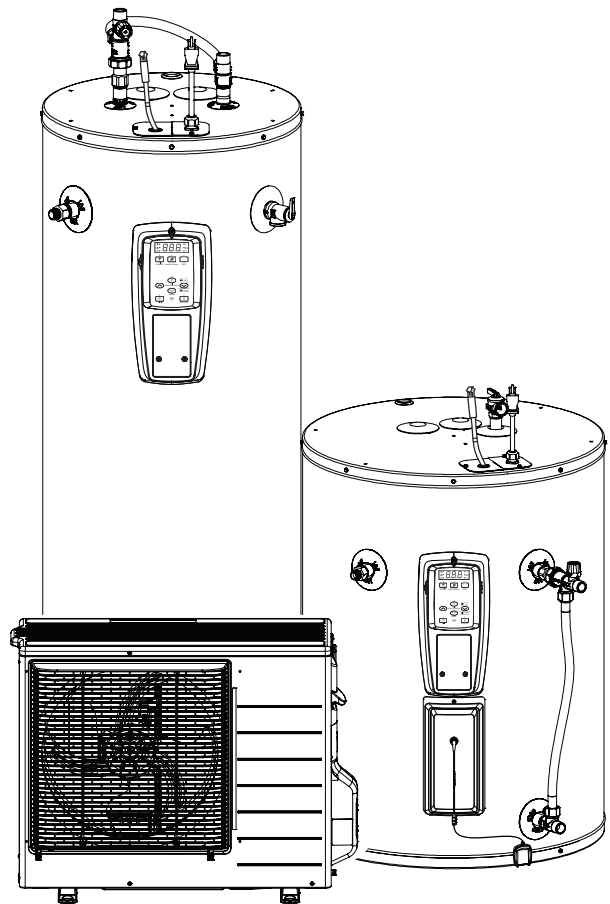


Service Handbook

Outdoor Split CO2 Heat Pump Water Heater

FOR USE ONLY WITH THESE MODELS:

BRAND	TANK	HEAT PUMP
A. O. SMITH	AXST-50LB AXST-50S AXST-50T AXST-66 AXST-80	HPACO-45
STATE	SXST-50LB SXST-50S SXST-50T SXST-66 SXST-80	SHPCO-45
AMERICAN	MXST-50LB MXST-50S MXST-50T MXST-66 MXST-80	MHPCO-45
RELIANCE	RXST-50LB RXST-50S RXST-50T RXST-66 RXST-80	RHPCO-45
LOCHINVAR	LXST-50LB LXST-50S LXST-50T LXST-66 LXST-80	LHPCO-45
A. O. SMITH CANADA	AXST-50LBC AXST-50SC AXST-50TC AXST-66C AXST-80C	HPACO-45C

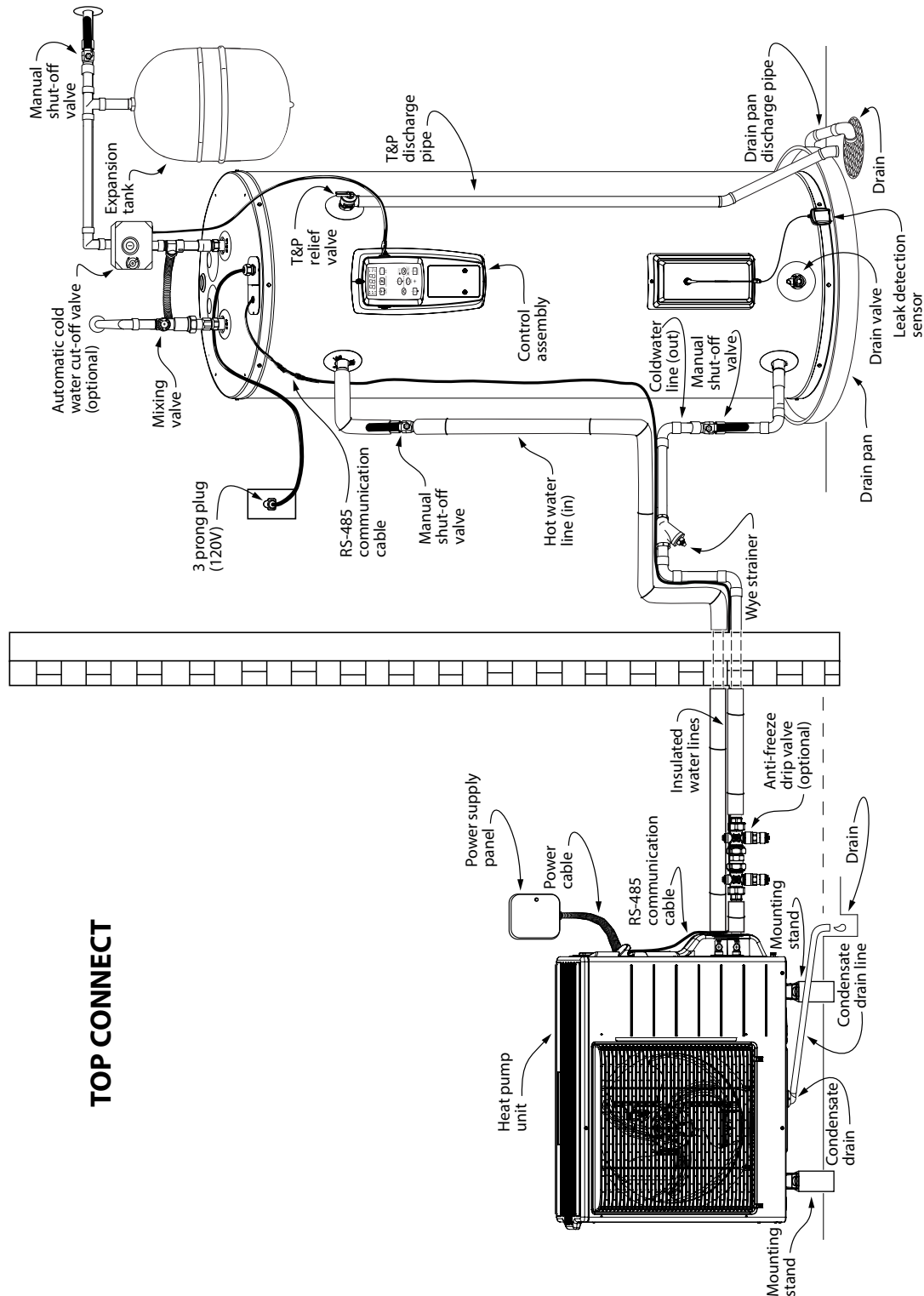


THIS SERVICE HANDBOOK IS FOR USE BY QUALIFIED SERVICE PROFESSIONALS ONLY.

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COMPLETED INSTALLATION (TOP CONNECT)



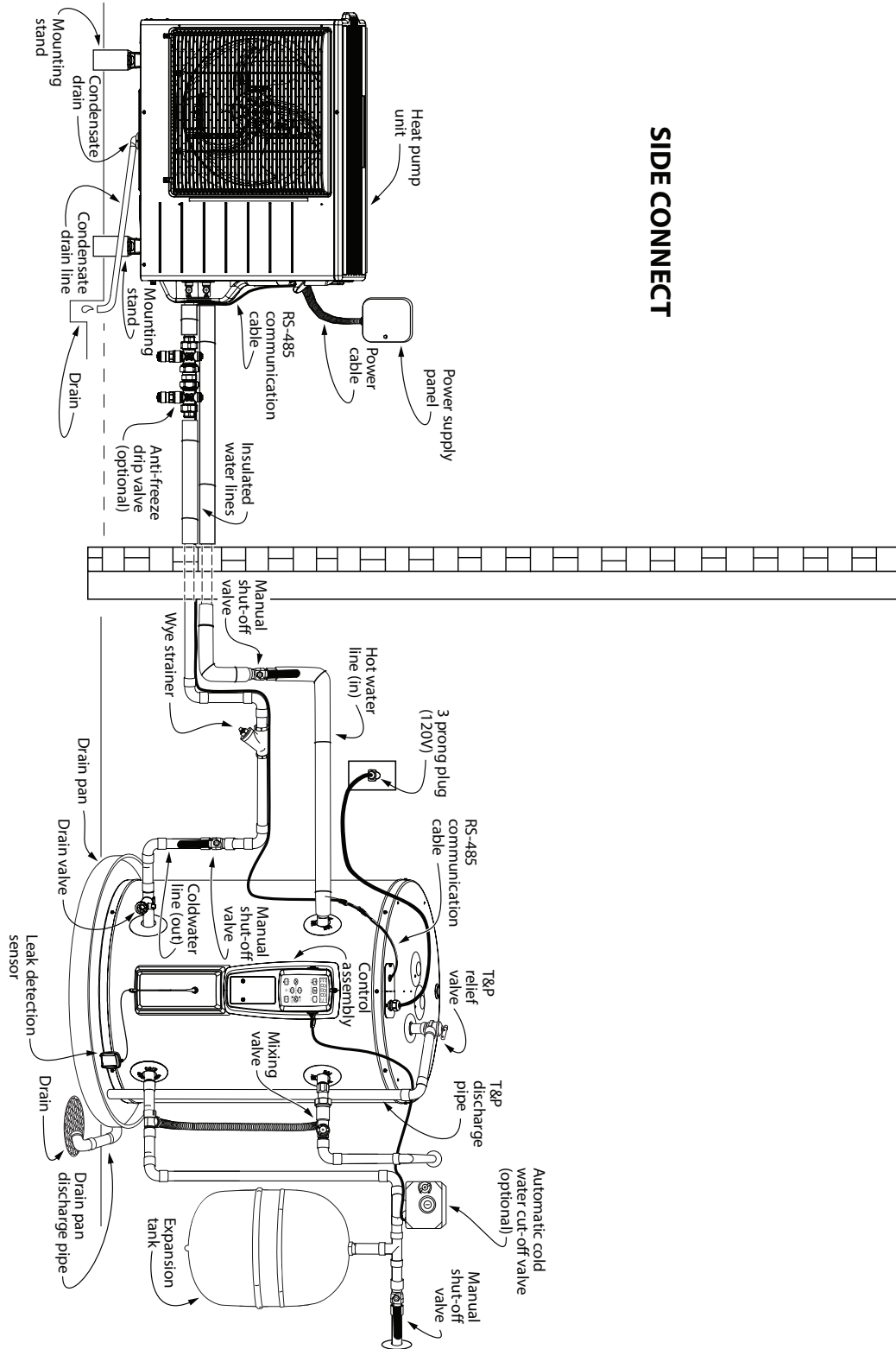
TOP CONNECT

Notes:

- 1) If copper piping is used, then unions must be dielectric at inlet and outlet.

COMPLETED INSTALLATION (SIDE CONNECT)

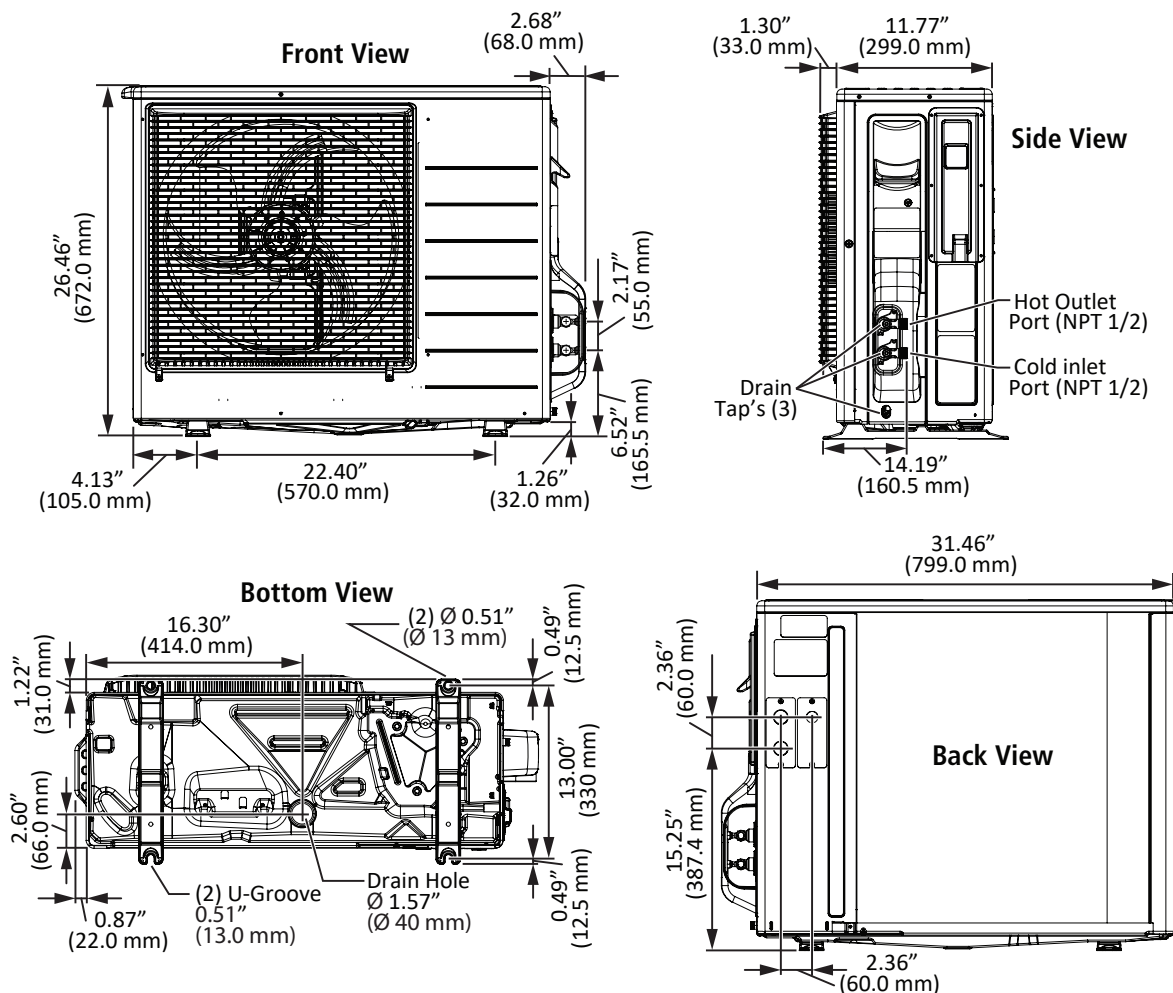
SIDE CONNECT



Note: If copper piping is used, then unions must be dielectric at inlet and outlet.

HEAT PUMP UNIT

- Product number: HE-AUM45BSU
- External form: The dimensions are as the following. Exterior color : Warm Silver
- Included items: Drain elbow
- Water port connection: (Inlet pipe, Outlet pipe) 1/2" MNPT
- Mounting part: Ø0.51 in(13 mm) hole (2 places), U-groove 0.51in(13 mm) width (2 places)
- Destination: America, Canada



- Standard Operating pressure 50-60 psi
 - Maximum water pressure 150 psi (1034 kPa)
 - Minimum water pressure 29 psi (200 kPa)
 - Applicable Voltage: AC 240 V (1Ph AC 208/240 V (~ 60 Hz))
 - Maximum Overlimit Protection: HE-AUM45BSU 20A
 - Minimum Circuit Ampacity 12.3A: L1, L2, ⊕
 - Use solid conductor power supply wire rated for 90 degrees C and sized in accordance with the NEC and local codes for the voltage and maximum current draw specified above.
- NOTICE:** If not using rigid or semi-rigid electrical conduit, ensure the power cable is rated for outdoor use with UV and weather resistance. Follow all local or national codes that may specify that an outdoor electrical disconnect be located near the outdoor heat pump unit.

Note: If copper piping is used, then unions must be dielectric at inlet and outlet.

IMPORTANT SAFETY INFORMATION

Read and follow all safety messages and instructions in this manual.



This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible property damage, serious injury or death. Do not remove any permanent instructions, labels, or the data plate from either the outside of the water heater or on the inside of the access panels. Keep this manual near the water heater.

 DANGER	DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.
 WARNING	WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE indicates practices not related to physical injury.

Important information to keep

Fill out this section and keep this manual in the pocket of the water heater for reference.

Date Purchased:

Model Number:

Serial number:

Maintenance performed:*	Date:

**Drain and flush tank, and remove and inspect anode rod after first six months of operation and at least annually thereafter. Inspect and operate the Temperature and Pressure Relief Valve (T&P) annually (see the label on the T&P valve for maintenance schedule). If no label is attached to the T&P Relief Valve, follow the instructions in the T&P Relief Valve Maintenance section of this manual. For the outdoor heat pump unit, inspect and clean any debris on the evaporator coil, and ensure the fan blade turns without hindrance. Inspect the condensate drain hole, or the drain tube if installed, and clear any obstructions. See the Maintenance section for more information about maintaining the outdoor split CO2 heat pump water heater.*

This product is certified to comply with a maximum weighted average of 0.25% lead content as required in some areas.

IMPORTANT SAFETY INFORMATION

This appliance is not intended for use 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 use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

To reduce the risk of property damage, serious injury or death, read and follow the precautions below, all labels on the water heater, and the safety messages and instructions throughout this manual.

RISKS DURING INSTALLATION AND MAINTENANCE



Electric Shock Risk

▲ WARNING! Contact with the electrical parts in the junction box, or behind the access panels can result in severe injury or death from the electrical shock. Safety and precautions to reduce the risk of fire, electric shock or injury to persons should be followed, including:

- READ ALL INSTRUCTIONS BEFORE USING THE WATER HEATER.
- This water heater must be grounded. See the “Electrical Connections” section found in the “Installation” chapter of this manual.
- Install or locate this heat pump water heater system only in accordance with the provided manual.
- Use this heat pump water heater system only for its intended use as described in this manual.
- As with any appliance, close supervision is necessary when used by children.
- This heat pump water heater system should be serviced only by qualified personnel. Contact a service person for examination, repair or adjustment.
- Disconnect power at both the outdoor heat pump unit and indoor storage tank unit. Alternatively the power can be disconnected to both

units by opening the circuit breaker and flipping off the designated breakers, or removing the fuses before installing or servicing.

- Use a non-contact circuit tester to confirm that power is **OFF** before working on or near any electrical parts.
- Replace all parts and panels before operating.



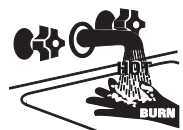
Lifting Risk

▲ WARNING! The heat pump water heater system is heavy. Follow these

precautions to reduce the risk of property damage, injuries from lifting or impact injuries from dropping the water heater.

- Use at least two people to lift either the heat pump unit or the storage tank.
- Be sure you both have a good grip before lifting.
- Use an appliance dolly (with strap) to move the storage tank.

RISKS DURING OPERATION



Scalding Risk

This water heater can make water hot enough to cause severe burns

instantly, resulting in severe injury or death.

- Feel water before bathing or showering. This water heater comes with an ASSE-1017 and ASSE-1070 certified mechanical mixing valve that must be installed on the hot water outlet from the storage tank. See Installation Instructions for full details. The factory default setting of the mixing valve is 120F. See Installation instructions for temperature adjustment.
- To reduce the risk of scalding, install Thermostatic Mixing Valves (temperature limiting valves) at each point-of-use. These valves automatically mix hot and cold water to limit the temperature at the tap. Mixing valves are available from your local plumbing supplier. Follow manufac-

turer's instructions for installation and adjustment of the valves.

- The mixing valve on this water heater has been factory set to approximately 120°F/49°C to reduce the risk of scalding. Higher temperatures increase the risk of scalding, but even at 120°F/49°C, hot water can scald. If you choose a higher temperature, Thermostatic Mixing Valves located at each point-of-use are particularly important to help avoid scalding.

Temperature	Time to Produce a Serious Burn
120°F (49°C)	More than 5 minutes
125°F (52°C)	1½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1½ seconds
155°F (68°C)	About 1 second

For more information about changing the factory thermostat setting(s), refer to the “Adjusting the Temperature” section in this manual (see page 11).

Regardless of the water heater Control Assembly setting, higher temperatures may occur in certain circumstances:

- Water temperature will be hotter if someone adjusted the thermostat(s) to a higher setting.
- Problems with the thermostat(s), or other malfunctions may result in higher than expected water temperatures.
- If the heat pump unit or storage tank are in a hot environment, the water in the tank can become as hot as the surrounding air, regardless of the thermostat setting.
- If the water supplied to the water heater is pre-heated (for example, by a solar water heating system) the heat pump unit may fail to operate.

To reduce the risk of unusually hot water reaching the fixtures in the house, install Thermostatic Mixing Valves at each point-of-use.

IMPORTANT SAFETY INFORMATION

If anyone in your home is at particular risk of scalding (for example, the elderly, children, or people with disabilities) or if there is a local code or state law requiring a certain water temperature at the hot water tap, then these precautions are particularly important.

According to the national standard American Society of Sanitary Engineering (ASSE 1070) and most local plumbing codes, the water heater's thermostat should not be used as the sole means to regulate water temperature to avoid scalds.

Properly adjusted Thermostatic Mixing Valves installed at each point-of-use allow you to set the tank temperature to a higher setting without increasing risk of scalds. A higher temperature setting allows the tank to provide much more hot water and can help provide proper water temperatures for appliances such as dishwashers and washing machines. Higher tank temperatures (140°F/60°C) also kill bacteria that cause a condition known as "smelly water" and can reduce the levels of bacteria that cause water-borne diseases.

NOTICE: The default temperature for the storage tank is 140°F and the default temperature for the mixing valve is 120°F.

Water Contamination Risk

Do not use chemicals that could contaminate the potable water supply. Do not use piping that has been treated with chromate, boiler seal, or other chemicals.



Fire Risk

To reduce the risk of a fire that could destroy your home and seriously injure or kill people:

- Do not store things that can burn easily such as paper or clothes next to the heat pump unit or storage tank.
- Be sure the junction box cover and the storage tank control housing, and heat pump unit access door covers are in place. These covers keep debris from entering and potentially being ignited, and help

keep any internal fires from spreading.

- Keep the indoor hot water storage tank from becoming wet. Immediately shut the water heater off and have it inspected by a qualified person if you find that the wiring, or surrounding insulation have been exposed to water in any way (e.g., leaks from plumbing or leaks from the hot water storage tank itself can damage property and could cause a fire risk). If the hot water storage tank is subjected to flood conditions the entire unit must be replaced.
- Use the supplied and pre-wired 3 prong 120V power cord to plug the indoor storage tank to an indoor 120V electric outlet. DO NOT use an extension cord to supply power to the indoor storage tank. Make electrical connections to the outdoor heat pump unit properly, according to the instructions found in the Installation Instructions and Use & Care Guide provided with the heat pump unit. Use solid copper wire conductors sized appropriately by following all local and national electrical codes for the voltage and amperage draws specified on the heat pump unit's data plate. Use a UL listed or CSA approved water tight strain relief for both the power connect, ground wire to the ground terminal block, and RS-485 cable connection.



Explosion Risk

High temperatures and pressures in the water heater tank can cause an explosion resulting in property damage, serious injury or death. A new Temperature and Pressure (T&P) Relief Valve is included with your water heater to reduce the risk of explosion by discharging hot water. Additional temperature and pressure protective equipment may be required by local codes.

A nationally recognized testing laboratory maintains periodic inspection of the valve production process and certifies that it meets the requirements for Relief Valves for Hot Water Supply Systems, ANSI Z21.22. The T&P

Relief Valve's relief pressure must not exceed the working pressure rating of the water heater as stated on the rating plate.

Maintain the T&P Relief Valve properly. Follow the maintenance instructions provided by the manufacturer of the T&P Relief Valve (label attached to T&P Relief Valve). If no label is attached to the T&P Relief Valve, follow the instructions in the T&P Relief Valve Maintenance section of this manual.

An explosion could occur if the T&P Relief Valve or discharge pipe is blocked. Do not cap or plug the T&P Relief Valve or discharge pipe.

Fire and Explosion Risk if Hot Water is Not Used for Two Weeks or More.

⚠ CAUTION! Hydrogen gas builds up in a hot water system when it is not used for a long period (two weeks or more). Hydrogen gas is extremely flammable. If the hot water system has not been used for two weeks or more, open a hot water faucet for several minutes at the kitchen sink before using any electrical appliances connected to the hot water system. Do not smoke or have an open flame or other ignition source near the faucet while it is open.

Your safety and the safety of others is extremely important in the servicing of this water heater. Many safety-related messages and instructions have been provided in this handbook and on your water heater to warn you of a potential hazard(s). Read, understand and follow all instructions in this handbook and in the Installation Instructions and Use & Care Guide that shipped with the water heater.

The information contained in this handbook is designed to answer common situations encountered when operating or servicing the residential electric heat pump water heater, it is not meant to be all-inclusive. For topics not covered in this handbook, please contact the technical information center listed on the water heater's warranty sheet.

This handbook is intended for use by qualified service technicians.

TROUBLESHOOTING

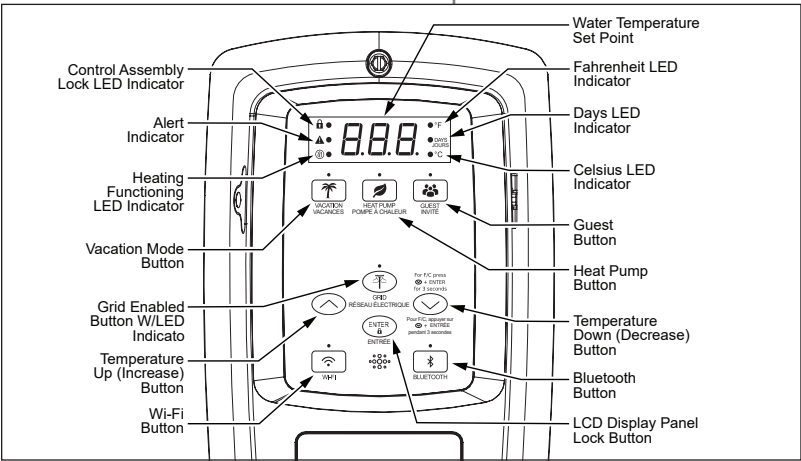


Figure 1 - Control Assembly

Accessing the Maintenance Display

1. Press the Up and Down Temperature buttons (⬆️⬆️) at the same time and hold for (3) seconds. After holding for three seconds, a flashing 1 will appear, the user will need to press enter, then they will enter the maintenance display menu.
2. A total of 14 options are available in this mode (see Table 4 below). Use the Up and Down Temperature buttons (⬆️⬆️) to switch between options.
3. The display will revert to normal operation after no buttons have been pressed over a period of approximately (15) seconds.

NOTICE: The water heater will conduct a system diagnostic (approximately seven (7) to ten (10) minutes) each time power is applied from an off state (the Control Assembly will display a series of single, alternating dashes repetitively during system diagnostic). Once the diagnostic sequence has finished, normal operation will begin and the fan will turn on. If the system diagnostic yields any codes, reference the diagnostic codes section in this Service Handbook (see pages 20-23).

Table 1: Maintenance Display

Display		Message	Meaning	Resistance Values	
				R-25°C	Ranges
1	P1	Upper Temperature Sensor	Measured at outer upper tank wall	50kΩ±2%	See Table on page 87) in the Appendix for more detail on sensor resistance data
2	P2	Lower Temperature Sensor	Measured at outer lower tank wall	50kΩ±2%	
3	P3	Discharge temperature	Measured at hairpin of evaporator	10kΩ±2%	
4	P4	Targeted Hot Water Temperature	Measured at compressor discharge pipe	50kΩ±2%	
5	P5	Defrost temperature	Measured at evaporator outlet pipe	10kΩ±2%	
6	P06	Outdoor Ambient temperature	Measured within heat pump component assembly	10kΩ±2%	
7	P07	EEV position	EEV (Electronic Expansion Valve) opening indication	N/A	
8	P08	Fan speed	0: Upper element is off / 1: Upper element is on		
9	P09	Lower Element Status	0: Lower element is off / 1: Lower element is on		
10	P10	Water supply temperature	“vXY” means the software version is “X.Y”		
11	H01	History Fault Code 1	Newest active fault code		
12	H02	History Fault Code 2	Historical fault code		
13	H03	History Fault Code 3	Historical fault code		
14	H04	History Fault Code 4	Historical fault code		

TROUBLESHOOTING

▲ WARNING! Do not cap or plug the T&P Relief Valve or discharge pipe, and do not operate the water heater without a functioning T&P Relief Valve - this could cause an explosion.

Before Using

- 1 Make sure the system has been properly installed, according to the Installation Instructions and Use & Care Guide. The water heater must be installed upright and level.
 - 2 Make sure there is nothing blocking the fan or coils of the outdoor heat pump unit.
 - 3 Make certain the tank is completely filled with water and all air has been bleed out of the heat pump circulation loop (see Installation Instructions and Use & Care Guide).
 - 4 After the water heater is completely filled with water, connect electrical power to the water heater.
- NOTICE:** The water heater will conduct a system diagnostic (approximately seven (7) to ten (10) minutes) each time power is applied from an off state. Normal operation will begin after the system diagnostic has been completed. If the system diagnostic yields any codes, reference the diagnostic codes section in this manual (see pages 15-20).
- 5 Adjust the set point temperature. See the “Water Temperature Adjustment” section on page 11.

IMPORTANT: Do not attempt to operate this water heater if the unit has been submerged, subjected to flooding, or surrounding insulation has been exposed to water in any way.

Do not attempt to repair a unit that has been subjected to flood conditions. Water heaters that have been subjected to flood conditions, or any time the unit has been submerged in water, must be replaced.

▲ WARNING! Working near an energized circuit can result in severe injury or death from electrical shock.

▲ WARNING! When you are finished, be sure all covers are secured to reduce the risk of fire and electric shock.

Troubleshooting & Maintenance

If you are not qualified or are not comfortable performing any of the troubleshooting, repair or maintenance procedures that follow, call our Technical Assistance Hotline for further assistance, or contact a qualified person.

Drips from T&P Relief Valve Discharge Pipe

A small amount of water dripping from the Temperature and Pressure (T&P) Relief Valve usually means the home's water pressure is too high or you need a properly sized and pressurized Thermal Expansion Tank (see page 18 for more information). A large amount of hot water coming from the T&P discharge pipe may be due to the tank overheating.

▲ WARNING! Do not cap or plug the T&P Relief Valve or discharge pipe, and do not operate the water heater without a functioning T&P Relief Valve - this could cause an explosion.

Water Pressure too High. High water pressure can cause the T&P Relief Valve to drip. Install a Pressure Reducing Valve (PRV) on the main cold water supply line. Adjust the PRV to between 50-60 psi/345-414 kPa.

Thermal Expansion Tank. Install a Thermal Expansion Tank. If a Thermal Expansion Tank is already installed and the T&P Relief Valve discharge pipe drips, the Thermal Expansion

Tank may be pressurized to the wrong pressure or the internal bladder may be defective. Refer to the instructions that came with the Thermal Expansion Tank for more information.

Debris. In rare cases, debris can stick inside the T&P Relief Valve preventing the valve from seating fully. In that case, the T&P Relief Valve discharge pipe will drip. You may be able to clear debris from the T&P Relief Valve by manually operating the valve, allowing small quantities of water to flush out the debris. See the label on the T&P Relief Valve for instructions.

▲ WARNING! When manually operating the T&P Relief Valve, make sure that no one is in front of or around the discharge outlet. The water may be extremely hot and could cause severe burns. Also, ensure that the water discharge will not cause property damage.

If the water pressure is between 50-60 psi/345-414 kPa, a Thermal Expansion Tank is installed and properly pressurized, the valve has been cleared of any debris, and it still drips, the valve may be broken – have a qualified person replace the T&P Relief Valve.

Water Odor

Harmless bacteria normally present in tap water can multiply in water heaters and give off a “rotten egg” smell. A higher tank temperature setting of 140°F/60°C kills the bacteria that causes “smelly water” and can reduce the levels of bacteria that cause water-borne disease. A properly adjusted Thermostatic Mixing Valve should be installed at each point of use.

NOTICE: To protect the tank, an anode rod must be installed in the water heater at all times or the warranty is void.

TROUBLESHOOTING

▲ **WARNING!** Because higher temperatures increase the risk of scalding, if the temperature set point is higher than 120°F/49°C, Thermostatic Mixing Valves are particularly important.

Water Heater Sounds

During the normal operation of the water heater, sounds or noises may be heard. These noises are common and may result from the following:

- Normal expansion and contraction of metal parts during periods of heat-up and cool-down.
- The heat pump compressor or fan running.

Low Water Pressure

Check both the cold and hot water at a sink to determine if the lower pressure is only on the hot water side. If both hot and cold faucets have low pressure, call your local water utility. If the low pressure is only on the hot water side, the primary causes of this are:

- Melted PEX liner. Soldering copper pipes while they are connected to the water heater can melt the PEX liner inside of the hot and cold water connections. Melting the PEX liner can restrict the flow of hot and cold water. If that is the case, replace the nipples at the hot and cold water connections.
- Partially closed supply valve. Open the water heater's supply valve fully.
- Clogged mesh strainer in the mixing valve.

Insufficient or No Hot Water, or Slow Hot Water Recovery

▲ **WARNING!** Because higher temperatures increase the risk of scalding, if the temperature set point is higher than 120°F/49°C, Thermostatic Mixing Valves are particularly important.

If the hot water is simply not warm enough, there are several possible causes:

- Thermostatic Mixing Valve faulty or set too low.
- Temperature set point too low.
- Hot water usage pattern exceeds the capability of the water heater in current mode (see "Operating Mode Descriptions" on page 11).
- Water connections to unit are reversed (disconnect and re-install correctly).
- Leak in plumbing system (check home for any leaks and repair).
- No power to the water heater (no lights on the unit are on and display is blank).
- Unit is in Vacation Mode.
- Non-functioning upper thermistor sensor (refer to code **003** in the "Diagnostic Codes" section on page 20).
- Clogged Wye strainer between storage tank and heat pump unit.
- Mixing valve at the tank outlet clogged with debris.

Thermostatic Mixing Valves. If the hot water is simply not warm enough, make sure the faucet you are checking does not have a defective Thermostatic Mixing Valve. If these devices fail, they can reduce the amount of hot water the shower or faucet delivers even though there is plenty of hot water in the tank. Always check the water temperature at several faucets to make sure the problem is not in a faucet or shower control.

Temperature Set Point Too Low. If the water temperature at several faucets is too cool, adjust the set point at the Control Assembly (see "Water Temperature Adjustment" on page 11).

Undersized Water Heater. If your storage tank runs out of hot water too quickly, it may be too small for your needs. Consider replacing it with a larger storage tank. If the water heater is in good condition, you may be able to meet your family's hot water needs by adjusting the provided mixing valve and then setting the temperature to a higher set point on the Control Assembly (see "Water Temperature Adjustment" on page 11).

You can also reduce your home's hot water needs by washing clothes in cold water, installing flow restrictors on shower heads, repairing leaky faucets, and taking other conservative steps.

Reversed Connections. Check the hot and cold connections and make sure your home's hot water pipe is connected to the hot water outlet on the water heater. Usually, reversed connections are found soon after the installation of a new unit.

TROUBLESHOOTING

Plumbing Leak. Even a small leak in the hot water side of the home's plumbing system can make it appear that the water heater is producing little or no hot water. Locate and repair the leak.

Symptom of Water Too Hot

- 1 Could be the result of debris in the cold water inlet to mixing valve.

Low Hot Water Pressure

- 1 Could be the result of debris in the mixing valve's—cold and/or hot water inlets.

Power Cycling the Unit

- 1 Find and turn **OFF** the heat pump's circuit breaker or remove disconnects and unplug the storage tank's power supply from the wall outlet.
- 2 Locate the electrical junction box on the top of the storage tank and side of the heat pump unit, remove covers and identify the power wires.
- 3 Turn the circuit breaker back **ON** (or reinstall the disconnects) and check for power on the incoming power wires using a multimeter. Additionally, plug the storage tank's power supply back into the wall outlet and check for power using a multimeter.

- 4 Again, turn **OFF** the water heater's circuit breaker, or remove the disconnects, unplug the storage tank's power supply from the wall outlet, and replace the electrical junction box cover, before performing maintenance work.

▲ WARNING! Working near an energized circuit can result in severe injury or death from electrical shock.

▲ WARNING! When you are finished, be sure all covers are secured to reduce the risk of fire and electric shock.

Closed System/ Thermal Expansion/ T&P Drip

Most public water systems are required to prevent water flowing from points of use (residences, businesses, etc.) back into the municipal water supply. This creates what is known as a "Closed System."

As water is heated, it expands. In a closed system the expansion of the water has nowhere to go, resulting in an increase in pressure. This increased pressure in the system can damage the water heater and may cause the T&P Relief Valve to open and relieve the pressure. Premature tank failure will result if this condition is not corrected. To prevent thermal expansion from increasing the system pressure, a properly sized Thermal Expansion Tank should be installed on the cold water supply to the water heater (see examples in the "Completed Installation" Figures on pages 3-5). The Thermal Expansion Tank must be charged with air to match the incoming water pressure. Always follow the manufacturer's instructions that come with the Thermal Expansion Tank.

Contact a plumbing service agency or your retail supplier regarding the installation of a Thermal Expansion Tank.

TROUBLESHOOTING

Checking and Adjusting the Air Charge of the Thermal Expansion Tank

- 1** Turn power OFF to the water heater at the circuit breaker or remove disconnects (disconnect 120V model from outlet).
- 2** Run cold water out of the tap for 10 seconds to relieve thermal expansion and then turn the faucet **OFF**.
- 3** Connect a water pressure gauge to the plumbing system and record the incoming water pressure.
- 4** Shut the cold water supply **OFF**.
- 5** Open a hot water tap and relieve pressure from the plumbing system.
- 6** The preferred method for checking air pressure of a Thermal Expansion Tank is to remove it from the plumbing if possible. Where it is not possible to remove the Thermal Expansion Tank, take necessary precautions to ensure water pressure at the plumbing connection to the Thermal Expansion Tank has been relieved. Failure to relieve water pressure at this location may invalidate the air pressure check. Improperly installed or charged Thermal Expansion Tanks can result in premature leaking of the water heater.

NOTICE: The air pressure check is not valid unless the Thermal Expansion Tank is completely removed from the system.

- 7** Remove the cap from the air pressure Schrader valve and use the air pressure gauge to measure the air pressure charge of the Thermal Expansion Tank. The air pressure charge should match the recorded incoming water pressure.

NOTICE: If water, rather than air, comes out of the Schrader valve the Thermal Expansion Tank will need to be replaced.

- 8** If the air charge does not match the incoming water pressure, adjust it by adding pressure with an air compressor or by relieving excess pressure at the Schrader valve until the air charge in the tank matches the pressure of the incoming water.
- 9** Re-install the Thermal Expansion Tank.
- 10** Open all plumbing shut-off valves and restore power to the water heater.
- 11** Check for leaks.

Clearing Error Code

To temporarily clear an error code from the control assembly display, press the Up and Down Temperature buttons   at the same time until the display shows "CLR."

TROUBLESHOOTING

CONTROL ASSEMBLY DIAGNOSTIC CODE CHART

IMPORTANT: Before attempting to adjust the thermostat, read the “Important Safety Information” section on page 7. If the instructions are not clear, contact a qualified person.

Error codes will display a sequence of three numbers.

The three sequence code will flash in the sequence:

1. Heat pump number, set by the dip switch (e.g. U01) or U0 for the storage tank.
2. Error code (e.g. 020)
3. Temp set-point (e.g. 140)

*For resistance specifications, see Appendix on page 85.

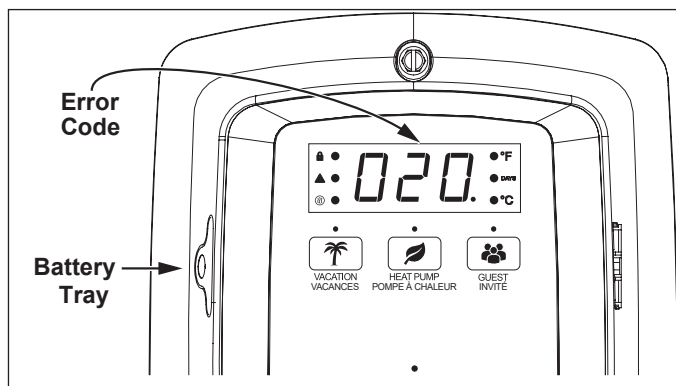


Figure 2 - Control Assembly Diagnostic Coding.

STORAGE TANK RELATED ERROR CODES		
ERROR CODE	INDICATES	CORRECTIVE ACTION*
No Error Code Displayed Not Enough Hot Water	High usage, plumbing leak, operating mode adjustment	1. Check for plumbing leak. 2. Adjust temperature; see scald warnings on heater and in manual. 3. Contact a qualified person to perform a volume test.
No Error Code Displayed Water Too Hot	Water temperature set too high	1. Reduce temperature setting; or 2. Turn OFF electrical power at the breaker. 3. Check wiring. 4. Turn ON electrical power at breaker. 5. If the error persists, contact a qualified person or call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
No Error Code Displayed No Hot Water	No power, control panel or thermostat operation	1. Turn OFF electrical power at breaker. 2. Unplug and reconnect 24 pin connector. 3. Turn ON electrical power at breaker. 4. Contact a qualified person to verify correct voltage to unit. NOTICE: If the control panel was not connected via Wi-Fi or Bluetooth, the time will need to be set.
002 with alert indicator flashing (also flashing red LED with audible alarm)	High tank temperature. Water temperature exceeded high limit.	1. Turn OFF electrical power at the breaker. 2. Contact Technical Support.
003 with alert indicator flashing (also flashing red LED with audible alarm)	Upper thermistor sensor failure. Upper thermistor sensor is mounted to tank	1. Turn OFF electrical power at the breaker. 2. Check electrical connections at Control Assembly board. 3. If there are no issues with the wiring, replace the thermistor. 4. Turn ON electrical power at breaker.
004 with alert indicator flashing (also flashing red LED with audible alarm)	Lower thermistor sensor failure. Lower thermistor sensor is mounted to tank and located above lower element.	1. Turn OFF electrical power at the breaker. 2. Check electrical connections at Control Assembly board. 3. If there are no issues with the wiring, replace the thermistor. 4. Turn ON electrical power at breaker.
010 with alert indicator flashing (also flashing red LED with audible alarm)	Frequency Fault	1. Turn OFF electrical power at the breaker. Now turn ON electrical power to see if error clears. If error has not cleared, turn OFF electrical power at the breaker and replace Control Assembly. 2. Turn ON electrical power at breaker.
011 with alert indicator flashing (also flashing red LED with audible alarm)	Internal Processor Error - Frequency Fault - Standard AD Reference Fault - Non-Volatile Memory Fault - Crystal Fault	1. Turn OFF electrical power at the breaker. Now turn ON electrical power to see if error clears. If error has not cleared, turn OFF electrical power at the breaker and replace Control Assembly. 2. Turn ON electrical power at breaker.

TROUBLESHOOTING

ERROR CODE	INDICATES	CORRECTIVE ACTION*
020 with alert indicator flashing (also flashing red LED with audible alarm)	Heat Pump (HPU) Communication	1. Turn OFF electrical power at the breaker, check the RS-485 communication cable connections at the storage tank and heat pump unit. 2. Check the cable for damage. 3. Turn ON electrical power at breaker. 4. If error is still present, replace the cable.
031 with alert indicator flashing (also flashing red LED with audible alarm)	Water Leak	1. Turn OFF electrical power at the breaker, check all electrical connections and wiring for damage. 2. Check for plumbing leaks and correct accordingly. 3. If tank is leaking, replace the unit. 4. Turn ON electrical power at breaker.
039 with alert indicator flashing (also flashing red LED with audible alarm)	Power supply voltage is too low	1. Check for loose electrical connections, refer to "Power Cycling the Unit" on page 18.
045 with alert indicator flashing (also flashing red LED)	Battery Low Energy	1. Make sure the battery protective tab has been properly removed from the battery tray, located on the left side of the control assembly. 2. Locate the battery tray on the side of the control assembly. 3. Remove the Phillips head screw, slide the battery tray out from the control panel. 4. Remove the old BR2032 battery and replace with Panasonic® BR2032 or Murata CR2032 battery only. Use of another battery may present a risk of fire or explosion. 5. Reinstall the battery tray with new battery and hand tighten the Phillips head screw to secure the battery tray in the control assembly. NOTICE: If the control assembly was not connected via WiFi or powered by a power source, the time will need to be set.
046 with alert indicator flashing (also flashing red LED with audible alarm)	Shut-off Valve (if applicable)	1. Turn OFF electrical power. Shut OFF the cold water valve at the main line and open a hot water faucet to release pressure from the water heater. 2. Check the shut-off valve, making sure the valve is not stuck in the open or closed position (see instructions provided with shut-off valve). 3. Replace the shut-off valve, if needed. 4. Turn ON electrical power at breaker. 5. Open the cold water valve to fill the heater with water, open a hot water faucet to bleed all air until water flows without air bursts. 6. Purge air from the heat pump water heater system. See Start-Up and Operations — page 9.
HEAT PUMP RELATED ERROR CODES		
006 with alert indicator flashing (also flashing red LED with audible alarm)	PCB Failure.	1. Inspect the installation location for ventilation obstructions and remove if present. 2. Make sure the fan is operating correctly by allowing the unit to cycle on and off. 3. Turn OFF electrical power at the breaker. 4. Check the V-coil resistance* and wiring for damage. 5. Replace either the fan motor or V-coil if any anomaly is present. 6. Turn ON electrical power at breaker. 7. If error persists, replace the PCB control.
009 with alert indicator flashing (also flashing red LED with audible alarm)	Low power voltage	1. Power OFF ("Power Cycling the Unit," page 18). 2. Disconnect and reconnect the communication cable. 3. Inspect wire for damage and replace if damage is present. 4. If error persists, replace PCB control.
012 with alert indicator flashing (also flashing red LED with audible alarm)	Input over-current detected	1. Inspect the installation location for ventilation obstructions and remove if present. 2. Turn OFF electrical power at the breaker 3. Inspect wiring at the terminals and correct if any issues are found. 4. Turn ON electrical power at breaker. 5. If error persists, replace the PCB control.

TROUBLESHOOTING

ERROR CODE	INDICATES	CORRECTIVE ACTION*
020 with alert indicator flashing (also flashing red LED with audible alarm)	Modbus communication error	1. Inspect the RS-485 communication cable connections at both the storage tank control assembly and heat pump unit. 2. Check the PCB control on the heat pump and the Control assembly on the storage tank. 3. If any issues are found, turn OFF power at the breaker and correct any issues found. 4. Turn ON electrical power at breaker. 5. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
027 with alert indicator flashing (also flashing red LED with audible alarm)	Discharge temperature sensor error	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, replace the sensor.
028 with alert indicator flashing (also flashing red LED with audible alarm)	Outdoor temperature sensor error	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, replace the sensor.
052 with alert indicator flashing (also flashing red LED with audible alarm)	Outlet water temperature sensor error	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, replace the sensor.
084 with alert indicator flashing (also flashing red LED with audible alarm)	Compressor anomaly	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
085 with alert indicator flashing (also flashing red LED with audible alarm)	Discharge temperature error	1. Turn OFF electrical power at the breaker, check discharge temperature sensor and V-coil electrical connections. 2. Check the resistance* of the discharge temperature sensor and V-coil. 3. If discharge sensor resistance* is abnormal, replace sensor. 4. If V-coil resistance* is abnormal, replace V-coil. 5. Turn ON electrical power at breaker. 6. If error persists, replace the PCB control. 7. If error persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
090 with alert indicator flashing (also flashing red LED with audible alarm)	High pressure Switch error/OLP error	1. Turn OFF electrical power at the breaker, check if the connection is open on the bi-metal switch or high pressure switch and correct accordingly. 2. If either of the switches have failed, replace. 3. Turn ON electrical power at breaker. 4. If error persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
091 with alert indicator flashing (also flashing red LED with audible alarm)	Defrost temperature sensor error	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, replace the sensor.
092 with alert indicator flashing (also flashing red LED with audible alarm)	Inlet water temperature sensor error	1. Turn OFF electrical power at the breaker, check all electrical connections, and wiring for damage. 2. Check the wiring and correct accordingly. 3. Turn ON electrical power at breaker. 4. If error persists, replace the sensor.
095 with alert indicator flashing (also flashing red LED with audible alarm)	Outlet water temperature error	1. Turn OFF electrical power at the breaker, check for any clogs in the circulation loop and correct if present. 2. Check the wiring connections and correct accordingly. 3. Check the resistance* of the outlet water temperature sensor and replace if abnormal. 4. Check for abnormal operation of the pump and replace if present. 5. Turn ON electrical power at breaker. 6. If error persists, replace the PCB control

TROUBLESHOOTING

ERROR CODE	INDICATES	CORRECTIVE ACTION*
097 with alert indicator flashing (also flashing red LED with audible alarm)	Water circulation system error	1. Ensure the unit is level and all water valves in the circulation loop are in the open position. 2. Turn OFF electrical power at the breaker, check for any clogs in the circulation loop and correct if present. 3. Check the inlet plumbing for frost and defrost if inlet water line is frozen. 4. Check the Wye strainer for clogs and debris. 5. Check the inlet water temperature sensor wiring and correct accordingly. 6. Check the resistance* of the inlet water temperature sensor and replace if abnormal. 7. Check the V-coil resistance* and replace if abnormal. 8. Turn ON electrical power at breaker. 9. If error persists, replace the PCB control 10. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
143 with alert indicator flashing (also flashing red LED with audible alarm)	Detecting output over-current	1. Check for any clogs in the circulation loop and correct if present. 2. Ensure the power to the system is on. Restore normal operation power. 3. Ensure the pump is operating correctly by allowing the unit to cycle on and off. If the water pump is not functioning properly, turn OFF electrical power at the breaker, and replace the water pump. 4. If error persists, turn OFF electrical power at the breaker and check the resistance* of the V-coil and replace if abnormal. 5. Turn ON electrical power at breaker. 6. If error persists, replace the PCB control 7. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
150 with alert indicator flashing (also flashing red LED with audible alarm)	Fan lock	1. Turn OFF electrical power at the breaker and replace the fan motor. 2. If error persists, replace the PCB control
167 with alert indicator flashing (also flashing red LED with audible alarm)	Refrigerant gas leakage	1. Check for loose electrical connections, refer to "Power Cycling the Unit" on page 18. 2. If error persists, turn OFF electrical power at the breaker and check the resistance* of the inlet temperature sensor and replace if abnormal.
185 with alert indicator flashing (also flashing red LED with audible alarm)	Hight inlet water temperature error	1. Turn OFF electrical power at the breaker, check all electrical connections, and correct if error is found. 2. Check the inlet temperature sensor wiring for damage. Replace if damaged. 3. If error persists, check the PCB control and replace if not functioning properly. 4. Check the storage tank control assembly and replace if not functioning properly. 5. Turn ON electrical power at breaker. 6. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
187 with alert indicator flashing (also flashing red LED with audible alarm)	Current detection error	1. Turn OFF electrical power at the breaker. 2. Measure the AC power input with a clamp volt meter. If the voltage is high, replace the PCB control. 3. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.
188 with alert indicator flashing (also flashing red LED with audible alarm)	Water pump error	1. Turn OFF electrical power at the breaker, check all electrical connections, and correct if error is found. 2. Measure the voltage to the water pump. If abnormal voltage, replace the PCB control. 3. If the pump continues to work improperly, replace the water pump. 4. If problem persists, call our Technical Assistance Hotline which is listed on the water heater's warranty sheet.

*These instructions are brief and intended as guidance for a qualified person.

**Audible alarm will beep if error code is triggered three (3) times in one (1) hour.

***Audible alarm will beep if error code is triggered three (3) times in seventy-two (72) hours.

TROUBLESHOOTING

Error Code List

Error Code	Description	Primary Location to Check
Indoor Controller		
97	Water circulation system error	Water Circuit
90	High pressure SW error/OLP error	Bimetal Thermal SW
143	Detecting output overcurrent	Water Circuit, Pump
12	Stop by detecting input overcurrent	Installation, Power Voltage, Main PCB
187	Current detection error	Main PCB
9	Power voltage error	Power Voltage
6	PFC failure	Installation, Fan Motor
188	Pump error	Pump
150	Fan lock	Fan Motor
94	Compressor anomaly	Compressor Connection
167	Stop by detecting gas leakage	Sensors, V-Coil
85	Stop by discharge temperature error	Discharge Temp. Sensor, V-Coil
95	Stop by outlet water temperature error	Outlet Temp. Sensor, Water Circuit
185	High inlet water temperature error	Inlet Temp. Sensor, Water Circuit
27	Discharge temp. sensor error/floating	Discharge Temp. Sensor and Wiring
52	Outlet water temp. sensor error/floating	Outlet Temp. Sensor and Wiring
92	Inlet water temp. sensor error	Inlet Temp. Sensor and Wiring
91	Defrost temp. sensor error	Outdoor Ambient Temp. Sensor & Wiring
28	Outdoor Temp. sensor error	Outdoor Ambient Temp. Sensor & Wiring
20	Modbus communication error	I/F PCB and Connection

H/W Protection and the error

Electrical Circuit

Component Failure

Refrigerant Cycle

Water Circuit Issue

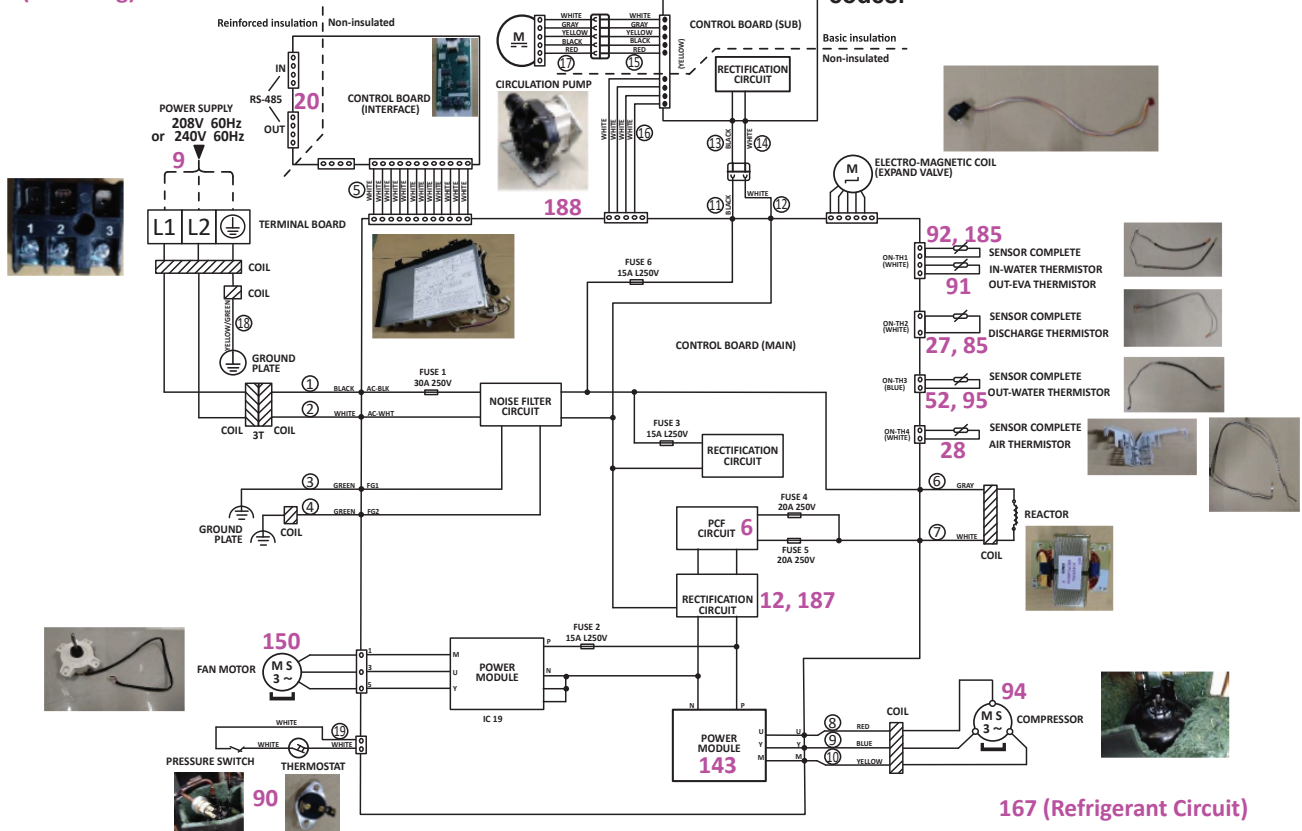
Sensor Abnormal

Communication

Fault Detection Diagram

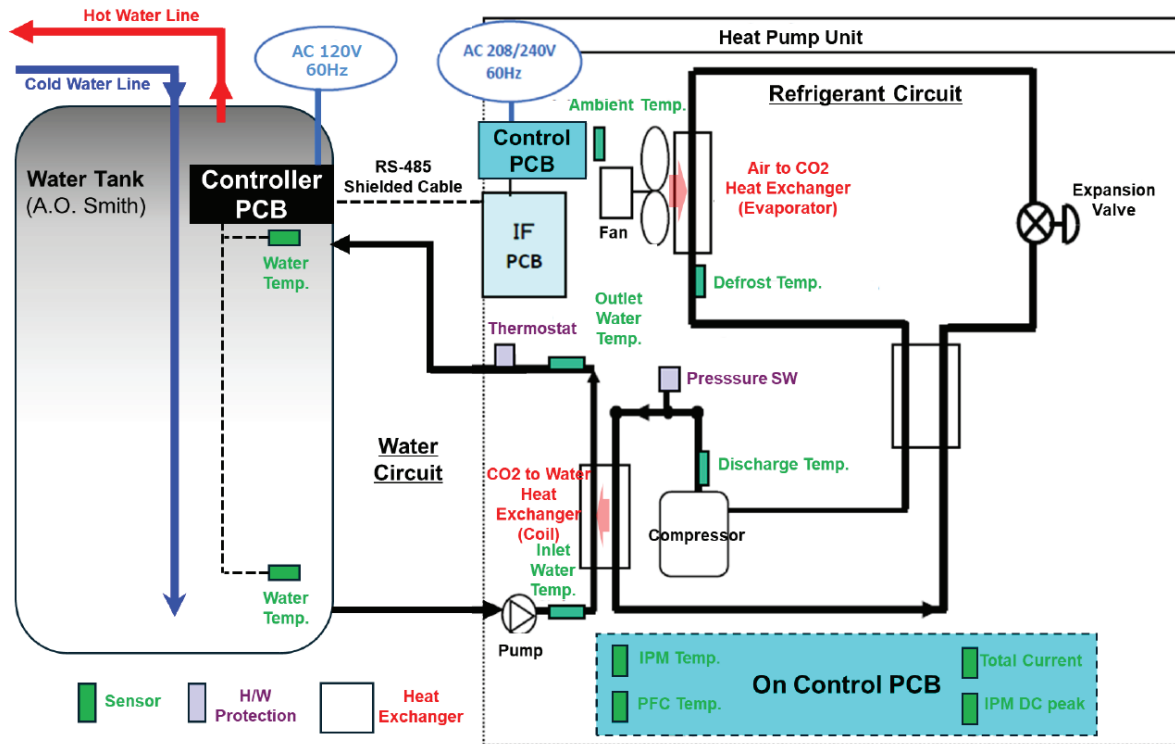
97 (Plumbing)

NOTICE: Numbers in Pink are error fault codes.



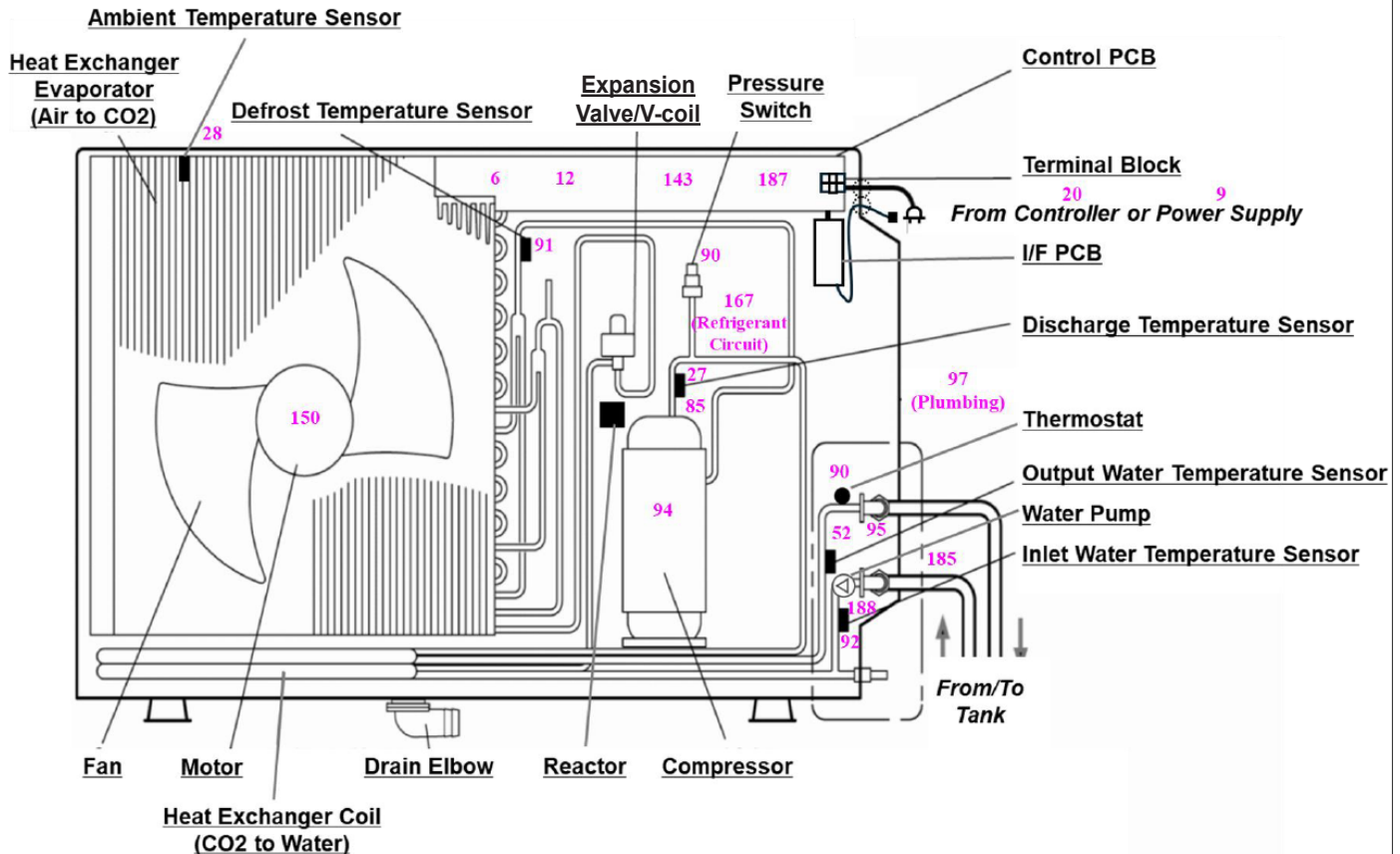
TROUBLESHOOTING

Split CO² Heat Pump System



Fault Detection Locations

NOTICE: Numbers in **Pink** are error fault codes.



TROUBLESHOOTING

Error Code 97: Water Circulation System Error

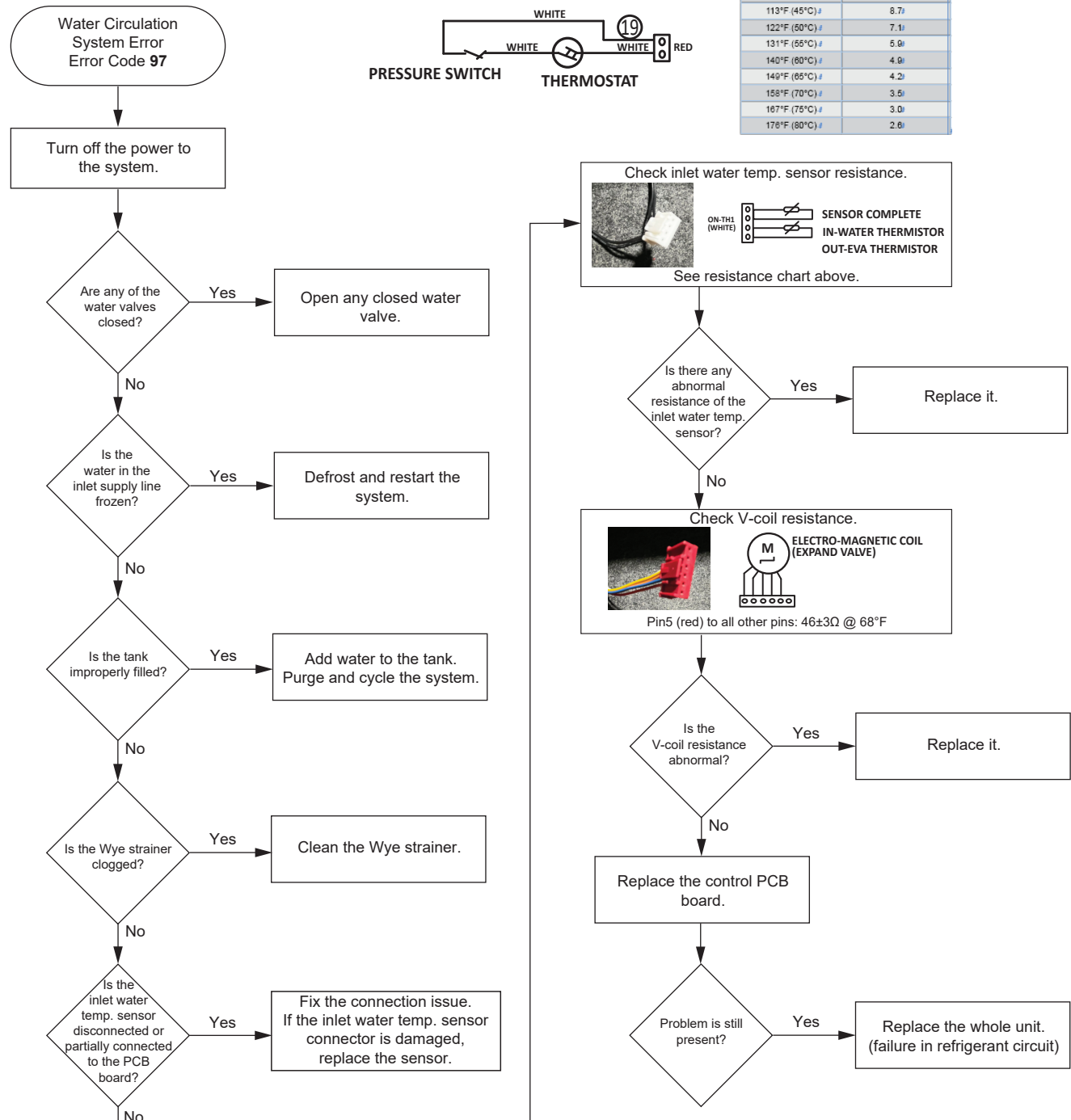
Detection Condition

The overpressure sensor or over-temperature sensor activated in the protection circuit.

Possible Root Causes

Water circuit error (clogging, lack of water in tank, frost) caused by extremely high pressure of refrigerant or unexpected heat to water.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 90: High Pressure SW Error/OLP Error

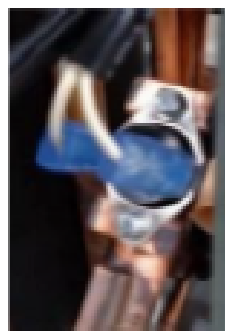
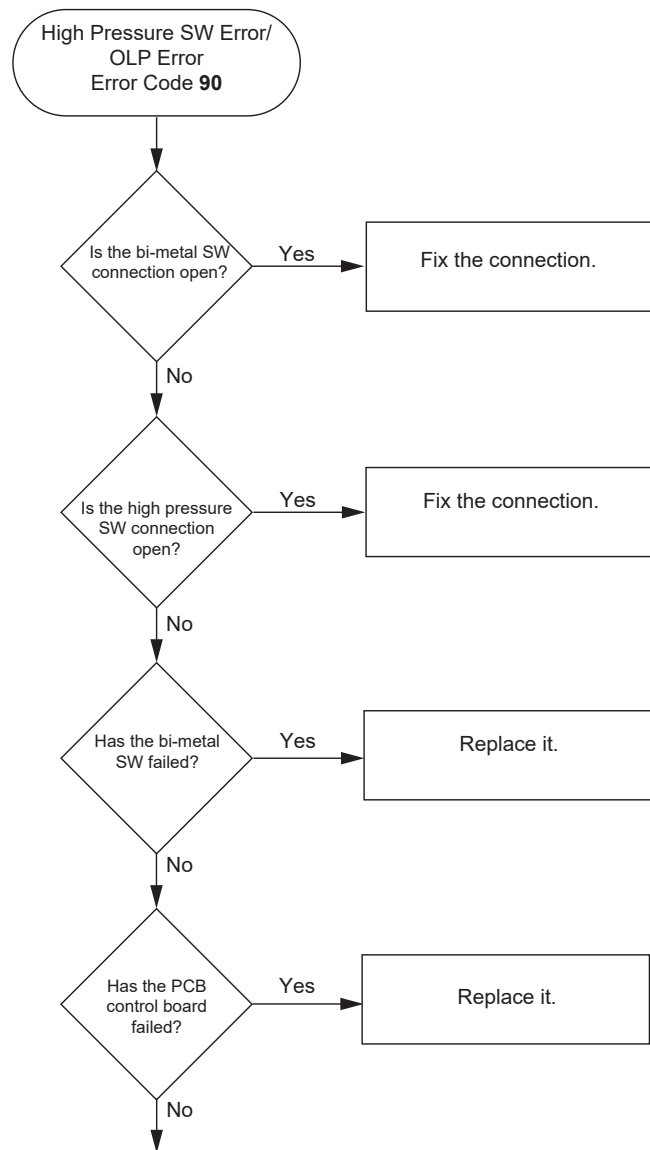
Detection Condition

The overpressure sensor or over-temperature sensor becomes open in the protection circuit.

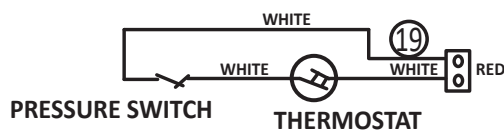
Possible Root Causes

Component failure of the high pressure SW or bi-metal thermal SW

Diagnosis Flow:



Open Circuit



TROUBLESHOOTING

Error Code 143: Detecting Output Overcurrent

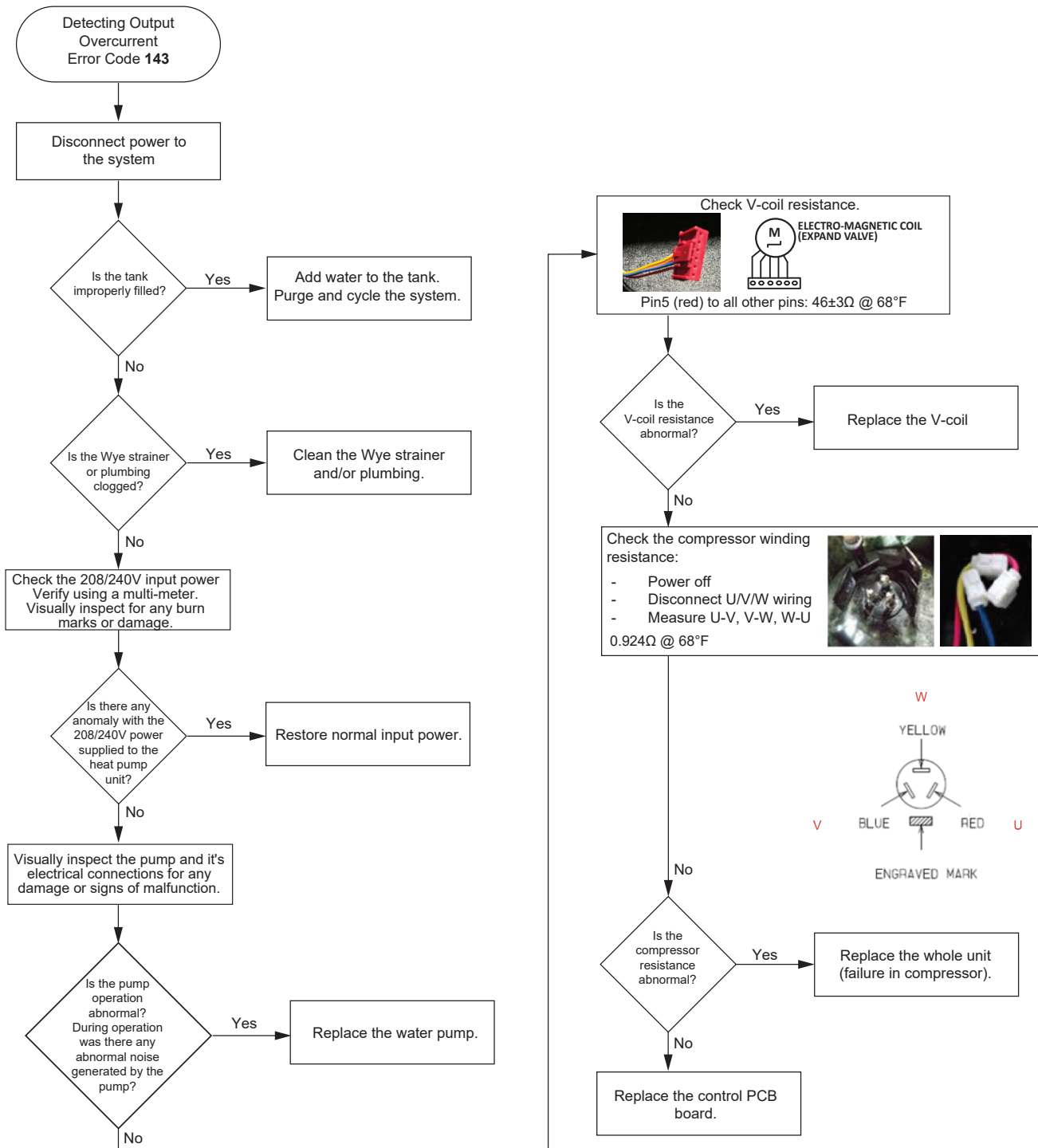
Detection Condition

Power transistor module shuts down—detecting either overcurrent, under voltage, or temperature in the power electronics circuit at start-up of compressor.

Possible Root Causes

Overload in inverter circuit due to abnormal water circulation or component's failure.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 12: Stop by Detecting Input Overcurrent

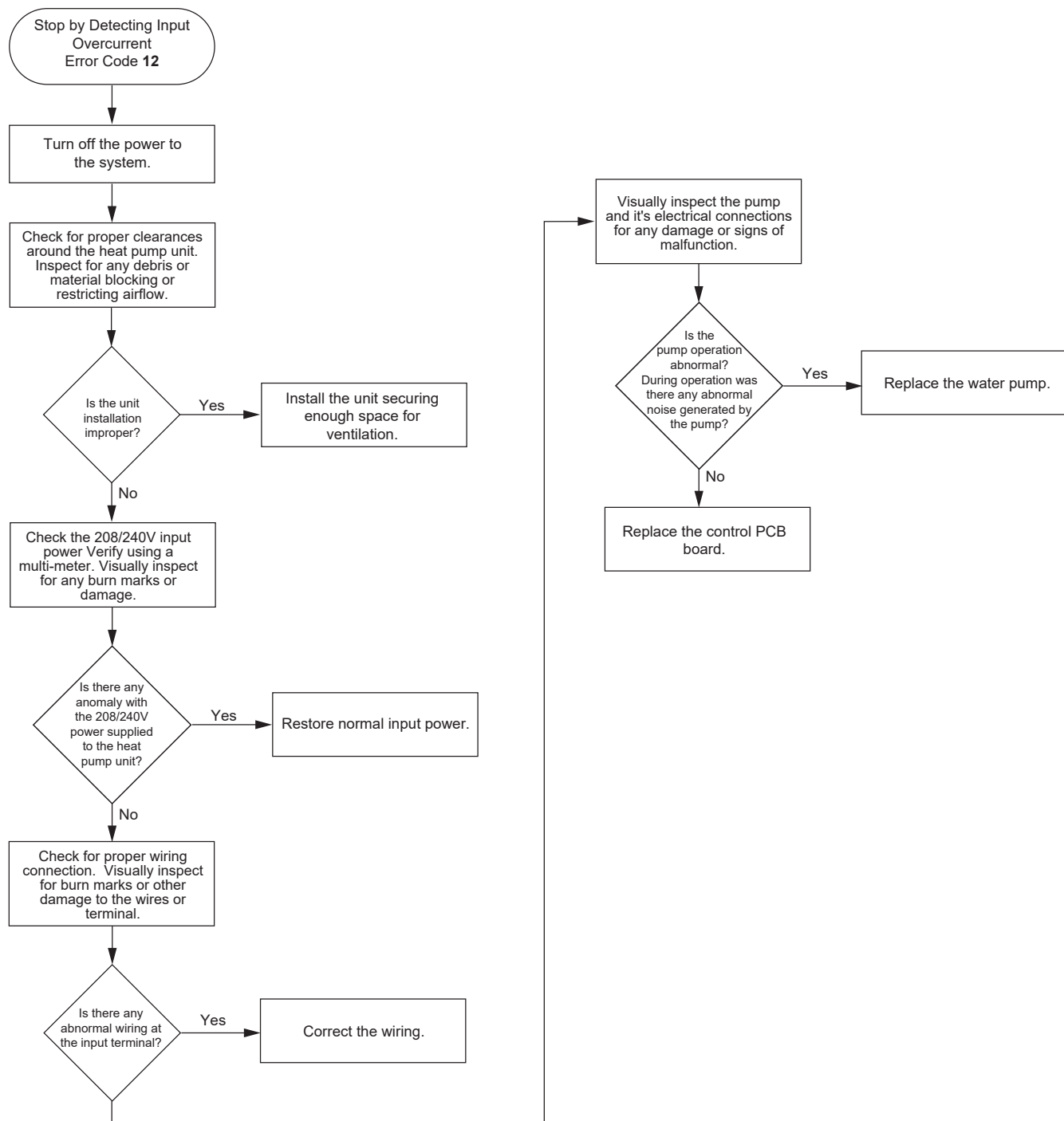
Detection Condition

Input overcurrent occurred during the operation.

Possible Root Causes

Improper installation (ventilation space) or abnormal power voltage/wiring.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 187: Current Detection Error

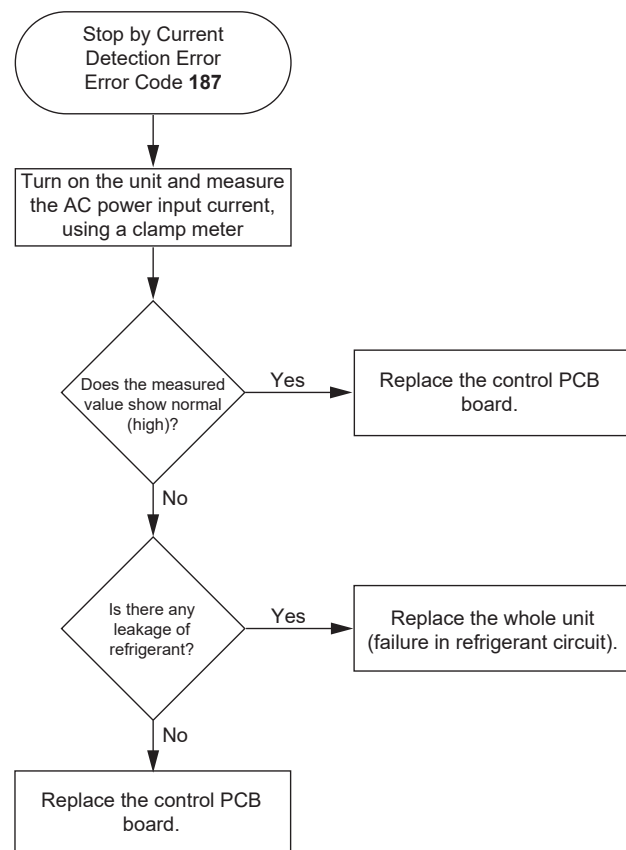
Detection Condition

An extremely low current value is detected even after the compressor rpm increases.

Possible Root Causes

Control PCB (CT) or refrigerant leakage.

Diagnosis Flow:



Error Code 9: Power Voltage Error

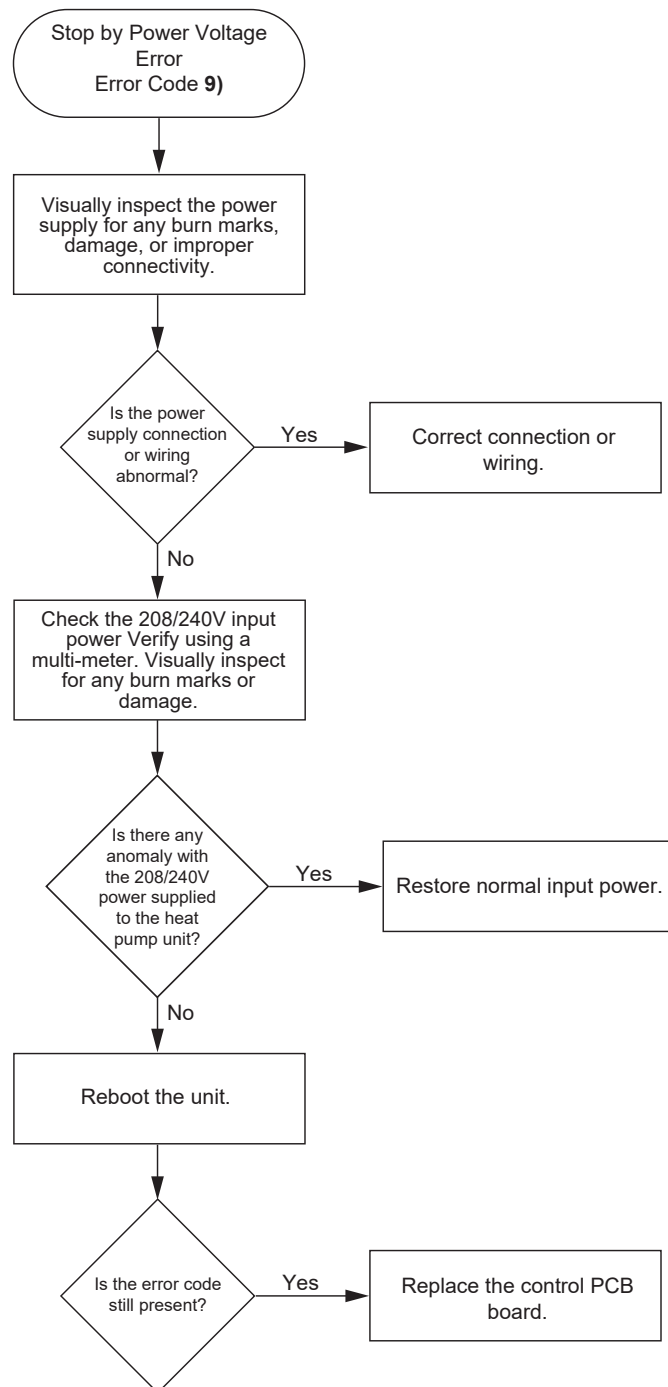
Detection Condition

A low voltage of internal DC value is detected.

Possible Root Causes

Input power supply or the wirings.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 6: PFC Failure

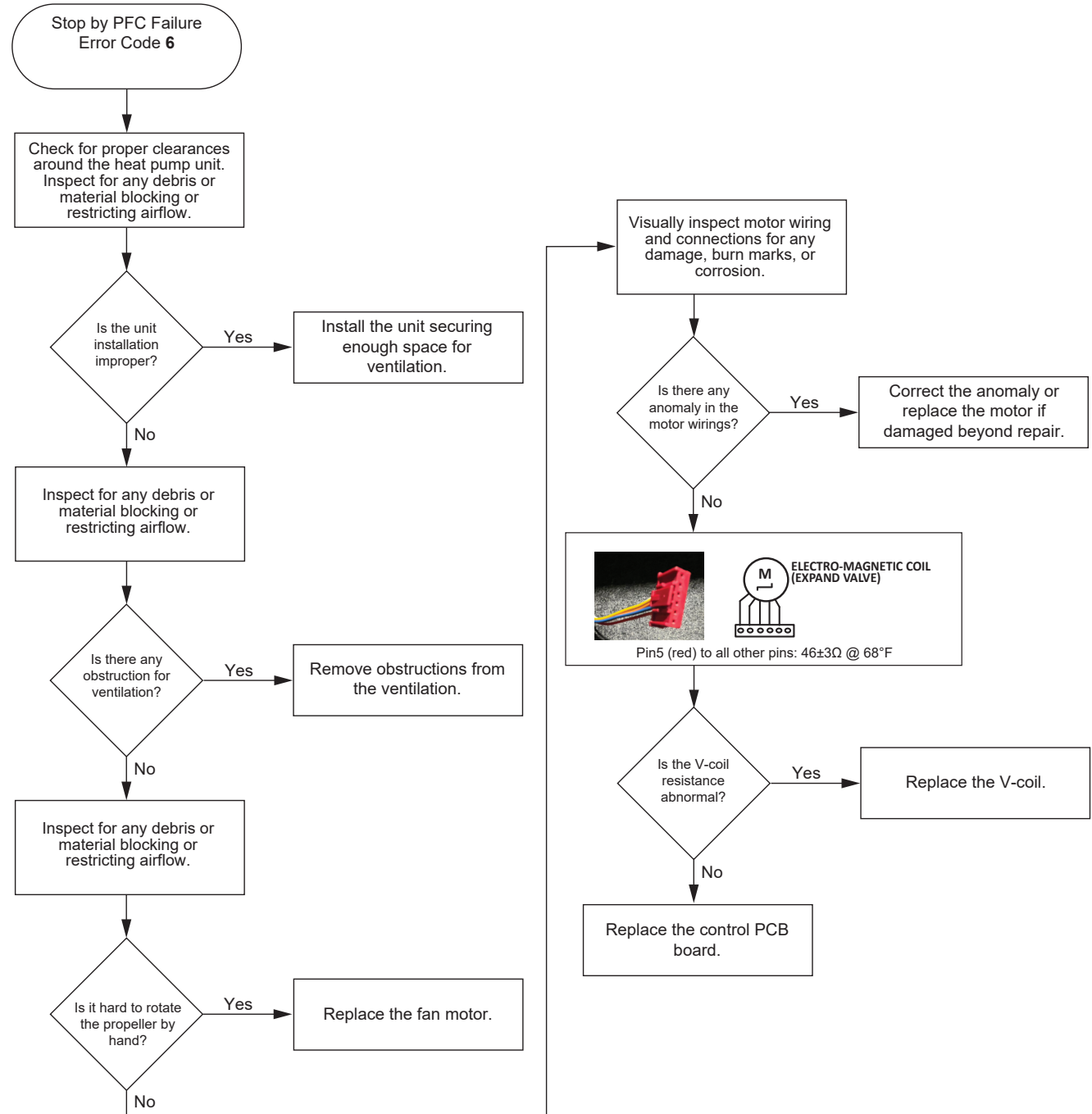
Detection Condition

An overvoltage of internal DC value is detected.

Possible Root Causes

Improper installation (ventilation space), fan or abnormal power voltage/wirings.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 188: Water Pump Error

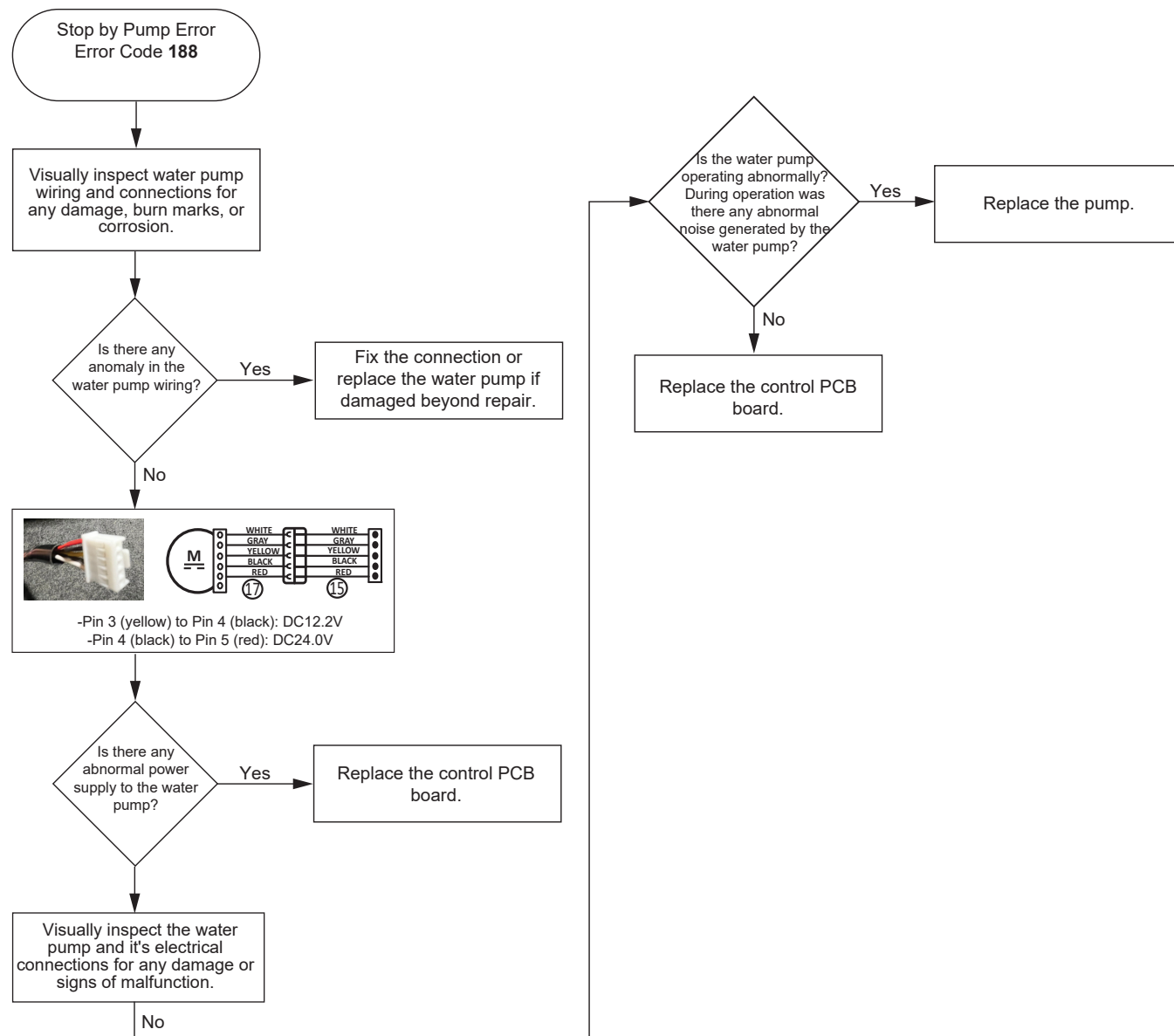
Detection Condition

The water pump rpm speed is extremely low or high.

Possible Root Causes

Water pump failure or the wirings error.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 150: Fan Lock

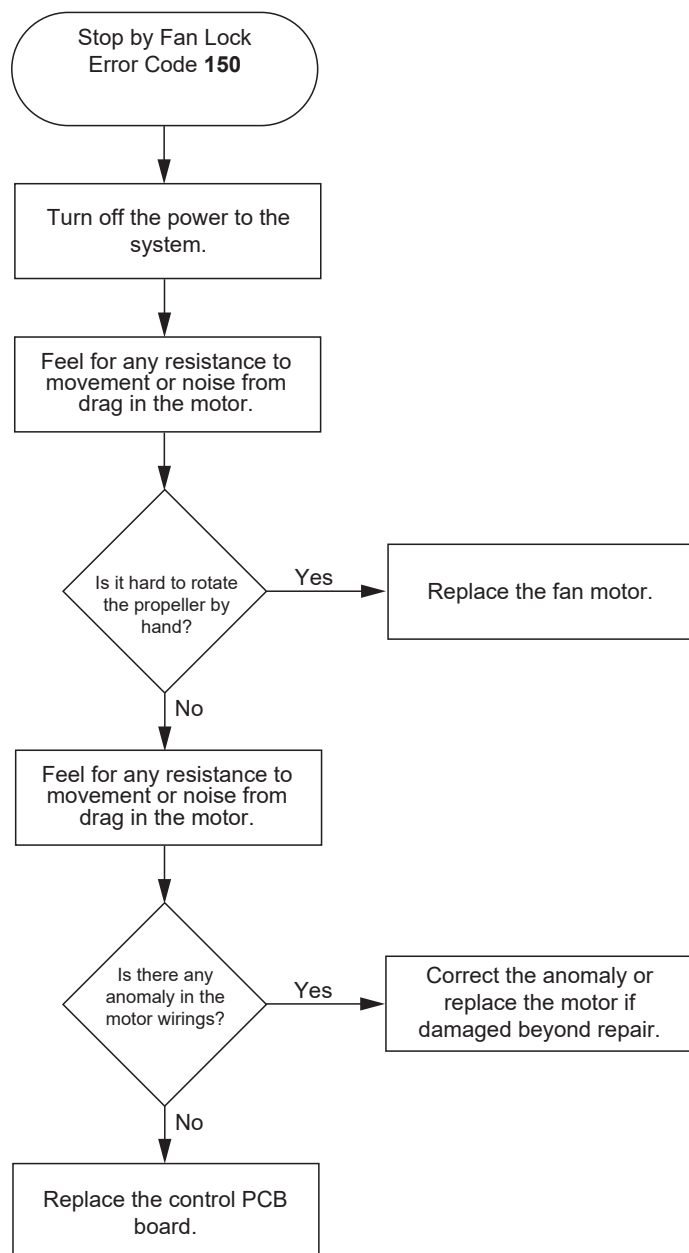
Detection Condition

The propeller doesn't rotate due to locked fan motor.

Possible Root Causes

Pump failure or the wirings error.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 84: Compressor Anomaly

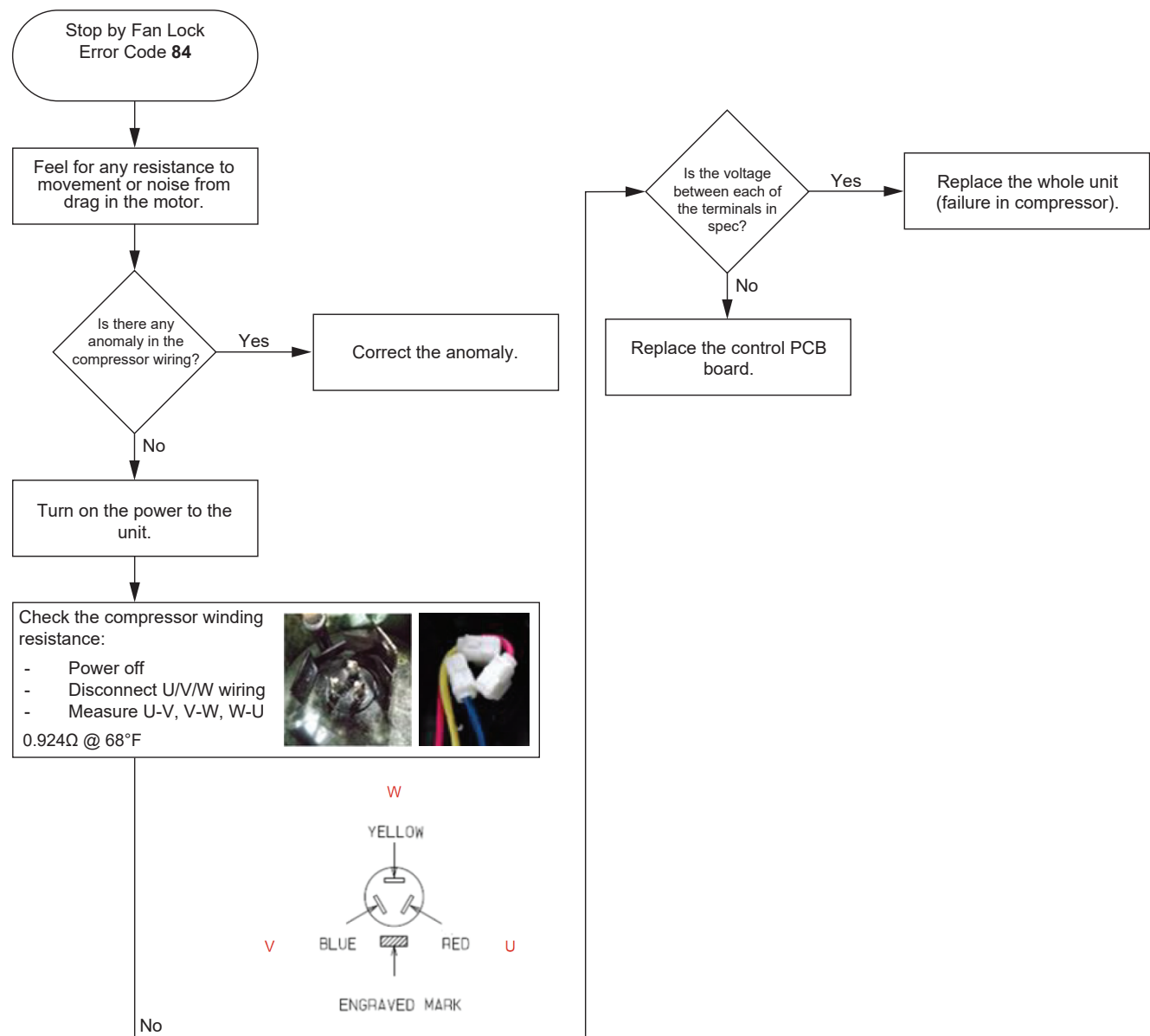
Detection Condition

The compressor doesn't rotate.

Possible Root Causes

Compressor failure or wiring error.

Diagnosis Flow:



TROUBLESHOOTING

Error Code 167 (90): Refrigerant Gas Leakage

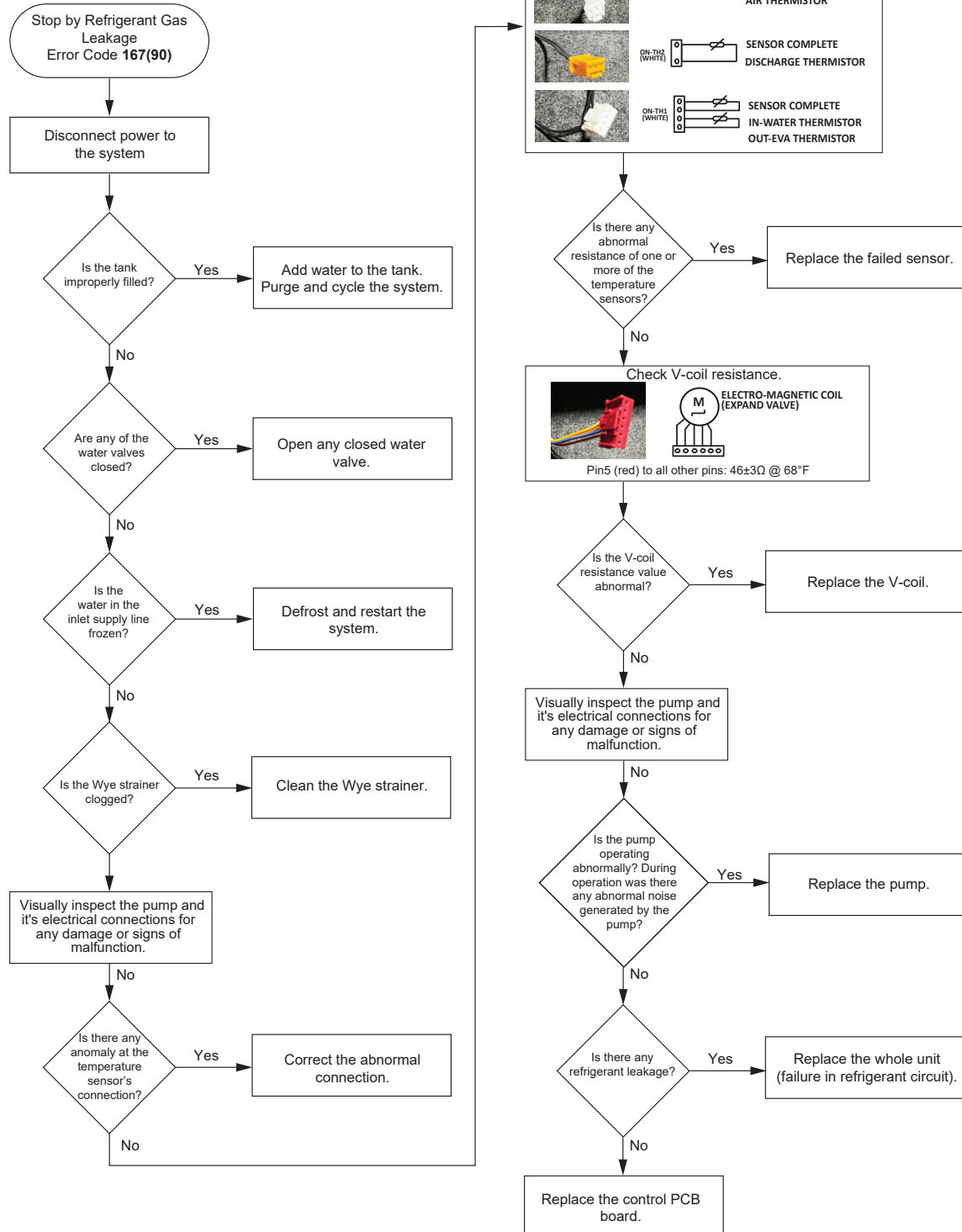
Detection Condition

Gas leakage in the refrigerant circuit.

Possible Root Causes

Gas leakage or component's failure (Temperature Sensors, V-coil, or Pump).

Diagnosis Flow:



TROUBLESHOOTING

Error Code 85: Stop by Discharge Temperature Error

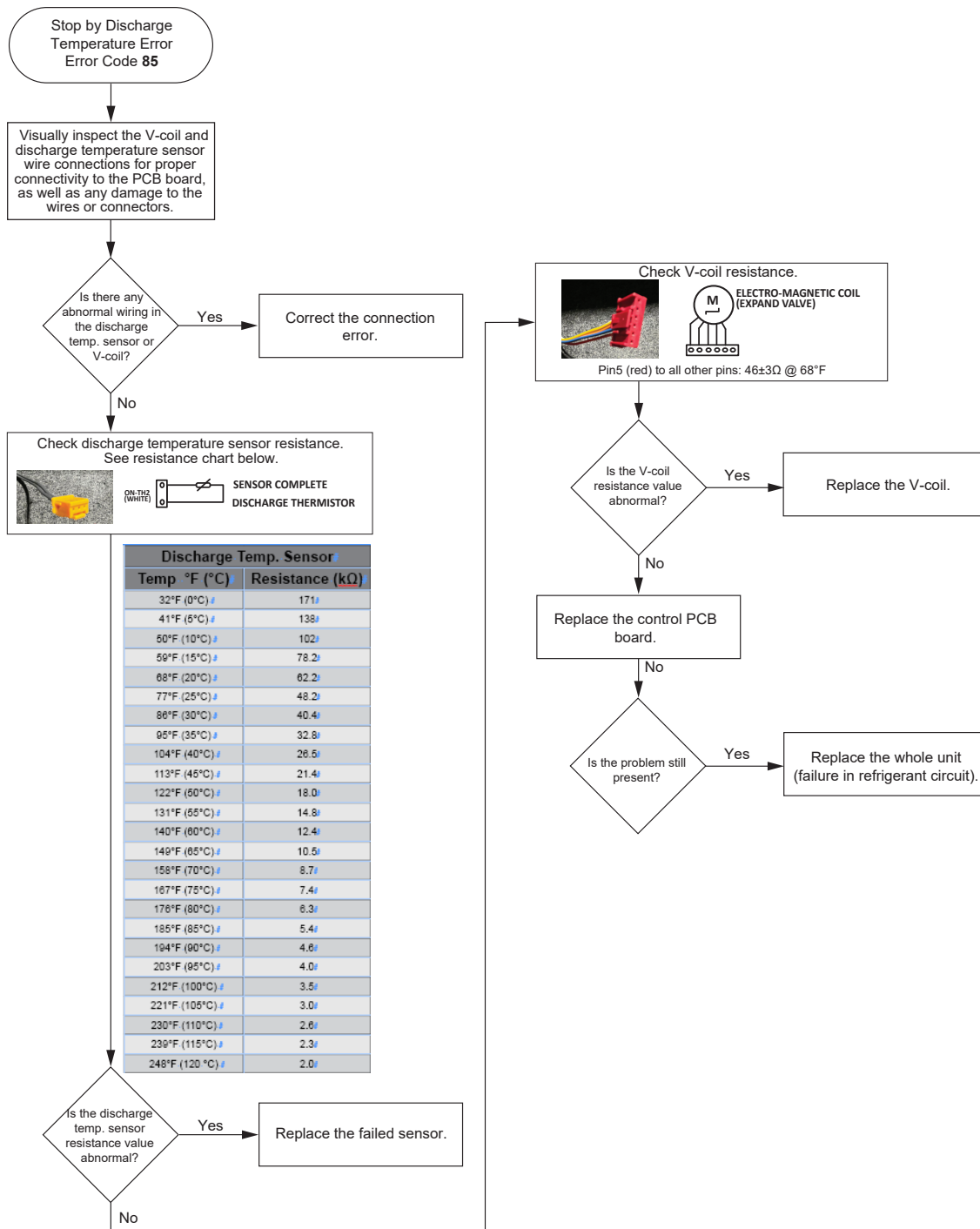
Detection Condition

Extremely high temperature of compressor discharge is detected.

Possible Root Causes

Failure detected in refrigerant circuit or component's (discharge temperature sensors, V-coil).

Diagnosis Flow:



TROUBLESHOOTING

Error Code 95: Outlet Water Temperature Error

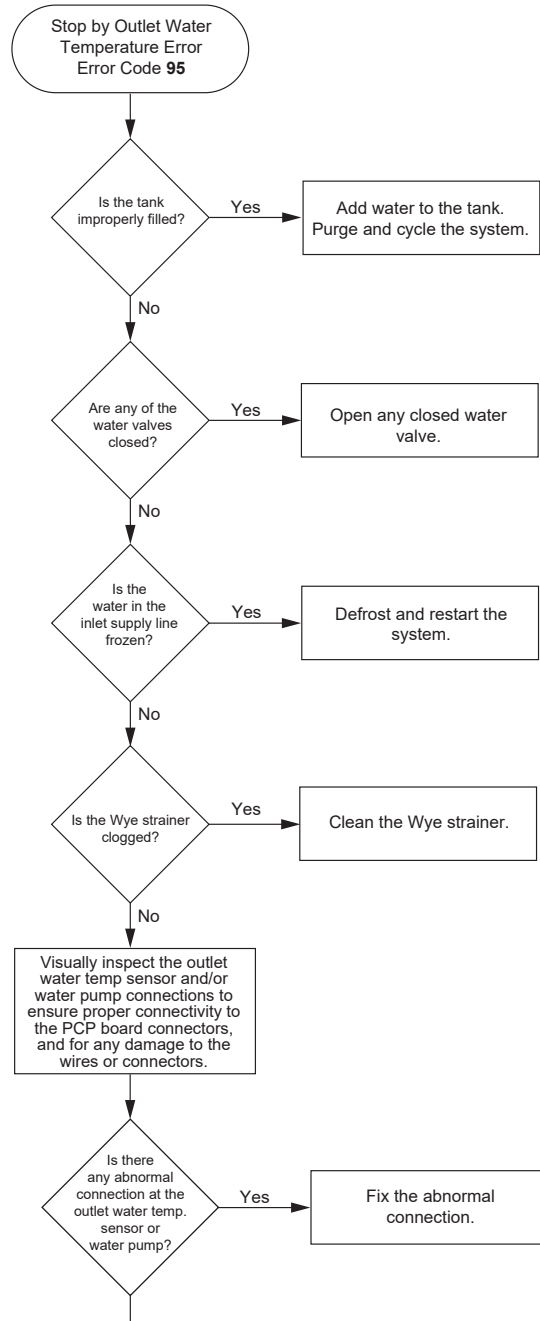
Detection Condition

Extremely high temperature of outlet water is detected.

Possible Root Causes

Lack of circulating water or component's failure (outlet water temperature sensors or pump).

Diagnosis Flow:



Check outlet temperature sensor resistance. See resistance charts, below.



SENSOR COMPLETE
OUT-WATER THERMISTOR

Outlet Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
32°F (0°C)	167.1
50°F (10°C)	101.1
59°F (15°C)	78.1
68°F (20°C)	62.2
77°F (25°C)	49.2
86°F (30°C)	37.8
95°F (35°C)	32.6
104°F (40°C)	28.2
113°F (45°C)	21.6
122°F (50°C)	17.8
131°F (55°C)	14.8
140°F (60°C)	12.3
149°F (65°C)	10.4
158°F (70°C)	8.7
167°F (75°C)	7.4
176°F (80°C)	6.3

Is there any abnormal resistance of the outlet water temp. sensor?

Yes

Replace the outlet water temp. sensor.

No

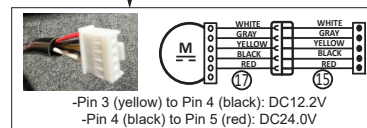
Visually inspect water pump wiring and connections for any damage, burn marks, or corrosion.

Is there any anomaly in the water pump wiring?

Yes

Fix the connection or replace the water pump if damaged beyond repair.

No



Is there any abnormal power supply to the water pump?

Yes

Replace the control PCB board.

Visually inspect the water pump and its electrical connections for any damage or signs of malfunction.

No

Is the water pump operating abnormally? During operation was there any abnormal noise generated by the water pump?

Yes

Replace the pump.

No

Replace the control PCB board.

TROUBLESHOOTING

Error Code 185: High Inlet Water Temperature Error

Detection Condition

Extremely high temperature of outlet water is detected.

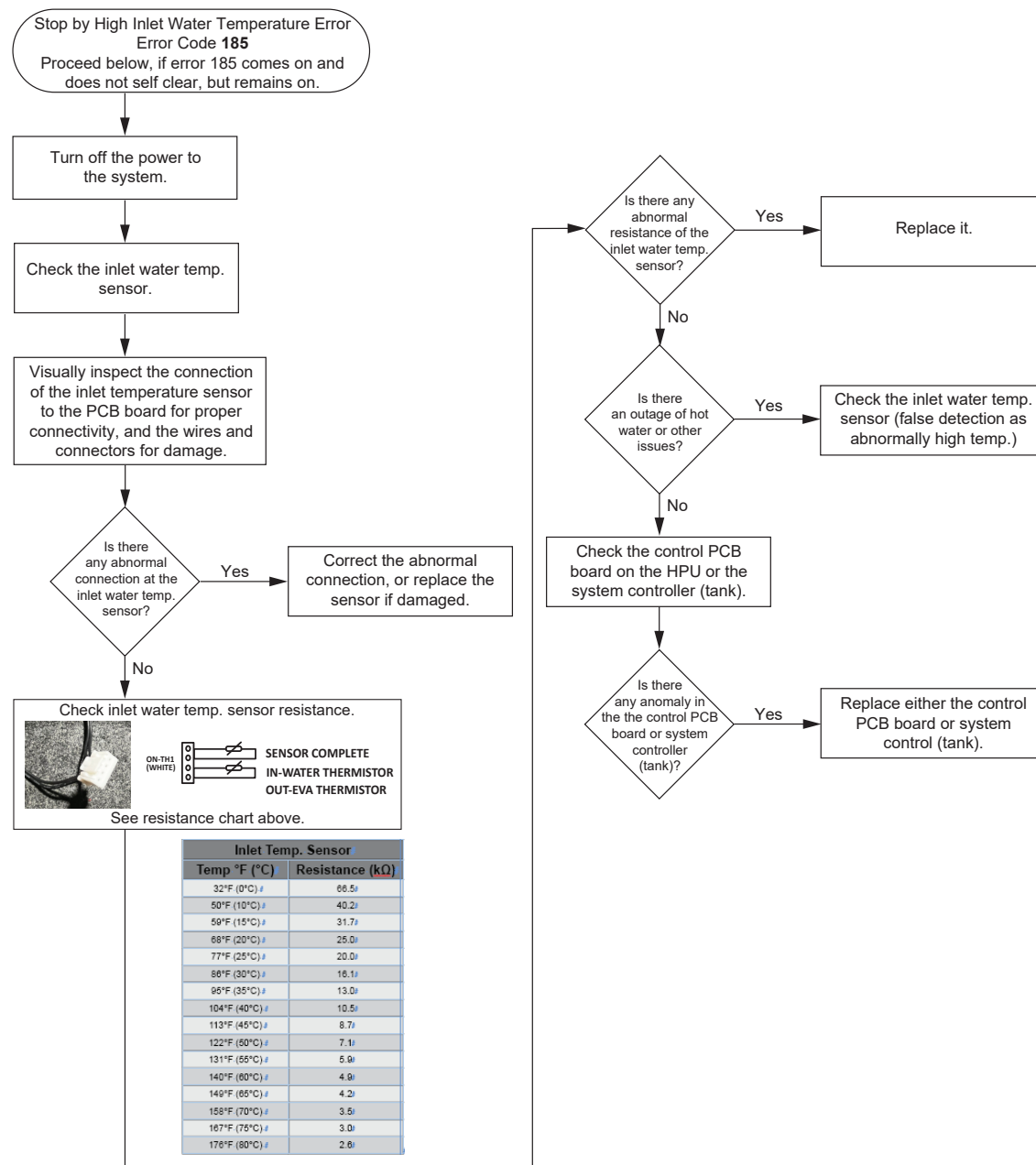
Possible Root Causes

Component's failure (inlet water temperature, control PCB board, or system controller).

Possible System Phenomena

- The HPU sends out request of "Heating Cancel" to the system controller (tank) when this error 185 is detection.
- Next, the system controller stops the water heating.
- The error is cleared because of the stoppage of heating.
- When the unit is powered back on the error is no longer present and the system returns back to normal operation.
- This error self clears during normal operation.

Diagnosis Flow:



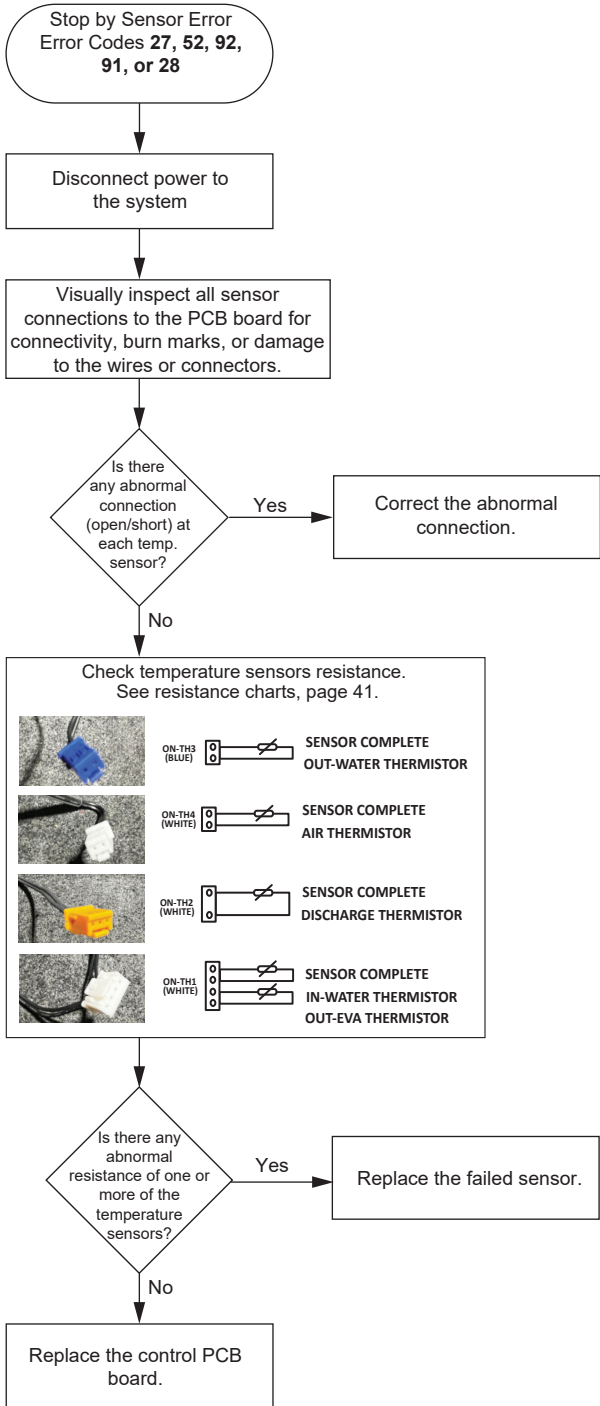
TROUBLESHOOTING

Error Codes 27, 52, 92, 91, or 28

Detection Condition
Open/short circuit of each temperature sensor.

Possible Root Causes
Component's failure or wiring error.

Diagnosis Flow:



MAINTENANCE

Evaporator Coil Maintenance

The evaporator coils may accumulate dust, dirt and debris if adequate air flow is not allowed through the air intake and exhaust ports of the water heater. Check the evaporator coils and clean as needed to maintain optimal operation of the heat pump. Follow the procedure below to keep the evaporator coils clean and free of debris.

⚠ WARNING! Working on an energized circuit can result in severe injury or death from electrical shock. Turn power OFF. Check wires with a non-contact circuit tester to make sure power is off. When you are finished, be sure all covers are secured to reduce the risk of fire and electric shock.

1 Unplug tank controller from wall outlet and turn **OFF** the breaker powering the heat pump unit.

2 Open the electrical junction box on the side of the heat pump unit. Using a non-contact circuit tester, check the power wires to make certain the power is **OFF**.

3 If possible, remove the lower condensate drain port, if installed, to allow debris to flow out easily.
NOTICE: DO NOT remove any protective covers. Removing any items increases the risk of water entering into the electronics.

4 Without removing any protective covers, use a water hose or similar device to spray down the evaporator fins located on the back and side of the unit. Spray water in a downward directions/motion to prevent water seeping into the electronics.
NOTICE: Avoid high pressure, especially near the compressor and electronic control.

5 If dirt is still present, a fin cleaning brush or comb may be used. **DO NOT** use heavy force when cleaning the fins
NOTICE: If bent fins are found, use a pair of flat nose pliers to straiten the damaged fins.

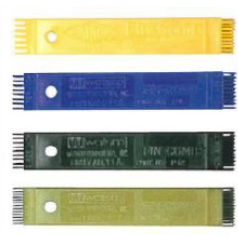
6 Allow unit to air dry before returning power to the controller and heat pump.

Damaged Fin (Evaporator) - Maintenance Tools

NOTICE: DO NOT use metal fin combs or brushes that would damage the protective coating on the fins.



Fin Comb



Fin Strainer



Fin Cleaner



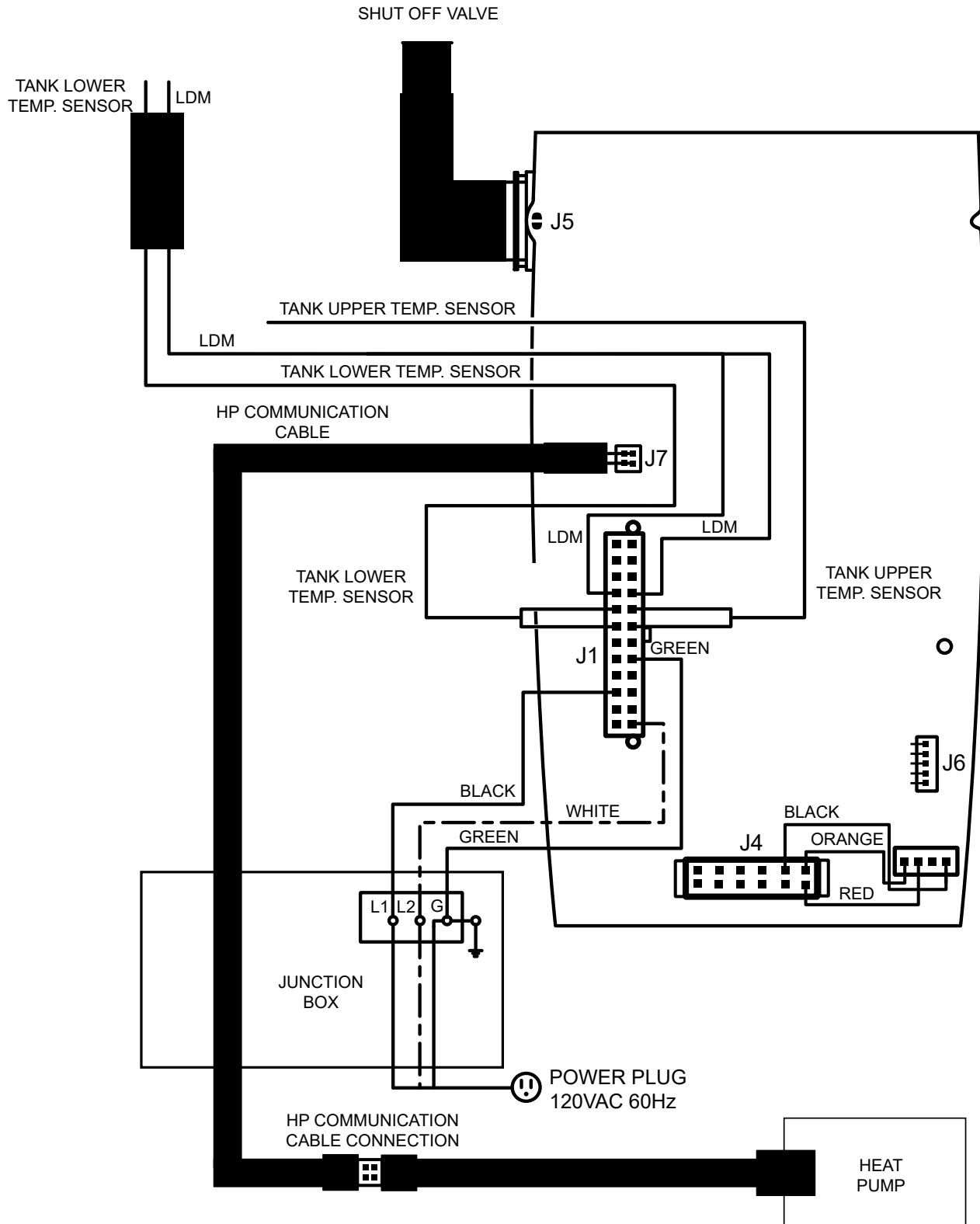
Flat Nose Pliers



Fin Tool

Model	HE-AUM45BSU
Evaporator Fin Per Inch (FPI)	20

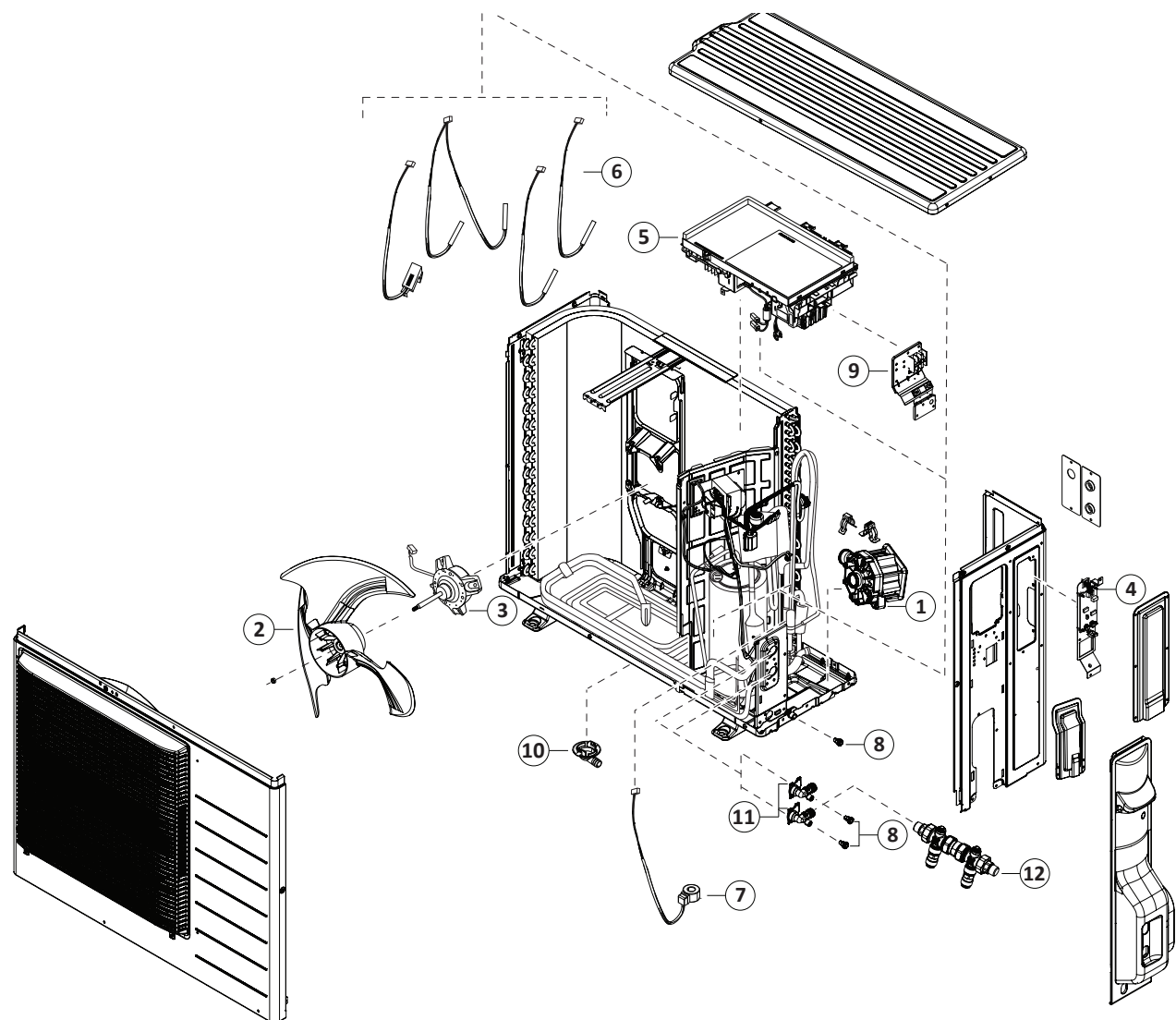
CONTROL ASSEMBLY & THERMOSTAT WIRING DIAGRAM



APPENDIX



REPAIR PARTS (HEAT PUMP UNIT)



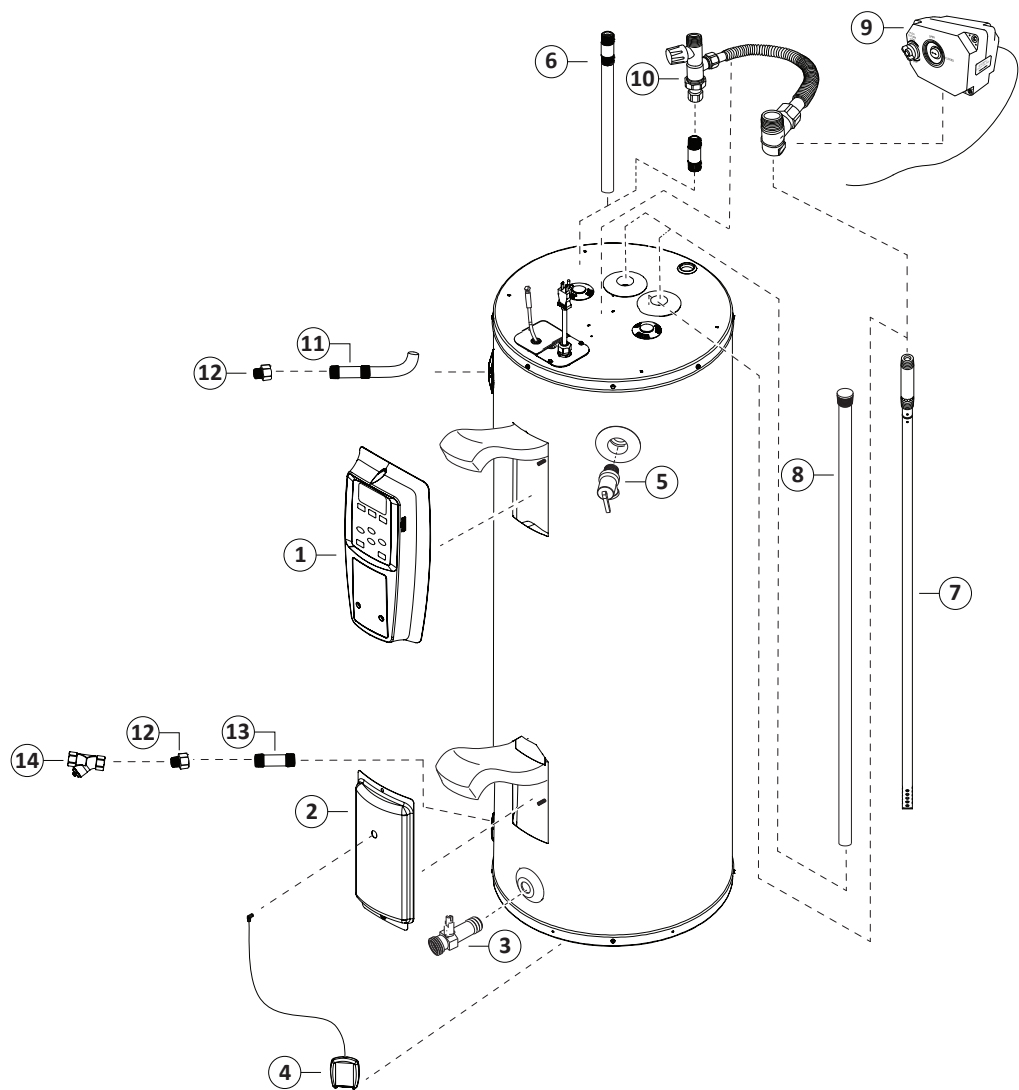
HEAT PUMP REPAIR PARTS

Repair parts may be ordered through your plumber, local distributor, home improvement center, or by calling our Technical Assistance Hotline which is listed on your warranty. When ordering parts, always give the following information:

1. Model, serial and product number
2. Item number
3. Parts description

ITEM NO.	PARTS DESCRIPTION
1	WATER PUMP
2	FAN BLADE
3	FAN MOTOR
4	INTERFERENCE BOARD (IF) BOARD
5	PCB CONTROL BOARD
6	TEMPERATURE SENSORS
7	EXPANSION VALVE
8	DRAIN TAPS
9	POWER TERMINAL
10	CONDENSATE DRAIN
11	WATER INLET/OUTLET
12	ANTI-FREEZE DRIP VALVE

REPAIR PARTS (STANDARD STORAGE TANK - TALL)



STORAGE TANK (TALL) REPAIR PARTS

Repair parts may be ordered through your plumber, local distributor, home improvement center, or by calling our Technical Assistance Hotline which is listed on your warranty. When ordering parts, always give the following information:

- 1. Model, serial and product number
- 2. Item number
- 3. Parts description

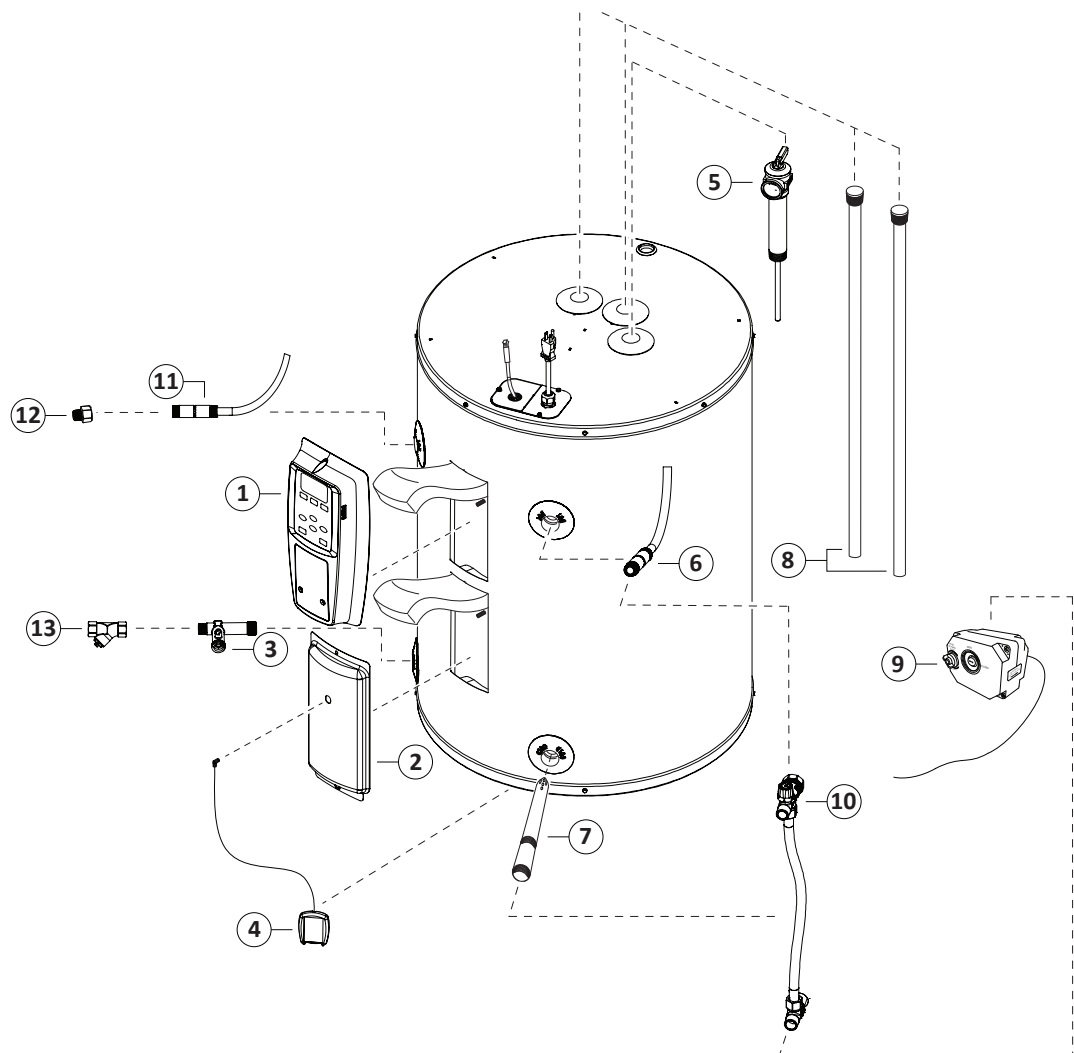
ITEM NO.	PARTS DESCRIPTION
1	CONTROL ASSEMBLY
2	ACCESS DOOR
3	DRAIN VALVE
4	LEAK DETECTION SENSOR (LDS)

ITEM NO.	PARTS DESCRIPTION
5	TEMPERATURE & PRESSURE RELIEF VALVE*
6	HOT OUTLET ANODE DEVICE**
7	DIP TUBE (INCLUDES NIPPLE AND HEAT TRAP)
8	ANODE ROD
9	(OPTIONAL) AUTOMATIC COLD WATER SHUT-OFF VALVE
10	MIXING VALVE
11	INLET NIPPLE J-TUBE COMBINATION
12	3/4" FNPT TO 1/2" MNPT BRASS REDUCER
13	3/4" OUTLET NIPPLE
14	WYE STRAINER

* For top T&P models, the side port will be plugged and the T&P valve will be installed at one of the top flanged positions.

**Only used on top T&P models

REPAIR PARTS (STORAGE TANK - LOWBOY)



STORAGE TANK (LOWBOY) REPAIR PARTS

Repair parts may be ordered through your plumber, local distributor, home improvement center, or by calling our Technical Assistance Hotline which is listed on your warranty. When ordering parts, always give the following information:

1. Model, serial and product number
2. Item number
3. Parts description

ITEM NO.	PARTS DESCRIPTION
1	CONTROL ASSEMBLY
2	ACCESS DOOR
3	DRAIN VALVE

ITEM NO.	PARTS DESCRIPTION
4	LEAK DETECTION SENSOR (LDS)
5	TEMPERATURE & PRESSURE RELIEF VALVE
6	HEAT TRAP/OUTLET J-TUBE COMBINATION
7	DIP TUBE (INCLUDES NIPPLE AND HEAT TRAP)
8	ANODE ROD
9	(OPTIONAL) AUTOMATIC COLD WATER SHUT-OFF VALVE
10	MIXING VALVE
11	INLET NIPPLE J-TUBE COMBINATION
12	3/4" FNPT TO 1/2" MNPT BRASS REDUCER
13	WYE STRAINER

OUTDOOR AMBIENT TEMPERATURE SENSOR SPECIFICATIONS

Outdoor Ambient Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
-4°F (-20°C)	160
5°F (-15°C)	117
14°F (-10°C)	88.8
23°F (-5°C)	66.1
32°F (0°C)	50.1
41°F (5°C)	40.1
50°F (10°C)	30.2
59°F (15°C)	23.8
68°F (20°C)	18.8
77°F (25°C)	15.0
86°F (30°C)	12.0
95°F (35°C)	9.7
104°F (40°C)	7.9
113°F (45°C)	6.5
122°F (50°C)	5.3
131°F (55°C)	4.4
140°F (60°C)	3.6
Outlet Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
32°F (0°C)	167
50°F (10°C)	101
59°F (15°C)	78.1
68°F (20°C)	62.2
77°F (25°C)	49.2
86°F (30°C)	37.8
95°F (35°C)	32.6
104°F (40°C)	26.2
113°F (45°C)	21.6
122°F (50°C)	17.8
131°F (55°C)	14.8
140°F (60°C)	12.3
149°F (65°C)	10.4
158°F (70°C)	8.7
167°F (75°C)	7.4
176°F (80°C)	6.3

Discharge Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
32°F (0°C)	171
41°F (5°C)	138
50°F (10°C)	102
59°F (15°C)	78.2
68°F (20°C)	62.2
77°F (25°C)	48.2
86°F (30°C)	40.4
95°F (35°C)	32.8
104°F (40°C)	26.5
113°F (45°C)	21.4
122°F (50°C)	18.0
131°F (55°C)	14.8
140°F (60°C)	12.4
149°F (65°C)	10.5
158°F (70°C)	8.7
167°F (75°C)	7.4
176°F (80°C)	6.3
185°F (85°C)	5.4
194°F (90°C)	4.6
203°F (95°C)	4.0
212°F (100°C)	3.5
221°F (105°C)	3.0
230°F (110°C)	2.6
239°F (115°C)	2.3
248°F (120 °C)	2.0

Defrost Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
-22°F (-30°C)	103
-13°F (-25°C)	72.1
-4°F (-20°C)	53.8
5°F (-15°C)	39
14°F (-10°C)	29.1
23°F (-5°C)	22.0
32°F (0°C)	16.8
41°F (5°C)	13.0
50°F (10°C)	10.3
59°F (15°C)	7.9
68°F (20°C)	6.2
77°F (25°C)	5.0
86°F (30°C)	4.0
95°F (35°C)	3.3
104°F (40°C)	2.6
113°F (45°C)	2.2
122°F (50°C)	1.8
131°F (55°C)	1.5
140°F (60°C)	1.3
149°F (65°C)	1.1
158°F (70°C)	0.9
167°F (75°C)	0.8
176°F (80°C)	0.6
Inlet Temp. Sensor	
Temp °F (°C)	Resistance (kΩ)
32°F (0°C)	66.5
50°F (10°C)	40.2
59°F (15°C)	31.7
68°F (20°C)	25.0
77°F (25°C)	20.0
86°F (30°C)	16.1
95°F (35°C)	13.0
104°F (40°C)	10.5
113°F (45°C)	8.7
122°F (50°C)	7.1
131°F (55°C)	5.9
140°F (60°C)	4.9
149°F (65°C)	4.2
158°F (70°C)	3.5
167°F (75°C)	3.0
176°F (80°C)	2.6

