Service Manual

GE APPLIANCES

ALTITUDE™

Single Zone

Ductless Split Heat Pumps

ASH109PRDBB / ASYW09PRDBB

ASH112PRDBB / ASYW12PRDBB

ASH115PRDBB / ASYW15PRDBB

ASH118PRDBB / ASYW18PRDBB

ASH124PRDBB / ASYW24PRDBB

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

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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
Installation should be performed by the dealer or another professional. Improper installation may cause water leakage, electrical shock, or fire.
Install the heat pump according to the instructions given in this manual. Incomplete installation may cause water leakage, electrical shock, or fire.
Use only the supplied or specified installation parts. Use of other parts may cause the unit to come lose, water leakage, electrical shock, or fire.
Install the heat pump 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 installation manual and national/local electrical wiring codes and rules of practice. Insufficient capacity or incomplete electrical work may cause electrical shock or fire.
Use a dedicated power circuit. Never use a power supply shared by another appliance.
For wiring, use a cable 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.
Use only the specified wire types 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.
After completing interconnecting and supply wiring connections, route the cables so that they do not put undue force 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 the installation work, ventilate the room. The refrigerant produces a toxic gas if exposed to flame.
After all installation is complete, check for and repair any system refrigerant leaks. The refrigerant produces a toxic gas if exposed to flames.
When installing or relocating the system, keep the refrigerant circuit free from substances other than the specified refrigerant (R410A), such as air. 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.
Be sure to establish a ground. Do not ground the unit to a utility pipe, arrester, or telephone earth. An complete earth may cause electrical shock, or fire. A high surge current from lightning or other sources may cause damage to the heat pump.

CAUTIONS
Do not install the heat pump in a place where there is danger of exposure to flammable gas. If the gas builds up around the unit, it may catch fire.
Install drain piping according to the instructions of this manual. Inadequate piping may cause flooding.
Tighten the flare nut according to the specified torque using a torque wrench. If the flare nut is overtightened, the flare nut may eventually crack and cause refrigerant leakage.
Provide adequate measures to prevent the outdoor unit from being used as a shelter by rodents. Rodents making contact with electrical parts can cause malfunctions, smoke or fire. Please instruct the customer to keep the area around the unit clean.

NOTE

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

ALTITUDE™

Compressor Type:
DC Inverter Driven Rotary

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

WIFI
Adaptable with WiFi Adapter (QAWF01A)

WIFI
Adaptable with WiFi Adapter (QAWF01A)

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		09	12	15	18	24
	Outdoor Unit	ASH109PRDBB	ASH112PRDBB	ASH115PRDBB	ASH118PRDBB	ASH124PRDBB
	UPC	084691920427	084691920434	084691920441	084691920458	084691920465
	Indoor Unit	ASYW09PRDBB	ASYW12PRDBB	ASYW15PRDBB	ASYW18PRDBB	ASYW24PRDBB
	UPC	084691920328	084691920335	084691920342	084691920359	084691920366
Cooling	Rated Capacity Btu/hr	9,000	12,000	15,000	17,000	22,000
	Capacity Range Btu/hr	3,200-12,500	3,300-15,000	5,400-24,000	5,400-26,500	6,400-30,000
	SEER2	23.5	23.0	21.5	21.0	20.0
	EER2	14.5	12.5	12.5	12.5	12.5
	Moisture Removal Pt./hr	3.5	3.9	4.1	4.3	7.0
Heating	Heating Capacity Range Btu/hr	3,800-15,600	3,900-20,000	4,000-26,000	4,000-30,000	6,200-36,000
	Rated Heating Capacity 47°F Btu/hr	10,000	13,000	16,000	21,000	27,600
	Max. Heating Capacity 5°F Btu/hr	8,500	10,400	14,200	15,400	20,000
	Max Heating Capacity -15°F Btu/hr	6,500	7,500	10,000	12,000	14,000
	HSPF2 (IV)/HSPF (V)	9.6/7.5	10.5/8.0	9.6/7.5	9.6/7.5	9.6/7.5
Operating Range	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)	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)	-15~75°F (-26~24°C)
Outdoor Unit	Maximum Fuse Size A	15	15	20	20	30
	Minimum Circuit Amp A	11	11	14	14	20
	Outdoor Noise Level dB	54	54	55	55	57
	Dimension: Height in (mm)	23 1/2 (597)	23 1/2 (597)	27 7/16 (697)	27 7/16 (697)	30 (762)
	Dimension: Width in (mm)	30 11/16 (780)	30 11/16 (780)	35 (890)	35 (890)	36 3/16 (920)
	Dimension: Depth in (mm)	11 7/16 (290)	11 7/16 (290)	13 7/8 (353)	13 7/8 (353)	15 1/8 (385)
	ODU Weight Ship/Net - lbs	90.2/78.3	90.2/78.3	117.5/100.3	117.5/100.3	149.5/130.1
Indoor Unit	Fan Speed Stages	5 + Auto	5 + Auto	5 + Auto	5 + Auto	5 + Auto
	Cooling Mode Indoor Motor RPM (Turbo/High/Med/Low/Quiet)	1150/1050/900/750/650	1150/1050/900/750/650	1100/950/850/750/700	1100/950/850/750/700	1250/1150/1000/850/800
	Heating Mode Indoor Motor RPM (Turbo/High/Med/Low/Quiet)	1100/1000/850/700/650	1100/1000/850/700/650	1050/850/775/700/600	1050/850/775/700/600	1250/1150/1000/850/800
	Cooling Airflow CFM (Turbo/High/Med/Low/Quiet)	385/335/265/200/175	400/360/285/215/190	620/545/335/290/210	620/545/335/290/210	635/575/480/390/355
	Heating Airflow CFM (Turbo/High/Med/Low/Quiet)	370/320/250/190/175	380/340/270/200/190	590/490/305/270/180	590/490/305/270/180	635/575/480/390/355
	Sound Level dB (Turbo/High/Med/Low/Quiet)	44/40/35/31/23	45/41/36/32/23	48/46/42/36/34	48/46/42/36/34	49/47/42/36/34
	Dimension: Height in (mm)	12 1/4 (310)	12 1/4 (310)	13 1/4 (336)	13 1/4 (336)	13 1/4 (336)
	Dimension: Width in (mm)	35 7/16 (900)	35 7/16 (900)	43 7/8 (1115)	43 7/8 (1115)	43 7/8 (1115)
	Dimension: Depth in (mm)	8 7/16 (215)	8 7/16 (215)	9 9/16 (243)	9 9/16 (243)	9 9/16 (243)
	IDU Weight Ship/Net - lbs	30.9/25.4	30.9/25.4	43.2/35.3	43.2/35.3	45.4/37.5
Refrigerant Lines	Connections	Flare	Flare	Flare	Flare	Flare
	Liquid O.D. in	1/4	1/4	1/4	1/4	1/4
	Suction O.D. in	3/8	3/8	1/2	1/2	1/2
	Factory Charge Oz	38.8	38.8	52.2	52.2	74.1
	Max Line Length Ft/m	50/15	50/15	83/25	83/25	83/25
	Max Height Ft/m	33/10	33/10	50/15	50/15	50/15

*Cooling below 23°F (-5°C) requires wind baffle.

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 R410A 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 60°F to 86°F in cooling mode and 60°F to 86°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 240 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 240 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 automatic control are follows:

Tr= room temperature Ts= set temperature

- High speed: Tr ≥ Ts+5.4F
- Medium Speed: Ts + 1.8°F ≤Tr < Ts + 5.4°F
- Low Speed: Tr ≤Ts + 1.8°F or when the sensor is off.

There will be a 2 second delay when manually controlling the speed.

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 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 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.

If the room temperature is less than the set temperature, yet higher than 2°F below the set temperature, the system will adjust the speed of the compressor automatically.

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

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 32°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 45°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.

Tr = room temperature Ts = set temperature

If Tr ≤ Ts, the outdoor unit will operate and the indoor fan operates in cold air prevention function

If Tr > Ts the outdoor unit turns off and the indoor fan operates at heat residue sending mode.

If Tr < Ts the outdoor unit will restart and the indoor fan operates in cold air proof mode.

The speed of the indoor fan can be controlled manually by the user or automatically by the system. The speed can be changed between HIGH, MEDIUM, and LOW. The predetermined conditions for automatic control are as follows:

- High Speed: Tr < Ts
- Medium Speed: Ts ≤ T ≤ Ts + 4°F
- Low Speed: Tr > Ts + 4°F

When the indoor fan is running in automatic mode and the speed switches from high to low, the indoor fan will maintain high speed for a period of 3 minutes before switching to low speed.

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 period usually takes 30 seconds to 3 minutes depending on the outdoor temperature.

4 minutes after the indoor fan starts, the light or low speed will switch to the set speed.

Residual heat sending: the indoor fan will operate on low speed until the coil temperature reaches 73 degrees. 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.

The indoor unit fan motor will continue to run at minimum speed, until the indoor coil reaches a minimum temperature of 73°F, when it will turn off. If the indoor coil temperature rises over 77°F, the indoor fan will start.

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 feedback 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 main board via the terminal 3 wire 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-wayvalve 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°F, the compressor will turn on and the indoor fan will operate at the set speed.

When Ts ≤ Tr ≤ Ts+ 4°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°F, High speed
- When Ts+ 5.4°F ≤ Tr< Ts+ 9°F, Medium speed
- When Ts+ 3.6°F ≤ Tr< Ts+ 5.4°F, Low speed
- When Tr< Ts+ 3.6°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

Defrost cycle will initiate if any of three conditions are met:

Te = Defrost temperature sensor
Tao = Outdoor ambient temperature sensor
Tes = Condensation point temperature

- Tes > 23°F, and Te ≤ 23°F
- 5°F Tes ≤ Tes < 23°F, and Te ≤ Tes
- Tes < 5°F and Te ≤ 5°F
- Tes = C X Tao-a
- Tao < 32°F, C = .08
- Tao > or = 32°F, C = .06
- a = 6

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. The compressor will stop for 1 minute
2. The outdoor fan will continue to operate at high speed.
3. After 50 seconds, the 4-wayvalve will shift to the cool mode position.
4. 5 seconds later the outdoor fan will stop.
5. After 1 minute, the compressor will start.

The outdoor unit will now defrost. The defrost cycle runs continuously for approximately 10 minutes.

The system will exit the defrost cycle if any of the following conditions are met:

1. The condenser maintains a temperature above 45°F for 80 seconds.
2. The condenser maintains a temperature above 54°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. 50 seconds later the 4-way valve will shift to the heat mode position.
4. 60 seconds later the compressor will start.

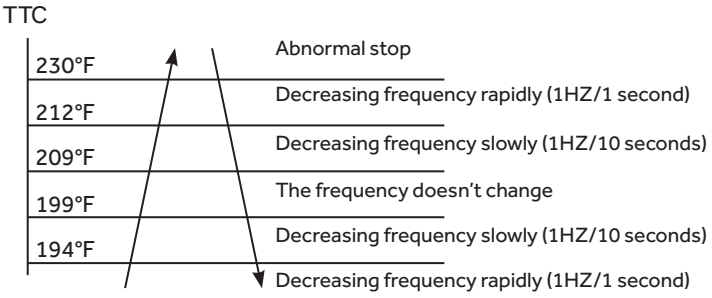
The system resumes normal operation.

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.

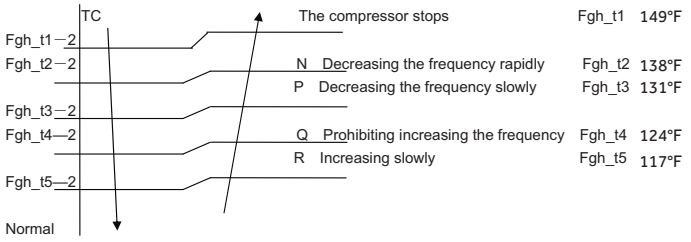


Overheating Protection for Indoor Unit

The indoor tube sensor senses the temperature of the indoor heat exchanger.

If the temperature sensed is greater than 133°F, the compressor frequency will decrease to prevent overheating of the heat exchanger.

If Tc >= 133°F for more than 10 seconds, the compressor will stop and an error code will be indicated at the outdoor unit. If the compressor is off for 3 minutes and Tc <118°F, the compressor will restart.
If the temperature sensed is lower than 118°F, the protection function is canceled.



N：Decreasing at the speed of 1HZ/1 second
P：Decreasing at the speed of 1Hz/10 seconds
Q：Continue to keep the last-time instruction cycle
R：Increasing at the speed of 1Hz/10seconds

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 3 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.

The frequency of the compressor may change depending on the current draw at start-up. Refer to the chart and current/Hz table shown below.

Greater than current 1: Decreases 1Hz/second

Greater than current 2: Decreases 0.1Hz/second

Greater than current 3: No change

Model	Over current Point (Approx.)	Decline Speed Current 1 (Approx.)	Decline Speed Current 2 (Approx.)	Decline Speed Current 3 (Approx.)
09K	11A	8.5A	8A	7A
12K	13A	10A	9.5A	8.5A
15K	15A	12A	11.5A	10.5A
18K	15A	12A	11.5A	10.5A
24K	17A	13.5A	13A	12A

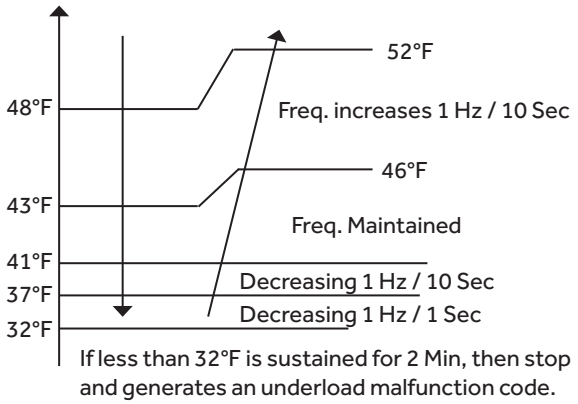
Anti-freeze Protection of the Indoor Coil

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.

Tpg_indoor: indoor unit pipe sensor temperature

- When Tpg_indoor < Tpg1, the frequency of the compressor decreases at the rate of 1HZ / 1 second.
- When Tpg_indoor < Tpg2, the frequency of the compressor decreases at the rate of 10HZ / 10 seconds.
- When Tpg_indoor begins to rise again, and Tpg2 ≤ Tpg_indoor ≤ Tpg3, the frequency of the compressor does not change.
- When Tpg3 < Tpg_indoor <Tpg4, the frequency of the compressor increases at the rate of 1HZ / 10 seconds.

Example: if Tpg_indoor ≤ 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 mini-mum of 3 minutes. When Tpg_indoor >Tpg4, 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 or the system was in Sleep mode, they will be canceled upon restart

Wired Controller:

- Auto Restart is Enabled by Default

Wireless Controller:

- Enable: Press the Sleep button 10 times within 7 seconds. You will hear 4 beeps as confirmation
- Disable: Press the Sleep button 10 times within 7 seconds. You will hear 2 beeps as confirmation

Timed Defrost

Via PCB DIP switch SW-1:

Enable method:

1. Set to switches SW1-1 and SW1-2 to OFF position (default setting)

Via Remote Controller (YR-HG):

Enable method:

2. Set to HEAT Mode
3. Set to 30°C/86°F
4. Set High Fan Speed
5. Press Temperature+ Button 10 times within 7 seconds
6. Hear Unit will Beep 7 times to Confirm

Cancel method:

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

Forced Defrost

Force defrost via Remote Controller (YR-HG):

Setting method:

1. Set to HEAT Mode
2. Set to 30°C/86°F
3. Set High Fan Speed
4. Press Health Button 10 times within 5 seconds
5. Hear Unit will Beep 4 times to Confirm. System will enter Force Defrost mode.

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, 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.

Temperature Compensation

This function allows you the capability to adjust the temperature compensation offset of any indoor unit. The adjusted value is programmed into the EEPROM.

Logic: The Actual Ambient Temperature = The Display Ambient Temperature+ Temperature Compensation

Guide:

1. Apply power to the unit.
2. Set to Cooling Mode or Heating Mode
3. Set the temperature to 24°C.
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. 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.
6. Once the desired value has been selected, turn OFF the unit via the YR-HG controller to save the compensation settings.

SmartHQ™ SERVICE

SmartHQ Service

The Bluetooth module will connect to the unit physically via RJ45 service ports located in the indoor and outdoor units, and connect to a smartphone or tablet via Bluetooth. It may be used to achieve the following functions:

1. Software updates
2. Real time sensor readings/ load control
3. View alerts, fault data, cycle history, graphs
4. Automated diagnostic tests (upcoming)
5. Data collection (upcoming)

ASH109PRDBB
ASH112PRDBB

ASH118PRDBB
ASH124PRDBB

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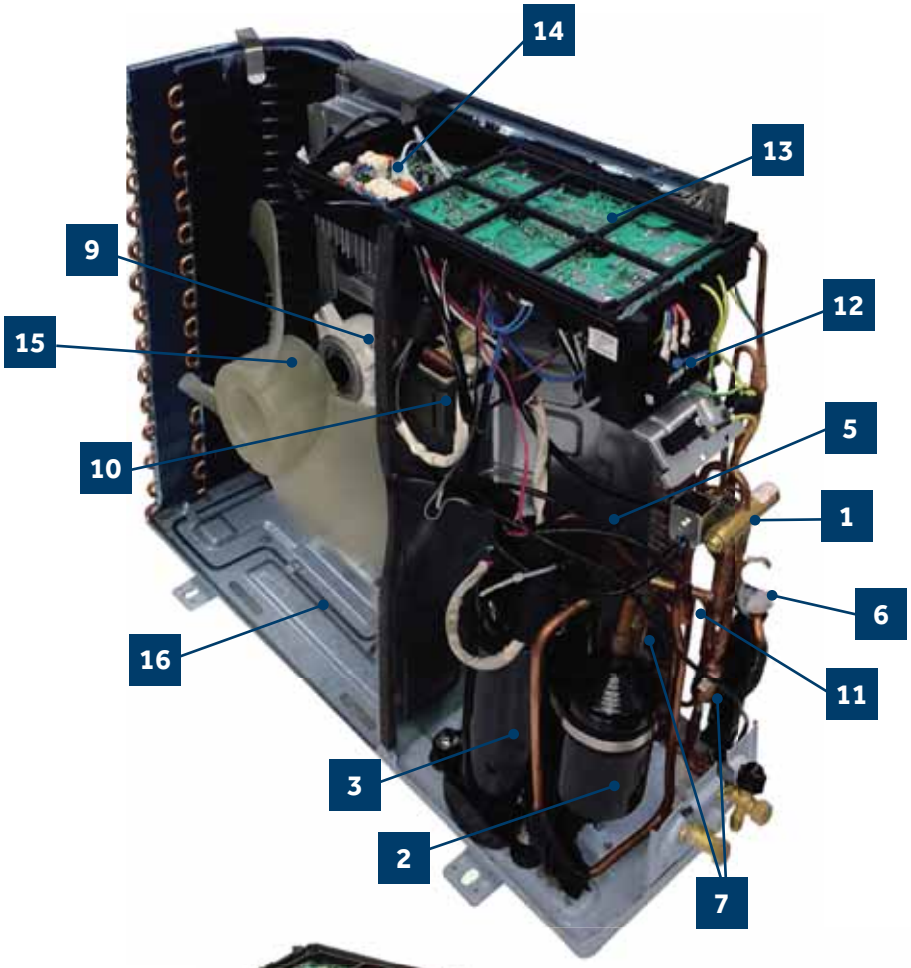
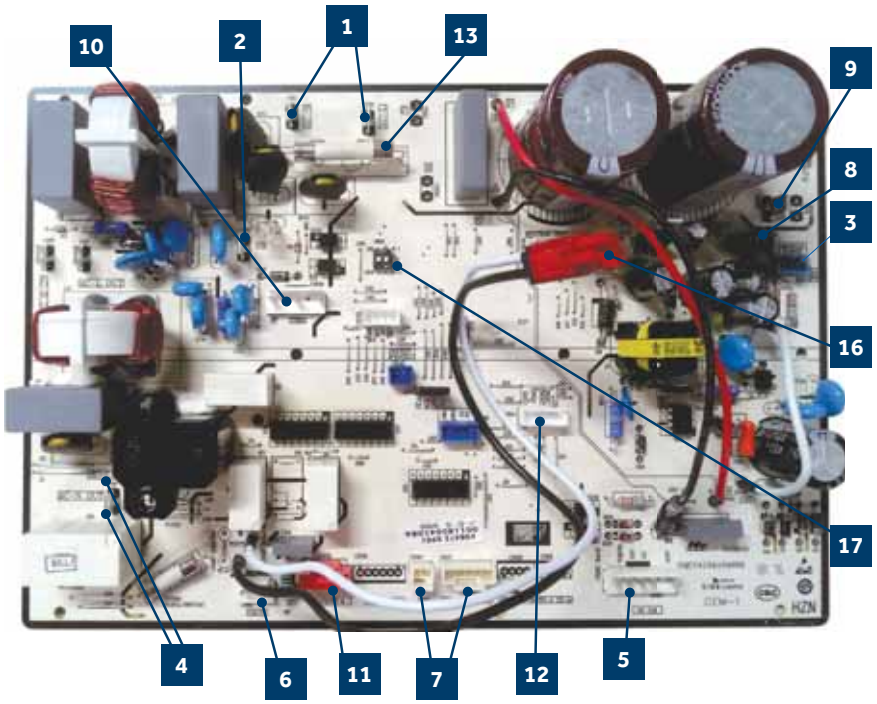
The outdoor unit has two circuit boards, an Inverter Assembly that drives the compressor and a Power Control Board that manages system functions and the Inverter Assembly calculations. Sensors monitor key temperatures throughout the system to manage operational decisions.

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 Filters
8. Outdoor Ambient Temperature Sensor
9. Outdoor Fan Motor
10. Power Factor Reactor
11. Suction Line Temperature Sensor
12. Terminal Block
13. Main Control Board (board cover not shown)
14. Module Control Board
15. Fan Blade
16. Base Pan Heater

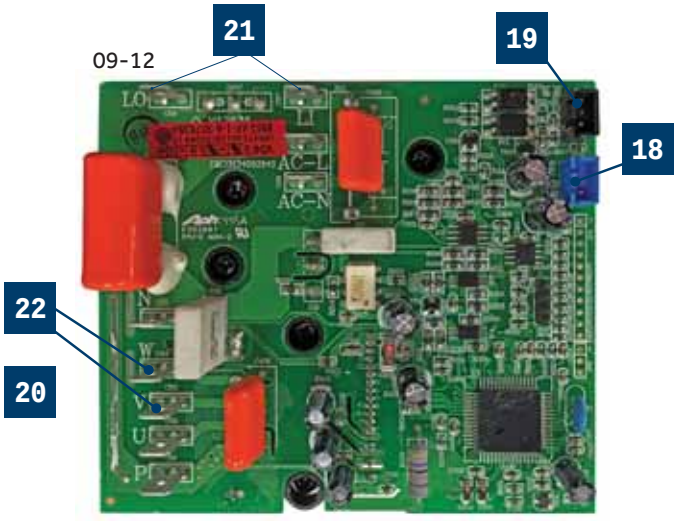


PCB (1): Outdoor Control PCB



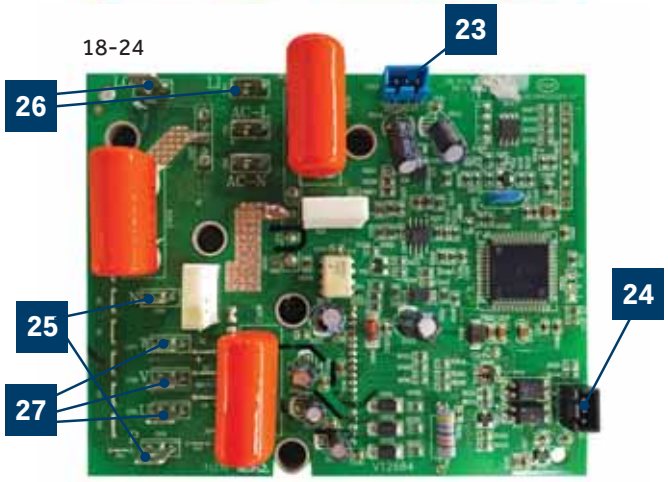
1. CN1, CN2: Connector for power N and L
2. CN3: Connector for ground
3. CN23: Connector for DC POWER 15V and 5V to the module board
4. CN9, CN8: Connector for CN2,CN1 on the module board
5. CN22: Connector for fan motor
6. CN11: Connector for four way valve coil
7. CN17, CN47: Connector for thermistors
8. CN24: Communication connector for control board and the module board
9. CN28, CN25: Connector to P and N of the module board
10. CN36: Connector for communicate between indoor and outdoor unit
11. CN15: Connector for electric expansion valves
12. CN50: Connector for DRED-control
13. FUSE 1: (25A, 250VAC); FUSE 2:(1A, 250VAC)
14. LED 1: Constant ON is normal operation, flashing indicates alarm.
15. RV1, RV2, RV3 Varistor
16. Base Pan Heater Connection
17. BM2-1, BM2-2: Defrost DIP Switches

PCB (2) (Module PCB for 09-12K)



18. CN10: Connector for the DC power 5V and 15V form the control PCB
19. CN11: Connector for communicate between the control board and the module board
20. P (CN1), N (CN5): Connector for capacitance board
21. LI (CN7), LO (CN6): Connector for reactor
22. CN2, CN3, CN4: Connector for the U, V, W wire of the compressor

PCB (3) (Module PCB for 18-24K)



23. CN10: Connector for the DC power 5V and 15V form the control PCB
24. CN11: Connector for communicate between the control board and the module board
25. P (CN8), N (CN9): Connector for capacitance board
26. LI (CN3), LO (CN4): Connector for reactor
27. CN5, CN6, CN7: Connector for the U, V, W wire of the compressor

Terminal Block

The outdoor unit is powered by 208/230 Volt Single Phase electricity connected at the Outdoor Unit Terminal Block. Terminals 1 and 2 on the outdoor unit terminal connect this voltage to the system. The number 3 terminal is a communication terminal that connects wiring between the indoor and outdoor units. A ground terminal connects the outdoor unit to the line voltage power source.

Condensate safety switches should break wire 1.

The indoor unit is also powered by the same electrical supply as the outdoor unit. #14 AWG wire is connected to the wiring terminal block at the outdoor unit and is run to the indoor unit wire 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 of the data 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. The compressor is capable of variable speed operation. The compressor operating frequency will be determined by the temperature difference between set point and room or outdoor air temperature. (Cool Mode versus Heat Mode)

The compressor is electrically connected to the Module Board on terminal connections CN-2, CN-3 and CN-4.

The compressor has an internal temperature overload that will open if the compressor becomes too hot. Additional protection of the compressor will be provided by the Compressor Discharge Temperature Sensor and Suction Line Temperature Sensor.

Power Factor Reactor

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

The Reactor is electrically connected to the Module Board on terminal connections CN-7 and CN-8.

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-21.

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.

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-17.

Suction Line Temperature Sensor

The Suction Line Temperature Sensor is a negative coefficient thermistor that senses the temperature of the suction line. The PCB monitors the temperature of the suction line and the EEV operation to maintain an acceptable superheat.

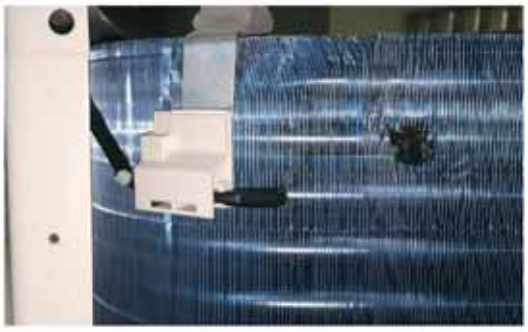
This sensor connects to the Main Control Board at PLUG CN-18.

Defrost Temperature Sensor

The Defrost Temperature Sensor A 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-19.

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-20

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-10.

Electronic Expansion Valve

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

The metering device position is determined by input from a Suction Line Temperature Sensor located in the outdoor unit. The EEV will change the internal orifice size to maintain a superheat level of around 10°F.

The electronic expansion valve is electrically connected to the Main Control Board at PLUG CN-15.

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 Filters

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 and energized with 230 VAC.

NOTE: Component resistance readings shown in this section are for reference only. Actual resistance values may 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

Disconnect the DC Fan Motor plug from the control board connector for this test. Failure to do so may provide inaccurate readings.

Step 2

Refer to the chart shown below for plug pin combinations and resistance values. Note: Test is polarity sensitive, adhere to probe placement as shown in chart.

Step 3

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

		Red Test Lead					
		Red	---	Black	White	Yellow	Blue
Black Test Lead	Red		---	3.10 Meg	3.05 Meg	3.28 Meg	Charges to infinity
	---			---	---	---	---
	Black				43.85K	145.1K	Charges to infinity
	White					189.0K	Charges to infinity
	Yellow						Charges to infinity
	Blue						

Checking the EEV Coil

Step 1

Disconnect the EEV Stepper Motor plug from the control board connector for this test. Failure to do so may provide inaccurate readings.

Step 2

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

Step 3

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

	White	Yellow	Orange	Blue	Red	Grey
White		---	92.6Ohm	---	47.0 Ohm	---
Yellow			---	93.1 Ohm	---	47.0 Ohm
Orange					46.5 Ohm	---
Blue						46.8 Ohm
Red						---
Grey						

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). 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.

NOTE: Resistance readings shown in this section are for reference only

Checking the PFC Reactors

Step 1

Disconnect wires from terminals LI and LO of the power module board.

Step 2

Using an Ohmmeter, check the resistance value of the PFC Reactor. The resistance value of the coil is 1.30 Ohms max. If the resistance value differs from this value, verify the wiring and connections to the PFC Reactor as well as the PFC Reactor itself. Repair or replace as necessary.

Step 3

Reconnect the wiring to the module board at the conclusion of the test.

Checking the Socket Protect Component

Step 1

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

Step 2

Using an Ohmmeter, check the resistance value of the Socket Protect component. The resistance reading should be 0 Ohms. If it is not, replace the component.

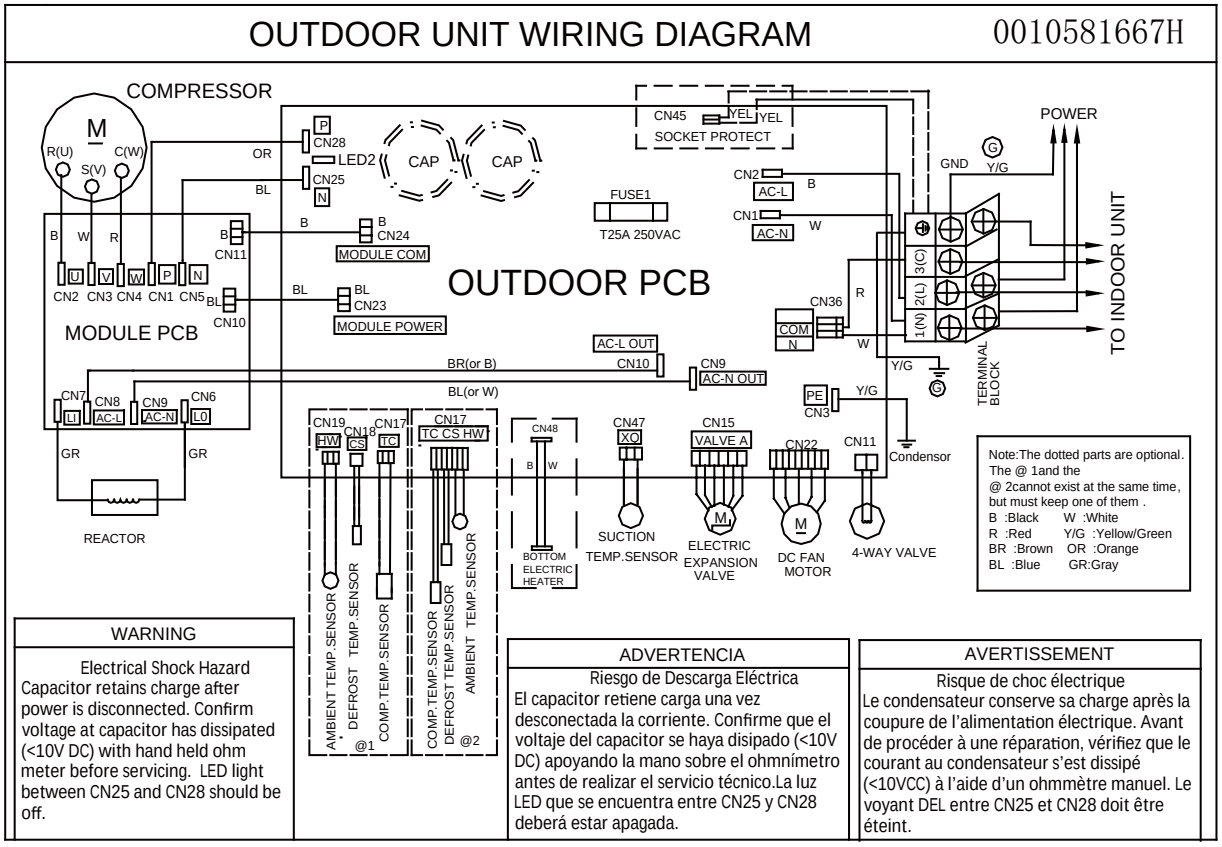
Step 3

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

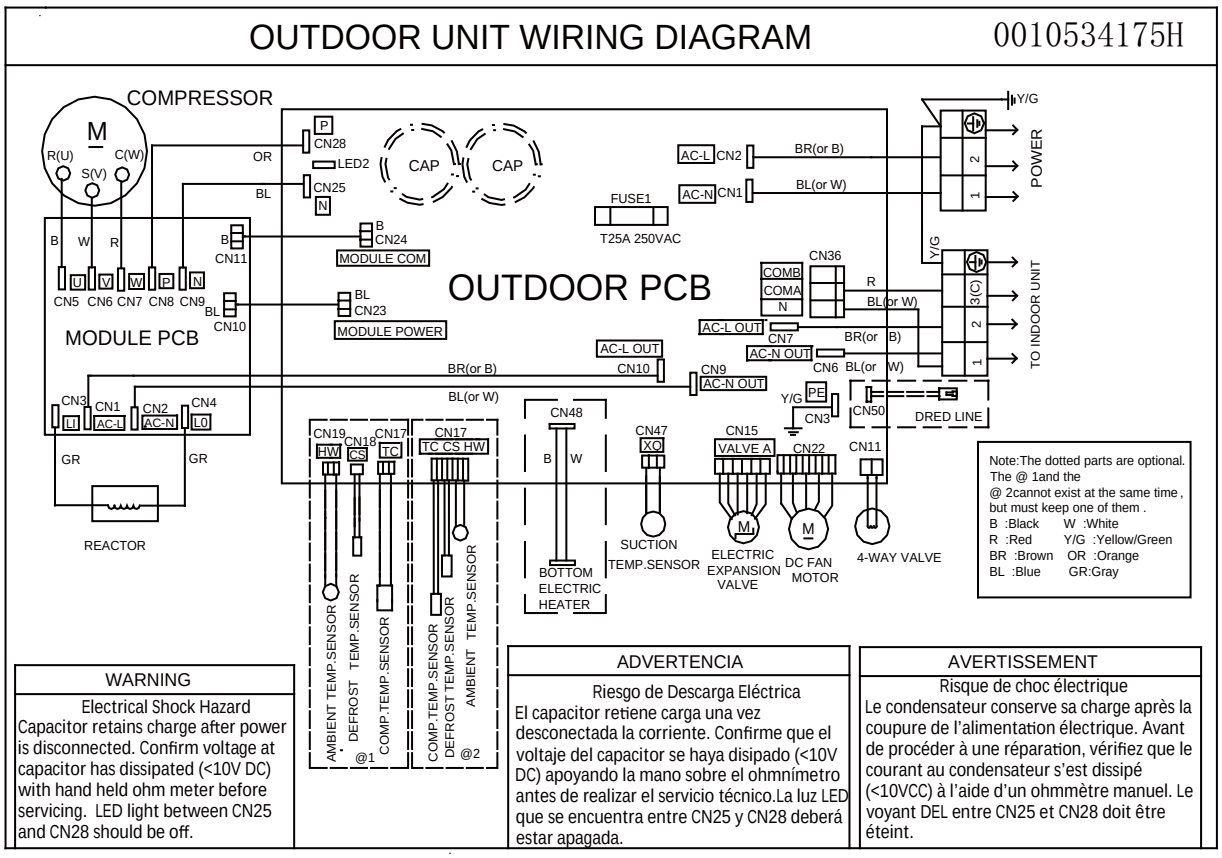
Checking the Base Pan Heater

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.

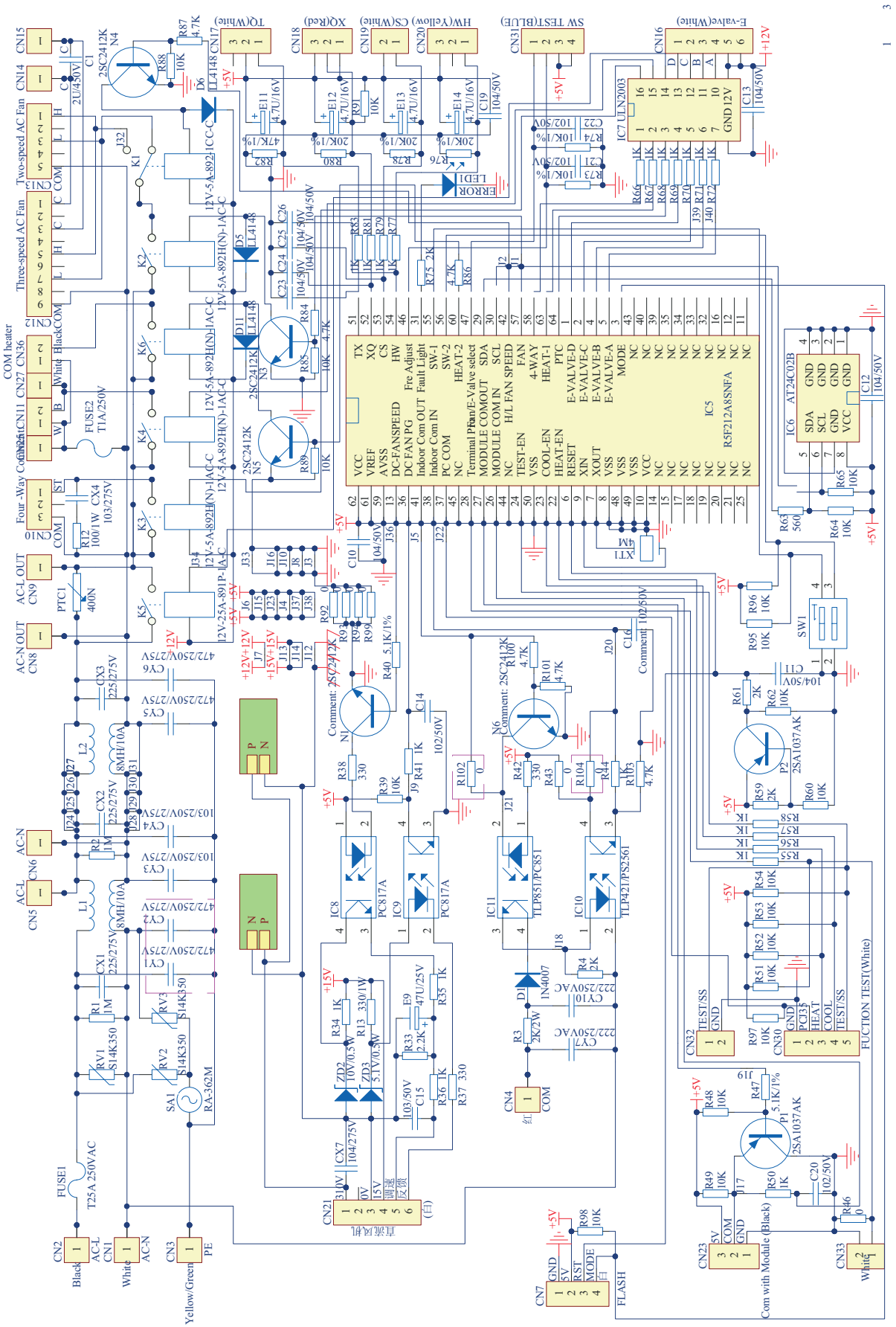
09-12K


OUTDOOR UNIT WIRING DIAGRAM
0010581667H
COMPRESSOR
M
R(U)
S(V)
C(W)
OR
BL
P
CN28
LED2
CAP
CAP
CN25
N
CN45
YEL
YEL
SOCKET PROTECT
POWER
GND
G
Y/G
FUSE1
T25A 250VAC
CN2
AC-L
B
CN1
AC-N
W
TO INDOOR UNIT
1(N)
2(L)
3(C)
B
W
R
CN11
CN24
MODULE COM
OUTDOOR PCB
CN2 CN3 CN4 CN1 CN5
CN10
CN23
MODULE POWER
MODULE PCB
CN36
COM
N
R
W
Y/G
TERMINAL BLOCK
AC-L OUT
CN10
CN9
AC-N OUT
BR(or B)
BL(or W)
PE
CN3
Condensor
CN7
CN8
CN9
CN6
LI
AC-L
AC-N
L0
GR
REACTOR
CN19
CN18
CN17
HW
CS
TC
TC CS HW
CN48
CN47
XO
CN15
VALVE A
CN22
CN11
AMBIENT TEMP.SENSOR
DEFROST TEMP.SENSOR
COMP.TEMP.SENSOR
@1
@2
BOTTOM ELECTRIC HEATER
SUCTION TEMP.SENSOR
ELECTRIC EXPANSION VALVE
DC FAN MOTOR
4-WAY VALVE
Note:The dotted parts are optional.
The @ 1and the
@ 2cannot exist at the same time,
but must keep one of them .
B :Black W :White
R :Red Y/G :Yellow/Green
BR :Brown OR :Orange
BL :Blue GR:Gray
WARNING
Electrical Shock Hazard
Capacitor retains charge after power is disconnected. Confirm voltage at capacitor has dissipated (<10V DC) with hand held ohm meter before servicing. LED light between CN25 and CN28 should be off.
ADVERTENCIA
Riesgo de Descarga Eléctrica
El capacitor retiene carga una vez desconectada la corriente. Confirme que el voltaje del capacitor se haya disipado (<10V DC) apoyando la mano sobre el ohmnímetro antes de realizar el servicio técnico.La luz LED que se encuentra entre CN25 y CN28 deberá estar apagada.
AVERTISSEMENT
Risque de choc électrique
Le condensateur conserve sa charge après la coupure de l'alimentation électrique. Avant de procéder à une réparation, vérifiez que le courant au condensateur s'est dissipé (<10VCC) à l'aide d'un ohmmètre manuel. Le voyant DEL entre CN25 et CN28 doit être éteint.

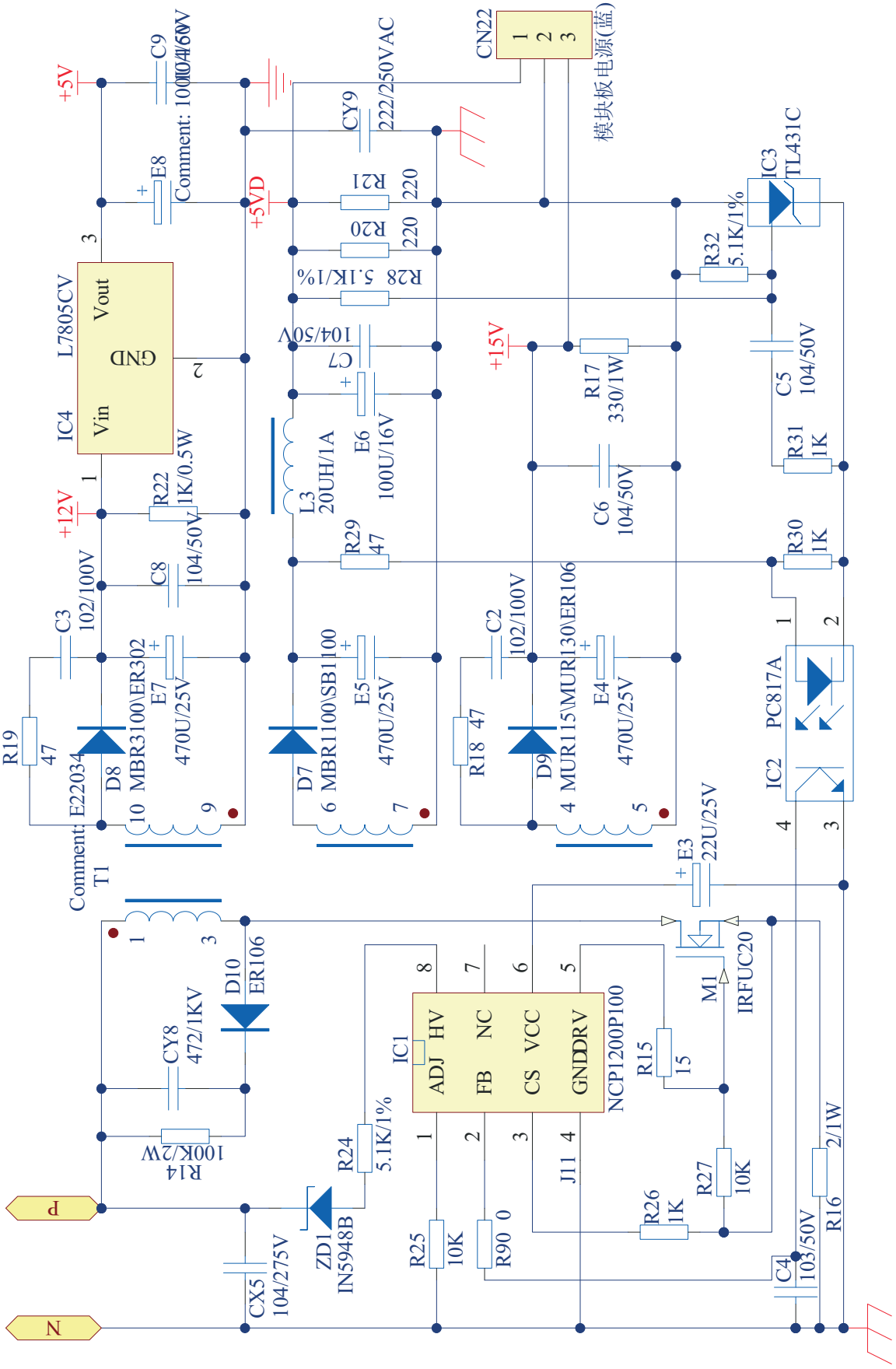
15-24K


OUTDOOR UNIT WIRING DIAGRAM
0010534175H
COMPRESSOR
M
R(U)
S(V)
C(W)
OR
BL
P
CN28
LED2
CAP
CAP
CN25
N
AC-L
CN2
BR(or B)
AC-N
CN1
BL(or W)
FUSE1
T25A 250VAC
Y/G
POWER
TO INDOOR UNIT
B
W
R
CN11
CN24
MODULE COM
OUTDOOR PCB
CN5 CN6 CN7 CN8 CN9
CN10
CN23
MODULE POWER
MODULE PCB
CN36
COMB
COMA
N
R
BL(or W)
AC-L OUT
CN7
BR(or B)
AC-N OUT
CN6
BL(or W)
AC-L OUT
CN10
CN9
AC-N OUT
BR(or B)
BL(or W)
PE
CN3
CN50
DRED LINE
CN3
CN1
CN2
CN4
LI
AC-L
AC-N
L0
GR
REACTOR
CN19
CN18
CN17
HW
CS
TC
TC CS HW
CN48
CN47
XO
CN15
VALVE A
CN22
CN11
AMBIENT TEMP.SENSOR
DEFROST TEMP.SENSOR
COMP.TEMP.SENSOR
@1
@2
BOTTOM ELECTRIC HEATER
SUCTION TEMP.SENSOR
ELECTRIC EXPANSION VALVE
DC FAN MOTOR
4-WAY VALVE
Note:The dotted parts are optional.
The @ 1and the
@ 2cannot exist at the same time,
but must keep one of them .
B :Black W :White
R :Red Y/G :Yellow/Green
BR :Brown OR :Orange
BL :Blue GR:Gray
WARNING
Electrical Shock Hazard
Capacitor retains charge after power is disconnected. Confirm voltage at capacitor has dissipated (<10V DC) with hand held ohm meter before servicing. LED light between CN25 and CN28 should be off.
ADVERTENCIA
Riesgo de Descarga Eléctrica
El capacitor retiene carga una vez desconectada la corriente. Confirme que el voltaje del capacitor se haya disipado (<10V DC) apoyando la mano sobre el ohmnímetro antes de realizar el servicio técnico.La luz LED que se encuentra entre CN25 y CN28 deberá estar apagada.
AVERTISSEMENT
Risque de choc électrique
Le condensateur conserve sa charge après la coupure de l'alimentation électrique. Avant de procéder à une réparation, vérifiez que le courant au condensateur s'est dissipé (<10VCC) à l'aide d'un ohmmètre manuel. Le voyant DEL entre CN25 et CN28 doit être éteint.

Outdoor Board Schematic



Outdoor Board Schematic



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ASYW09PRDBB
ASYW12PRDBB
ASYW15PRDBB
ASYW18PRDBB
ASYW24PRDBB

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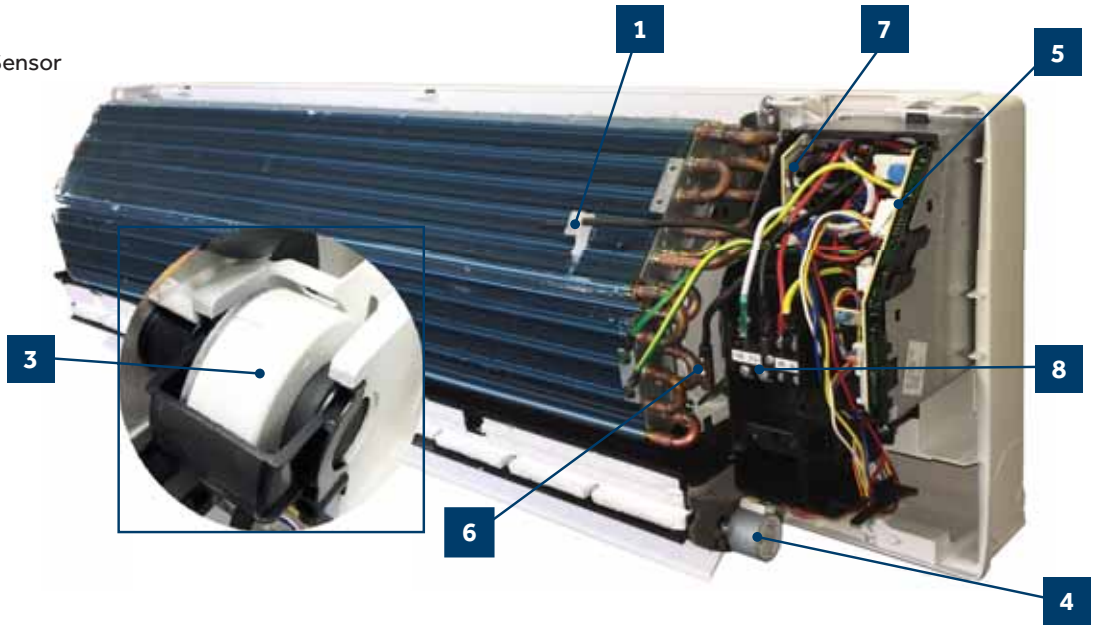
COMPONENTS

The indoor unit is mounted high on the wall to provide air conditioning coverage of a conditioned space. Field installed/supplied condensate pump accessories can be added to these systems.

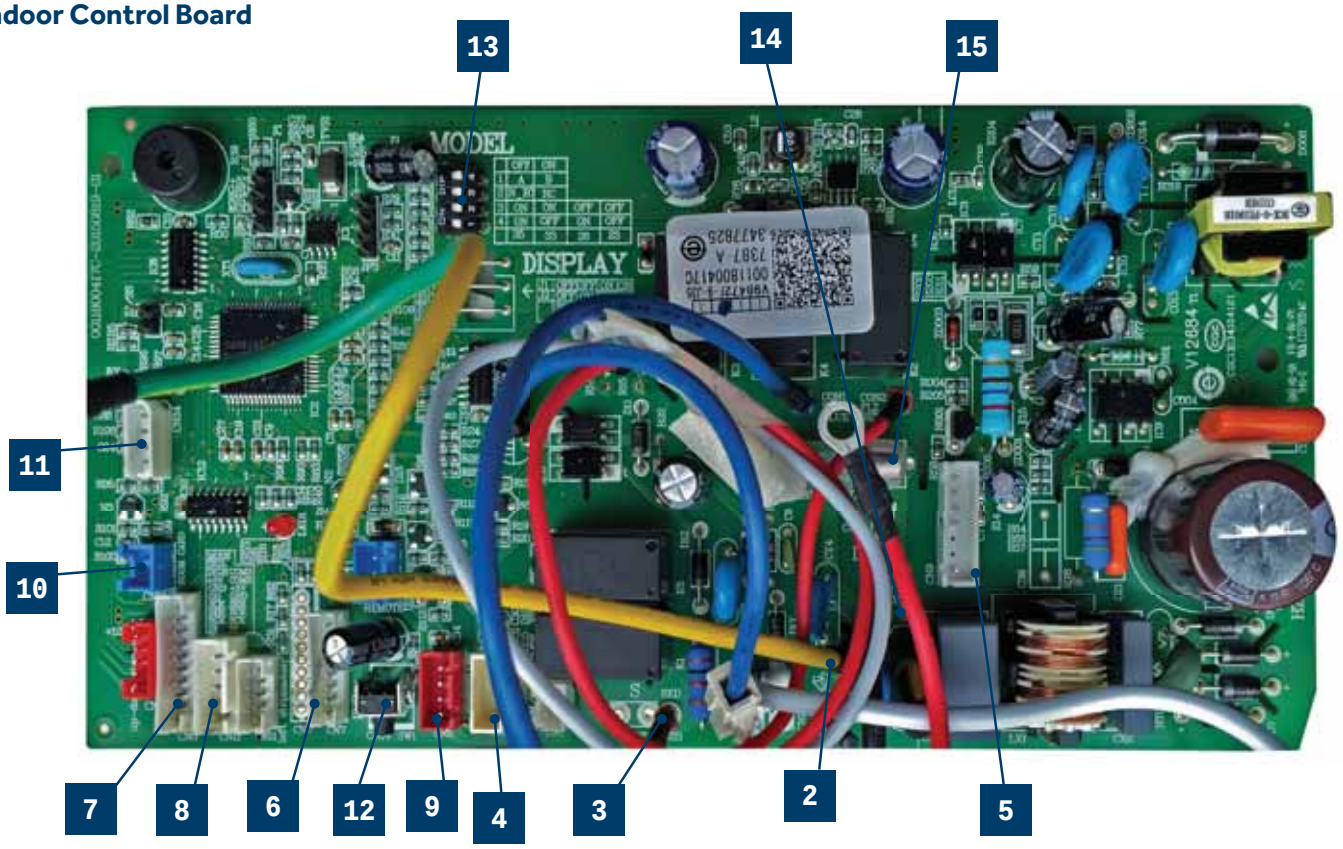
Features of the system include: Variable speed blower operation that speeds up and slows down with changes in demand, Moving louvers to direct air, Indoor air temperature sensing, Evaporator coil temperature sensing, Consumer operation display, Evaporator coil with metering device located in outdoor unit, and an Emergency Operation Switch.

Indoor Component Identification

1. Indoor Ambient Temperature Sensor
2. Display
3. Fan Motor
4. Louver Motor
5. Main Control Board
6. Piping Temperature Sensor
7. Power Supply Board
8. Terminal Block



Indoor Control Board



1 CN21, CN52: Connector for power N and L

2 CN27: Connector for ground

3 CN23: Connector for communication between indoor and outdoor unit

4 CN6: Connector for thermistors

5 CN9: Connector for fan motor

6 CN7: Connector for display

7 CN5: Connector for up-down stepper motor

8 CN11: Connector for left-right stepper motor

9 CN2: Connector for wiring-control

10 CN51: Connector for room card

11 CN34: Connector for WiFi control

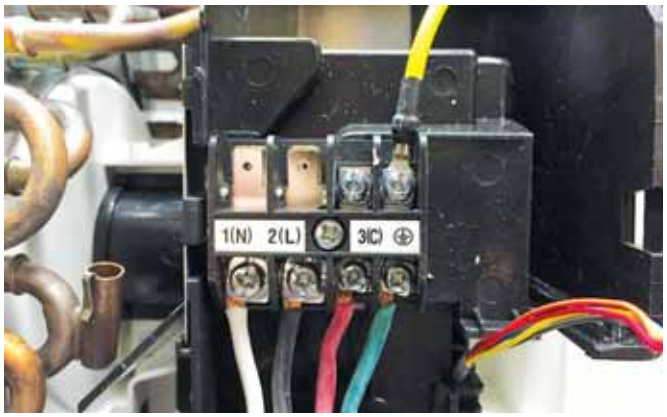
12 SW1: Connector for Emergency operation ON / OFF switch

13 SW2: 1- Select remote code A or B
2- Select room card able or disable
3,4- Select EEPROM code 23, 26, 33 and 35

14 RV1: Varistor

15 FUSE1: Fuse 3.15A/250VAC

Terminal Block



The indoor 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 code E7.

Display

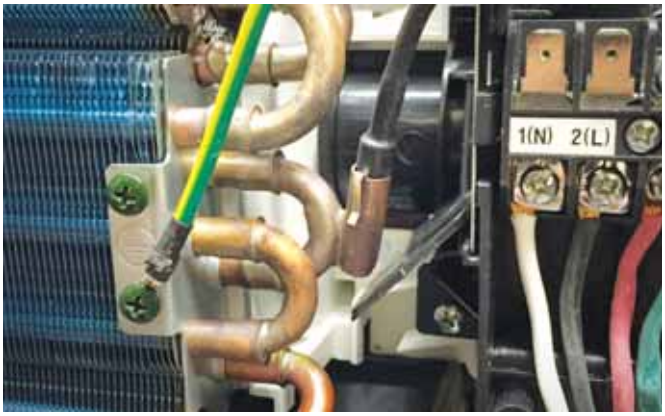
The indoor display has an infrared communication circuit that receives operating commands from the remote control. This display will indicate operating modes, error codes, indoor air temperature, timer status and power status.

Ambient Temperature Sensor

The Room Ambient 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 to the surface of the indoor coil.

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

Piping Temperature Sensor

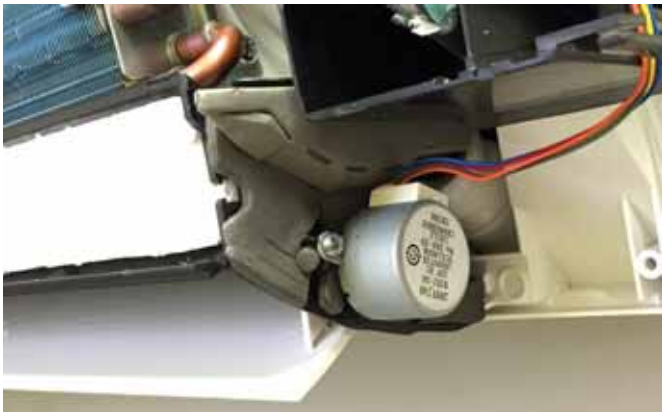


The Piping Temperature Sensor is a negative coefficient thermistor that will decrease in resistance with increases in coil temperature. The sensor is located in a socket soldered to the surface of the indoor coil.

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 functional corrective steps to correct the condition or report an ERROR CODE.

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

Stepper Motor Louver



The STEPPER MOTOR moves the louver up or down, and right or left depending upon selections made at the remote control.

The motor is connected to the indoor control board at PLUG CN-11.

Fan Motor

The Indoor Fan Motor is a variable speed motor. The motor will vary speed with the speed of the compressor inverter. The speed can also be set at the remote control or automatically adjusted using the AUTO fan mode. When in AUTO fan mode, the speed of the fan is calculated using the indoor set temperature and the indoor room ambient temperature. (Outdoor air temperature in heat mode.)

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 accessed by swinging open the front of the wall unit. The button is located on the right side.

Pushing this button will activate AUTO MODE operation. AUTO MODE activated with this button will maintain 75°F. The system will stay in this mode until commands are received by the indoor unit communication circuit via the remote control.

DIP Switch

The PCB for the indoor unit of the Altitude series of single zone mini-splits has a set of DIP switches that must be set when replacing the PCB.

The replacement PCB is shipped with all switches set to the OFF position.

Switch settings:

SW2-1 Selects remote code A or B. Normally set to the off position for code A operation.

If two indoor units are used in the same area and the user wishes to control them separately, switch SW2-1of the second unit is set to the ON position for code B operation. The wireless remote for the second unit is also set to code B.

SW2-2 Selects room card able or disable.

Normally set to the OFF position. Set to the ON position when used in conjunction with a room card interface utilized in hotel rooms.

SW-3 & SW-4 Selects EEPROM code 23, 26, 33 and 35. Set to identify the tonnage of the unit.

Settings:

9K	(23)	SW-3	OFF	SW-4	OFF
12K	(26)	SW-3	OFF	SW-4	ON
18K	(33)	SW-3	ON	SW-4	OFF
24K	(35)	SW-3	ON	SW-4	ON

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 Up/Down 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.

Step 3

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

Up/Down Stepper Motors

	White	Yellow	Orange	Blue	Red	Grey
White	-	---	92.6 Ω	---	47.0 Ω	---
Yellow	-	-	---	93.1 Ω	---	47.0 Ω
Orange	-	-	-	-	46.5 Ω	---
Blue	-	-	-	-	-	46.8 Ω
Red	-	-	-	-	-	---
Grey	-	-	-	-	-	-

Left Stepper Motor

	Red	Orange	Yellow	Pink	Blue	Grey
Red	-	193.0 Ω	189.5 Ω	185.4 Ω	191.5 Ω	---
Orange	-	-	381.6 Ω	377.4 Ω	383.3Ω	47.0 Ω
Yellow	-	-	-	373.9 Ω	379.9 Ω	---
Pink	-	-	-	-	375.8 Ω	46.8 Ω
Blue	-	-	-	-	-	---
Grey	-	-	-	-	-	-

Checking the Indoor DC Fan Motor

Step 1

Disconnect the DC Fan Motor plug from the control board connector for this test. Failure to do so may provide inaccurate readings.

Step 2

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

Note: Test is polarity sensitive, adhere to probe placement as shown in chart below.

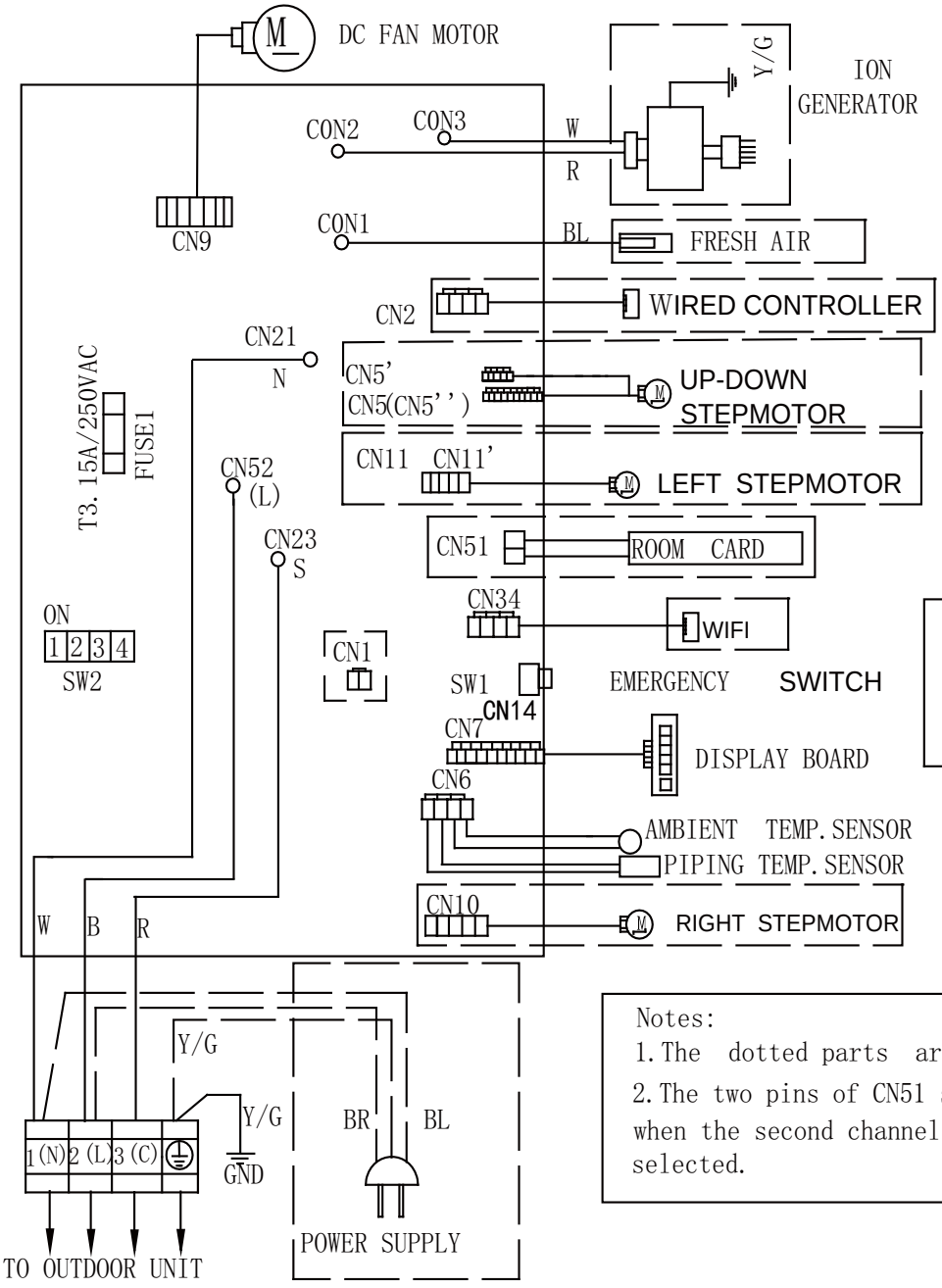
Step 3

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

		Red Test Lead						
		Pink	X	X	Black	White	Blue	Yellow
Black Test Lead	Pink	-	X	X	15.27 Meg	15.46 Meg	Infinity	15.85 Meg
	X	-	-	X	X	X	X	X
	X	-	-	-	X	X	X	X
	Black	-	-	-	-	108.2K	Infinity	241.8K
	White	-	-	-	-	-	Infinity	349.5K
	Blue	-	-	-	-	-	-	5.14 Meg
	Yellow	-	-	-	-	-	-	-

INDOOR UNIT DIAGRAM

0010561514H



R:Red B:Black
W:White BL:Blue
Y:Yellow BR:Brown
Y/G:Yellow/Green

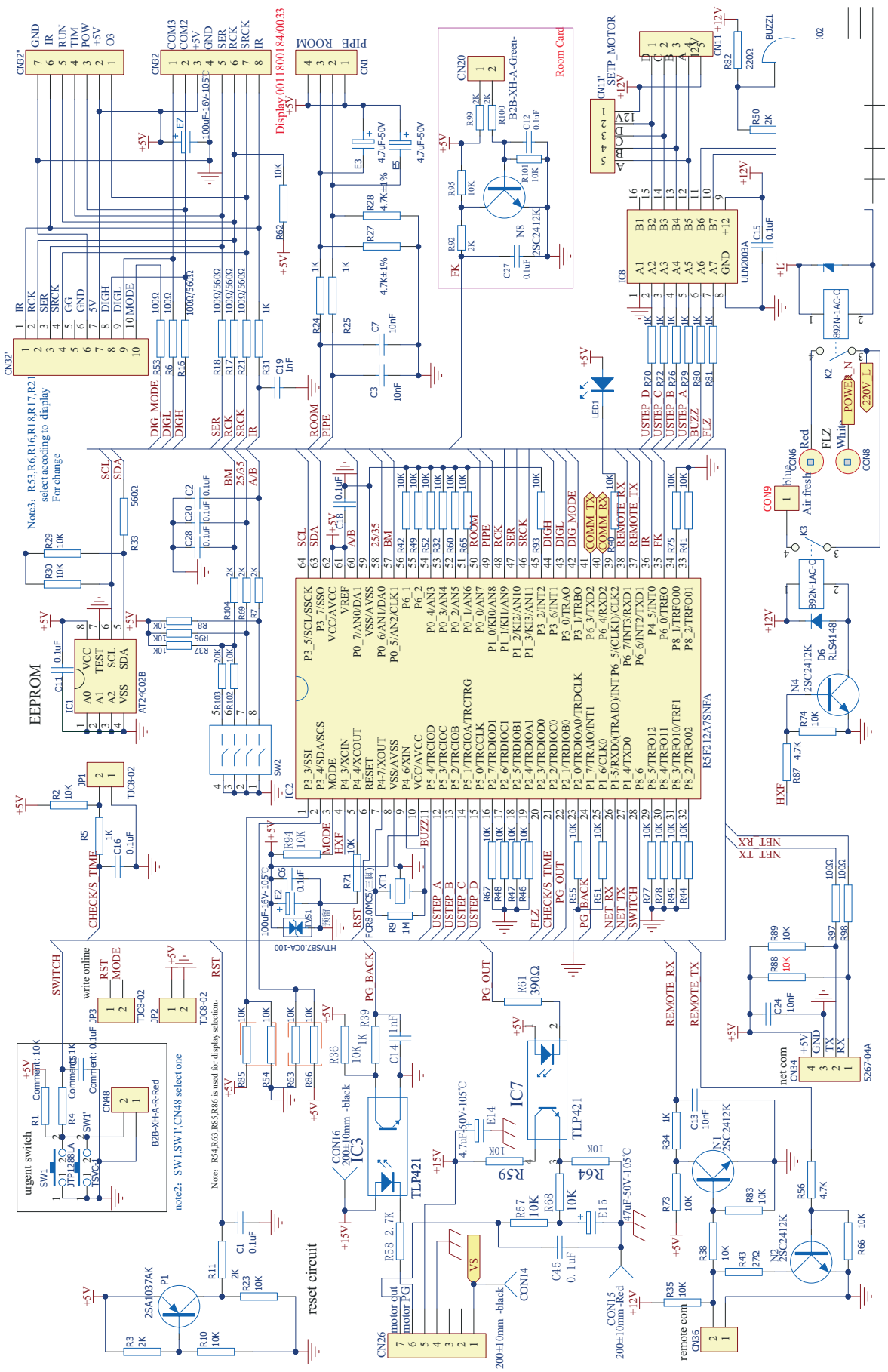
Notes:
1. The dotted parts are optional.
2. The two pins of CN51 should be shorted, when the second channel(RC) of SW2 is selected.

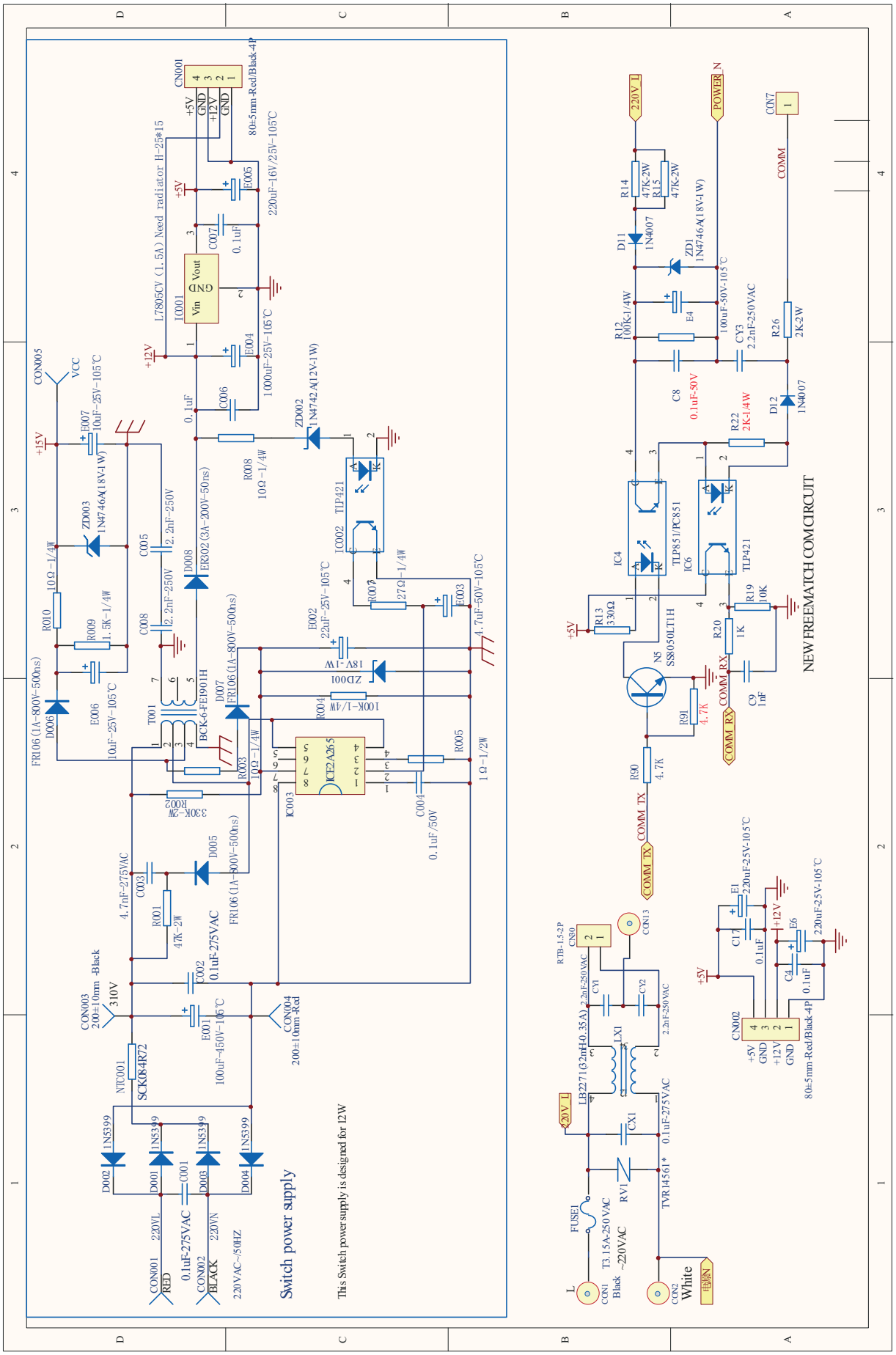
Model selection:

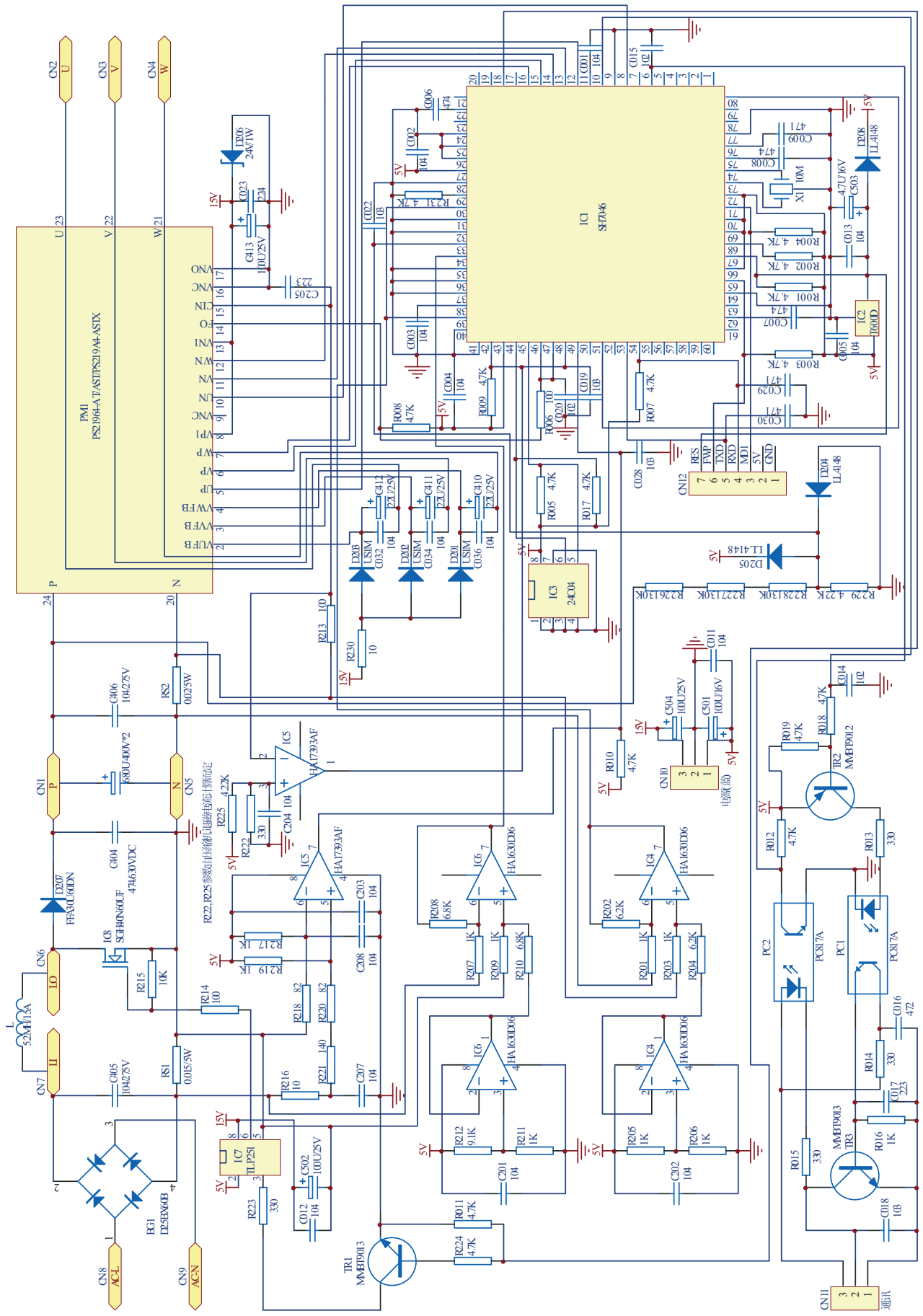
09K model-23 code - SW2	- 3 off	4 off
12K model-26 code - SW2	- 3 off	4 on
15K model-33 code - SW2	- 3 on	4 off
18K model-33 code - SW2	- 3 on	4 off
24K model-35 code - SW2	- 3 on	4 on

Except for this model:
AS18ND1HRA/AW18LC2VHB-23 code - SW2 - 3 off 4 off

Notes:Before replacing the board,It is necessary to ensure that the machine is matched with the board code.


Display:0011800184/0033
Room Card
Note3: R53,R6,R16,R18,R17,R21 select according to diaplay For change
EEPROM
AT24C02B
R5F212A7SNFA
CHECK/S_TIME
SWITCH
RESET
PG_BACK
PG_OUT
REMOTE_RX
REMOTE_TX
reset circuit
write online
urgent switch
net com
remote com
motor out
motor PG
Air fresh
POWER_N
220V_L
FLZ
HXF
USTEP_A
USTEP_B
USTEP_C
USTEP_D
DIG_MODE
SETP_MOTOR
ULN2003A
B2B-XH-A-Green-
B2B-XH-A-R-Red
892N-1AC-C
HTV587.0CA-100
FCR8.0MC5
2SA1037AK
2SC2412K
RLS4148
TLP421
IC7
IC3


Switch power supply
This Switch power supply is designed for 12W
NEW FREEMATCH COM CIRCUIT
220VAC~50HZ
L
N
White
Black
RED
BLACK
FUSE1
T3.15A-250VAC
~220VAC
TVR14561*
RV1
CX1
0.1uF-275VAC
LB2271(32mH0.35A)
LX1
2.2nF-250VAC
CY1
CY2
RTB-1.5-2P
CN001
CN002
CN003
CN004
CN005
CN007
CN0
CON1
CON2
NTC001
SCK084R72
D001
D002
D003
D004
D005
D006
D007
D008
D011
D12
1N5399
FR106(1A-800V-500ns)
ER302(3A-200V-50ns)
1N4007
ZD001
ZD002
ZD003
ZD1
1N4742A(12V-1W)
1N4746A(18V-1W)
T001
BCK-6-FE1901H
IC001
L7805CV(1.5A) Need radiator H-25*15
IC002
TLP421
IC003
ICE2A265
IC4
IC6
TLP851/PC851
N5
SS8050LT1H
C001
0.1uF-275VAC
C002
0.1uF-275VAC
C003
4.7nF-275VAC
C004
0.1uF/50V
C005
2.2nF-250V
C006
0.1uF
C007
0.1uF
C008
2.2nF-250V
C9
1nF
C8
0.1uF-50V
C17
0.1uF
C4
0.1uF
CY3
2.2nF-250VAC
E001
100uF-450V-105℃
E002
22uF-25V-105℃
E003
4.7uF-50V-105℃
E004
1000uF-25V-105℃
E005
220uF-16V/25V-105℃
E006
10uF-25V-105℃
E007
10uF-25V-105℃
E1
220uF-25V-105℃
E4
100uF-50V-105℃
E6
220uF-25V-105℃
R001
47K-2W
R002
330K-5W
R003
1Ω-1/4W
R004
100K-1/4W
R005
1Ω-1/2W
R008
10Ω-1/4W
R009
1.5K-1/4W
R010
10Ω-1/4W
R003
27Ω-1/4W
R12
100K-1/4W
R13
330Ω
R14
47K-2W
R15
47K-2W
R19
10K
R20
1K
R22
2K-1/4W
R26
2K-2W
R30
4.7K
R91
4.7K
+5V
+12V
+15V
GND
Vout
Vin
VCC
220V L
220V N
POWER N
COMM
COMM TX
COMM RX
80±5mm-Red/Black-4P
310V
200±10mm-Black
200±10mm-Red



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ERROR CODES ***D-2***

TROUBLESHOOTING FLOWCHARTS ***D-4***

E14 ..... D-4

LED 1: 5 Flash D-4

LED1: 2 Flash D-5

LED 1: 3 or 24 or 25 Flash D-5

LED1: 4 Flash D-6

LED1: 6 Flash D-6

LED1: 8 Flash D-7

E7/LED1: 15 Flash D-7

LED 1: 18 or 19 Flash D-8

SENSOR RESISTANCE TABLES ***D-9***

ERROR CODES

OUTDOOR UNITS LED DISPLAY	FAULT DESCRIPTION	INDOOR UNIT DIGITAL DISPLAY
1	OUTDOOR EEPROM FAILURE	F12
2	IPM OVERCURRENT OR SHORT CIRCUIT	F1
/	OUTDOOR ALTERNATING CURRENT, OVER CURRENT PROTECTION	F22
3	COMPRESSOR OVER CURRENT DURING DECELERATION	/
4	COMMUNICATION FAILURE BETWEEN THE IPM AND OUTDOOR PCB	F3
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
/	HIGH OUTDOOR SUCTION TEMPERATURE	F30*
14	PFC CIRCUIT LOOP VOLTAGE	/
15	COMMUNICATION FAILURE BETWEEN THE INDOOR & OUTDOOR UNIT	E7
16	LACK OF REFRIGERANT OR DISCHARGING	F13*
17	4-WAY VALVE SWITCHING FAILURE	F14*
18	LOSS OF SYNCHRONISM DETECTION	F11
/	POSITION DETECTION CIRCUIT FAULT OF COMPRESSOR	F28
19	LOW DC OR AC VOLTAGE	/
/	TERMINAL BLOCK TEMP TOO HIGH	F15*
20	INDOOR THERMAL OVERLOAD	E9
/	INDOOR UNIT OVERLOAD PROTECTION, HEATING MODE ONLY.	E9*
/	INDOOR COIL FROSTED	E5
/	INDOOR ANTI-FROSTING PROTECTION	E5*
22	PFC CIRCUIT LOOP OVERCURRENT	/
/	INDOOR COIL TEMPERATURE (ABNORMAL READING)	/
23	MODULE THERMAL OVERLOAD	F5*
24	COMPRESSOR START FAILURE, OVER-CURRENT	F2*
25	PHASE CURRENT PROTECTION (IPM)	F23*
/	MCU RESET	F9
26	IPM POWER SUPPLY PHASE LOSS (3-PHASE)	/
27	MODULE CURRENT DETECT CIRCUIT MALFUNCTION	F24
28	WIRING ERROR: COMPRESSOR TO IPM	/
/	LOW REFRIGERANT FLOW. LOCKOUT.	/

* Hidden indoor error code. LED1 will flash outdoors, but no error will appear on indoor unit display. To view error code on indoor display, press and hold the Emergency button for 15 seconds.

OUTDOOR UNITS	FAULT DESCRIPTION	INDOOR UNIT
LED DISPLAY		DIGITAL DISPLAY
/	LIQUID PIPE SENSOR FAILURE: CIRCUIT A	F10
/	LIQUID PIPE SENSOR FAILURE: CIRCUIT B	F16
/	LIQUID PIPE SENSOR FAILURE: CIRCUIT C	F17
/	LIQUID PIPE SENSOR FAILURE: CIRCUIT D	F18
/	GAS PIPE SENSOR FAILURE: CIRCUIT A	F29
/	GAS PIPE SENSOR FAILURE: CIRCUIT B	F30
/	GAS PIPE SENSOR FAILURE: CIRCUIT C	F31
/	GAS PIPE SENSOR FAILURE: CIRCUIT D	F32
/	GAS PIPE SENSOR FAILURE: CIRCUIT E	F26
/	OUTDOOR PIPE TEMPERATURE PROTECTION IN COOLING MODE	F34
37	COMPRESSOR OVERCURRENT DETECTED BY IPM	/
38	MALFUNCTION OF MODULE TEMPERATURE SENSOR MOMENTARY POWER FAILURE DETECTION	F35
39	MALFUNCTION OF CONDENSING TEMPERATURE SENSOR	F36
/	LIQUID PIPE SENSOR FAILURE: CIRCUIT E	F33
/	TOCI TEMPERATURE SENSOR FAILURE	F38
42	HIGH PRESSURE SWITCH OPEN	F39
43	LOW PRESSURE SWITCH OPEN	F40
44	SYSTEM HIGH PRESSURE PROTECTION: OVERCHARGED, HIGH CONDENSING TEMPERATURE OR MALFUNCTION OF FAN MOTOR.	F41
45	SYSTEM LOW PRESSURE PROTECTION: UNDERCHARGED, LOW DEFROSTING TEMPERATURE, OR MALFUNCTION OF FAN MOTOR.	F42
/	INCORRECT MATCH BETWEEN INDOOR & OUTDOOR	F43
/	OAT LESS THAN -22°F (-30°C)	/
/	INDOOR AMBIENT TEMPERATURE SENSOR FAILURE	E1
/	INDOOR COIL TEMPERATURE SENSOR FAILURE	E2
/	INDOOR PCB EEPROM FAILURE	E4
/	COMMUNICATION FAULT BETWEEN THE INDOOR AND OUTDOOR UNIT	/
/	COMMUNICATION FAULT BETWEEN THE CONTROLLER AND INDOOR UNIT	/
/	DC VOLTAGE OF THE FAN MOTOR DRIVER TOO HIGH OR TOO LOW	/
/	FAN MOTOR DRIVER OVER 95°F (35°C)	/
/	INDOOR FAN MOTOR OUT OF STEP	/
/	DRAIN SYSTEM MALFUNCTION	/
/	ZERO CROSS SIGNAL DETECTED WRONG	/
/	INDOOR FAN MOTOR MALFUNCTION	E14*
/	OUTDOOR PCB FAIL	D1, D2, D3

* Hidden indoor error code. LED1 will flash outdoors, but no error will appear on indoor unit display. To view error code on indoor display, press and hold the Emergency button for 15 seconds.

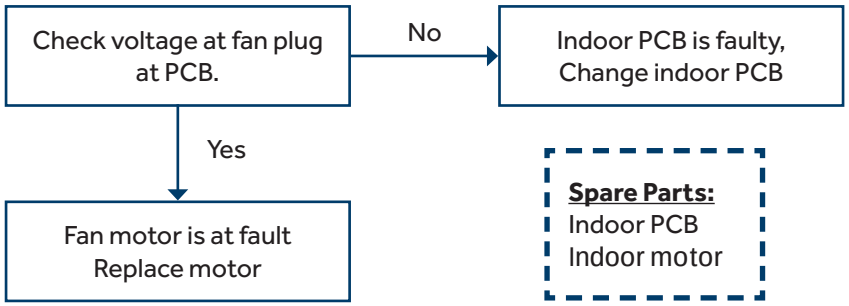
Error Code (Indoor)

E14

Indoor Motor or Indoor PCB fault

Models:

ASYW09PRDBB
ASYW12PRDBB
ASYW15PRDBB
ASYW18PRDBB
ASYW24PRDBB



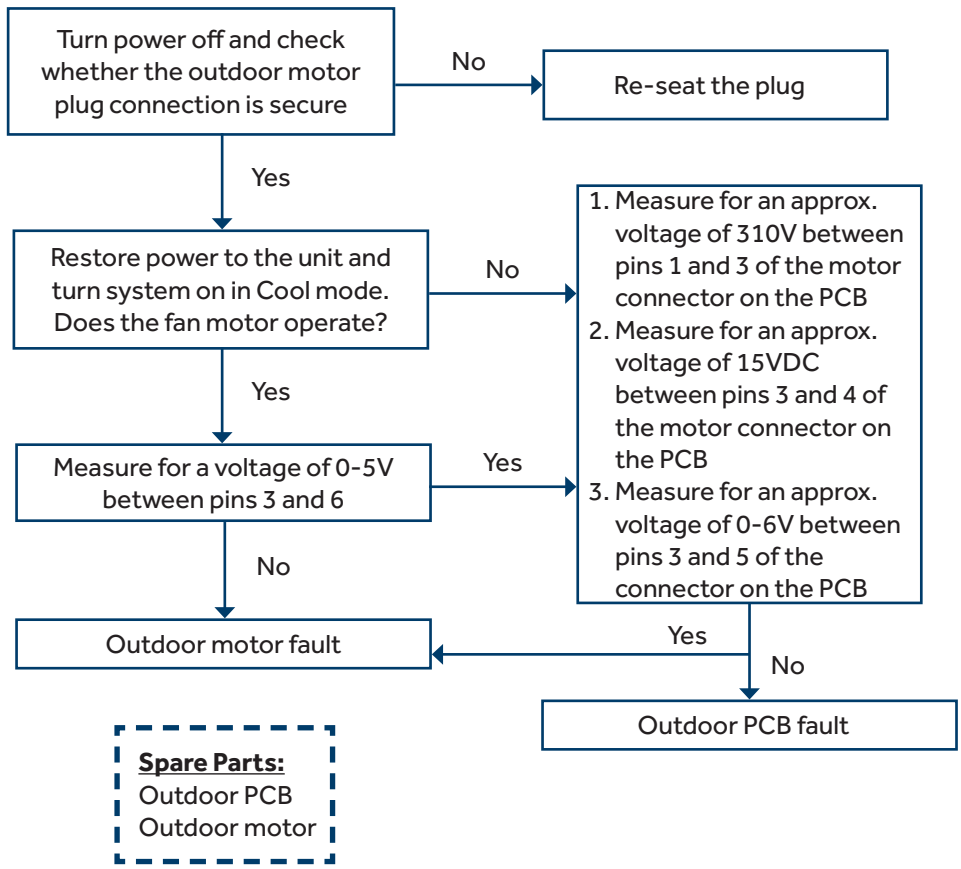
Error Code (Outdoor)

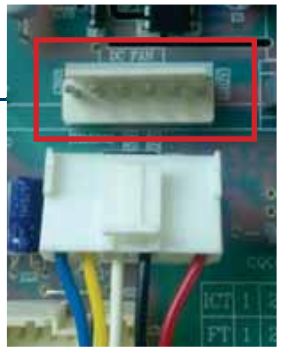
LED 1: 5 Flash

Outdoor Motor or Outdoor PCB Fault

Models:

ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



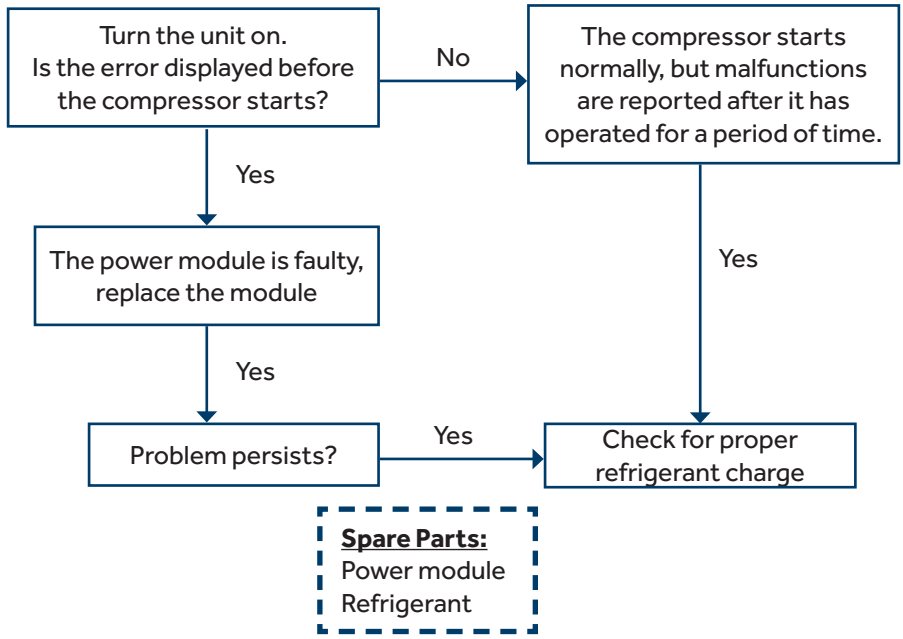


Error Code (Outdoor)
LED 1: 2 Flash
IPM Protection

Under this error, please ensure the refrigerant system pressure is normal with no blockages, then replace power module

Models:

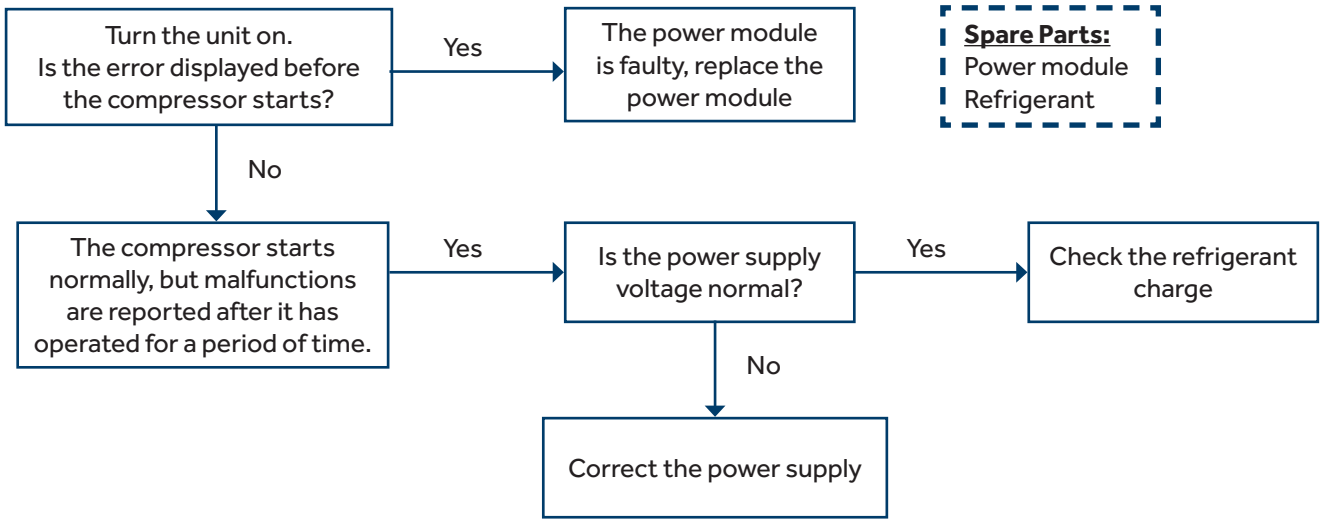
ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



Error Code (Outdoor)
LED 1: 3 or 24 or 25 Flash
Over-Current of the Compressor

Models:

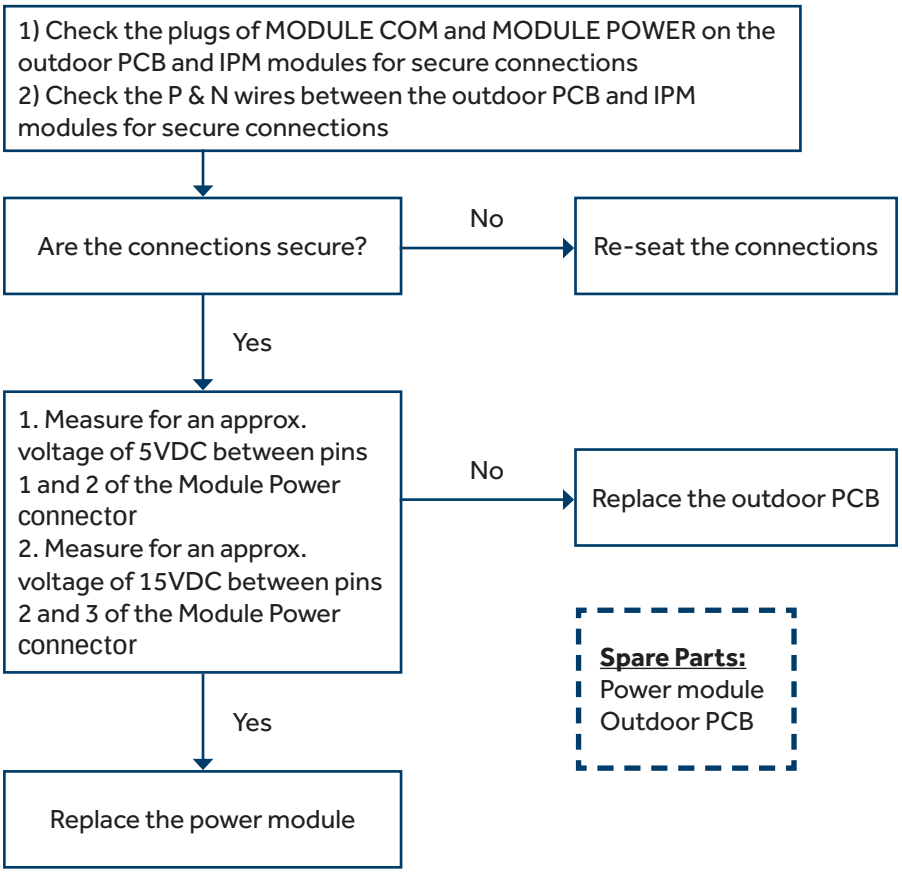
ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



Error Code (Outdoor)
LED 1: 4 Flash
Communication Fault Between IPM and Outdoor PCB

Models:

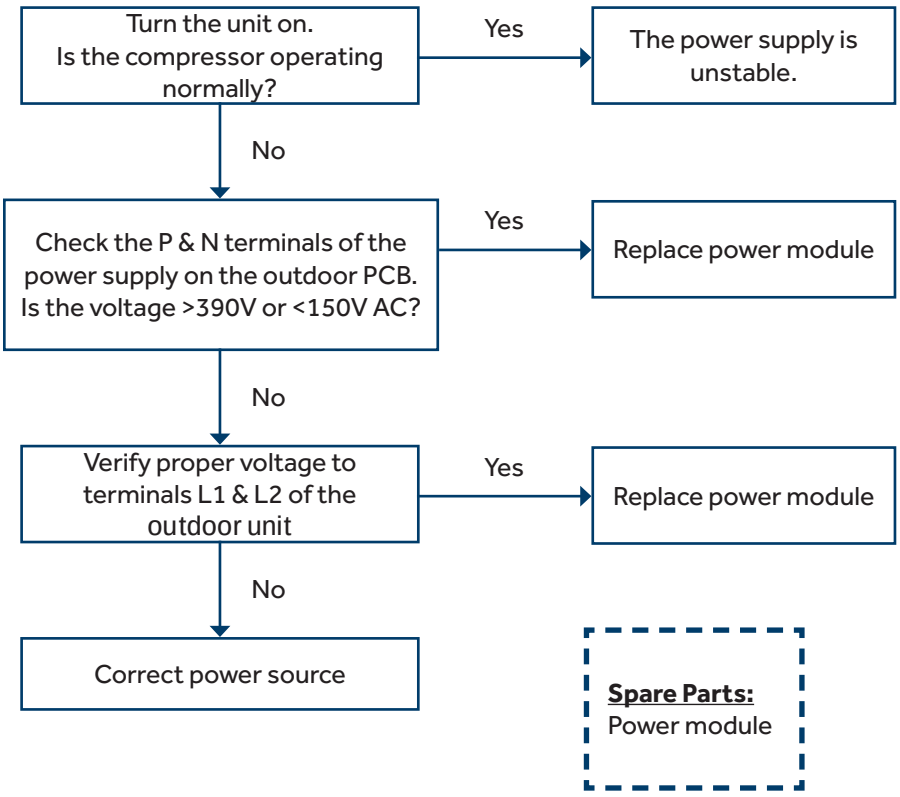
ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



Error Code (Outdoor)
LED 1: 6 Flash
Power Supply Too High or Too Low

Models:

ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



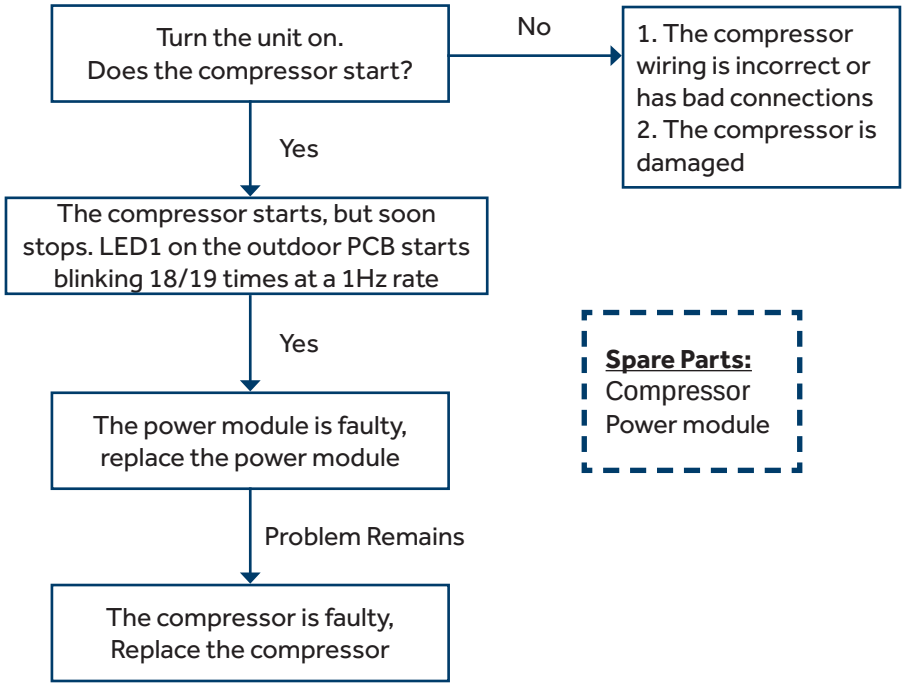
Error Code (Outdoor)

LED 1: 8 Flash

Overheat Protection for Discharge Temperature

Models:

ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



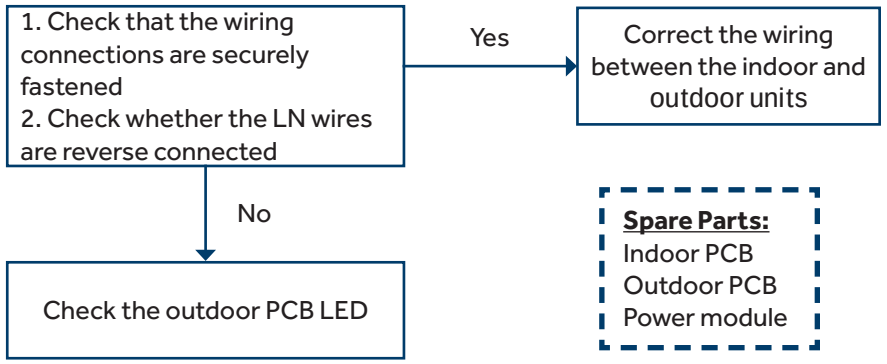
Error Code (Indoor/Outdoor)

E7/LED 1: 15 Flash

Communication Fault Between Indoor and Outdoor Units

Models:

ASYW09PRDBB
ASYW12PRDBB
ASYW15PRDBB
ASYW18PRDBB
ASYW24PRDBB
ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



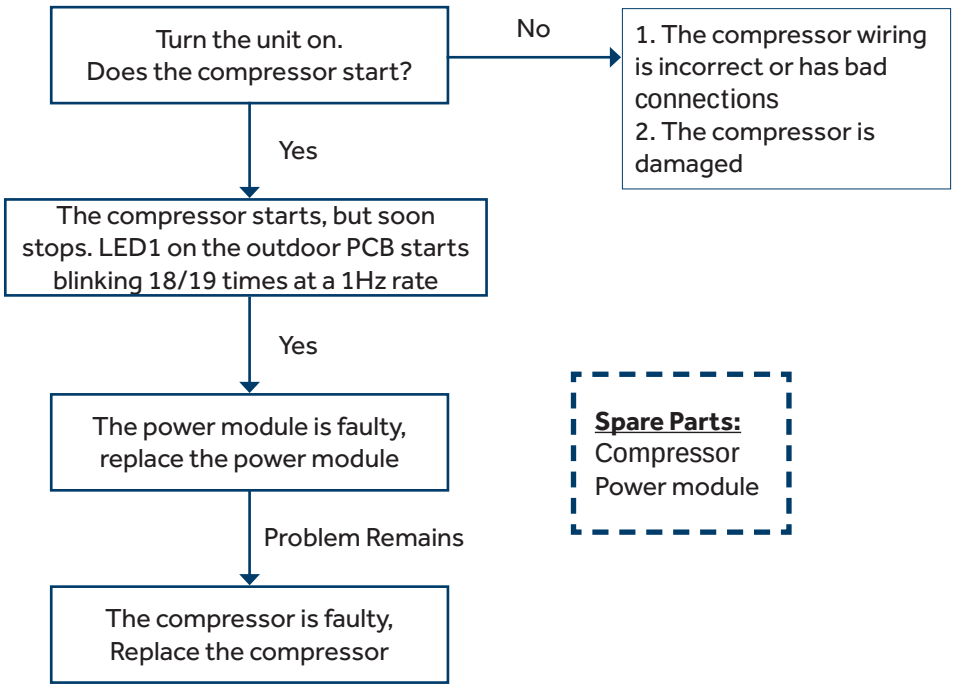
LED	LED 1	LED 2	Solution
ON/OFF	OFF	ON	Outdoor PCB fault
ON/OFF	ON	ON	This is caused by Outdoor PCB or Indoor PCB fault. Change one part firstly, it still unsolved, change another one.
ON/OFF	OFF	OFF	This is caused by Outdoor PCB or Power module fault. Change one part firstly, if still unsolved change another one.

ENGLISH

Error Code (Outdoor)
LED 1: 18 or 19 Flash
Loss of Synchronism Detection

Models:

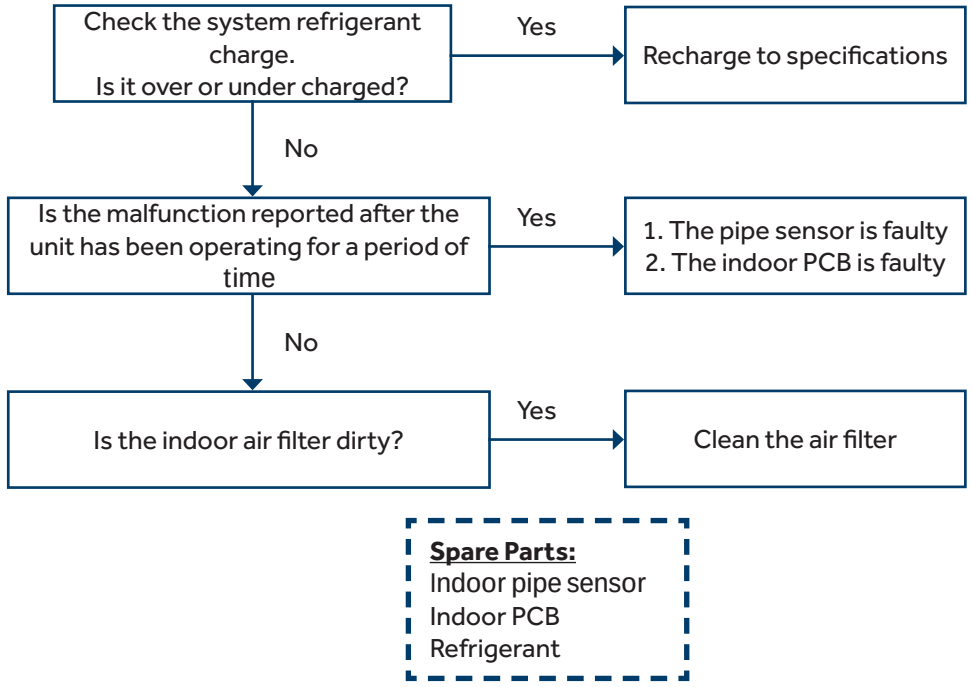
ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



Error Code (Outdoor)
LED 1: 18 or 19 Flash
Indoor Unit Overload in Heating Mode

Models:

ASH109PRDBB
ASH112PRDBB
ASH115PRDBB
ASH118PRDBB
ASH124PRDBB



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 Caliber & All CAC)	23K

10K Sensors: Ambient (all except ducted, cassette, and 9K-12K Caliber), suction, gas, defrost, and pipe sensors.
23K Sensors: Ambient sensors for ducted, cassette, and 9K-12K Caliber
50K Sensors: Discharge sensors

		Normal (KΩ)		
°F	°C	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
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
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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