), the compressor frequency decreases to the lower level until to F1 and then runs at F1. If T3<129.2°F(54°C), the compressor keeps running at the current frequency.
- T3<125.6°F(52°C), the compressor does not limit the frequency and resumes the former frequency.
- T3>140°F(60°C) for 5 seconds, the compressor stops until T3<125.6°F(52°C).

Evaporator Low Temperature T2 Protection:

- T2<32°F(0°C), the compressor stops and restarts when T2=41°F(5°C).
- 32°F(0°C) ≦ T2<39.2°F(4°C), the compressor frequency is limited and decreases to the lower level
- 39.2°F(4°C)=T2<44.6°F(7°C), the compressor retains the current frequency
- T2>44.6°F(7°C), the compressor frequency is not limited.

Operation Modes and Functions

FAN Mode

1. Outdoor fan and compressor stop
2. Temperature setting function is disabled and no setting temperature appears.
3. Indoor fan can be set to high/med/low/auto
4. The louver operates same as in the **COOLING** mode.
5. Auto fan

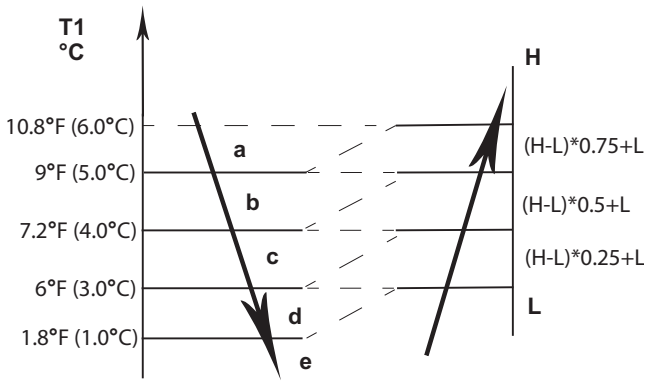


Fig. 14 — FAN Mode

COOLING Mode

Outdoor Fan Running Rules

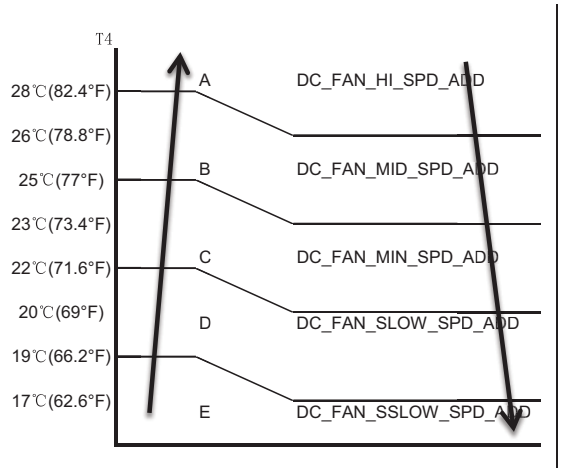


Fig. 15 — Outdoor Fan Running Rules

In the **COOLING** mode, the indoor fan runs all the time and the speed can be selected as high, medium, low and auto. The indoor fan is controlled as shown in Fig. 16.

Setting Fan Speed	T1-Td °F (°C)		Actual Fan Speed
H	4.5(40.1)		H+(H+=H+G)
	3.0(37.4)	A	H（=H）
	1.5(34.7)	B	H-（H-=H-G)
		C	
M	4.5(40.1)		M+(M+=M+Z)
	3.0(37.4)	D	M(M=M)
	1.5(34.7)	E	M-(M-=M-Z)
		F	
L	4.5(40.1)		L+(L+=L+D)
	3.0(37.4)	G	L(L=L)
	1.5(34.7)	H	L-(L-=L-D)
		I	

Fig. 16 — Indoor Fan Table

The **AUTO** Fan function under the **COOLING** mode acts (see Fig. 17).

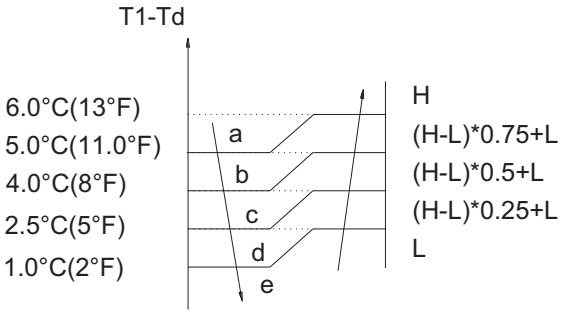


Fig. 17 —AUTO Fan function under the COOLING Mode

HEATING Mode

Outdoor Fan Running Rules

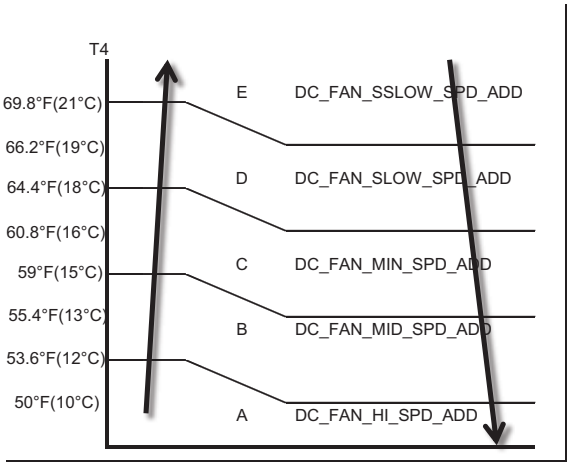


Fig. 18 — Outdoor Fan Running Rules

Indoor Fan Running Rules

When the compressor is on, the indoor fan can be set to high/med/low/auto. And the anti-cold wind function has the priority. The indoor fan is controlled as shown in Fig. 19.

Setting Fan Speed	T1-Td+34.7°F(1.5°C)	Actual Fan Speed
H	-3°F(-1.5°C)	H-（H-=H-G)
	-6°F(-3.0°C)	H（=H）
	-10°F(-4.5°C)	H+(H+=H+G)
M	-3°F(-1.5°C)	M-(M-=M-Z)
	-6°F(-3.0°C)	M(M=M)
	-10°F(-4.5°C)	M+(M+=M+Z)
L	-3°F(-1.5°C)	L-(L-=L-D)
	-6°F(-3.0°C)	L(L=L)
	-10°F(-4.5°C)	L+(L+=L+D)

Fig. 19 — Indoor Fan Running Rules

AUTO Fan action in HEATING mode

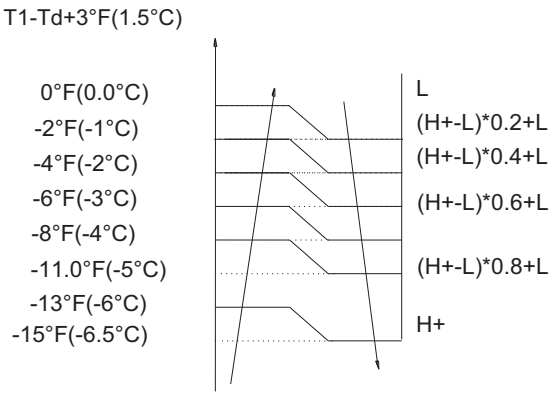
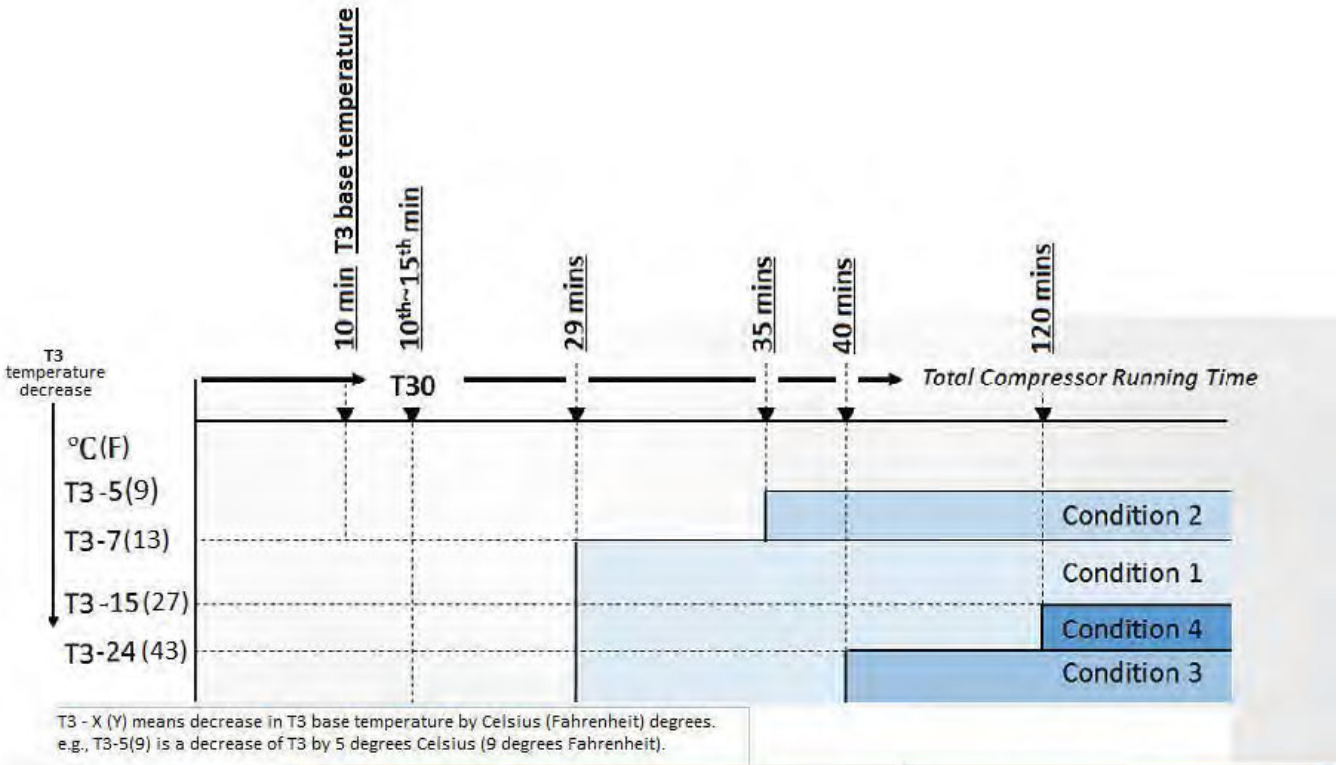


Fig. 20 — AUTO Fan action in HEATING mode

Defrosting Mode

If any one of the following conditions are met, AC enters the **DEFROSTING** mode. After the compressor starts and continues to run, mark the minimum value of T3 from the 10th minute to 15th minute as T30.



	Compressor run time	Temperature Change
Condition 1	Total compressor running time is 29 mins	T3-7°C & **T30**-2.5°C
Condition 2	Total compressor running time is 35 mins	T3-5 & **T30**-3°C
Condition 3	Total compressor running time is 40 mins	T3 -24°C for 3 mins
Condition 4	Total compressor running time is 120 mins	T3 -15°C

Defrost Exit Conditions: **Any of the following conditions will terminate Defrost and return the unit to normal heating mode.**

Note: T3 temperature refers to the sensor reading at the time when Defrost begins.

T3 temperature rises above 15°C (59°F).

T3 temperature remains above 8°C (46°F) for more than 80 seconds.

The unit has been in Defrost Mode for 10 minutes.

Fig. 21 — Defrosting Chart

Evaporator Coil Temperature Protection

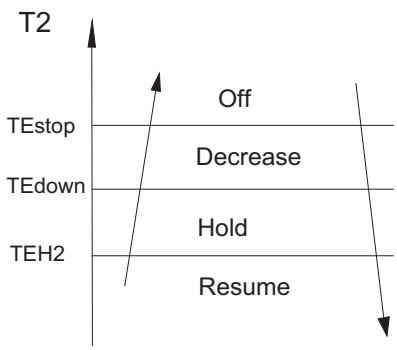


Fig. 22 — Evaporator Coil Temperature Protection

Off: Compressor stops
Decrease: Decrease the running frequency to the lower level
Hold: Keep the current frequency
Resume: No limitation for frequency

Auto Mode

This mode can be chosen with remote controller and the setting temperature can be changed between 62.6~86°F(17~30°C).

In **AUTO** mode, the machine either selects **COOLING**, **HEATING** or **FAN-Only** mode according to ΔT (ΔT=T1-Ts).

ΔT=T1-Ts	Running Mode
ΔT≥2F(1 ℃)	Cooling Mode
-2°F(-1 ℃)<ΔT<3(2°F1 ℃)	Fan-only Mode
ΔT≤-1 ℃ (-2°F)	Heating Mode

The indoor fan runs in the **AUTO** Fan mode of the relevant mode.

The louver operates same as in relevant mode. If the machine switches mode between heating and cooling, the compressor will continue to stop for 15 minutes and then choose a mode according to T1-Ts. If the setting temperature is modified, the machine selects a running function once again.

DRYING Mode

DRYING mode works the same as **COOLING** mode in **BREEZE** speed. All protections are active and the same as that in the **COOLING** mode.

Auto-Restart Function

The indoor unit is equipped with an auto-restart function, which is carried out through an auto-restart module. In case of a sudden power failure, the module memorizes the setting conditions before the power failure. The unit resumes the previous operation setting (not including sleep function) automatically after 3 minutes when power returns.

POINT CHECK FUNCTION

Press the remote controller **LED DISPLAY** or **LED** or **MUTE** three times, and then press **AIR DIRECTION** or **SWING** three times in ten seconds (the buzzer rings for two seconds). The air conditioner enters the information enquiry status.

The user can press the **LED DISPLAY** or **AIR DIRECTION** to check the next or front item's information. When the air conditioner enters the enquiry information status, it displays the code name in 2 seconds. Refer to Table 12 for details.

Table 12 — Enquiry Information

ENQUIRY INFORMATION	DISPLAYING CODE	MEANING
T1	T1	T1 temp.
T2	T2	T2 temp.
T3	T3	T3 temp.
T4	T4	T4 temp.
T2B	Tb	T2B temp.
TP	TP	TP (T5) temp.
TH	TH	TH temp.
Targeted Frequency	FT	Targeted Frequency
Actual Frequency	Fr	Actual Frequency
Indoor Fan Speed	IF	Indoor Fan Speed
Outdoor Fan Speed	OF	Outdoor Fan Speed
EXV Opening Angle	LA	EXV Opening Angle
Compressor Continuous Running Time	CT	Compressor Continuous Running Time
Compressor Stop Issues	ST	Compressor Stop Issues

When the air conditioner enters the information enquiry status, the **LED** displays the code value within 25 seconds (see Table 13 on page 19).

Enquiry Information

Table 13 — Enquiry Information

ENQUIRY INFORMATION	DISPLAY VALUE	MEANING	REMARK
T1,T2,T3,T4, T2B,TP,TH, Targeted Frequency, Actual Frequency	- 1F,- 1E,- 1d,- 1c,- 1 b,- 1A	- 25,- 24,- 23,- 22,- 21,- 20	1. All the displaying temperature is actual value. 2. Temperature is °C no matter the remote. 3. T1,T2,T3,T4,T2B display range:- 25~ 70, 4. TP display range:- 20~ 130. 5. Frequency display range: 0~159HZ. 6. If the range, it displays the maximum value or minimum value.
	- 19—99	- 19—99	
	A0,A1,●●●A9	100,101,●●●109	
	b0,b1,●●●b9	110,111,●●●119	
	c0,c1,●●●c9	120,121,●●●129	
	d0,d1,●●●d9	130,131,●●●139	
	E0,E1,●●●E9	140,141,●●●149	
	F0,F1,●●●F9	150,151,●●●159	
Indoor fan speed/ Outdoor fan speed	0	OFF	
	1,2,3,4	Low speed, Medium speed, High speed, Turbo	For some big capacity motors
	14- FF	Actual fan speed = Display value turns to decimal value and then multiply 10. The unit is RPM.	For some small capacity motors the display value is 14- FF (hexadecimal), the corresponding fan speed range is from 200- 2550 RPM.
EXV opening angle	0- FF	Actual EXV opening value = Display value turns to decimal value and then multiply 2.	
Compressor continuous running time	0- FF	0- 255 minutes	If the actual value exceeds the range, it displays the maximum value or minimum value.
Compressor stop causes	0- 99	For a detailed meaning, please consult with an engineer	Decimal display
Reserve	0- FF		

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" on page 62.

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 following pages.

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 multimeter 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 14 — Indoor Unit Error Display

OPERATION LAMP	TIMER LAMP	DISPLAY	LED STATUS	SOLUTION
☆ 1 time	X	E0	Indoor unit EEPROM parameter error	Page 24
☆ 2 times	X	E1	Communication malfunction between indoor and outdoor units	Page 26
☆ 4 times	X	E3	Fan speed is operating outside of the Normal Range	Page 28
☆ 5 times	X	E4	Indoor room temperature sensor (T1) malfunction	Page 29
☆ 6 times	X	E5	Evaporator coil temperature sensor (T2) malfunction	Page 29
☆ 7 times	X	EC	Refrigerant leakage detection	Page 30
☆ 8 times	X	EE	Water-level alarm malfunction	Refer to Indoor Unit Service Manual
☆ 1 time	O	F0	Current overload protection	Page 25
☆ 2 times	O	F1	Outdoor ambient temperature sensor (T4) malfunction	Page 29
☆ 3 times	O	F2	Condenser coil temperature sensor (T3) malfunction	Page 29
☆ 4 times	O	F3	Compressor discharge temperature sensor (T5) malfunction	Page 29
☆ 5 times	O	F4	Outdoor unit EEPROM parameter error	Page 24
☆ 6 times	O	F5	Outdoor fan speed malfunction	Page 28
☆ 7 times	O	F6	Indoor coil outlet pipe sensor (Located on outdoor unit low pressure valve)	Refer to Indoor Unit Service Manual
☆ 8 times	O	F7	Communication malfunction between the cassette optional lift panel and the unit	Refer to Indoor Unit Service Manual
☆ 9 times	O	F8	Cassette optional lift panel malfunction	Refer to Indoor Unit Service Manual
☆ 10 times	O	F9	Cassette optional lift panel not closed	Refer to Indoor Unit Service Manual
☆ 1 time	☆	P0	Inverter module (IPM) malfunction	Page 31
☆ 2 times	☆	P1	Over-voltage or under-voltage protection	Page 34
☆ 3 times	☆	P2	Compressor top high temperature protection (OLP)	Page 35
☆ 4 times	☆	P3	Low ambient temperature cut off in HEATING mode	Refer to Indoor Unit Service Manual
☆ 5 times	☆	P4	Compressor drive malfunction	Page 36
☆ 6 times	☆	P5	Indoor units mode conflict	Refer to Indoor Unit Service Manual
☆ 7 times	☆	P6	Low pressure protection	Refer to Indoor Unit Service Manual
☆ 8 times	☆	P7	Outdoor IPM temperature sensor error	Page 37

O (light) X (off) ☆ (flash)

Table 15 — Error Display on Two Way Communication Wired Controller

DISPLAY	LED STATUS	SOLUTION
F0	Communication error between wired controller and indoor unit	Page 25
F1	The cassette faceplate is abnormal	Page 29
E1	Communication malfunction between indoor and outdoor units	Page 26
E2	Indoor room temperature sensor (T1) malfunction	Refer to Indoor Unit Service Manual
E3	Evaporator coil temperature sensor (T2) malfunction	Refer to Indoor Unit Service Manual
E5	Outdoor ambient temperature sensor (T4) malfunction	Page 29
E5	Condenser coil temperature sensor (T3) malfunction	Page 29
E5	Compressor discharge temperature sensor (T5) malfunction	Page 29
E7	Indoor unit EEPROM parameter error	Refer to Indoor Unit Service Manual
E8	Indoor fan speed malfunction	Refer to Indoor Unit Service Manual
EF	Refrigerant leak detection	Refer to Indoor Unit Service Manual
EE	Water-level alarm malfunction	Refer to Indoor Unit Service Manual
ED	Outdoor unit EEPROM parameter error	Refer to Indoor Unit Service Manual
ED	Outdoor fan speed malfunction	Refer to Indoor Unit Service Manual
EB	Inverter module (IPM) malfunction	Refer to Indoor Unit Service Manual
EF	Other malfunction	

DIAGNOSIS AND SOLUTION

Outdoor Unit Error Display

Table 16 — Diagnostic Guide for Outdoor Units

NO.	PROBLEMS	ERROR CODE	SOLUTION
1	Communication malfunction between indoor and outdoor units	E1	Page 26
2	Current overload protection	F0	Page 25
3	Outdoor ambient temperature sensor (T4) malfunction	F1	Page 29
4	Condenser coil temperature sensor (T3) malfunction	F2	Page 29
5	Compressor discharge temperature sensor (T5) malfunction	F3	Page 29
6	Outdoor unit EEPROM parameter error	F4	Page 24
7	Outdoor fan speed malfunction	F5	Page 28
8	Inverter module (IPM) malfunction	P0	Page 30
9	Over-voltage or under-voltage protection	P1	Page 34
10	Compressor top high temperature protection (OLP)	P2	Page 35
11	Low ambient temperature cut off in HEATING mode	P3	Refer to Indoor Unit Service Manual
12	Compressor drive malfunction	P4	Page 36
13	High temperature protection of indoor coil in HEATING mode	J0	Page 38
14	Outdoor temperature protection of outdoor coil in COOLING	J1	Page 39
15	Temperature protection of compressor discharge	J2	Page 40
16	PFC module protection	J3	Page 41
17	Communication malfunction between control board and IPM board	J4	Page 42
18	High pressure protection	J5	Page 43
19	Low pressure protection	J6	Page 44
20	Outdoor IPM module temperature sensor malfunction	P7	Page 37
21	AC voltage protection	J8	Page 45

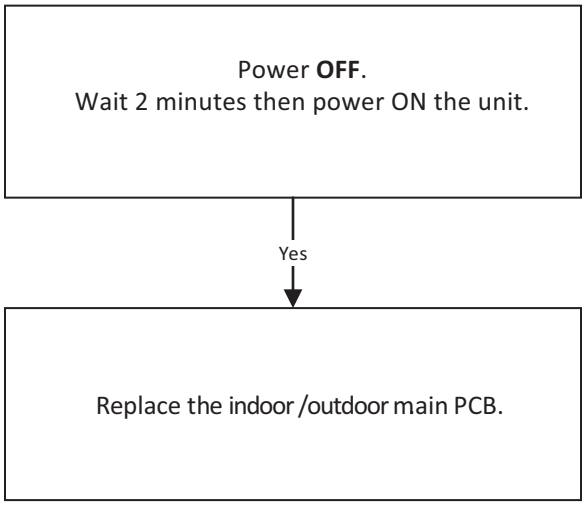
Table 17 — Outdoor Check Function

N	DISPLAY	REMARK		
00	Normal display	Display running frequency, running state or malfunction code		
01	Indoor unit capacity demand code	Actual data*HP*10 If the capacity demand code is higher than 99, the digital display tube displays a single digit and a ten digit. (For example, the digital display tube displays “5.0” it means the capacity demand is 15. The digital display tube displays “60” it means the capacity demand is 6.0).		
02	Amendatory capacity demand code			
03	The frequency after the capacity requirement transfer			
04	The frequency after the frequency limit			
05	The frequency of sending to 341 chip			
06	Indoor unit evaporator outlet temp. (**HEATING** T2， **COOLING** T2B)	If the temp. is lower than 0 degree, the digital display tube displays “0”. If the temp. is higher than 70 degree, the digital display tube displays “70”.		
07	Condenser pipe temp.(T3)	If the temp. is lower than -9 degree, the digital display tube displays “-9”.If the temp. is higher than 70 degree, the digital display tube displays “70”. If the indoor unit is not connected, the digital display tube displays: “--”		
08	Outdoor ambient temp.(T4)			
09	Compressor discharge temp.(T5)	The display value is between 13~129 degree. If the temp. is lower than 13 degrees, the digital display tube displays “13”. If the temp. is higher than 99 degrees, the digital display tube displays a single digit and a ten digit. (For example, if the digital display tube displays “0.5”, it means the compressor discharge temp. is 105 degrees. If the digital display tube displays “1.6”, it means the compressor discharge temp. is 116 degrees).		
10	AD value of current	The display value is a hex number.		
11	AD value of voltage			
12	Indoor unit running mode code	Off:0, Fan only 1,Cooling:2, Heating:3		
13	Outdoor unit running mode code	Off:0, Fan only 1,Cooling:2, Heating:3, Forced cooling:4		
14	EXV open angle	Actual data/4. If the value is higher than 99, the digital display tube displays a single digit and a ten digit. For example, if the digital display tube displays “2.0”,it means the EXV open angle is 120×4=480p.).		
15	Frequency limit symbol	Bit7	Frequency limit caused by IGBT radiator	The display value is a hex number. For ex., the digital display tube displays 2A, then Bit5=1, Bit3=1, Bit1=1. It represents the frequency limit caused by T4, T3 and 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	
16	DC fan motor speed			
17	IGBT radiator temp.	The display value is between 30~120 degrees. If the temp. is lower than 30 degrees, the digital display tube displays “30”. If the temp. is higher than 99 degrees, the digital display tube displays a single digit and a ten digit. (For example, if the digital display tube displays “0.5”, it means the IGBT radiator temp. is 105 degrees. If the digital display tube displays “1.6”, it means the IGBT radiator temp. is 116 degrees).		
18	Indoor unit number	The indoor unit can communicate well with the outdoor unit. General:1, Twins:2		
19	Evaporator pipe temp. T2 of1# indoor unit	If the temp. is lower than 0 degree, the digital display tube displays “0”.If the temp. is higher than 70 degrees, the digital display tube displays “70”. If the indoor unit is not connected, the digital display tube displays: “--”.		
20	Evaporator pipe temp. T2 of 2# indoor unit			
21	Evaporator pipe temp. T2 of 3# indoor unit			
22	1# Indoor unit capacity demand code	Actual data*HP*10 If the capacity demand code is higher than 99, the digital display tube displays a single digit and a tens digit. (For example, the digital display tube displays “5.0”,it means the capacity demand is 15. If the digital display tube displays “60”,it means the capacity demand is 6.0). If the indoor unit is not connected, the digital display tube displays: “--”.		
23	2# Indoor unit capacity demand code			
24	3# Indoor unit capacity demand code			
25	Room temp. T1 of 1# indoor unit	If the temp. is lower than 0 degree, the digital display tube displays “0”.If the temp. is higher than 70 degrees, the digital display tube displays “70”. If the indoor unit is not connected, the digital display tube displays: “--”.		
26	Room temp. T1 of 2# indoor unit			
27	Average room temp. T1			
28	Reason of stop			
29	Evaporator pipe temp. T2B of 1# indoor unit	If the temp. is lower than 0 degree, the digital display tube displays “0”.If the temp. is higher than 70 degrees, the digital display tube displays “70”. If the indoor unit is not connected, the digital display tube displays: “--”.		
30	Evaporator pipe temp. T2B of 2# indoor unit			

EEPROM Parameter Error - Diagnosis and Solution (E0/F4)

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. For the location of the EEPROM chip, refer to the Fig. 23.

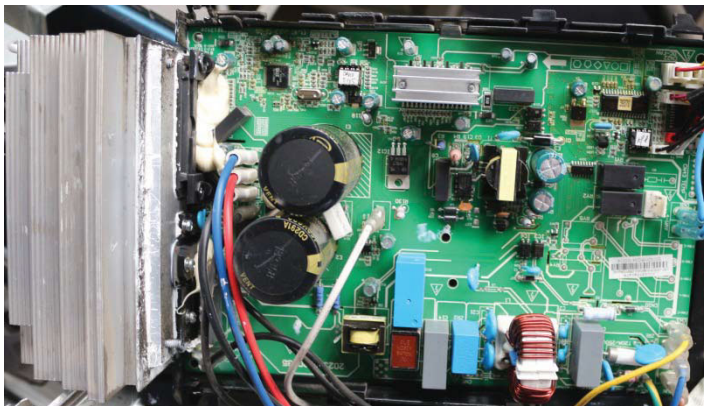


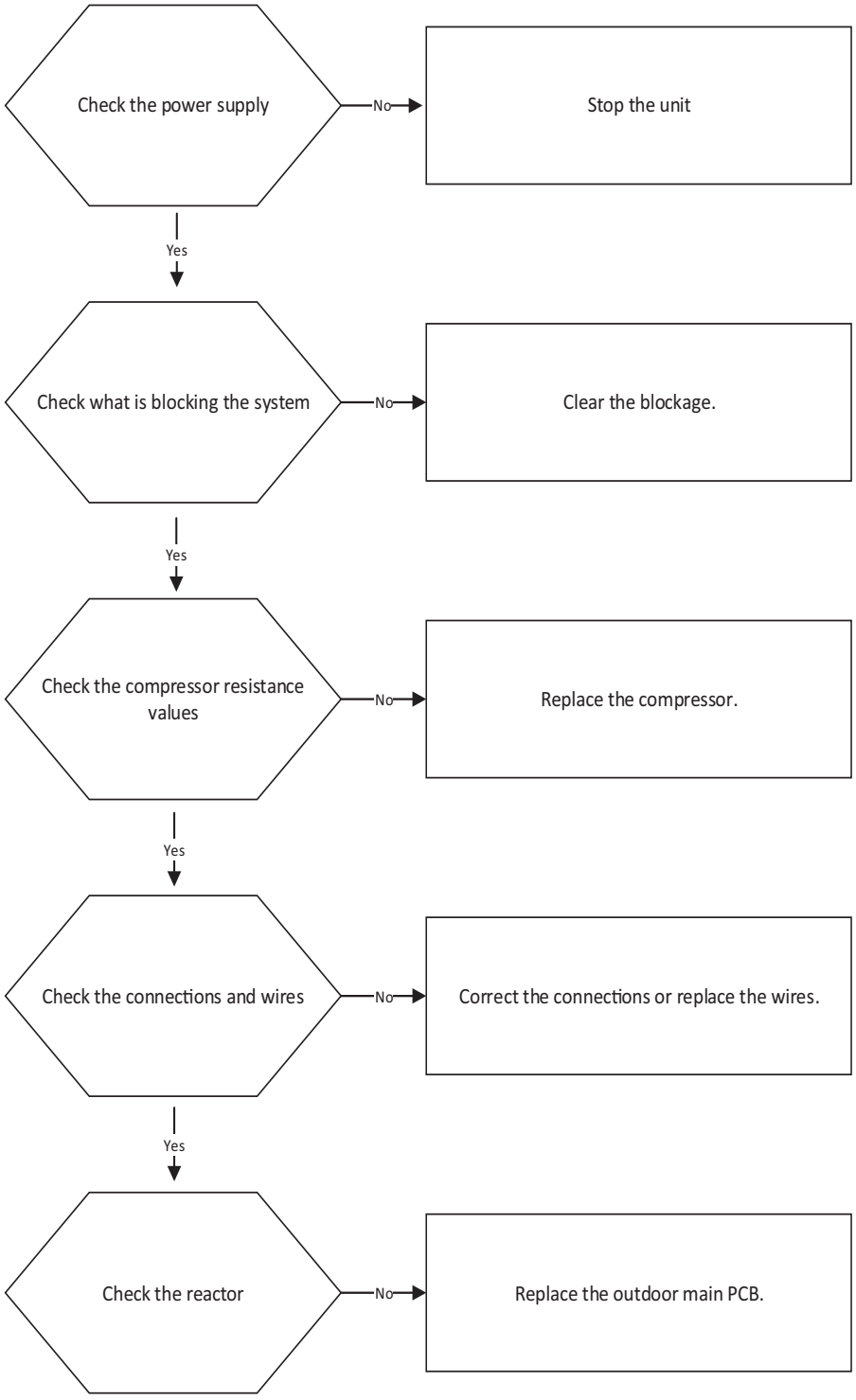
Fig. 23 — Outdoor PCB

Figure 23 is for illustration purposes **only** and may differ from your actual unit.

Overload Current Protection Diagnosis and Solution (F0)

Error Code	F0
Malfunction decision conditions	An abnormal current rise is detected by checking the specified current detection circuit.
Supposed Causes	• Power supply problems • System blockage • PCB faulty • Wiring mistake • Compressor malfunction

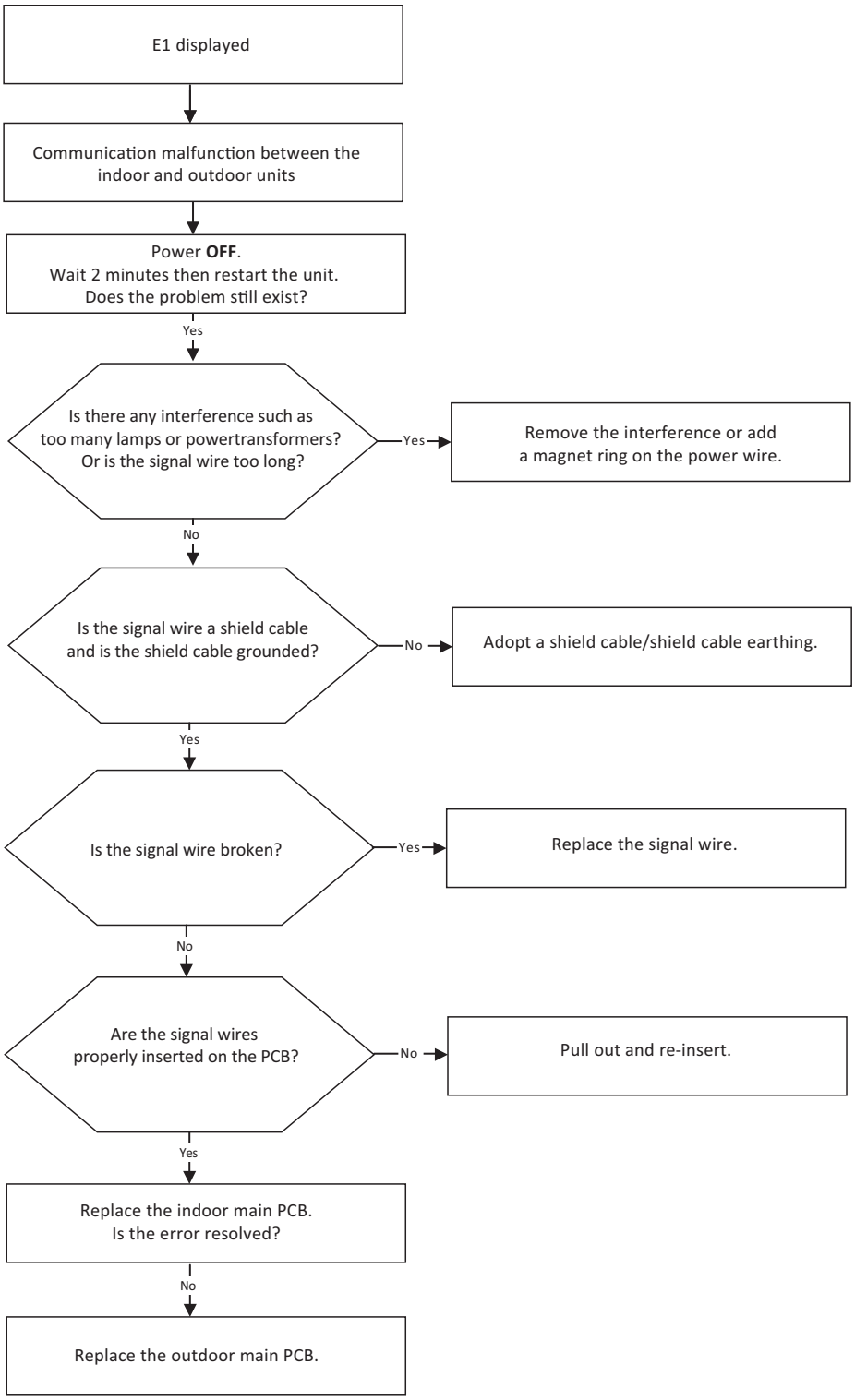
Troubleshooting



Indoor / Outdoor Unit's Communication Error - Diagnosis and Solution (E1)

Error Code	E1
Malfunction decision conditions	Indoor unit does not receive feedback from outdoor unit for 60 seconds, or the outdoor unit does not receive feedback from indoor unit for 120 seconds.
Supposed Causes	• Wiring mistake • Faulty indoor or outdoor PCB

Troubleshooting



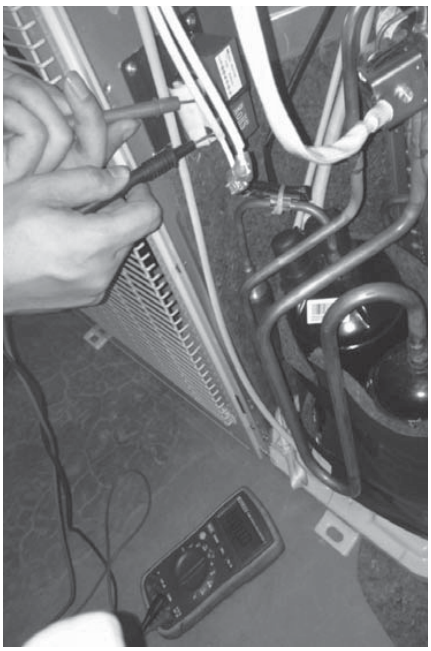


Fig. 24 — Reactor Resistance Test

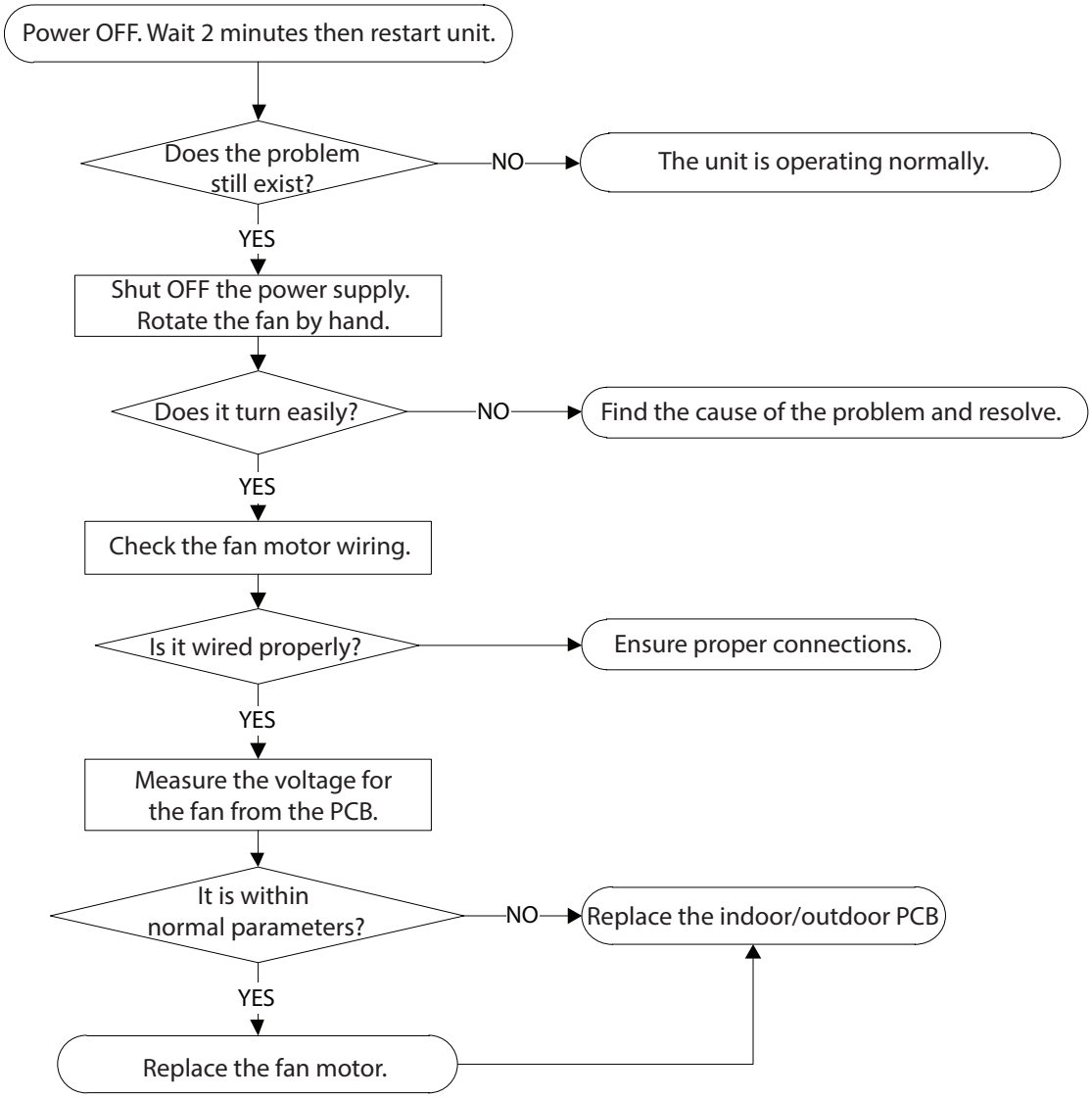
Remark

Use a multimeter to test the reactor resistance that does not connect with the capacitor (Fig. 24). The normal values should be around zero ohm. Otherwise, the reactor has malfunctioned and needs to be replaced.

Fan speed is operating outside of the Normal Range (E3/F5)

Error Code	E3/F5
Description	When the indoor fan speed maintains a low speed (ex. 300RPM) or a speed that's too high (ex.1500RPM) for a certain time, the unit stops and the LED displays the failure (E3). When the outdoor fan speed registers below 200RPM or over 1500RPM for an extended period of time, the unit stops and the LED displays the failure (F5).
Supposed Causes	• Wiring mistake • Faulty fan assembly • Faulty fan motor • Faulty PCB

Troubleshooting



Open Circuit or Short Circuit of Temperature Sensor Diagnosis and Solution (E4/E5/F1/F2/F3)

Error Code	E4/E5/F1/F2/F3
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

Troubleshooting

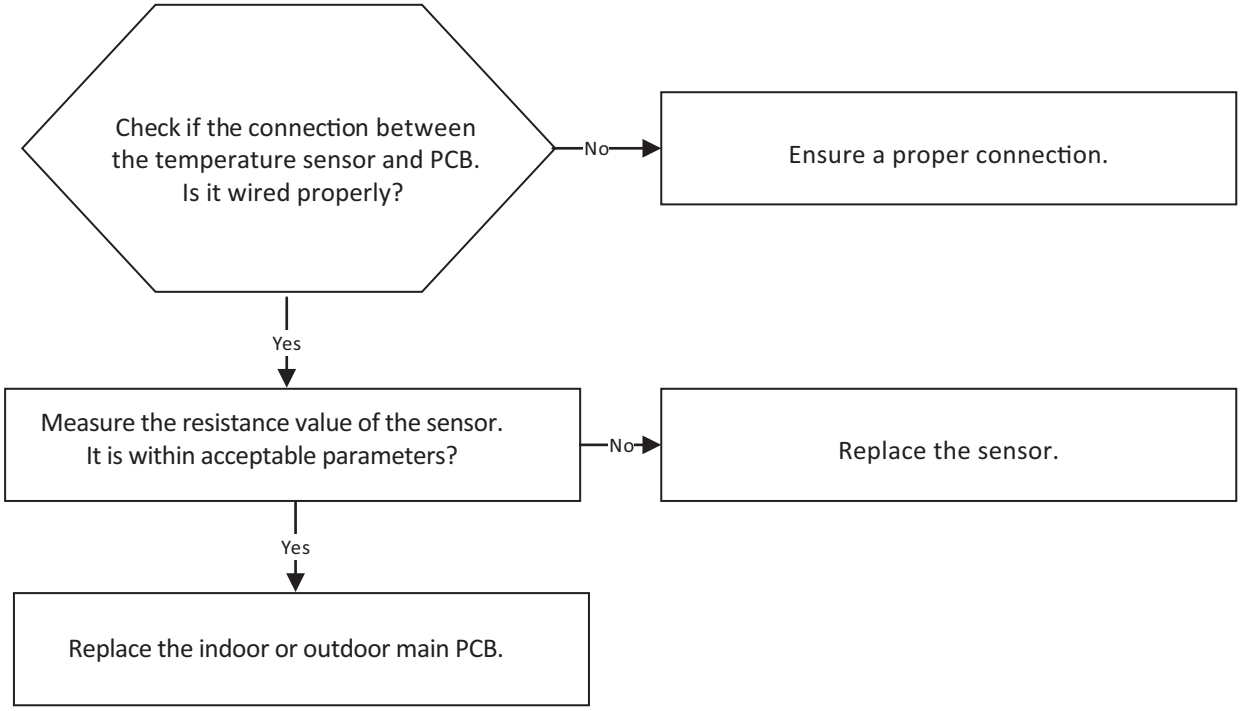
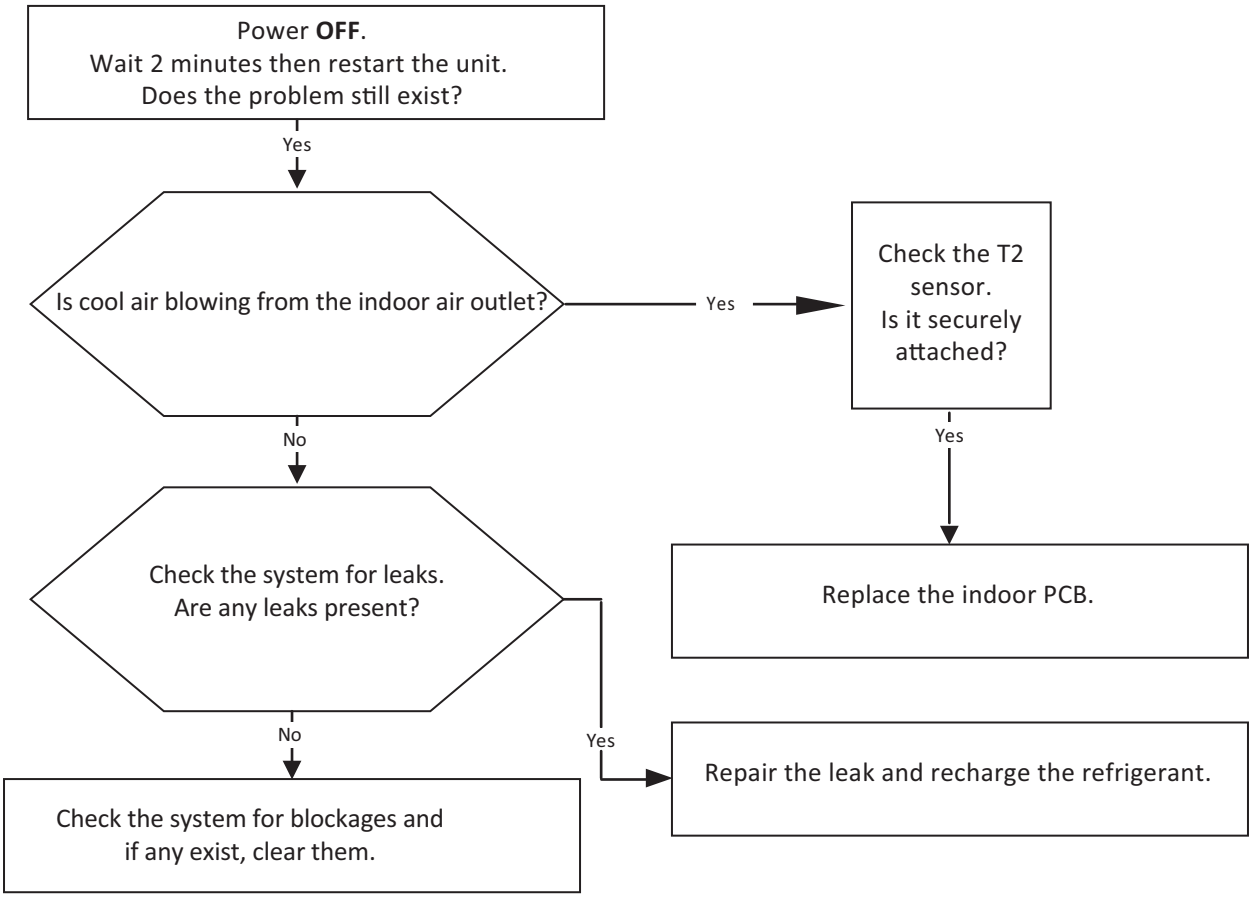


Fig. 25 — Test

Refrigerant Leakage Detection Diagnosis and Solution (EC)

Error Code	EC
Malfunction decision conditions	Define the evaporator coil temp.T2 of the compressor just starts running as Tcool. In the beginning 5 minutes after the compressor starts up, if T2 <Tcool-35.6°F(Tcool-2°C) does not keep continuous 4 seconds and this situation happens 3 times, the display area shows “EC” and AC turns off.
Supposed Causes	• T2 sensor faulty • Indoor PCB faulty • System problems, such as leakage or blocking

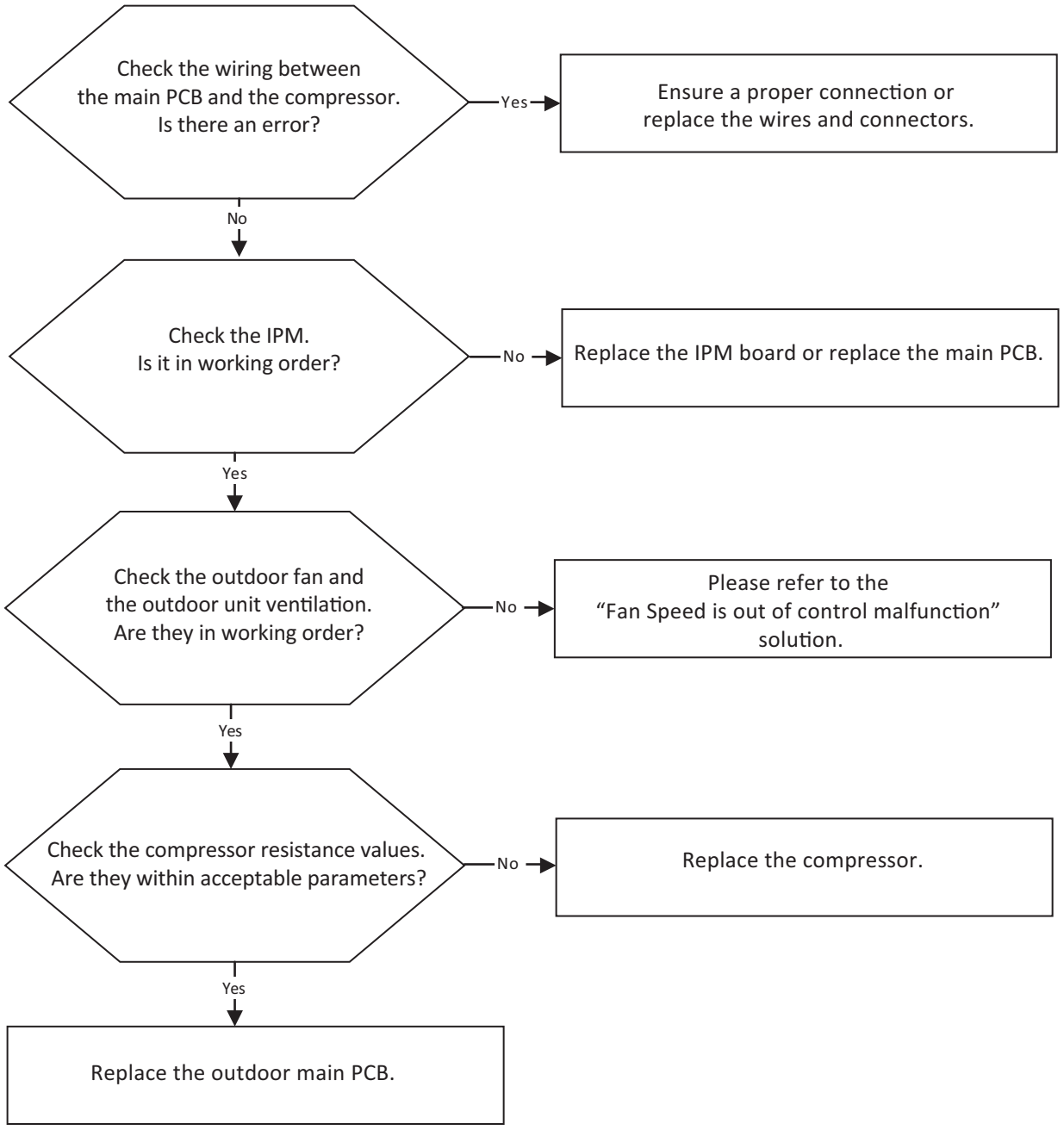
Troubleshooting



IPM Malfunction or IGBT Over-strong Current Protection Diagnosis and Solution (PO)

Error Code	PO
Malfunction decision conditions	When the voltage signal that IPM sends to the compressor drive chip is abnormal, the LED displays "PO" and the AC turns off.
Supposed Causes	• Wiring mistake • IPM malfunction • Outdoor fan assembly faulty • Compressor malfunction • Outdoor PCB faulty

Troubleshooting



NOTE: In figures 26-27 the following is observed:

- U,V,W references the compressor connection point
- P references input voltage
- N references output voltage

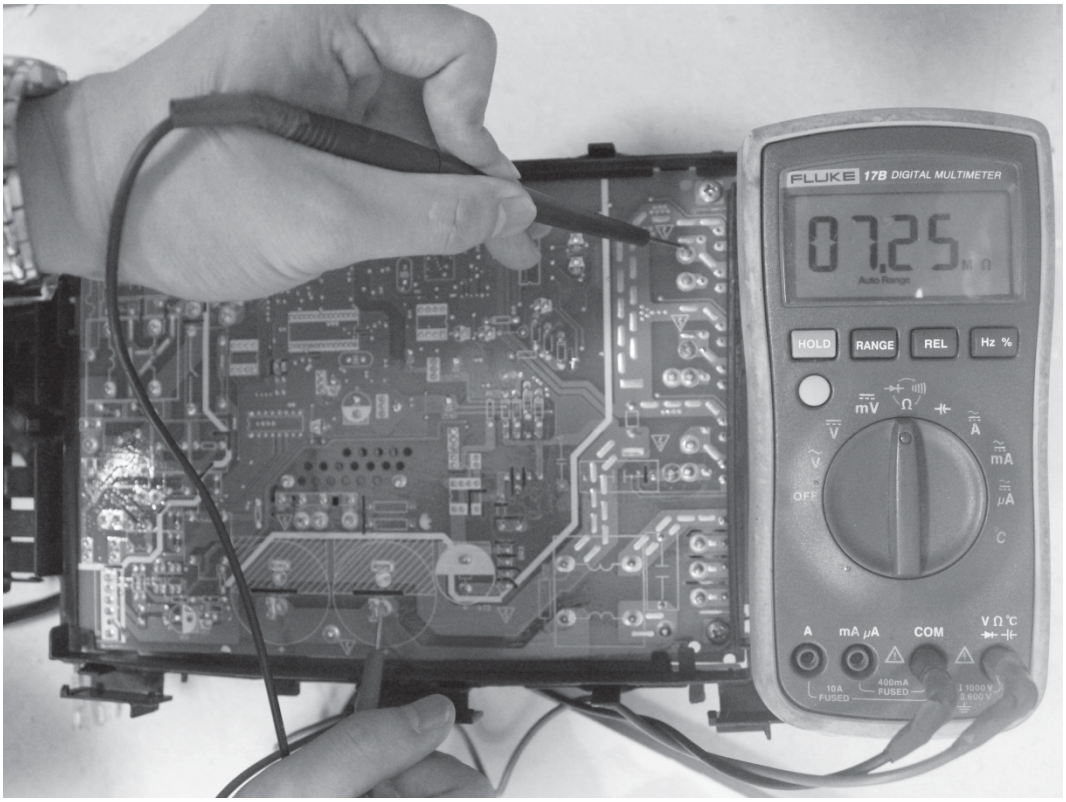


Fig. 26 — P-U

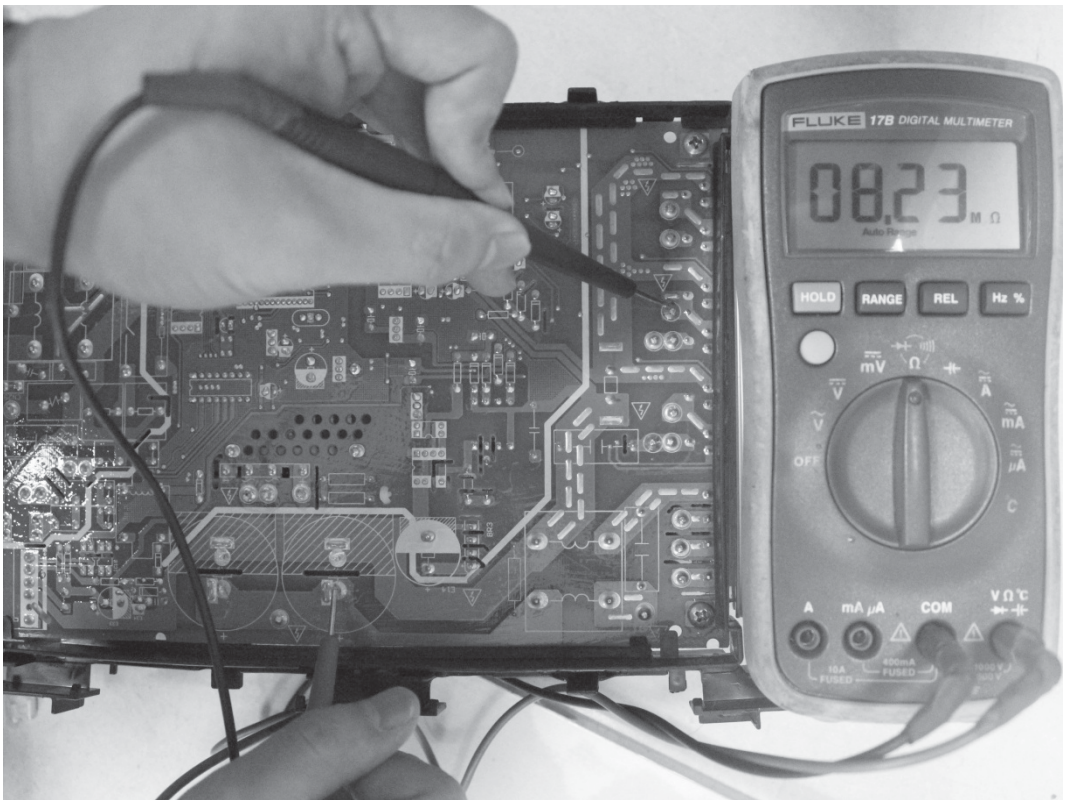


Fig. 27 — P-V

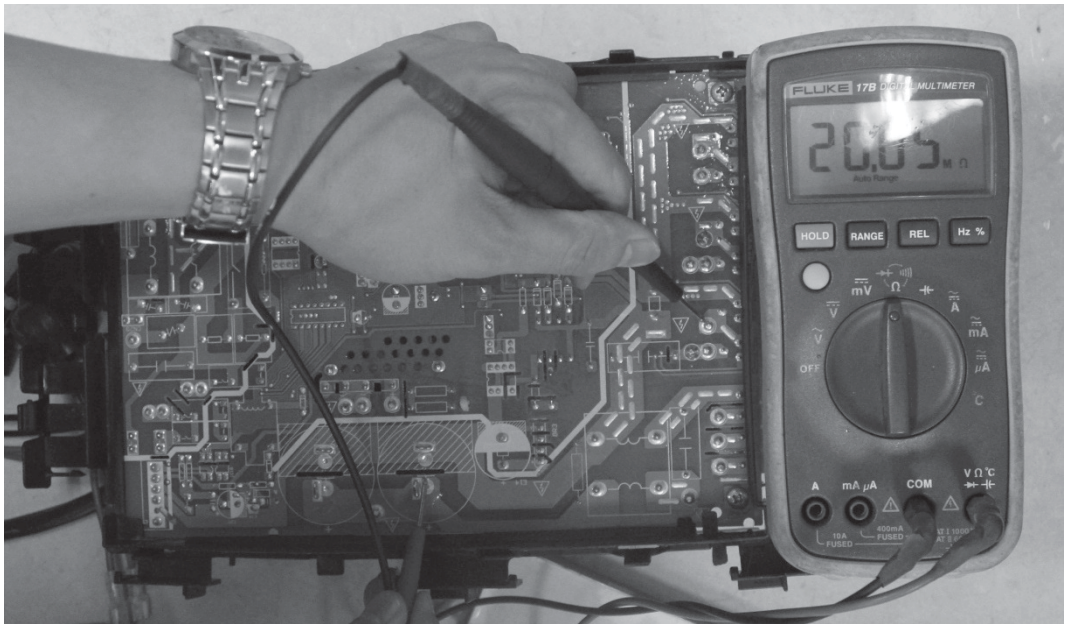


Fig. 28 — P-W

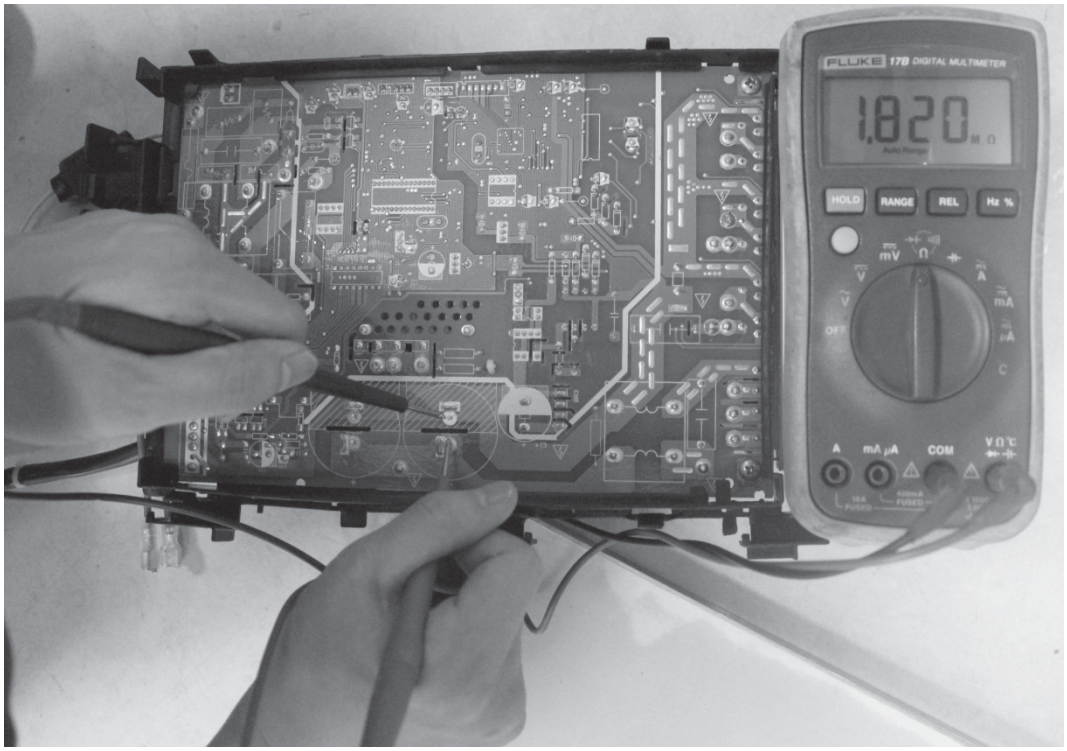
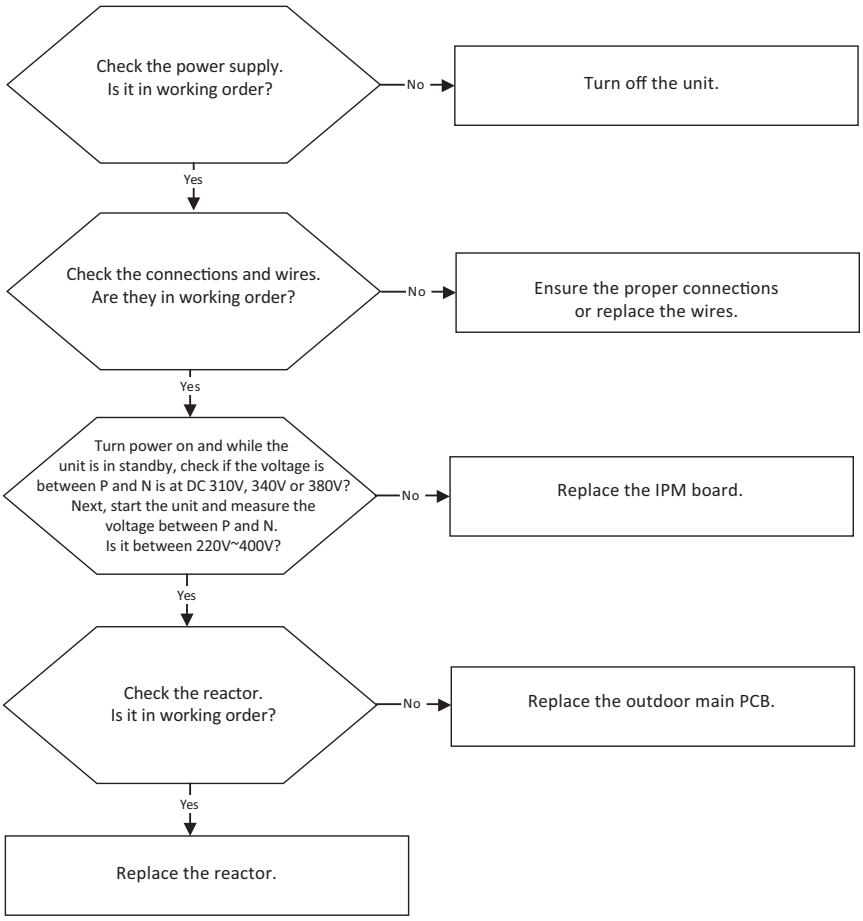


Fig. 29 — P-N

Over Voltage or Too Low Voltage Protection Diagnosis and Solution (P1)

Error Code	P1
Malfunction decision conditions	An abnormal current rise is detected by checking the specified current detection circuit.
Supposed Causes	• Power supply problems • System leakage or blockage • PCB faulty

Troubleshooting



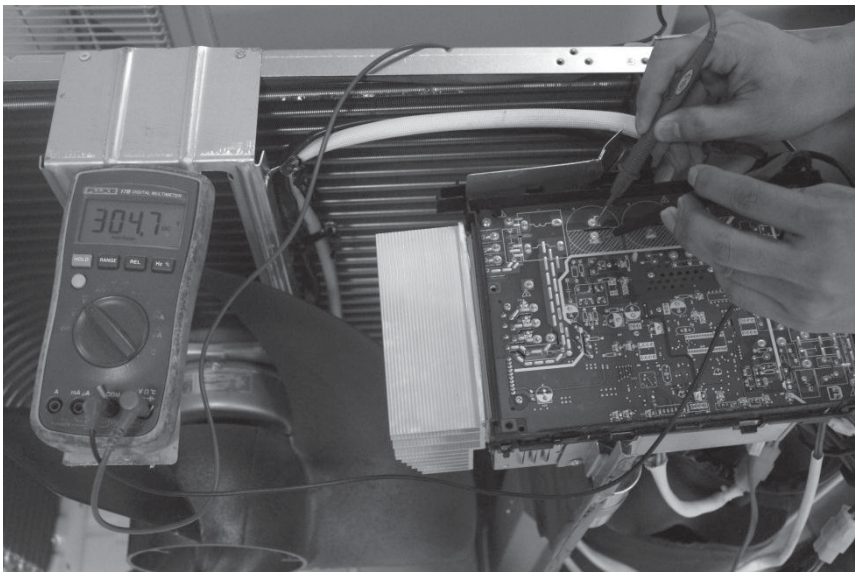
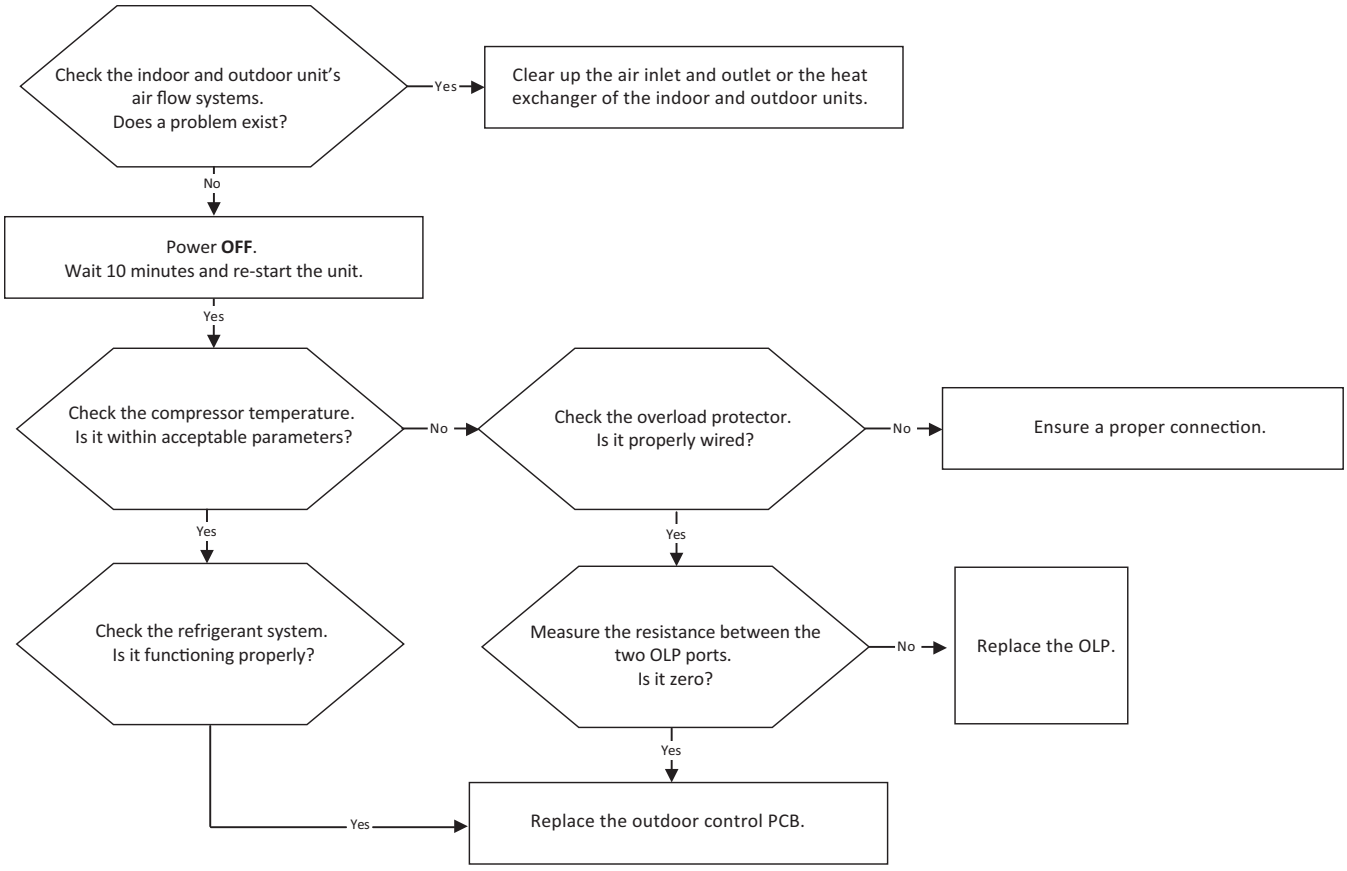


Fig. 30 — Test

High Temperature Protection of Compressor Top Diagnosis and Solution (P2)

Error Code	P2
Malfunction decision conditions	If the sampling voltage is not 5V, the LED displays the failure.
Supposed Causes	• Power supply problems • System leakage or block • PCB faulty

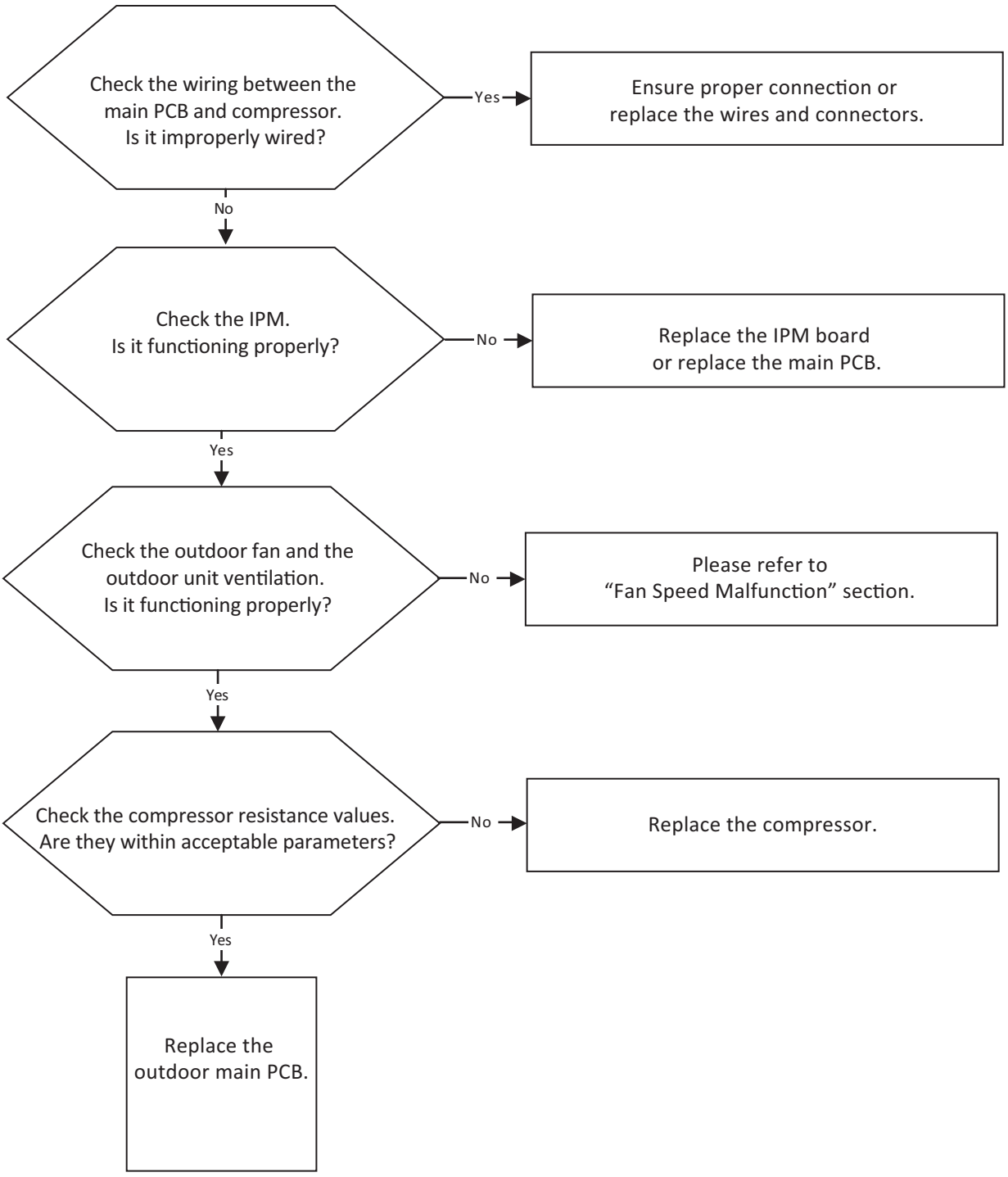
Troubleshooting



Inverter Compressor Drive Error Diagnosis and Solution (P4)

Error Code	P4
Malfunction decision conditions	An abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.
Supposed Causes	• Wiring mistake • IPM malfunction • Outdoor fan assembly fault • Compressor malfunction • Outdoor PCB faulty

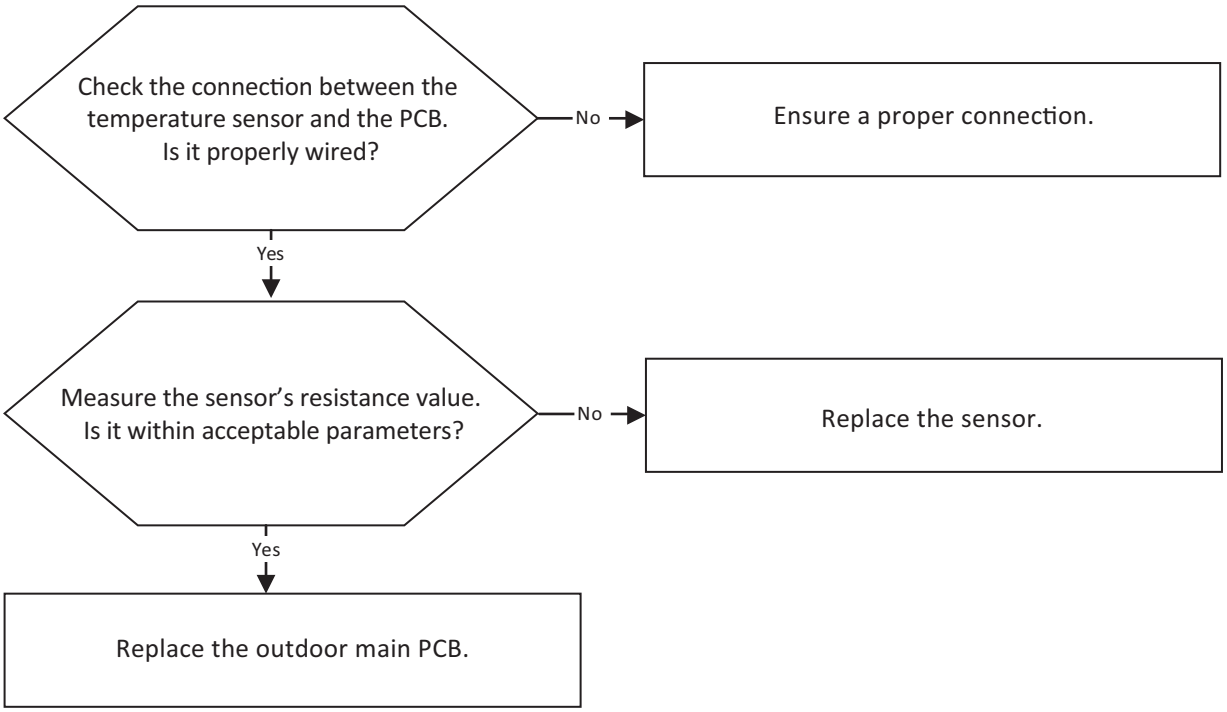
Troubleshooting



Outdoor IPM Module Temperature Sensor Malfunction Diagnosis and Solution (P7)

Error Code	P7
Malfunction decision conditions	If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays a failure.
Supposed Causes	• Faulty wiring • Faulty sensor

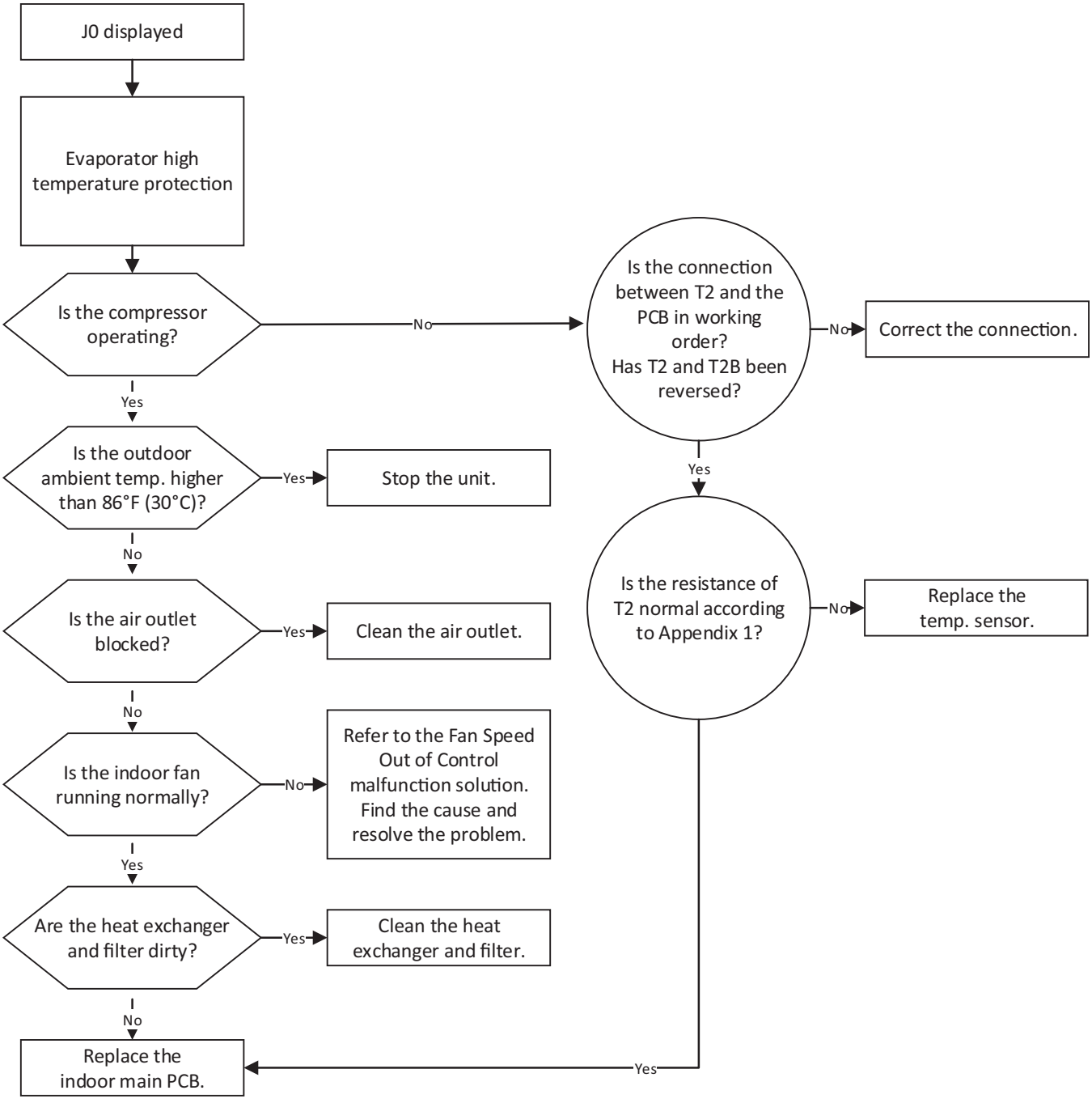
Troubleshooting



J0 Malfunction

Error Code	J0
Malfunction decision conditions	When the evaporator coil is more than 140°F(60°C), the unit stops. It starts up again only when the evaporator coil is less than 129°F(54°C).
Supposed Causes	• Faulty evaporator coil temperature sensor • Dirty heat exchanger • Faulty fan • Faulty PCB

Troubleshooting

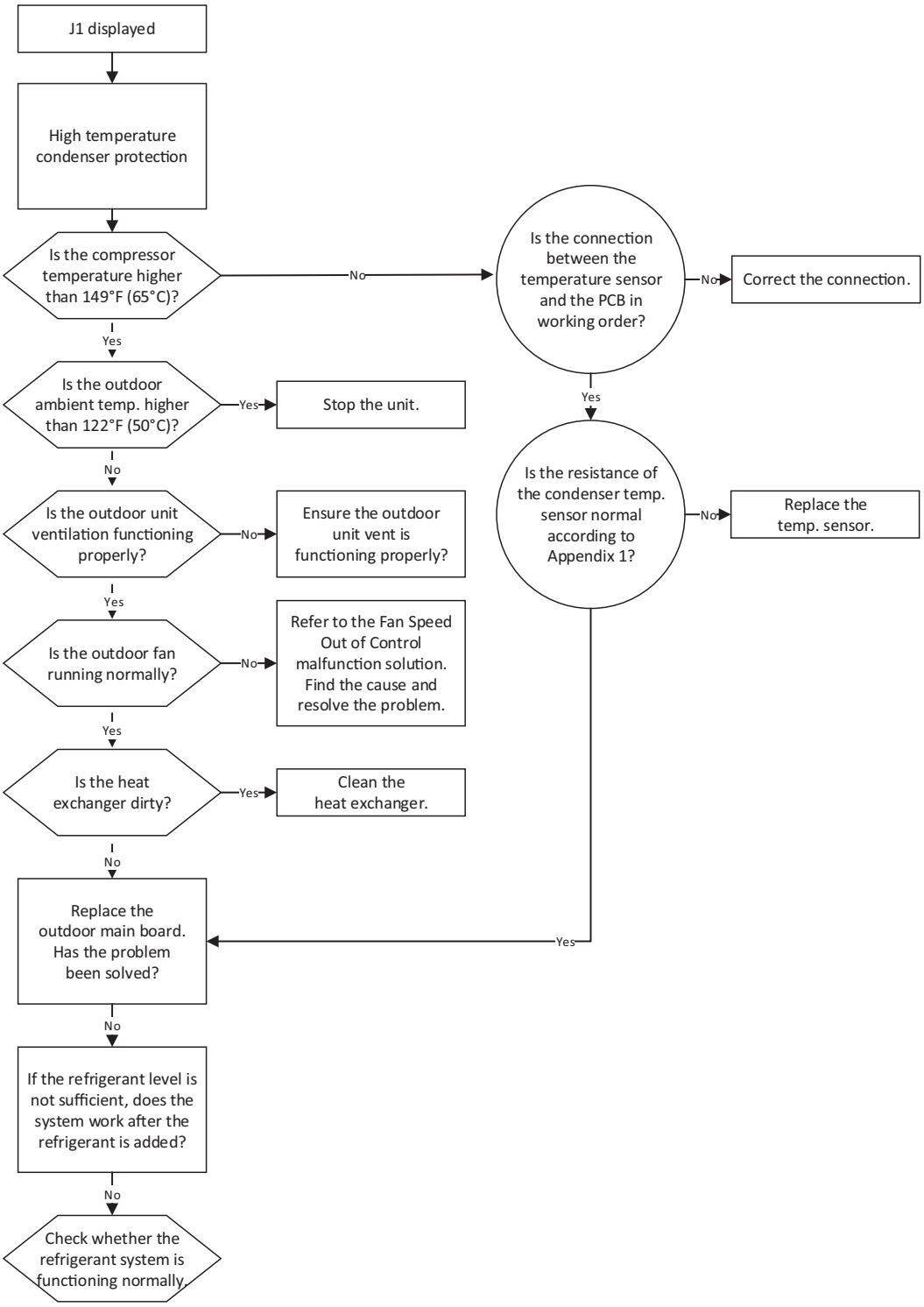


*Refer to “Appendix 1” on page 62.

J1 Malfunction

Error Code	J1
Malfunction decision conditions	When the outdoor pipe temperature is more than 149°F(65°C), the unit stops. It starts up again only when the outdoor pipe temperature is less than 126°F(52°C).
Supposed Causes	• Faulty condenser temperature sensor • Dirty heat exchanger • System leakage or blockage

Troubleshooting

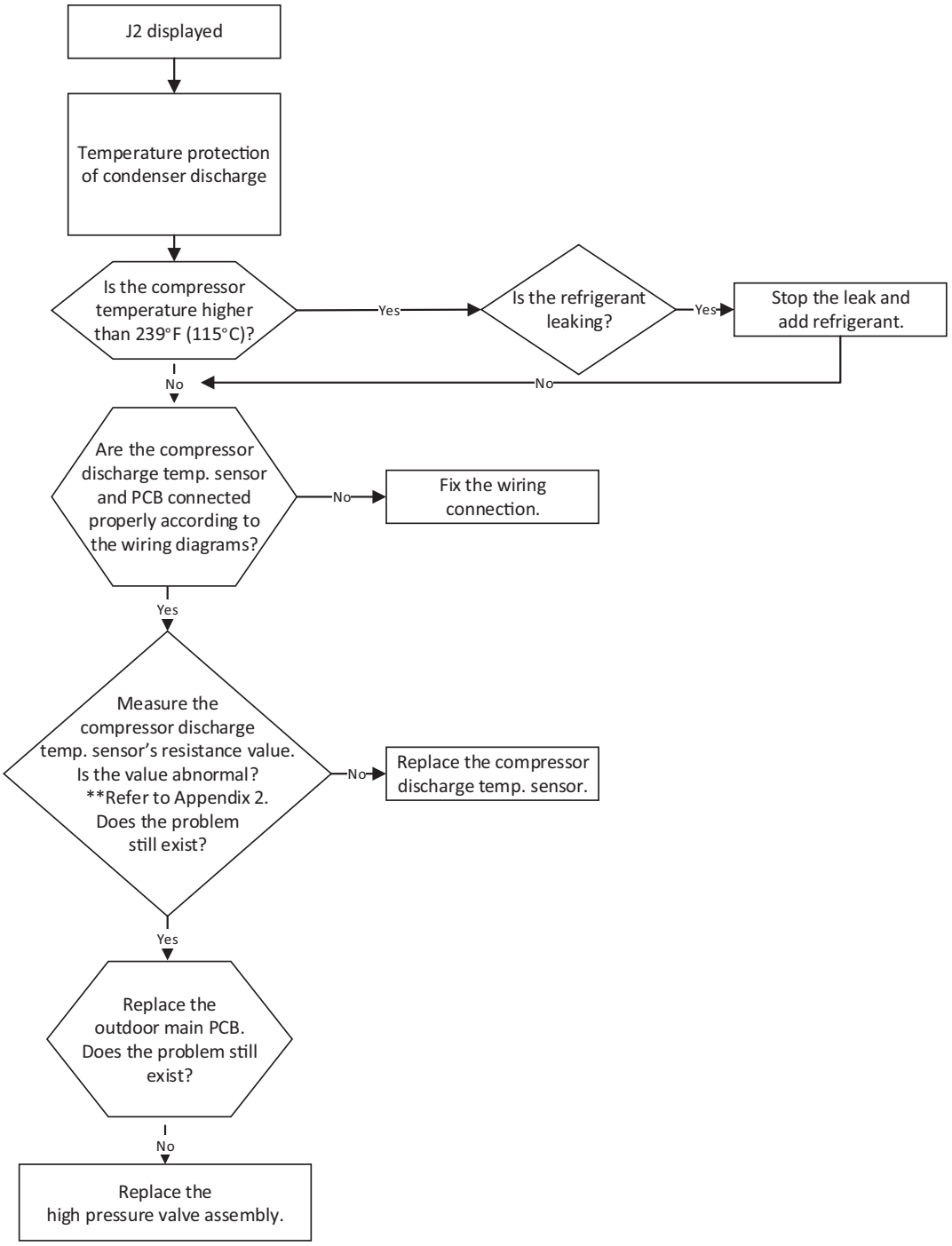


*Refer to “Appendix 1” on page 62.

J2 Malfunction

Error Code	J2
Malfunction decision conditions	When the compressor discharge temperature (T5) is more than 115°C for 10 seconds, the compressor will stop and not restart until T5 is less than 90°C.
Supposed Causes	• Refrigerant leakage • Faulty wiring • Faulty discharge temperature sensor • Faulty outdoor PCB

Troubleshooting

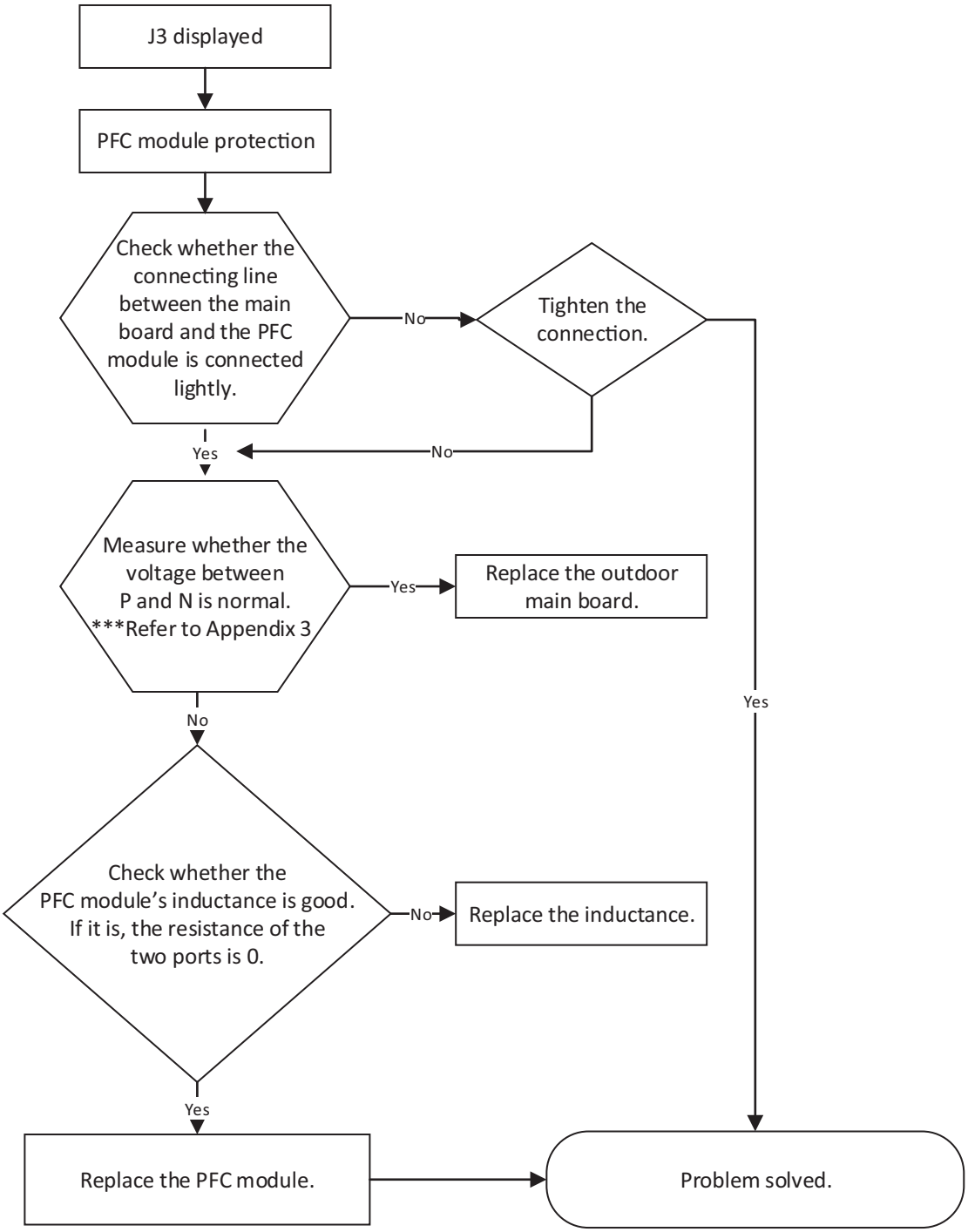


**Refer to "Appendix 2" on page 63.

J3 Malfunction

Error Code	J3
Malfunction decision conditions	When the voltage signal that the IPM sends to the compressor is abnormal, the display LED shows “J3” and the unit turns off.
Supposed Causes	• Faulty wiring • Faulty IPM board • Faulty outdoor fan assembly • Compressor malfunction • Faulty outdoor PCB

Troubleshooting

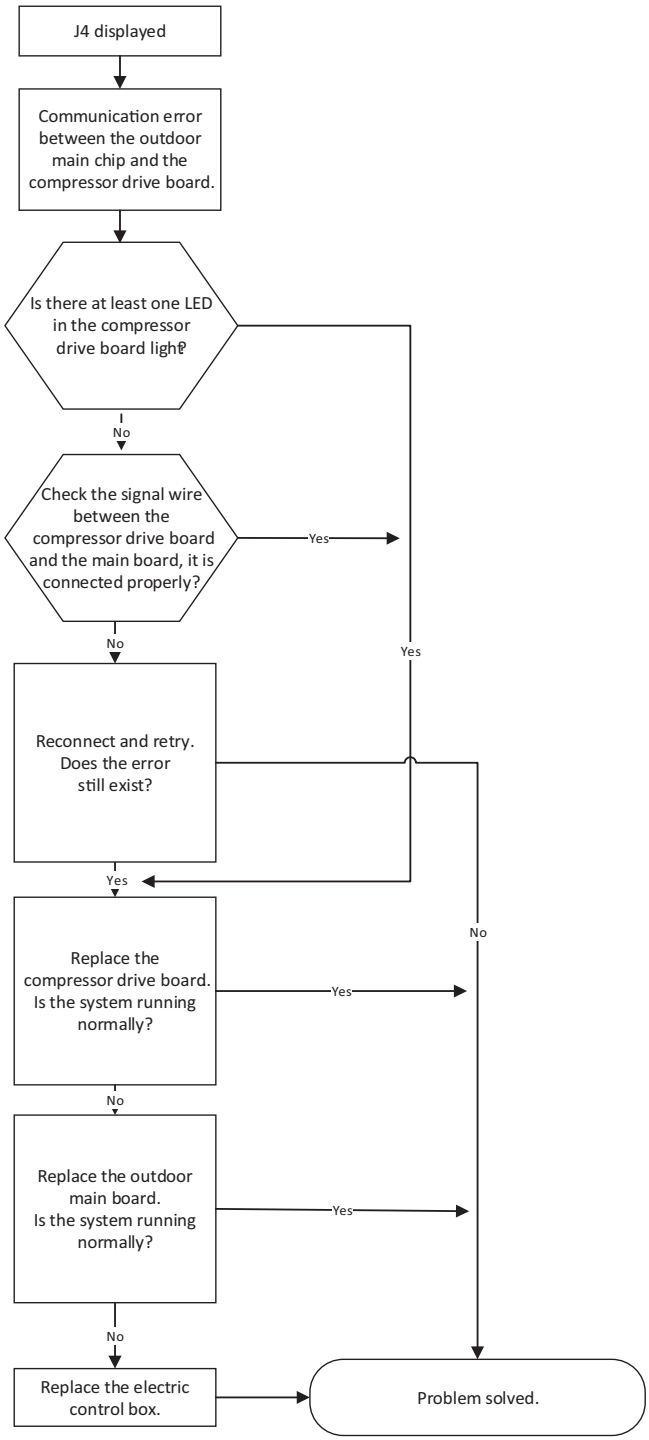


***Refer to “Appendix 3” on page 64.

J4 Malfunction

Error Code	J4
Malfunction decision conditions	When the signal from the IPM to the Main Control Board and IPM Board is abnormal, the display LED shows “J4” and the unit turns off.
Supposed Causes	• Faulty wiring • Faulty IPM Outdoor board • Faulty Main Outdoor board • Faulty rectifier

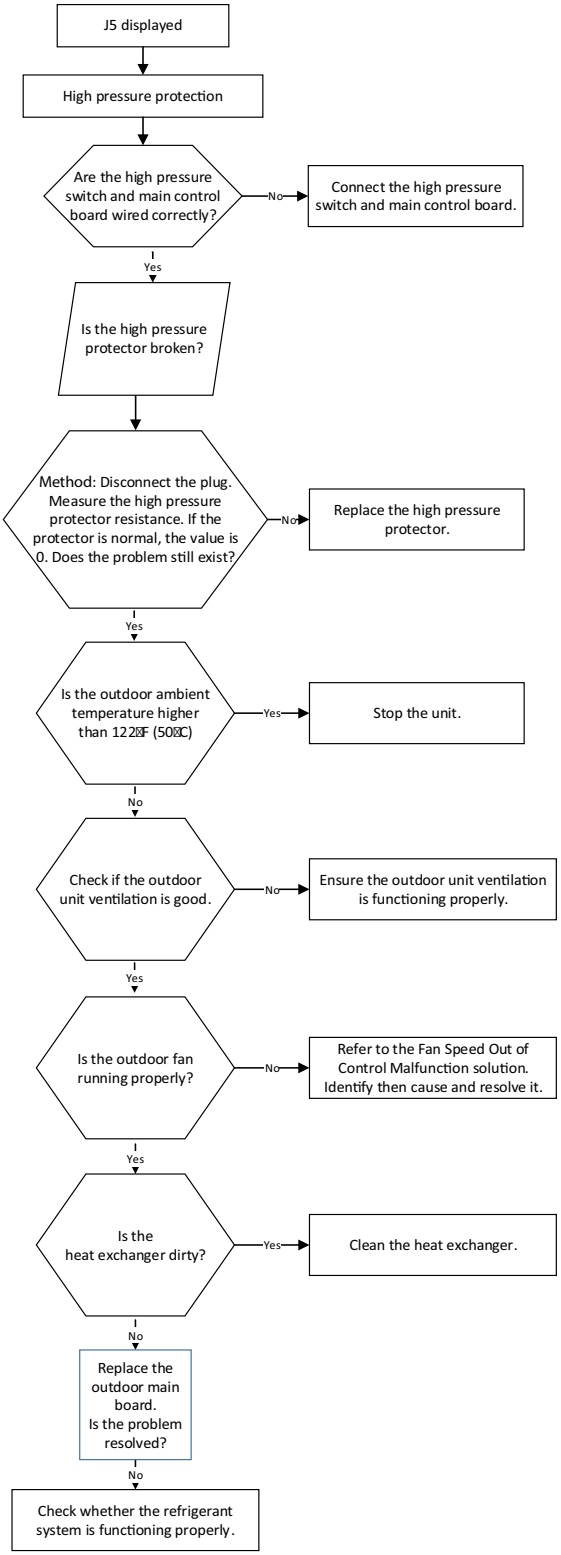
Troubleshooting



J5 Malfunction

Error Code	J5
Malfunction decision conditions	The sampling voltage is not 5V, the LED displays a failure code.
Supposed Causes	• Faulty wiring • Faulty overload protector • System blockage • Faulty outdoor PCB

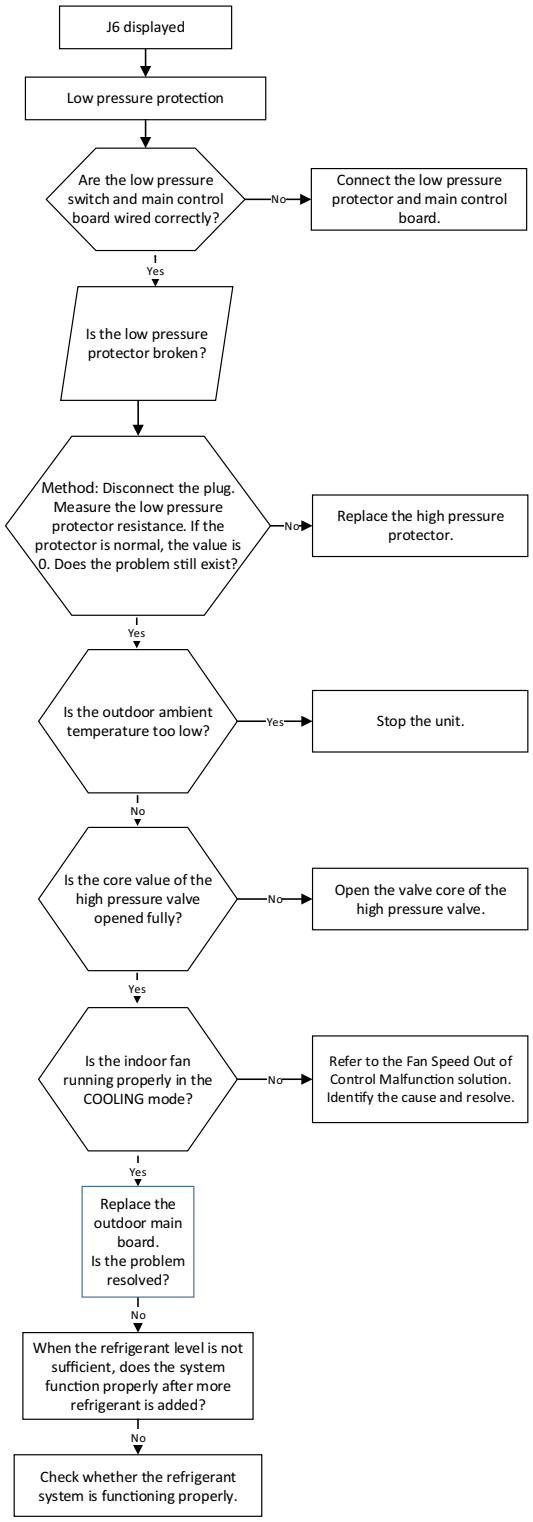
Troubleshooting



J6 Malfunction

Error Code	J6/P6
Malfunction decision conditions	If the sampling voltage is not 5V, the LED displays a failure code.
Supposed Causes	• Faulty wiring • Faulty overload protector • System blockage • Faulty outdoor PCB

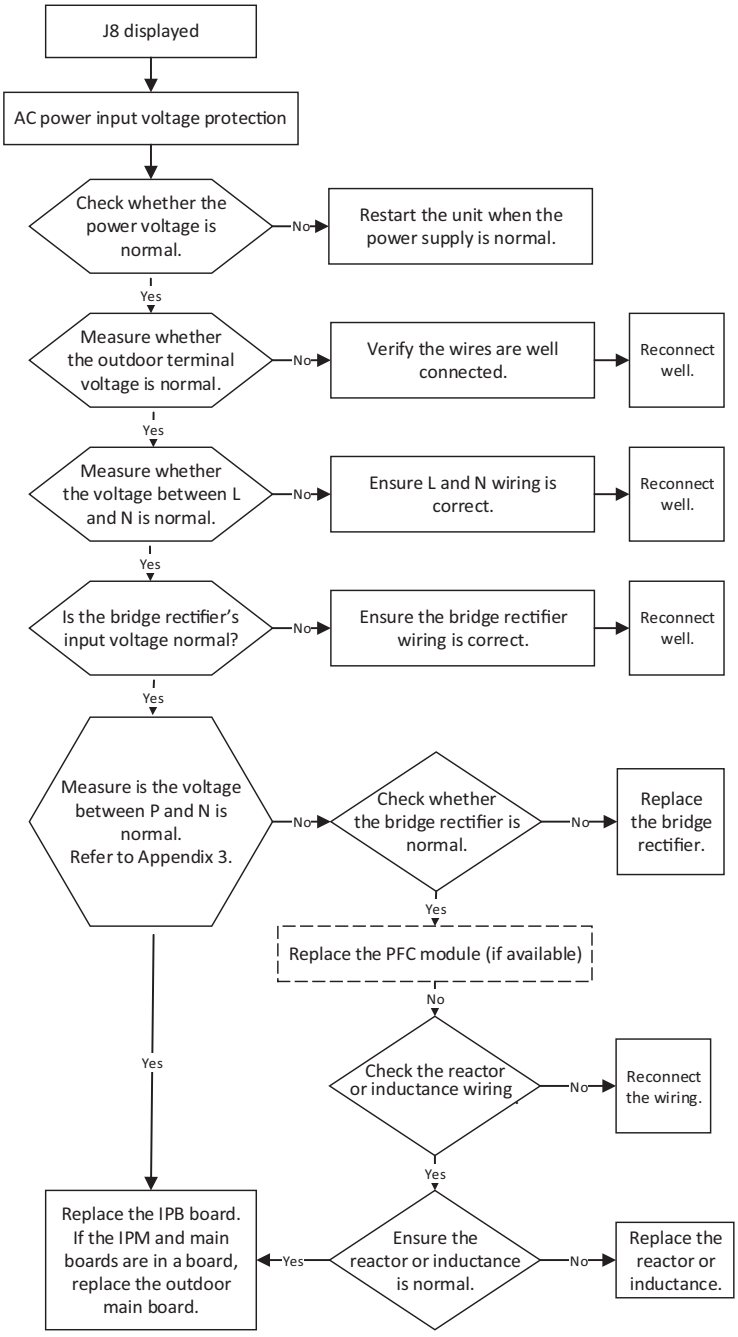
Troubleshooting



J8 Malfunction

Error Code	J8
Malfunction decision conditions	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
Supposed Causes	• Faulty or wrong power supply • Faulty wiring • Faulty bridge rectifier • Faulty IPM board

Troubleshooting

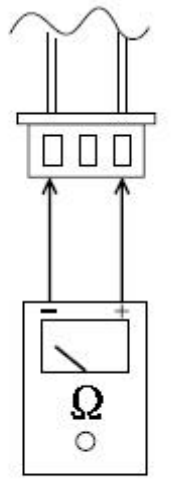


*** Refer to "Appendix 3" on page 64.

Main Parts Check

Temperature sensor checking

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



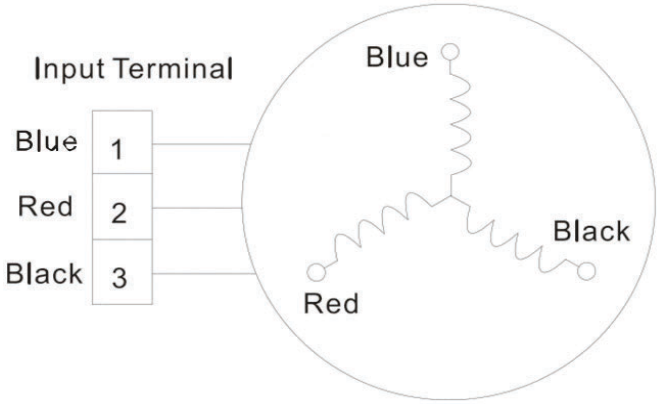
Temperature sensors:

- Room temp. (T1) sensor,
- Indoor coil temp. (T2) sensor,
- Outdoor coil temp. (T3) sensor,
- Outdoor ambient temp. (T4) sensor,
- Compressor discharge temp. (T5) sensor.

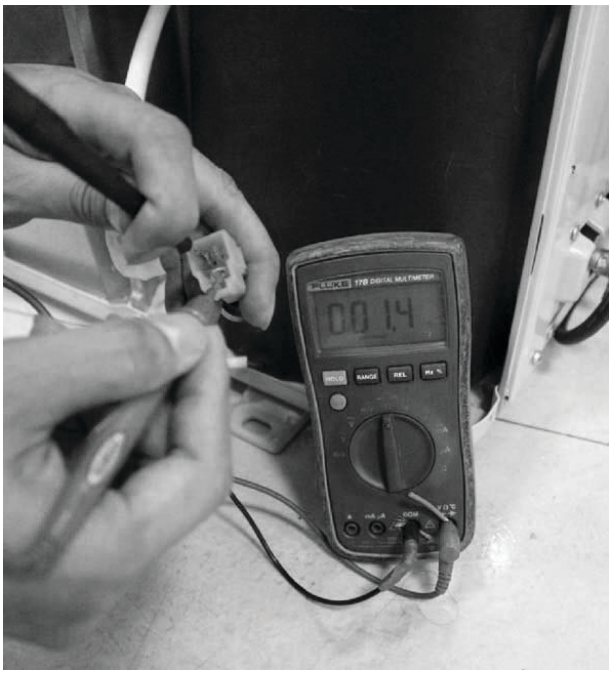
Measure the resistance value of each sensor by using the multi-meter.

Compressor Checking

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



POSITION	NOMINAL RESISTANCE VALUE	
	ATF310D43UMT	ATQ420D1UMU
Blue - Red	0.65Ω	0.38Ω
Blue - Black		
Red - Blue		



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.

DIGITAL TESTER		NORMAL RESISTANCE VALUE	DIGITAL TESTER		NORMAL RESISTANCE VALUE
(+)Red	(-)Black	∞ (Several MΩ)	(+)Red	(-)Black	∞ (Several MΩ)
P	N		U	N	
	U		V		
	V		W		
	W		(+)Red		

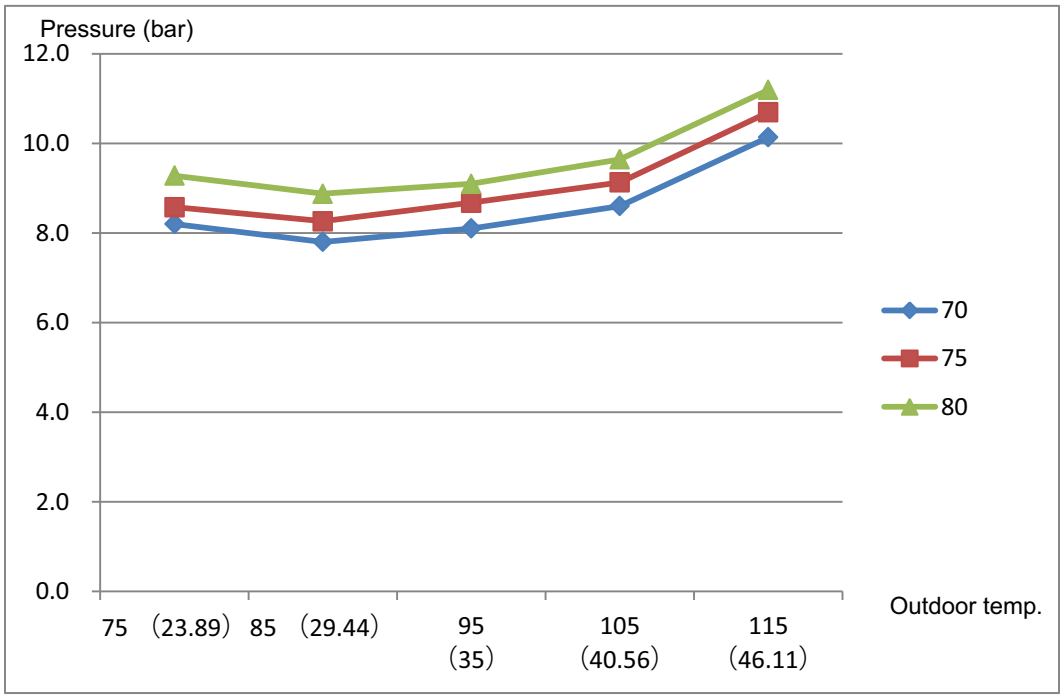
Pressure on Service Port

Cooling Charts (Cooling Mode)

F° C°	INDOOR TEMP	OUTDOOR TEMP.				
		75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)
BAR	70	8.2	7.8	8.1	8.6	10.1
BAR	75	8.6	8.3	8.7	9.1	10.7
BAR	80	9.3	8.9	9.1	9.6	11.2

PSI	70	119	113	117	125	147
PSI	75	124	120	126	132	155
PSI	80	135	129	132	140	162

MPA	70	0.82	0.78	0.81	0.86	1.01
MPA	75	0.86	0.83	0.87	0.91	1.07
MPA	80	0.93	0.89	0.91	0.96	1.12



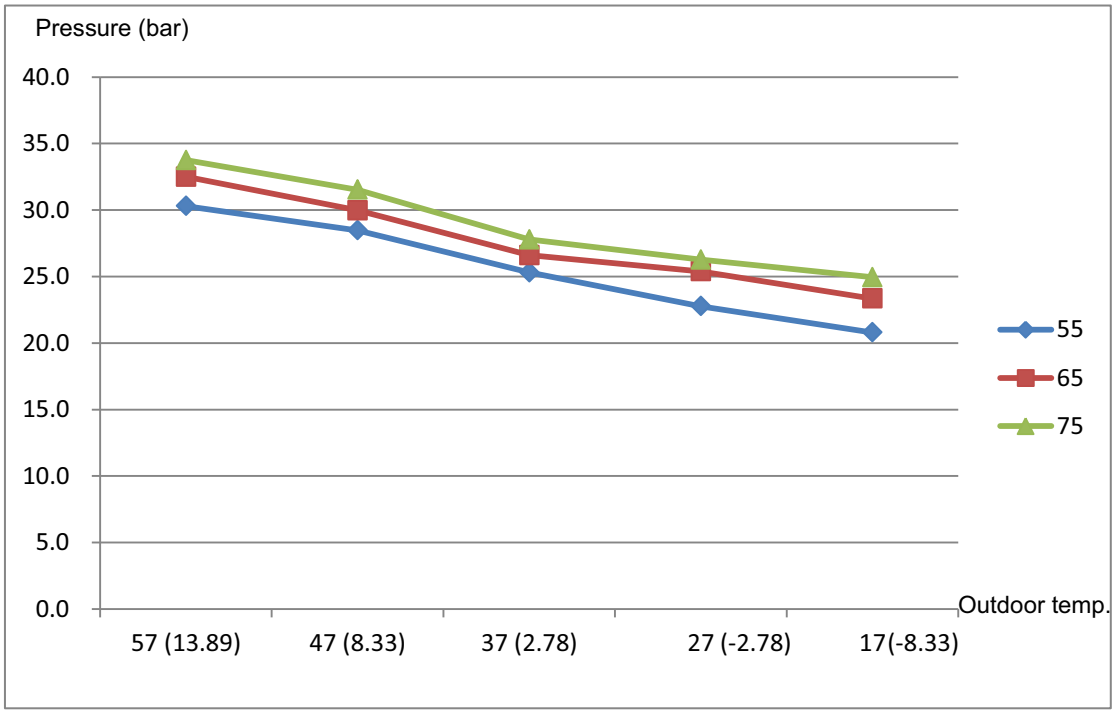
Pressure on Service Port (cont.)

Heating Charts (Heating Mode)

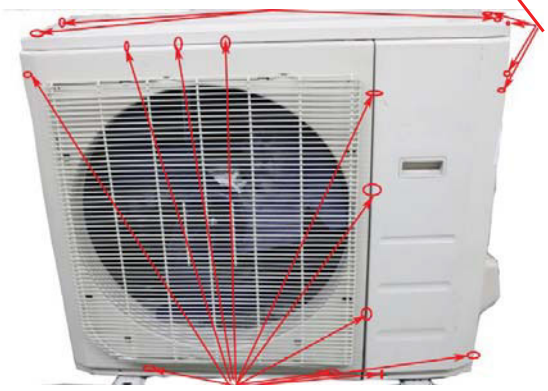
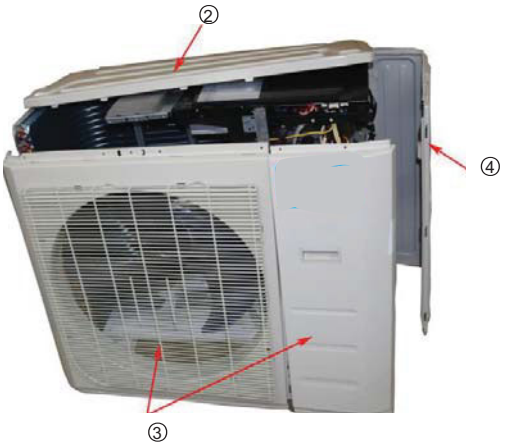
F° C°	INDOOR TEMP.	OUTDOOR TEMP.				
		57 (13.89)	47 (8.33)	37 (2.78)	27 (-2.78)	17 (-8.33)
BAR	55	30.3	28.5	25.3	22.8	20.8
BAR	65	32.5	30.0	26.6	25.4	23.3
BAR	75	33.8	31.5	27.8	26.3	24.9

PSI	55	439	413	367	330	302
PSI	65	471	435	386	368	339
PSI	75	489	457	403	381	362

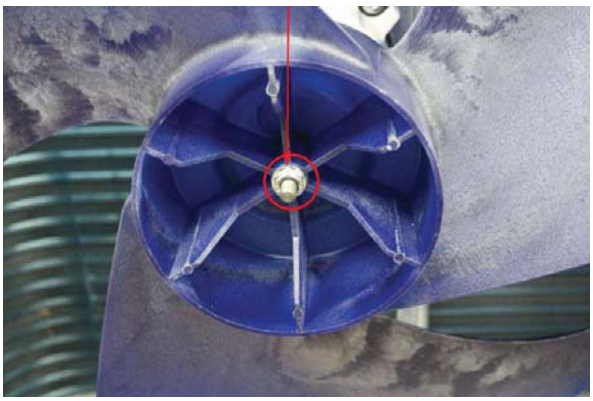
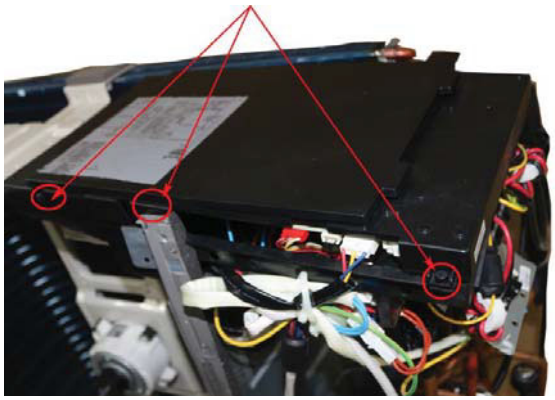
MPA	55	3.03	2.85	2.53	2.28	2.08
MPA	65	3.25	3.00	2.66	2.54	2.33
MPA	75	3.38	3.15	2.78	2.63	2.49



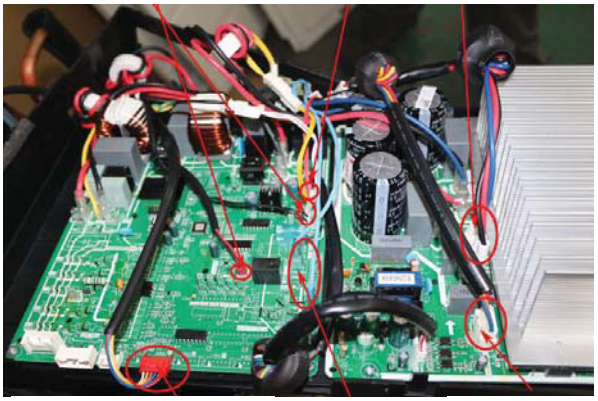
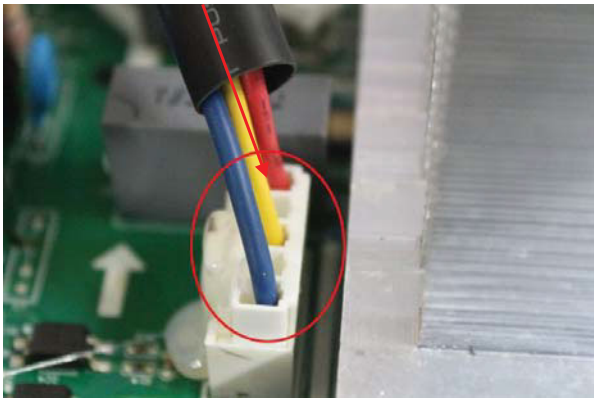
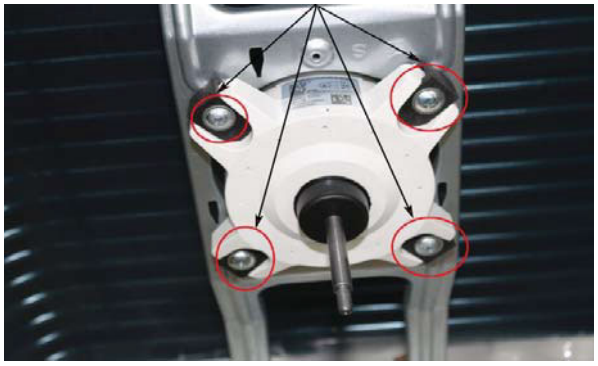
DISASSEMBLY INSTRUCTIONS SIZE 36

No.	Part name	Procedures	Remarks
1	Panel plate	Remove the panel plate 1) Stop the air conditioner and turn off the power breaker. 2) Remove the big handle first, then remove the top cover (7 screws). 3) Remove the front panel screws (11). (4) Remove the right side panel screws (13).	Big handle (4 screws) Screws of top panel (3screws, 1screws is under the big handle)  Front panel screws (11) 

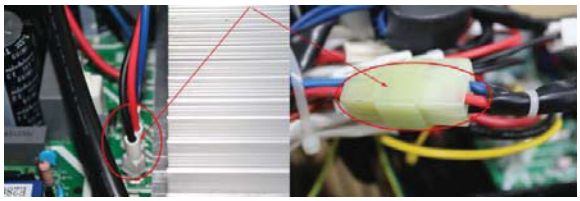
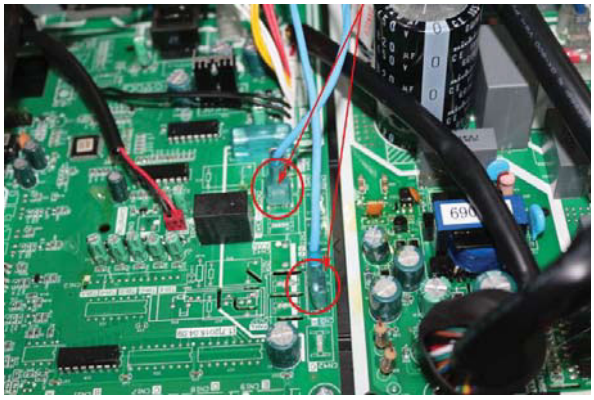
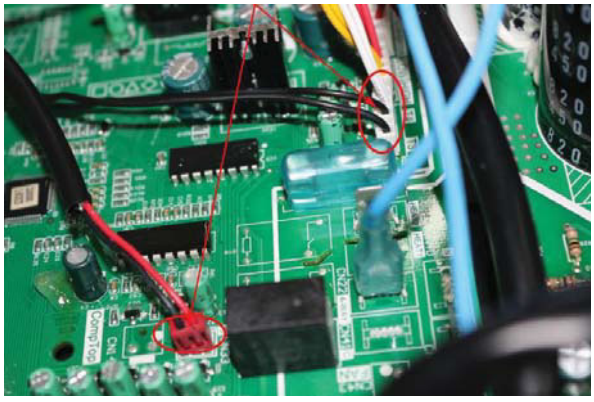
DISASSEMBLY INSTRUCTIONS SIZE 36 (CONT)

2	Fan Assembly	Remove the fan assembly	
		1) Use procedure 1 to remove the panel plate.	Fan Electronic control box  compressor
		2) Remove the nut securing the fan, then remove the fan.	② 
		3) Unfix the hooks and remove the screws. Next, open the electronic control box cover.	③ 

DISASSEMBLY INSTRUCTIONS SIZE 36 (CONT)

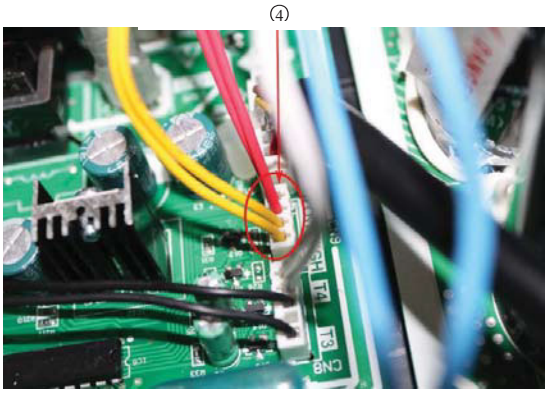
		4) Disconnect the fan motor connector from the electronic control board. 5) Remove the fan motor's screws (4) then remove the motor.	T3,T4,T5,sensor Pressure switch Compressor wire  Electronic expansion 4 way valve Motor wire ④  ⑤ 

DISASSEMBLY INSTRUCTIONS SIZE 36 (CONT)

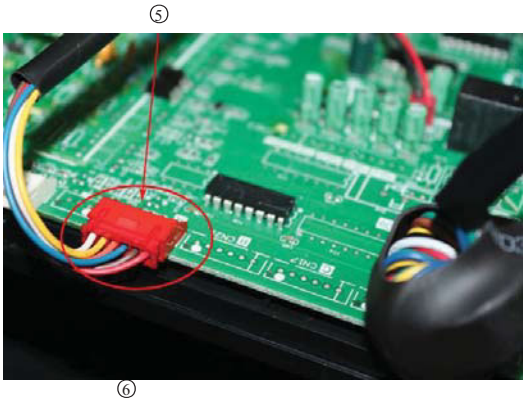
3	Electrical parts	Remove the electrical parts 1) After completing steps in sections 1 and 2, remove the compressor connector. 2) Pull out the two blue wires connected with the 4-way valve. 3) Pull out the condenser coil temp. sensor (T3) connectors, outdoor ambient temp. sensor (T4), and the discharge temp. sensor (T5).	①  ②  ③ 

DISASSEMBLY INSTRUCTIONS SIZE 36 (CONT)

4) Disconnect the pressure switch connector.

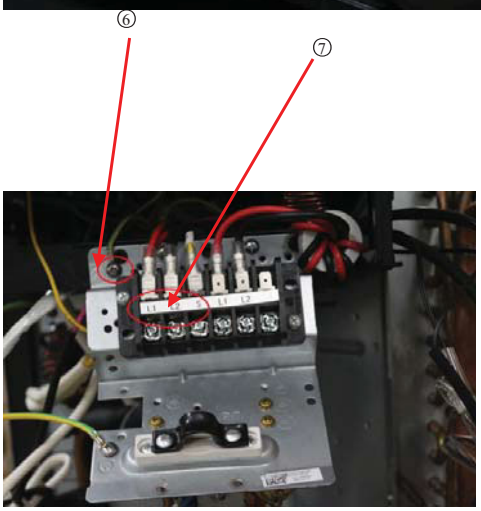


5) Disconnect the electronic expansion valve from the control board.

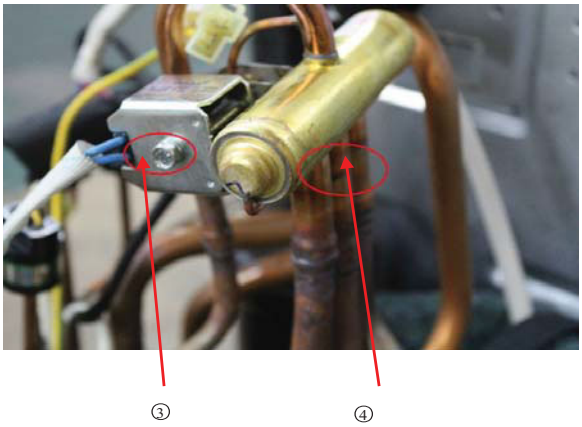
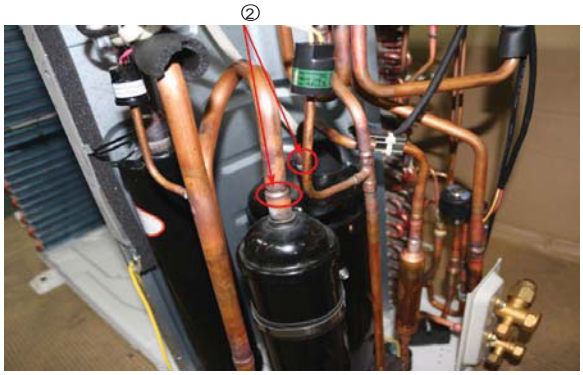
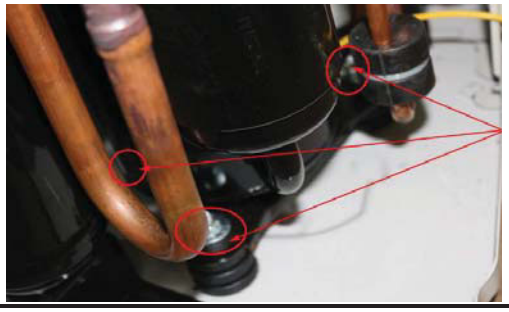


6) Remove the ground wires.

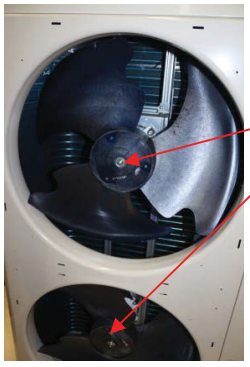
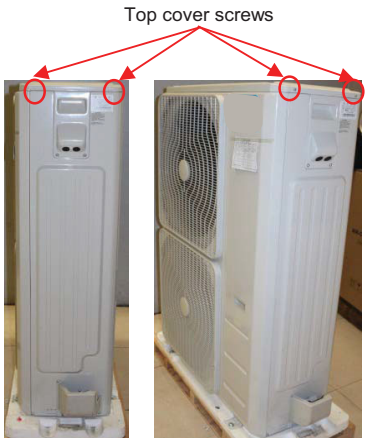
7) Remove the wires (1,2,3 or L1,L2, S). Next, remove the electronic control box.



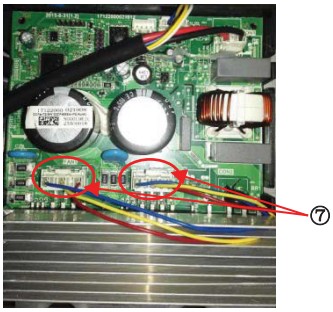
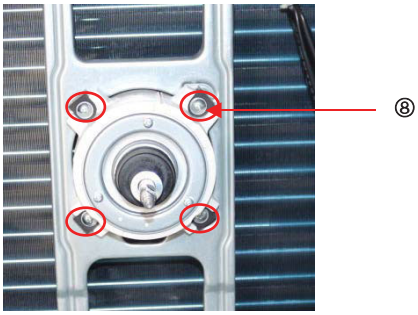
DISASSEMBLY INSTRUCTIONS SIZE 36 (CONT)

4	4-Way Valve	Remove the 4-way valve 1) Complete the steps in sections 1 and 3. 2) Recover refrigerant from the refrigerant coil. 3) Remove the coil screw then remove the coil. 4) Detach the 4-way valve's and pipe's welded parts. 5) Remove the 4-way valve assembly.	The picture of the 4-way may differ from your actual valve. 
5	Compressor	Remove the compressor 1) After completing the steps in sections 1 and 3, recover the refrigerant from the refrigerant circuit. 2) Remove the discharge pipe and the suction pipe with a burner. 3) Remove the hex nuts and washers securing the compressor on the bottom plate. 4) Lift the compressor from the base pan assembly.	②  

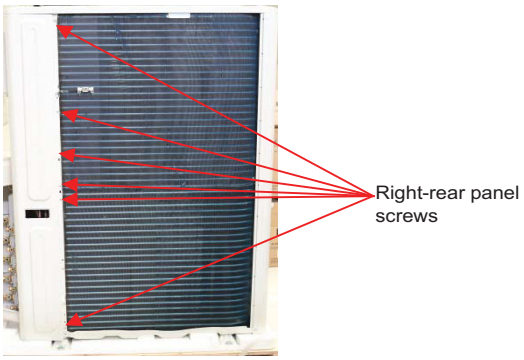
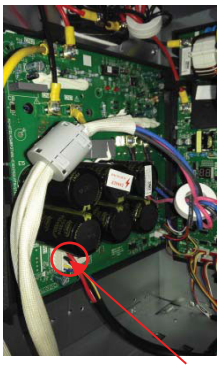
DISASSEMBLY INSTRUCTIONS SIZE 48

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

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

		6) Remove the right front side screw (1) and the right front side panel.	
		7) Disconnect the fan motor connectors FAN (3p, white) and FAN2 (3p, white) from the DC motor driver board.	
		8) Remove the fan motor after unfastening the securing screws.	
2	Panel plate	Remove the panel plate. 1) Remove the big handle screws (2) and the water collector screws (2). 2) Remove the terminal board screws (2) and the right-rear panel screws (7) and remove the right-rear panel.	

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

			
3	Electrical parts	Remove the electrical parts 1) Complete steps 5 - 6 in section 1 and section 2. 2) Disconnect the fan motor connector (5p, white) from the IPM board. 3) Disconnect the following eight (8) connection wires and connectors between the IPM and the other parts.	 

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

CN2(yellow)

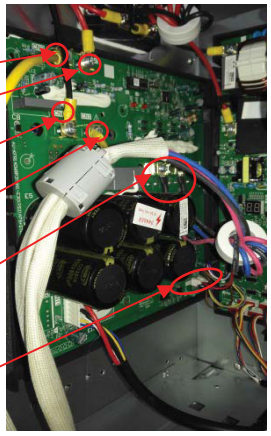
CN1(red)

CN6(black)

CN3(yellow)

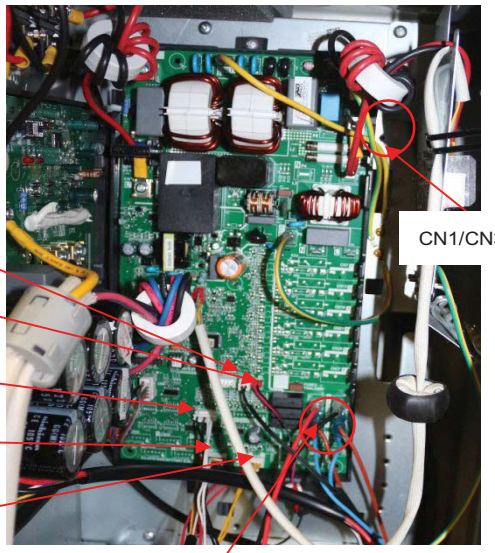
U、V、W(black)

CN9(10p,white)



4) Remove the screws securing the IPM board and remove the IBM board.

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



CN1/CN3

Connectors:

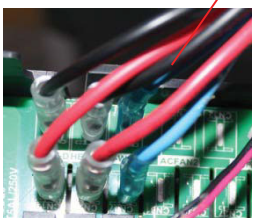
CN8: Discharge temperature sensor (2p,white)

CN12：Heatsink temperature sensor(2p,red)

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

CN15: Electronic expansive valve (6p,red)

CN10: High and low pressure switch (2p/2p, white)



CN17/CN18

CN19/CN20

CN24/CN25

Wires:

CN17/CN18: 4-way valve (blue-blue)

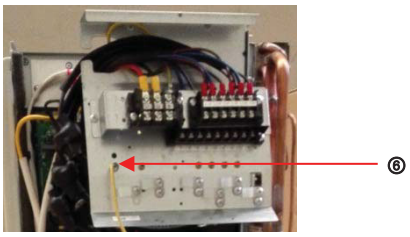
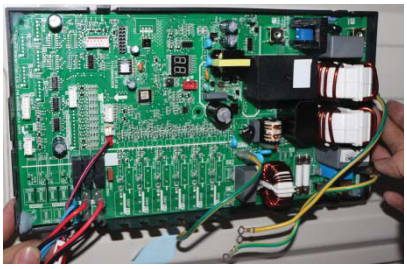
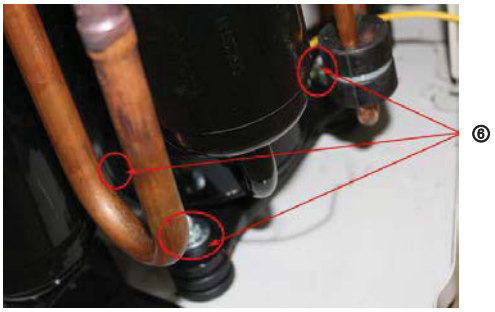
CN19/CN20: connected to crankcase heating cable. (black-red)

CN24/CN25: Electric heater of chassis (orange-orange)

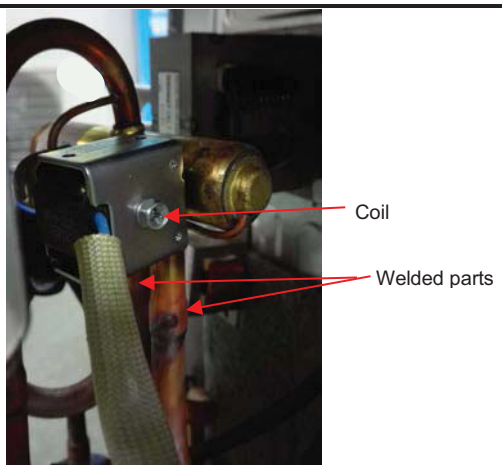
CN1:L-IN (red or white)

CN3:N-IN (black)

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

		6) Disconnect the grounding wire (yellow-green) after removal of the big handle. 7) Remove the PCB board.	 
4	Compressor	Remove the compressor. 1) Complete steps 5 - 6 in section and section 2. 2) Extract the refrigerant gas. 3) Remove the sound insultation material and crankcase heating cable. 4) Remove the compressor terminal cover and disconnect the crankcase electric heater wires and compressor from the terminal. 5) Remove the discharge pipe and suction pipe with a burner. 6) Remove the hex nuts and washers securing the compressor to the bottom plate. 7) Lift the compressor.	 

DISASSEMBLY INSTRUCTIONS SIZE 48 (CONT)

5	The 4-way valve	Remove the 4-way valve 1) Complete steps 5 - 6 of section 1 and section 2. 2) Extract the refrigerant gas. 3) Remove the electrical parts in section 3. 4) Remove the coil screw and remove the coil. 5) Detach the welded parts of the 4-way valve and pipe.	
6	Expansion valve	Remove the expansion valve 1) Complete the steps in sections 1 - 2. 2) Remove the electrical parts described in section 3. 3) Remove the coil. 4) Detach the expansion valves welded parts and pipes.	

APPENDIX

Appendix 1

Table 1 — Temperature Sensor Resistance Value Table for T1, T2, T3, T4 (°C--K)

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

Appendix 2

Table 2 — Temperature Sensor Resistance Value Table for T5 (° C- -K)

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

Appendix 3

Table 3 — Appendix 3

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-5	23	21	69.8	51	123.8	82	179.6	113	235.4
-4	24.8	22	71.6	52	125.6	83	181.4	114	237.2
-3	26.6	23	73.4	53	127.4	84	183.2	115	239
-2	28.4	24	75.2	54	129.2	85	185	116	240.8
-1	30.2	25	77	55	131	86	186.8	117	242.6
0	32	25.5	77.9	56	132.8	87	188.6	118	244.4
0.5	32.9	26	78.8	57	134.6	88	190.4	119	246.2
1	33.8	27	80.6	58	136.4	89	192.2	120	248
1.5	34.7	28	82.4	59	138.2	90	194	121	249.8
2	35.6	29	84.2	60	140	91	195.8	122	251.6
2.5	36.5	30	86	61	141.8	92	197.6	123	253.4
3	37.4	31	87.8	62	143.6	93	199.4	124	255.2
3.5	38.3	32	89.6	63	145.4	94	201.2	125	257
4	39.2	33	91.4	64	147.2	95	203	126	258.8
4.5	40.1	34	93.2	65	149	96	204.8	127	260.6
5	41	35	95	66	150.8	97	206.6	128	262.4
6	42.8	36	96.8	67	152.6	98	208.4	129	264.2
7	44.6	37	98.6	68	154.4	99	210.2	130	266
8	46.4	38	100.4	69	156.2	100	212	131	267.8
9	48.2	39	102.2	70	158	101	213.8	132	269.6
10	50	40	104	71	159.8	102	215.6	133	271.4
11	51.8	41	105.8	72	161.6	103	217.4	134	273.2
12	53.6	42	107.6	73	163.4	104	219.2	135	275
13	55.4	43	109.4	74	165.2	105	221	136	276.8
14	57.2	44	111.2	75	167	106	222.8	137	278.6
15	59	45	113	76	168.8	107	224.6	138	280.4
16	60.8	46	114.8	77	170.6	108	226.4	139	282.2
17	62.6	47	116.6	78	172.4	109	228.2	140	284
18	64.4	48	118.4	79	174.2	110	230	141	285.8
19	66.2	49	120.2	80	176	111	231.8	142	287.6
20	68	50	122	81	177.8	112	233.6	143	289.4