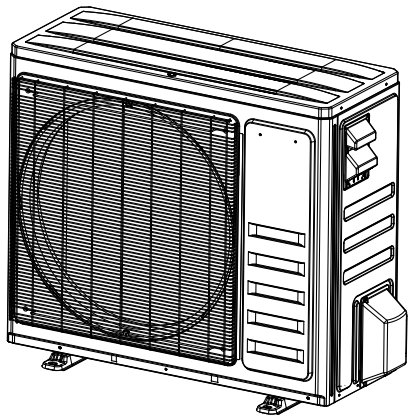
Service Facts

Side Discharge Heat Pump

5HPL5024A1000A
5HPL5036A1000A
5HPL5048A1000A
5HPL5060A1000A



Notes:

- *Graphics in this document are for representation only. Actual model may differ in appearance.*
- *The manufacturer recommends installing only approved matched indoor and outdoor systems. All of the manufacture's split systems are AHRI rated only with TXV/EEV indoor systems. Some of the benefits of installing approved matched indoor and outdoor split systems are maximum efficiency, optimum performance and the best overall system reliability.*

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

February 2026

ODR-SVF010B-EN

Safety Section

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/ sleeves, butyl gloves, safety glasses, hard hat/ bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

⚠ WARNING

Cancer and Reproductive Harm!

This product can expose you to chemicals, including lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury or property damage.

This unit is not to be used by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the appliance by a person responsible for their safety.

Do not allow children to play or climb on the unit or to clean or maintain the unit without supervision.

Important: *This document contains a wiring diagram and service information. This is customer property and is to remain with this unit. Please return to service information pack upon completion of work.*

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury and/or property damage.

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

⚠ WARNING

Risk of Fire — Flammable Refrigerant!

Failure to follow instructions below could result in death or serious injury, and equipment damage.

- **To be repaired only by trained service personnel.**
- **Do not puncture refrigerant tubing.**
- **Dispose of properly in accordance with federal or local regulations.**

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury and/or property damage.

Only qualified personnel with adequate electrical and mechanical experience must repair the unit. The manufacturer or seller is not responsible for any interpretation or resulting liability.

⚠ WARNING

Ventilation Required!

Failure to follow instructions below could result in death or serious injury or property damage.

Confirm the area is adequately ventilated before breaking into the system or conducting any hot work.

⚠ WARNING

Hazardous Voltage!

Failure to follow instructions below could result in death or serious injury.

Voltage may be present even with power disconnected due to high winds causing fan rotation. Refer to the Technical Manual for servicing instructions.

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury and equipment or property damage.

- **Store the appliance in a room without continuously operating ignition sources(for example: open flames, an operating gas appliance, or an operating electric heater).**
- **Do not pierce or burn.**
- **Be cautious that refrigerants may be odorless.**

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury or property damage.

Children should be supervised to ensure that they do not play with the appliance.

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠ WARNING

Grounding Required!

Failure to follow instructions below could result in death or serious injury, or property damage.

- **Reconnect all grounding devices.**
- **All parts of this product that are capable of conducting electrical current are grounded.**
- **If grounding wires, screws, straps, clips, nuts, or washers used to complete a path to ground are removed for service, they must be returned to their original position and properly fastened.**

⚠ WARNING

Electrical Shock Hazard!

Failure to follow instructions below could result in death or serious injury or property damage.

Confirm proper grounding before connecting electrical supply.

⚠ CAUTION

Caution!

Failure to follow instructions below could result in minor to moderate injury or equipment damage.

- **For brazing, confirm all joints are brazed, not soldered.**
- **For mechanical connections, confirm a negative leak test.**
- **Inspect lines and use proper service tools.**

⚠ CAUTION

Unit Contains R–454B Refrigerant!

Failure to use proper service tools may result in equipment damage or personal injury.

Use only R-454B refrigerant and approved compressor oil.

Table 1. Operating Range

Mode	Model	Operating Range
Cooling	2 – 5 Ton	5 °F – 115°F
Heating	2 – 5 Ton	-4° F – 86°F

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Trademark

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Revision History

- Updated Product Specifications chapter.
- Updated Low voltage connection diagram in the Electrical – Low Voltage chapter.
- Updated Capacity adjustment using unit dip switches figure in Unit Capacity Adjustment chapter.
- Updated Sequence of Operation chapter.
- Updated the pressure curves diagrams in the Pressure Curves chapter.

Product Specifications

Table 2. 5HPL5 heat pump models

Outdoor Unit [a] [b]	**5HPL5024A1**	**5HPL5036A1**	**5HPL5048A1**	**5HPL5060A1**
Power conns. – v/ph/hz [c]	208/230/1/60	208/230/1/60	208/230/1/60	208/230/1/60
Min. Brch. Cir. Ampacity	22	30	35	35
Max. Over Current Protection	35	45	55	55
Compressor	Rotary - Inverter	Rotary - Inverter	Rotary - Inverter	Rotary - Inverter
No. Used - No. Stages	1 - Multi	1 - Multi	1 - Multi	1 - Multi
Volts/Ph/Hz	208/230/1/60	208/230/1/60	208/230/1/60	208/230/1/60
R.L. amps[d]	15.8	20	25	25
Factory Installed				
Start components [e]	NA	NA	NA	NA
Insulation/Sound Blanket	Yes	Yes	Yes	Yes
Compressor Heat	Yes	Yes	Yes	Yes
Outdoor Fan	Propeller	Propeller	Propeller	Propeller
DIA. (in.) – No. used	21-5/8-1	23-5/8-1	20-7/8-2	20-7/8-2
Type Drive – No. Speeds	Direct - Multi	Direct - Multi	Direct - Multi	Direct - Multi
No. Motors – HP	1-1/8	1-1/4	2-1/8	2-1/8
Cfm @ 0.0 in. W.G.[f]	2350	3000	4200	4200
Motor Speed R.P.M.	200 - 1200	200 - 1200	200 - 1200	200 - 1200
Volts/Ph/Hz	208/230/1/60	208/230/1/60	208/230/1/60	208/230/1/60
F.L. amps	1.1	1.1	1.45	1.45
Outdoor Coil – Type	Plate Fin™	Plate Fin™	Plate Fin™	Plate Fin™
Rows – F.P.I.	2-18	3-17	3-17	3-17
Face Area (Sq. Ft.)	8.09	9.72	12.56	12.56
Tube Size (in.)	0.275	0.275	0.275	0.275
Refrigerant Control	Elec. Expansion Valve	Elec. Expansion Valve	Elec. Expansion Valve	Elec. Expansion Valve
Refrigerant				
lb R-454B (outdoor unit) [g]	5 lb, 5 oz	7 lb, 10 oz	8 lb, 13 oz	8 lb, 13 oz
Factory Supplied	Yes	Yes	Yes	Yes
Line Size – in. O.D. Gas [h]	3/4	3/4	7/8	7/8
Line Size - in. O.D. Liq.	3/8	3/8	3/8	3/8
Dimensions	H x W x D			
Crated (in.)	36-11/16 x 40-1/4 x 18-15/16	38-3/16 x 44-11/16 x 20-7/8	57-3/8 x 42-17/32 x 16-15/16	57-3/8 x 42-17/32 x 16-15/16
Uncrated (in.)	31-11/32 x 38-1/2 x 16-9/16	33-25/32x 42-1/2 x 19-15/32	52-11/16 x 40-23/32 x 16-1/8	52-11/16 x 40-23/32 x 16-1/8
Weight				
Shipping (Lbs.)	146	192	260	260
Net (Lbs.)	135	181	247	247

[a] Certified in accordance with the air-source unitary air-conditioner equipment certification program, which is based on ahri standard 210/240.
[b] Rated in accordance with ahri standard 270/275.
[c] Calculated in accordance with Natl. Elec. Codes. Use only HACR circuit breakers or fuses.
[d] This value shown for compressor RLA on the unit nameplate and on this specification sheet is used to compute minimum branch circuit ampacity and max. fuse size. The value shown is the branch circuit selection current.
[e] NA means no start components. Yes means quick start kit components. PTC means positive temperature coefficient starter.
[f] Standard Air – Dry coil – Outdoor.
[g] This value approximate. For more precise value see unit nameplate.
[h] Reference the outdoor unit ship-with literature for refrigerant piping length and lift guidelines. Reference the refrigerant piping software pub # 32-3312-xx or *Refrigerant Piping Manual for Small Split Cooling and Heat Pump Systems Application Guide* (SS-APG006*-EN) for long line sets or specialty applications (xx denotes latest revision).

System Charge Adjustment

Table 3. Additional refrigerant per line set length

Liquid pipe diameter	3/8 -in.
Additional charge for ft. pipe (R-454B)	0.32 oz

Factory charge is sufficient for 24.6 ft of line length.

Electrical – Low Voltage

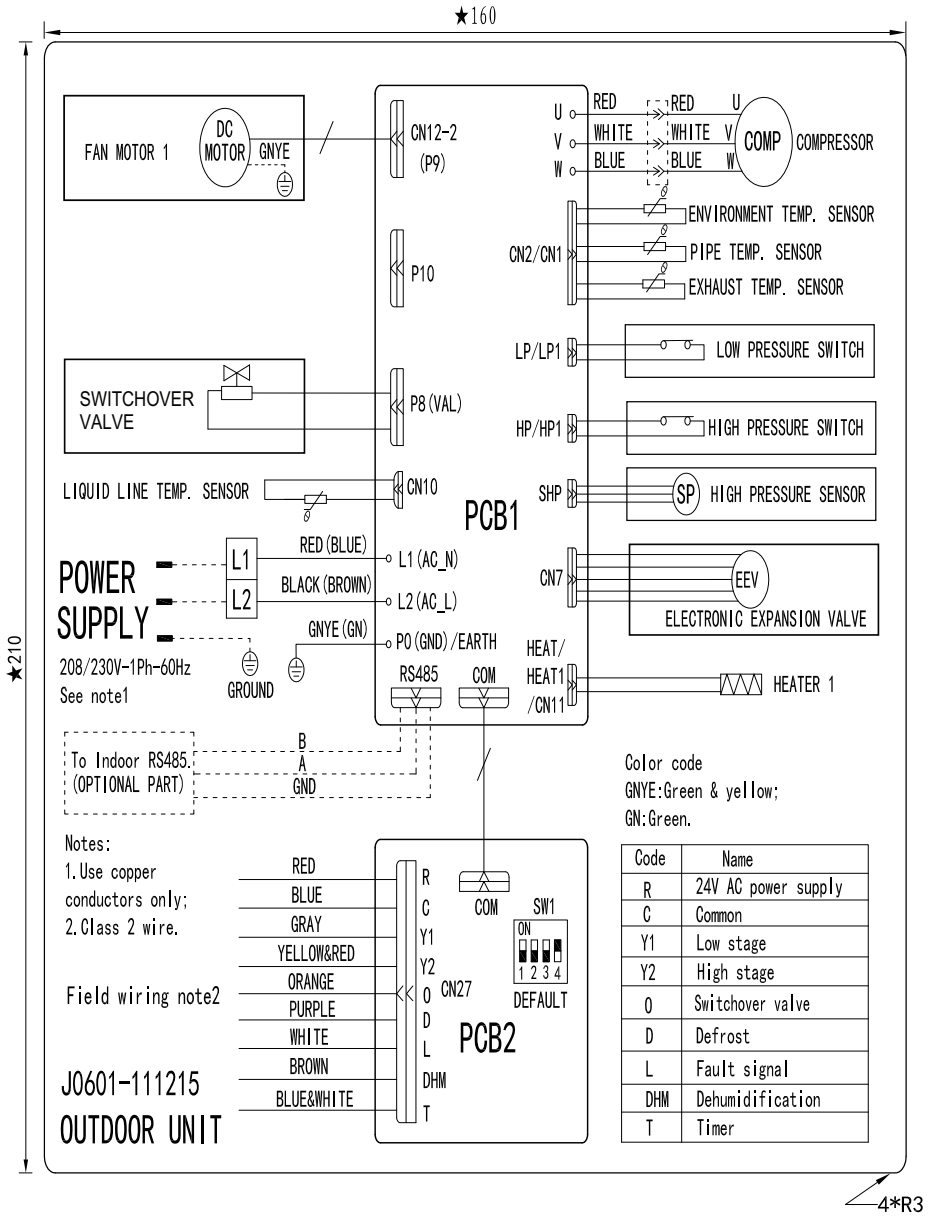
Notes:

- *Field-installed electrical conduit is required at the low voltage wire entry point to prevent pests from entering into the control box resulting in PCB damage.*
- *The use of color coded low voltage wire is recommended to simplify connections between the outdoor unit, the control, and the indoor unit.*

Table 4. Low voltage maximum wire length

Control Wiring	
Wire Size	**Maximum Wire Length (ft.)**
18 AWG	150
16 AWG	225
14 AWG	300

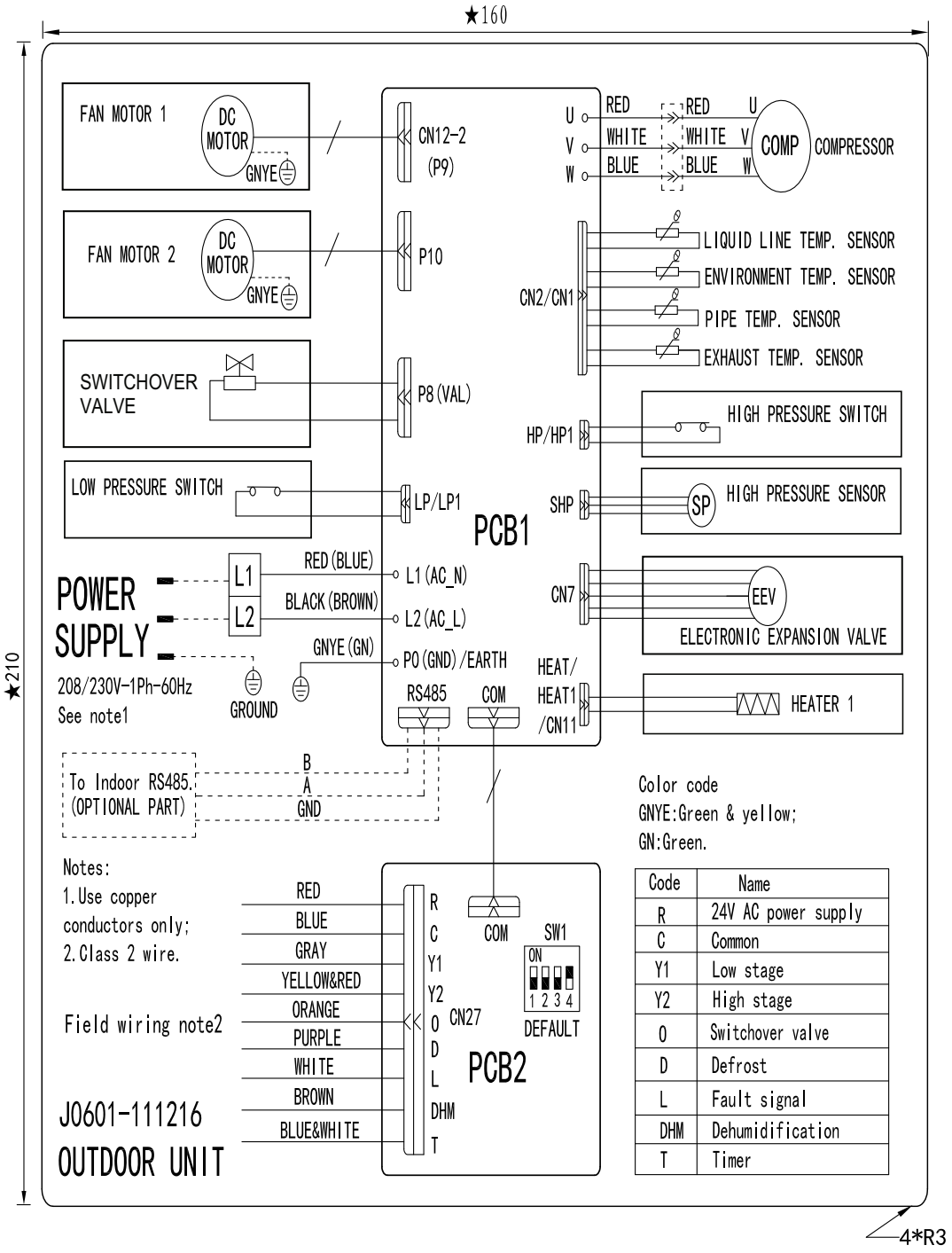
Figure 1. Wiring diagam – 2-ton and 3-ton models



Notes:

- *Class 2 low voltage control wiring should not be run in conduit with main power wiring and should be separated.*
- *See the low voltage connection diagram in Figure 3, p. 9.*

Figure 2. Wiring diagam – 4-ton and 5-ton models

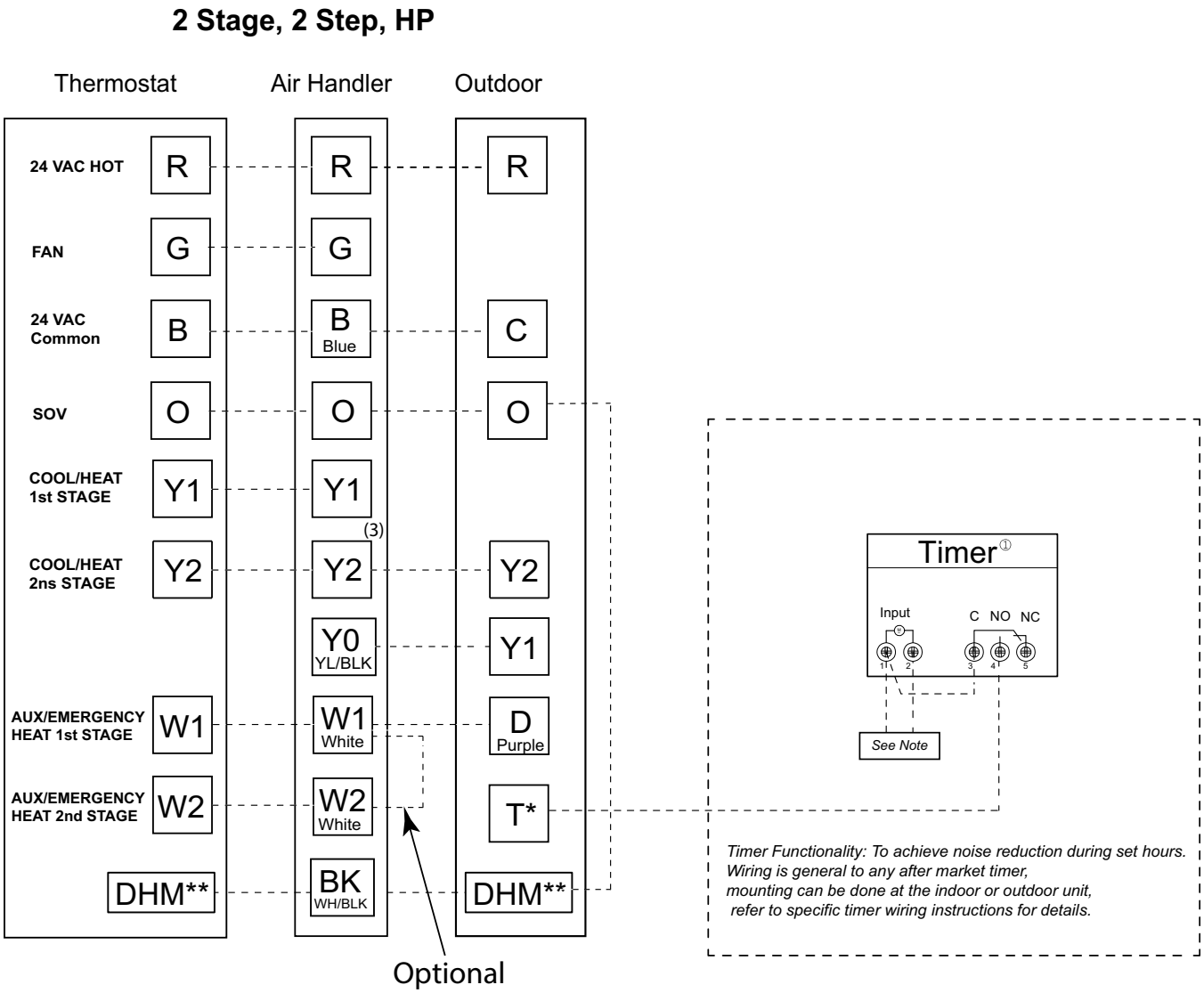


Code	Name
R	24V AC power supply
C	Common
Y1	Low stage
Y2	High stage
O	Switchover valve
D	Defrost
L	Fault signal
DHM	Dehumidification
T	Timer

Notes:

- *Class 2 low voltage control wiring should not be run in conduit with main power wiring and should be separated.*
- *See the low voltage connection diagram in Figure 3, p. 9.*

Figure 3. Low voltage connection diagram



Notes:

1. *Units with pigtails require wirenuts for connections.*
2. *Cap all unused wires.*
3. *For other wiring options, please scan QR code in Figure 4, p. 10.*
4. *When BK is used, cut the jumper between R and BK on the control board. See wiring schematic for details.*
5. *In AC systems for multiple stages of electric heat, jumper W1 and W2 together if comfort control has only one stage of heat.*
6. *Reversing valve is energized in cooling.*
7. *If a standard control is used without a dehumidification function, a jumper will need to be placed between O and DHM on the Outdoor PCB.*

Figure 4. Additional wiring diagrams

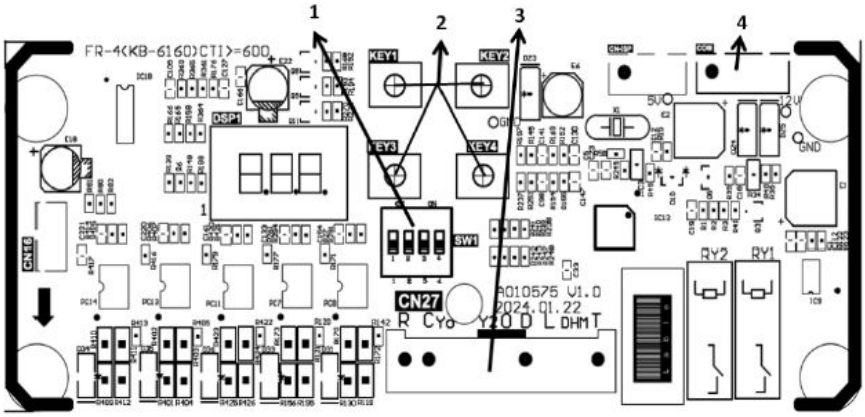
Mitigation Board Guidelines

- The approved ID/OD combination will provide sufficient safe ventilation in case of a leak.
- Refer to Indoor Unit Installer's Guide for correct specifications on indoor unit install.
- All systems require mitigation boards so an altitude adjustment factor may be required.
- Mitigation Control Board needs to be included in an A2L System.

Unit Capacity Adjustment

The DIP switches of the outdoor unit are located on the operating board of the ODU. There is a set of four-digit DIP switches with the label SW1 as shown below:

Figure 5. DIP switches of the outdoor unit



1	Dial switch
2	KEY switch
3	Thermostat connector
4	COM connector

This second switch, SW1-2, allows the capacity of the unit to be adjusted during installation. The default setting (SW1-2 at the digit end (down)) represents 100% capacity. The capacity can be adjusted by positioning the SW1-2 to the ON position.

Note: *The dip switch should be adjusted only when the unit is powered off. If the dip switch is activated when the unit is powered on, there will be no change until it is power cycled.*

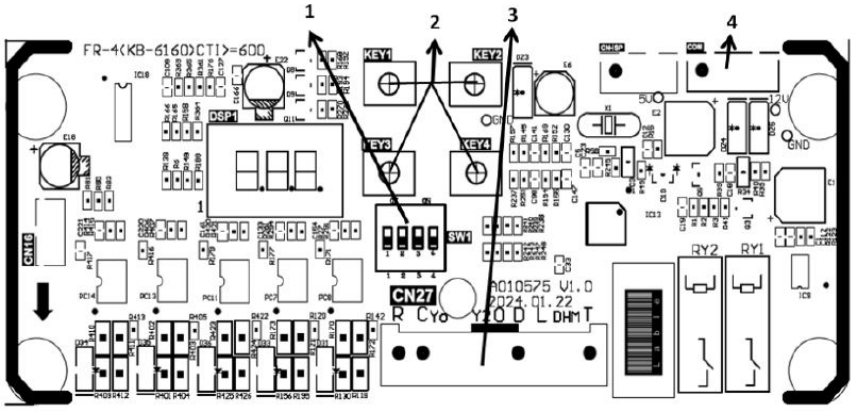
Figure 6. Capacity adjustment using unit dip switches

SW1-2	Unit capacity selection	ON Digital 1 2 3 4	100% capacity (default setting)
		ON Digital 1 2 3 4	2T → 1.5T, 3T → 2.5T, 4T → 3.5T, 5T → 4.5T

Technician Controls - Key Switches

The outdoor unit key switches are located on the operating board of the ODU. There is a group of four keys as shown below, and marked as KEY1 ~ KEY4

Figure 7. Outdoor unit key switches



1	Dial switch-**SW1**
2	KEY switch
3	Thermostat connector
4	COM connector

Forced Start Function

When the unit is not connected to the thermostat, or the thermostat cannot normally turn on the cooling/heating mode, the technician can forcibly start the outdoor unit for troubleshooting purposes.

1. Forced start in Cooling mode: Press and hold the KEY4 button for 3 seconds and release it, then the third digital display digit (DSP1-3) shows 7, and the system enters into the forced cooling operation after 1 minute.
2. Forced start in Heating mode: Press and hold the KEY4 button for 6 seconds and release it, the third digital display digit (DSP1-3) shows 8, and the system enters the forced heating operation after 1 minute.
3. Quit from the forced mode operation by pressing KEY4 once during the forced run operation.

Forced Defrosting Function

When the unit is in freezing rain, snow, or other extreme weather conditions, you can enter the forced defrosting operation through the key switch of the outdoor unit. If applicable, clean out the snow and ice before entering the forced defrosting function.

1. Enter forced defrosting: When the unit is in heating mode, press the KEY4 button twice within 5 seconds, and release it after 3 seconds. The third digital display digit (DSP1-3) will show a 6, after 3 seconds the system enters the forced defrosting operation.
2. The unit will automatically exit forced defrosting according to the system parameters. After exiting forced defrosting, the unit will continue heating operation according to the mode set by the thermostat.

Setting Parameter Settings

The unit can be set to different engineering conditions by changing the parameter settings. In the standby state, press and hold the KEY1 button for 5 seconds and release to enter the Engineering Parameter Setting function menu. In any state, while in the lower menu, press the KEY1 button to return to the upper menu.

Lowest Outdoor Ambient Temperature Setting for Heating Mode

While in the parameter setting menu under the state of selection:

1. Press the KEY2 button to adjust the digital display to S01.
2. Press the KEY3 button to adjust the parameter menu.
3. Press the KEY2 button to adjust the parameter value.
4. Press the KEY3 button to save the above section.

The parameters and their meanings are shown in the following table.

Table 5. Parameters and their meanings

Parameter Code	Value	Description
S01	0	The **Heating** mode cannot be started when the ambient temperature below -40 ° F. **(Default)**
	1	Heating cannot be started when below 41℉
	2	Heating cannot be started when below 14℉
	3	Heating cannot be started when below -4℉
	4	Heating cannot be started when below -22℉
	5	Heating cannot be started when below -40℉

Timed Defrost Setting

The defrost time can be adjusted according to the actual installation ambient conditions.

While in the parameter setting menu under the state of selection:

1. Press the KEY2 button to adjust the digital display to S02.
2. Press the KEY3 button to adjust the parameter menu.
3. Press the KEY2 button to adjust the parameter value.
4. Press KEY3 button to save the above section.

The parameters and their meanings are shown in the following table.

Table 6. Parameters and their meanings

Parameter Code	Val-ue	Description
S02	0	The compressor runs for **120** minutes accumulatively to perform one defrosting cycle **(Default)**.
	1	The compressor runs for **40** minutes accumulatively to perform one defrosting cycle.
	2	The compressor runs for **60** minutes accumulatively to perform one defrosting cycle.
	3	The compressor runs for **80** minutes accumulatively to perform one defrosting cycle.
	4	The compressor runs for **100** minutes accumulatively to perform one defrosting cycle.
	5	Turn off the timing defrosting function.

Anti-Freezing Protection Pressure Setting

This function is mainly used to reduce the freezing risk when the indoor unit is in cooling mode and the outdoor or indoor ambient temperature is too low. Since the pressure sensor is in the outdoor unit, the protection value can be appropriately reduced to improve the cooling effect in applications with long line sets. If the indoor unit is freezing often, the protection value can be appropriately increased.

While in the parameter setting menu under the state of selection:

1. Press the KEY2 button to adjust the digital display to S03.
2. Press the KEY3 button to adjust the parameter menu.
3. Press the KEY2 button to adjust the parameter value.
4. Press KEY3 button to save the above section.

The parameters and their meanings are shown in the following table:

Table 7. Parameters and their meanings

Parameter Code	Value	Description
S03	0	The unit will stop **Cooling** while the system low pressure detected lower than 94.3psi. **(Default)**
	1	The unit will stop **Cooling** while the system low pressure detected lower than 87.1psi.
	2	The unit will stop **Cooling** while the system low pressure detected lower than 78.9psi.
	3	The unit will stop **Cooling** while the system low pressure detected lower than 71.7psi.
	4	The unit will stop, when the system detect the low pressure is lower than 64.5psi.
	5	The unit will stop **Cooling** while the system low pressure detected lower than 50.1psi.

Sequence of Operation

Control Operational Overview

The systems operation mode will be determined by the 24V control signal from the thermostat. This controls the output actions of the indoor fan motor, electric auxiliary heat, compressor, outdoor fan motor, switchover valve and electronic expansion valve to achieve cooling and heating functions.

There is a digital display on the outdoor unit control board for indicating the operating status. The first digit and second digit of DSP1 display normally blank, and if there is protection or fault, it will be displayed. The specific fault codes are described in the technical service manual; The third digit of DSP1 displays the operating status of the outdoor unit.

Table 8. Operational overview

The third bit of DSP1 display	The operating system of the outdoor unit
0	Off state. The startup signal is not received.
1	Power signal received. Ready to start.
2	Cooling mode operation
3	Heating mode operation
4	Oil return operation
5	Defrosting operation
6	Forced defrosting operation
7	Forced cooling operation
8	Forced heating operation
9	Testing mode operation
A	Fault or protection shutdown state
C	Refrigerant charging mode
H	Dehumidification mode operation
q	Seattle low noise mode operation

Cooling Mode

When the thermostat calls for cooling, the circuit from R to G is completed. The blower motor is energized by the fan control, which receives the 24Vac signal from the control.

The circuit from R to Y, R to O, and DHM to O are also completed energizing the inputs at the outdoor unit for cooling operation.

The compressor will start after the outdoor fan motor runs for 2 seconds. The rotational speed of the outdoor fan motor is automatically adjusted based on the compressor frequency, outdoor ambient temperature, and coil temperature. In general, the outdoor fan motor runs at a higher speed when the outdoor ambient temperature and the compressor rotation speed are high, and the outdoor fan motor runs at a lower speed when the outdoor ambient temperature and the compressor rotation speed are low.

Heating Mode

When the thermostat calls for heating, the circuit from R to G is completed. The blower motor is energized by the fan control, which receives the 24Vac signal from the control. The circuit from R to Y is completed energizing the input at the outdoor unit for heat pump operation.

The compressor will start after the outdoor fan motor runs for 2 seconds, and the switchover valve will get power immediately when the compressor runs. The rotational speed of the outdoor fan motor is automatically adjusted based on the compressor frequency, outdoor ambient temperature, and coil temperature.

In general, the outdoor fan motor runs at a lower speed when the outdoor ambient temperature and the compressor speed are high, and the outdoor fan motor runs at a higher speed when the outdoor ambient temperature and the compressor speed are low.

The electronic expansion valve is at the maximum opening when on standby, and the valve opening will be adjusted according to the system parameters to ensure the rationality of the control system under various environmental conditions, such as exhaust temperature and exhaust pressure. In general, when the exhaust temperature is lower than the set value, the opening of the electronic expansion valve will decrease; When the exhaust temperature is higher than the set value, the opening of the electronic expansion valve will increase.

Notes:

1. *The outdoor electronic expansion valve will drive fully open during the transition from heat pump heating to defrost.*
2. *The electronic expansion valve will re-calibrate each time there is a power cycle. The valve will be driven closed and open to re-establish position. During this process, an audible sound will be heard from the valve.*

Defrost Mode

When the system is operating in heating, the outdoor control determines the need for defrost by the outdoor coil temperature.

The outdoor unit digital display will show a “5”, and the unit will perform the following actions:

1. The compressor stops running.
2. The outdoor fan motor stops rotating.
3. The switchover valve is switched to the cooling state.
4. The EEV valve of the outdoor unit is fully open.

5. The compressor runs at the preset defrosting frequency.
6. The D terminal of outdoor unit sends a 24V defrosting signal to the indoor unit.

Oil Return Operation

When the outdoor unit is in low frequency operation for long periods of time the compressor speed will be increased to ensure internal lubrication of the compressor as well as ensuring that oil is returned to the compressor. During this time, the digital display (DPS1) will show a “4”. In this case, the operating mode of the unit remains unchanged, and the compressor speed, outdoor fan motor speed, and electronic expansion valve opening will be adjusted to the corresponding parameters of the oil return mode. After 3 minutes, the system will exit the oil return mode and restore the original operating state.

Outdoor Compressor Preheating (Sump Heat)

To avoid the poor oil return or start-up difficulties caused by refrigerant migration into the compressor at low temperatures, the winding preheating function is set. It is recommended that when the outdoor ambient temperature is too low, the unit should be preheated for 8 hours before starting the unit operation.

The preheating function is implemented as follows:

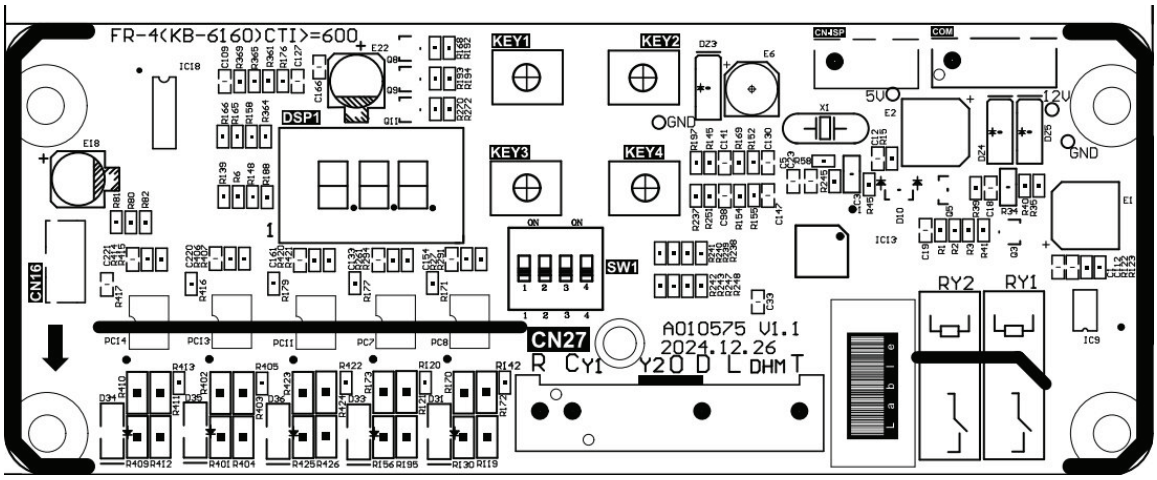
1. When the temperature of outdoor ambient environment and unit exhaust temperature sensor are lower than 10℃ (50℉), and the compressor is in an off state, the controller will apply a certain current value to the winding coil of the compressor, so that the winding coil will heat up and play the role of heating the compressor oil pool. When at 0~10℃ (32~50℉), the preheating power is about 20W, and then when the temperature decreases by 10℃ (50℉), the power will increase by about 15W~20W.
2. When the outdoor ambient temperature is higher than 15℃ (59℉) or the temperature of unit exhaust temperature sensor is higher than 20 ℃ (68℉), the system will exit the winding preheating mode.

Operation Mode Display

Side Discharge Operation Mode Display

The display enables the technician to observe the unit's mode of operation. When the unit is running in normal condition, the left and center positions on the digital display will not be illuminated. The right position of the digital display will indicate the ODU operation mode. Refer to the following chart for the indicators of the different modes.

Figure 8. Operation mode display



S3 is the indicator for the ODU operation mode, the display description is as below:

Table 9. Indicators and display descriptions

Indicator	Description
0	0 No startup signal is received, stop state
1	Startup signal has been received, ready to start up
2	Cooling mode
3	Heating mode
4	Oil return mode
5	Defrosting mode

Table 9. Indicators and display descriptions (continued)

Indicator	Description
6	Force defrosting mode
7	Force cooling mode
8	Force heating mode
A	Failure or protection, stop state
H	Dehumidification mode
q	Low noise mode

Sensors

Environmental Sensor, Coil and Suction Temperature Sensor

This table shows the corresponding voltage, resistance and temperature readings for Sensors. The power source for them is 5Vdc.

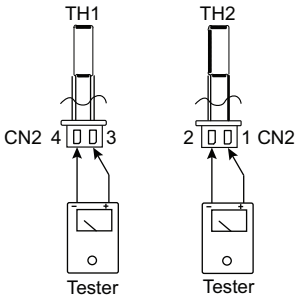
Table 10. Sensors

TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance	TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance	TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance
-22.0	63.513	4.628	59.0	7.447	2.968	140.0	1.464	1.115
-20.2	60.135	4.609	60.8	7.148	2.918	141.8	1.418	1.088
-18.4	56.956	4.589	62.6	6.863	2.868	143.6	1.374	1.061
-16.6	53.963	4.568	64.4	6.591	2.819	145.4	1.331	1.035
-14.8	51.144	4.547	66.2	6.332	2.769	147.2	1.290	1.009
-13.0	48.488	4.524	68.0	6.084	2.720	149.0	1.250	0.984
-11.2	45.985	4.501	69.8	5.847	2.671	150.8	1.212	0.960
-9.4	43.627	4.477	71.6	5.621	2.621	152.6	1.175	0.936
-7.6	41.403	4.452	73.4	5.404	2.572	154.4	1.139	0.913
-5.8	39.305	4.426	75.2	5.198	2.524	156.2	1.105	0.890
-4.0	37.326	4.399	77.0	5.000	2.475	158.0	1.072	0.868
-2.2	35.458	4.371	78.8	4.811	2.427	159.8	1.040	0.847
-0.4	33.695	4.343	80.6	4.630	2.379	161.6	1.009	0.825
1.4	32.030	4.313	82.4	4.457	2.332	163.4	0.979	0.805
3.2	30.458	4.283	84.2	4.292	2.285	165.2	0.950	0.785
5.0	28.972	4.252	86.0	4.133	2.238	167.0	0.922	0.765
6.8	27.567	4.219	87.8	3.981	2.192	168.8	0.895	0.746
8.6	26.239	4.186	89.6	3.836	2.146	170.6	0.869	0.728
10.4	24.984	4.152	91.4	3.697	2.101	172.4	0.843	0.710
12.2	23.795	4.117	93.2	3.563	2.057	174.2	0.819	0.692
14.0	22.671	4.082	95.0	3.435	2.012	176.0	0.795	0.675
15.8	21.606	4.045	96.8	3.313	1.969	177.8	0.773	0.658
17.6	20.598	4.008	98.6	3.195	1.926	179.6	0.751	0.641
19.4	19.644	3.969	100.4	3.082	1.883	181.4	0.729	0.625
21.2	18.732	3.930	102.2	2.974	1.842	183.2	0.709	0.610
23.0	17.881	3.890	104.0	2.870	1.800	185.0	0.689	0.595
24.8	17.068	3.850	105.8	2.770	1.760	186.8	0.669	0.580
26.6	16.297	3.808	107.6	2.674	1.720	188.6	0.651	0.566
28.4	15.565	3.766	109.4	2.583	1.681	190.4	0.633	0.552
30.2	14.871	3.723	111.2	2.494	1.642	192.2	0.615	0.538
32.0	14.212	3.680	113.0	2.410	1.604	194.0	0.598	0.525
33.8	13.586	3.635	114.8	2.328	1.567	195.8	0.582	0.512
35.6	12.991	3.590	116.6	2.250	1.530	197.6	0.566	0.499

Table 10. Sensors (continued)

TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance	TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance	TEMP. (°F)	Resistance (k Ohm)	Voltage of resistance
37.4	12.426	3.545	118.4	2.174	1.495	199.4	0.550	0.487
39.2	11.889	3.499	120.2	2.102	1.459	201.2	0.535	0.475
41.0	11.378	3.452	122.0	2.032	1.425	203.0	0.521	0.463
42.8	10.893	3.406	123.8	1.965	1.391	204.8	0.507	0.452
44.6	10.431	3.358	77.87	1.901	1.357	206.6	0.493	0.441
46.4	9.991	3.310	74.0	1.839	1.325	208.4	0.480	0.430
48.2	9.573	3.262	70.34	1.779	1.293	210.2	0.467	0.419
50.0	9.174	3.214	66.88	1.721	1.262	212.0	0.455	0.409
51.8	8.795	3.165	63.61	1.666	1.231	–	–	–
53.6	8.433	3.116	60.52	1.613	1.201	–	–	–
55.4	8.089	3.067	57.59	1.561	1.172	–	–	–
57.2	7.760	3.017	54.82	1.512	1.143	–	–	–

Figure 9. TH1 and TH2 sensors



Note: *Resistance at 77°F: 5 kΩ.*

TH1: Outside air temperature sensor.

TH2: Outside exchange temperature sensor.

Before measuring resistance, disconnect connectors as shown above.

A working ambient temperature sensor is required for the following:

- Low Pressure Monitoring
- Defrost (Heat Pump)
- Aux Heat Control During Defrost (Heat Pump)
- Aux Heat Lockout Compressor Lockout (Heat Pump)
- Oil Management
- Humidifier Dew-Point Control
- OD EEV Startup Position
- Pre Heating (Sump Heat)
- Normal Operation of the OD Fan Diagnostics

A working coil temperature sensor is required for the following:

- Defrost Initiation and Termination
- Compressor Sump Heat (Preheating)
- Diagnostics, Charge Level, Indoor/Outdoor Airflow

A working suction temperature sensor is required for:

- Outdoor EEV Control (Target Super Heat)
- Diagnostics, Charge level, Indoor/Oudoor Airflow

Compressor Discharge Temperature Sensor

This table shows the corresponding voltage, resistance and temperature readings for Compressor Discharge Temperature Sensors. The power source for this sensor is 5Vdc.

Table 11. Compressor discharge temperature sensors

TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance
-22.0	283.3	322.9	367.7	4.96922	75.2	19.36	20.89	22.52	4.56313	172.4	2.563	2.654	2.745	2.85131
-20.2	267.4	304.4	346.3	4.96736	77.0	18.55	20	21.54	4.54545	174.2	2.481	2.567	2.654	2.81038
-18.4	252.5	287.1	307.4	4.96541	78.8	17.77	19.14	20.6	4.52696	176.0	2.402	2.484	2.567	2.76985

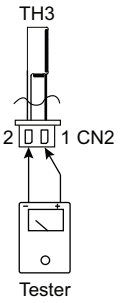
Table 11. Compressor discharge temperature sensors (continued)

TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance
-16.6	238.5	270.9	307.4	4.96336	80.6	17.03	18.32	19.7	4.50787	177.8	2.327	2.404	2.483	2.72934
-14.8	225.4	255.7	289.8	4.9612	82.4	16.32	17.55	18.85	4.48849	179.6	2.254	2.327	2.401	2.68893
-13.0	213.1	241.4	273.3	4.95892	84.2	15.65	16.81	18.04	4.46837	181.4	2.183	2.253	2.323	2.64872
-11.2	201.5	228	257.9	4.95652	86.0	15	16.1	17.27	4.44751	183.2	2.115	2.182	2.248	2.6088
-9.4	190.6	215.5	243.4	4.95402	87.8	14.39	15.43	16.54	4.42628	185.0	2.05	2.113	2.176	2.56868
-7.6	180.3	203.6	229.8	4.95136	89.6	13.81	14.79	15.34	4.40441	186.8	1.985	2.047	2.109	2.52903
-5.8	170.7	192.5	217	4.94859	91.4	13.25	14.18	15.17	4.38195	188.6	1.922	1.983	2.045	2.48933
-4.0	161.6	182.1	205	4.94568	93.2	12.72	13.6	14.54	4.35897	190.4	1.861	1.922	1.983	2.45028
-2.2	153.1	172.3	193.7	4.94263	95.0	12.21	13.05	13.93	4.33555	192.2	1.802	1.862	1.923	2.41067
-0.4	145	163.1	183.2	4.93943	96.8	11.72	12.52	13.36	4.31129	194.0	1.746	1.805	1.865	2.37188
1.4	137.5	154.4	173.2	4.93606	98.6	11.26	12.01	12.81	4.28622	195.8	1.692	1.75	1.809	2.33333
3.2	130.3	146.2	163.9	4.93252	100.4	10.82	11.53	12.29	4.2609	197.6	1.639	1.697	1.755	2.2951
5.0	123.6	138.5	155.1	4.92883	102.2	10.29	11.07	11.78	4.23489	199.4	1.589	1.646	1.703	2.25727
6.8	117.3	131.3	146.8	4.92498	104.0	9.986	10.63	11.31	4.20823	201.2	1.54	1.596	1.653	2.21913
8.6	111.3	124.4	139	4.92089	105.8	9.6	10.21	10.85	4.181	203.0	1.493	1.549	1.604	2.1823
10.4	105.6	118	131.7	4.91667	107.6	9.231	9.813	10.42	4.15347	204.8	1.448	1.502	1.558	2.14449
12.2	100.3	111.9	124.7	4.91220	109.4	8.878	9.43	10	4.12511	206.6	1.404	1.458	1.512	2.10816
14.0	95.24	106.2	118.2	4.90758	111.2	8.54	9.064	9.612	4.09617	208.4	1.362	1.415	1.469	2.07174
15.8	90.49	100.8	112.1	4.90272	113.0	8.217	8.714	9.233	4.06664	210.2	1.321	1.373	1.426	2.03528
17.6	85.99	95.68	106.3	4.89762	114.8	7.908	8.38	8.872	4.03661	212.0	1.284	1.335	1.387	2.0015
19.4	81.75	90.86	100.8	4.89231	116.6	7.612	8.06	8.526	4.00596	213.8	1.245	1.296	1.348	1.96602
21.2	77.74	86.31	95.74	4.88676	118.4	7.328	7.754	8.196	3.97478	215.6	1.209	1.258	1.309	1.93063
23.0	73.94	82.01	90.88	4.88097	120.2	7.057	7.461	7.88	3.94303	217.4	1.173	1.222	1.272	1.89634
24.8	70.35	77.95	86.29	4.87492	122.0	6.797	7.18	7.578	3.91068	219.2	1.139	1.187	1.236	1.86225
26.6	66.96	74.11	81.96	4.86861	123.8	6.548	6.912	7.289	3.87792	221.0	1.105	1.153	1.202	1.82842
28.4	63.74	70.48	77.87	4.86203	125.6	6.309	6.655	7.013	3.8446	222.8	1.073	1.12	1.168	1.79487
30.2	60.69	67.05	74.0	4.85518	127.4	6.08	6.409	6.748	3.8108	224.6	1.042	1.089	1.136	1.76271
32.0	57.81	63.8	70.34	4.84802	129.2	5.861	6.173	6.495	3.77646	226.4	1.013	1.058	1.104	1.72989
33.8	55.08	60.72	66.88	4.84056	131.0	5.651	5.947	6.253	3.74166	228.2	0.9833	1.028	1.074	1.69749
35.6	52.49	57.81	63.61	4.8328	132.8	5.449	5.73	6.02	3.70634	230.0	0.9553	0.9997	1.045	1.66633
37.4	50.03	55.05	60.52	4.82472	134.6	5.255	5.522	5.798	3.67057	231.8	0.9283	0.9719	1.016	1.63515
39.2	47.71	52.44	57.59	4.81631	136.4	5.07	5.323	5.585	3.63444	233.6	0.9021	0.9451	0.9892	1.60453
41.0	45.5	49.97	54.82	4.80758	138.2	4.891	5.132	5.381	3.59787	235.4	0.8765	0.9191	0.9626	1.57429
42.8	43.41	47.62	52.2	4.79847	140.0	4.72	4.949	5.101	3.56094	237.2	0.8524	0.894	0.9367	1.54457
44.6	41.42	45.4	49.71	4.78903	141.8	4.556	4.774	4.997	3.52377	239.0	0.8087	0.8595	0.9117	1.50289
46.4	39.53	43.2	42.33	4.77876	143.6	4.398	4.605	4.817	3.486	240.8	0.8059	0.8461	0.8875	1.48642
48.2	37.74	41.29	45.12	4.76900	145.4	4.247	4.448	4.644	3.44913	242.6	0.7837	0.8233	0.8641	1.45805
50.0	36.04	39.39	43.01	4.75840	147.2	4.101	4.288	4.479	3.40967	244.4	0.7623	0.8012	0.8413	1.4301

Table 11. Compressor discharge temperature sensors (continued)

TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance	TEM-P. (° F)	R min (k Ohm)	R(t) (k Ohm)	R max (k Ohm)	Voltage of resist-ance
51.8	34.42	37.59	41	4.74741	149.0	3.961	4.139	4.32	3.37107	246.2	0.7415	0.7798	0.8193	1.40262
53.6	32.89	35.87	39.1	4.73594	150.8	3.827	3.995	4.167	3.33194	248.0	0.7201	0.7581	0.7910	1.37431
55.4	31.43	34.25	37.29	4.72414	152.6	3.698	3.858	4.021	3.29293	249.8	0.702	0.7386	0.7773	1.3485
57.2	30.04	32.71	35.58	4.71190	154.4	3.552	3.712	3.883	3.24929	251.6	0.6631	0.7195	0.7572	1.32285
59.0	29.72	31.24	33.95	4.69916	156.2	3.410	3.692	3.742	3.24314	253.4	0.6649	0.7007	0.7378	1.29726
60.8	28.31	30.72	31.82	4.69437	158.0	3.339	3.476	3.616	3.17385	255.2	0.6472	0.6824	0.7189	1.272
62.6	26.87	29.21	30.72	4.67958	159.8	3.229	3.359	3.491	3.13398	257.0	0.6301	0.6647	0.7006	1.24723
64.4	25.13	27.26	29.55	4.65824	161.6	3.122	3.246	3.372	3.09379	258.8	0.6135	0.6476	0.6829	1.22299
66.2	24.05	26.07	28.23	4.64375	163.4	3.02	3.138	3.257	3.05372	260.6	0.5974	0.6309	0.6657	1.19902
68.0	23.02	24.93	26.97	4.62867	165.2	2.921	3.033	3.146	3.01311	262.4	0.5818	0.6148	0.649	1.17562
69.8	22.04	23.84	25.77	4.61300	167.0	2.827	2.933	3.04	2.97284	264.2	0.5667	0.5991	0.6328	1.15251
71.6	21.1	22.81	24.63	4.59694	168.8	2.735	2.836	2.938	2.93218	266.0	0.5521	0.5839	0.6171	1.12988
73.4	20.21	21.83	23.55	4.58036	170.6	2.647	2.743	2.84	2.89163	–	–	–	–	–

Figure 10. TH3 sensor



Note: *Resistance at 77°F: 20 kΩ.*

TH3: Outdoor unit discharge pipe sensor.

Before measuring resistance, disconnect connectors as shown above.

A working compressor discharge temperature sensor is required for:

- Protection (High/Low Temperature)
- Preheating (Sump Heat)
- Outdoor EEV Control
- Diagnostics, Charge Level

High Pressure Sensor

Table 12. High pressure sensors

High Pressure (MPa)	Volts DC
4.6	4.50
4.5	4.41

Table 12. High pressure sensors (continued)

High Pressure (MPa)	Volts DC
4.4	4.33
4.3	4.24
4.2	4.15
4.1	4.07
4	3.98
3.9	3.89
3.8	3.80
3.7	3.72
3.6	3.63
3.5	3.54
3.4	3.46
3.3	3.37
3.2	3.28
3.1	3.20
3	3.11
2.9	3.02
2.8	2.93
2.7	2.85
2.6	2.76
2.5	2.67
2.4	2.59
2.3	2.50

Table 12. High pressure sensors (continued)

High Pressure (MPa)	Volts DC
2.2	2.41
2.1	2.33
2	2.24
1.9	2.15
1.8	2.07
1.7	1.98
1.6	1.89
1.5	1.80
1.4	1.72
1.3	1.63
1.2	1.54
1.1	1.46
1	1.37
0.9	1.28
0.8	1.20
0.7	1.11
0.6	1.02
0.5	0.93
0.4	0.85

Table 12. High pressure sensors (continued)

High Pressure (MPa)	Volts DC
0.3	0.76
0.2	0.67
0.1	0.59
0	0.50

A working high pressure sensor is required for the following:

- Start Up (Pressure Limits)
- High Pressure
- Outdoor EEV Control (Target Super Heat)
- Diagnostics; Charge Level
- Indoor/Outdoor Airflow

The high pressure transducer control is measured across wire white and black of pin SHP. and has an active 0-4.9Vdc transducer input for sensing high pressure.

Table 13. Wire color

Description	Wire color
4.9Vdc POWER	RED
OUTPUT	WHITE
COMMON	BLACK

Alert Codes

Error Code Display

The same digital display is used for error codes using the left and center positions. In the case of multiple failures or protections, the error codes will alternate on the display. Please refer to the list of error codes in the following chart.

Table 14. Error codes list

Code	Reason	Remark
E3	ODU Coil temperature sensor failure. (OPT)	ODU coil sensor and ODU PCB.
E7	ODU Ambient Temperature sensor failure.(OAT)	ODU ambient sensor and ODU PCB.
E8	ODU Exhaust Temperature sensor failure.(ODT)	ODU Exhaust sensor and ODU PCB.
E9	IPM / Compressor driving control abnormal.	ODU PCB , compressor, etc.
EA	ODU current sampling failure	ODU PCB
EB	The Communication abnormal of Main PCB and operating board □IDU failure□	Display board and main PCB.
EC	The communication abnormal of ODU main PCB and operating PCB	ODU main PCB, ODU operating PCB.
EE	ODU EEPROM failure.	1. ODU PCB broken? 2. Try to re-power on AC unit.
EF	ODU DC fan motor failure.	Fan motor, ODU PCB.
P0	IPM module protection.	ODU PCB
P1	Over / under voltage protection.	1. ODU PCB broken? 2. Power supply abnormal?
P4	ODU Exhaust pipe Over temperature protection.	Please check the troubleshooting for detail.
P5	Sub-cooling protection on Cooling mode.	Please check the troubleshooting for detail.
P6	Overheating protection on Cooling mode.	Please check the troubleshooting for detail.
P7	Overheating protection on Heating mode.	Please check the troubleshooting for detail.
P8	Outdoor Over temperature/Under temperature protection.	Please check the troubleshooting for detail.
P9	Compressor driving protection (Load abnormal).	Please check the troubleshooting for detail.
F5	PFC PROTECTION	Please check the troubleshooting for detail.
F6	The Compressor lack of phase / Anti-phase PROTECTION	Please check the troubleshooting for detail.
F7	IPM Module over temperature PROTECTION.	Please check the troubleshooting for detail.
F8	4-Way Value reversing abnormal.	Please check the troubleshooting for detail.
FA	The compressor Phase-current test circuit failure.	ODU PCB
H1	High pressure switch failure	1. High pressure switch damage. 2. High pressure switch connection is loose. 3. DU main PCB damage.
H2	Low pressure switch failure	1. Low pressure switch damage. 2. Low pressure switch connection is loose. 3. ODU main PCB damage.
H3	High pressure sensor failure	1. High pressure sensor damage. 2. High pressure sensor connection is loose. 3. ODU main PCB damage.
H4	Low pressure sensor failure	1. Low pressure sensor damage. 2. Low pressure sensor connection is loose. 3. ODU main PCB damage.

Troubleshooting

⚠ WARNING

Safety Hazard!

Failure to follow instructions below could result in death or serious injury or equipment damage.

If one of the following conditions occurs, switch off the power supply immediately and contact your dealer for further assistance:

- **The operation light continues to flash rapidly after the unit restarts.**
- **The unit continually trips fuses or circuit breakers.**
- **A foreign object or water enters the unit.**
- **Other abnormal conditions occur.**

The following symptoms are not a malfunction and in most situations will not require repairs:

Table 15. Common problems

Problem	Possible Cause
Abnormal noises of outdoor unit.	The unit will make different sounds based on its current operating mode.
Both the indoor and outdoor units make noises.	The outdoor may hum during operation. This is a normal phenomenon, which is caused by refrigerant gas flowing through the indoor and outdoor units.
	When the unit is turned on, and just stopped or defrosted, a hiss may be heard. This noise is normal and is caused by refrigerant gas stopping or turning.
Unit does not turn on when pressing ON/ OFF button.	The unit has a 3-minute protection feature that prevents the unit from overloading. The unit cannot be restarted within three minutes of being turned off.
	Cooling and Heating Models: If the Operation light and PRE-DEF (Pre-heating/ Defrost) indicators are lit up, the outdoor temperature is too cold and the unit's anti-cold wind is activated in order to defrost the unit.
The unit changes from COOL mode to FAN mode.	The unit changes its setting to prevent frost from forming on the unit. Once the temperature increases, the unit will start operating again.
	The set temperature has been reached, at which point the unit turns off the compressor. The unit will resume operating when the temperature fluctuates again.
Both the indoor and outdoor units emit white mist .	When the unit restarts in HEAT mode after defrosting, white mist may be emitted due to moisture generated from the defrosting process.
Dust is emitted from either the indoor or outdoor unit.	The unit may accumulate dust during extended periods of nonuse, which will be emitted when the unit is turned on. This can be mitigated by covering the unit during long periods of inactivity.
The unit emits a bad odor.	The unit may absorb odors from the environment (such as furniture, cooking, cigarettes, etc.), which will be emitted during operations.
	The unit filters have become moldy and should be cleaned.
The fan of the outdoor unit does not operate.	During operation, the fan speed is controlled to optimize product operation.

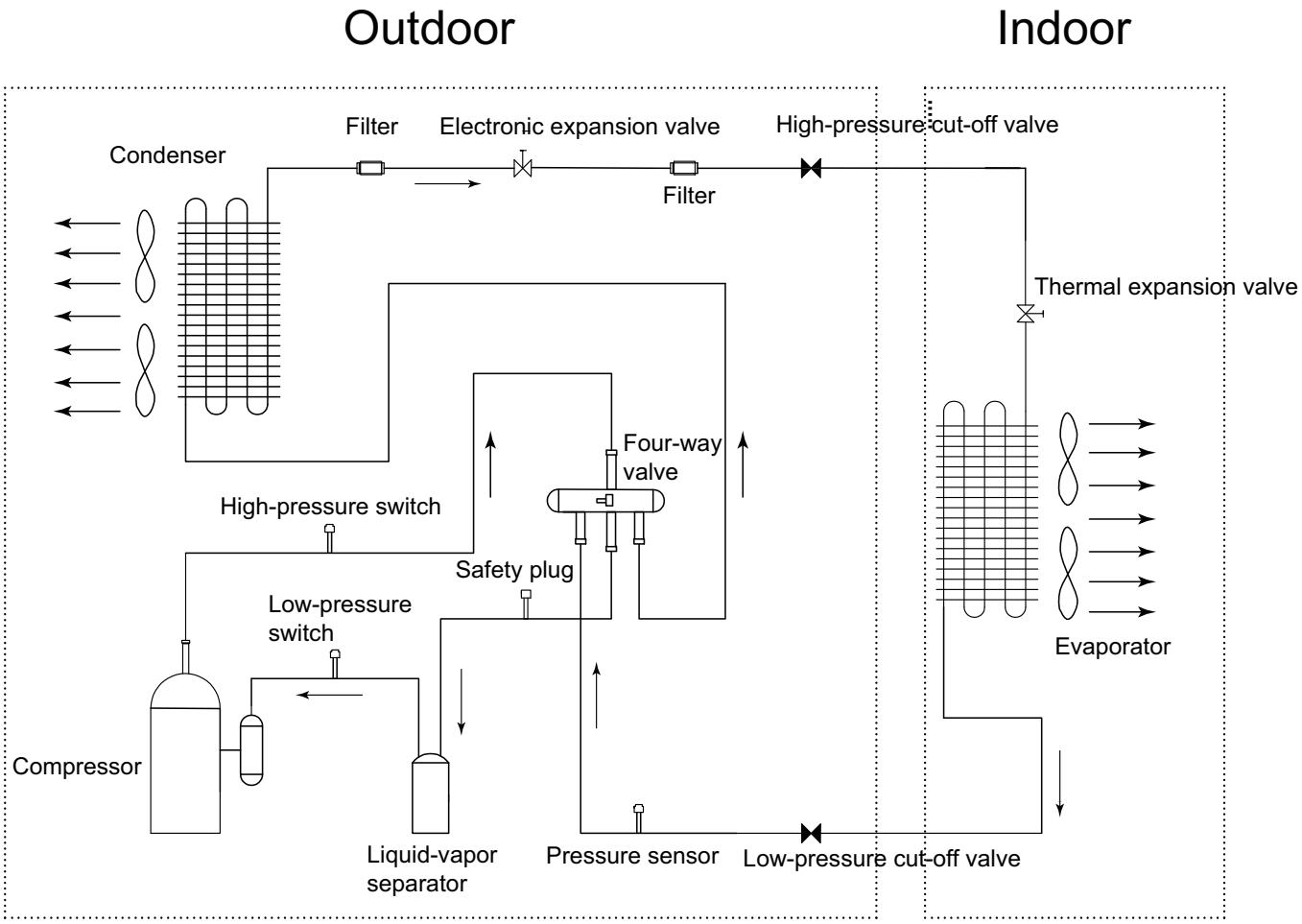
When problem occur, please check the points in the Table 16, p. 24 before contacting a repair company.

Table 16. Troubleshooting

Problem	Possible Cause	Solution
The unit is not working	Power failure.	Wait for the power to be restored.
	The power switch is off.	Turn on the power.
	The fuse is burned out.	Replace the fuse.
	The unit's 3-minute protection has been activated.	Wait three minutes after restarting the unit.
Poor cooling performance	Temperature setting may be higher than the ambient room temperature.	Lower the temperature setting.
	The heat exchanger on the indoor or outdoor unit is dirty.	Clean the affected heat exchanger.
	The air filter is dirty.	Remove the filter and clean it according to instructions.
	The air inlet or outlet of either unit is blocked.	Turn the unit off, remove the obstruction and turn it back on.
	Doors and windows are open.	Make sure that all doors and windows are closed while operating the unit.
	Excessive heat is generated by sunlight.	Close windows and curtains during periods of high heat or bright sunshine.
	Low refrigerant due to leak or long-term use.	Check for leaks, reseal if necessary and top off refrigerant.
The unit starts and stops frequently	There's too much or too little refrigerant in the system	Check for leaks and recharge the system with refrigerant.
	There is air, incompressible gas or foreign material in the refrigeration system.	Evacuate and recharge the system with refrigerant.
	System circuit is blocked.	Determine which circuit is blocked and replace the malfunctioning piece of equipment.
	The compressor is broken.	Replace the compressor.
	The voltage is too high or too low.	Install a monostatic to regulate the voltage.
Poor heating performance	The outdoor temperature is lower than 44.5˚F.	Check for leaks and recharge the system with refrigerant.
	Cold air is entering through doors and windows.	Make sure that all doors and windows are closed during use.
	Low refrigerant due to leak or long-term use.	Check for leaks, reseal if necessary and top off refrigerant.

Refrigeration Circuits

Figure 11. Refrigerant circuit



Sound Pressure Level

Figure 12. Sound pressure

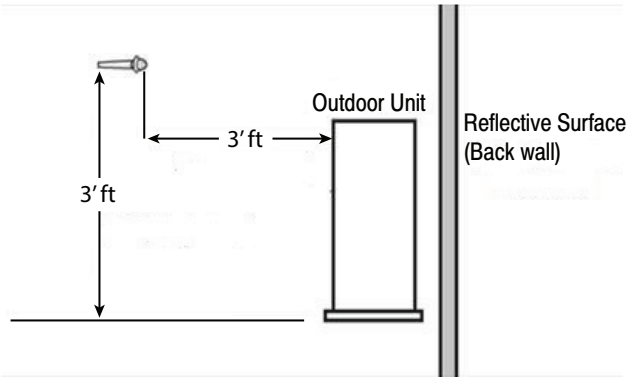


Table 17. 2-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Heating)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	60	55	
1	63[a]	58	
2	66	61	58

[a] Lab tested as per the illustration shown above

Table 18. 2-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	57	52	
1	60[a]	55	
2	63	58	55

[a] Lab tested as per the illustration shown above

Table 19. 3-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	65.5	60.5	
1	68.5[a]	63.5	
2	71.5	66.5	6.35

[a] Lab tested as per the illustration shown above

Table 20. 3-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	61	56	
1	64[a]	59	
2	67	62	59

Table 20. 3-ton cooling (continued)

(a) Lab tested as per the illustration shown above

Table 21. 4-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	66	61	
1	69[(a)]	64	
2	72	67	64

(a) Lab tested as per the illustration shown above

Table 22. 4-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	63	58	
1	66[(a)]	61	
2	69	64	61

(a) Lab tested as per the illustration shown above

Table 23. 5-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	66	61	
1	69[(a)]	64	
2	72	67	64

(a) Lab tested as per the illustration shown above

Table 24. 5-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)			
Number of Reflective Surfaces	**3 ft From the Property Line**	**5 ft From the Property Line**	**7 ft From the Property Line**
0	63	58	
1	66[(a)]	61	
2	69	64	61

(a) Lab tested as per the illustration shown above

Noise-With Barrier

Table 25. 2-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**6 ft From the Barrier**	**11 ft From the Barrier**	**16 ft From the Barrier**
Normal	Within 3m of the reflector	54	49	45.5
Low	Within 3m of the reflector	43	38	34.5

Table 26. 2-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**6 ft From the Barrier**	**11 ft From the Barrier**	**16 ft From the Barrier**
Normal	Within 3m of the reflector	52	47	43.5
Low	Within 3m of the reflector	42	37	33.5

Table 27. 3-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ftFrom the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	45	42.5	40.5
Low	Within 3m of the reflector	45	42.5	40.5

Table 28. 3-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ft From the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	40	37.5	35.5
Low	Within 3m of the reflector	40	37.5	35.5

Table 29. 4-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ftFrom the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	55	52.5	50.5
Low	Within 3m of the reflector	45	42.5	40.5

Table 30. 4-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ft From the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	50	47.5	45.5
Low	Within 3m of the reflector	41	38.5	36.5

Table 31. 5-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ftFrom the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	55	52.5	50.5
Low	Within 3m of the reflector	45	42.5	40.5

Table 32. 5-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**15 ft From the Barrier**	**20 ft From the Barrier**	**25 ft From the Barrier**
Normal	Within 3m of the reflector	51	48.5	46.5
Low	Within 3m of the reflector	41	38.5	36.5

Noise-Without Barrier

Table 33. 2-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**12 ft From the Barrier**	**17 ft From the Barrier**	**22 ft From the Barrier**
Normal	Within 3m of the reflector	55	52	49.5
Low	Within 3m of the reflector	45	42	39.5

Table 34. 2-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**12 ft From the Barrier**	**17 ft From the Barrier**	**22 ft From the Barrier**
Normal	Within 3m of the reflector	53	50	47.5
Low	Within 3m of the reflector	43	40	37.5

Table 35. 3-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	45	43.5	42.5
Low	Within 3m of the reflector	45	43.5	42.5

Table 36. 3-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	40	38.5	37.5
Low	Within 3m of the reflector	40	38.5	37.5

Table 37. 4-ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	55	53.5	52.5
Low	Within 3m of the reflector	45	43.5	42.5

Table 38. 4-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	50	48.5	47.5
Low	Within 3m of the reflector	41	39.5	38.5

Table 39. 5.0 Ton heating

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	55	53.5	52.5
Low	Within 3m of the reflector	45	43.5	42.5

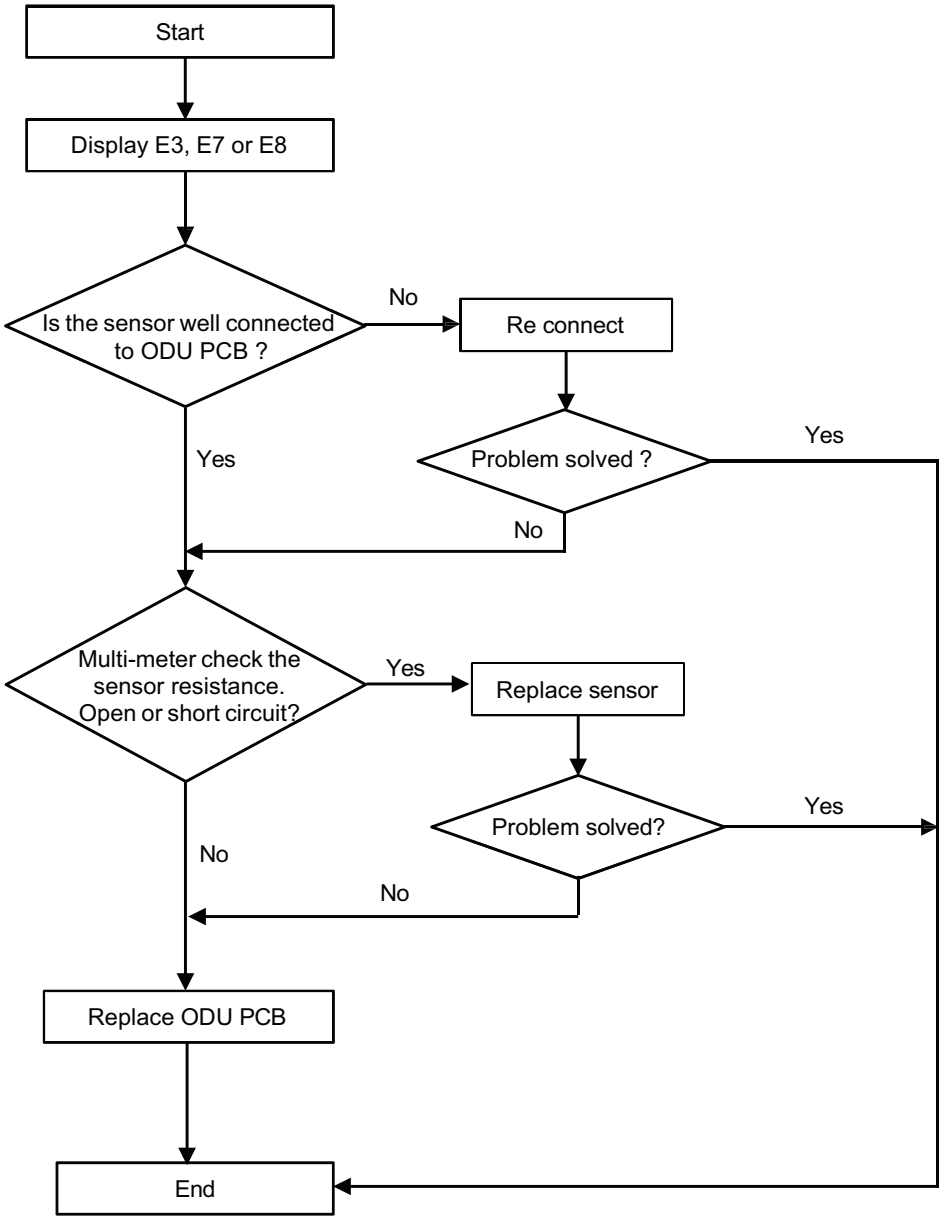
Table 40. 5-ton cooling

Sound Pressure Level dB(A) per ARI 275 (Max Cooling)				
	Number of Reflective Surfaces	**35 ft From the Barrier**	**40 ft From the Barrier**	**45 ft From the Barrier**
Normal	Within 3m of the reflector	51	49.5	48.5
Low	Within 3m of the reflector	41	39.5	38.5

E3, E7 or E8 - ODU Coil Temperature Sensor, Ambient Temperature Sensor or Discharge Temperature Sensor Failure

When any of the sensor open or short circuits, the unit will display failure code as E3/E7 or E8, IDU and ODU turns off. When the sensor resistance recovered, the unit will revert to be on standby, the unit can be switched on directly.

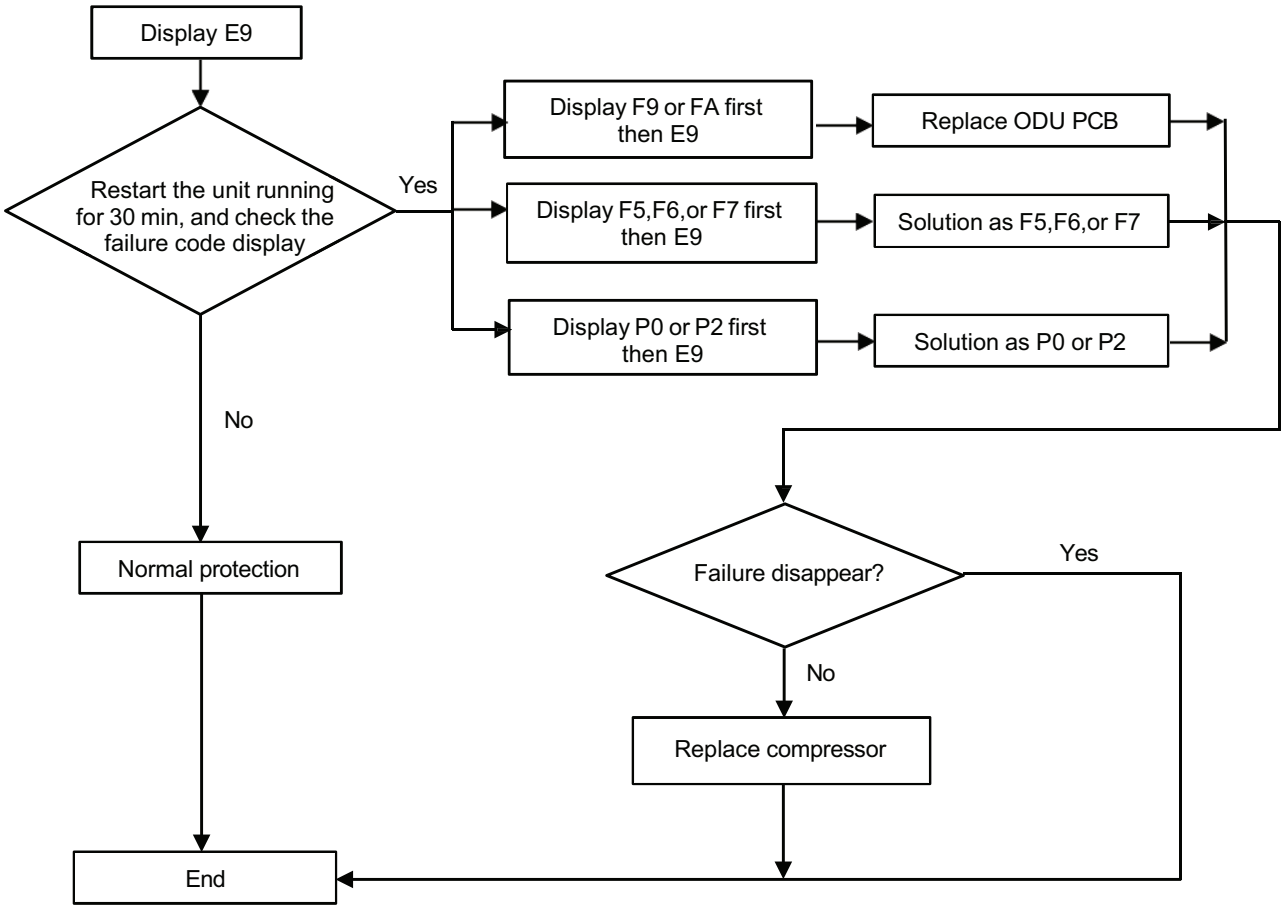
Figure 13. E3, E7 and E8 temperature sensors



E9 - ODU IPM or Compressor Drive Fault

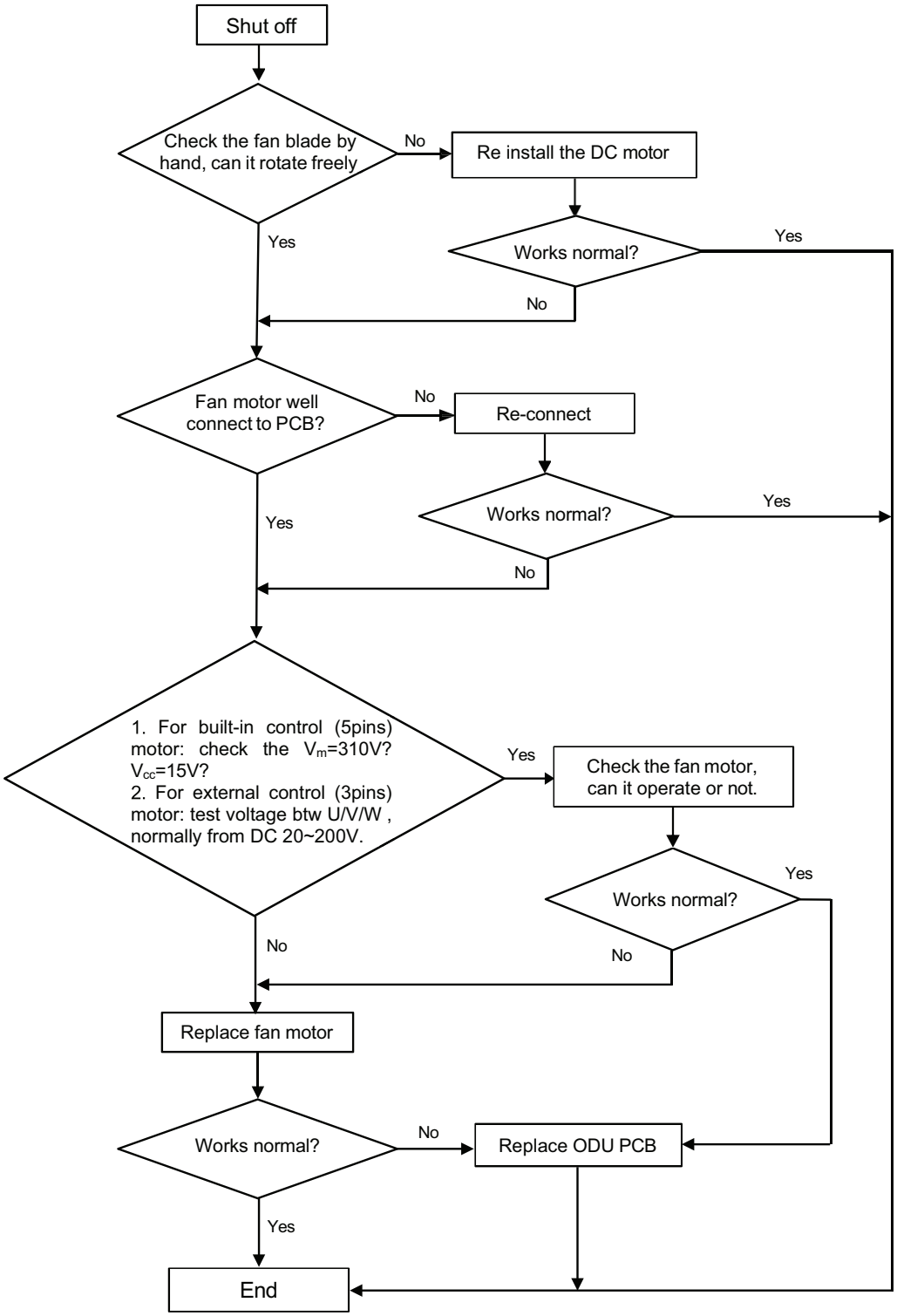
If unit stops working 6 times continuously caused by IPM protection (P0), it will display E9 error, and unit cannot be recovered to operation, except press the ON/OFF button.

Figure 14. E9 - ODU IPM or compressor drive fault



EF - ODU DC Fan Motor Failure

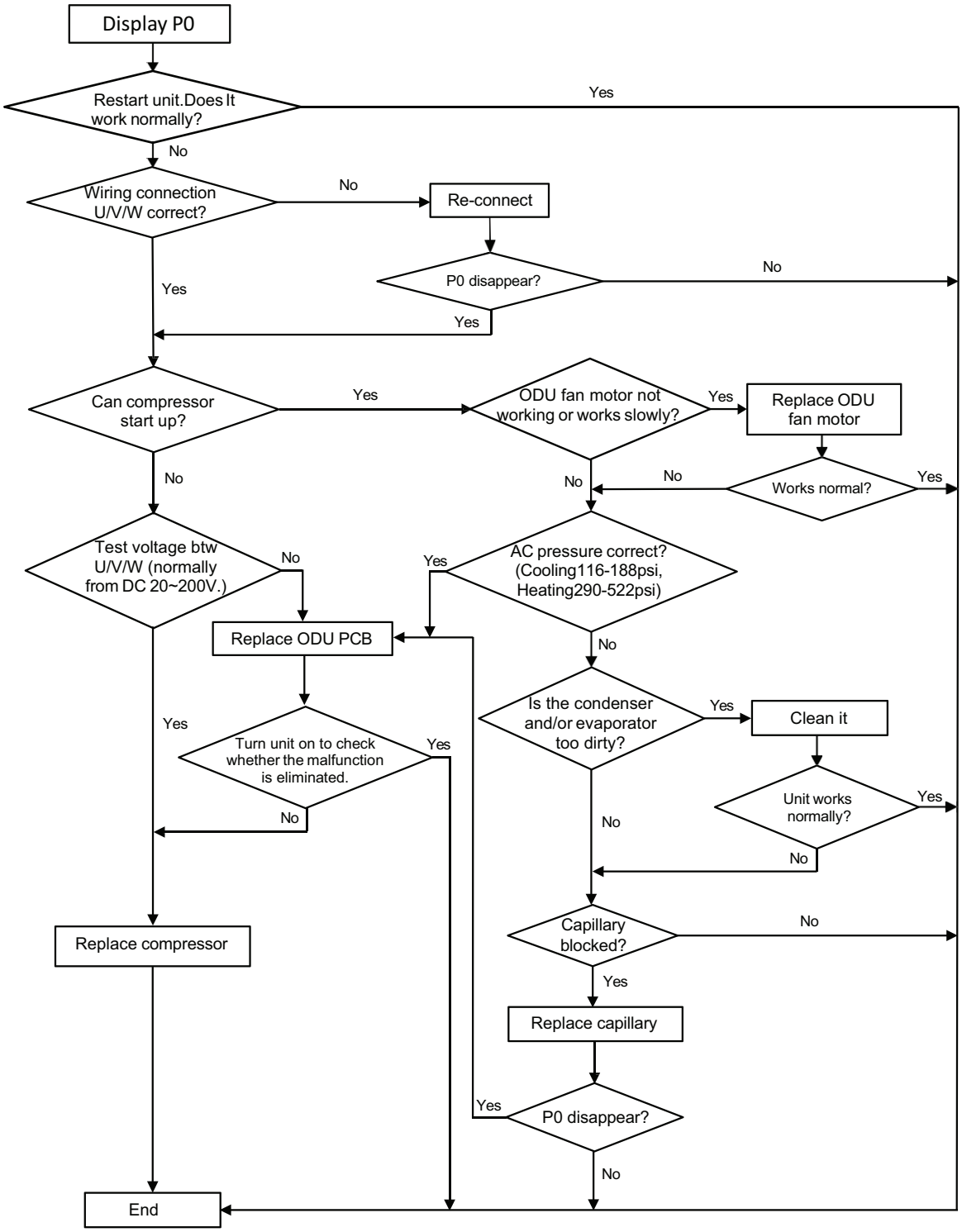
Figure 15. EF – ODU DC fan motor failure



P0 - IPM Protection

When overheating or overcurrent happens for IPM, IDU will display P0 protection.

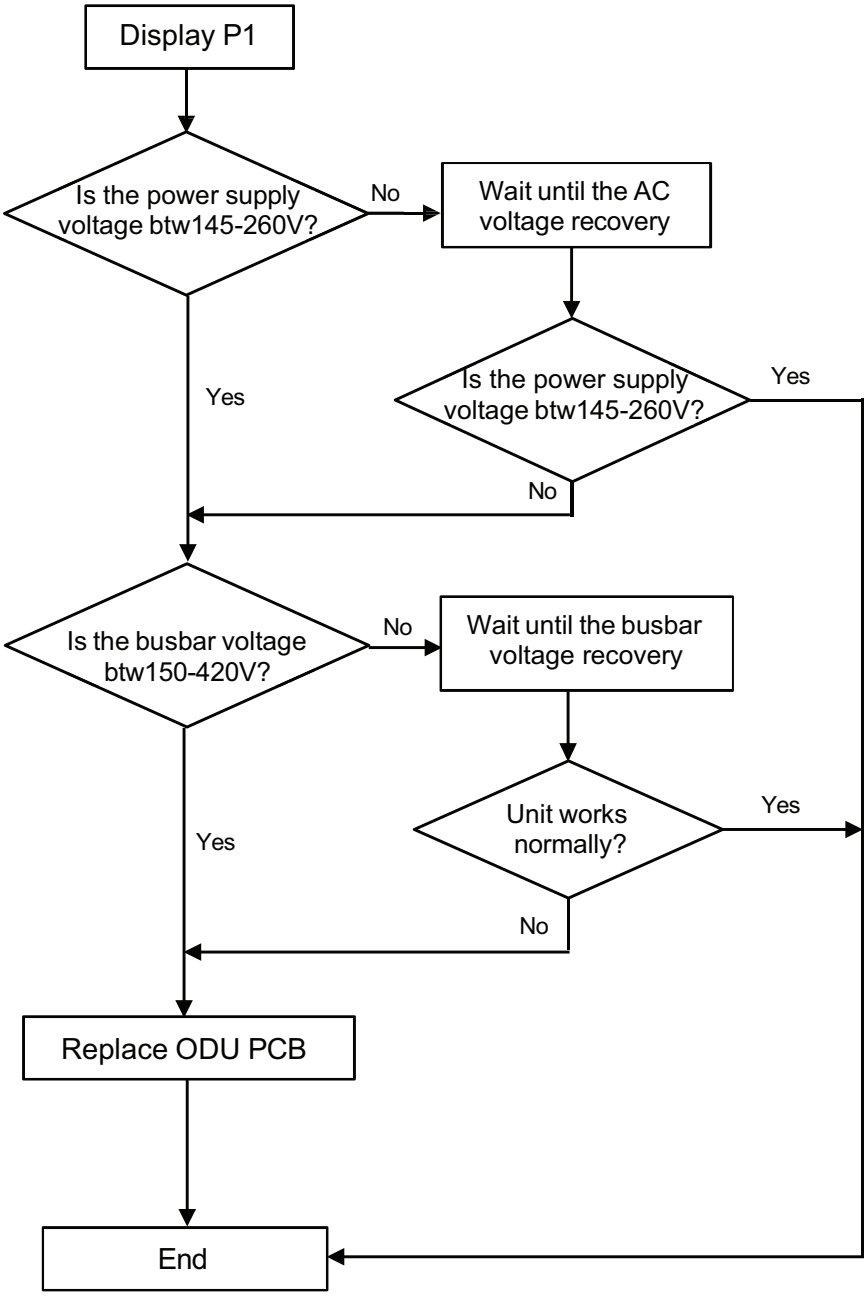
Figure 16. P0 – IPM protection



P1 - Over or Under Voltage Protection

1. Test voltage between L1 & L2, When the power supply V > AC260V or V < AC150V, AC will display P1 protection, unit will recover back to previous status while V > AC155V.
2. Test voltage on the electrolytic capacitor of ODU PCB, When DC busbar voltage V > DC420V or V < DC150V, unit will recover back to previous status while DC190V < V < DC410V.

Figure 17. P1 - over or under voltage protection

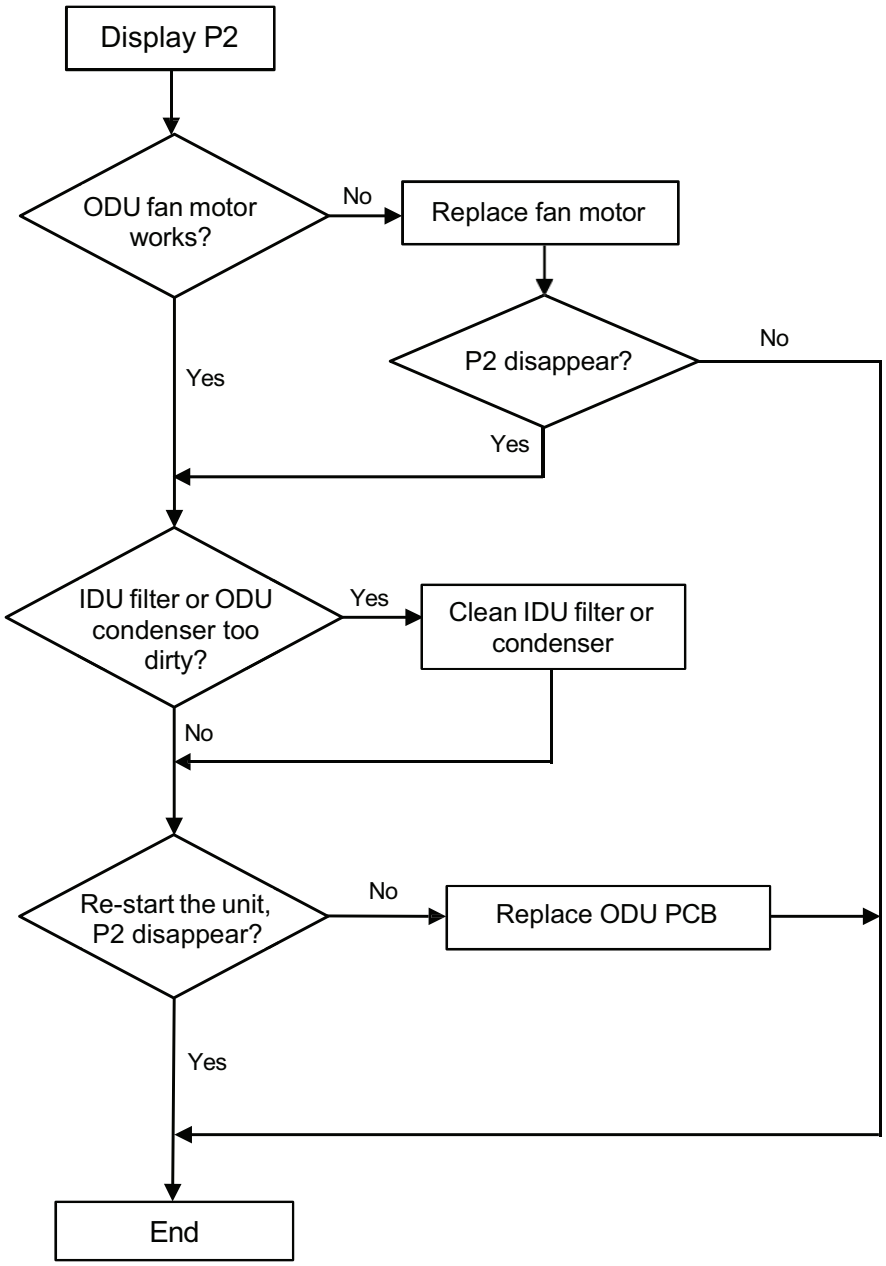


P2 - Over Current Protection

When the AC unit running current more than Imax, it will stop and display P2 protection.

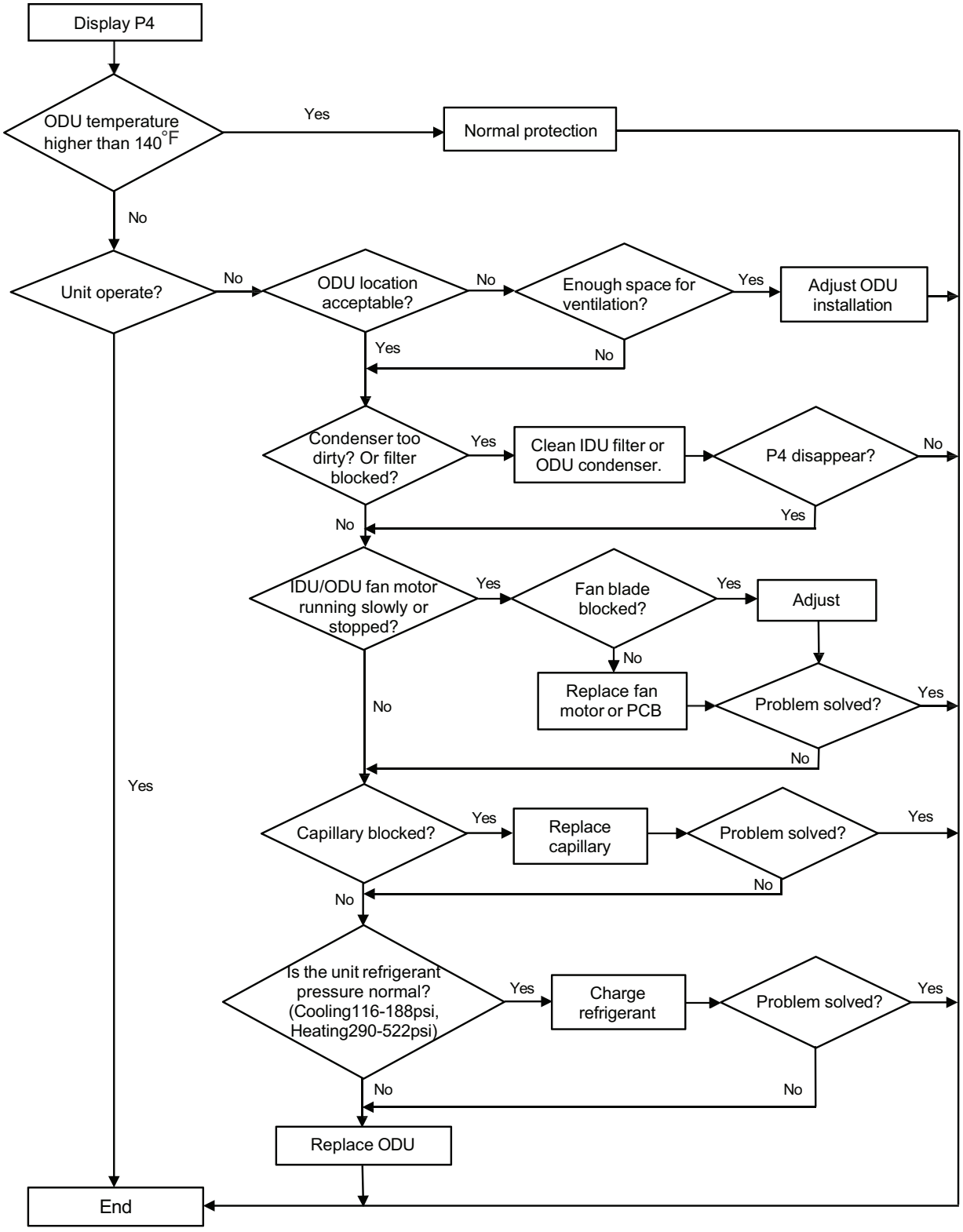
Note: *For different AC model, Imax has difference valve.*

Figure 18. P2 – over current protection



P4 - ODU Exhaust Temperature Overheating Protection

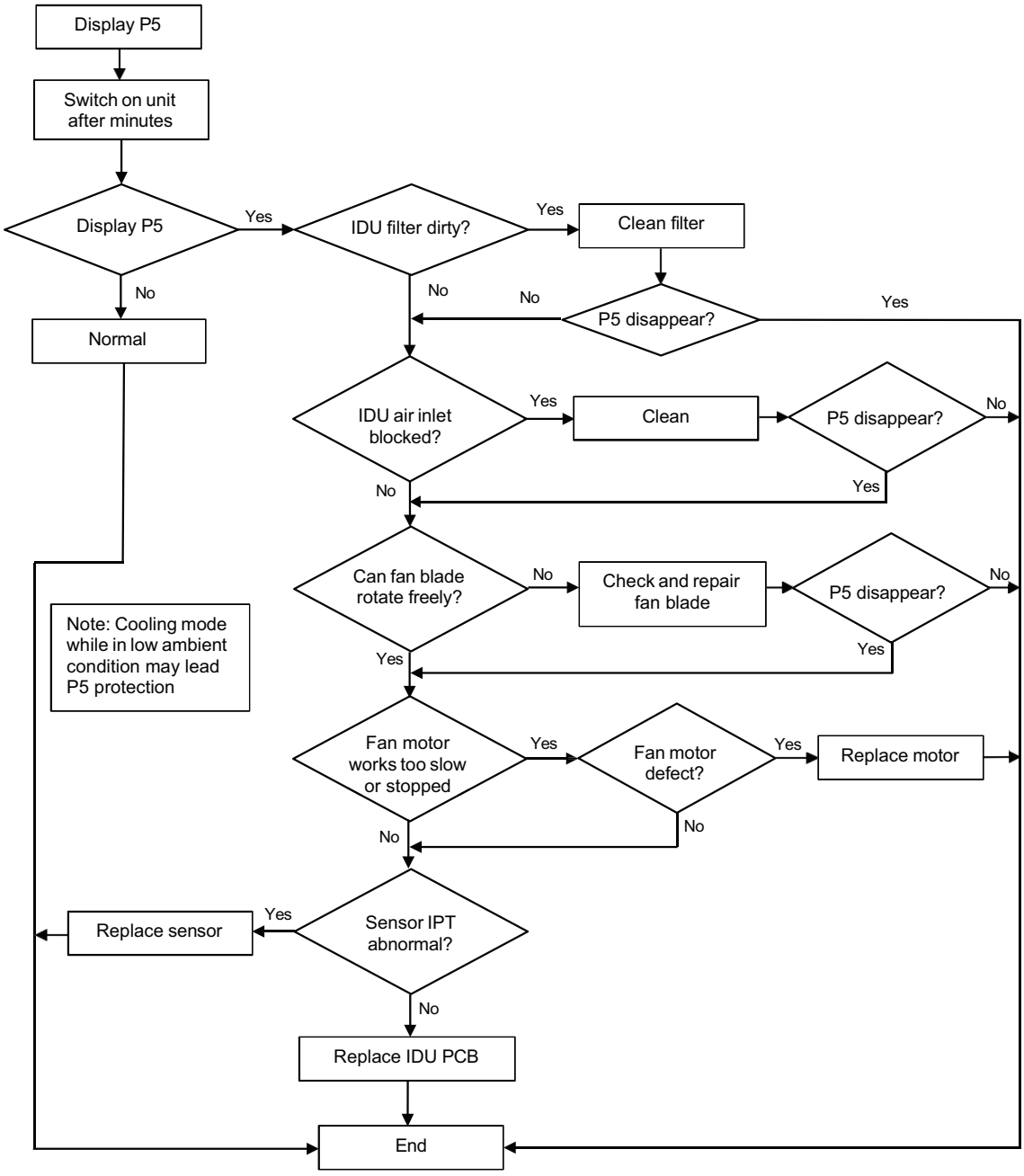
Figure 19. P4 - ODU exhaust temperature overheating protection



P5 - Sub-Cooling Protection on Cooling or Dry Mode

On cooling or dry mode, when IDU evaporator coil temperature IPT <33.8°F continuously for 3 min after compressor start up for 6 min, CPU will switch off outdoor unit and show P5 failure code.

Figure 20. P5 - sub-cooling protection

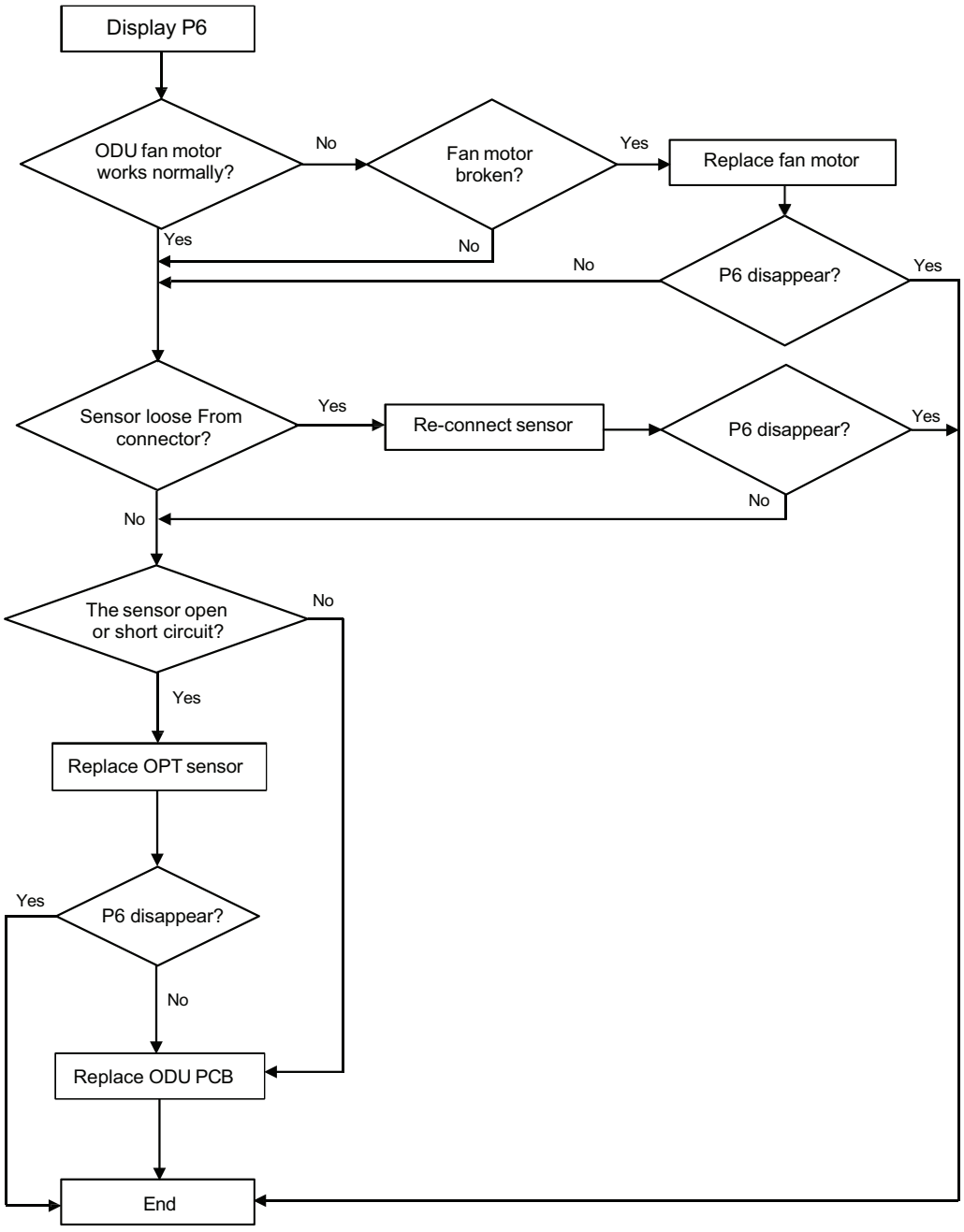


Note: *IPT=Indoor unit Pipe(coil) Temperature.*

P6 - Overheating Protection on Cooling Mode

On cooling or dry mode, when ODU condenser coil temperature OPT ≥143.6°F, MCU will switch off outdoor unit and show P6 failure code.

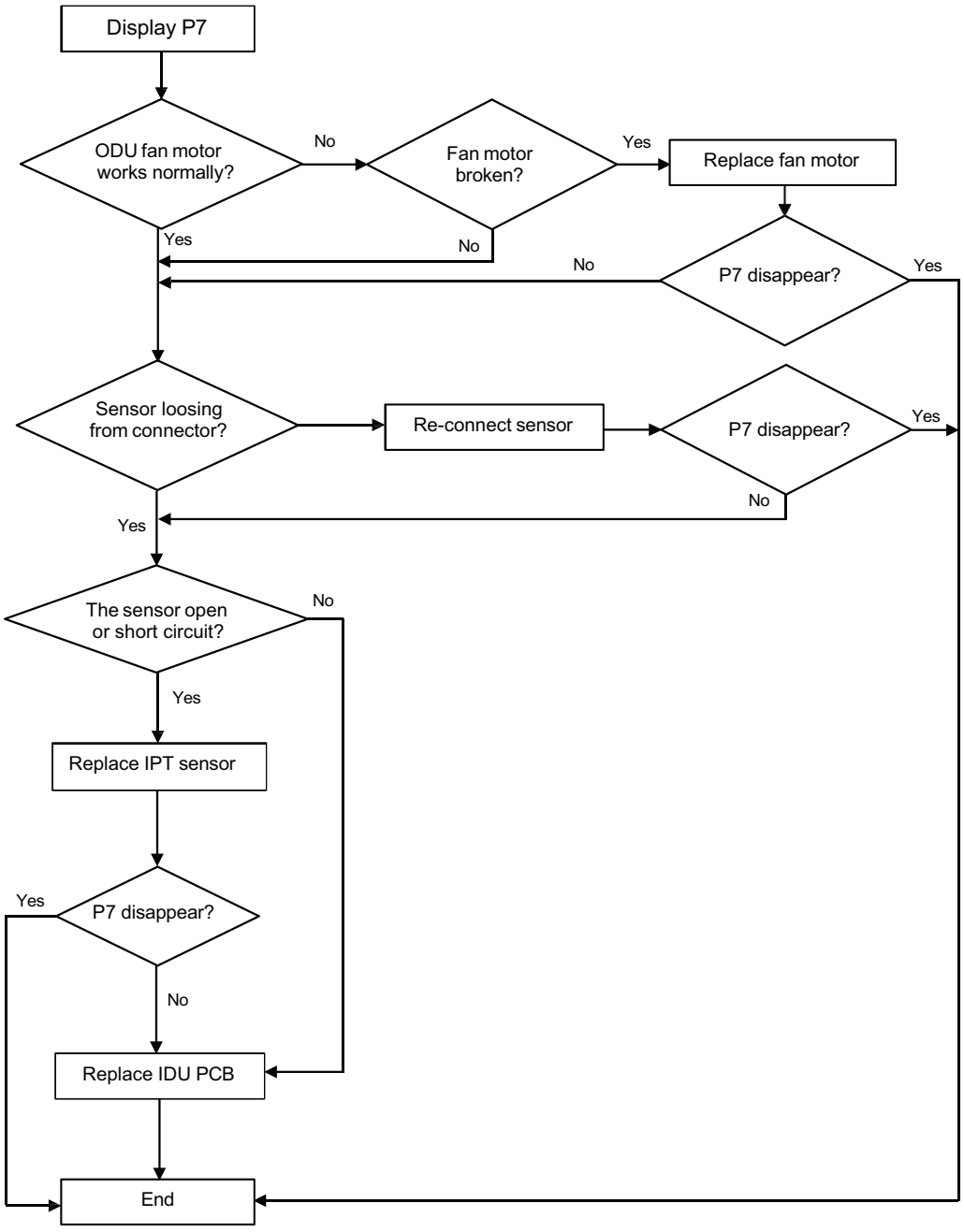
Figure 21. P6 - overheating protection



P7 - Overheating Protection on Heating Mode

On heating mode, when IDU evaporator coil temperature IPT≥143.6°F, ODU PCB will switch off outdoor unit and show P7 failure code.

Figure 22. P7 - overheating protection

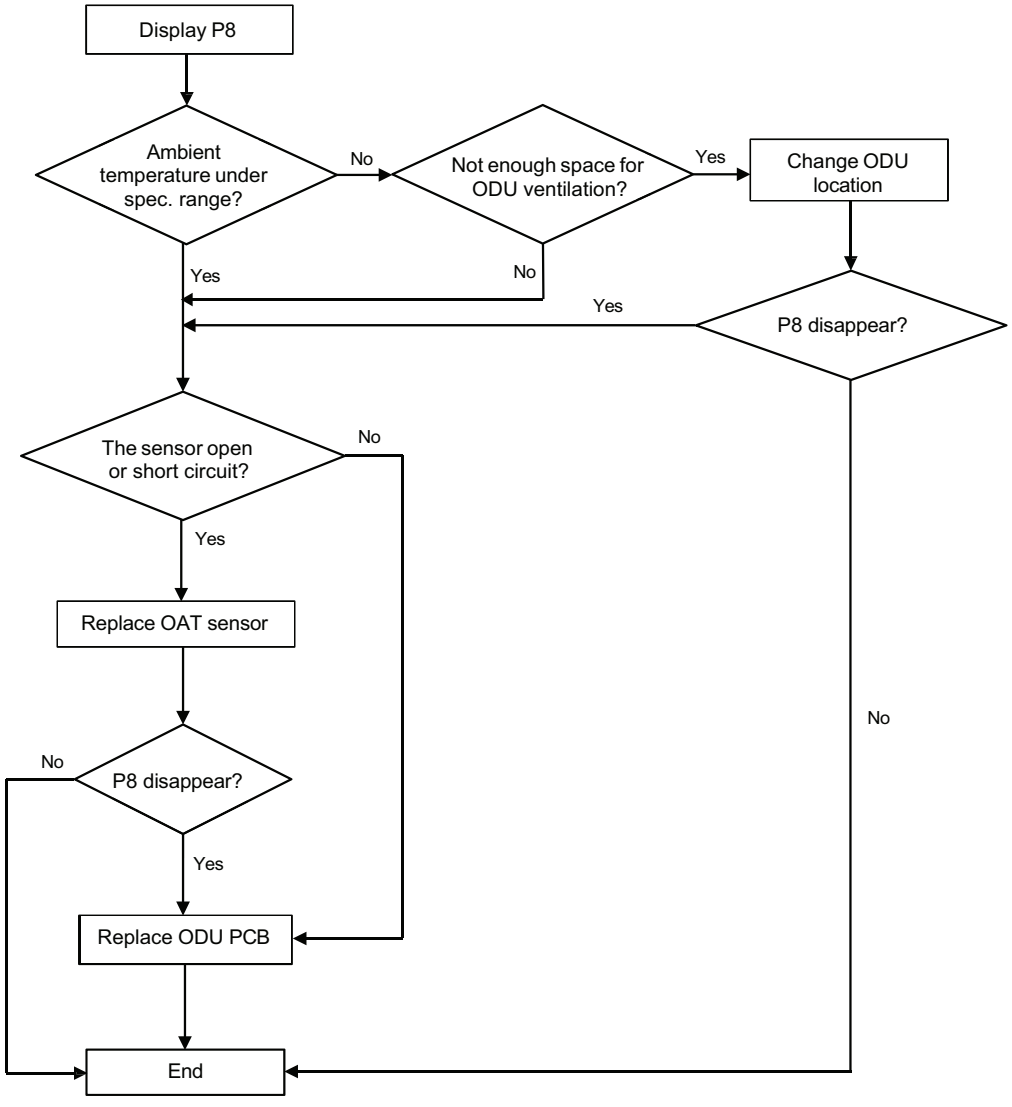


P8 - Outdoor Over-Temperature or Under-Temperature Protection

When ambient temperature is in the condition listed as below, the compressor will stop working, after 200s delay, the IDU will show P8 failure code.

1. On cooling or dry mode: ODU ambient temperature: OAT < -4°F or OAT > 145°F.
2. On Heating mode:
   a. OAT≥104°F
   b. 86°F < OAT≤104°F and RT > 95°F

Figure 23. P8 - outdoor over-temperature or under-temperature protection



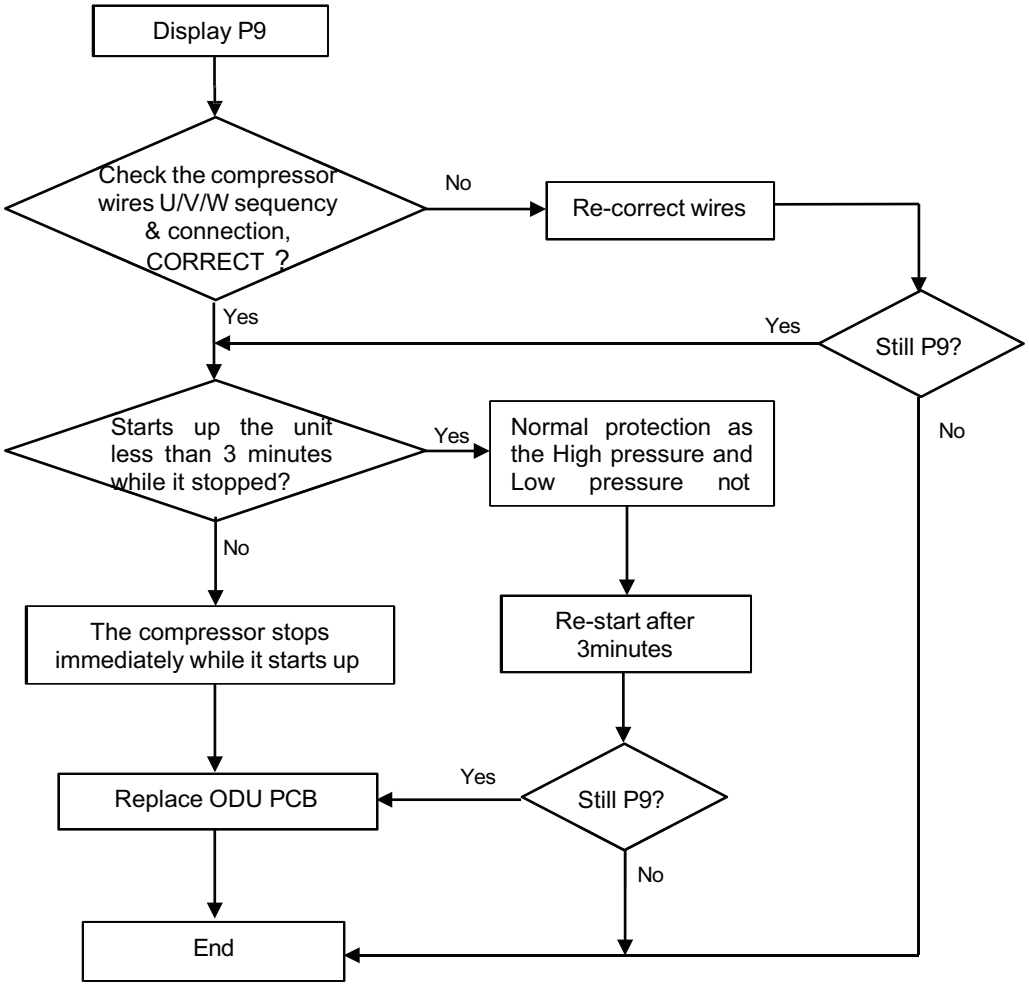
Compressor Driving Part Protection (Compressor Abnormal Load)

When compressor starts up or in operating, if:

1. MCU can't test the feedback signal from compressor, or
2. Tested an abnormal signal from compressor, or
3. The compressor starts up abnormal.

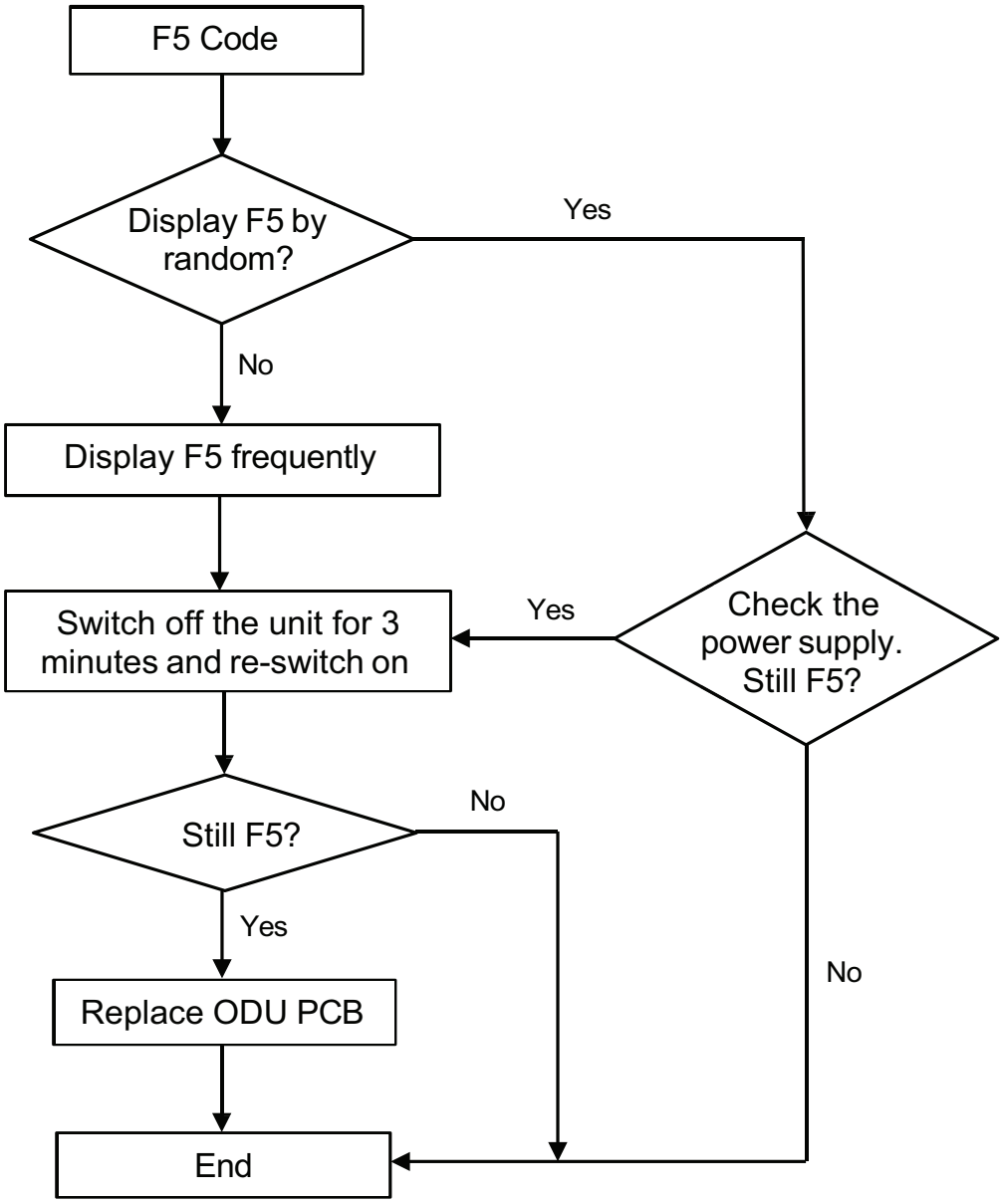
The outdoor unit will shut off, and show P9 protection. (The unit will re-startup 6 times continuously, if it still can't work normal, then show P9 code)

Figure 24. Compressor driving part protection



F5 - PFC Protection

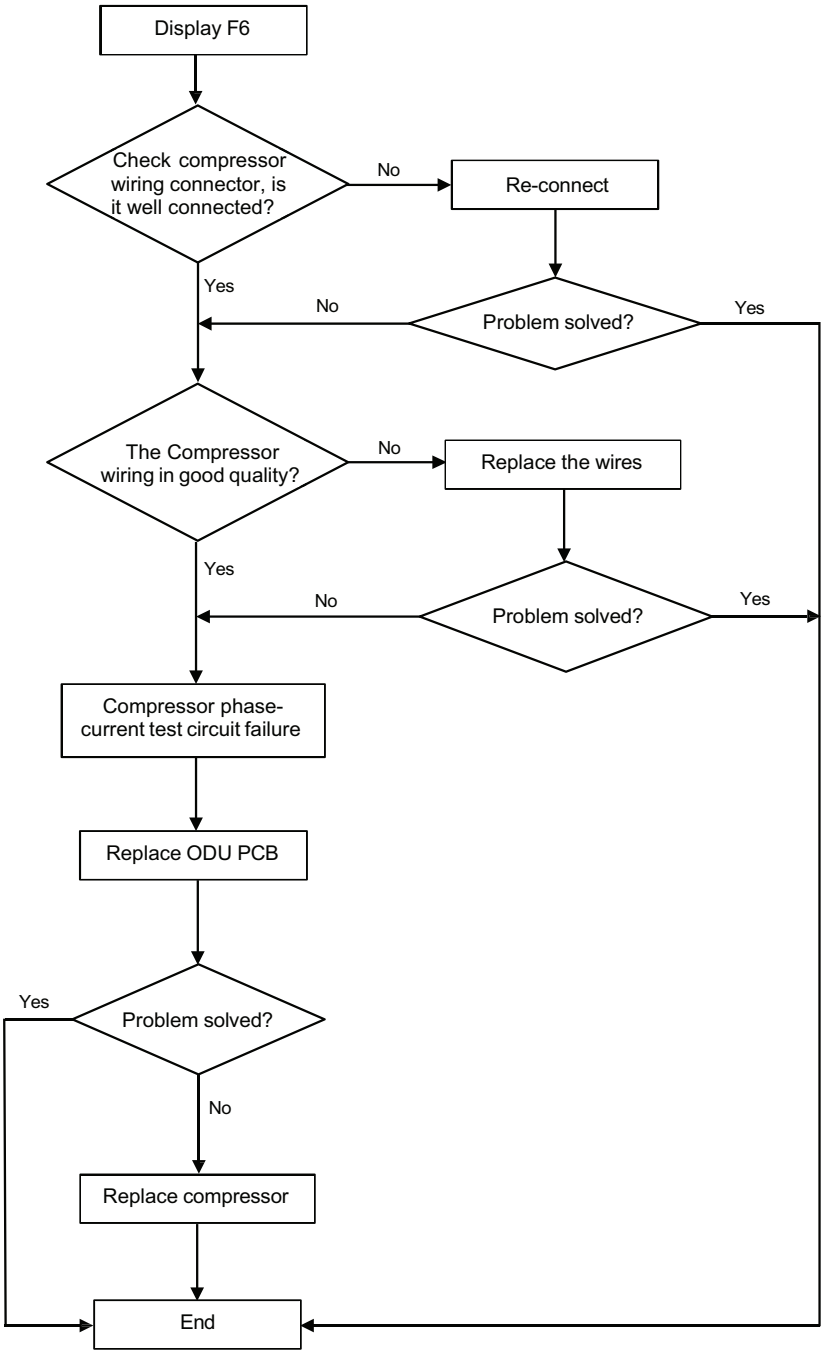
Figure 25. F5 - PFC protection



F6 - The Compressor Lack Phase or Mis Phase Protection

If ODU PCB cannot test compressor U, V, W phase current, or there is U/V/W phase sequence mistake, it will show F6 protection.

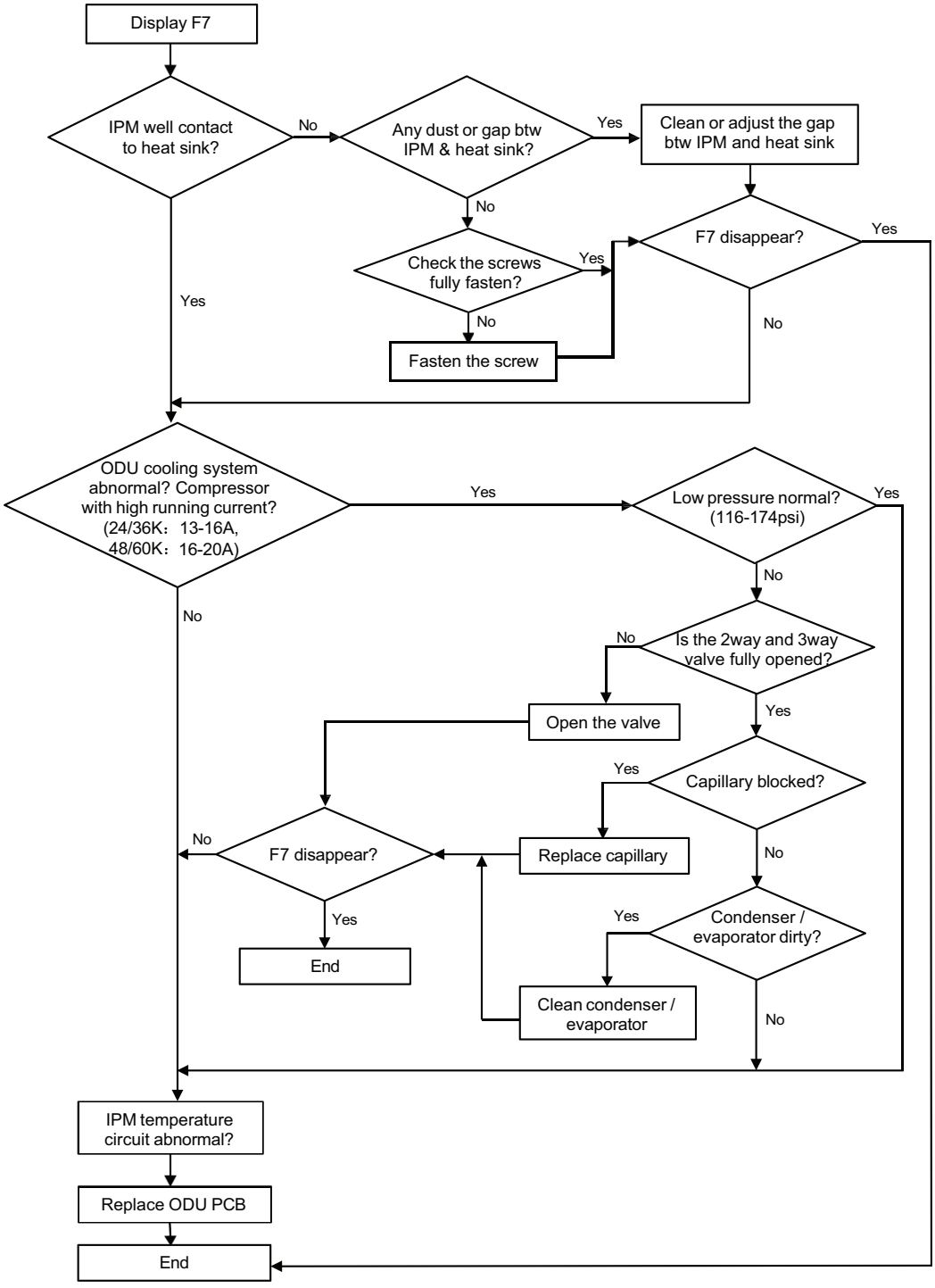
Figure 26. F6 – the compressor lack phase



F7 - Module Temperature Protection

IPM over temperature protection, when IPM temperature more than 203°F, it will show F7.

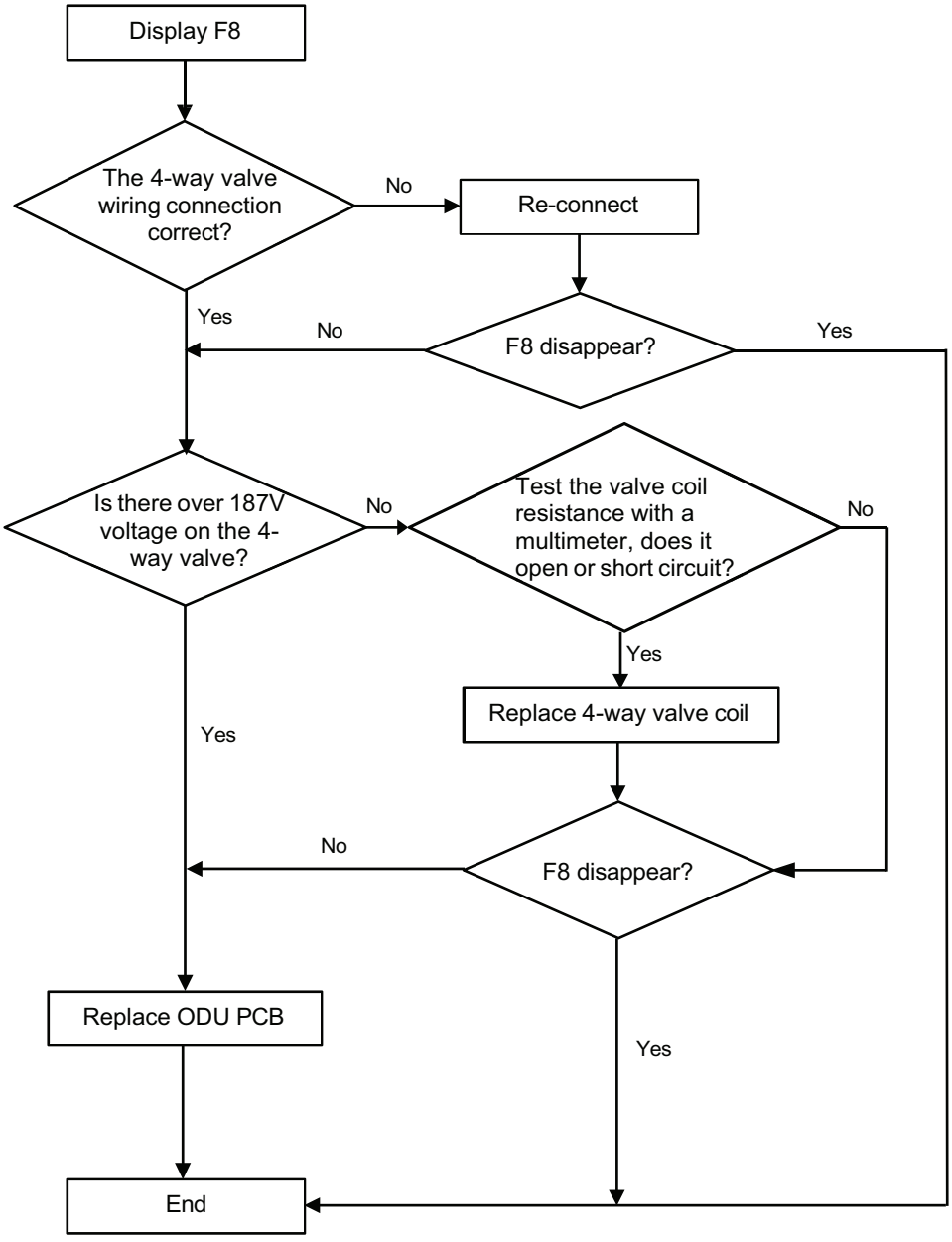
Figure 27. F7 - module temperature protection



F8 - 4-Way Value Reversing Abnormal

On heating mode, if the IDU Coil temperature is lower than Room temperature 41°F or more after compressor is on for 8 minutes, the unit will show F8 code.

Figure 28. F8 - 4-way value reversing abnormal



Pressure Curves

Cooling performance can be checked when the outdoor temp is above 65°F.

To check cooling performance, select the proper indoor CFM, allow pressures to stabilize. Measure indoor wet bulb temperature, outdoor temperature, discharge and suction pressures.

On the plots:

1. Locate outdoor temperature.
2. Locate indoor wet bulb.
3. Find intersection of OD temperature and ID W.B.
4. Read the discharge or suction pressure in the left column.

Example:

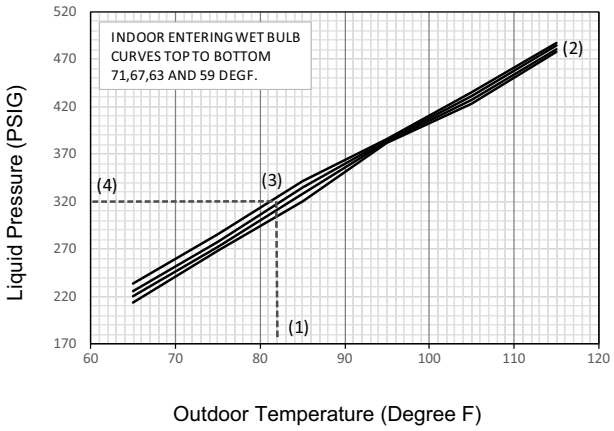
1. Outdoor temp. 82°F.
2. Indoor wet bulb 67°F
3. At intersection
4. Discharge pressure at 865 CFM is 320 PSIG
5. Suction pressure at 865 CFM is 134 PSIG

Actual:

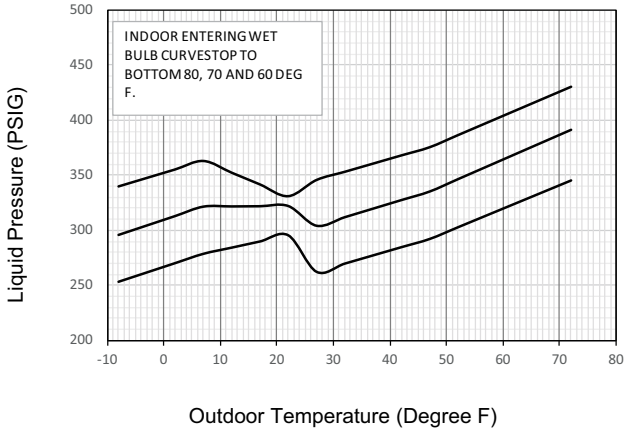
- Discharge pressure should be +/- 10 PSI of chart
- Suction pressure should be +/- 3 PSIG of chart

Figure 29. Pressure curves – model 5HPL5024A1

Cooling@SCFM
865



Heating@SCFM
980



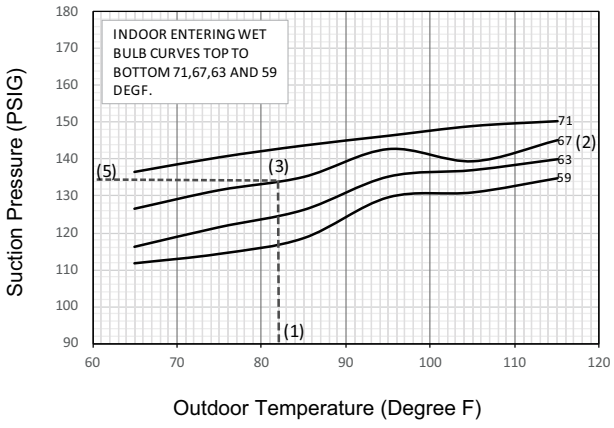
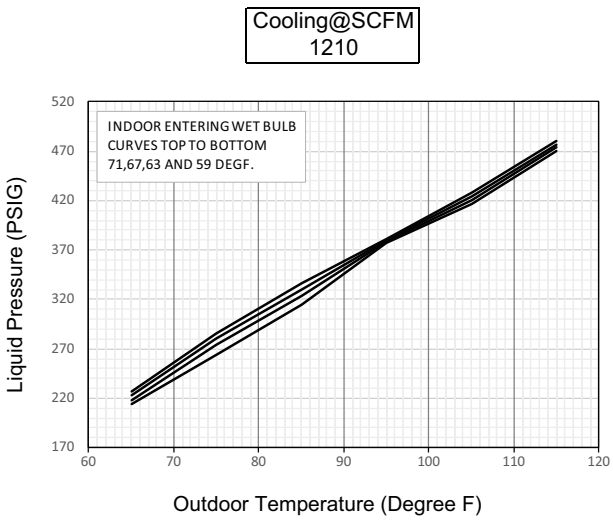
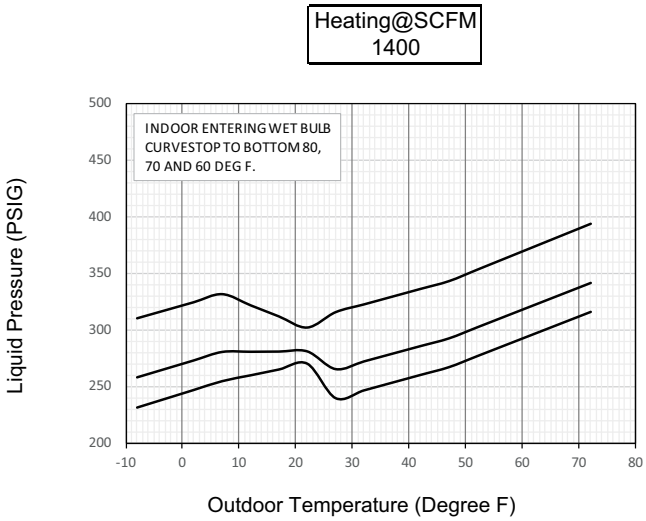


Figure 30. Pressure curves – model 5HPL5036A1





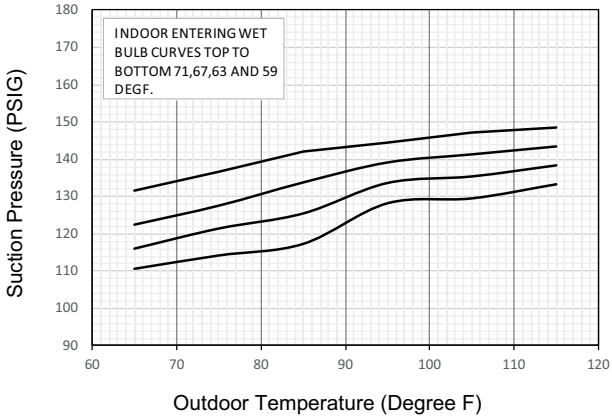
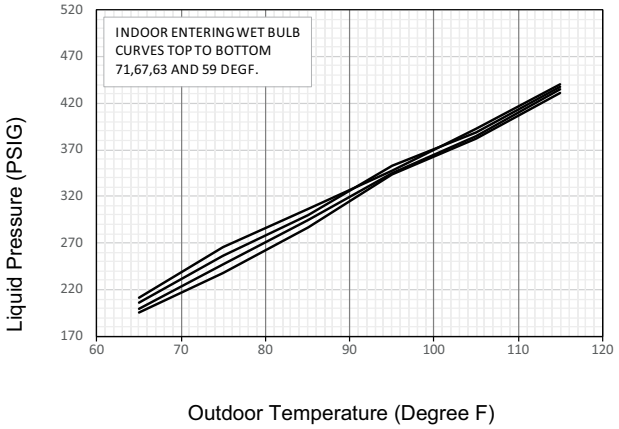
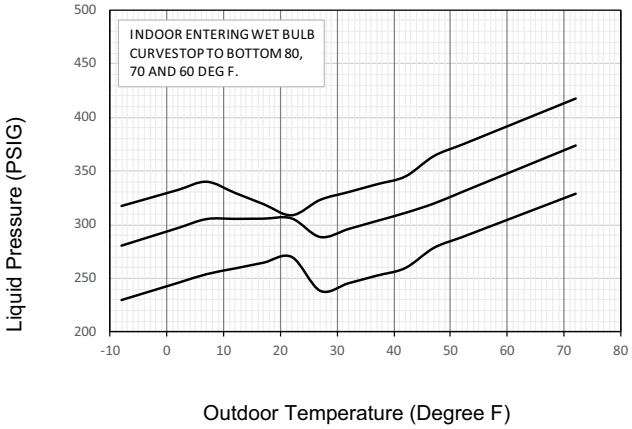


Figure 31. Pressure curves – model 5HPL5048A1

Cooling@SCFM
1380



Heating@SCFM
1530



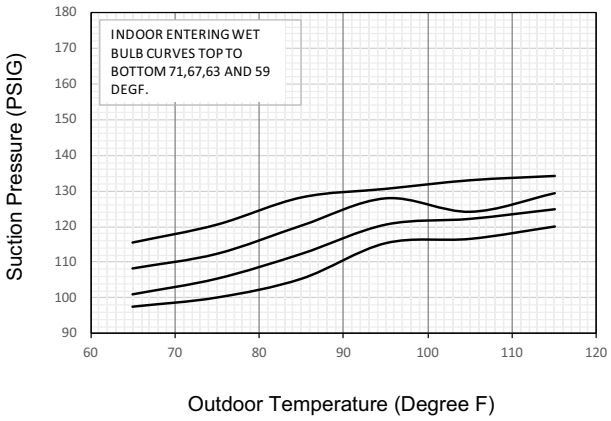
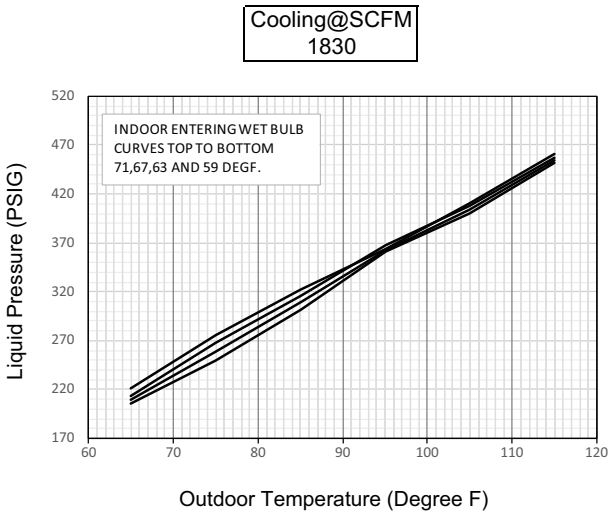
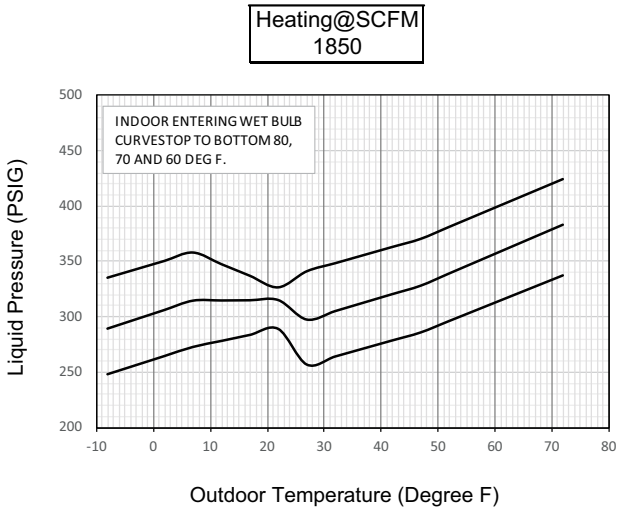
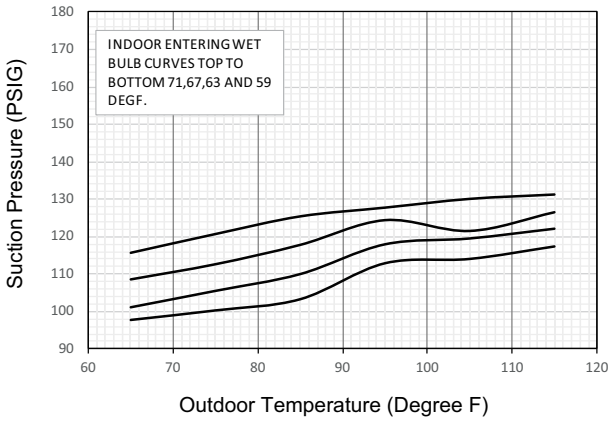


Figure 32. Pressure curves – model 5HPL5060A1

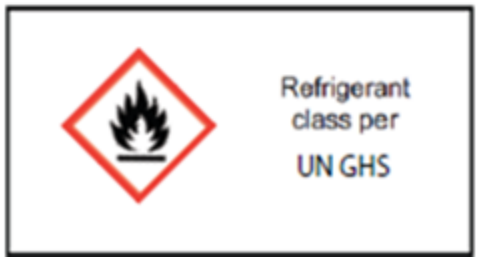






Symbols

	[symbol UN GHS]	warning; flammable materials
	[symbol ISO 7000-1659 (2004-01)]	service indicator; read technical manual
	A2L symbol	warning; low burning velocity material
	[symbol ISO 7000-1701 (2004-01)]	pressure
	[symbol IEC 60417-6040 (2010-08)]	ultraviolet radiation, instructional safeguard
	[symbol ISO 7000-1641 (2004-01)]	operator's manual; operating instructions



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