SERVICE MANUAL

Hotpoint®

Single Zone
Ductless Split Systems

Cooling Only:

1H12HN2CAA1 / HW12HN2CAA1

1H18HN2CAA1 / HW18HN2CAA1

1H24HN2CAA1 / HW24HN2CAA1

Heat Pump:

1H09HN2DAA1 / HW09HN2DAA1

1H12HN2DAA1 / HW12HN2DAA1

1H18HN2DAA1 / HW18HN2DAA1

1H24HN2DAA1 / HW24HN2DAA1

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.

GE APPLIANCES a Haier company

AIR&WATER SOLUTIONS

31-5000931 Rev. 1 07-25

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Revision History

06/24 - Edition release.
07/25 - 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 lose, 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 (R32), 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.

NOTE

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

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COOLING-ONLY MODELS

Compressor Type:
DC Inverter Driven Rotary

Voltage/Cycle/Phase:
208-230/60/1

WIFI
Built-in WiFi

		12K	18K	24K
	Outdoor Unit	**1H12HN2CAA**	**1H18HN2CAA**	**1H24HN2CAA**
	UPC	**084691949534**	**084691949558**	**084691949572**
	Indoor Unit	**HW12HN2CAA**	**HW18HN2CAA**	**HW24HN2CAA**
	UPC	**084691949541**	**084691949565**	**084691949589**
Cooling	Rated Capacity Btu/hr	12,000	18,000	24,000
	Capacity Range Btu/hr	33,00~13800	4,100~20,000	4,700~25,200
	SEER2	20.0	19.0	18.0
	EER2	12.0	12.0	10.6
	Moisture Removal Pt./hr	1.2	2.2	2.4
Operating Ranges	Cooling °F (°C)	14~115 °F (-10~46 °C)	14~115 °F (-10~46 °C)	14~115 °F (-10~46 °C)
Outdoor Unit	Maximum Fuse Size A	15	20	25
	Minimum Circuit Amp A	12	14	18
	Outdoor Noise Level dB	55	59	60
	Dimension: Height in (mm)	21 3/4 (553)	25 1/4 (642)	25 1/4 (642)
	Dimension: Width in (mm)	31 1/2 (800)	32 1/4 (820)	32 1/4 (820)
	Dimension: Depth in (mm)	11 (280)	12 (306)	12 (306)
	Carton Dimension: Height in (mm)	23 5/8 (600)	26 1/2 (673)	26 1/2 (673)
	Carton Dimension: Width in (mm)	36 (914)	36 5/8 (930)	36 5/8 (930)
	Carton Dimension: Depth in (mm)	15 7/16 (392)	14 13/16 (377)	14 13/16 (377)
	Weight Ship/Net - lbs (kg)	83.11/70.55 (37.7/32.0)	96.78/84.22 (43.9/38.2)	99.87/87.30 (45.3/39.6)
Indoor Unit	Fan Speed Stages	5 + Auto	5 + Auto	5 + Auto
	Indoor Sound Level dB (Turbo/High/Med/Low/Quiet)	46/44/39/33/29	49/46/43/40/31	52/49/46/43/38
	Dimension: Height in (mm)	11 (292)	12 1/8 (307)	13 5/8 (345)
	Dimension: Width in (mm)	31 3/4 (805)	34 1/2 (875)	43 1/2 (1105)
	Dimension: Depth in (mm)	7 7/8 (200)	8 1/2 (217)	9 1/2 (240)
	Carton Dimension: Height in (mm)	10 (254)	11 (278)	12 5/16 (313)
	Carton Dimension: Width in (mm)	33 7/8 (861)	36 5/8 (930)	46 1/16 (1170)
	Carton Dimension: Depth in (mm)	13 3/4 (350)	14 3/4 (375)	16 1/4 (413)
	Weight Ship/Net - lbs (kg)	24.47/18.74(11.1/8.5)	28.22/21.83(12.8/9.9)	41.67/32.63(18.9/14.8)
Refrigerant Lines	Connections	Flare	Flare	Flare
	Liquid O.D. in	1/4	1/4	1/4
	Suction O.D. in	3/8	1/2	1/2
	R32 Factory Charge Oz	25.75	38.8	45.86
	Maximum Line Length Ft/m	66/20	83/25	83/25
	Maximum Height Ft/m	33/10	50/15	50/15

ENGLISH

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HEAT PUMP MODELS

Compressor Type:
DC Inverter Driven Rotary

Voltage/Cycle/Phase:
208-230/60/1

WIFI
Built-in WiFi

		09K	12K	18K	24K
	Outdoor Unit	**1H09HN2DAA**	**1H12HN2DAA**	**1H18HN2DAA**	**1H24HN2DAA**
	UPC	**084691944430**	**084691949473**	**084691949497**	**084691949510**
	Indoor Unit	**HW09HN2DAA**	**HW12HN2DAA**	**HW18HN2DAA**	**HW24HN2DAA**
	UPC	**084691949466**	**084691949480**	**084691949503**	**084691949527**
Cooling	Rated Capacity Btu/hr	9,000	12,000	18,000	24,000
	Capacity Range Btu/hr	3,100~11,000	3,300~13,800	4,100~20,000	4,700~25,200
	SEER2	18.0	18.0	18.0	18.0
	EER2	12.0	12.0	12.0	10.6
	Moisture Removal Pt./hr	1.0	1.2	2.2	2.4
Heating	Heating Capacity Range Btu/hr	2,100~11,000	2,800~13,300	3,800~20,000	4,300~25,600
	Rated Heating Capacity 47°F Btu/hr	10,000	13,000	19,000	25,000
	COP @ 47°F	3.7	3.5	3.1	3.0
	Max. Heating Capacity 5°F Btu/hr	7,000	9,100	13,300	17,500
	COP @ 5°F	1.8	1.8	1.8	1.8
	HSPF2 (IV)/HSPF2 (V)	9.5/7.2	9.5/7.1	9.5/7.2	9.5/7.1
Operating Ranges	Cooling °F (°C)	14~115 °F (-10~46 °C)	14~115 °F (-10~46 °C)	14~115 °F (-10~46 °C)	14~115 °F (-10~46 °C)
	Heating °F(°C)	-15~75 °F (-26~24 °C)	-15~75 °F (-26~24 °C)	-15~75 °F (-26~24 °C)	-15~75 °F (-26~24 °C)
Outdoor Unit	Maximum Fuse Size A	15	15	20	25
	Minimum Circuit Amp A	12	12	14	18
	Outdoor Noise Level dB	55	55	59	60
	Dimension: Height in (mm)	21 3/4 (553)	21 3/4 (553)	25 1/4 (642)	25 1/4 (642)
	Dimension: Width in (mm)	31 1/2 (800)	31 1/2 (800)	32 1/4 (820)	32 1/4 (820)
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	Carton Dimension: Depth in (mm)	15 7/16 (392)	15 7/16 (392)	14 13/16 (377)	14 13/16 (377)
	Weight Ship/Net - lbs (kg)	80.47/67.9 (36.5/30.8)	80.47/67.9 (36.5/30.8)	93.26/80.69 (42.3/36.6)	96.34/83.78 (43.7/38)
Indoor Unit	Fan Speed Stages	5 + Auto	5 + Auto	5 + Auto	5 + Auto
	Indoor Sound Level dB (Turbo/High/Med/Low/Quiet)	45/43/38/32/28	46/44/39/33/29	49/46/43/40/31	52/49/46/43/38
	Dimension: Height in (mm)	11(292)	11 (292)	12 1/8 (307)	13 5/8 (345)
	Dimension: Width in (mm)	31 3/4 (805)	31 3/4 (805)	34 1/2 (875)	43 1/2 (1105)
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	Carton Dimension: Width in (mm)	33 7/8 (861)	33 7/8 (861)	36 5/8 (930)	46 1/16 (1170)
	Carton Dimension: Depth in (mm)	13 3/4 (350)	13 3/4 (350)	14 3/4 (375)	16 1/4 (413)
	Weight Ship/Net - lbs (kg)	24.47/18.74(11.1/8.5)	24.47/18.74(11.1/8.5)	28.22/21.83(12.8/9.9)	41.67/32.63(18.9/14.8)
Refrigerant Lines	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
	R32 Factory Charge Oz	25.75	25.75	38.8	45.86
	Maximum Line Length Ft/m	66/20	66/20	83/25	83/25
	Maximum Height Ft/m	33/10	33/10	50/15	50/15

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 R32 refrigerant and PVE oil. The outdoor units are 208/230 volt rated systems. They come factory charged for up to 25 ft. of interconnecting piping.

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 14~115 °F in cooling mode and -15~75 °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 and 4. A splice in these wires may cause the system to lose communication between the indoor and outdoor units. The system will then display an error code E7.

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(N), 2(L), 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(N) and ground, and terminals 2(L) and ground should be 120 VAC. The voltage reading between terminals 1(N) and 2(L) should be 230 VAC.

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 60°F - 86°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 communicated 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. WARNING: Do not measure compressor voltages as damage to the meter may result.

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 60°F - 86°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.

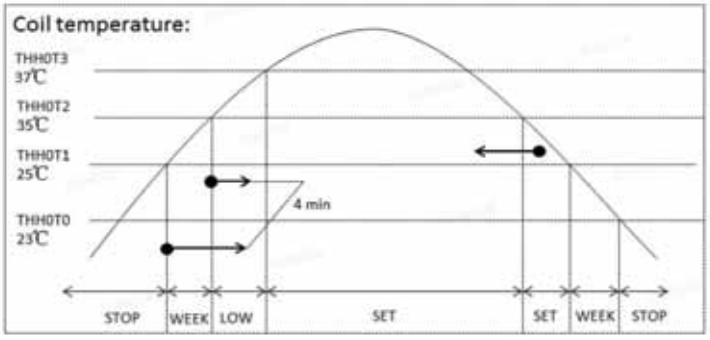
As the indoor ambient temperature falls, the change of fan speed follows the following temperature conditions:

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 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..

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:

1. 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;
2. Coil temperature between 25°C/ 77°F and 35°C/ 96°F fan speed is weak;
3. Coil temperature between 35°C/ 96°F and 37°C/ 100°F fan speed is weak;
4. Coil temperature is higher than 37°C/ 100°F, fan speed according to the set operation.
5. When the coil temperature drops, the fan speed is judged according to the hot cross temperature:
6. Coil temperature is higher than 35°C, fan speed according to the set operation.
7. Coil temperature between 35°C and 25°C fan speed is weak;
8. Coil temperature between 25°C and 23°C fan speed is weak;
9. The fan stops when the coil temperature is lower than 23°C;
10. Oil temperature is maintained in the interval:
11. The wind speed will automatically enter the low wind stage after 4 minutes in the weak interval, and the fan speed will run low;
12. After the fan speed is maintained in the low wind range for 4 minutes, it automatically enters the wind setting stage, and the wind speed runs to set the wind;
13. After the fan speed is set, it is necessary to run continuously for 4 minutes to set the wind speed, and then adjust the wind speed according to the coil temperature change;
14. Before setting the wind speed, the guide position is in a healthy blowing position.

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 I 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

When the running mode is turned to automation after starting the system, the system will first determine the running mode according to the current room temperature and then will run according to the determined mode.

Tr = Room Temperature
Ts = Setpoint Temperature
Tp = Indoor Coil Pipe Temperature

- Tr > Ts-3°C Choose Cooling Mode
- Tr ≤ Ts-3°C Choose Heating Mode

After turning to the automation mode, the running mode can be switched between cooling mode, fan mode and heating mode according to the change of the indoor ambient temperature. But the automatic conversion between cooling mode and heating mode must be conducted after 15 minutes.

Dry Mode

Overview

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

Fan Speed	Ambient Indoor Air Temperature
Quiet	1.8°F and lower below setpoint
Low	Between 1.7°F below setpoint and 6.5°F above setpoint
Medium	Between 6.6°F and 10.1°F above setpoint
High	10.2°F and higher above setpoint

There will be a 3 minutes delay when the higher fan speed to lower fan speed.

There will no delay when the lower fan speed to higher fan speed.

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 sequence takes 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.

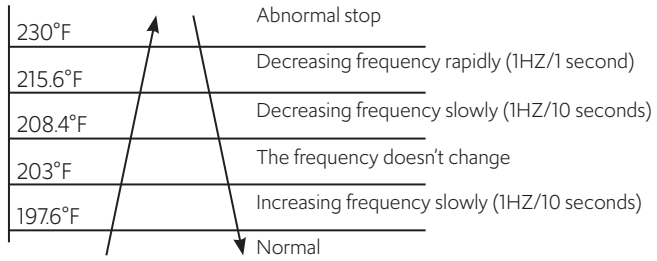
Protection Functions

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 >= 230 °F is sensed for 2 seconds, an exhaust overheating protection error code will be indicated at the outdoor unit.

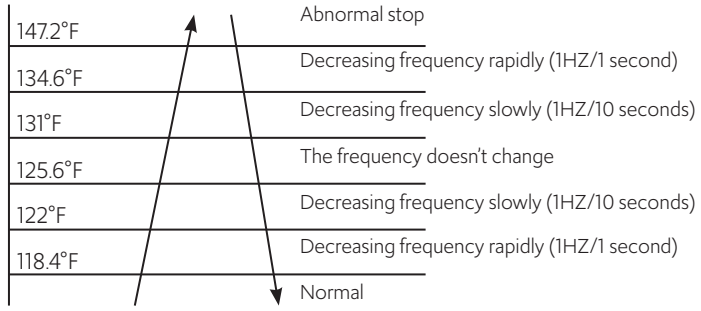
TTC



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:

TTC



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

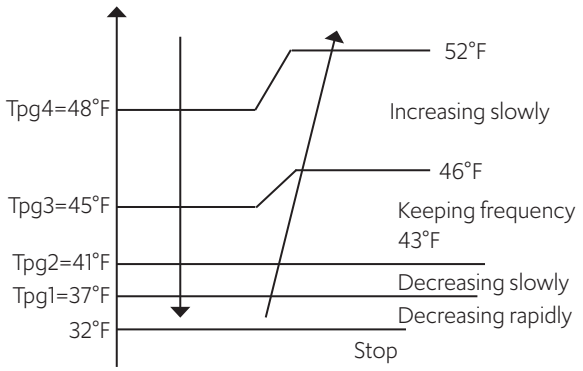
Indoor Coil Anti-Freeze Protection

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

Example: if Min(TCI_indoor, TCI_indoor + tS)/2) ≤ 32°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 Min(TCI_indoor, TCI_indoor + tS)/2) > 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. Refer to the chart below for the operating parameters.

Outdoor Temperature	Pan Heater
> 37°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°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.

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, Hear Unit will Beep 4 times to confirm.

Ambient temperature:

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

ECO Mode

Activate Eco mode by pressing the "ECO" button repeatedly as follows to select the desired Eco mode:

First Press: Level 3 Eco (Reduces some energy consumption). "L3" shown on indoor display.

Second Press: Level 2 Eco (Additional reduction in energy consumption). "L2" shown on indoor display.

Third Press: Level 1 Eco (Greatest reduction in energy consumption). "L1" shown on indoor display.

Note: ECO modes will reduce the compressor operation frequency and increase the time needed to reach temperature set point. To exit ECO mode, press the ECO Button a fourth time.

1H12HN2CAA1
1H18HN2CAA1
1H24HN2CAA1
1H09HN2DAA1
1H12HN2DAA1
1H18HN2DAA1
1H24HN2DAA1

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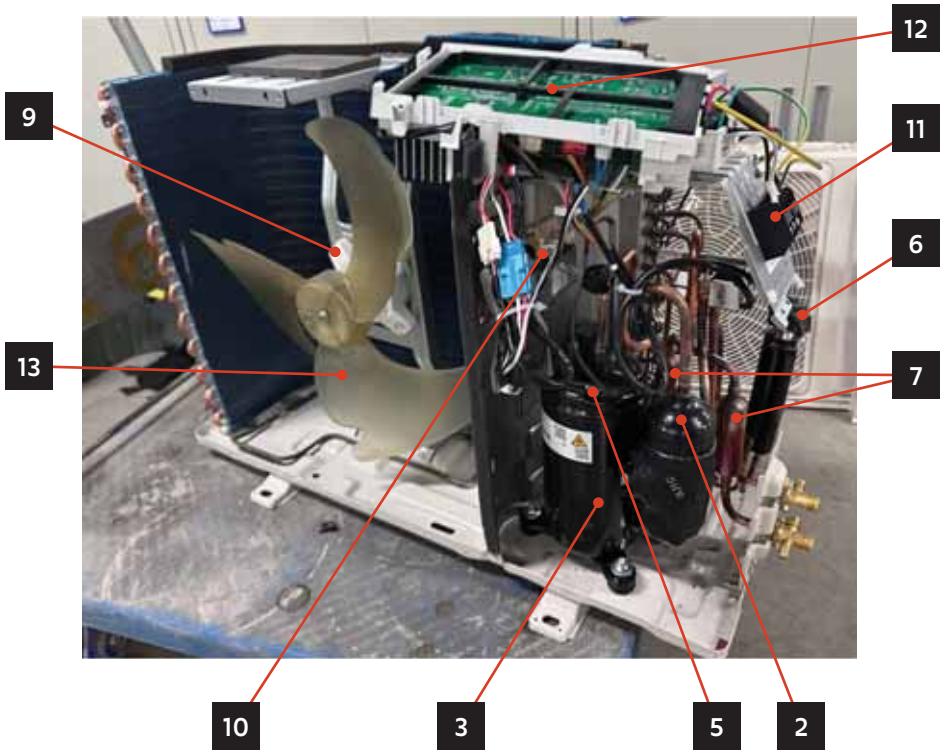
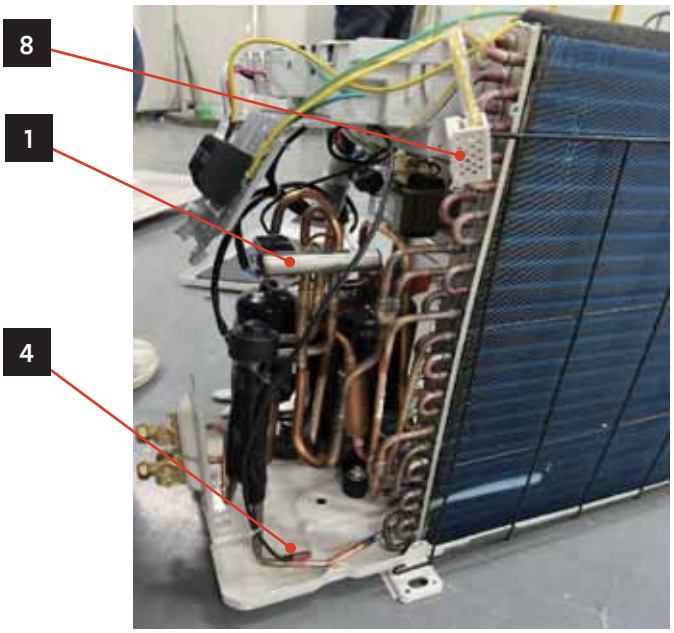
The outdoor unit has a PCB that integrates the control functions and power functions into one PCB. Sensors monitor key temperatures throughout the system to manage operational decisions.

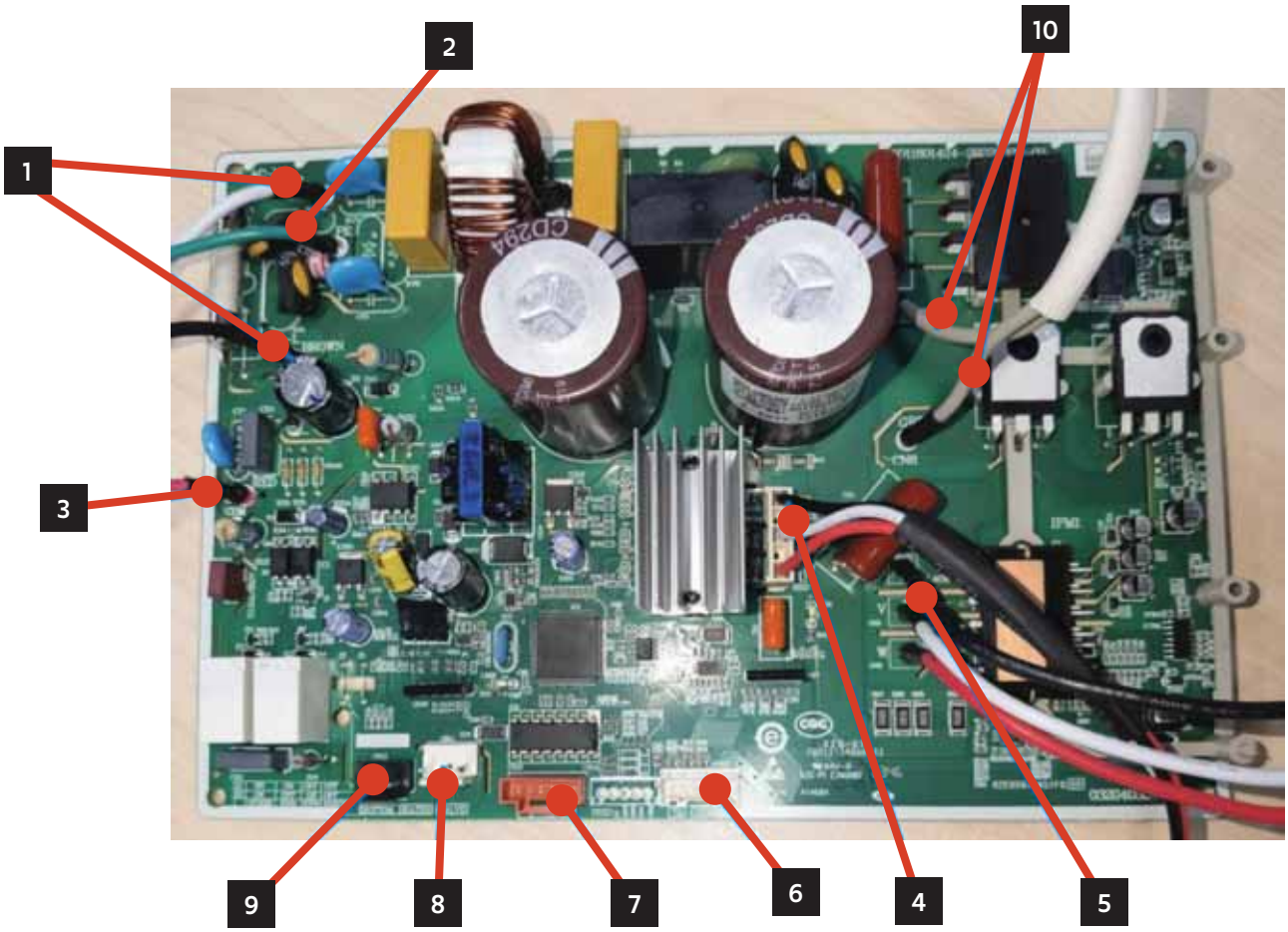
Outdoor Component Identification

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



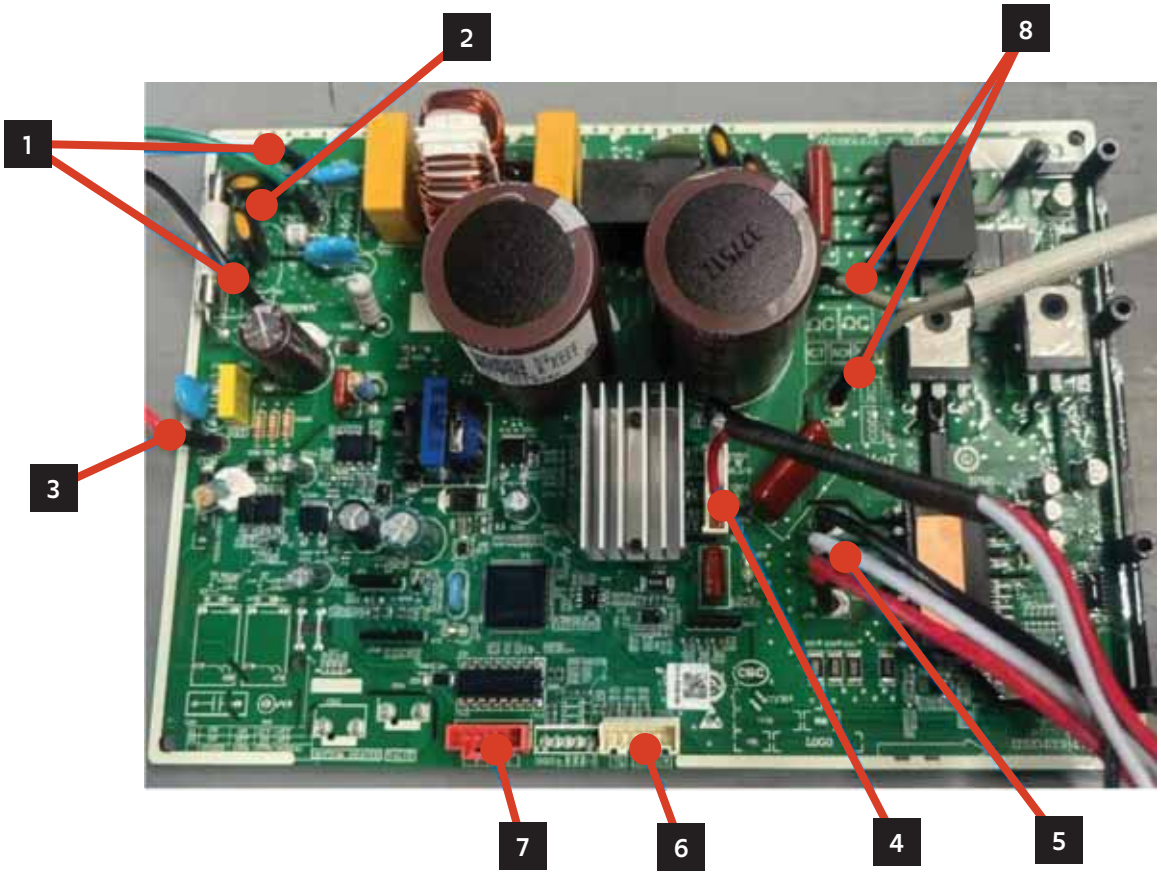


9K-12K Heat Pump Control Board



1. **CN1, CN2:** 230VAC power from terminal block connections 1(N) and 2(L)
2. **CN3:** 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. **CNS, CN6:** Connector for the reactor

9K-12K Cool Only Control Board



1 **CN1, CN2:** 230VAC power from terminal block connections 1(N) and 2(L)

2 **CN3:** Connector for GND

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

4 **CN10:** Connector for the fan motor

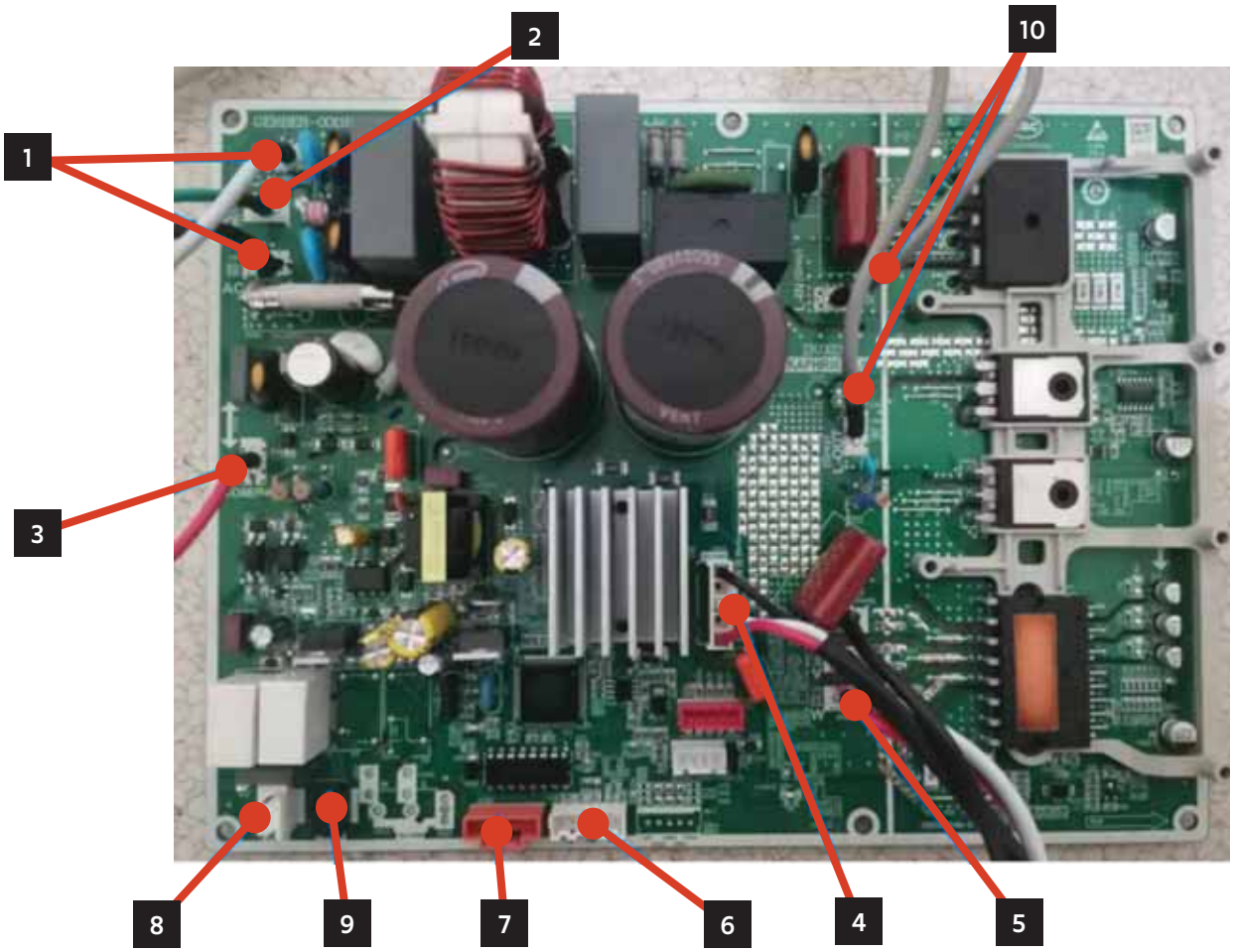
5 **CN7, CN8,CN9:** Compressor U, V, W connections

6 **CN15:** Connections for temperature sensors

7 **CN16:** Connector for the electronic expansion valve

8 **CN5, CN6:** Connector for the reactor

18K Control Board



1 **CN1, CN2:** 230VAC power from terminal block connections 1 (N) and 2(L)

2 **CN3:** 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 **CN 15:** Connections for temperature sensors

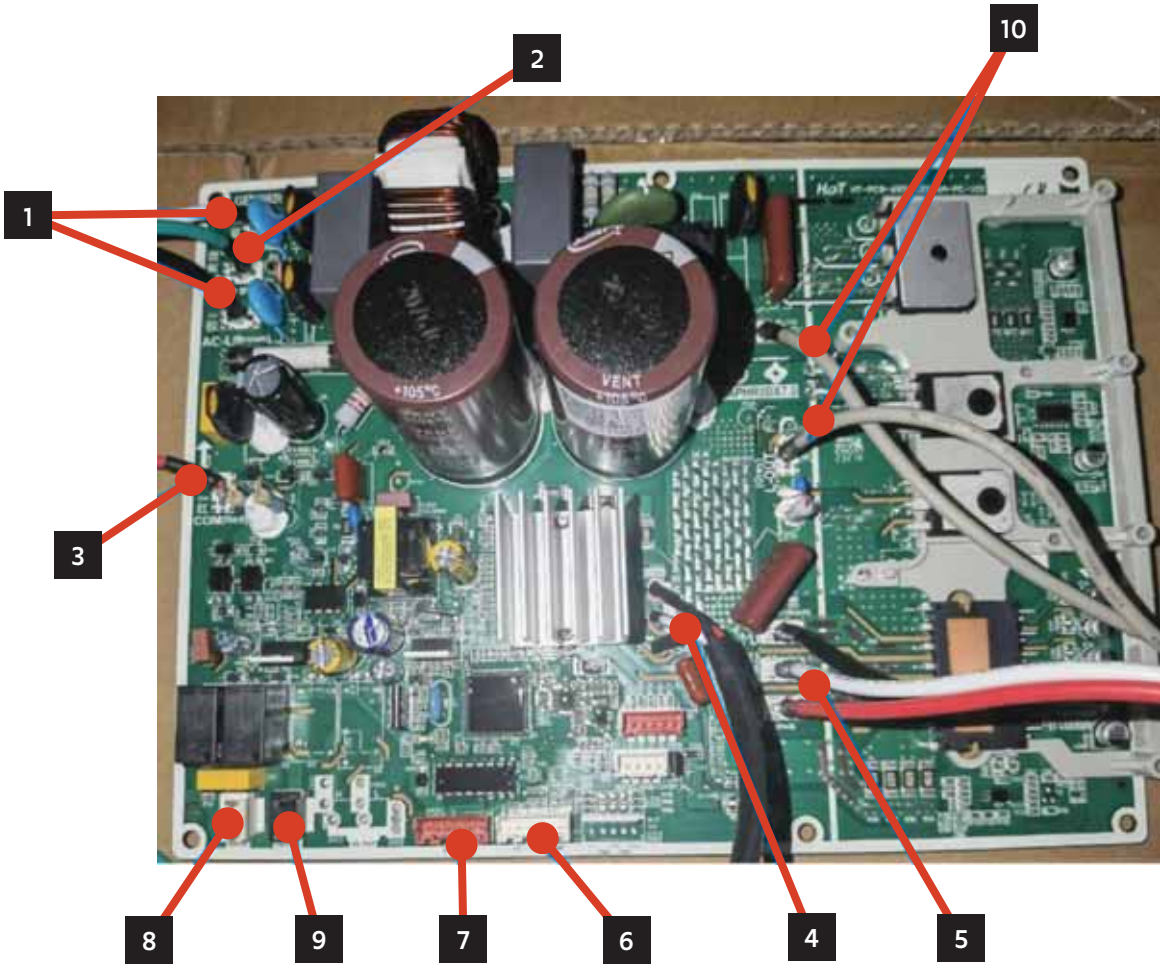
7 **CN16:** Connector for the electronic expansion valve

8 **CN11:** Connector for four way valve coil

9 **CN12:** Connector for the base pan heater

10 **CN5, CN6:** Connector for the reactor

24K Control Board



1 **CN1, CN2:** 230VAC power from terminal block connections 1(N) and 2(L)

2 **CN3:** 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

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.

Drain pumps with condensate safety switches should break the wire on terminal 2 to the indoor unit.

The indoor unit is also powered by the same electrical supply as the outdoor unit. Only 14-4 stranded copper wire is allowed connected to the wiring terminal 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.

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 1PM on terminal connections CN-7, CN-8 and C-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.

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 .

Fan Motor

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

In cool and dry mode, the indoor fan motor blows constantly when room set point is satisfied. In heat mode, the indoor fan motor will stop when room set point is satisfied.

Temperature Sensors

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

Discharge 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 Main 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 Main 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 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 Main 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 Suction Line 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 Main 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.

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.

Base Pan Heater

The Base Pan Heater is electrically connected to the Main Control Board at PLUG CN-12 and energized with 230 VAC.

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 DC Fan Motor

Step 1

Using needle probes, check the DCV at the back of the fan plug on the PCB. The values are:

- Red to black: +310 VDC
- White to black: +15 VDC
- Yellow to black: 1-4 VDC when running; 0 VDC when there is no call for heating or cooling
- Blue to black: pulsing 0-8 VDC when running; 14 VDC when there is no call for heating or cooling

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

The resistance values of plus pin combinations are 46 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.

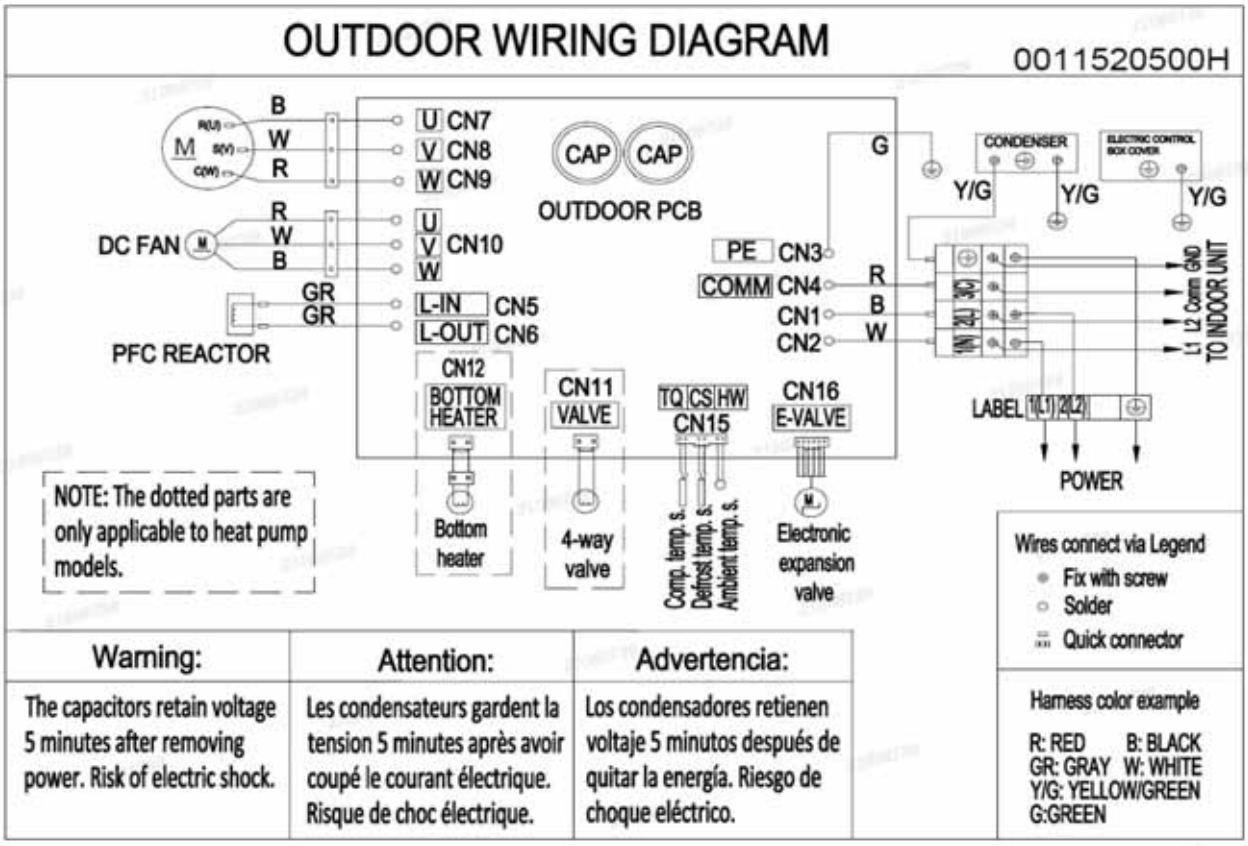
Step 3

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

Checking the Base Pan Heater

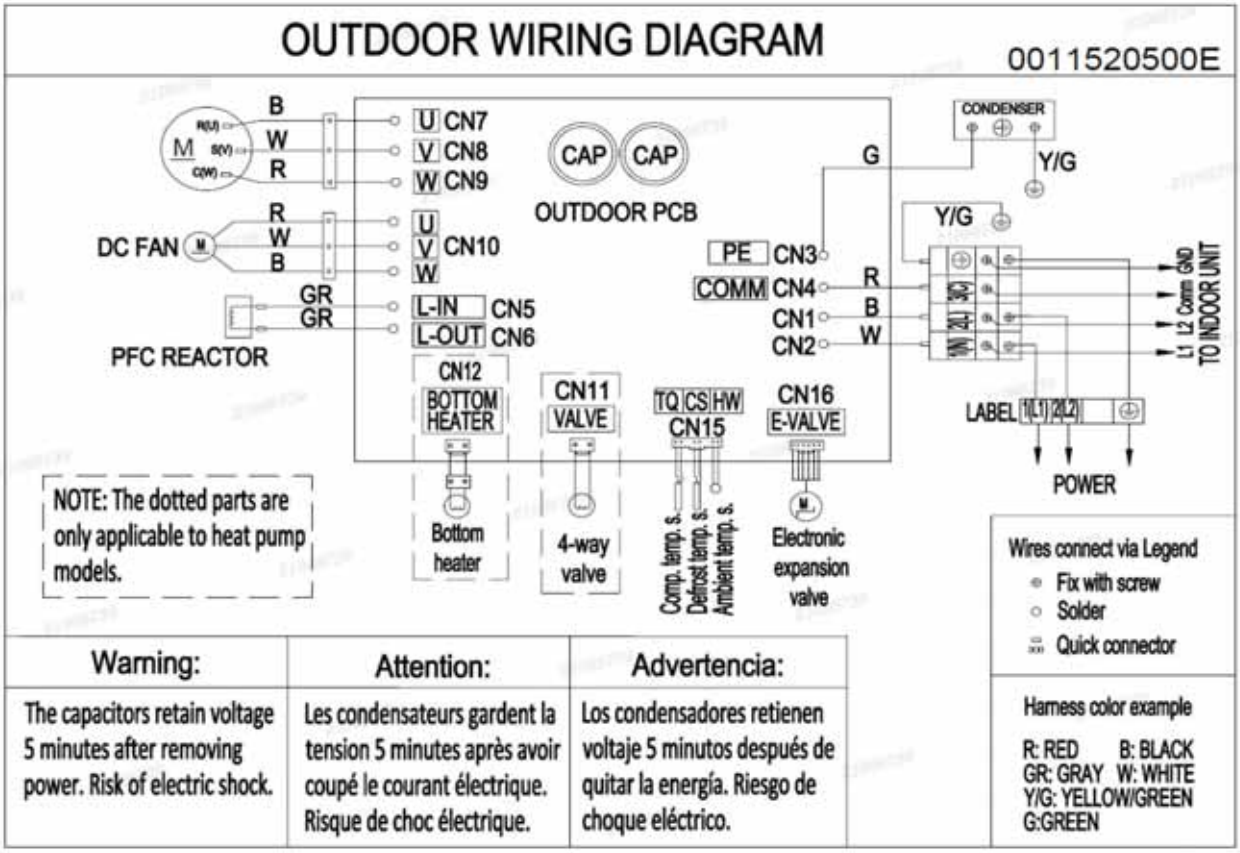
The resistance across the heater should be 100 to 500 ohms. Replace it if the value is significantly different, or if the heater reads open or shorted.

09-12K



Warning:	Attention:	Advertencia:
The capacitors retain voltage 5 minutes after removing power. Risk of electric shock.	Les condensateurs gardent la tension 5 minutes après avoir coupé le courant électrique. Risque de choc électrique.	Los condensadores retienen voltaje 5 minutos después de quitar la energía. Riesgo de choque eléctrico.

18-24K



Warning:	Attention:	Advertencia:
The capacitors retain voltage 5 minutes after removing power. Risk of electric shock.	Les condensateurs gardent la tension 5 minutes après avoir coupé le courant électrique. Risque de choc électrique.	Los condensadores retienen voltaje 5 minutos después de quitar la energía. Riesgo de choque eléctrico.

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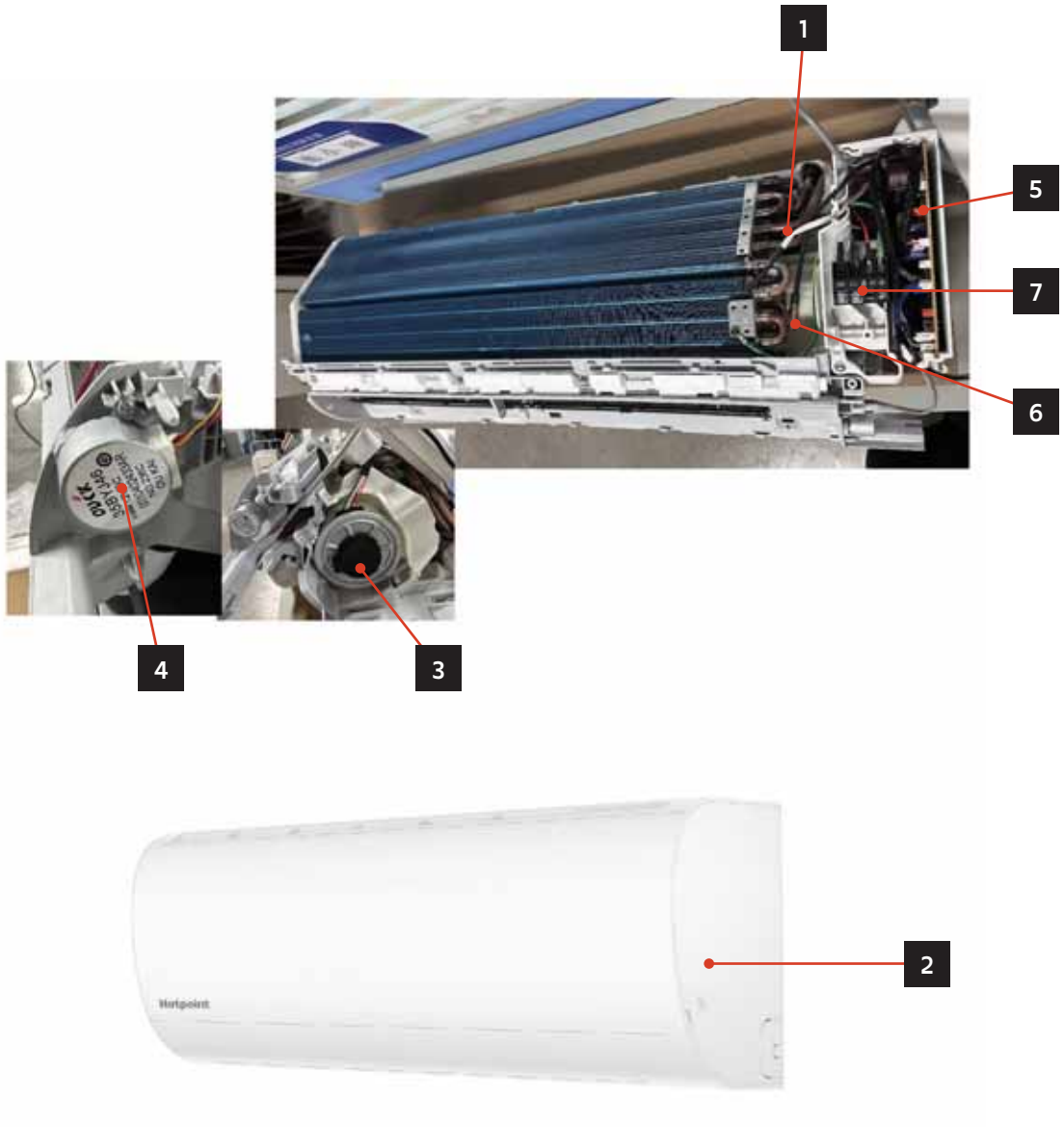
HW12HN2CAA1
HW18HN2CAA1
HW24HN2CAA1
HW09HN2DAA1
HW12HN2DAA1
HW18HN2DAA1
HW24HN2DAA1

TABLE OF CONTENTS

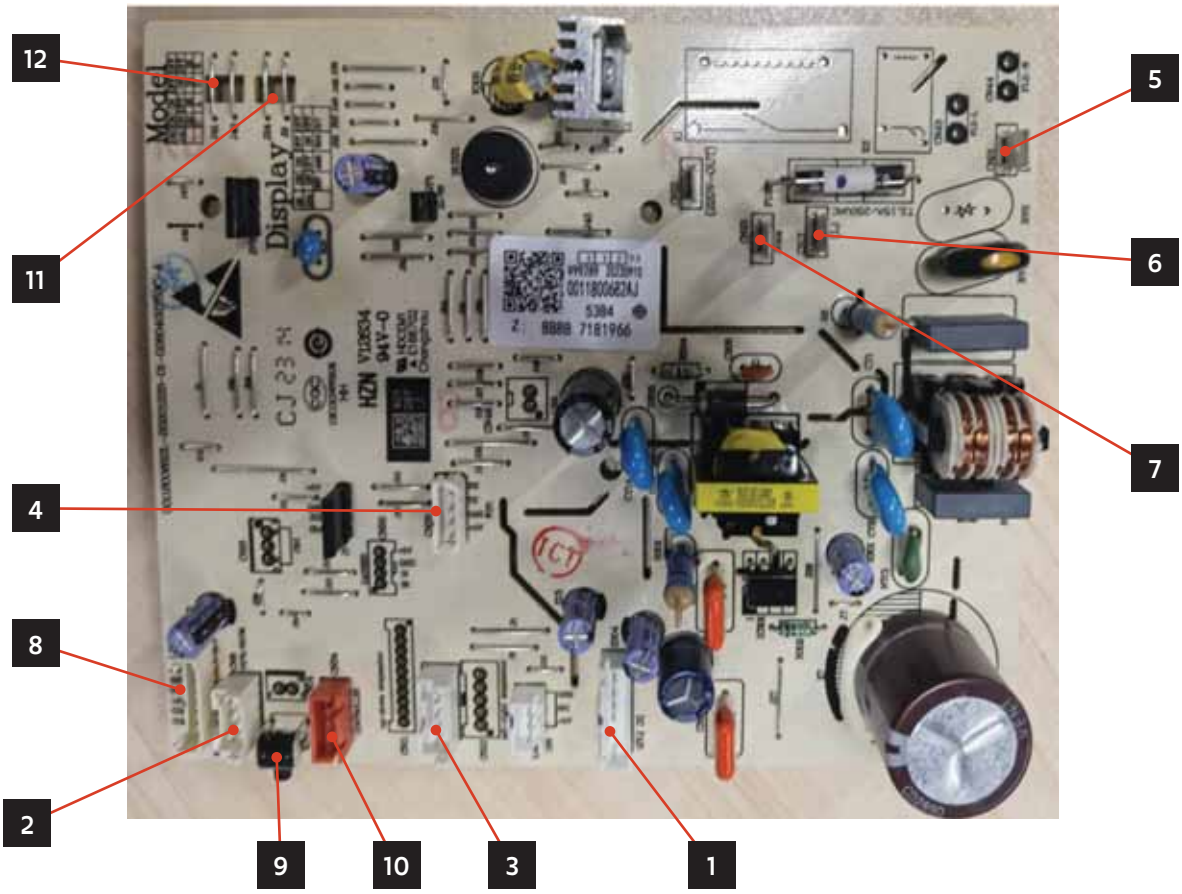
The indoor unit is mounted high on the wall to provide comfort and air movement within the conditioned space. Features of the system include: Variable speed blower operation that speeds up and slows down with changes in demand, moving louvers to direct air, indoor air temperature sensing, evaporator 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. PCB
6. Piping Temperature Sensor
7. Terminal Block

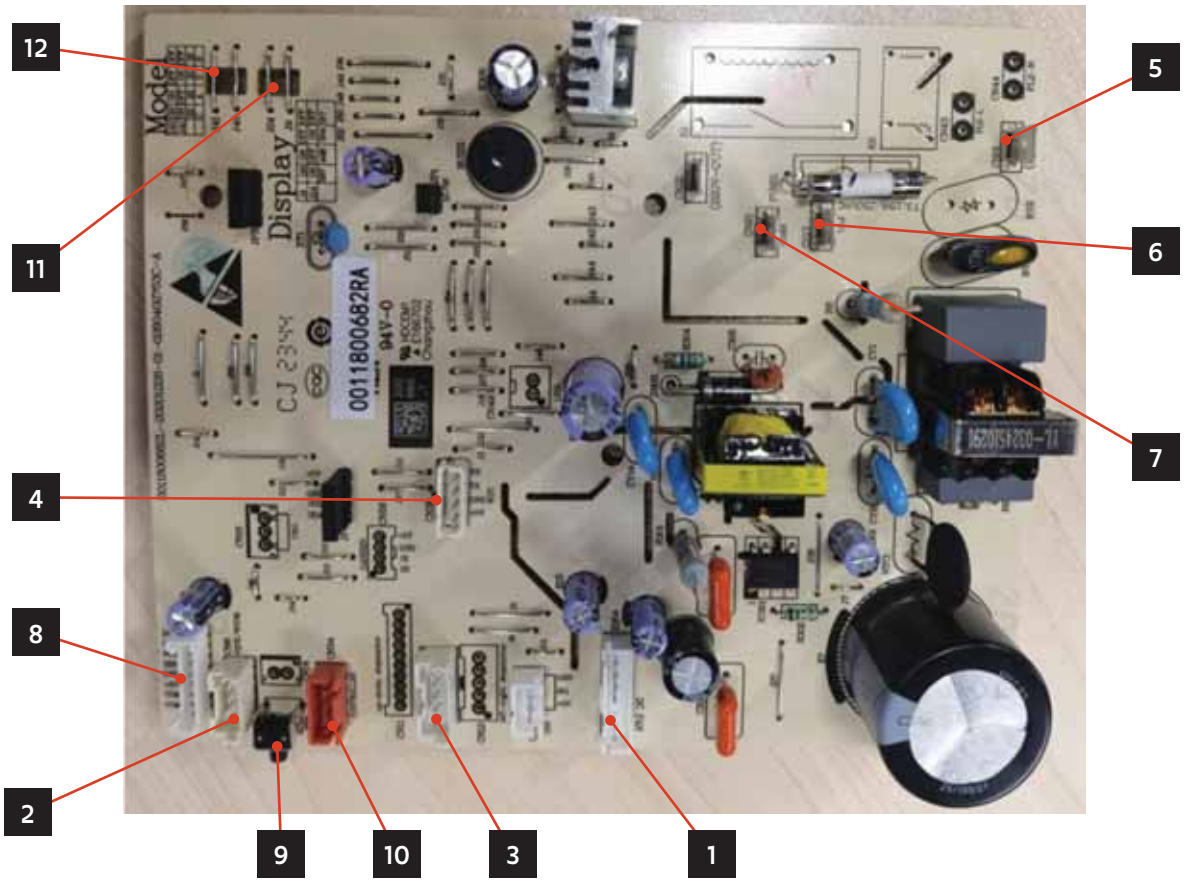


9K-12K PCB



1. **CN9:** Connector for fan motor
2. **CN6:** Connector for pipe temperature sensor and room temperature sensor
3. **CN11:** Connector for UP/DOWN STEP motor
4. **CN35:** Connector for WiFi module
5. **CN21:** Connector for power N
6. **CN 17:** Connector for power L
7. **CN23:** Communication connection between the PCB and the outdoor unit
8. **CN7:** Connector for display board
9. **CN14:** Connector for forced operation ON/ OFF switch
10. **CN34:** Connector for wired controller interface
11. **J40, J41:** Select A,B,C,D
12. **J9, J24:** Select model of the display board

18K-24K PCB



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10. **CN34:** Connector for wired controller interface
11. **J40, J41:** Select A,B,C,D
12. **J9, J24:** Select model of the display board

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.

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.

Display

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.

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-11

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.

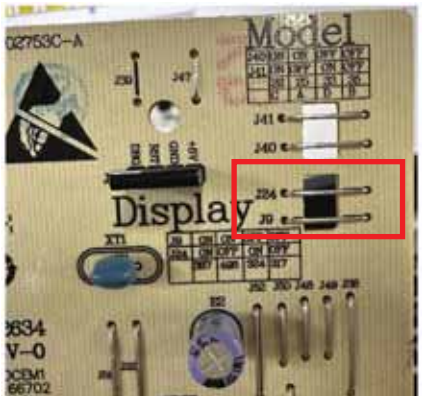
Emergency Button

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

Jumper Wire 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.



J40 and J41 Selects EEPROM codes A, B, C and D. Cut wires to match the model type listed below:

Cooling Only Models

	J40	J41
12K	Cut	Cut
18K	Keep	Cut
24K	Keep	Keep

Heat Pump Models

	J40	J41
9K	Keep	Cut
12K	Keep	Keep
18K	Cut	Cut
24K	Cut	Keep

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 Louver Stepper Motor

Step 1

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

Step 2

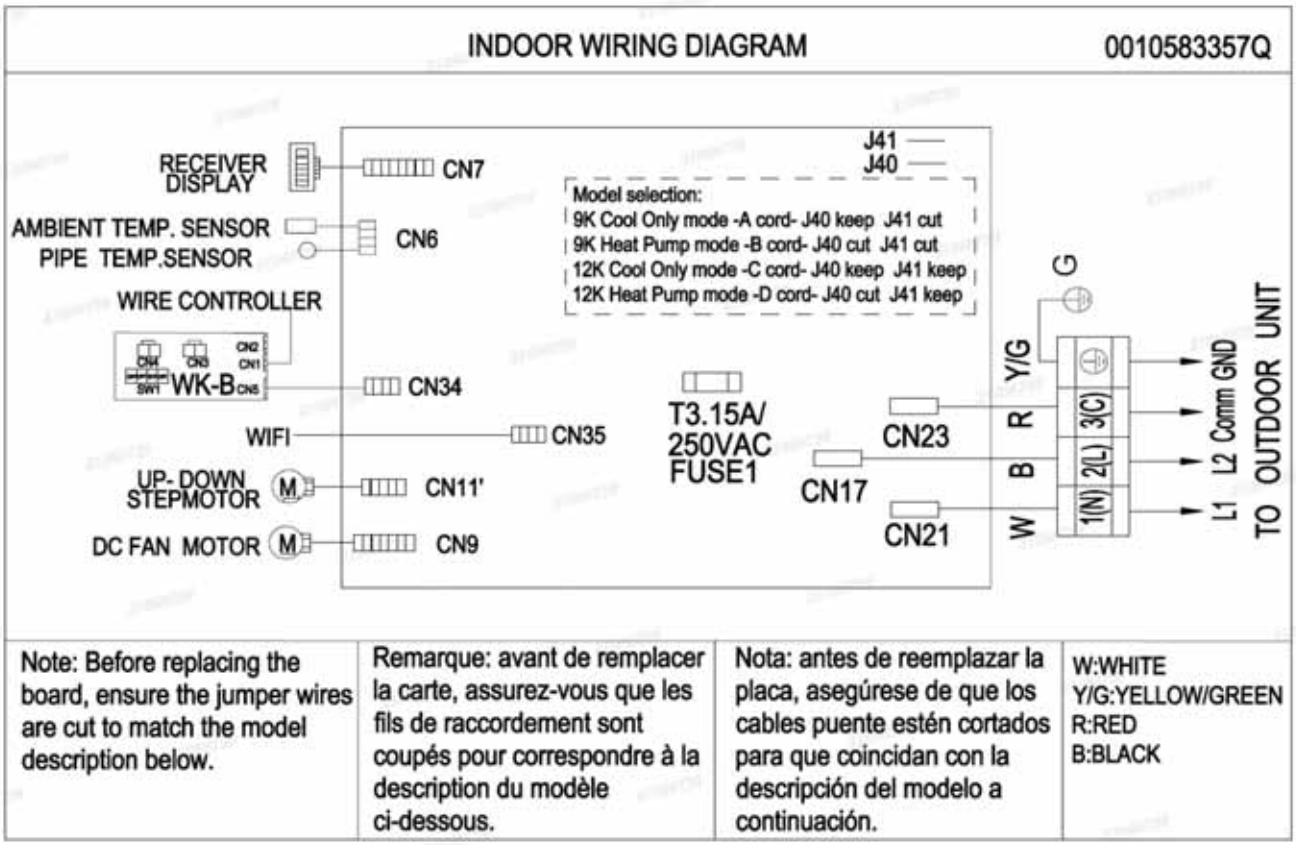
Refer to the chart shown below for plug pin combinations and resistance values (+/- 10%).

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

Step 3

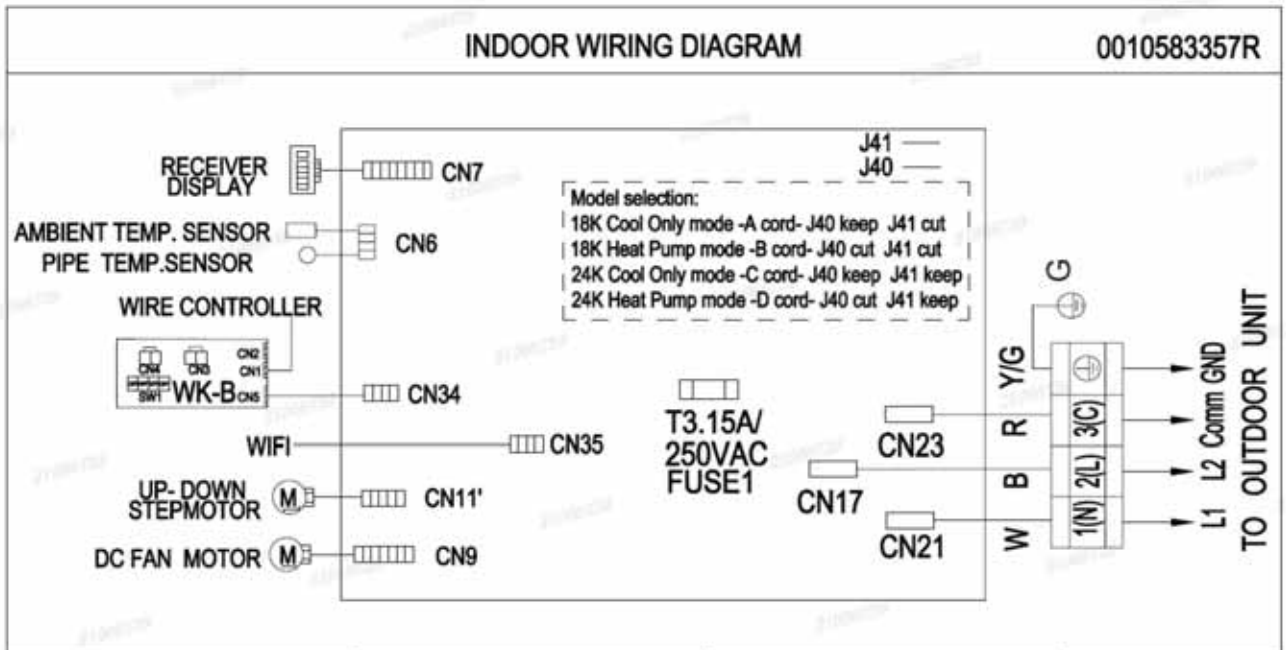
Re-seat the plug on the connector at the conclusion of the test.

09-12K



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

18-24K



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

TABLE OF CONTENTS

ERROR CODES

OUTDOOR UNITS	FAULT DESCRIPTION	INDOOR UNIT
LED DISPLAY		DIGITAL DISPLAY
1	OUTDOOR EEPROM FAILURE	F12
2	IPM OVERCURRENT OR SHORT CIRCUIT	F1
3	OUTDOOR ALTERNATING CURRENT, OVER CURRENT PROTECTION	F22
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
11	SUCTION TEMPERATURE SENSOR FAILURE	F7
12	AMBIENT TEMPERATURE SENSOR FAILURE	F6
13	DISCHARGE TEMPERATURE SENSOR FAILURE	F25
14	HIGH OUTDOOR SUCTION TEMPERATURE	F30
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
/	INDOOR AMBIENT TEMPERATURE SENSOR FAILURE	E1
/	INDOOR COIL TEMPERATURE SENSOR FAILURE	E2
/	INDOOR PCB EEPROM FAILURE	E4
/	INDOOR FAN MOTOR MALFUNCTION	E14

Error Codes (Indoor/Outdoor)

E1/LED1: No Flash
Room Temperature Sensor Failure

E2/LED1: No Flash
Indoor Coil Temperature Sensor Failure

LED1: 10 Flash
Defrost Temperature Sensor Failure

LED1: 11 Flash
Suction Temperature Sensor Failure

LED1: 12 Flash
Ambient Temperature Sensor Failure

LED1: 13 Flash
Discharge Temperature Sensor Failure

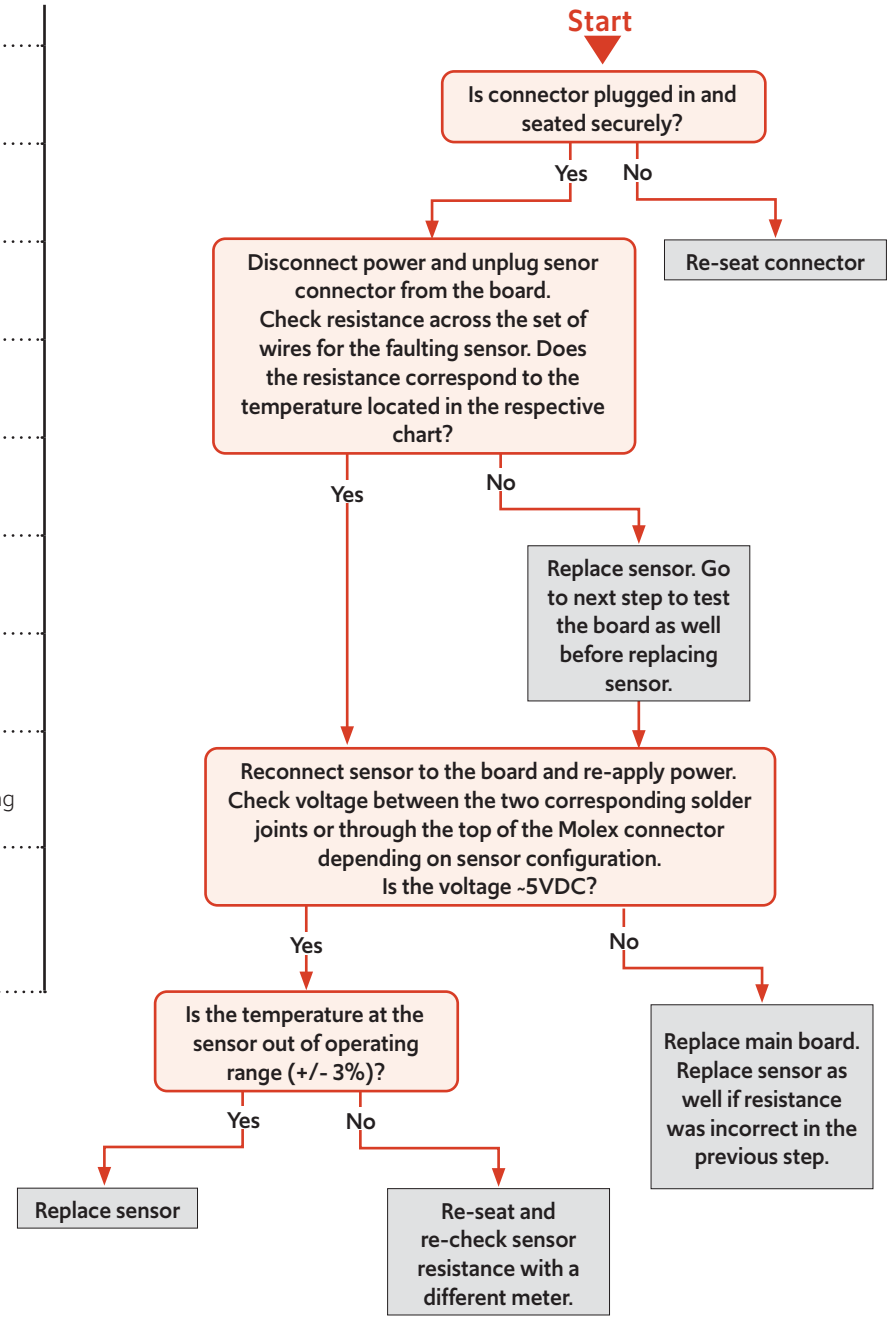
LED1: 14 Flash
Discharge Temperature Sensor Failure

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



Error Code (Indoor/Outdoor)

E4
Indoor EEPROM Error

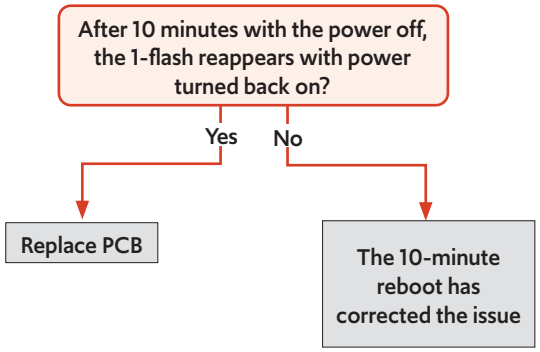
F12/ LED1: 1 Flash
Outdoor EEPROM Error

Detection Conditions:

- EEPROM data error or the EEPROM is damaged

Possible Causes:

- Faulty EEPROM data
- Faulty EEPROM
- Faulty PCB



Error Code (Indoor)

E14

Indoor Fan Motor Failure

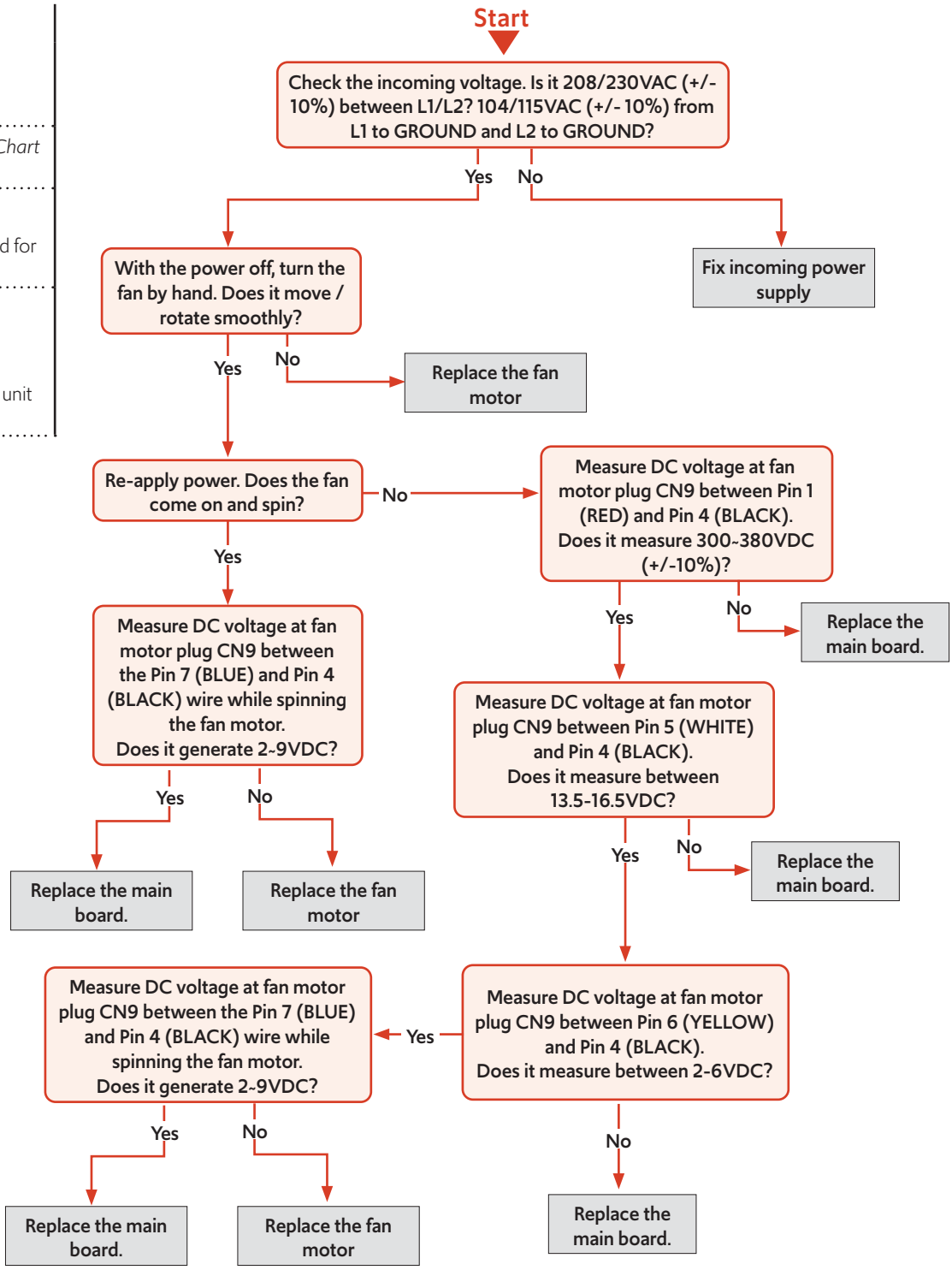
Complete the "Check This First" Flow Chart before continuing.

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 Code (Indoor/Outdoor)

F8/LED1: 9 Flash

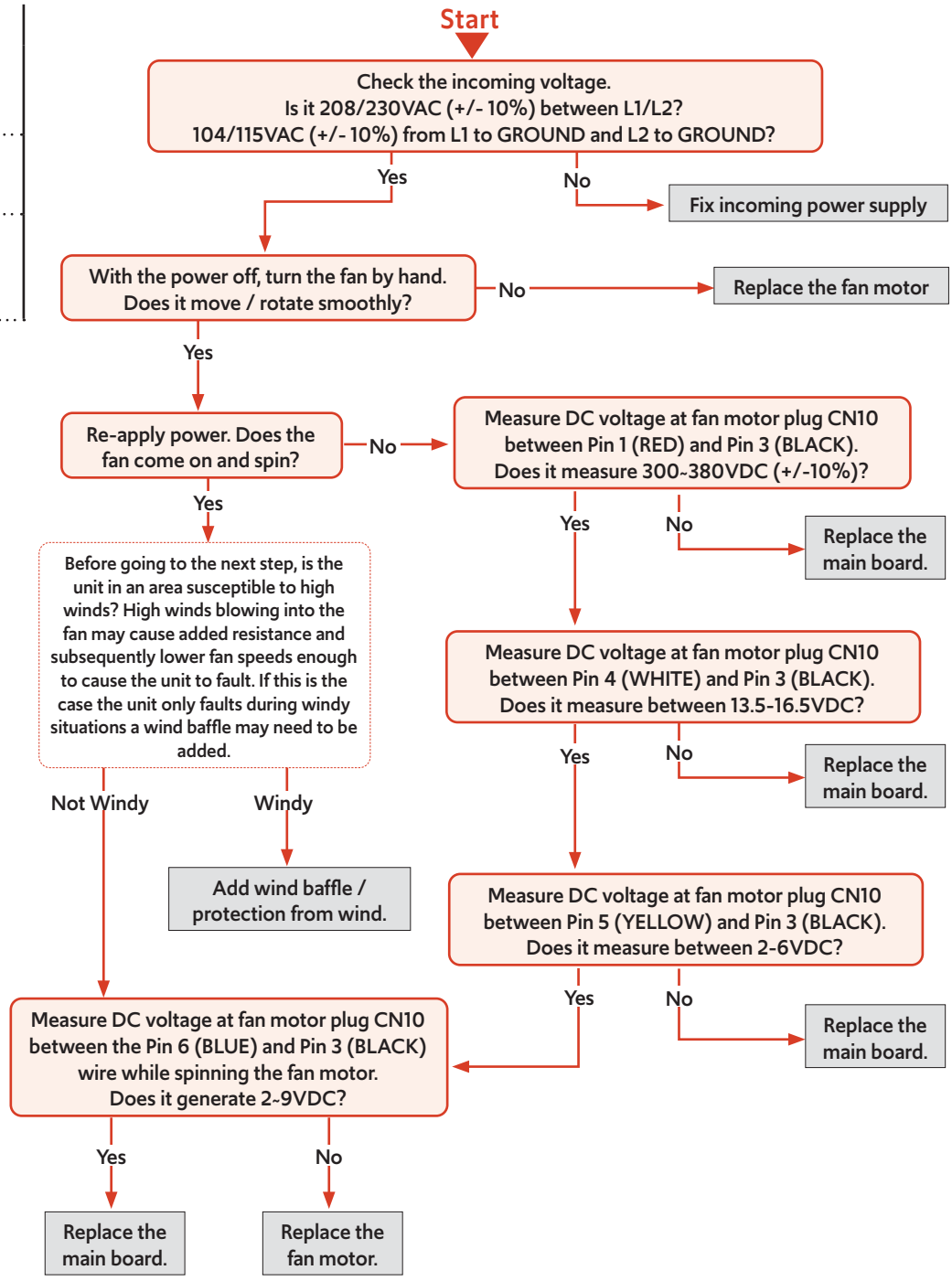
Outdoor DC Fan Motor Fault

Detection Conditions:

- High temperature, high pressure

Possible Causes:

- Faulty fan motor
- DC fan motor protection



Error Code (Indoor/Outdoor)

F1/LED1: 2 Flash

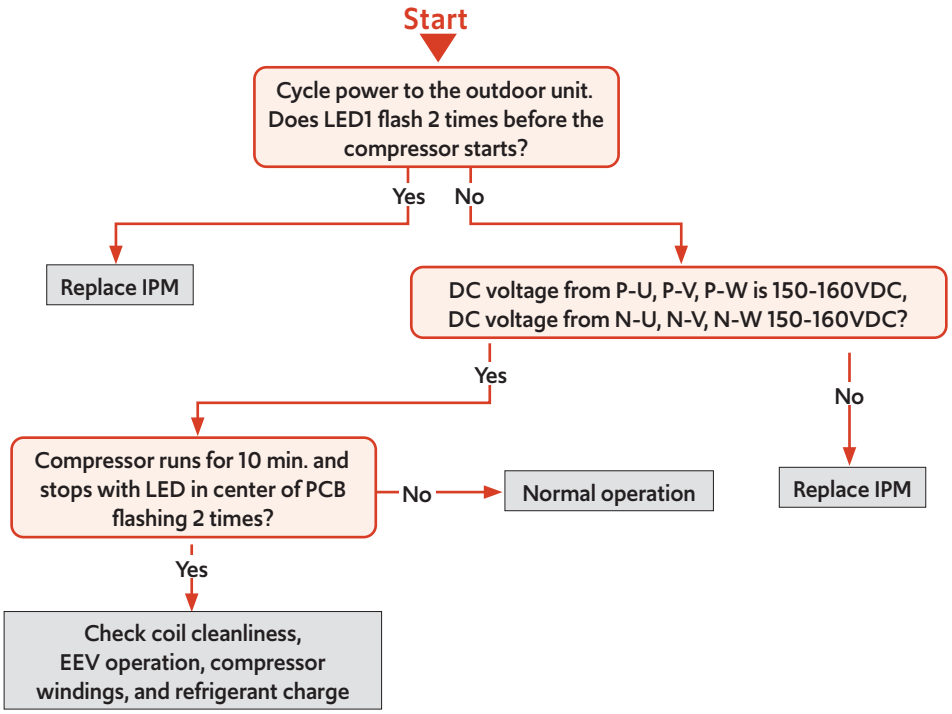
IPM Power Module Fail
(IPM power module protection)

Detection Conditions:

- The system leads to IPM protection due to over current
- The compressor faulty leads to IPM protection
- Circuit component of IPM is broken and led to IPM protection

Possible Causes:

- Faulty compressor
- Faulty PCB of IPM module
- Disconnected compressor wiring



Error Code (Indoor/Outdoor)

F2/LED1: 3 or 24 or 25 Flash

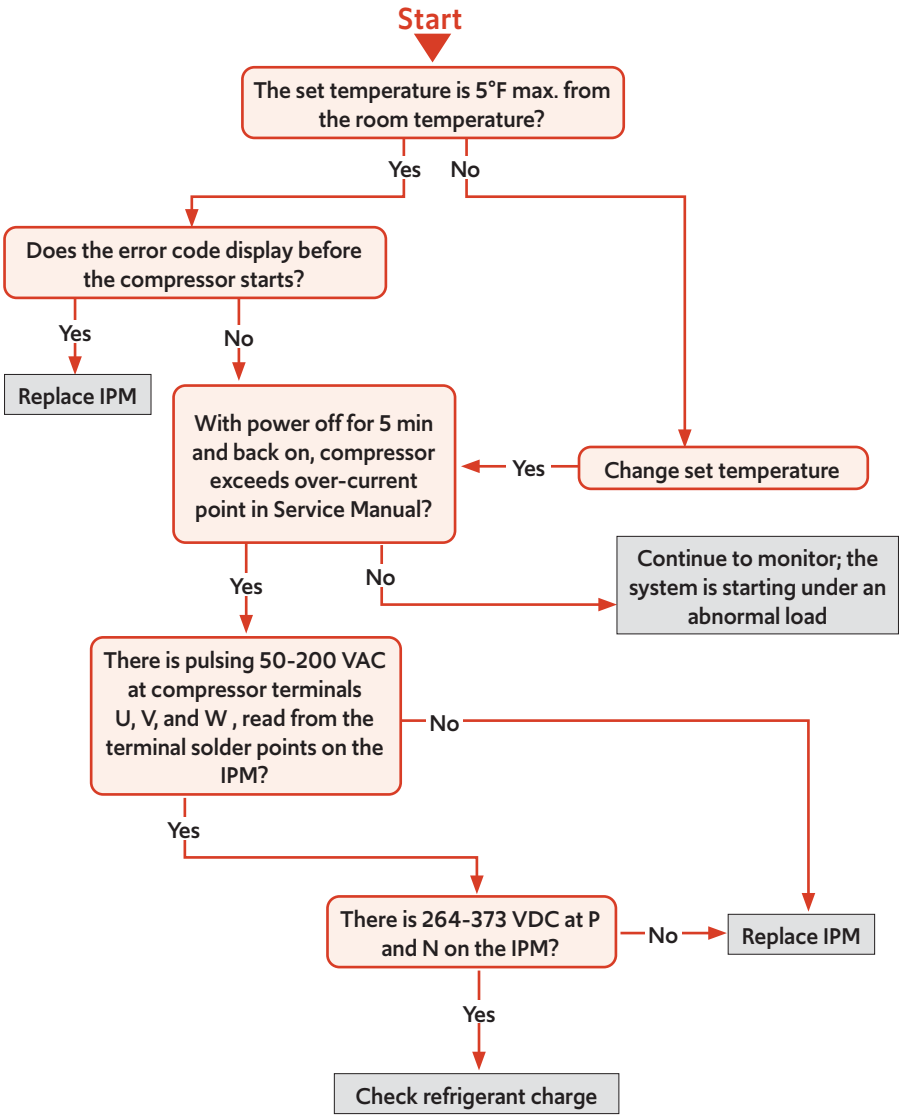
Overcurrent of the Compressor

Detection Conditions:

- The IPM module is damaged, or the compressor is damaged.
- Power supply voltage is too low or too high

Possible Causes:

- Faulty IPM Module
- Faulty compressor
- Faulty power supply



Error Code (Outdoor)

LED1: 6 Flash

Power supply is over voltage

LED1: 7 Flash

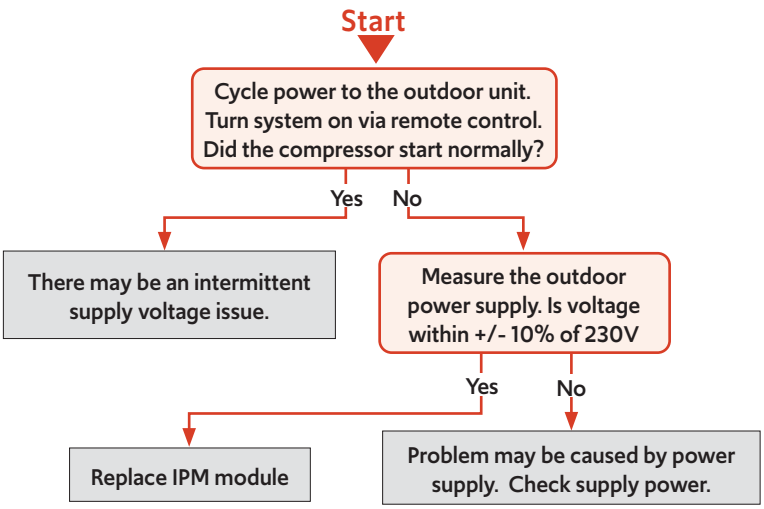
Power supply is under voltage

Detection Conditions:

- Abnormal voltage detection

Possible Causes:

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



Error Code (Indoor/Outdoor)

F4/LED1: 8 Flash

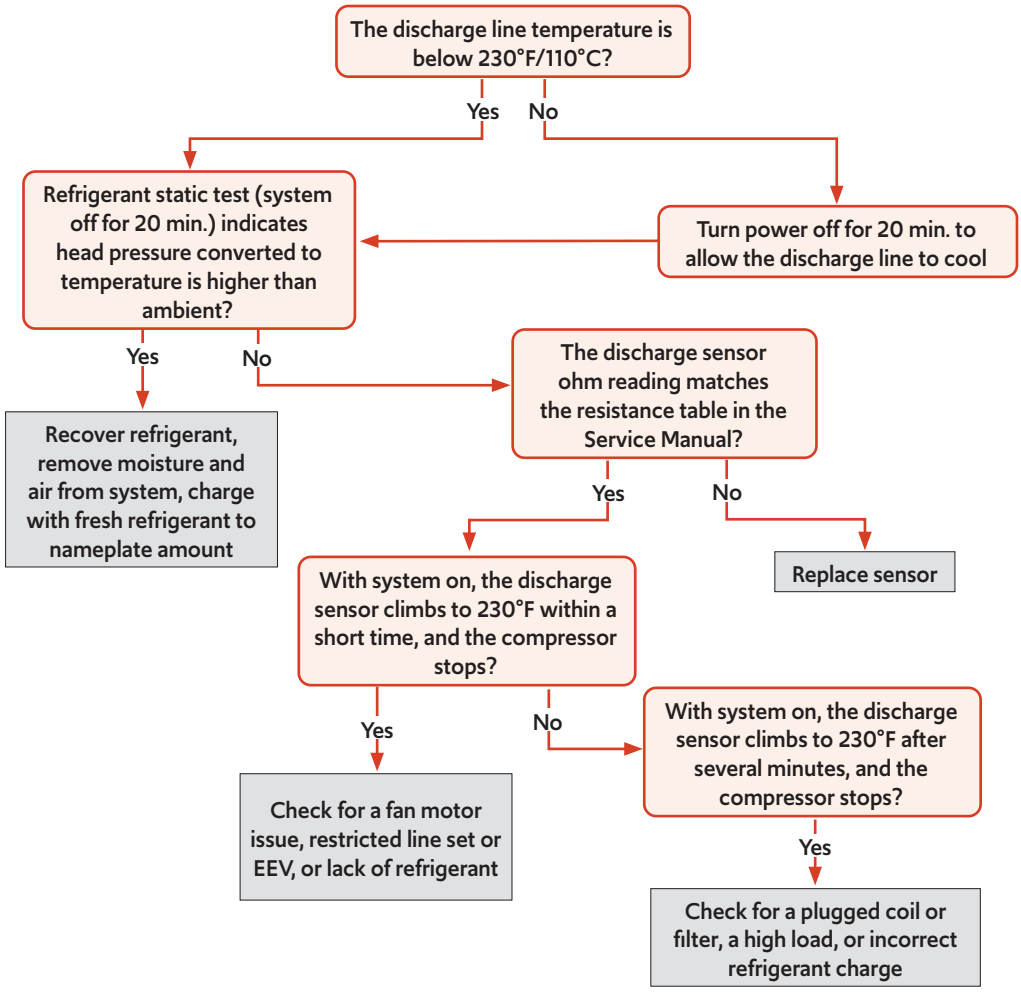
Overheat Protection for Discharge Temperature

Detection Conditions:

- Compressor discharge temperature above 110°C

Possible Causes:

- Faulty electronic expansion valve
- Faulty thermistor
- Faulty PCB



Error Code (Indoor/Outdoor)

E7/LED1: 15 Flash

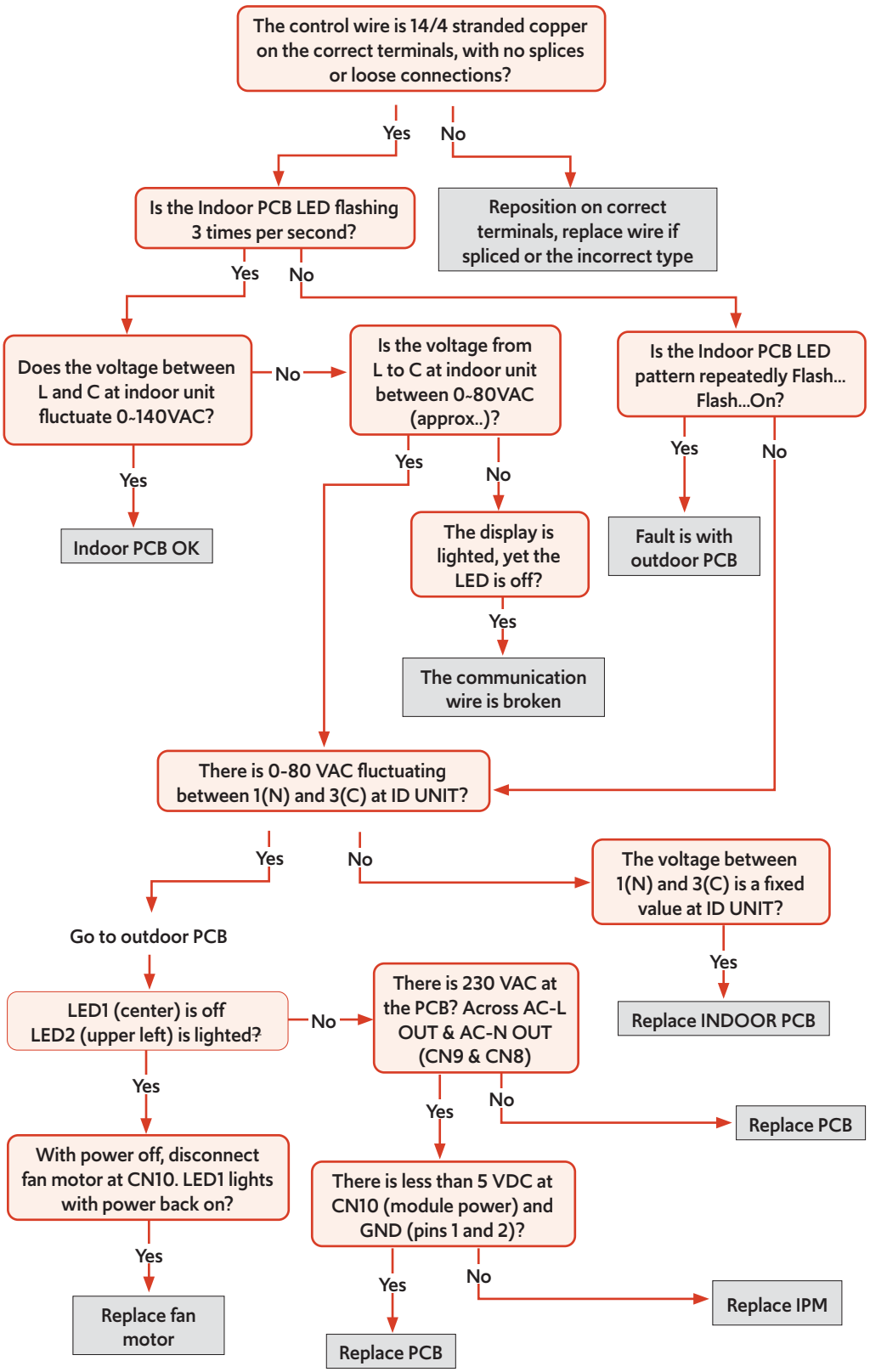
ID and OD Loss of Communication

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)



Error Code (Indoor/Outdoor)

F11/LED1: 18 or 19 Flash

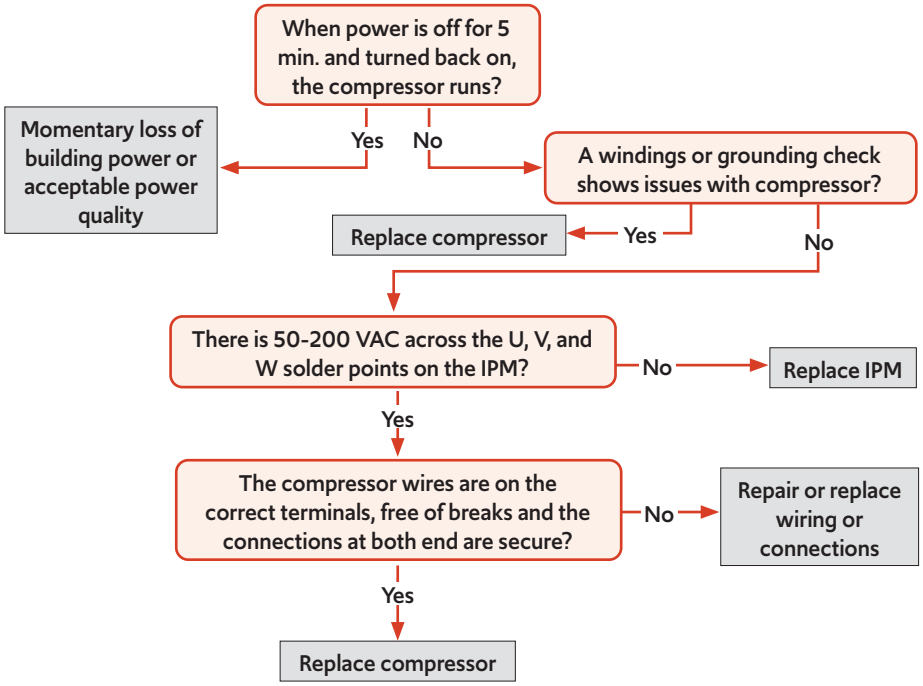
Loss of Compressor Synchronization

Detection Conditions:

- Compressor faulty, miswired or wiring connection faulty

Possible Causes:

- Faulty wiring
- Faulty compressor
- Faulty PCB



Error Code (Outdoor)

LED1: 5 or 21 Flash

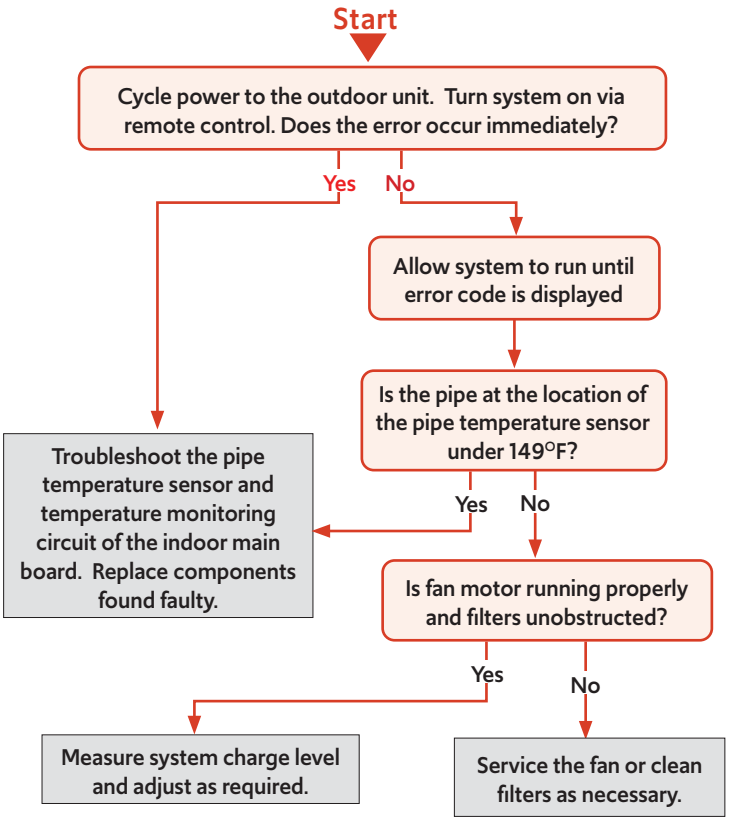
Indoor Unit Overload Protection (Heating Mode Only)

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



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
Idr	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

°F	°C	Normal (KΩ) 10K SENSORS	23K SENSORS	50K SENSORS
80.6	27	9.21	20.949	464.05
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

°F	°C	Normal (KΩ) 10K SENSORS	23K SENSORS	50K SENSORS
183.2	84	1.25		43.25
185	85	1.22		41.72
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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