

Use and Care Guide

200 Series



AHE-250-D03



Thank you for equipping your RV, coach, or caravan with an Aqua-Hot hydronic heating system! We deeply value your business and we are grateful for the trust you have placed with Aqua-Hot Heating Systems, LLC. Our customers are our top priority and we are committed to providing best-in-class products, service, and support.

We understand how important comfort is to you as a recreational vehicle or manufactured home owner; therefore, we have designed a heating system to significantly improve all of your comfort levels. Additionally, the Aqua-Hot hydronic heating system is a low-emissions, fuel efficient system that adds thousands of dollars in value to your RV or home.

We know that you must be eager to get underway, but take time to read and understand this Use and Care Guide to understand the basic functionality of the Aqua-Hot. This guide should be maintained in legible condition and kept in a safe, accessible location for future reference.

Should you have any suggestions on how we can better serve you, please do not hesitate to contact us.

Technical Support can be contacted at 574-AIR-XCEL (574-247-9235). Hours of operation are 7:00am to 4:00pm (MST) Monday through Friday.

The Aqua-Hot heating system is protected by the finest warranty in the industry (read about it at the back of this manual).

Important Notes:

- A qualified installer or service technician must perform equipment installation or service. Contact Aqua-Hot for Factory Authorized Service Centers or Certified technicians located near you at www.aquahot.com/service-help, or call us at 574-AIR-XCEL (574-247-9235).
- Warranty work must be performed by an Aqua-Hot Factory Authorized Service Center.
- Your on-product identity label contains the specifications of your unit. Factory settings may be adjusted by the vehicle manufacturer, confirm final setting with your dealer.



- Follow this guide exactly. Failure to do so may result in a fire or explosion resulting in property damage and/or personal injury.



Comfort Zone #1: Comfortable Cabin Heat.

Get heat where you want it, when you want it. This Aqua-Hot system puts heat where you need it. Therefore, your interior temperatures will be just right. Don't hesitate to crank up the heat because the Aqua-Hot system doesn't remove moisture from the air. From now on, you will have to blame the dry skin and itchy eyes on Mother Nature!

Comfort Zone #2: Quiet Operation

Say goodbye to rude awakenings from the forced air furnace, you're an Aqua-Hot owner now! The Aqua-Hot is quiet when operating, so you'll never have to turn up the TV, yell across the room, or have an interrupted night of sleep again due to your heating system.

Comfort Zone #3: Continuous Hot Water

Take long, guilt-free showers knowing there is no recovery time for the next shower or load of laundry. The freedom to take a hot shower when you want makes your experience much more like home.

Comfort Zone #4: Low Emissions

Aqua-Hot's new low emission systems are fume-less and odorless. It's good for you, good for your neighbor, and good for the environment.



Comfort Zone #5: Over 200 Factory-Trained Service Centers

You won't need to service your Aqua-Hot often, but when you do, you can be confident in our Certified Service Centers that are close by and trained to assist you with all of your Aqua-Hot specific needs.

Comfort Zone #6: Adds Value

The NADA Recreational Vehicle Guide lists Aqua-Hot as adding thousands of dollars to the value of a RV or caravan. That value will pay off when it's time to trade up or sell.

Comfort Zone #7: Low Fuel Costs

There's no need to burn diesel each time heat or hot water is needed. The Aqua-Hot heats a boiler tank and uses the heat stored in the liquid of the boiler tank to provide interior heat. Aqua-Hot's 200 Series uses TribridHot™ technology to power the Aqua-Hot system by pulling heat from one or a combination of heat sources. Use the electric setting to keep the boiler tank up to temperature and for light heating needs. Use the burner when colder conditions require or when using hot water.

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Caution Notes

As you read this information, take particular note of the NOTICE, CAUTION, WARNING, and DANGER symbols when they appear. This information is important for safe and efficient use of the Aqua-Hot system.

NOTICE

NOTICE signals a situation where potential damage to the Aqua-Hot could occur.



CAUTION

CAUTION signals a situation where potential harm or risk of minor or moderate injury could occur if you do not follow instructions.



WARNING

WARNING signals a hazardous situation where potential harm, risk of serious injury, or death could result if instructions are not followed.



DANGER

DANGER signals a situation where immediate risk of serious injury or death will result if instructions are not followed.

NOTE: This manual will also use notes sections similar to this one to draw attention to features and practices which must be observed.

Read all instructions before using the Aqua-Hot unit. Aqua-Hot Heating Systems is not liable for damage resulting from failing to follow instructions contained in this, and any other Aqua-Hot documentation relevant to this unit.

- Read this user manual before using the Aqua-Hot System to reduce the risk of injury to persons or damage to the equipment.
- The product identity label contains specifications of the unit, to what standard it has been tested, and important safety notices.
- Propylene Glycol based antifreeze “Generally Recognized As Safe “ (GRAS) by the FDA must be utilized for the antifreeze and water heating solution.
- An interlock switch prevents the Aqua-Hot heater from operating when the cover is not installed in the correct position.
- Should any additional assistance be needed, please contact the Product Application Department at 574-AIR-XCEL (574-247-9235).



- Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.
- Disconnect electric wiring to the Aqua-Hot System before welding or plasma cutting the RV to avoid damage to equipment.
- The Aqua-Hot tank and heating loop operate at 0.0 PSI (zero pressure system). Air pressure to the tank must not exceed 20 PSI. Exceeding this rating will cause internal damage to the Aqua-Hot.
- DO NOT connect the 12-volt DC power to the Aqua-Hot if the vehicle requires welding.
- At maximum operating temperature, the coolant will be very hot and scalding hot vapor or coolant may result in serious burns or injury. Be aware of hot surfaces.
- Do NOT activate the burner until the antifreeze and water heating solution has been added to the boiler tank to avoid serious damage to the heater.



WHAT TO DO IF YOU SMELL GAS:

- Evacuate all persons from the vehicle.
- Shut off the gas supply at the gas container or source.
- Do not touch any electrical switch or use any phone or radio in the vehicle.
- Do not start the engine or electric generator (if equipped).
- Contact the nearest gas supplier or qualified service technician for repairs.
- If you cannot contact the nearest gas supplier or qualified service technician, contact the nearest fire department.
- Do not turn on the gas supply until the gas leak or leaks (if relevant) has been repaired.
- Installation and service must be performed by a qualified installer, service agency, or gas supplier.

The Aqua-Hot's exhaust is HOT!

- Do NOT park in areas where dry conditions exist (i.e. dry, grassy fields).
- Do NOT operate the burner inside an enclosed building or garage.
- The heater must be turned OFF when refueling.



Safe Operation

The Aqua-Hot Heating system consists of an electric heating element and a burner. The electric element and/or the burner heat a propylene glycol and water mixture, that flows through tubing and into heat exchangers to heat a zone that calls for heat. The heating system also heats domestic water for hot water use in the shower or at hot water faucets.

To safely and properly operate the Aqua-Hot 200 Series heater, please make sure that the fluid level is up to the “COLD” level line on the expansion tank before heating. If the heater has already been activated and running, the fluid should be to the “HOT” level.

Locate the Aqua-Hot LCD screen (*optional*) or RV control panel inside the RV (contact the vehicle manufacturer if unable to find), turn on either the “ELECTRIC” to turn on the Electric Element or “BURNER” to turn on the burner. It will take approximately 20 minutes (*via the burner*) to get the glycol fluid up to operating temperature. After the tank is to temperature, you can turn on the heat on your RV thermostat or run hot water.

General Care

The Aqua-Hot 200’s fluid levels should be checked regularly to ensure it is at the proper level. It should be checked when the Aqua-Hot is at maximum operating temperature, when the burner completes a cycle or when the electric element disengages. The level should be at the “HOT” mark on the expansion tank.

It is necessary to take precautions during any user maintenance. Note that the fluid will be very hot, and any scalding hot vapor or coolant could cause serious burns or injury.

Intended Use

This manual explains the operation and care of the Aqua-Hot heating system.

These instructions are approved for the Aqua-Hot 200 series model for recreational vehicles only. Not for use in boats.

Service and repairs may only be carried out by an authorized, factory-trained Aqua-Hot technician. The heating system must be installed/serviced in accordance with local codes, or, in the absence of local codes, follow NFPA 1192.

- The vehicle owner is responsible for correct operation of the appliance.
- Make sure to properly winterize the Aqua-Hot’s domestic water system when not in use and/or any time the heater is stored where freezing temperatures may be experienced. The Aqua-Hot warranty will not cover claims for freeze

damage. Please refer to page 12 for proper winterization of the Aqua-Hot.

- In order to provide the best freeze protection, boil-over protection, anti-corrosion, and rust protection, a mixture of 50/50 Propylene Glycol antifreeze and distilled water is recommended.
- The mixture may be modified to provide the most adequate freezing, boiling, and rust/anti-corrosive protection. A 50/50 mixture of Propylene Glycol and distilled water has a freeze point of approximately -29°F and a boiling point of approximately 223°F. Reference page 16 for measuring the antifreeze mixture with a refractometer.

Hot Water System

When hot water is requested, domestic water from the RV’s fresh water tank is transported through the domestic copper coil, that goes into the boiler tank located in the Aqua-Hot. The water is then heated by the heated antifreeze and distilled water solution. The heated domestic water then flows through the tempering valve to be mixed with cool water from the fresh water tank to achieve an appropriate temperature before it flows to the faucet.

NOTE: The Aqua-Hot 5” LCD is an **OPTIONAL** add-on. It is encouraged that RVs already equipped with an RV-C enabled touchscreen have all Aqua-Hot screens and features mirrored on the RV display. For more information on the Aqua-Hot 5” LCD Screen, please reference the “LCD Operation Guide” which can be found at www.aquahot.com.



Figure 1

250-D03

1. Access Cover Screw
2. Drain Valve
3. 3-Way Valve
4. Tempering Valve
5. Diesel Burner Controller
6. Diesel Burner Assembly
7. Interlock Switch
8. Domestic Cold Water Inlet
9. Domestic Hot Water Outlet
10. 120V AC Connection
11. Diesel Fuel Return Port
12. Diesel Fuel Supply Port
13. Expansion Tank Connection
14. Heating Zone Return Port
15. Heating Zone Outlet Port
16. Boiler Tank
17. Domestic Hot-Water Coil
18. Zone Circulation Pump
19. Aqua-Hot Controller

19

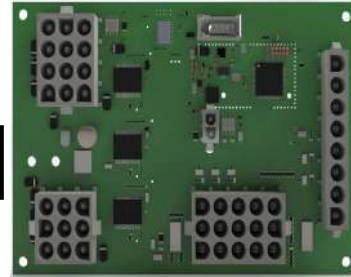


Figure 2

NOTE: The side panel in the view below has been made transparent to aid in the explanation of the heater. DO NOT remove the panels. Doing so risks irreparable damage to the Aqua-Hot. Only remove the service panel for service.

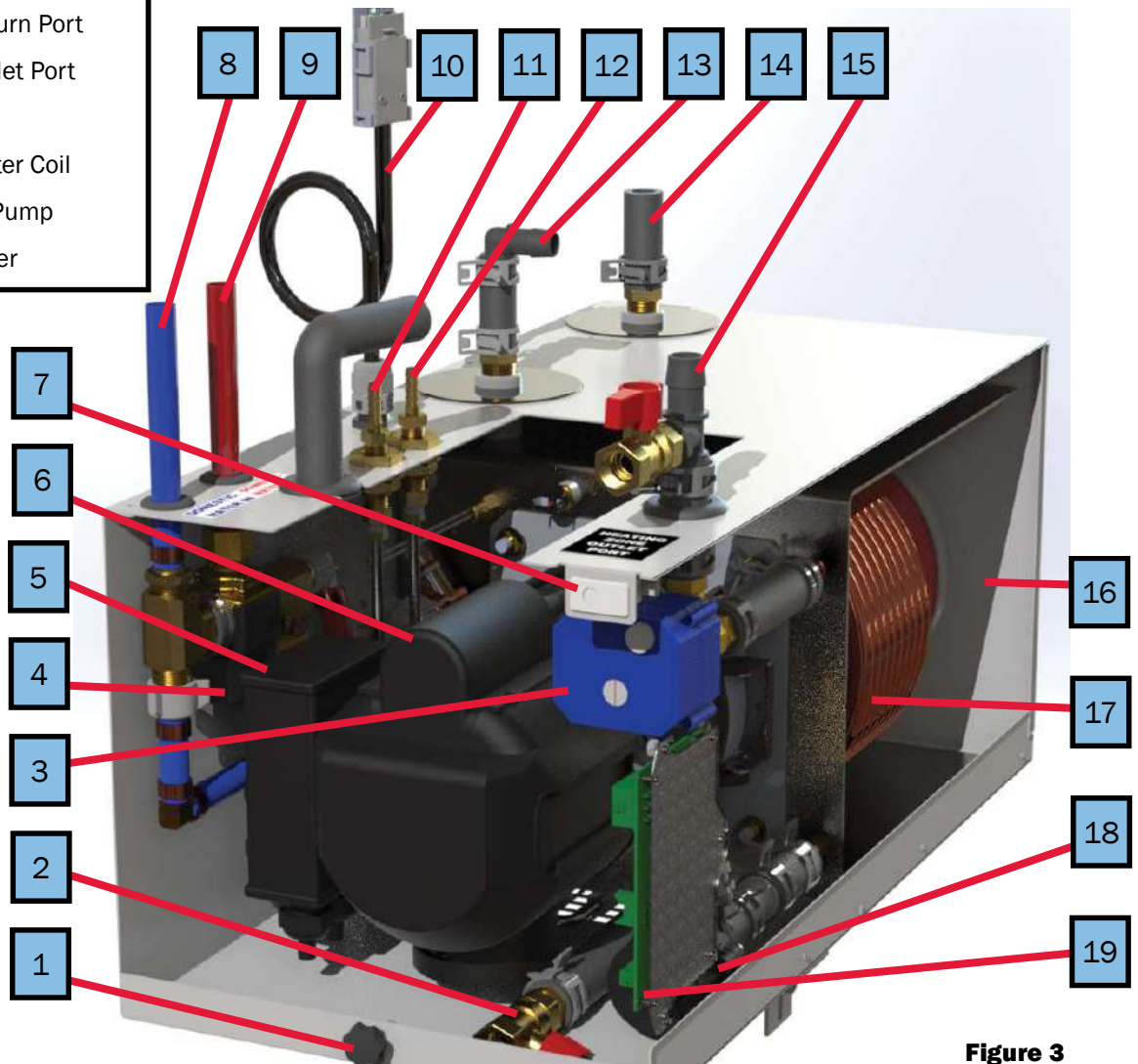


Figure 3

System Features

The Aqua-Hot 250 Diesel Series is a Low-Emissions Hydronic Heating System that significantly improves your level of comfort, decreases harmful emissions released into the atmosphere, and adds thousands of dollars in value to your RV.

The Aqua-Hot Heating System is a 2-in-1 system

1. Interior Heating System: Provides quiet, comfortable interior heat and even temperatures.
2. Tank-less Hot Water System: Provides a steady flow of continuous hot water.

The Aqua-Hot is powered by TribridHot™ technology and uses one or a combination of the following heat sources:

- **Burner:** This is the Aqua-Hot's most powerful heat source. The burner must be on for the Aqua-Hot to provide continuous hot water. The burner must be on for the Aqua-Hot to provide interior heat in colder conditions.
- **120VAC Electric Element:** When plugged into shore power, the electric element lets you use the power you are already paying for to provide heat in mild conditions and meet your light duty hot water needs.

Bring the Aqua-Hot to Operating Temperature:

Your Aqua-Hot hydronic heating system heats a propylene glycol antifreeze and distilled water solution that is stored in the Aqua-Hot's boiler tank. This water and antifreeze solution must be up to operating temperature before the Aqua-Hot will provide interior heat or comfortable hot water. To bring the Aqua-Hot up to temperature, turn the Burner to the ON position. Depending on the ambient temperature, it may take up to 10 minutes for the Aqua-Hot's water and antifreeze solution to reach operating temperature.

Once the tank is up to operating temperature, the electric element may be used to maintain the operating temperature and provide light duty hot water and interior heat.

For continuous hot water, or for heat in colder conditions, it is recommended to utilize the burner.

NOTE: This Aqua-Hot product utilizes a **propylene glycol** based antifreeze and water heating solution. This propylene glycol based solution is a boiler-type antifreeze that is "Generally Recognized As Safe" (GRAS) by the FDA. For additional information regarding this "GRAS" antifreeze product, see the Care & Maintenance section of this guide, or contact Aqua-Hot Technical Support at 574-AIR-XCEL (574-247-9235) or visit the website at www.aquahot.com.



For installation only in a compartment that is completely closed off from living quarters and accessible only from the outdoors.
 Exhaust system MUST NOT terminate beneath the vehicle and not less than 3 feet from an openable window.
 Combustion Air MUST BE supplied from outside the vehicle.
 Suitable for water (potable) heating and space heating.
THIS APPLIANCE OPERATES ON BOTH DC AND AC POWER.
USE COPPER CONDUCTORS ONLY!
 Use a circuit breaker that cuts power at 20-Amps maximum for over-current protection for the 120-VAC power supply.
 Mount the Heater near a bay/storage door so that the Access cover can be easily removed for service.

For Detailed Information, reference the Owner's Manual or contact Aqua-Hot Heating Systems Inc. at 574-AIR-XCEL (574-247-9235).

Minimum Service Clearances
 Front - Open Access
 Back - 1 Inches
 Top - 8 inches
 Sides - 1 inches

This appliance must be installed in accordance with local codes or, in the absence of local codes, the Standard for Recreational Vehicles, ANSI A119.2/NFPA 1192 or CAN/CSA-Z240 RV.



Intertek
3069328

For Direct Vent Installation in a Recreational Vehicle.

Meets or Exceeds: UL 307A, UL 174
 CSA/CAN B140.0-03
 CAN/CSA-C22.2 No. 110-94

Max Tank Pressure	0 PSI
Watts (DC)	146.4
Watts (AC)	1000
Tank Capacity	3.7 gal
Orifice Size/Angle	0.35/60°
Volts/Amps	12VDC, 12.2A
Volts/Amps/Frequency	120VAC, 9.6A, 50/60Hz
Pump Pressure	145 PSI/10.0 bar
Input Firing Rate	56,000 BTU/hr / 16.4kW
Diesel Burner Model	Webasto
Fuel Type	Diesel

Diesel Burner Serial XXXXXX
 Number: XXXXXX
 Model Number: 250-D03
 Serial Number: A250D-XXXXXX

7501 Miller Drive • Frederick, CO 80504 • 574-AIR-XCEL • www.aquahot.com

NOTE: This product label is attached to the side of the Aqua-Hot and provides a ready reference to specifications, test standards, and important safety notices.

Operational Overview

The heating features are powered by the DC diesel burner and/or the AC electric element on the 250-D03. These maintain the temperature of the Aqua-Hot's antifreeze and water heating solution to provide hot water and interior heat.

Diesel Burner:

The diesel burner is the Aqua-Hot's primary and most powerful heat source, and provides all of the heating and hot water needs when cold temperatures exist, and/or when there is a high demand for hot water. It can be activated by turning the burner on by tapping BURNER to ON on the LCD screen shown below. The burner has two modes: ON and OFF.

While ON, the burner will maintain a tank temperature of 185 °F and minimum temperature of 160 °F. In OFF mode, the burner is off and will not provide any heat to the Aqua-Hot tank.

Electric Element:

The electric element is the Aqua-Hot's secondary heat source and can be used when plugged into shore power. The electric element will work to maintain tank temperature at 5 °F below the heater activation threshold. It can be activated by tapping on the ELECTRIC button of the LCD screen interface. The electric element has two modes: ON and OFF.

While ON, the element will maintain a tank temperature of 180 °F and minimum temperature of 165 °F. In OFF mode, the element is off and will not provide any heat to the Aqua-Hot tank.



Figure 4

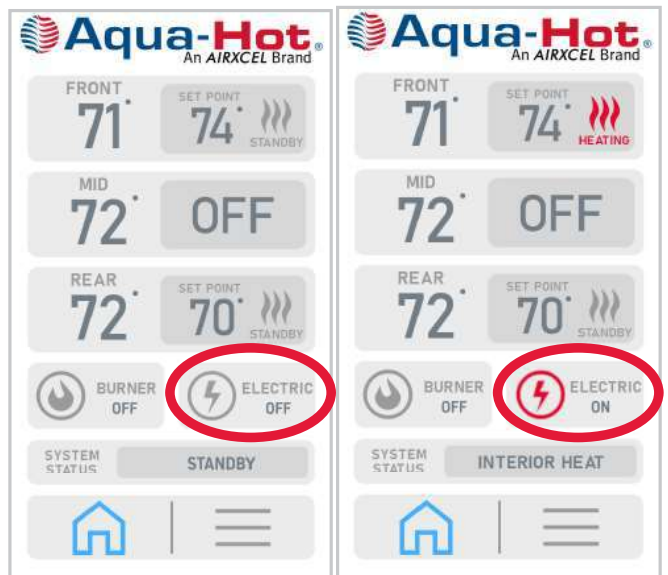


Figure 5

Controlling Heat Levels with Room Thermostat:

When the Aqua-Hot is on and up to operating temperature, adjust the room thermostat to the desired temperature and it will automatically activate the Aqua-Hot's heating functions to maintain the desired interior temperature.

Different manufacturers may use different types of thermostats. Please contact the dealer or manufacturer for the exact type, location, and thermostat operation.

Aqua-Hot LCD Display (optional)

NOTE: The Aqua-Hot LCD Screen is optional. The RV may be equipped with a RV LCD with the RV-C network communication. Either will work with the Aqua-Hot system and the display screens will be similar. The screens will be referred to as "LCD Screen" or "interior/RV control panel".



Figure 6

The Aqua-Hot electronic display provides direct diagnostic and control of the Aqua-Hot. This display is directly interfaced with the Aqua-Hot to relay real-time operational information such as unit diagnostics, warnings, faults, and operating conditions. Please contact Aqua-Hot, or your vehicle manufacturer for more information. Your RV may have a RV control panel in lieu of the Aqua-Hot LCD screen.

Using Hot Water:

When hot water is requested, domestic water from the RV's fresh water tank is transported through the domestic water line, that goes into a heat exchanger located in the Aqua-Hot. The water is then heated by transfer from the heated antifreeze and distilled water solution. The heated domestic water then flows through the tempering valve to be mixed with cool water from the fresh water tank to achieve an appropriate temperature before it flows to the faucet.

Heat Priority Option:

The Aqua-Hot comes equipped with the three-way valve (sometimes known as the summer/winter valve). This controls the flow of the antifreeze and water heating solution within the Aqua-Hot to deliver either hot water or interior as priority. Tapping on this element will change the valve's orientation. When this element displays "INT. HEAT", this valve is oriented to provide interior heat by circulating the heating solution throughout the interior heating zone. When the element says "HOT WATER", the valve is oriented so that the heating solution is routed to prioritize hot water.

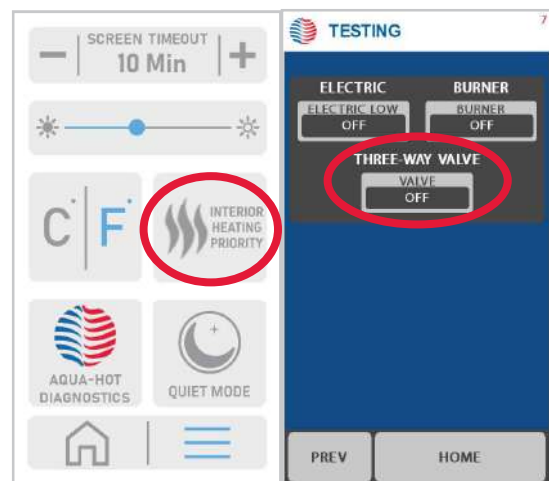
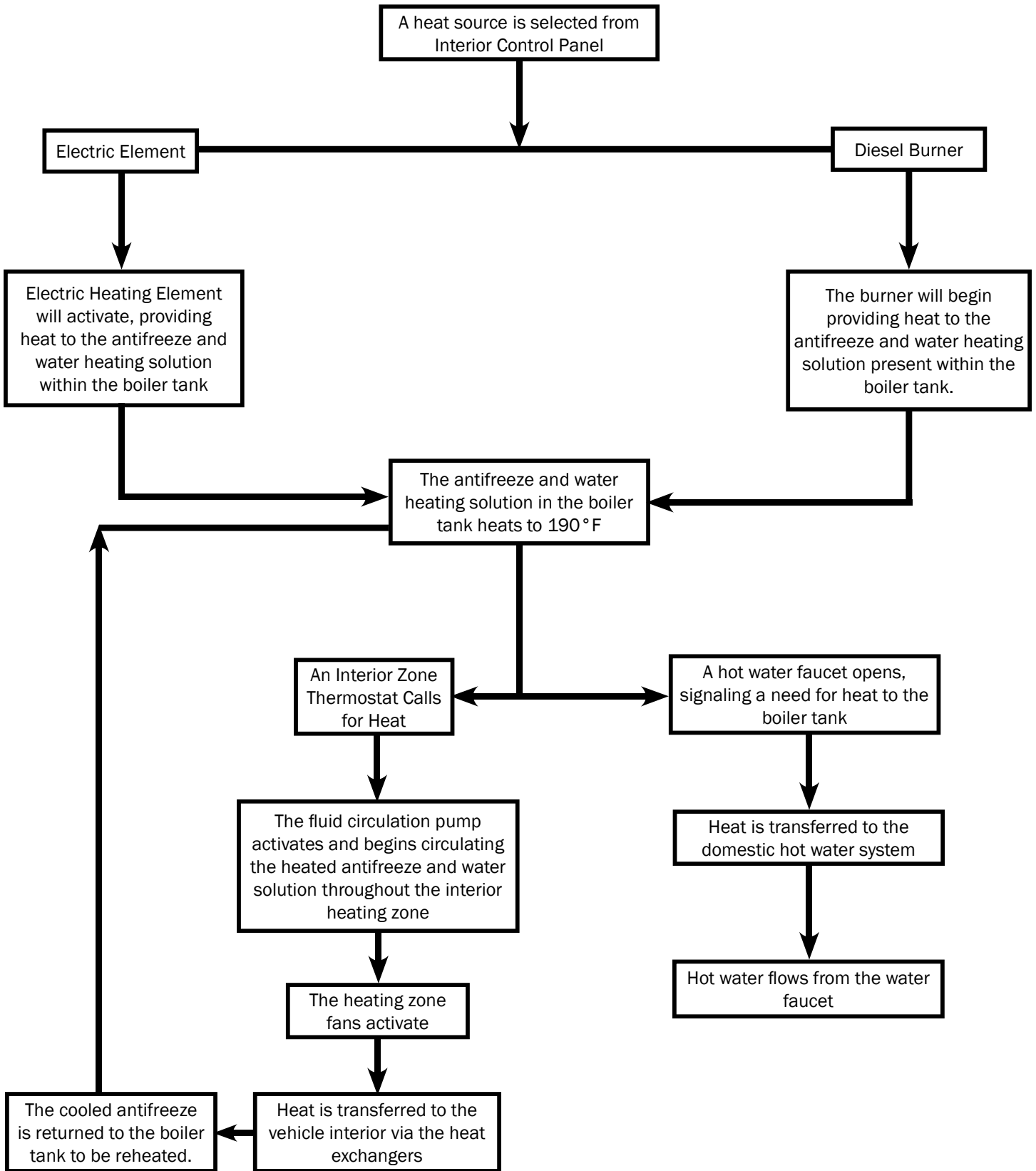


Figure 7

NOTICE

Do NOT operate the burner and/or electric element without antifreeze and water heating solution in the Aqua-Hot's boiler tank. Doing so will cause serious damage to the heater.

Operational Flow Chart



Maintenance Schedule

Monthly Maintenance

Check the Aqua-Hot's antifreeze and water heating solution to ensure that it is at the proper level. This can be accomplished by visually checking the coolant level in the Aqua-Hot's expansion tank; reference Figure 9 on page 13.

Please note that the coolant level should be checked ONLY when the Aqua-Hot is at maximum operating temperature. This should be done immediately after the diesel burner has completed a cycle or after the electric element disengages.

At maximum operating temperature, the antifreeze and water heating solution should be at the level marked "HOT" on the expansion tank. Run the interior heating zones until you feel warm air blowing out of the heat exchangers.

It is also recommended to run the burner once a month for a full cycle (at least 20 minutes) to ensure optimum heater condition.

Replenishing the Antifreeze and Water Heating Solution

If the antifreeze and water heating solution needs replenishing, remove the cap for the expansion bottle and fill it to the "HOT" mark. Replace the expansion bottle cap when this is complete. DO NOT operate the unit without first replacing the cap of the bottle. Reference Figure 9 for additional information. Excess air will escape through this bottle as the stir pump of the unit operates. While bleeding this system of air it will be necessary to continue to fill the bottle until this process is complete.

Reference the Appendix on page 16 for the proper tool and instructions for usage in measuring the system's antifreeze mixture ratio.

The Aqua-Hot does not need regular replacement of the antifreeze and water heating solution, but in the event that more antifreeze is required, contact Aqua-Hot Heating Systems to purchase antifreeze, or for guidance in selecting an appropriate antifreeze product for use with this unit.

In order to provide the best freeze protection, boil-over protection, anti-corrosion, and rust protection, a mixture of 50/50 propylene glycol antifreeze and distilled water is recommended.

The mixture may be modified to provide the most adequate freezing, boiling, and rust/anti-corrosive protection. A 50/50 mixture of propylene glycol and distilled water has a freeze point of approximately -29°F and a boiling point of approximately 223°F. Reference page 16 for measuring the antifreeze mixture with a refractometer.

Annual Maintenance

Diesel

To keep the diesel burner running smoothly, a tune-up or annual service should be performed on the unit. An annual service consists of a new fuel nozzle and fuel filter. To ensure best diesel burner performance, always use the recommended fuel nozzle and fuel filter when replacing these parts.



DANGER

When the Aqua-Hot is at maximum operating temperature, the coolant is very hot. If the Aqua-Hot heating system is accessed, scalding by hot vapor or coolant may occur. Before cleaning or servicing, disconnect all power supplies.



WARNING

DO NOT operate the burner and/or electric heating element without antifreeze and water heating solution present in the Aqua-Hot's boiler tank. Doing so will cause serious damage to the heater.

Propylene glycol that is "Generally Recognized As Safe" by the FDA must be utilized for the antifreeze and water heating solution.

NOTE: For additional information regarding this propylene glycol based boiler-type antifreeze that has been "Generally Recognized As Safe" by the FDA, please reference pages 13 & 14, contact Aqua-Hot Heating Systems Technical Support Department at **574-AIR-XCEL** (574-247-9235), or visit the website at **www.aquahot.com**.

Winterizing the Aqua-Hot

The Aqua-Hot's domestic water heating system must be completely drained of domestic water at any time the heater is stored where freezing temperatures may be experienced.

NOTE: The Aqua-Hot can continue to be used for interior heat once the domestic hot water system has been winterized.

Please follow these instructions when winterizing the Aqua-Hot domestic water heating system. Reference Figure 8 below for a system overview.

1. Completely drain the fresh water storage tank.
2. Disconnect the domestic water demand pump suction line from the fresh water storage tank.
3. Attach an adequate piece of hose onto the suction side of the domestic water demand pump.
4. Place the opposite end of the hose into an adequate supply of non-toxic RV winterization antifreeze (FDA certified as "GRAS" must be used) and allow the fluid to pump through.
5. Open and close all interior and exterior water faucets one at a time, until ONLY pure RV antifreeze is present. Perform this procedure for both cold and hot water faucets.
6. Remove the hose and reconnect the domestic water demand pump's suction line to the fresh water storage tank.

WARNING

Not winterizing the Aqua-Hot when freezing temperatures are present will result in serious damage to the Aqua-Hot domestic water heating system. Ensure that FDA approved "GRAS" antifreeze rated for winterization is used when winterizing this unit.

De-Winterization

To de-winterize the Aqua-Hot system, completely fill the fresh water storage tank. Open and close the interior and exterior faucets, one at a time, until only clear water is present.

Disinfecting the Domestic Water System

NOTICE

The Aqua-Hot Heating systems contain copper tubing and are not compatible to prolonged exposure to sodium hypochlorite (bleach or liquid bleach.) Using products containing bleach, including water refreshers, may cause corrosion of the domestic water lines, resulting in a catastrophic failure of the Aqua-Hot system by creating leaks that cannot be repaired. This damage is not covered by the Aqua-Hot warranty.

If disinfecting the hot water heating system, be sure to follow NFPA 1192 Standard on Recreational Vehicles "Instructions for Disinfection of Potable Water Systems."

NOTE: Extended exposure to household bleach will corrode the components of the Aqua-Hot will potentially dramatically shorten the operational lifetime of the Aqua-Hot. Under no circumstances is the Aqua-Hot to be exposed to household bleach for extended periods of time.

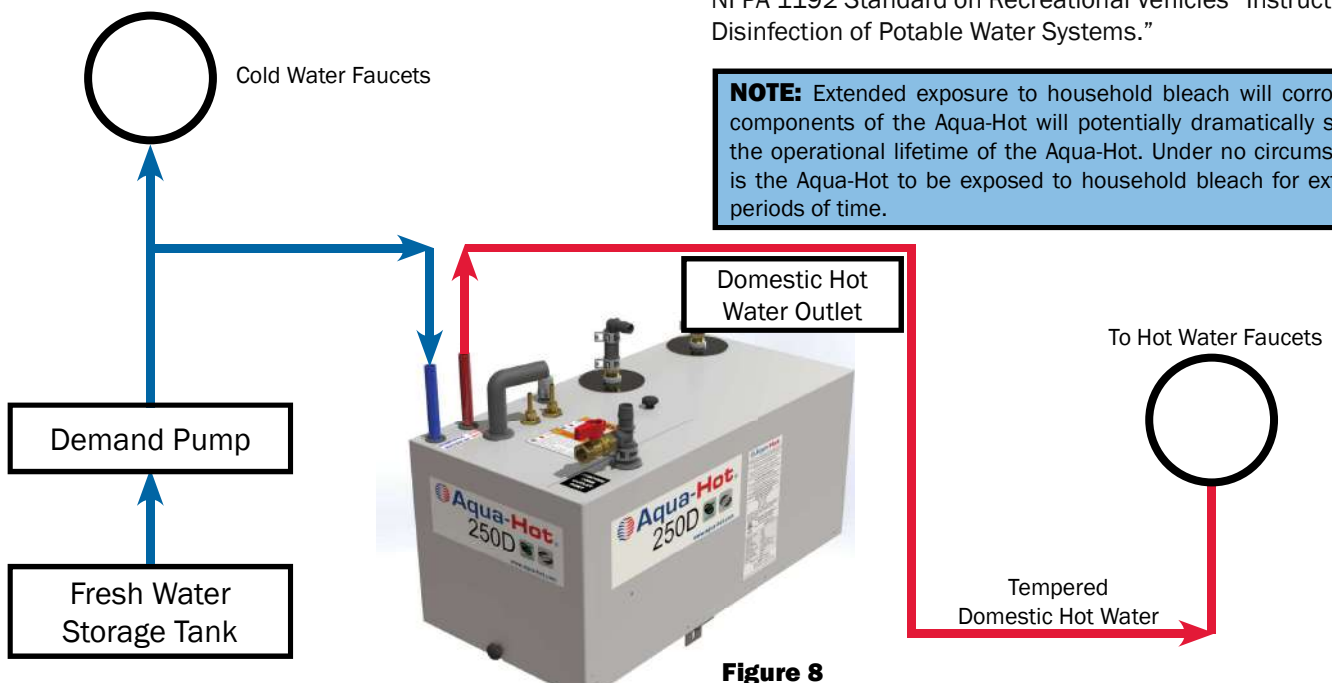


Figure 8

General Troubleshooting

Should the Aqua-Hot Hydronic Heating System fail to operate, complete the following checks:

1. Verify that the Aqua-Hot's access cover is securely installed. The Aqua-Hot will not operate if the access cover is not fully installed.

NOTE: An interlock switch prevents the Aqua-Hot from operating when the cover is not installed and properly secured in place. Reference page 6 Part #7 for the interlock switch locations.

2. Verify that the Aqua-Hot is supplied with electrical power.
3. Make sure there is an adequate supply of diesel fuel (at least ¼ tank).
4. Ensure that the Aqua-Hot boiler tank has an adequate supply of antifreeze and water heating solution by checking the level at the expansion tank. If the level is low, reference the maintenance section of this guide for refilling instructions.
5. Verify the functionality of any in-line fuses connected to the Aqua-Hot. Replace these fuses if necessary.
6. Ensure that all RV-side hot water faucets are closed.
7. Visually inspect the interior of the Aqua-Hot to ensure that there are not any pinched or damaged wires.
8. Locate the high-limit thermostats within the Aqua-Hot. Test these thermostats for functionality, and replace if necessary.
9. Locate and test the ETS module for functionality. Replace if necessary.
10. Locate and test the fluid circulation pump. Replace if necessary.
11. Locate the three-way valve and test it for functionality. Replace if necessary.

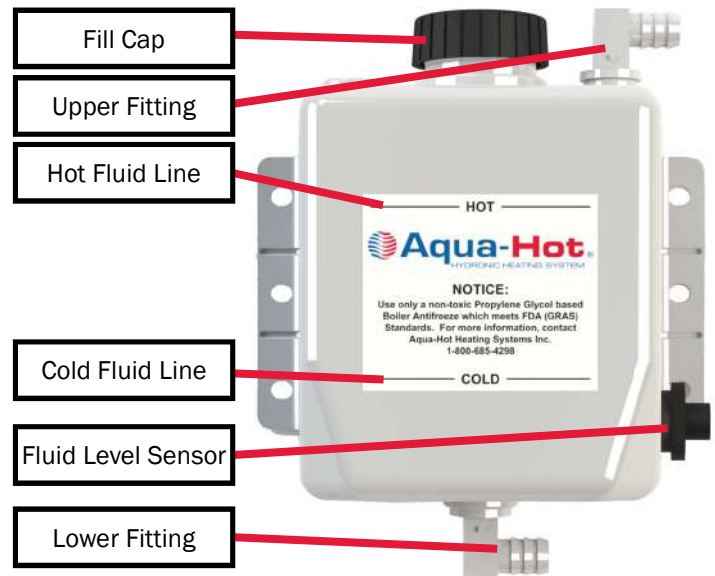


Figure 9

NOTE: The fluid level sensor is located in the Aqua-Hot's expansion tank. If the antifreeze solution in the expansion tank drops below the level of the fluid sensor, the Aqua-Hot will not operate.

Antifreeze Types

The following information addresses the necessary usage of a propylene glycol based “boiler” type antifreeze in the Aqua-Hot. Propylene glycol is a safer alternative to the more toxic ethylene glycol antifreeze; however, as mandated by IAPMO (International Association of Plumbing and Mechanical Officials), only propylene glycol based “boiler” type antifreezes deemed “Generally Recognized As Safe” (GRAS) by the FDA should be utilized.

Due to the significant impact various types of antifreeze can have on a hydronic heating system, including the level of safety provided, it has been recognized that there is a need to provide an explanation regarding two additional prominent types of antifreeze/coolant available. The following information should be utilized as an educational means of ensuring that the proper type of propylene glycol based antifreeze is selected.

RV & Marine Antifreeze

These types of propylene glycol based antifreeze products are formulated specifically for “winterizing” applications only. Although RV & Marine antifreeze is often “Generally Recognized As Safe” by the FDA, it should never be used in the Aqua-Hot’s Hydronic Heating System. This type of antifreeze is not formulated to transfer heat, which is essential to the heating system’s functionality and does not contain rust inhibitors. Please note, however, that RV & Marine antifreeze can be utilized to winterize the Aqua-Hot’s Domestic Hot Water Heating Systems.

Automotive Antifreeze/Coolant

These types of propylene glycol based antifreeze products are formulated specifically to protect automotive engines against corrosion, freezing temperatures, and overheating. They also have excellent heat transfer and thermal conductivity characteristics. Although these types of antifreeze products are considered less toxic and safer than ethylene glycol for people, pets, and the environment, they are not “Generally Recognized As Safe” (GRAS) rated by the FDA. Therefore, they must be marked with a “harmful if swallowed” warning. This additional warning is required because these types of antifreeze products contain high levels of chemical rust inhibitors. Due to their potentially hazardous properties, they should never be used in the Aqua-Hot’s Hydronic Heating System.

Antifreeze Mixture Quality Recommendations

In order to ensure maximum performance and longevity of an Aqua-Hot heating system’s boiler tank and associated components, it has been determined that there is a need to use distilled, deionized, or soft water in combination with

concentrated propylene glycol for the Aqua-Hot’s antifreeze and water heating solution.

Please note that this is only necessary when mixing concentrated propylene glycol antifreeze with water; suppliers of premixed antifreeze are responsible for the use of high-quality (distilled, deionized, or soft) water when preparing their antifreeze for sale.

Hard water possesses a high-level of calcium and magnesium ions, which deplete the propylene glycol antifreeze’s corrosion inhibitors. This, in turn, causes the antifreeze and water heating solution to begin turning acidic, which can corrode the Aqua-Hot’s boiler tank and associated components prematurely. Therefore, concentrated propylene glycol should be diluted with distilled, deionized, or soft water which is 80ppm or less in total hardness. The local water agency should have up-to-date water quality reports, which should indicate if the local tap water is within this guideline.

Antifreeze Terms & Mixture Ratio

Propylene Glycol Based Antifreeze Solution

The following information addresses the process of selecting a propylene glycol based antifreeze solution that provides adequate freeze, boiling, and rust/anti-corrosive protection.

A propylene glycol antifreeze solution that is 35% to 50% propylene glycol to distilled water is recommended. Antifreeze solution with 50% propylene glycol will result in a freeze point of approximately -28° F and a boil point of approximately 222° F.

Freeze Point and Burst Point

NOTE: The installer of the Aqua-Hot system must refer to the information and chart to determine the percentage of propylene glycol the antifreeze solution should contain for the level of protection needed.

Antifreeze solution lowers the freezing point of any liquid, to which it has added, by preventing the formation of ice crystals. However, as the ambient temperature continues to decline, the water in the solution will attempt to attain a solid state. The point in which the water begins to solidify is termed the “Freeze Point”. Although the water in the solution has begun to freeze and starts producing a “slushy” consistency, the antifreeze in the solution will continue to combat the normal expansion of the solution as it freezes. The point in which the solution can begin to expand, due to colder temperatures, is called the “Burst Point”. Once the solution reaches the burst point, the potential is present for ruptured pipes to exist. The burst point of the antifreeze and water heating solution is dependent upon

the brand of propylene glycol antifreeze employed.

Rust and Anti-Corrosive Inhibitors

Another major function of antifreeze solution is to provide protection to the internal metal components of the Aqua-Hot Hydronic Heating System from corrosion and rust. Antifreeze is able to perform this function by the addition of rust and anti-corrosive inhibitors, which are designed specifically to activate in a water solution.

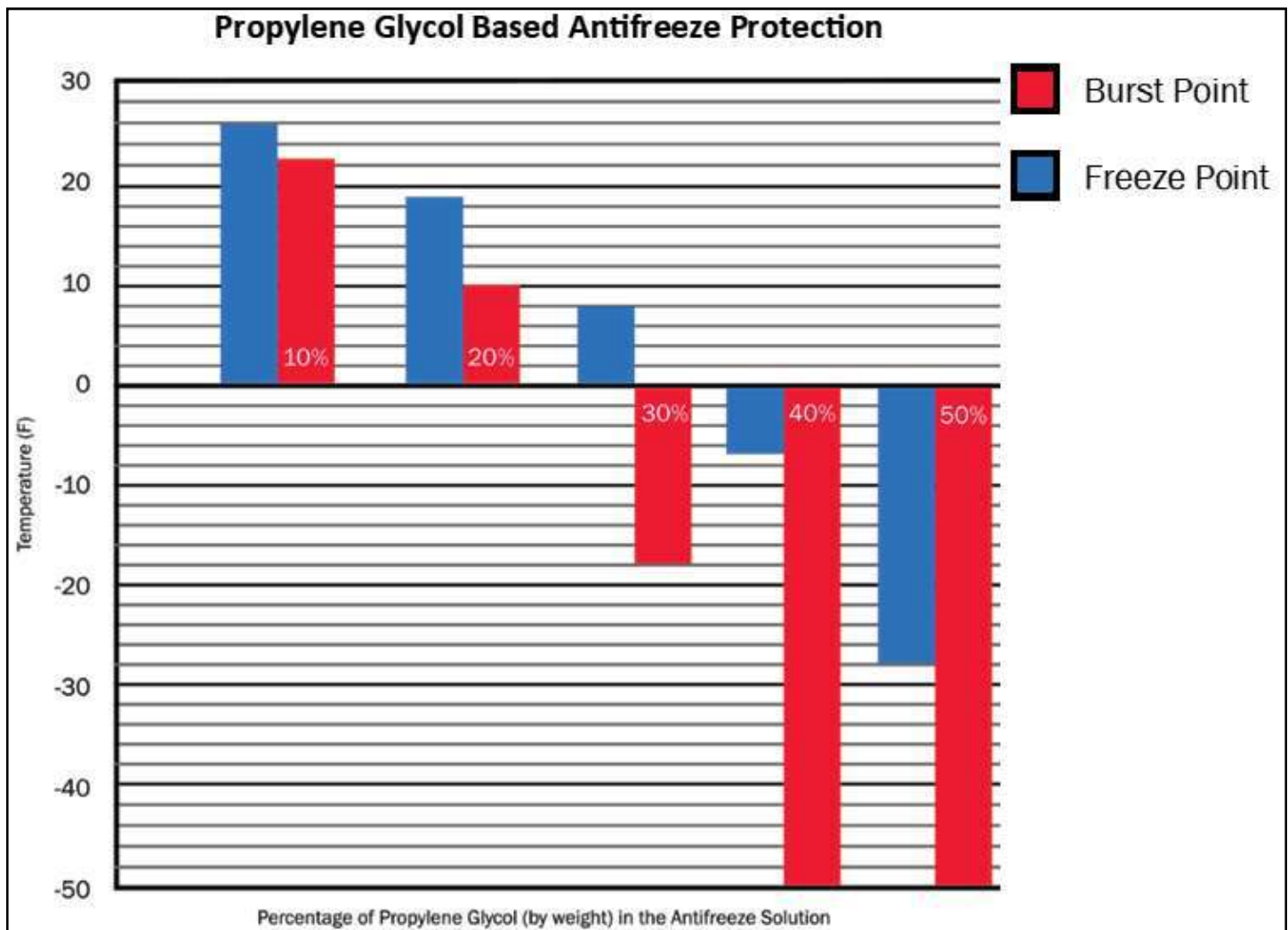
Summary

Antifreeze solution has three basic functions: freeze protection, boil-over protection, and rust/anti-corrosion protection.

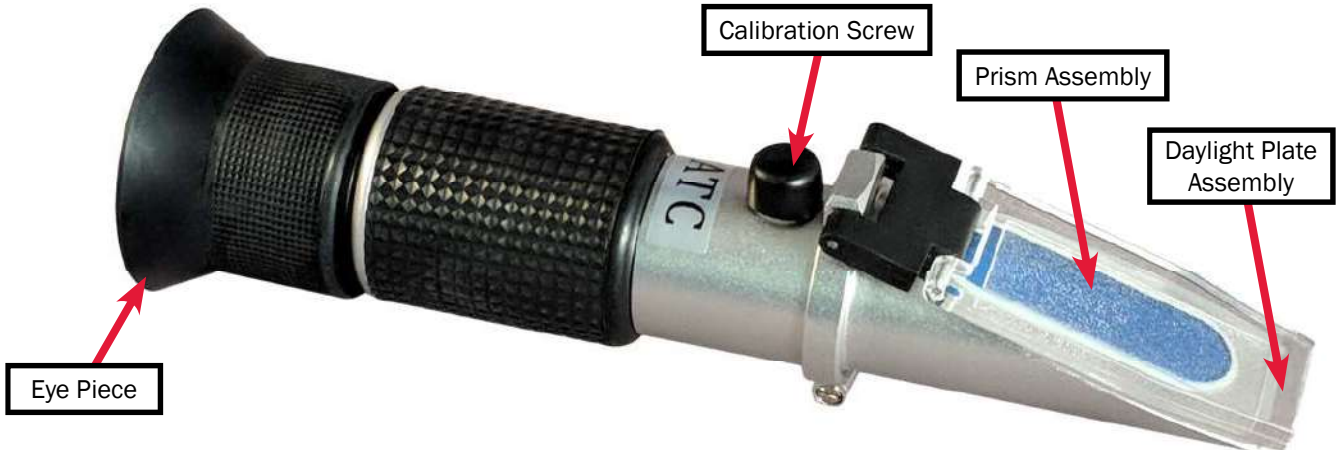
Propylene glycol antifreeze solution is also primarily responsible for heat transfer; however, propylene glycol itself does not possess acceptable heat transfer characteristics.

Therefore, as water is an excellent heat conductor, it is added to the mixture. Propylene glycol antifreeze solution, mixed with distilled water, at a ratio of 35% to 50% is recommended to provide the best performance combination of the aforementioned functions. If excess propylene glycol exists within the heating solution, the water's heat absorption properties are compromised. Ultimately, this could inhibit the Aqua-Hot from providing adequate domestic hot water and interior heating.

Additionally, if the antifreeze and water heating solution contains over 70% propylene glycol, the freezing point is actually raised, resulting in less freeze protection. Please reference the attached graphical representation regarding the percentage of antifreeze to water and how it directly affects the solution's freezing point.



Measuring Antifreeze Using a Refractometer

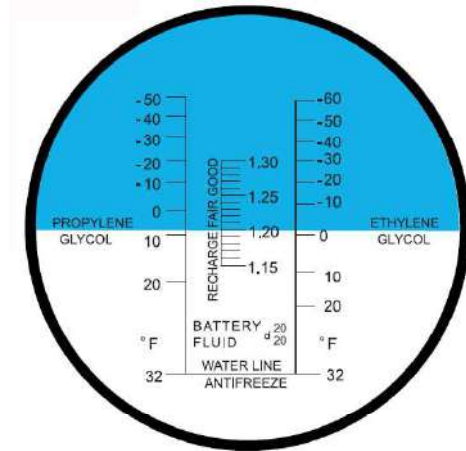


Properly Apply Antifreeze to the Prism Assembly

Use the guide below to properly apply the propylene glycol mixture to the prism assembly of the refractometer. Once that is complete, peer through the eyeglass of the refractometer to continue to the next step.

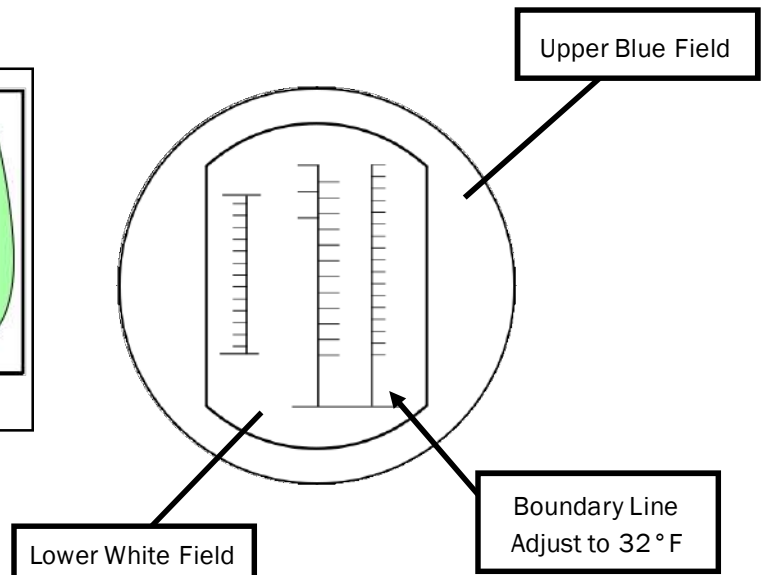
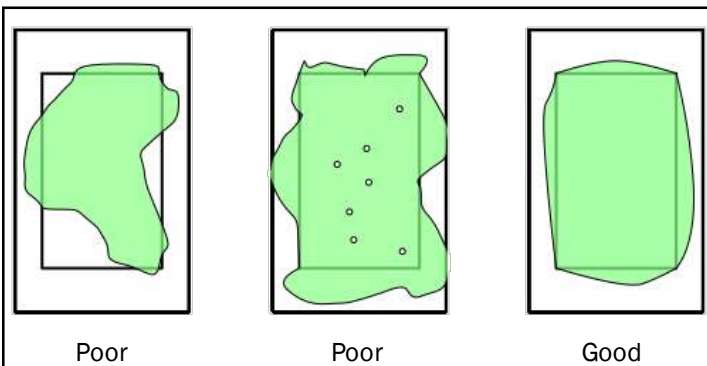
Adjust the Boundary Line

Once the glycol solution has been properly applied, adjust the calibration screw until the boundary line labeled "Propylene Glycol" is set to 32 °F. The graphic to the right has been designed as an aid, but note that it may differ from what is shown in the refractometer sight glass.



Refractometer Sight Glass

Application of Propylene Glycol



DATE	SERVICE PERFORMED	SERVICE CENTER

DATE	SERVICE PERFORMED	SERVICE CENTER



2-YEAR LIMITED WARRANTY AQUA-HOT® HYDRONIC HEATING SYSTEM

Aqua-Hot Heating Systems Inc. warrants the Aqua-Hot Heater to be free from defects in material and workmanship under normal use and service for a period of two years on both parts and labor commencing upon the original date of registration of the vehicle. Replacement parts are warranted for the remainder of the Heater's standard warranty coverage or for six months, whichever is greater. The intent of this warranty is to protect the heater's end-user from such defects, which would occur in the manufacturing of the product. Thus, problems due to improper specifications, improper installations, improper use, the use of accessory parts or parts not authorized by Aqua-Hot Heating Systems Inc., repair by unauthorized persons, and damage or abuse of the heater are specially excluded from warranty coverage.

For additional information, or to obtain a warranty repair authorization, please contact the Aqua-Hot Heating Systems Warranty Administrator at 574-AIR-XCEL (574-247-9235) (7:00 AM to 4:00 PM Mountain Standard Time) or visit www.aquahot.com.

My Comfort Zones are On-Board

Vehicle:

Purchased From:

Dealer Information:

Name:

Location:

Phone Number:

Heating System:

Serial Number:

LTE-300-003

200_{SERIES}

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