

Haier

Single Zone

Ductless Split Heat Pumps



1Q09TE2BEA / QS09WB2BEA
1Q12TE2BEA / QS12WB2BEA
1Q18 TE2BEA / QS18 WB2BEA
1Q24 TE2BEA / QS24WB2BEA

Before troubleshooting or servicing equipment, review equipment installation guides and confirm ALL installation requirements & specifications have been met. Including, but not limited to: wiring, clearance, ducting (where applicable), power, and line set requirements. Correct any installation issues before continuing.



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Revision History

10-16-25: *Edition release.*



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FOLLOW ALL WARNINGS, CAUTIONS, AND PRECAUTIONS BELOW, AND INDUSTRY BEST SAFETY PRACTICES AND STANDARDS. FAILURE TO DO SO MAY RESULT IN EQUIPMENT DAMAGE OR FAILURE, AND SERIOUS PERSONAL INJURY OR DEATH.

WARNINGS

Service should be performed by the dealer or another professional.

Improper service may cause water leakage, electrical shock, or fire.

Use only the supplied or specified service parts.

Use of other parts may cause the unit to come loose, water leakage, electrical shock, or fire.

The heat pump must be installed on a solid base that can support the unit's weight.

An inadequate base or incomplete installation may cause injury in the event the unit falls off the base.

Electrical work should be carried out in accordance with the manual and national/local electrical wiring codes and rules of practice.

Insufficient capacity or incomplete electrical work may cause electrical shock or fire.

A dedicated power circuit must be used. The power supply should NEVER be shared by another appliance.

Wiring cable must be long enough to cover the entire distance with no splices.

Do not use an extension cord. Do not put other loads on the power supply, use a dedicated power circuit.

Failure to do so may cause abnormal heat, electric shock or fire.

Only the specified wire types may be used for electrical connections between the indoor and outdoor units.

Firmly clamp the interconnecting wires so they receive no external stresses. Incomplete connections or clamping may cause terminal overheating or fire.

Wiring must not put undue stress or tension on the electrical covers or panels.

Install covers over the wires. Incomplete cover installation may cause terminal overheating, electrical shock, or fire.

If any refrigerant has leaked out during service work, ventilate the room.

The refrigerant produces a toxic gas if exposed to flame.

After all service is complete, check for and repair any system refrigerant leaks.

The refrigerant produces a toxic gas if exposed to flames.

When servicing or relocating the system, keep the refrigerant circuit free from substances other than the specified refrigerant (R454B), such as air or moisture

The presence of air or other foreign substance in the refrigerant circuit causes an abnormal pressure rise or rupture, resulting in injury.

During pump-down, stop the compressor before removing the refrigerant piping.

If the compressor is still running, and the stop valve is open during pump-down, air will be sucked into the system while the compressor is running. This will cause abnormal pressure and noncondensables added to the system.

Unit must NOT be grounded to a utility pipe, arrester, or telephone line ground.

An complete ground may cause electrical shock, or fire. A high surge current from lightning or other sources may cause damage to the heat pump.

CAUTIONS

The heat pump must not be installed in a place where there is danger of exposure to flammable gas.

If the gas builds up around the unit, it may catch fire.

Drain piping must comply with installation guidelines.

Inadequate piping may cause flooding.

Tighten flare nuts according to the specified torque using a torque wrench.

If flare nuts are overtightened, they may eventually crack and cause refrigerant leakage.

Ensure proper clearances around unit per installation guidelines.

SPECIFICATIONS

NOTE

Our continued commitment to quality products may mean a change in specifications without notice.
Visit GEAppliancesAirandWater.com to access current specification tables online.



	Outdoor Unit	1Q09TE2BEA	1Q12TE2BEA	1Q18TE2BEA	1Q24TE2BEA
	Indoor Unit	QS09WB2BEA	QS12WB2BEA	QS18WB2BEA	QS24WB2BEA
Cooling	Rated Capacity Btu/hr	9,000	11,800	17,000	24,000
	Capacity Range Btu/hr	3,400-10,000	3,400-12,000	6,000-17,500	6,500-25,000
	SEER2	23	21	20	18
	EER2	12	12	12	12
	Moisture Removal Pt./hr	2.6	2.7	3.6	4.9
Heating	Rated Heating Capacity 47°F Btu/hr	10,000	13,000	19,000	24,000
	Heating Capacity Range Btu/hr	3,400-11,000	3,400-13,500	6,000-21,000	6,500-26,000
	HSPF2 (IV)	9.5	9.5	9.5	9.5
	Rated Heating Capacity 5°F Btu/hr	8,000	10,400	15,200	19,200
	Heating Capacity at 5°F / Capacity at 47°F	80%	80%	80%	80%
Operating Range	COP 5°F	1.8	1.8	1.8	1.8
	Cooling (Without Wind Baffle or Top Cover)	23~115°F (-5~46°C)	23~115°F (-5~46°C)	23~115°F (-5~46°C)	23~115°F (-5~46°C)
Power Supply	Heating	-4~75°F (-20~24°C)	-4~75°F (-20~24°C)	-4~75°F (-20~24°C)	-4~75°F (-20~24°C)
	Voltage, Cycle, Phase (V/Hz/-)	208-230/60/1	208-230/60/1	208-230/60/1	208-230/60/1
	Maximum Fuse Size A	10	10	20	30
Outdoor Unit	Minimum Circuit Amp A	9	9	15	20
	Compressor Type	DC Inverter Rotary	DC Inverter Rotary	DC Inverter Rotary	DC Inverter Rotary
	Outdoor Noise Level dB	55	55	58	61
	Dimension: Height in (mm)	21 3/4 (553)	21 3/4 (553)	25 1/4 (642)	32 1/8 (815)
	Dimension: Width in (mm)	34 (863)	34 (863)	35 3/8 (898)	40 3/8 (1024)
	Dimension: Depth in (mm)	11 (280)	11 (280)	12 (306)	14 5/8 (370)
	Weight (Net/Ship) - lbs (kg)	70.17/82.96 (31.8/37.6)	70.17/82.96 (31.8/37.6)	90.47/103.26 (41/46.8)	121.36/147.84 (55/67)
	Basepan Heater	No	No	No	No
Indoor Unit	Fan Speed Stages	5 + Auto	5 + Auto	5 + Auto	5 + Auto
	Airflow CFM: Cooling (Turbo/High/Med/Low/Quiet)	360/290/260/230/210	360/300/272/240/210	570/520/480/420/330	800/730/630/535/440
	Airflow CFM: Heating (Turbo/High/Med/Low/Quiet)	350/290/250/220/200	350/290/260/230/200	570/520/450/380/310	800/730/630/535/440
	Indoor Sound Level dB: Cooling (Turbo/High/Med/Low/Quiet)	44/38/35/32/27	44/39/36/33/27	50/46/44/40/35	54/50/47/44/38
	Indoor Sound Level dB: Heating (Turbo/High/Med/Low/Quiet)	42/36/32/28/26	42/36/32/29/26	48/46/41/38/33	54/50/47/44/38
	Auto Up-Down Louver	Yes	Yes	Yes	Yes
	Auto Left-Right Louver	No	No	No	No
	Drain Pipe Size O.D in	5/8	5/8	5/8	5/8
	Dimension: Height in (mm)	11 7/8 (301)	11 7/8 (301)	12 7/8 (327)	13 1/2 (343)
	Dimension: Width in (mm)	34 1/4 (870)	34 1/4 (870)	39 3/8 (999)	44 1/2 (1129)
	Dimension: Depth in (mm)	7 3/4 (196)	7 3/4 (196)	8 3/4 (223)	9 1/8 (232)
	Weight (Net/Ship) - lbs (kg)	21.84/26.92 (9.9/12.2)	21.84/26.92 (9.9/12.2)	27.8/34.64 (12.6/15.7)	34.86/43.03 (15.8/19.5)
	Factory-Installed Refrigerant Detection Sensor (RDS)	No	No	No	No
	Refrigerant Detection Sensor (RDS) Compatible	Yes (UALS01A, sold separately)	Yes (UALS01A, sold separately)	Yes (UALS01A, sold separately)	Yes (UALS01A, sold separately)
	WiFi*	Built-in	Built-in	Built-in	Built-in
Refrigerant Lines	Refrigerant	R454B	R454B	R454B	R454B
	Connections	Flare	Flare	Flare	Flare
	Liquid O.D. in	1/4	1/4	1/4	1/4
	Suction O.D. in	3/8	3/8	1/2	1/2
	Factory Charge Oz	36.5	36.5	45.9	67.0
	Maximum Line Length Ft / m	66/20	66/20	83/25	165/50
	Maximum Height Ft / m	33/10	33/10	50/15	100/30

*WiFi includes SmartHQ™ Home and SmartHQ™ Service compatibility.

Introduction to System

Single Zone Ductless Split System Heat Pumps feature a wall mounted indoor fan/evaporator unit that receives refrigerant from an inverter driven variable speed outdoor condensing unit. The system operation is controlled with a remote control.

The outdoor unit features a variable speed rotary compressor, EEV metering device and DC fan motor. These systems use R454B refrigerant and PVE oil. The outdoor units are 208/230 volt rated systems.

The indoor units are wall mounted. They feature a DC blower motor and a DC louver motor. The unit has a room temperature sensor and an evaporator tube temperature sensor. The wall unit is powered by voltage from the outdoor unit.

Specifications for Proper Operation

The systems are designed to operate in temperature ranges of 23~115 °F in cooling mode and -4~75 °F in heat mode.

PVE oil is non-reactive to water and will not go into hydrolysis. There is no need to add a refrigeration drier when servicing or installing this system.

The indoor wall mounted unit receives operating voltage and communication data signals on #14 AWG wire that connects between the indoor and outdoor units. There should not be any splices in the field wiring that goes between terminals 1, 2, 3 GND. A splice in these wires may cause the system to lose communication between the indoor and outdoor units.

The field-supplied refrigerant tubing connects using flare type fittings at both the indoor and outdoor units. Tubing must be sized per the specifications. Both lines must be insulated. The only method of checking charge or adjusting charge is by weight method explained in this manual (no exceptions).

The condensate system is a gravity type. A field installed condensate pump may be added to the system. Always follow the manufacturer's installation instructions when installing a condensate pump.

Proper clearances at both indoor and outdoor units must be maintained. Improper clearances cause incorrect refrigerant pressures and coil freezing.

System Fundamentals

The indoor unit will sense room temperature at the point where the wall unit is installed. The indoor fan will run continuously when placed in heating or cooling mode and will not cycle on and off with the outdoor unit. If it did, room temperature could not be sensed or maintained.

The inverter compressor system in the outdoor unit will vary the refrigerant flow and indoor air volume levels to match the comfort requirement inside the conditioned space. If an abnormal condition is detected by the system's sensors, the system has the ability to take reactive measures.

The amount of refrigerant flow and associated capacity generated by the system will be determined by how fast the system's variable speed rotary compressor is pumping. The compressor operating speed is determined by the difference between the conditioned space temperature and the set point.

If a large amount of capacity is needed, the compressor will operate at a high speed. As the need for capacity reduces and the temperature of the room nears set point, the compressor will slow down. When set point has been reached, the compressor will shut off while the fan continues to operate. When a difference in temperature is sensed between the set point and room, the compressor will restart at a new calculated speed.

If a system sensor determines there is a need to adjust the frequency signal to prevent a system malfunction, the compressor frequency may be over ridden and a new frequency established. It should be noted that the frequency signal level that is sent to the compressor cannot be determined by a servicing technician.

In this manual, system components, operation, sensor functions, and diagnostic procedures will be explained in greater detail.

System Power

The 208/230 Volt AC power for the system connects to terminals 1, 2, and ground of the outdoor unit terminal block. This terminal block also has terminals to connect power to the indoor unit.

The voltage readings between terminals 1 and ground should be 0 VAC, and terminals 2 and ground should be 230VAC. The voltage reading between terminals 1 and 2 should be 230VAC.

One additional connection on the terminal block (3) is for the communication wire between the indoor and outdoor units.

NOTE: Miswiring of these connections may cause improper operation or damage to system components.

Cooling Operation Mode

Overview

The temperature control range in cooling mode is 23°F to 115°F. The temperature set by the remote control and the indoor unit ambient temperature sensor will determine if a call for cooling is needed. If a call for cooling is received from the indoor unit to the outdoor unit. The indoor unit louver will open using a stepper motor, and the indoor fan will operate at the speed last set. The outdoor unit will determine the position of the EEV and speed frequency of the compressor. There can be a delay of up to 3 minutes before the outdoor unit fan and compressor start.

The speed of the indoor fan can be controlled manually by the user or automatically by the system. The speed can be changed between LOW, MEDIUM, and HIGH.

The predetermined conditions for cool mode automatic fan speed control are follows:

Fan Speed	Ambient Indoor Air Temperature
Low	1.8°F and lower below setpoint
Medium	Between 1.7°F below setpoint and 5.3°F above setpoint
High	5.4°F and higher above setpoint

There will be a 3 minute delay when switching from high speed fan to low speed fan. There will be no delay when switching from low speed fan to high speed fan.

The outdoor unit temperature sensors: outdoor ambient, defrost, suction line, and compressor discharge, used in conjunction with the indoor temperature sensors, indoor ambient and coil, provide information to the outdoor control board to monitor the system and regulate the frequency of the compressor, the EEV, and outdoor fan speed, to achieve the desired room temperature.

When the call for cooling has been satisfied, the compressor will turn off, followed by the outdoor fan. The indoor unit fan will continue to run. If the system detects a malfunction, it may shut down or show an error code.

This code will be shown on the indoor display board or a flashing LED will appear on the outdoor PCB.

Indoor Unit

To enter the cool mode, point the infrared remote control at the indoor unit and press the power button, then press the COOL mode button if not already set to cool mode. The signals received by the infrared receiver are relayed to the main board of the indoor unit to turn the system on and set it to cool mode. The indoor unit PCB will illuminate the display, indicating the set temperature and current status of the unit. The PCB will signal the stepper motor to open the louver to either a stationary position, or one of several oscillating modes.

As the louver opens, the indoor unit main board will power up the indoor fan motor, operating the fan at the speed last set. The indoor fan motor has a feedback circuit which provides the indoor unit main board with information for controlling the speed of the fan motor.

Temperature Sensors

The indoor unit has two sensors that provide temperature information to the main board. The sensors: an indoor ambient temperature sensor, and pipe temperature sensor, are used for controlling the system during cool mode. The resistance values of the sensors will vary with temperature. The resistance to temperature values can be found to the sensor being checked.

Communication

The indoor and outdoor unit main boards communicate via a digital signal on the wire connected to terminal 3 of each unit. A splice or break in this wire will cause a communication error. When a command is received from the remote control, the indoor unit main board communicates with the outdoor unit main board to perform the requested function.

Outdoor Unit

Upon a request for cooling, the outdoor unit main board applies power to the outdoor fan motor and compressor. Depending on system cycling, there may be up to a 3 minute wait period before the compressor and outdoor fan start.

Temperature Sensors

Four temperature sensors located in the outdoor unit provide temperature information to the outdoor unit main board for control of the system during cool mode.

The outdoor ambient temperature sensor provides the temperature of the air drawn into the condenser coil.

The defrost temperature sensor provides the temperature sensed at the output of the condenser coil.

The suction line temperature sensor provides the temperature sensed at the incoming suction line pipe.

The compressor discharge sensor provides the temperature sensed at the discharge pipe of the compressor.

Call to Terminate Cooling

The system will terminate cooling when the indoor ambient temperature sensor is equal to or lower than 2°F of the room set temperature. The indoor control board will communicate to the outdoor control board to de-energize the compressor.

The outdoor fan will run for 60 seconds before stopping. The indoor fan motor and louver will continue operating after cooling has been terminated.

To stop cool mode, press the power button to turn the system off, or change to another mode.

Freeze Protection Function

When the compressor operates continuously for 10 seconds and the temperature of the indoor coil has been below 35.6°F for 10 seconds, the compressor will stop. The indoor unit fan will continue to operate.

When the temperature of the indoor coil rises to 50°F for more than 3 minutes the compressor will restart and the system will continue functioning.

Heating Operation Mode

Overview

The temperature control range in heating mode is -4°F to 75°F. The temperature set by the remote control and the indoor unit ambient temperature sensor will determine if a call for heat is needed. If a call for heat is justified, a temperature compensation adjustment is automatically added to the operating parameter and the call is communicated from the indoor unit to the outdoor unit.

The indoor unit louver will open using a stepper motor. The indoor fan will not operate at this time.

The outdoor unit will shift the 4-way valve to the heat mode position and determine the position of the EEV and speed (frequency) of the compressor. There can be a delay of up to 3 minutes before the outdoor unit fan and compressor start.

The predetermined conditions for automatic control are follows:

Note: The heating mode has a temperature compensation of 4 °C, resulting in the actual ambient temperature being subtracted from the calculation by approximately 7 °F.

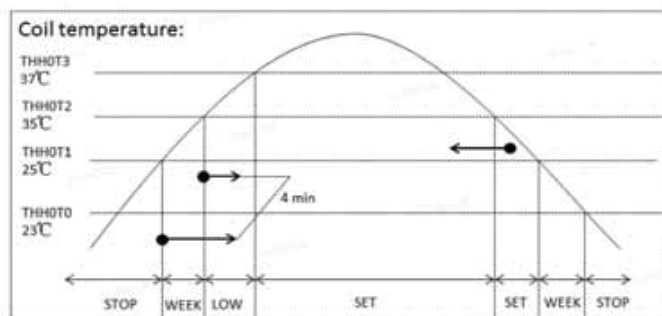
As the indoor ambient temperature falls, the change of fan speed follows the following temperature conditions:

Fan Speed	Ambient Indoor Air Temperature
Stop	8.8°F and higher above setpoint
Low	Between 5.9°F and 8.7°F above setpoint
Medium	Between 3.6°F and 5.8°F above setpoint
High	Below setpoint and up to 3.5°F above setpoint

There will be a 3 minutes delay when switching from high speed fan to low speed fan. There will be no delay when switching from low speed fan to high speed fan.

Cold Air Proof Operation

At initial start of heat mode, indoor blower will not be turned on immediately until indoor coil temperature senses a minimum temperature. This prevents cold air from being blown until the coil is heated.



The indoor fan is controlled based on the coil temperature, as shown in the figure above.

When the coil temperature rises, the fan speed is judged according to the coil temperature:

- At the end of heating or defrosting after the first power on, the fan stops when the coil temperature is lower than 25°C/ 77°F;
- Coil temperature between 25°C/ 77°F and 35°C/ 96°F fan speed is weak;
- Coil temperature between 35°C/ 96°F and 37°C/ 100°F fan speed is weak;
- Coil temperature is higher than 37°C/ 100°F, fan speed according

to the set operation.

- When the coil temperature drops, the fan speed is judged according to the hot cross temperature:
 - Coil temperature is higher than 35°C, fan speed according to the set operation.
 - Coil temperature between 37°C and 35°C fan speed is mid
 - Coil temperature between 35°C and 25°C fan speed is low
 - Coil temperature between 25°C and 23°C fan speed is weak
 - The fan stops when the coil temperature is lower than 23°C

Residual heat sending: the indoor fan will operate on low speed until the coil temperature reaches 73°F or stop after 50 seconds.

The outdoor unit temperature sensors: outdoor ambient, defrost, suction line, and compressor discharge, used in conjunction with the indoor coil and room temperature sensors, provide information to the outdoor control board to monitor the system and regulate the speed of the compressor, the EEV and outdoor fan speed to achieve the desired room temperature.

When heating has been satisfied, the compressor will turn off first, followed by the outdoor fan. The 4-way valve will de-energize 2 minutes after compressor stops.

To save energy, The indoor unit fan will continue to run at minimum speed until indoor coil temperature reaches a minimum temperature, when it will turn off.

If the system detects a malfunction, it may shut down or show an error code on the indoor unit display board and/or outdoor unit main board LED.

Defrost

When the system initiates a call for defrost, the indoor fan motor stops. The indoor unit display will not change. Any indoor unit malfunctions will be ignored at this time. The system will cycle through the defrost operation. Any indoor unit malfunctions will be ignored until the compressor restarts and has been operating for 30 seconds. At the conclusion of the defrost cycle, the indoor fan will enter the cold air proof operation. Heat mode resumes.

Automatic Heating Temperature Compensation

When the system is in heating mode, a temperature compensation adjustment is added to the sensed temperature. This is intended to adapt for temperature stratification in the conditioned environment relative to the installation location of the indoor head.

Indoor Unit

To enter the heat mode, point the infrared remote controller at the indoor unit and press the power button, then press the HEAT mode button if not already set to heat mode.

The signals received by the infrared receiver are relayed to the main board of the indoor unit to turn the system on and set it to heat mode.

The indoor unit PCB will activate the display of the indoor unit, illuminating the display and indicating the set temperature and current status of the unit.

The indoor unit PCB will signal the stepper motor to open the louver to a stationary position.

The PCB will power up the indoor fan motor after the outdoor unit has started and heating of the indoor coil has taken place (see cold air proof operation). The motor has a feed-back circuit which provides information for controlling the speed of the fan motor.

Temperature Sensors

The indoor unit has two sensors that provide temperature information to the indoor unit main board. The sensors: a room temperature sensor, and pipe temperature sensor, are used for controlling the system during heat mode.

The resistance values of the sensors will vary with temperature. The resistance to temperature values can be found using a temperature/resistance chart specific to the sensor being checked.

Communication

The indoor and outdoor unit main boards communicate via a digital signal on the wire connected to terminal 3 of each unit. A splice or break in this wire will cause a communication error.

When a command is received from the remote control, the indoor unit main board communicates with the outdoor unit to perform the requested function.

Outdoor Unit

Upon a request for heat, the outdoor unit PCB applies power to the 4-way valve, outdoor fan motor, and compressor. Depending on system cycling, there may be up to a 3 minute wait period before the compressor and outdoor fan start.

NOTE: Do not measure compressor voltages as damage to the meter may result.

If the room temperature is above the set temperature, yet lower than 2°F above the set temperature, the system will adjust the running frequency of the compressor automatically.

The outdoor unit main board also controls the position of the EEV (Electronic Expansion Valve) to regulate the flow of refrigerant to the outdoor unit evaporator coil.

Temperature Sensors

Four temperature sensors located in the outdoor unit provide temperature information to the PCB for control of the system during heat mode.

The ambient temperature sensor provides the temperature of the air drawn into the condenser coil.

The defrost temperature sensor provides the temperature sensed at the output of the condenser coil.

The suction line temperature sensor provides the temperature sensed at the incoming suction line pipe.

The compressor discharge sensor provides the temperature sensed at the discharge pipe of the compressor.

Call to Terminate Heating

The system will call to terminate heating when the indoor temperature is equal to or higher than 2°F above the room set temperature. The indoor control board will communicate to the outdoor control board to de-energize the compressor. The outdoor fan will run for 60 seconds before stopping. The 4-way valve will de-energize 2 minutes after the compressor stops.

To stop heat mode, press the power button to turn the system off, or change to another mode.

Auto Mode

With the system turned on, press the AUTO button on the remote control. The system will change to the auto mode of operation.

As the room is cooled or heated, the system will automatically switch between cool mode, fan mode, and heat mode. There is a minimum 15 minute operating time between mode changes.

Dry Mode

Overview

The temperature control range is 60°F - 86°F. This mode is used for dehumidification.

Tr= room temperature Ts= set temperature

When $Tr > Ts + 4^{\circ}\text{F}$, the compressor will turn on and the indoor fan will operate at the set speed.

When $Ts \leq Tr \leq Ts + 4^{\circ}\text{F}$, the compressor will operate at the high dry frequency for 10 minutes, then at the low dry mode for 6 minutes. The indoor fan will operate at low speed.

When $Tr < Ts$, the outdoor unit will stop, and the indoor fan will stop for 3 minutes, then operate at the low speed option.

Automatic fan speed:

- When $Tr > Ts + 9^{\circ}\text{F}$, High speed
- When $Ts + 5.4^{\circ}\text{F} \leq Tr < Ts + 9^{\circ}\text{F}$, Medium speed
- When $Ts + 3.6^{\circ}\text{F} \leq Tr < Ts + 5.4^{\circ}\text{F}$, Low speed
- When $Tr < Ts + 3.6^{\circ}\text{F}$, Light speed

Note: TURBO and QUIET mode must be set using the remote controller.

If the outdoor fan is stopped, the indoor fan will pause for 3 minutes.

If the outdoor fan is stopped for more than 3 minutes, and the compressor is still operating, the system will change to light speed mode.

Indoor Unit

To enter the dry mode, point the infrared remote control at the indoor unit and press the power button, then press the DRY mode button if not already set to dry mode.

The signals received by the infrared receiver are relayed to the main board of the indoor unit to turn the system on and set it to dry mode.

The indoor unit main board will illuminate the display, indicating the set temperature and current status of the unit.

The PCB will then signal the louver stepper motor to open the louver to either a stationary position, or one of several oscillating modes.

As the louver opens, the indoor fan motor will operate at the speed last set. The fan motor has a feedback circuit which provides the main board with information for controlling the speed of the fan motor.

NOTE: It is recommended that Dry mode is not used for longer than a 4-hour period to minimize overflowing the condensate drain pipe.

Temperature Sensors

The indoor unit has two sensors that provide temperature information to the PCB. An ambient temperature sensor and pipe temperature sensor are used for controlling the system during dry mode. The resistance values of the sensors will vary with temperature. The resistance to temperature values can be found using a temperature/resistance chart specific to the sensor being checked.

Communication

The indoor and outdoor unit main boards communicate via a digital signal on the wire connected to terminal 3 of each unit. A splice or break in this wire will cause a communication error.

When a command is received from the remote control, the indoor unit main board communicates with the outdoor unit main board via the terminal 3 wire to perform the requested function.

Outdoor Unit

Upon a request for dry mode, the outdoor unit main board applies power to the fan motor and compressor. Depending on system cycling, there may be up to a 3 minute wait period before the compressor and outdoor fan start.

WARNING: Do not measure compressor voltages, damage to the meter may result.

The outdoor unit PCB also controls the position of the EEV (Electronic Expansion Valve) to regulate the flow of refrigerant to the indoor unit evaporator coil.

Temperature Sensors

Four temperature sensors located in the outdoor unit provide information to the outdoor unit PCB for control of the system during dry mode.

The outdoor ambient temperature sensor provides the temperature of the air drawn into the condenser coil.

The defrost temperature sensor provides the temperature sensed at the output of the condenser coil.

The suction line temperature sensor provides the temperature sensed at the incoming suction line pipe.

The compressor discharge sensor provides the temperature sensed at the discharge pipe of the compressor.

To stop dry mode, press the power button to turn the system off, or change to another mode.

Defrost Operation

To enter the defrost mode, the compressor must have accumulated 10 minutes of run time, and 45 minutes of accumulated run time since the last defrost cycle.

When the defrost cycle begins, the following conditions take place:

1. Indoor fan motor stops.
2. Compressor stops for 40 seconds.
3. After 40 seconds, the 4-way valve shifts to cooling position and outdoor fan stops. Compressor start again.
4. About 1 minute, the compressor accelerates to the defrost frequency.
5. The outdoor unit will now defrost. Defrost cycle runs continuously for approximately 10 minutes, unless the condenser maintains a temperature above 48°F for 60 seconds, or the condenser maintains a temperature above 59°F for 5 seconds.

Upon exiting the defrost cycle, the following conditions will take place:

1. The compressor will stop.
2. The outdoor fan will operate at high speed.
3. 25 seconds later the 4-way valve will shift to the heating mode.
4. 30 seconds later the compressor will start, and the system resumes normal operation.

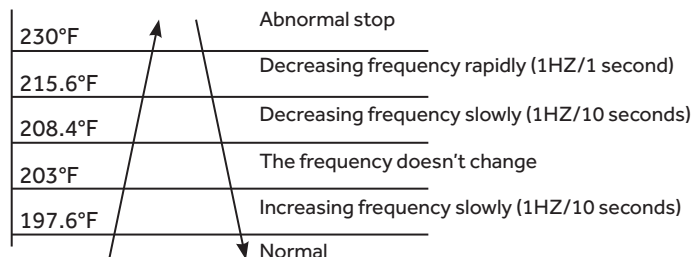
Protection Functions

These functions limit the operation of the system when encountering the normal operating limits of the equipment.

Compressor High Temperature

The compressor discharge pipe sensor (exhaust temp) senses the temperature of the refrigerant exiting the compressor. The sensed temperature received from the sensor by the control circuitry will cause the compressor frequency to increase or decrease (see chart below). If a temperature of $\geq 230^\circ\text{F}$ is sensed for 2 seconds, an exhaust overheating protection error code will be indicated at the outdoor unit.

TTC



Overheating Protection for Indoor Unit

A sensor monitors coil temperature in both heating and cooling modes, and causes the compressor to speed up, slow down, or stop.

Compressor Over-Current Protection

If the current draw of the compressor at startup is greater than the values listed on the chart below for approximately 5 seconds, the compressor will stop. After 3 minutes the compressor will restart. If the over-current condition occurs 3 times in 20 minutes, the system will lock-out, and a code will be indicated at the outdoor unit. It will be necessary to remove power to the system to reset the lock-out condition.

Model	Cooling Increase Point	Cooling Decrease Point	Heating Increase Point	Heating Decrease Point	Stop Point
09K	5.5A	6.5A	7A	8A	10.5A
12K	5.5A	6.5A	7A	8A	10.5A
18K	12A	12A	13A	13A	14A
24K	14A	15A	14A	15A	16A

Compressor frequencies:

Model	Cooling	Heating
09K	15-71 Hz	20-102 Hz
12K	15-81 Hz	20-102 Hz
18K	13-48 Hz	13-81 Hz
24K	15-75 Hz	20-105 Hz

Indoor Coil Anti-Freeze Protection

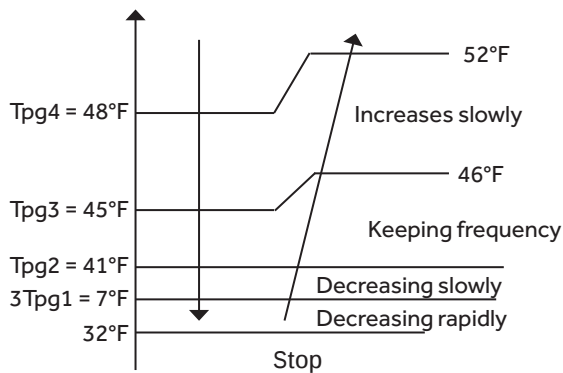
The temperature sensed by the coil sensor is used to determine at what speed the compressor is to run to avoid the coil temperature being too cold.

TCI_Indoor: Indoor unit pipe sensor temperature

tS: Outdoor unit Suction Line sensor temperature

- When $\text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) < \text{TCI1}$, the frequency of the compressor decreases at the rate of 1HZ / 1 second.
- When $\text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) < \text{TCI2}$, the frequency of the compressor decreases at the rate of 1HZ / 10 second.
- When TCI_indoor begins to rise again, and $\text{TCI2} \leq \text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) \leq \text{TCI3}$, the frequency of the compressor does not change.
- When $\text{TCI3} < \text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) < \text{TCI4}$, the frequency of the compressor increases at the rate of 1HZ / 10 second.

Example: if $\text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) \leq 32^\circ\text{F}$ sustains for 2 minutes, the outdoor unit will stop and indicate an underload malfunction code at the outdoor unit. The compressor stops for a minimum of 3 minutes. When $\text{Min}(\text{TCI_indoor}, (\text{TCI_indoor} + \text{tS})/2) > \text{TCI4}$, the compressor will restart.



Base Pan Heater

To keep condensate water from freezing inside the cabinet, a base pan heater is installed at the factory.

Operation condition:

- It will start while defrosting process is running.
- If AC is not in defrost process, it will work refer to the chart below for the operating parameters.

Outdoor Temperature	Pan Heater
$> 37^\circ\text{F}$ (3°C)	OFF
28°F (-2°C) to 34°F (1°C)	OFF 20min, ON 10min
10°F (-12°C) to 25°F (-4°C)	OFF 15min, ON 15min
$< 10^\circ\text{F}$ (-12°C)	ON

Special Functions

Auto Restart

When this is enabled, the following functions will automatically resumes after a power loss:

- ON/OFF State, Mode of Operation, Fan Speed, Temperature Setpoint, Louver Swing settings.
- If there was a timer set , it will be canceled upon restart.

Forced Defrost

Via Remote Controller

Setting method:

- Set to HEAT Mode
- Set to $30^\circ\text{C}/86^\circ\text{F}$
- Set High Fan Speed
- Press Temperature+ Button 10 times within 7 seconds
- Unit will Beep 7 times to Confirm.

Cancel method:

Same process as Setting Method. Hear Unit Beep 5 times to confirm of cancel function.

Indoor Temperature Display

This function will allow you to set the display to show either the Ambient temperature or the setpoint:

Set temperature:

- Press the Light button 10 times within 5 second. Unit will Beep 4 times to confirm.

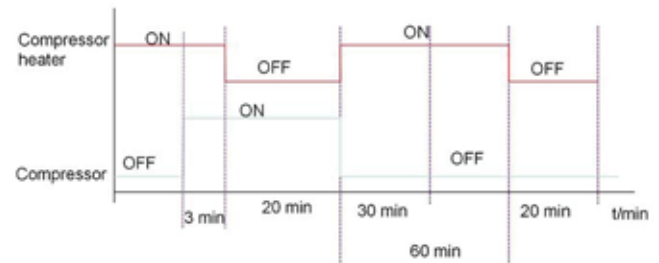
Ambient temperature:

- Press the Light button 10 times within 5 second. Unit will Beep 2 times to confirm.

Crankcase (Compressor) Heater

Operation logic:

- If outdoor ambient temperature is 5°C , compressor heater is OFF.
- If outdoor ambient temperature is $< 3^\circ\text{C}$, compressor heater functions as shown:



Temperature Compensation

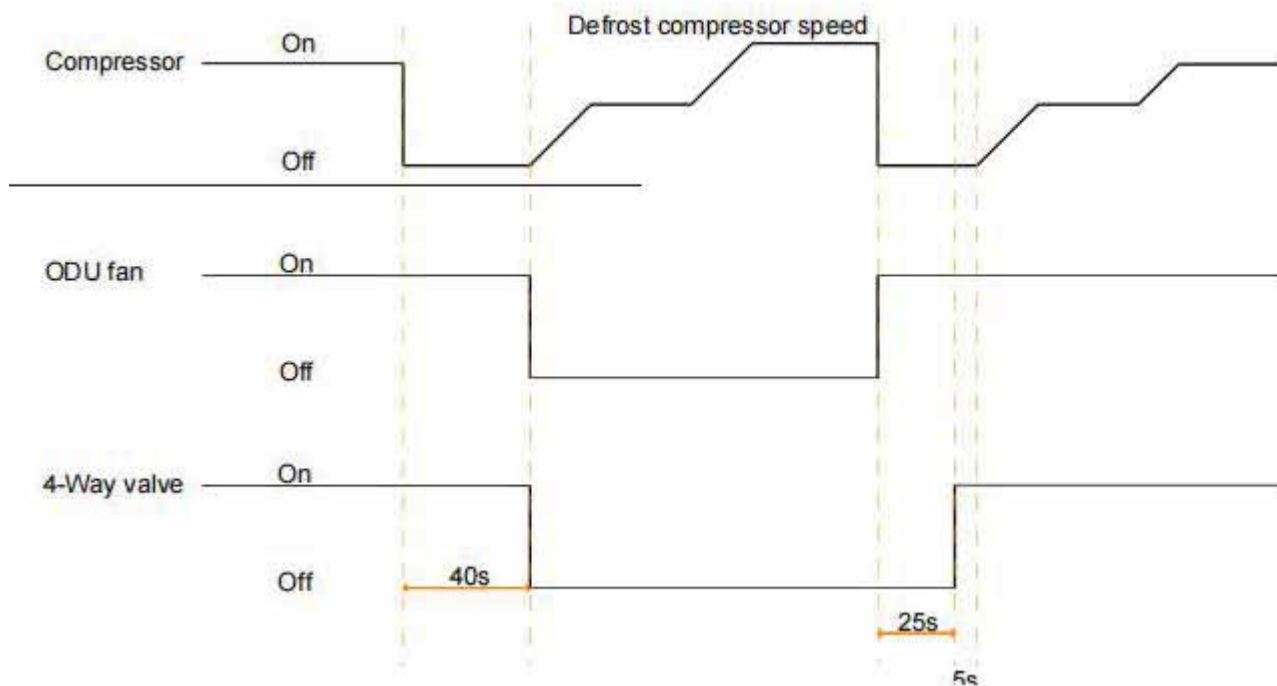
Set Temperature:

1. Apply power to the unit.
2. Set to Cooling Mode or Heating Mode
3. Set the temperature to 24°C (75°F).
4. Press the SLEEP button 7 times within 5 seconds. Indoor PCB will beep 2 times to confirm.
5. 24°C will be the starting/reference point for the Temperature Compensation.
6. Press ▲ or ▼ on the controller to adjust compensation temperature value. Temperature Compensation can be adjusted from -8°C to +6 °C. (Example: if you want to set the Temperature Compensation value by 4°C, then set the temperature to 28°C.)
7. Once the desired value has been selected, turn OFF the unit to save the compensation settings.

Timed Defrost

Logic:

1. After receiving the defrost signal, the compressor will stop.
2. 40 seconds later, the four-way valve is reversed and the outdoor fan stops.
3. The compressor gradually increases frequency to the highest defrosting frequency.
4. After defrosting completes, the outdoor fan motor starts, the compressor stop, and the four-way valve is opened after 25seconds
5. The compressor will start after 5 seconds.





1Q09TE2BEA
1Q12TE2BEA
1Q18 TE2BEA
1Q24 TE2BEA

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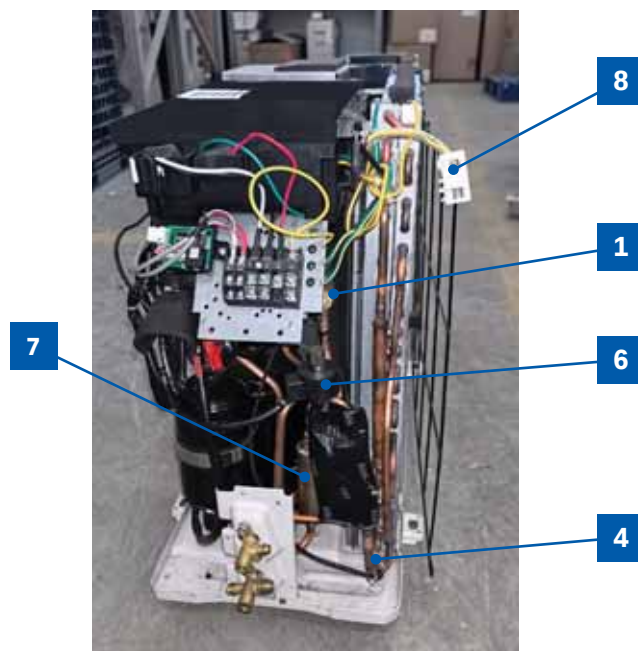
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COMPONENTS

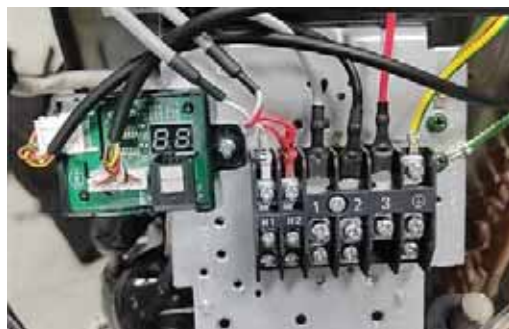
The outdoor unit has a PCB that integrates the control functions and power functions into one PCB. Sensors monitor key temperatures throughout the system to manage operational decisions.

Outdoor Component Identification

- 1 4-Way Valve
- 2 Accumulator
- 3 Compressor
- 4 Defrost Temperature Sensor
- 5 Discharge Temperature Sensor
- 6 Electronic Expansion Valve
- 7 Refrigerant Strainers
- 8 Ambient Temperature Sensor
- 9 Fan Motor
- 10 Power Factor Reactor
- 11 Terminal Block
- 12 Power Control Board (PCB)
- 13 Fan Blade
- 14 Compressor Heater
- 15 Base Pan Heater



Terminal Block



The outdoor unit is powered by 208/230 volt single phase electricity connected at the terminal block.

Terminals 1 and 2 connect this voltage to the system.

The number 3 terminal is communication that connects wiring between the indoor and outdoor units. A ground terminal connects the outdoor unit to the line voltage power source.

The indoor unit is also powered by the same electrical supply as the outdoor unit. Only AWG 14-4 stranded copper wire is allowed connected to the Terminal Block block at the outdoor unit and is run to the same terminals on the indoor terminal block.

When installing the field supplied wiring, make certain the wire gauge is correct. There should not be any electrical wiring splices between the indoor unit and outdoor unit wire connection 3. This wire is used to carry communication data between the indoor and outdoor units. A wiring splice where wires are twisted in a wire nut may cause deformation of the communication signal. If communication is lost between the indoor and outdoor units, an ERROR CODE E7 will occur.

Power Factor Reactor



The Reactor is a power filter. It is unlikely to ever have an electrical failure of this component.

The Reactor of all outdoor units is electrically connected to the IPM on terminal connections CN-5 and CN-6 .

Compressor



The compressor is a three phase DC inverter driven rotary type, capable of variable speed operation. The compressor operating frequency will be determined by the temperature difference between set point and room temperature.

The compressor of all outdoor units is electrically connected to the IPM on terminal connections CN-7, CN-8 and CN-9.

Protection of the compressor will be provided by the discharge temperature sensor, the suction line temperature sensor, and the over current protection parameter in the PCB.

Fan Motor



The fan motor is a variable speed DC motor. The required speed is calculated by the PCB. The motor is electrically connected to the PCB via PLUG CN-10.

In cool mode, the motor will slow down as outdoor air temperature falls.

In heat mode, the motor will increase speed as the outdoor air temperature falls.

Temperature Sensors

These 3 sensors are part of an assembly and will all be changed together:

Defrost Temperature Sensor



The Discharge Temperature Sensor is a negative coefficient thermistor that senses the temperature of the compressor hot gas. The PCB monitors the temperature of the compressor hot gas and will make inverter speed changes in response to input from this device.

This sensor connects to the Main Control Board at PLUG CN-15

Defrost Temperature Sensor



The Defrost Temperature Sensor is a negative coefficient thermistor that will change resistance in response to outdoor coil temperature changes. The PCB monitors the temperature of the outdoor coil to determine when the system should perform a defrost cycle. The sensor also monitors coil temperature during defrost cycles to determine termination conditions.

This sensor connects to the Power Control Board at PLUG CN-15.

Outdoor Ambient Temperature Sensor



The Ambient Temperature Sensor is a negative coefficient thermistor that will change resistance in response to outdoor air temperature changes. The PCB monitors the temperature of the outdoor air to determine fan speed requirements and inverter speed. The sensor also plays a role in calculation of required defrost conditions.

This sensor connects to the Power Control Board at PLUG CN-15

4-Way Valve



The 4-Way Valve redirects the flow of refrigerant in the piping circuit to allow the system to reverse the functions of the indoor and outdoor coils. When de-energized in COOL MODE, the valve will direct the refrigerant hot gas to the outdoor coil. When energized in HEAT MODE, the valve will direct the hot gas to the indoor coil.

The valve flow direction capability is controlled by an electrical solenoid. When energized with 208/230 VAC, the solenoid will magnetically move an internal slide within the 4-Way Valve to change the direction of refrigerant flow.

The 4-Way Valve is electrically connected to the Power Control Board at PLUG CN-11.

Electronic Expansion Valve



The metering device is an electronic expansion valve. The valve consists of an electrical operator and a valve body with internal variable size orifice. When operating, the PCB will send pulses of voltage to the electrical operator. The operator will then magnetically move the position of the metering orifice pin to vary refrigerant flow.

The metering device position is determined by input from a Discharge Temperature Sensor. The EEV will change the internal orifice size to maintain an acceptable level of superheat.

During COOL MODE the valve meters low pressure refrigerant to the indoor coil. During HEAT MODE the valve meters low pressure refrigerant to the outdoor coil.

The electrical expansion valve is electrically connected to the Power Control Board at PLUG CN-16.

Accumulator



The Accumulator is located in the suction line circuit at the entrance to the compressor. The accumulator helps prevent liquid refrigerant from entering the compressor during run operation.

Compressor Heater



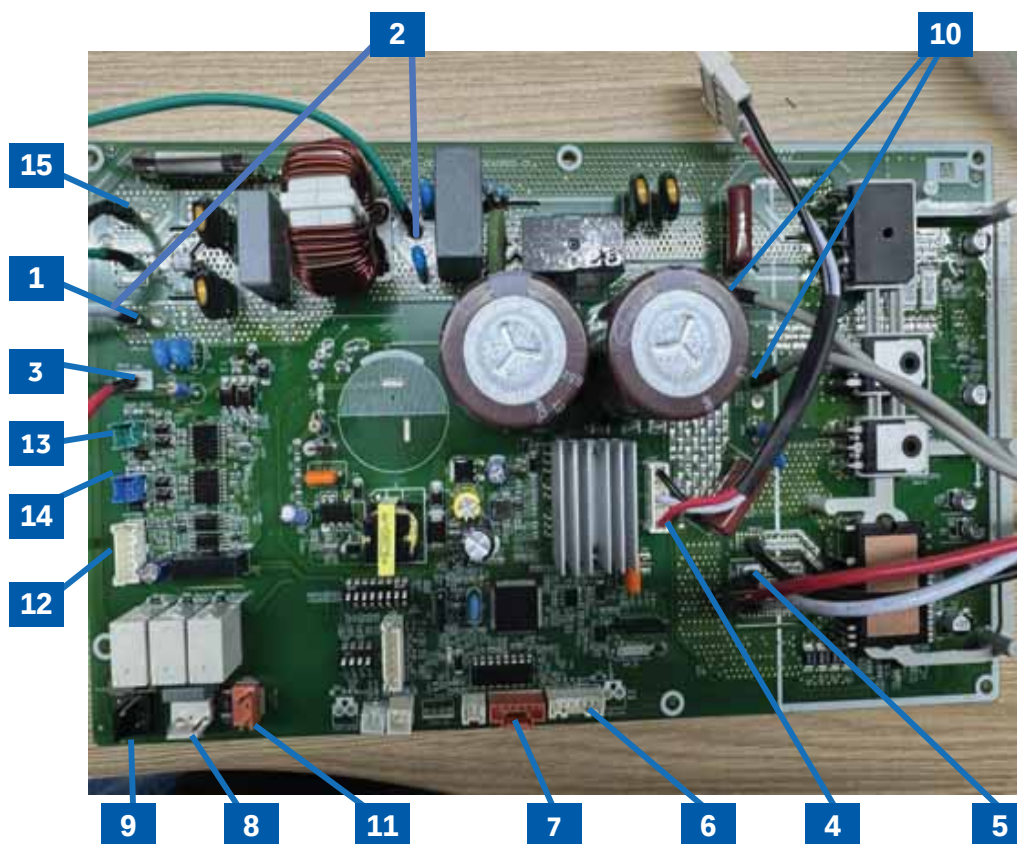
The Compressor heater is used to preheat the compressor and assist the start of the compressor at low temperature. The Compressor Heater is electrically connected to the Power Control Board at PLUG CN-13 and energized with 208/230 VAC.

Refrigerant Strainers



The system has debris-catching strainers that protect internal system components from contaminants in the refrigerant. The strainer is a permanent part that is not typically replaced.

Outdoor Unit Control Board



1 CN1: 230VA C power from terminal block connections and 1(L1)

2 CN3, CN30: Connector for GND

3 CN4: Communication connection between the indoor board and the outdoor board

4 CN10: Connector for the fan motor

5 CN7, CN8, CN9: Compressor U, V, W connections

6 CN15 : Connections for temperature sensors

7 CN16 : Connector for the electronic expansion valve

8 CN11: Connector for four way valve coil

9 CN12 : Connector for the base pan heater

10 CN5, CN6: Connector for the reactor

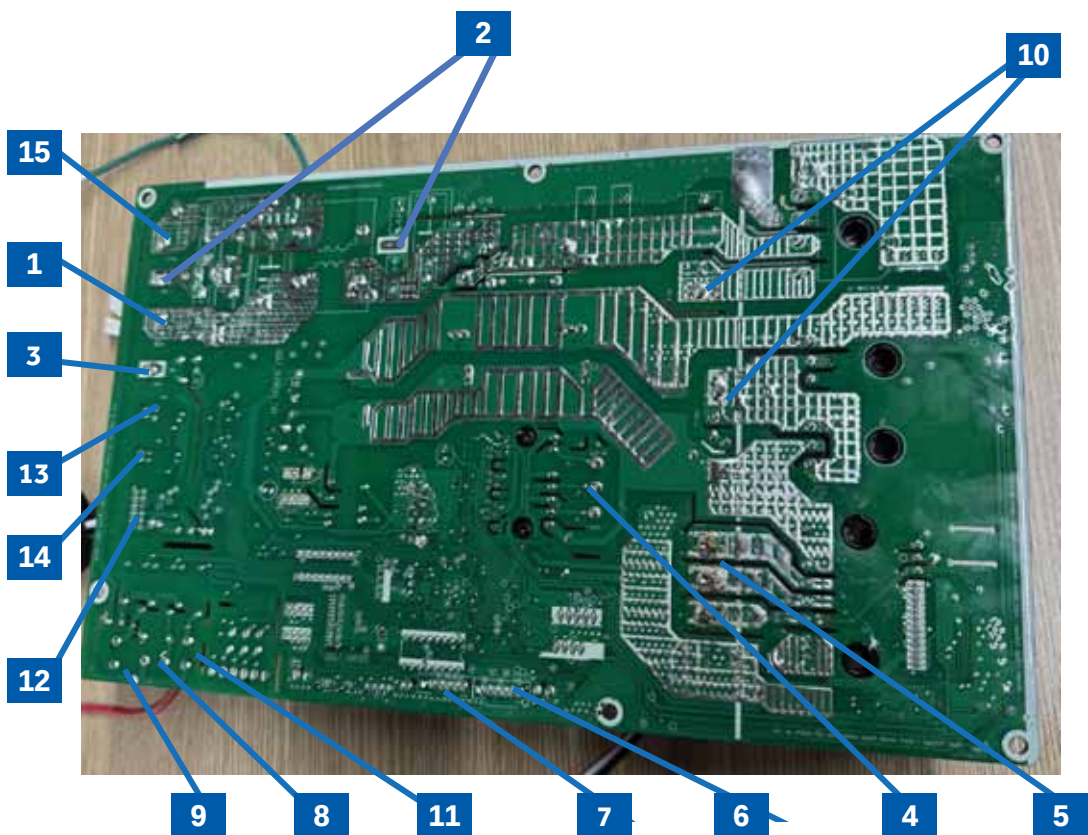
11 CN13: Connector for the compressor heater

12 CN19: Connector for the RJ45

13 CN24: Connector for the OTA

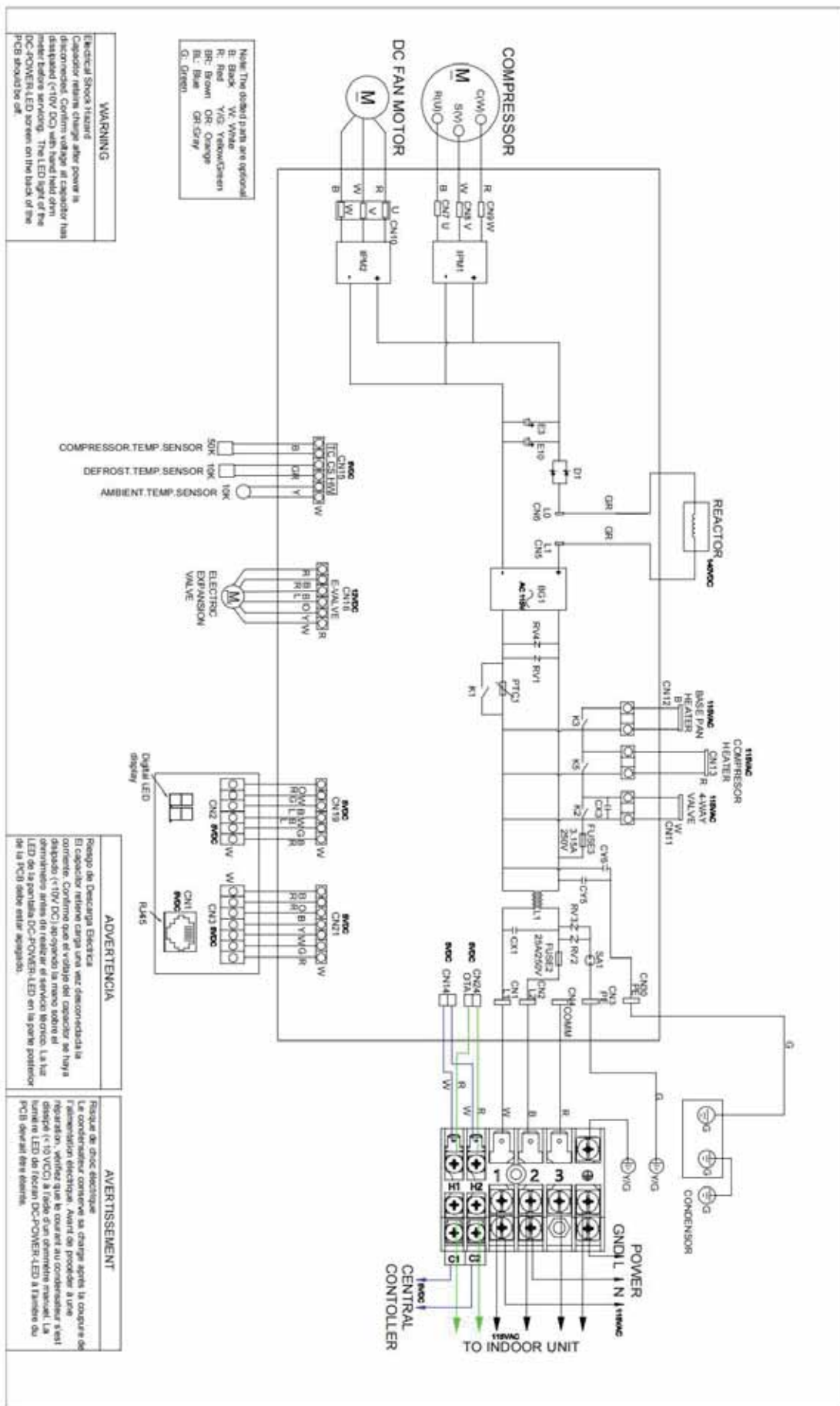
14 CN14: Connector for the centralized controller

15 CN2: 230VAC power from terminal block connections and 2(L2)



- | | |
|---|---|
| 1 CN1: 230VA C power from terminal block connections and 1(L1) | 9 CN12 : Connector for the base pan heater |
| 2 CN3, CN30: Connector for GND | 10 CN5, CN6: Connector for the reactor |
| 3 CN4: Communication connection between the indoor board and the outdoor board | 11 CN13: Connector for the compressor heater |
| 4 CN10: Connector for the fan motor | 12 CN19: Connector for the RJ45 |
| 5 CN7, CN8, CN9: Compressor U, V, W connections | 13 CN24: Connector for the OTA |
| 6 CN15 : Connections for temperature sensors | 14 CN14: Connector for the centralized controller |
| 7 CN16 : Connector for the electronic expansion valve | 15 CN2: 230VAC power from terminal block connections and 2(L2) |
| 8 CN11: Connector for four way valve coil | |

WIRING DIAGRAM





Purpose of Dip Switch Settings

AC Loop Communication: AC loop communication setting make sure communication between the indoor and outdoor units aims at communication between the indoor and outdoor units

Central Controller: Enable system for compatibility with a central controller. Currently, a 5-inch central controller is available.

24V Communication: Enable system for use with a third-party 24v controller

BMS Protocol Setting: With this setting, system can be connected to building system.

DIP SW1

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8	Setting	Description
OFF	----	----	----	----	----	----	----	AC Loop Communications	Default
ON	----	----	----	----	----	----	----	24V Communication	
----	OFF	----	----	----	----	----	----	Central Controller Protocol	Default
----	ON	----	----	----	----	----	----	BMS Protocol	
----	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Central Controller Address 1	Default
----	OFF	OFF	OFF	OFF	OFF	OFF	ON	Central Controller Address 2	
----	OFF	----	----	----	----	----	----	--	
----	OFF	ON	ON	ON	ON	ON	ON	Central Controller Address 64	
----	ON	OFF	OFF	OFF	OFF	OFF	OFF	BMS protocol Address 1	
----	ON	OFF	OFF	OFF	OFF	OFF	ON	BMS protocol Address 2	
----	ON	----	----	----	OFF	----	----	--	
----	ON	ON	ON	ON	ON	ON	ON	BMS Controller Address 64	

DIP SW2

SW2-1	SW2-2	SW2-3	SW2-4	Setting	Description
OFF	OFF	ON	ON	Tempo 9K	
OFF	ON	OFF	OFF	Tempo 12K	
OFF	ON	OFF	ON	Tempo 15K	
OFF	ON	ON	OFF	Tempo 18K	
OFF	ON	ON	ON	Tempo 24K	
ON	OFF	ON	OFF	Reserved	
ON	OFF	ON	ON	Reserved	
ON	ON	OFF	OFF	Reserved	
ON	ON	OFF	ON	Reserved	
ON	ON	ON	OFF	Reserved	
ON	ON	ON	ON	Reserved	

NOTE: Component resistance readings shown in this section are for reference only. Actual resistance values may vary based on model being tested.

Testing of the following components requires the use of needle probes. Avoid testing the connector end of the plug, as damage to the internal sections of the plug can occur.

Checking the Outdoor Unit Sensors

NOTE: Use respective temperature / sensor chart for sensor type being tested.

- Compressor discharge sensor
- Suction sensor
- Defrost temperature sensor
- Ambient sensor

Step 1

Disconnect the sensor plug from the control board for this test. Failure to do so may provide inaccurate readings.

Step 2

Using k-type temperature probe, determine the temperature of the sensor being tested.

Step 3

Using an ohmmeter, check the resistance value of the sensor.

Step 4

Referring to the temperature / resistance table for the sensor being checked, verify the resistance value corresponds to the temperature checked in Step 2. Replace the sensor if the reading is open, shorted, or outside

Step 5

Re-seat the plug on the connector at the conclusion of the test.

Checking the Reversing Valve Coil

Step 1

Disconnect the reversing valve plug from the PCB for this test. Failure to do so may provide inaccurate readings.

Step 2

Using an ohmmeter, check the resistance value of the coil. The resistance value of the coil should be 1.2 kilo ohms to 1.8 kilo ohms. Replace the valve coil if the reading is significantly different, or if the coil shows open or shorted.

Step 3

Re-seat the plug on the connector at the conclusion of the test.

Checking the EEV Coil

Step 1

Disconnect the EEV coil from the PCB for this test. Failure to do so may provide inaccurate readings.

Step 2

Measure the resistance between 6 and 4, 6 and 2, 5 and 3, 5 and 1, and the resistance between them is roughly the same, all less than 100 Ohm.

Step 3

Re-seat the plug on the connector at the conclusion of the test.



Checking the Compressor Windings

Step 1

Disconnect wiring from terminals U, V and W of the IPM.

Step 2

Using an Ohmmeter, check the resistance value of the compressor windings. Measure between wires U and V, U and W, and V, and W.

The resistance value of the windings should be balanced (equal +/-20%). If the resistance values are not equal, verify the wiring and connections to the compressor as well as the compressor itself. Repair or replace as needed.

Step 3

Reconnect the wiring to the IPM at the conclusion of the test.

Checking the Outdoor DC Fan motor

Step 1

Initiate forced cooling.

Step 2

If the outdoor unit fan motor does not run, or the Service Monitor Board indicates an error code of 09, check the following voltages at connector CN11 on the outdoor unit PCB. Set the meter to read DC volts with a minimum voltage range of 360 volts (voltage values are approximate):

DC voltage between the Red and Black, between the White and Black, and between the Red and White wires should read 310~334VDC. This is the main voltage for powering the fan motor.



If the outdoor fan initially runs, increases speed, then stops, and the Service Monitor Board indicates an error code of 09, the feedback circuit is not functioning. Check that the wiring and plug connections are in good condition.

Checking the Compressor Heater

Use a multimeter to measure the resistance at both ends of the heating wire harness terminal of the compressor. The resistance value is $2400 \pm 5\%$.



Checking the Reactor

Use a multimeter to test the resistance between two terminals of a reactor. The maximum resistance is $130\text{m}\Omega$.



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QS09WB2BEA
QS12WB2BEA
QS18 WB2BEA
QS24WB2BEA

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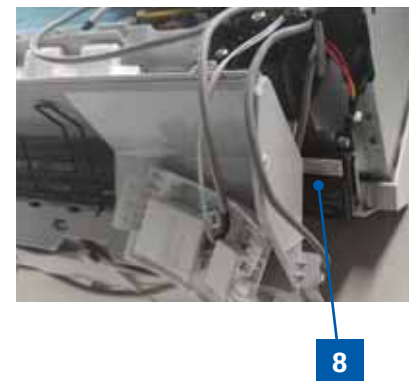
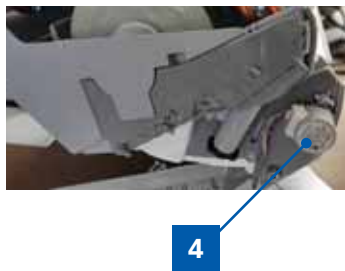
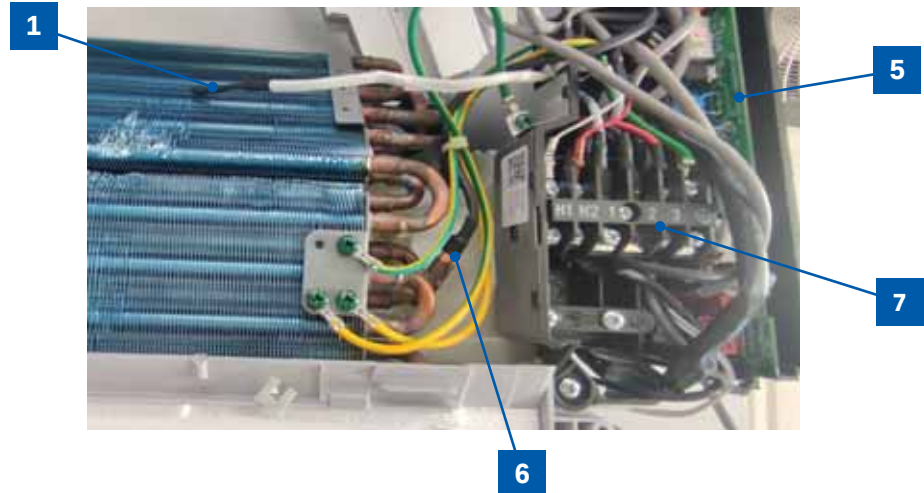
Checking the Stepper Motors..... C10

COMPONENTS

The indoor unit is mounted high on the wall to provide comfort and air movement within the conditioned space. Features of the system include: Variable speed blower operation that speeds up and slows down with changes in demand, moving louvers to direct air, indoor air temperature sensing, evaporator coil temperature sensing, a status display, evaporator coil with metering device located in outdoor unit, and an emergency operation button.

Indoor Component Identification

- 1 Ambient Temperature Sensor
- 2 Display Panel
- 3 Fan Motor
- 4 Louver Motors
- 5 Power Control Board (PCB)
- 6 Piping Temperature Sensor
- 7 Terminal Block
- 8 R454B Leakage sensor



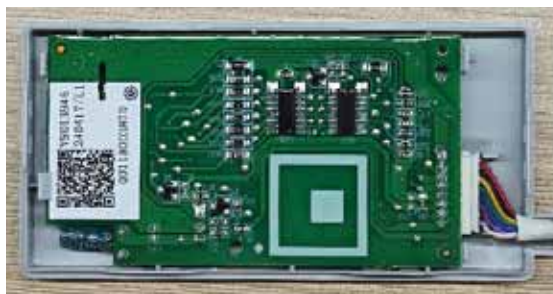
Terminal Block



The unit terminal block receives electrical power from the outdoor unit. There are 4 connections for electrical wires. Terminals 1 and 2 are connected to terminals 1 and 2 of the outdoor unit. This wiring supplies power to the indoor unit.

Terminal 3 is a communication wire. The indoor unit sends indoor air temperature, coil temperature and temperature setpoint information to the outdoor unit on this wire. If a splice or break in this wire is present, the indoor unit will not be able to communicate with the outdoor unit. The ERROR CODE will be an E7.

Display



The indoor display has an infrared communication circuit that receives The indoor display has an infrared communication circuit that receives operating commands from the remote control. This display will indicate operating modes, error codes, indoor air temperature, timer status, and power status.

The display board connects to the control board at Plug CN-7.

Ambient Temperature Sensor



The Ambient (room) Temperature Sensor is a negative coefficient thermistor that will decrease in resistance with increases in room air temperature. The sensor is located on a clip mounted in the return air stream.

The sensor connects to the control board at Plug CN-6.

Piping Temperature Sensor



The Piping Temperature Sensor is a negative coefficient thermistor that will decrease in resistance with increases in coil temperature. The sensor is located in a socket soldered to the surface of the indoor coil.

This sensor will monitor the temperature of the indoor coil in both cooling and heating modes of operation. Should abnormally cold or hot coil temperature be detected by this sensor, the system will take steps to correct the condition or report an ERROR CODE.

The sensor connects to the control board at Plug CN-6.

Louver Stepper Motor



The motor moves the louver side to side depending upon selections made at the remote control.

These motors are connected at CN-5.

Emergency Button



If the remote control is non-functional, the Emergency Button can be used. 73 -78°F will be maintained, until commands are received via the remote control.

Fan Motor



The Fan Motor is a variable speed motor. Fan speed will vary depending upon the temperature variation from set point, or can be set with the remote control to maintain a single set speed.

The Fan Motor is connected to the indoor control board via PLUG CN-9.

Indoor Unit Control Board



1 CN17 and CN21: 230AC power from terminal block connections 1(N) and 2(L)

2 CN27: Connector for GND

3 CN23: Communication connection between the indoor board and the outdoor board

4 CN9: Connector for fan motor

5 CN14: Connector for emergency switch

6 CN36: Connector for the centralized controller

7 CN7: Connector for the display board

8 CN1: Connector for non-polar wire controller

9 CN51: Connector for the room card

10 CN6: Connector for the temperature sensor

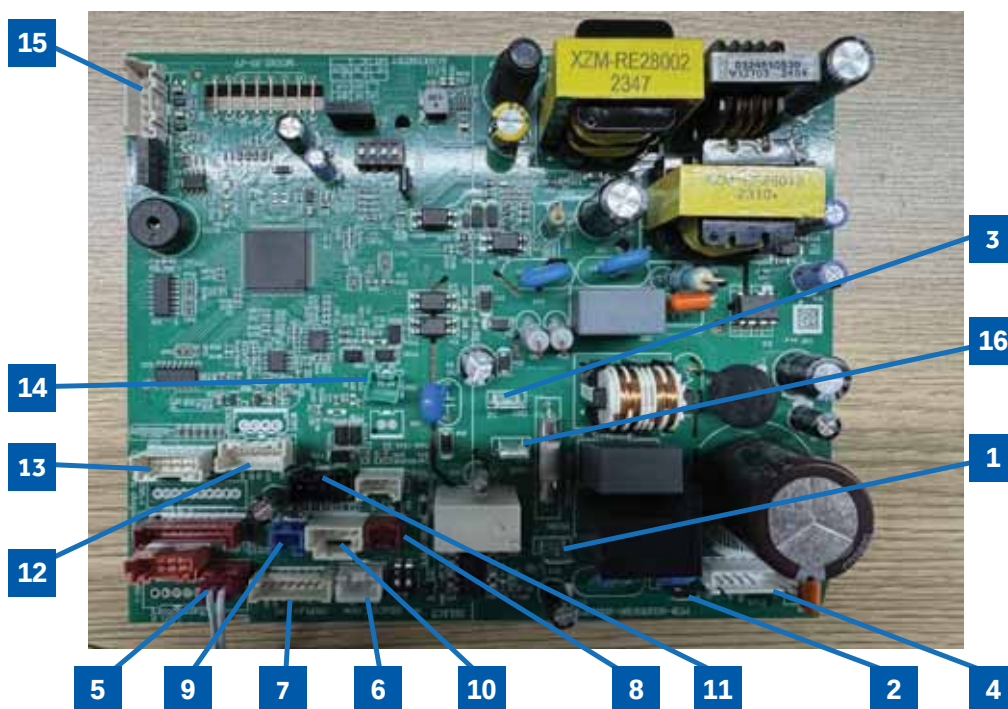
11 CN3: Connector for the leakage sensor

12 CN35: Connector for the WIFI

13 CN5: Connector for the up-down step motor

14 CN2: Connector for the OTA

15 CN38: Connector for the RJ45



1 CN21: 208/230 AC power from terminal block connections 1(L1)

2 CN27: Connector for GND

3 CN23: Communication connection between the indoor board and the outdoor board

4 CN9: Connector for fan motor

5 CN14: Connector for emergency switch

6 CN36: Connector for the centralized controller

7 CN7: Connector for the display board

8 CN1: Connector for non-polar wire controller

9 CN51: Connector for the room cord

10 CN6: Connector for the temperature sensor

11 CN3: Connector for the leakage sensor

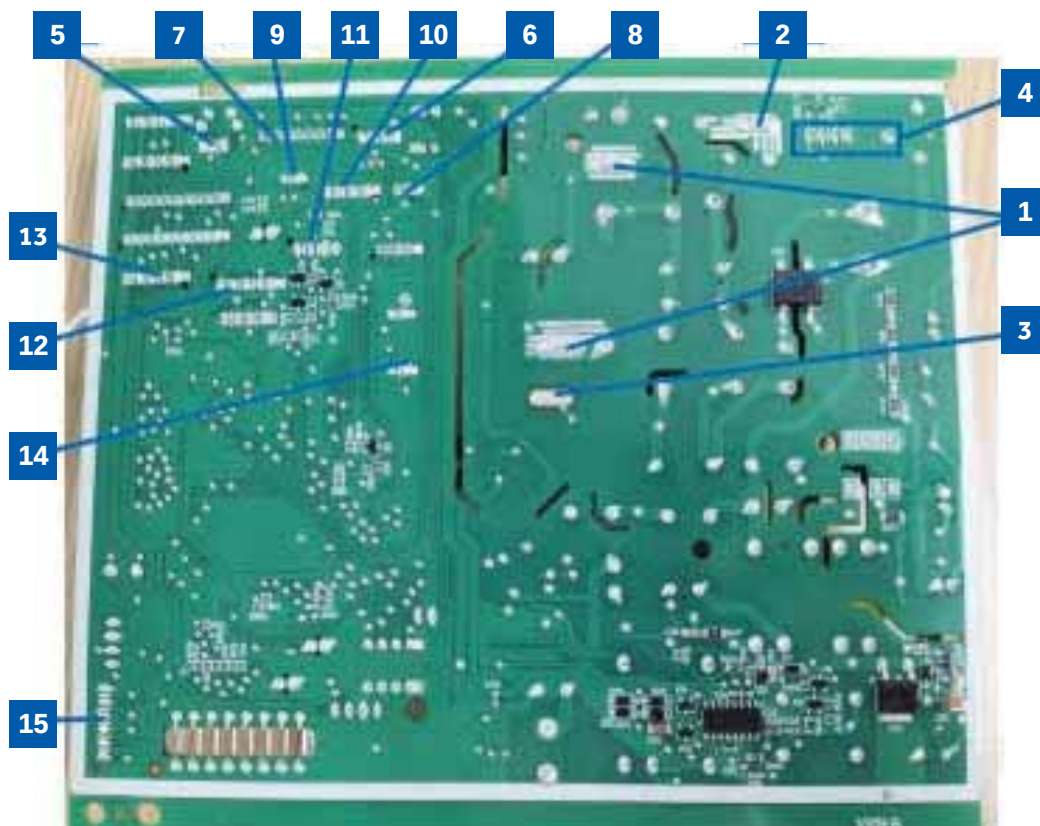
12 CN35: Connector for the WIFI

13 CN5: Connector for the up-down step motor

14 CN2: Connector for the OTA

15 CN38: Connector for the RJ45

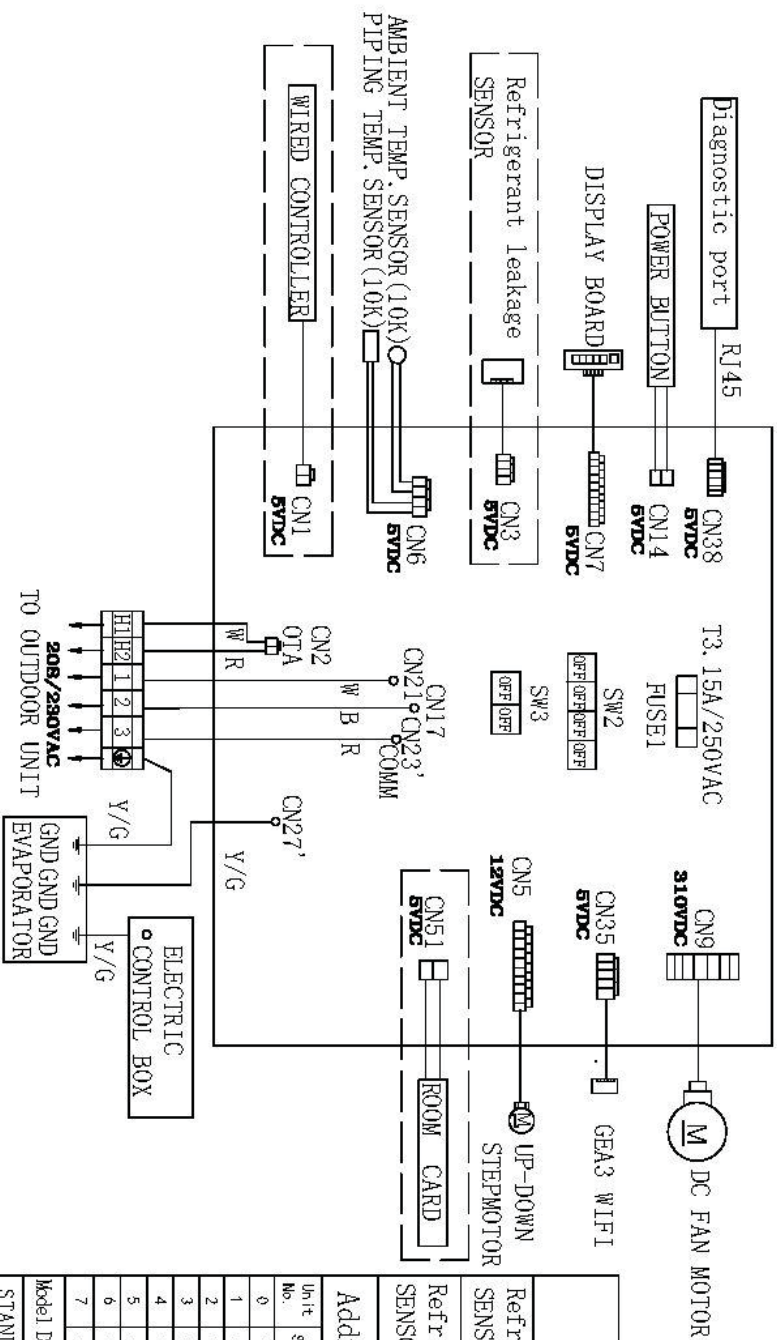
16 CN17: 208/230 AC power from terminal block connections 2(L2)



- | | |
|--|---|
| 1 CN17 and CN21: 230AC power from terminal block connections 1(N) and 2(L) | 9 CN51: Connector for the room card |
| 2 CN27: Connector for GND | 10 CN6: Connector for the temperature sensor |
| 3 CN23: Communication connection between the indoor board and the outdoor board | 11 CN3: Connector for the leakage sensor |
| 4 CN9: Connector for fan motor | 12 CN35: Connector for the WIFI |
| 5 CN14: Connector for emergency switch | 13 CN5: Connector for the up-down step motor |
| 6 CN36: Connector for the centralized controller | 14 CN2: Connector for the OTA |
| 7 CN7: Connector for the display board | 15 CN38: Connector for the RJ45 |
| 8 CN1: Connector for non-polar wire controller | |

INDOOR UNIT WIRING DIAGRAM

0011534809D



Note: Before replacing the board, ensure the jumper wires are cut to match the model description.

Remarque: avant de remplacer la carte, assurez-vous que les fils de raccordement sont coupés pour correspondre à la description du modèle ci-dessous.

Nota: antes de reemplazar la placa, asegúrese de que los cables puente estén cortados para que coincidan con la descripción del modelo a continuación.

W: WHITE
Y/G: YELLOW/GREEN
R: RED
B: BLACK

Notes:
1. The dotted parts are optional.
2. The two pins of CN51 should be shorted, when the J1 is cut.
3. Before replacing the board, it is necessary to ensure that the machine is matched with the board code.

Address for Wired Controller

Unit No.	SW2-1	SW2-2	SW2-3	SW2-4	Unit No.	SW2-1	SW2-2	SW2-3	SW2-4
0	OFF	OFF	OFF	OFF	8	ON	OFF	OFF	OFF
1	OFF	OFF	OFF	ON	9	ON	OFF	OFF	ON
2	OFF	OFF	ON	OFF	10	ON	OFF	ON	OFF
3	OFF	OFF	ON	ON	11	ON	OFF	ON	ON
4	OFF	ON	OFF	OFF	12	ON	ON	OFF	OFF
5	OFF	ON	OFF	ON	13	ON	ON	OFF	ON
6	OFF	ON	ON	OFF	14	ON	ON	ON	OFF
7	OFF	ON	ON	ON	15	ON	ON	ON	ON

Model Description

Model Description	J7	J6	J5	J4	J3
STANDARD 18K	OFF	ON	OFF	ON	OFF
STANDARD 24K	OFF	ON	OFF	ON	ON

DIP SWITCH SETTINGS



The PCB has a set of jumper wires that must be checked when replacing the PCB. The replacement PCB is shipped with no jumper wires cut.



Jumpers J3-J7

J7	J6	J5	J4	J3	Setting
OFF	OFF	ON	ON	ON	Tempo 09K
OFF	OFF	OFF	OFF	OFF	Tempo 12K
OFF	ON	OFF	OFF	ON	Tempo 15K
OFF	ON	OFF	ON	OFF	Tempo 18K
OFF	ON	OFF	ON	ON	Tempo 24K
OFF	ON	ON	ON	OFF	Reserved
OFF	ON	ON	ON	ON	Reserved
ON	OFF	OFF	OFF	OFF	Reserved
ON	OFF	OFF	OFF	ON	Reserved
ON	OFF	OFF	ON	OFF	Reserved
--	--	--	--	--	Reserved
ON	ON	ON	ON	ON	Reserved

DIP SW2: Wire Controller Address

SW2-1	SW2-2	SW2-3	SW2-4	Setting	Description
OFF	OFF	OFF	OFF	0#	Default
OFF	OFF	OFF	ON	1#	
OFF	OFF	ON	OFF	2#	
OFF	OFF	ON	ON	3#	
OFF	ON	OFF	OFF	4#	
OFF	ON	OFF	ON	5#	
OFF	ON	ON	OFF	6#	
OFF	ON	ON	ON	7#	
ON	OFF	OFF	OFF	8#	
ON	OFF	OFF	ON	9#	
ON	OFF	ON	OFF	10#	
ON	OFF	ON	ON	11#	
ON	ON	OFF	OFF	12#	
ON	ON	OFF	ON	13#	
ON	ON	ON	OFF	14#	
ON	ON	ON	ON	15#	

DIP SW3

SW3-1	SW3-2	Setting	Description
OFF	--	Central Controller	Default
ON	--	24v Controller	
--	OFF	Refrigerant Leak Detector Disable	Default
--	ON	Refrigerant Leak Detector Enable	

Jumpers J1, J2, J8

J1	J2	J8	J4	Setting	Description
OFF	--	--	--	Room Card Valid	
ON	--	--	--	Room Card Invalid	Default
--	OFF	--	--	Sub	
--	ON	--	--	Main	Default
--	--	OFF	--	WiFi 2.18 Protocol	
--	--	ON	--	WiFi GE3 Protocol	Default

Testing of the following components requires the use of an ohmmeter and k-type temperature probe.

NOTE: When using the test probes, probe the back or side contacts of the plug to obtain the reading. Do not try to probe the connector end of the plug, as this may damage the contacts.

Checking the Indoor Unit Sensors

NOTE: Use respective temperature / sensor chart for sensor type being tested.

- Coil sensor
- Ambient sensor

Step 1

Disconnect the sensor from the PCB for this test. Failure to do so may provide inaccurate readings.

Step 2

Determine the temperature of the sensor being tested.

Step 3

Check the resistance value of the sensor.

Step 4

Referring to the temperature / resistance table for the sensor being checked, verify the resistance value corresponds to the temperature checked in step 2.

Replace the sensor if the reading is open, shorted, or outside

Step 5

Re-seat the plug on the PCB at the conclusion of the test.

Checking the Stepper Motors

Step 1

Disconnect the Stepper Motor plug PCB for the test. Failure to do so may provide inaccurate readings.

Step 2

Refer to the chart shown below for plug pin combinations and resistance values.

	Red
Blue	200 Ω
Violet	200 Ω
Yellow	200 Ω
Orange	200 Ω

Step 3

Re-seat the plug on the connector at the conclusion of the test.



1Q09TE2BEA / QS09WB2BEA
 1Q12TE2BEA / QS12WB2BEA
 1Q18 TE2BEA / QS18 WB2BEA
 1Q24 TE2BEA / QS24WB2BEA

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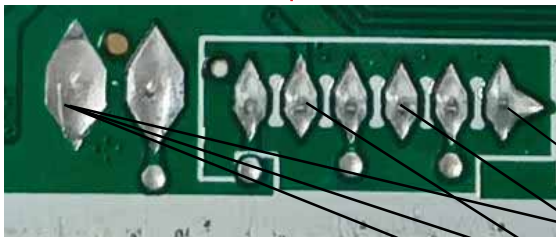
ERROR CODES.....	D2
TROUBLESHOOTING FLOWCHARTS.....	D3
E1/LED1: No Flash.....	D3
E2/LED1: No Flash.....	D3
F21/LED1: 10 Flash	D3
F25/LED1: 13 Flash	D3
F6/LED1: 12 Flash.....	D3
E4	D4
F12/ LED1: 1 Flash.....	D4
F20/LED1: 5 Flash.....	D4
E14	D5
F1/LED1: 2Flash	D6
F8/LED1: 9Flash	D7
F19/LED1: 6 Flash.....	D8
F22/LED1: 3 Flash.....	D9
F23/LED1: 35 Flash	D9
F4/LED1: 8 Flash.....	D10
E7/LED1: 15 Flash	D11
F11/LED1: 18 or 19 Flash	D12
LED1: 21 Flash	D12
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E22/LED1: 21 Flash	D13
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bA	D15
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ERROR CODES

OUTDOOR UNITS	FAULT DESCRIPTION	INDOOR UNIT
LED DISPLAY		DIGITAL DISPLAY
1	OUTDOOR EEPROM FAILURE	F12
2	IPM OVERCURRENT OR SHORT CIRCUIT	F1
5	MODULE OPERATED OVERLOAD (COMPRESSOR OVERLOAD PROTECTION)	F20
6	MODULE LOW OR HIGH VOLTAGE	F19
7	COMPRESSOR CURRENT SAMPLING CIRCUIT FAULT	F27
8	OVERHEAT PROTECTION FOR DISCHARGE TEMPERATURE	F4
9	MALFUNCTION OF THE DC FAN MOTOR	F8
10	MALFUNCTION OF DEFROST TEMPERATURE SENSOR	F21
12	AMBIENT TEMPERATURE SENSOR FAILURE	F6
13	DISCHARGE TEMPERATURE SENSOR FAILURE	F25
15	COMMUNICATION FAILURE BETWEEN THE INDOOR & OUTDOOR UNIT	E7
18	LOSS OF SYNCHRONISM DETECTION	F11
21	INDOOR UNIT OVERLOAD PROTECTION, HEATING MODE ONLY.	/
24	COMPRESSOR START FAILURE, OVER-CURRENT	F2
25	PHASE CURRENT PROTECTION (IPM)	F23
28	LACK OF REFRIGERANT OR DISCHARGING	/
3	AC CURRENT OVERLOAD	F22
AA	REFRIGERANT LEAK FAULT >10% LFL	AA
Ab	REFRIGERANT LEAK FAULT <8% LFL	Ab
Ac	LEAK SENSOR COMMUNICATION FAULT	Ac
Ad	LEAKAGE SENSOR SELF-CHECK FAULT - SELF CHECK FAULT	Ad
AE	SENSOR REACHING END OF LIFE WARNING	AE
AF	SENSOR REACHING END OF LIFE	AF
bA	DIP SWITCH ENABLED, NO SENSOR DETECTED	bA

Error Codes (Indoor/Outdoor)**E1/LED1: No Flash***Room Temperature Sensor Failure***E2/LED1: No Flash***Indoor Coil Temperature Sensor Failure***F21/LED1: 10 Flash***Defrost Temperature Sensor Failure***F25/LED1: 13 Flash***Discharge Temperature Sensor Failure***F6/LED1: 12 Flash***Ambient Temperature Sensor Failure***Detection Conditions:***Thermistor input is more than 4.92V or less than 0.08V during compressor operation.***Possible Causes:**

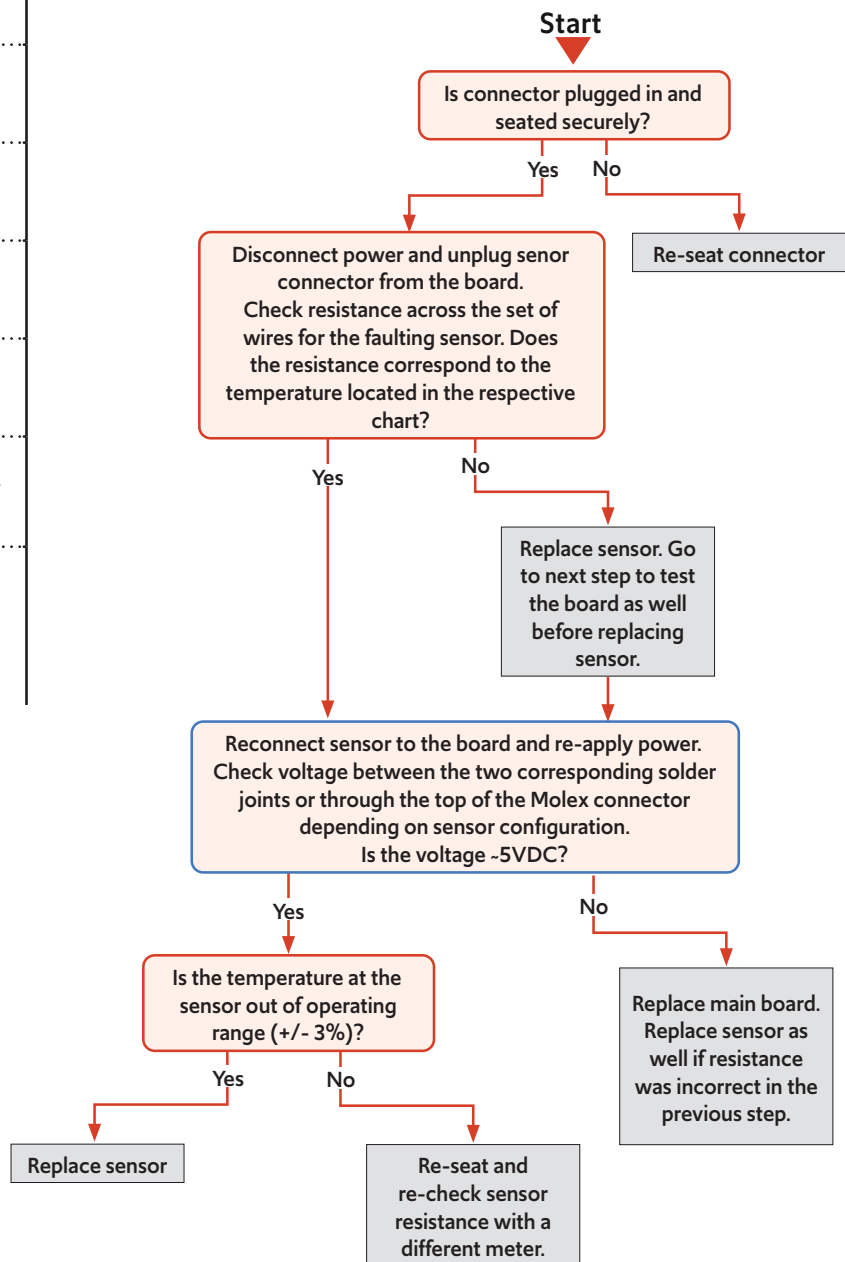
- Faulty connector connection
- Faulty thermistor
- Faulty PCB



5V Discharge Temperature Sensor

5V Defrost Temperature Sensor

5V Ambient Temperature Sensor



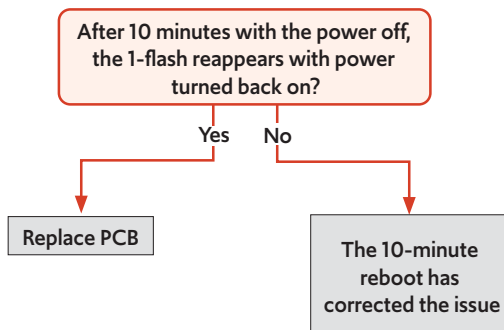
Error Codes (Indoor/Outdoor)

E4**Indoor EEPROM Error****F12/ LED1: 1 Flash****Outdoor EEPROM Error****Detection Conditions:**

EEPROM data error or the EEPROM is damaged

Possible Causes:

- Faulty EEPROM data
- Faulty EEPROM
- Faulty PCB



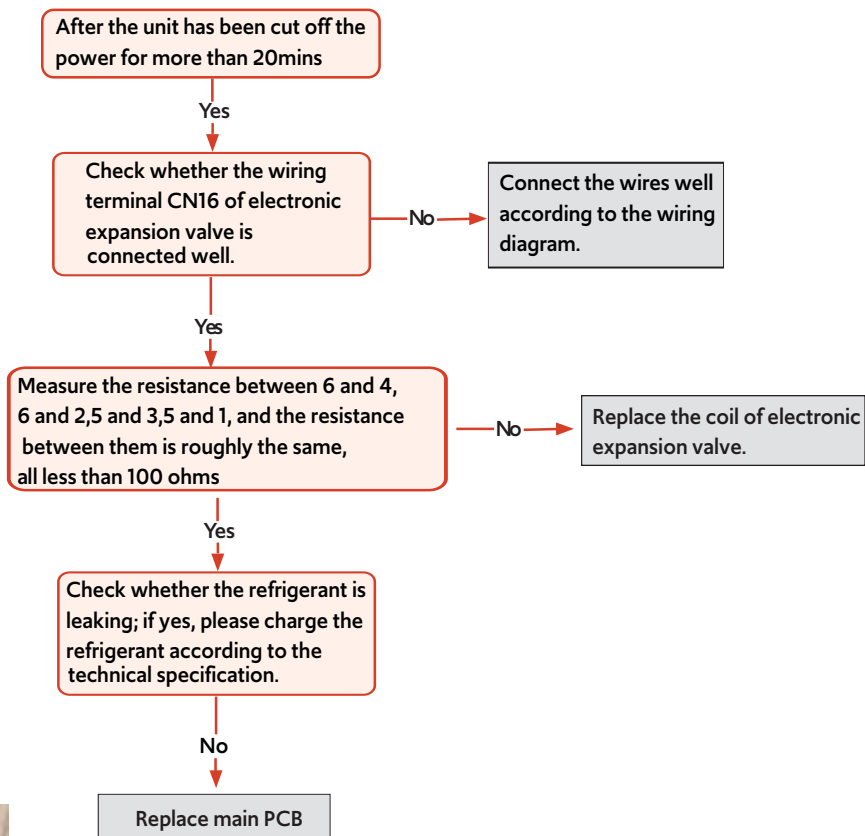
Error Codes (Indoor/Outdoor)

F20/LED1: 5 Flash**Module operated overload
(compressor overload protection)****Detection Conditions:**

Measure the resistance between 6 and 4, 6 and 2, 5 and 3, 5 and 1, and the resistance between them is roughly the same, all less than 100 ohms.

Possible Causes:

- Electronic Expansion Valve is bad
- Electronic Expansion Valve terminal is bad
- Lack of refrigerant

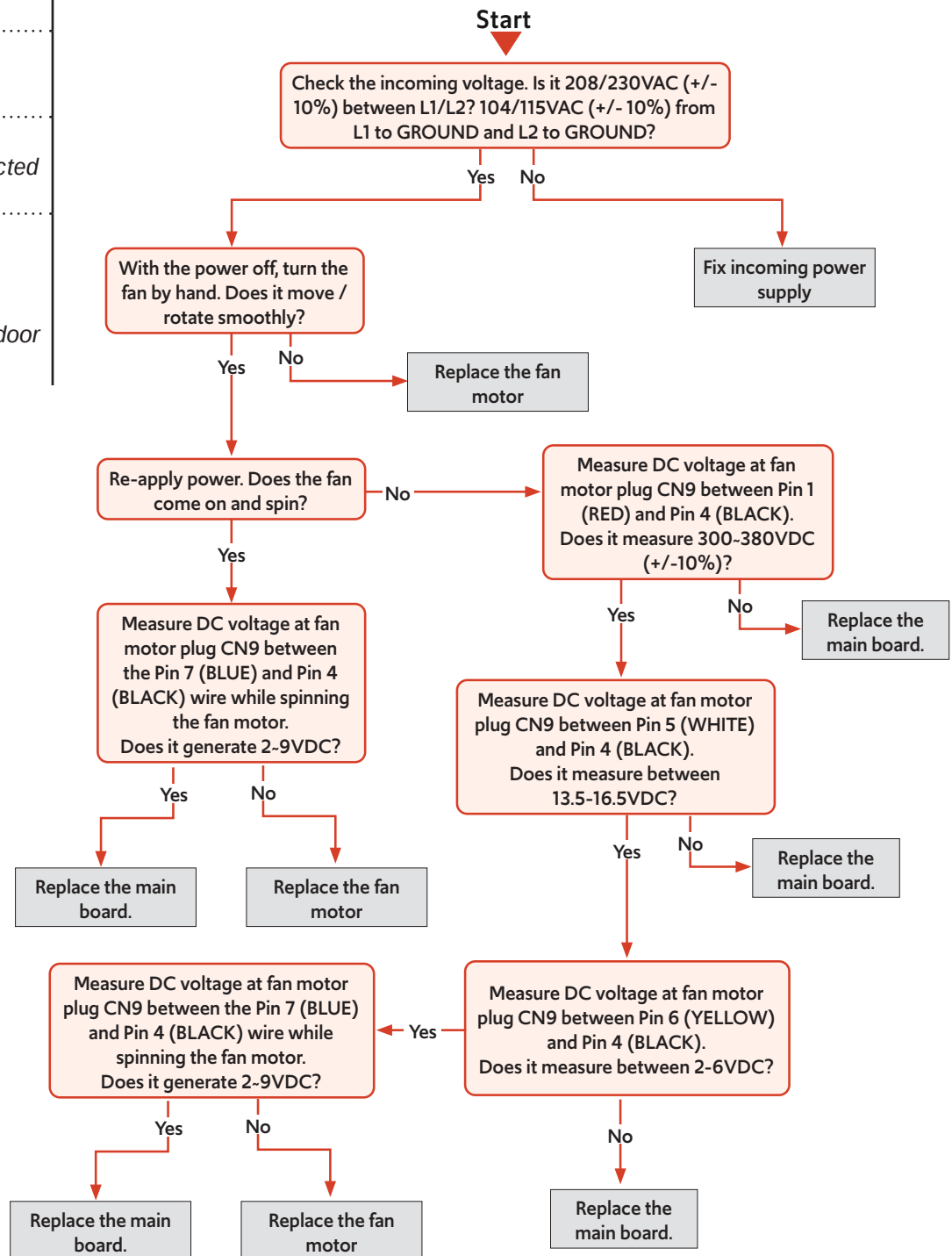


Error Code (Indoor)**E14****Indoor Fan Motor Failure****Detection Conditions:**

No rotation feedback signal detected for 2 minutes

Possible Causes:

- Faulty fan motor
- Fan motor overheat protection
- Detection error due to faulty indoor unit PCB



Error Codes (Indoor/Outdoor)

F1/LED1: 2 Flash

IPM Power Module Failure

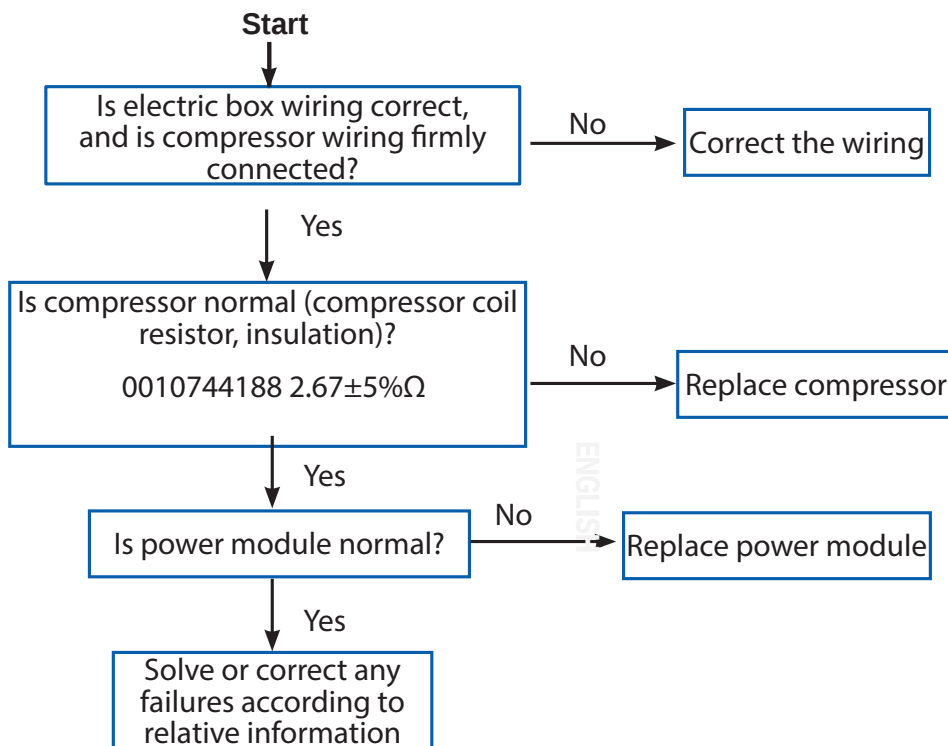
(PM power module protection)

Detection Conditions:

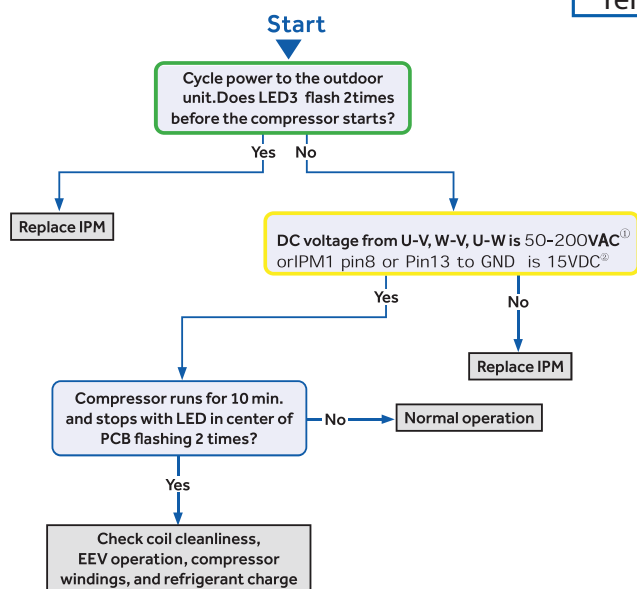
Amp limit hot 3 times in 30 minutes

Possible Causes:

- IPM bad
- Loose compressor wire
- Bad compressor

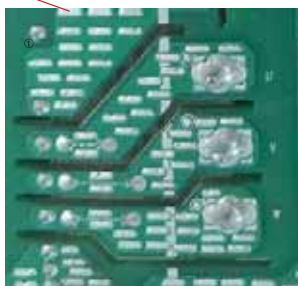
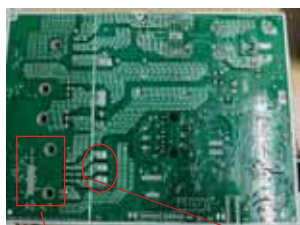


IPM Detect Process Below:



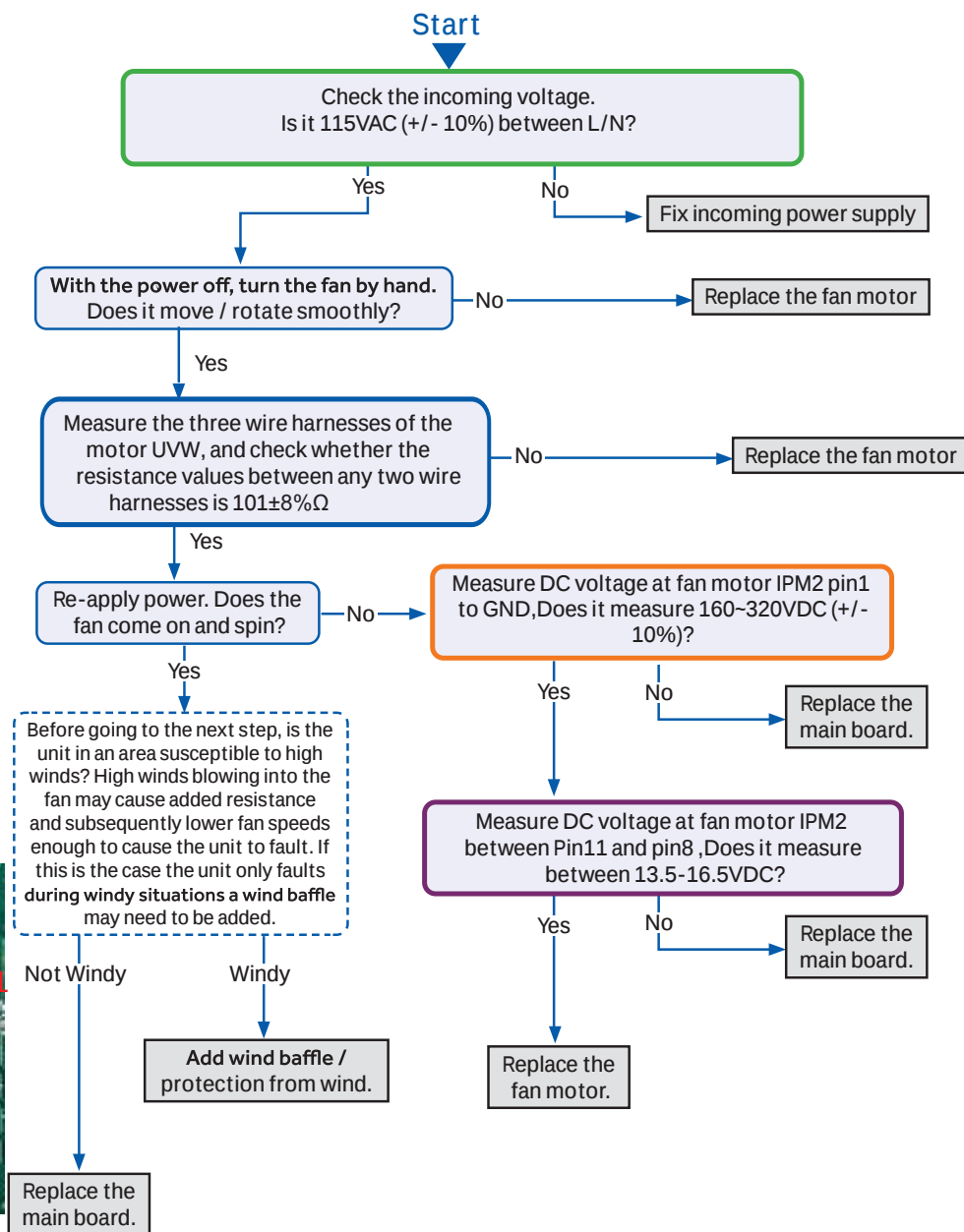
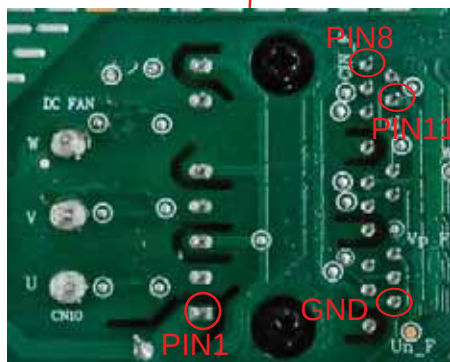
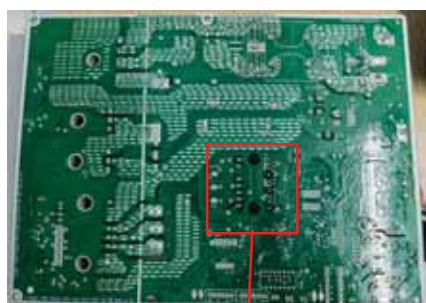
Trigger condition:

The abnormal resistance value of R010 was collected, resulting F1 fault occurs.



Error Codes (Indoor/Outdoor)**F8/LED1: 9 Flash****Outdoor DC Fan Motor Fault****Detection Conditions:**

Resistance values between any two wire harness connections is $101 \pm 8\% \Omega$



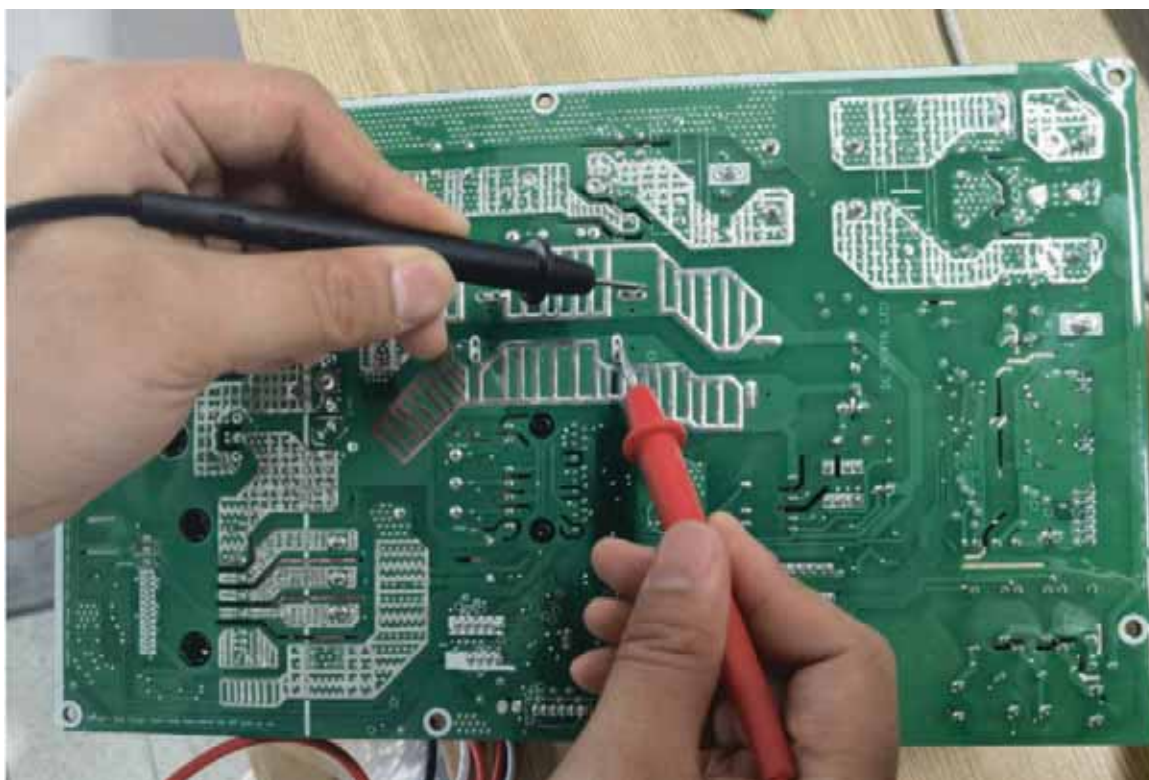
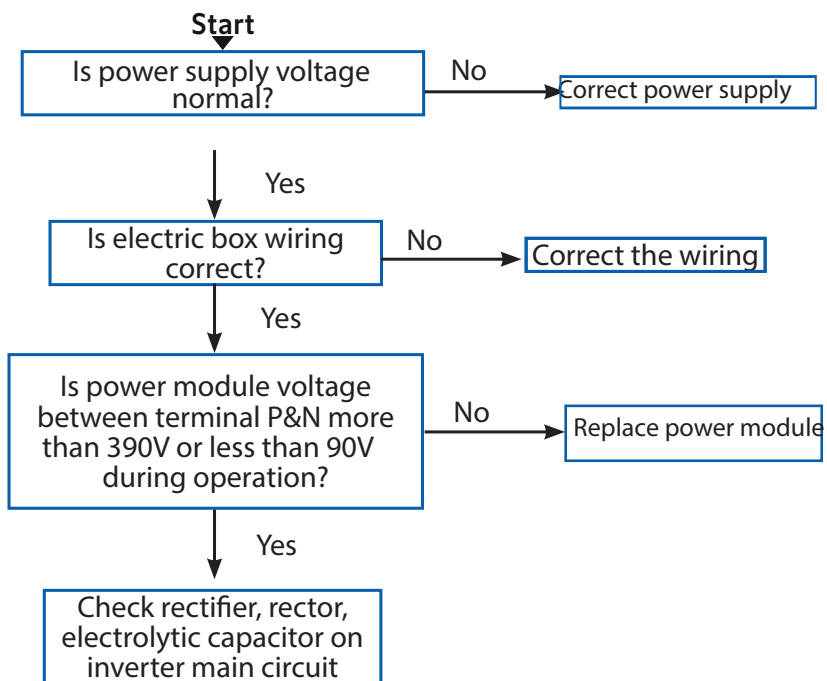
Error Codes (Indoor/Outdoor)

F19/LED1: 6 Flash**Power supply is over voltage or under voltage****Detection Conditions:**

- Abnormal voltage detection
- Terminal P&N more than 390V or less than 90V during operation

Possible Causes:

- Supply voltage not as specified
- Faulty IPM module
- Faulty outdoor PCB

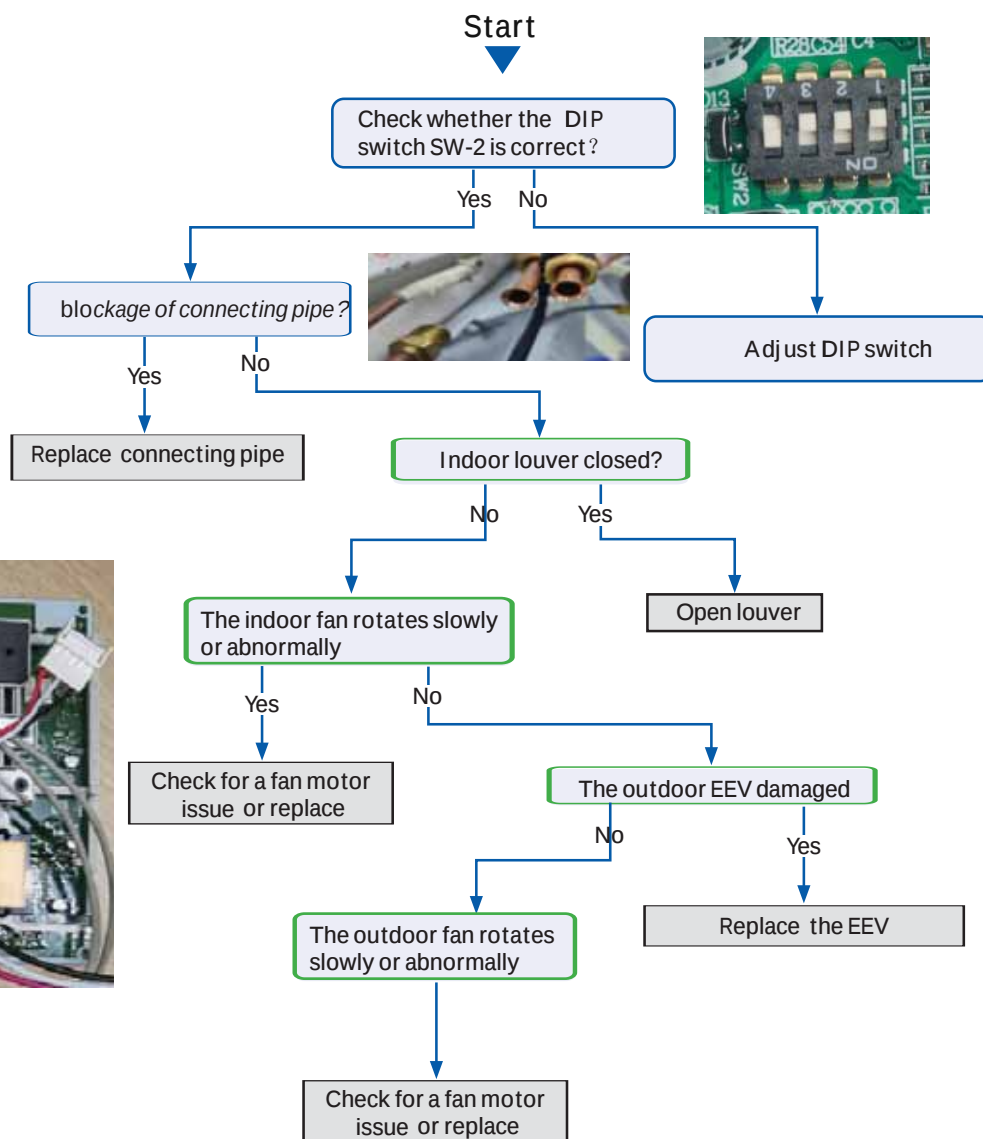


Error Codes (Indoor/Outdoor)**F22/LED1: 3 Flash****AC current overload****F23/LED1: 35 Flash****Phase current protection****Detection Conditions:**

Current value is over 14.4A

Possible Causes:

- Incorrect compressor wiring
- The power module is bad
- The compressor is bad



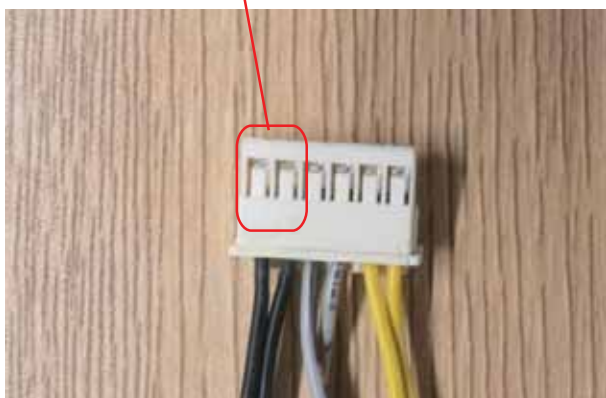
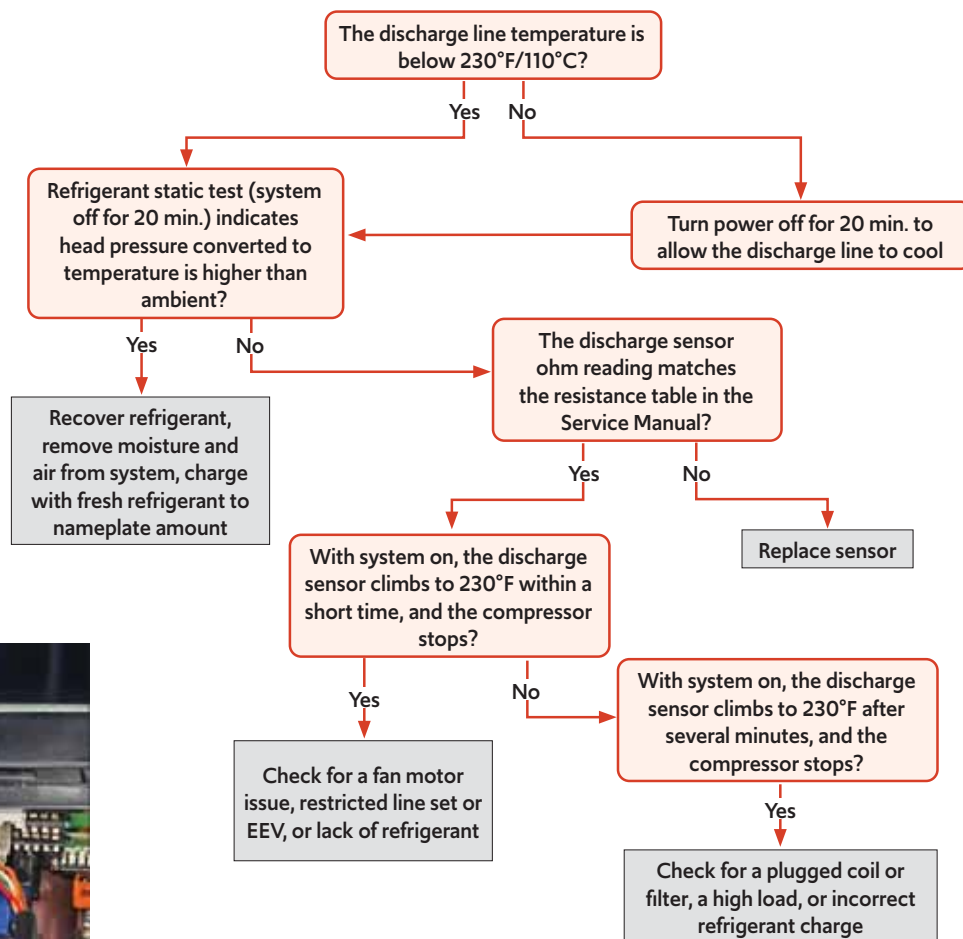
Error Codes (Indoor/Outdoor)

F4/LED1: 8 Flash**Overheat Protection for Discharge Temperature****Detection Conditions:**

Compressor discharge temperature above 110°C

Possible Causes:

- Faulty electronic expansion valve
- Faulty thermistor
- Faulty PCB



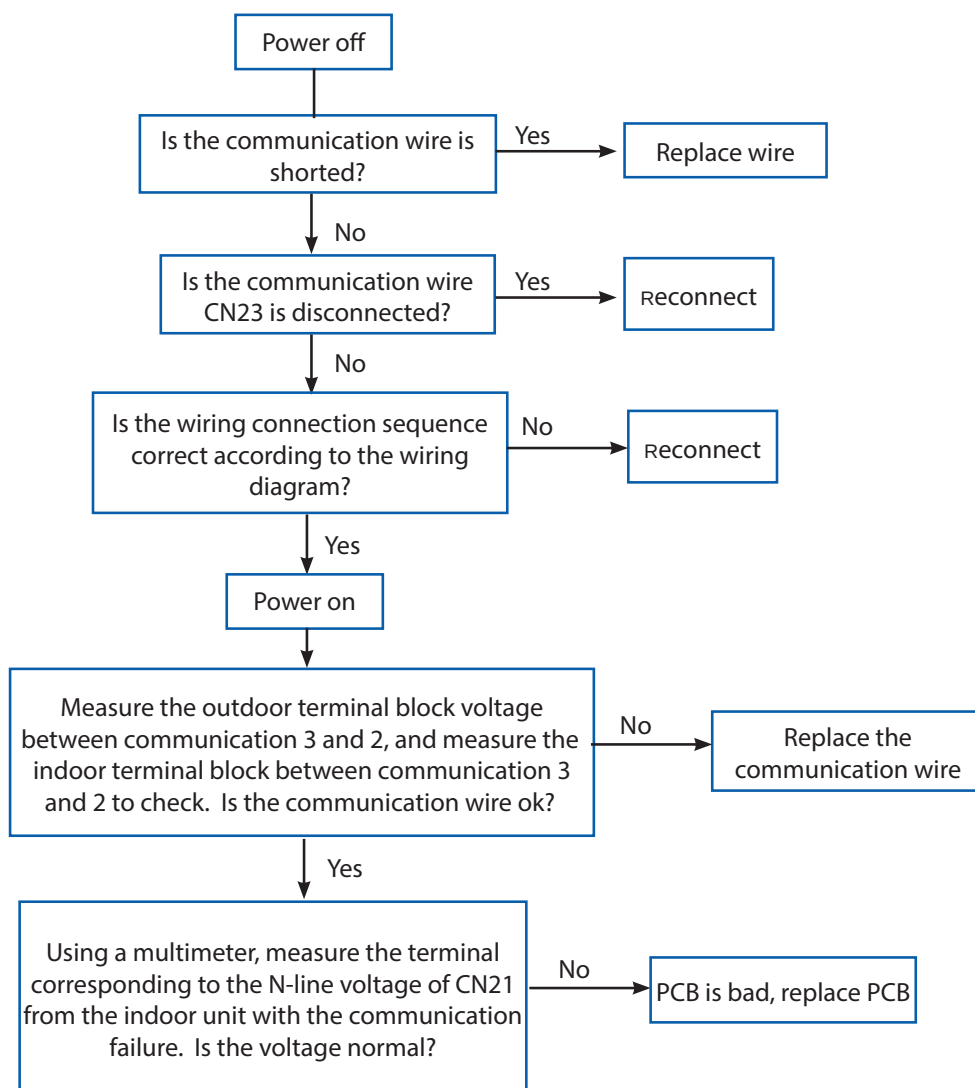
Mesure this two wire to check resistance

Error Codes (Indoor/Outdoor)**E7/LED1: 15 Flash****ID and OD Loss of Communication****Detection Conditions:***Outdoor PCB communication failure*

- *Indoor PCB communication failure*

Possible Causes:

- *Communication wiring disconnected*
- *Faulty indoor PCB*
- *Faulty outdoor PCB*
- *Faulty Outdoor Fan (may cause communication signal interference)*

**outdoor terminal****indoor terminal**

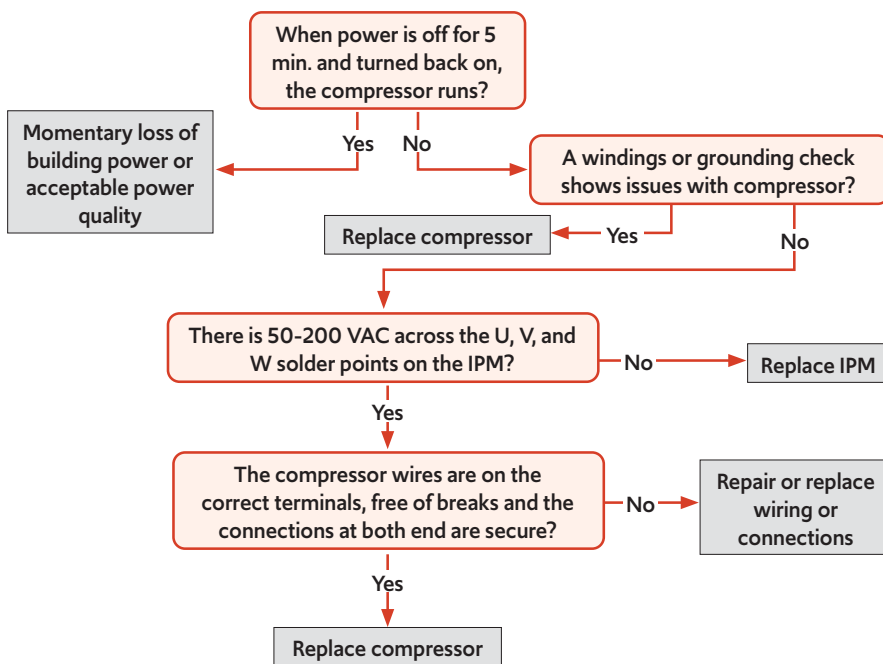
Error Codes (Indoor/Outdoor)

F11/LED1: 18 or 19 Flash**Loss of Compressor Synchronization****Detection Conditions:**

Compressor faulty, miswired or wiring connection faulty

Possible Causes:

- Faulty wiring
- Faulty compressor
- Faulty PCB



Error Codes (Outdoor)

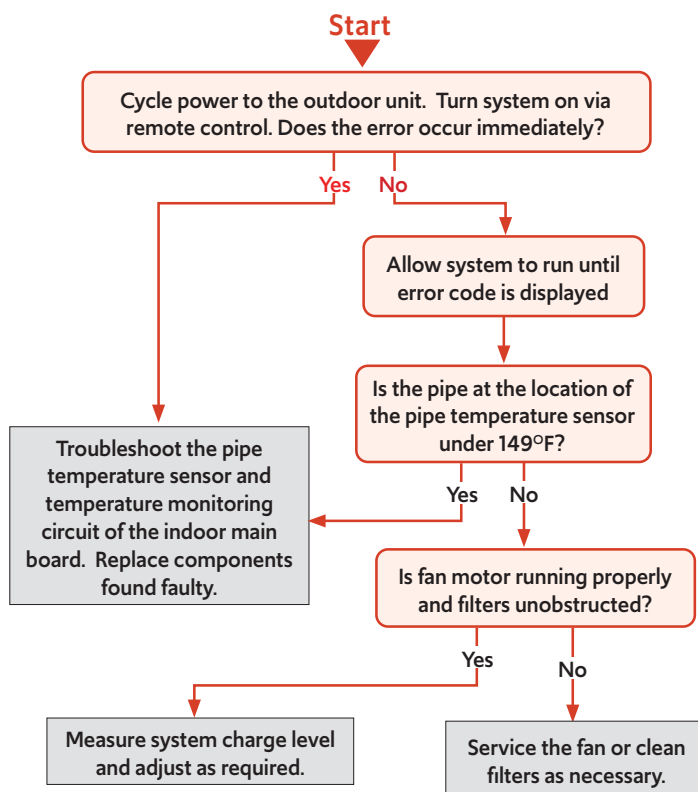
LED1: 21 Flash**Indoor Unit Over Temperature (Heating Mode Only)****Detection Conditions:**

Activated when the temperature being sensed by the heat exchanger pipe sensor rises above 149°F twice in 30 minutes.

Possible Causes:

- Faulty electronic expansion valve
- Dirty heat exchanger
- Faulty heat-exchange sensor
- Refrigerant undercharge

Note: this is a resetting fault that will not lockout operation.

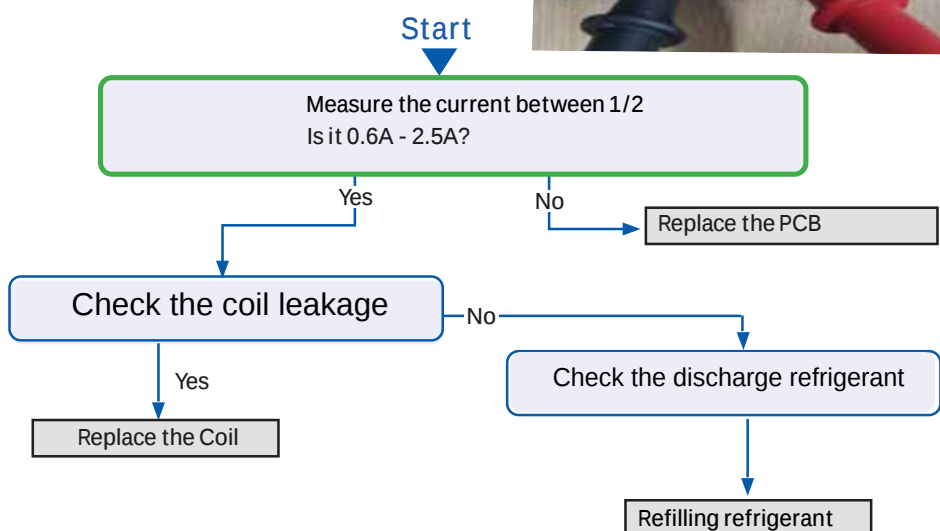


Error Codes (Indoor/Outdoor)**LED1: 28 Flash****Lack of Refrigerant or Discharging****Detection Conditions:**

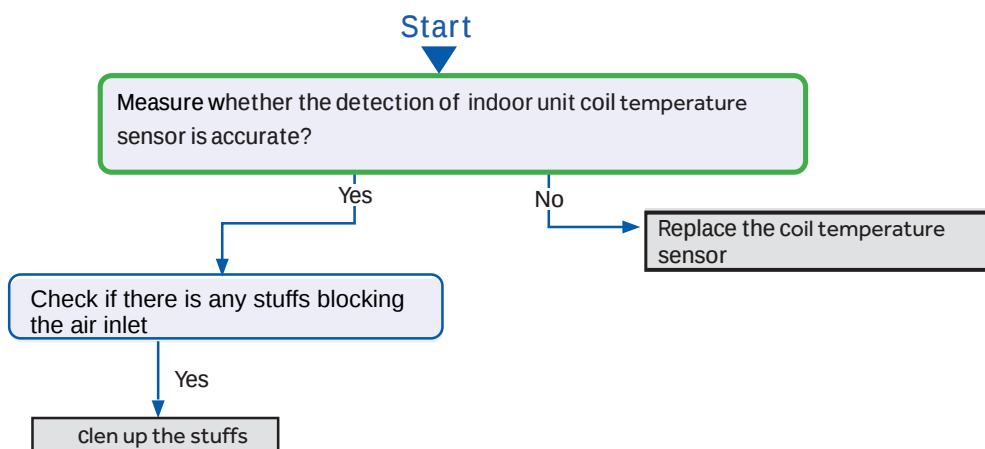
Compressor operation frequency more than 46Hz, the current between 0.6A and 2.5A

Possible Causes:

- Coil leakage
- Discharge refrigerant

**Error Codes (Indoor/Outdoor)****E22/LED1: 21 Flash****IDU Anti-Frosting Protection****Possible Causes:**

- Coil temperature sensor
- IDU air inlet blockage

**Error Codes (Indoor/Outdoor)****F27/LED1: 21 Flash****Compressor Current Sampling Circuit Fault****Detection Conditions:**

It is compressor block fault, the compressor will not work when this fault happen. It also can be self recovery when this fault happens.

Possible Causes:

- Ambient temperature is too low
- Compressor damage

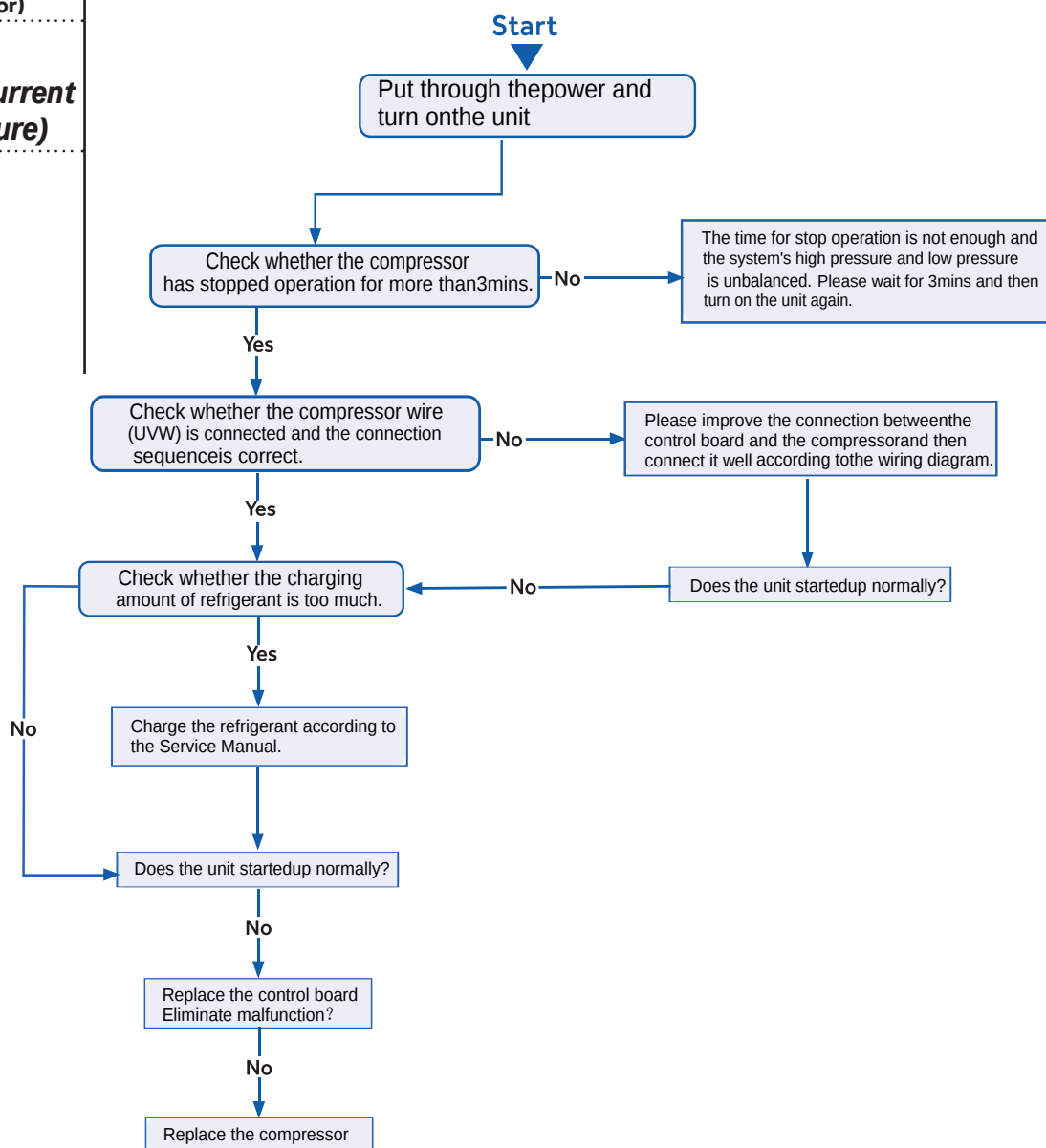
Error Codes (Indoor/Outdoor)

F2/LED1: 24 Flash

Module Operated Over Current (Compressor Startup Failure)

Possible Causes:

- The power supply is abnormal
- Incorrect compressor wiring
- The power module is bad
- The compressor is bad
- System overload



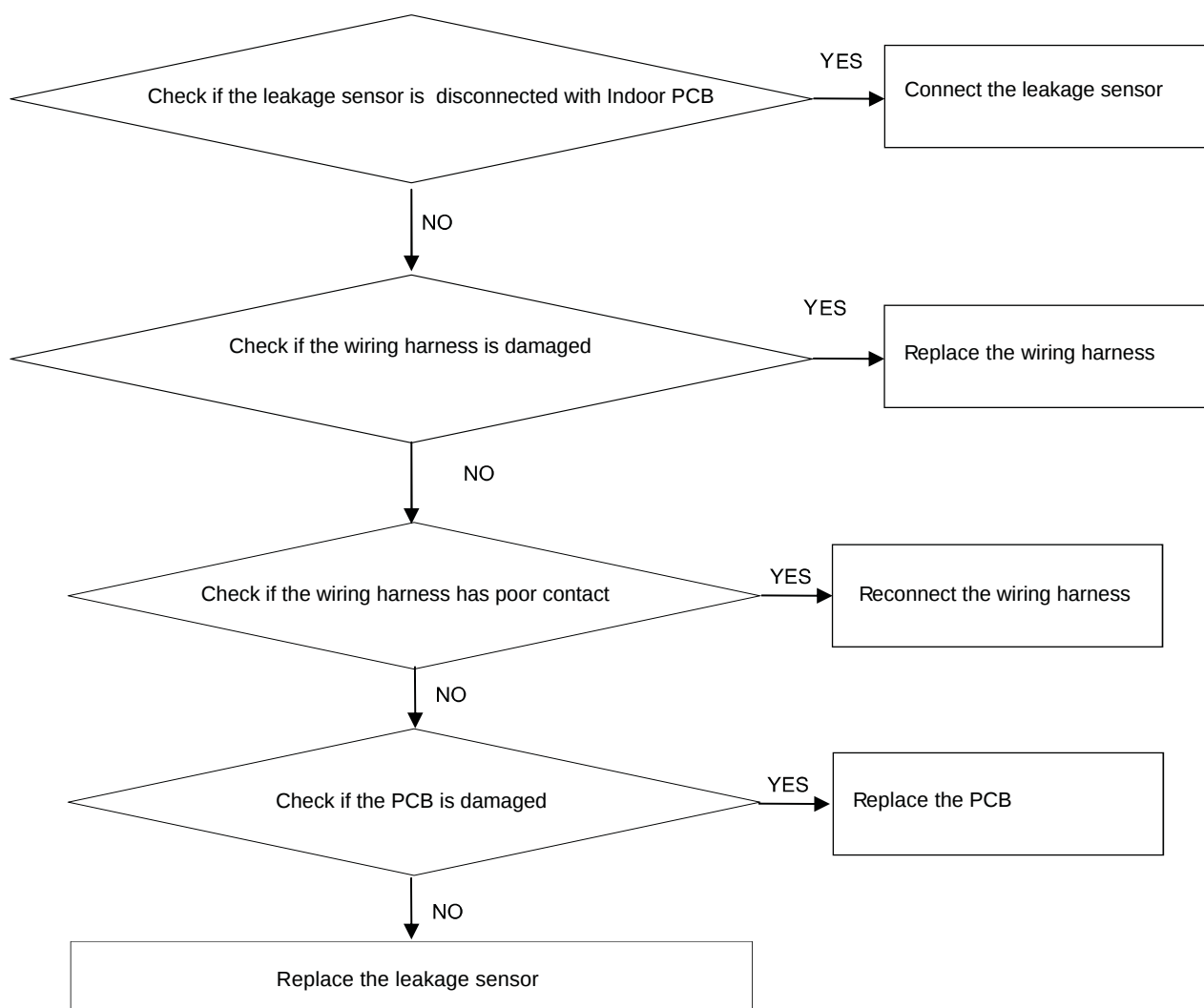
Trigger condition:

- The abnormal resistance value of R020 was collected, resulting in the F2 error code occurs



Error Codes (Indoor)**bA****DIP Switch Enabled, No Sensor Detected****Detection Conditions:***DIP Switch Enabled, No Sensor Detected***Possible Causes:**

- Loose wiring terminals
- Damaged wiring harness
- The leakage sensor is not connected
- PCB damage

*** Caution***Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.*

Error Codes (Indoor)

AA and Ab

Refrigerant Leakage Fault

Detection Conditions:

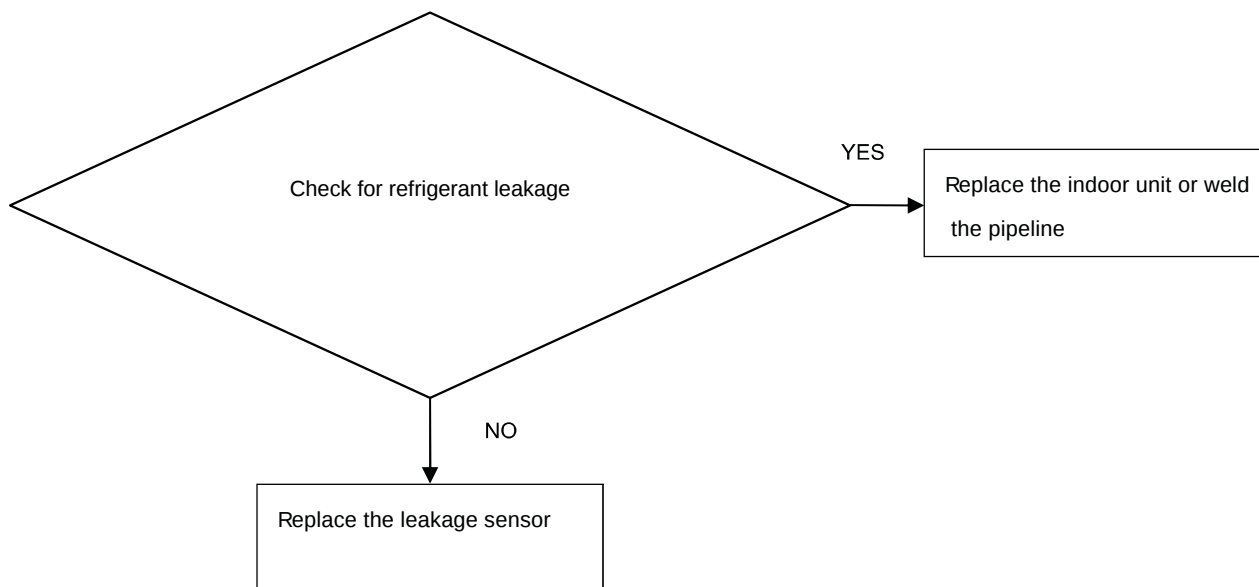
- AA: Refrigerant concentration over 10% LFL
- Ab: AA display after 5 minutes and refrigerant concentration of less than 8% LFL detected

Possible Causes:

- Pipe cracking
- The union nut is not secured

* Caution

Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.



Error Codes (Indoor)**Ac****Leakage Sensor Communication Fault****Detection Conditions:**

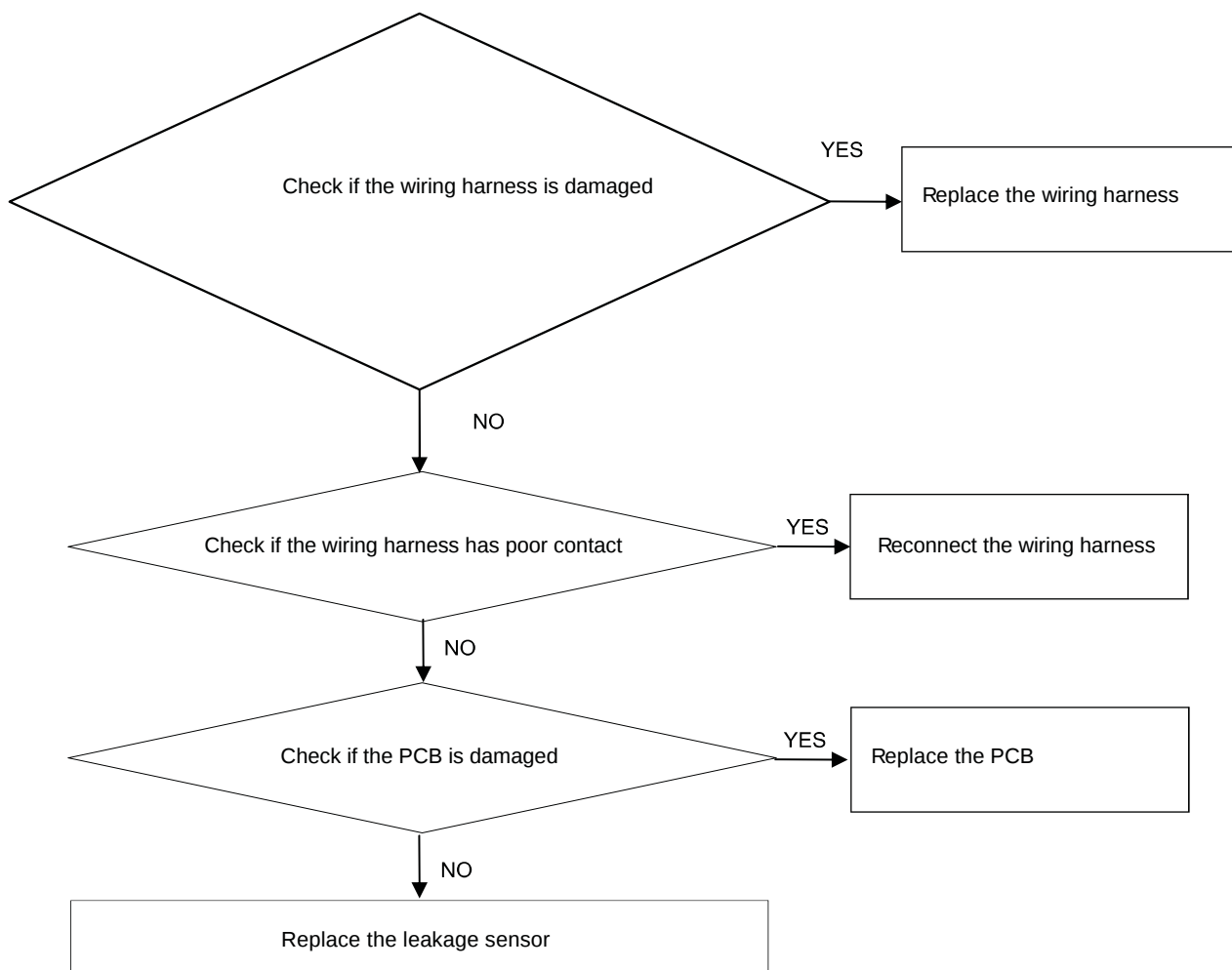
The communication between the leakage sensor and the PCB is faulty

Possible Causes:

- Loose wiring terminals
- Damaged wiring harness
- PCB damage

*** Caution**

Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.



Error Codes (Indoor)

Ad

Leakage Sensor Self-Check Fault

Detection Conditions:

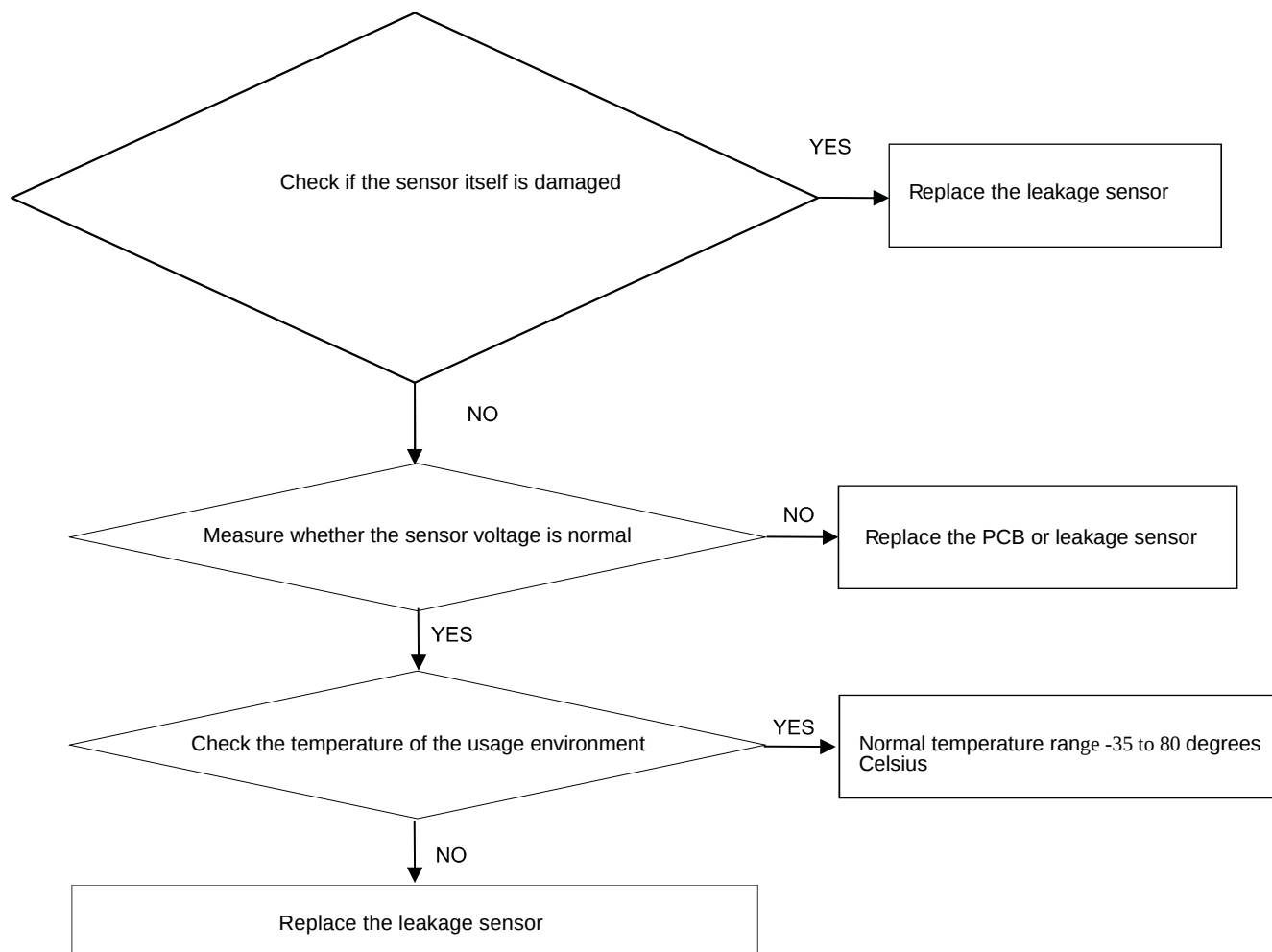
Leakage sensor self-test failed

Possible Causes:

- Power supply overvoltage and undervoltage (5VDC)
- The temperature value detected by the leakage sensor exceeds the limit value
- Internal sensor error

* Caution

Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.



Error Codes (Indoor)**AE****Leakage Sensor Reaching-End-of-Life Warning****Detection Conditions:**

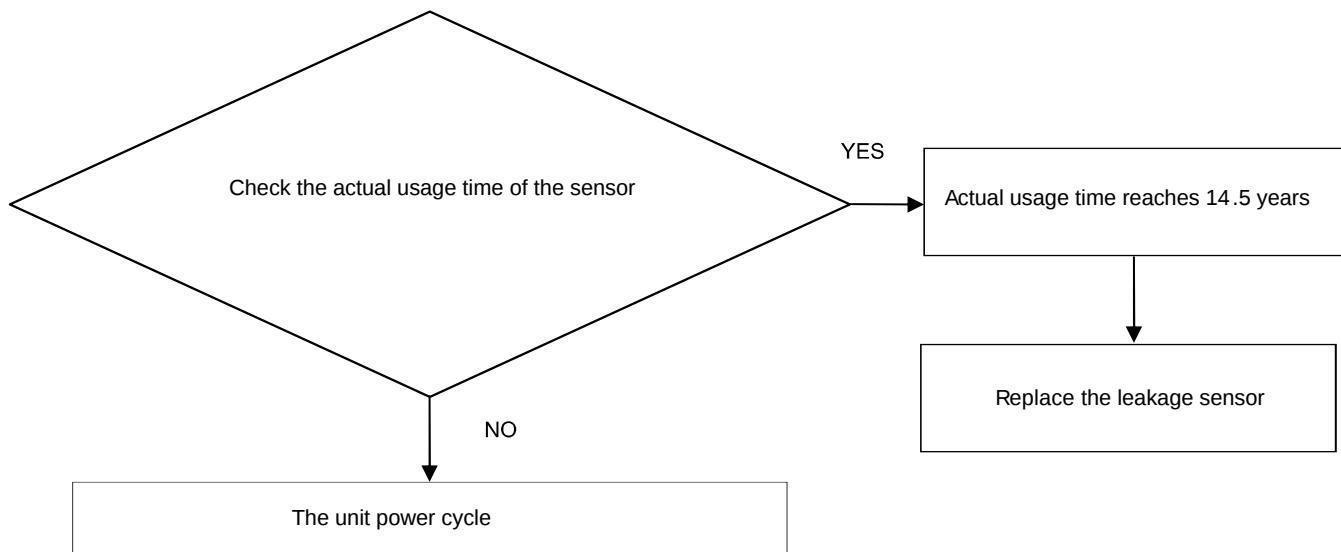
The sensor is 6 months away from the end of its life

Possible Causes:

- The sensor approaching the end of life
- End of life counting error of sensor

*** Caution**

Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.



Error Codes (Indoor)

AF

Leakage Sensor End- Of- Life

Detection Conditions:

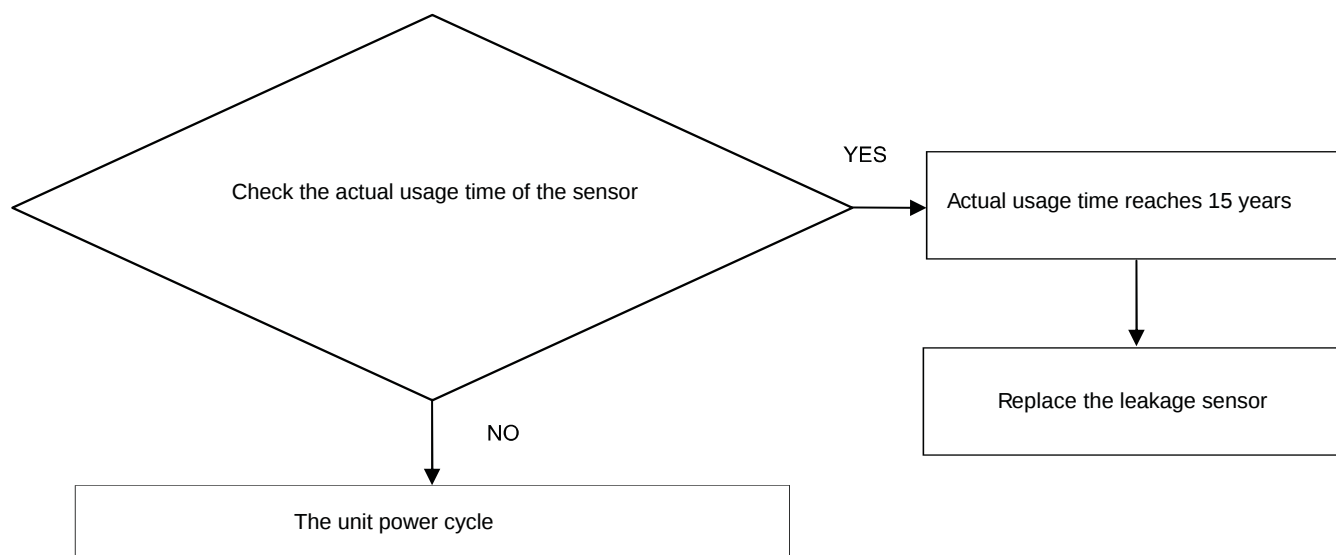
The sensors have reached the end of life

Possible Causes:

- The sensor approaching the end of life
- End of life counting error of sensor

* Caution

Be sure to turn off power switch before connect or disconnect connector, or else parts damage may be occurred.



SENSOR RESISTANCE VALUES

Abbr.	Definition	Type
tAo	Temperature of outdoor ambient	10K
tc	Temperature of outdoor condenser	10K
td	Temperature of outdoor discharge	50K
tE	Temperature of outdoor defrost	10K
tS	Temperature of outdoor suction	10K
tdr	Temperature of compressor driver module	10K
ldr	Current of the compressor	10K

Abbr.	Definition	Type
tAi	Temperature of indoor ambient	10K
TCi	Temperature of indoor condenser	10K
Toci	Hot Gas Leaving the 4-Way Valve	10K
Tc2	EEV Liquid Sensor	10K
Tc1	EEV Gas Sensor	10K
Tm	Module Temp Sensor	10K
TAI	Temperature of indoor ambient (9K/12K Tempo & All CAC)	23K

10K Sensors: Ambient (all except ducted, cassette, and 9K-12K Tempo) suction, gas, defrost, and pipe sensors.

23K Sensors: Ambient sensors for ducted, cassette, and 9K-12K Tempo

50K Sensors: Discharge sensors

°F	°C	Normal (KΩ)		
		10K SENSORS	23K SENSORS	50K SENSORS
-22	-30	147.95	513.115	12061.74
-20.2	-29	139.56	478.894	11267.87
-18.4	-28	131.70	447.408	10531.37
-16.6	-27	124.34	418.379	9847.72
-14.8	-26	117.44	391.564	9212.81
-13	-25	110.96	366.751	8622.85
-11.2	-24	104.89	343.754	8074.38
-9.4	-23	99.19	322.407	7564.22
-7.6	-22	93.83	302.567	7089.47
-5.8	-21	88.80	284.105	6647.45
-4	-20	84.07	266.905	6235.71
-2.2	-19	79.62	250.866	5851.99
-0.4	-18	75.44	235.895	5494.21
1.4	-17	71.50	221.911	5160.46
3.2	-16	67.79	208.838	4849.00
5	-15	64.30	196.609	4558.19
6.8	-14	61.01	185.163	4286.55
8.6	-13	57.91	174.443	4032.71
10.4	-12	54.99	164.399	3795.39
12.2	-11	52.23	154.983	3573.43
14	-10	49.62	146.153	3365.73
15.8	-9	47.17	137.87	3171.31
17.6	-8	44.85	130.096	2989.25
19.4	-7	42.65	122.799	2818.67
21.2	-6	40.58	115.946	2658.81
23	-5	38.62	109.51	2508.91
24.8	-4	36.77	103.462	2368.32
26.6	-3	35.01	97.779	2236.39
28.4	-2	33.36	92.437	2112.55
30.2	-1	31.78	87.415	1996.25
32	0	30.30	82.691	1887.00
33.8	1	28.89	78.248	1784.33
35.6	2	27.55	74.067	1687.81
37.4	3	26.29	70.133	1597.04
39.2	4	25.09	66.43	1511.65
41	5	23.95	62.943	1431.28
42.8	6	22.87	59.659	1355.62
44.6	7	21.84	56.566	1284.36
46.4	8	20.87	53.651	1217.23
48.2	9	19.94	50.904	1153.96
50	10	19.06	48.314	1094.32
51.8	11	18.23	45.872	1038.07
53.6	12	17.43	43.569	985.01
55.4	13	16.68	41.395	934.94
57.2	14	15.96	39.343	887.68
59	15	15.28	37.406	843.05
60.8	16	14.63	35.577	800.89
62.6	17	14.01	33.848	761.06
64.4	18	13.42	32.215	723.41
66.2	19	12.86	30.671	687.82
68	20	12.32	29.21	654.16
69.8	21	11.81	27.828	622.32
71.6	22	11.33	26.521	592.18
73.4	23	10.86	25.283	563.66
75.2	24	10.42	24.111	536.65
77	25	10.00	23	511.08
78.8	26	9.60	21.947	486.94
80.6	27	9.21	20.949	464.05

°F	°C	Normal (KΩ)		
		10K SENSORS	23K SENSORS	50K SENSORS
82.4	28	8.85	20.003	442.35
84.2	29	8.50	19.104	421.77
86	30	8.16	18.252	402.24
87.8	31	7.84	17.442	383.72
89.6	32	7.54	16.674	366.13
91.4	33	7.25	15.943	349.43
93.2	34	6.97	15.249	333.58
95	35	6.70	14.588	318.52
96.8	36	6.45	13.96	304.22
98.6	37	6.20	13.362	290.62
100.4	38	5.97	12.794	277.70
102.2	39	5.75	12.252	265.41
104	40	5.53	11.736	253.73
105.8	41	5.33	11.244	242.62
107.6	42	5.13	10.776	232.04
109.4	43	4.94	10.329	221.98
111.2	44	4.76	9.904	212.41
113	45	4.59	9.497	203.29
114.8	46	4.43	9.11	194.61
116.6	47	4.27	8.74	186.34
118.4	48	4.11	8.387	178.46
120.2	49	3.97	8.05	170.95
122	50	3.83	7.728	163.80
123.8	51	3.69	7.421	156.97
125.6	52	3.57	7.127	150.47
127.4	53	3.44	6.846	144.26
129.2	54	3.32		138.35
131	55	3.21		132.70
132.8	56	3.10		127.31
134.6	57	2.99		122.16
136.4	58	2.89		117.25
138.2	59	2.79		112.56
140	60	2.70		108.08
141.8	61	2.61		103.80
143.6	62	2.52		99.70
145.4	63	2.44		95.79
147.2	64	2.36		92.06
149	65	2.28		88.48
150.8	66	2.21		85.06
152.6	67	2.14		81.79
154.4	68	2.07		78.66
156.2	69	2.00		75.67
158	70	1.94		72.80
159.8	71	1.88		70.06
161.6	72	1.82		67.43
163.4	73	1.76		64.91
165.2	74	1.71		62.50
167	75	1.65		60.19
168.8	76	1.60		57.98
170.6	77	1.55		55.86
172.4	78	1.51		53.82
174.2	79	1.46		51.87
176	80	1.41		50.00
177.8	81	1.37		48.21
179.6	82	1.33		46.48
181.4	83	1.29		44.83
183.2	84	1.25		43.25
185	85	1.22		41.72

°F	°C	Normal (KΩ)		
		10K SENSORS	23K SENSORS	50K SENSORS
186.8	86	1.18		40.26
188.6	87	1.14		38.85
190.4	88	1.11		37.50
192.2	89	1.08		36.21
194	90	1.05		34.96
195.8	91	1.02		33.77
197.6	92	0.99		32.62
199.4	93	0.96		31.51
201.2	94	0.93		30.45
203	95	0.91		29.42
204.8	96	0.88		28.44
206.6	97	0.86		27.50
208.4	98	0.83		26.59
210.2	99	0.81		25.71
212	100	0.79		24.87
213.8	101	0.76		24.06
215.6	102	0.74		23.28
217.4	103	0.72		22.52
219.2	104	0.70		21.80
221	105	0.68		21.10
222.8	106	0.67		20.43
224.6	107	0.65		19.78
226.4	108	0.63		19.16
228.2	109	0.61		18.56
230	110	0.60		17.98
231.8	111	0.58		17.42
233.6	112	0.57		16.88
235.4	113	0.55		16.36
237.2	114	0.54		15.85
239	115	0.52		15.37
240.8	116	0.51		14.90
242.6	117	0.50		14.45
244.4	118	0.48		14.01
246.2	119	0.47		13.59
248	120	0.46		13.19
249.8	121			12.80
251.6	122			12.42
253.4	123			12.05
255.2	124			11.70
257	125			11.35
258.8	126			11.02
260.6	127			10.70
262.4	128			10.40
264.2	129			10.10
266	130			9.81
267.8	131			9.53
269.6	132			9.26
271.4	133			9.00
273.2	134			8.74
275	135			8.50
276.8	136			8.26
278.6	137			8.03
280.4	138			7.81
282.2	139			7.60
284	140			7.39



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