

USE & CARE GUIDE

400 SERIES



400-LP



Thank you for equipping your RV with an Aqua-Hot hydronic heating system! We value your business and are grateful for the trust you have placed with Aqua-Hot Heating Systems Inc. Our customers are 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 motor home owner; therefore, we have designed a heating system to significantly improve all of your comfort levels while on the road. Additionally, the Aqua-Hot hydronic heating system is a low emission, fuel efficient system that adds thousands of dollars to your motor home.

We know you must be eager to get underway, but take time to read the entire Use & Care Guide and understand your Aqua-Hot unit. This guide should be maintained in legible condition and kept in a safe, accessible location for future review.

Should you have any suggestions how we can better serve you, please do not hesitate to contact us at 800-685-4298 or 303-651-5500.

The Aqua-Hot hydronic heating system is protected by the finest warranty in the industry (read it on page 19).

IMPORTANT NOTE:

- 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: www.aquahot.com/ service-help: 800-685-4298 or 303-651-5500.
- Warranty work must be performed by an Aqua-Hot Factory Authorized Service Center.

IMPORTANT NOTE:

- Your on-product identity label contains specifications of your unit. Factory settings may be adjusted by your RV manufacturer, confirm final setting with your dealer.

WARNING:

- If the information in this guide is not followed exactly, a fire or explosion may result, causing property damage or personal injury.



Comfort Zone #1: Comfortable Cabin Heat.

Get heat where you want it, when you want it! The Aqua-Hot system heats by zones. Therefore, your bedroom, living room, and bathroom can be custom temperatures. 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, On-Demand 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 shower when you want makes your RV experience feel much more like home.

Comfort Zone #4: Low Emissions

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



Comfort Zone #5: Over 160 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 an RV. 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 propane each time heat or hot water is needed. Aqua-Hot's TribridHot technology powers the Aqua-Hot system by pulling heat from one or a combination of heat sources. When shore power is available, simply plug it in. When dry-camping or in very cold conditions, use the Diesel Burner.

The Unit

IMPORTANT NOTE: Read all instructions before installing this appliance.

- Read this Installation Manual before installing or using the Aqua-Hot System to reduce the risk of injury to persons or damage to equipment.
- The product identity label contains specifications of the unit, to what standard it has been tested, and important safety notices.
- The Aqua-Hot must be installed in a compartment that is closed off from living quarters and accessible only from outdoors.
- Propylene glycol based antifreeze “Generally Recognized as Safe” by the FDA must be utilized for anti-freeze 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 800-685-4298 or 303-651-5500.

WARNING

If this information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

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.

CAUTION:

- Disconnect electric wiring to the Aqua-Hot System before welding or plasma cutting the coach to avoid damage to equipment.
- Air pressure to the tank must not exceed 20 PSI or will cause internal damage.
- The Aqua-Hot’s exhaust is HOT and must be kept away from heat sensitive material.
- Use caution when working on or near the propane gas system.
- DO NOT connect the 12 Volt-DC power to the Aqua-Hot if the vehicle requires welding.
- At maximum operating temperatures, the coolant will be very hot and scalding hot vapor or coolant may result in serious burns or injury.
- 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.

- Do not start the vehicle’s engine or electric generator.
- Contact the nearest gas supplier or qualified service technician for repairs.
- If you cannot reach a gas supplier or qualified service technician, contact the nearest fire department.
- Do not turn on the gas supply until the gas leak(s) has been repaired.
- Installation and service must be performed by a qualified installer, service agency, or gas supplier.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device, which automatically lights the burner. Do **not** try to light the burner by hand.
 - gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.
- B. **BEFORE OPERATING**, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
 - C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Forced or attempted repair may result in a fire or explosion.
 - D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the

POUR VOTRE SÉCURITÉ LISEZ AVANT DE METTRE EN MARCHÉ

AVERTISSEMENT. Quiconque ne respecte pas à la lettre les instructions dans la présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
 - Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
 - Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.
- B. **AVANT DE FAIRE FONCTIONNER**, renifliez tout autour de l'appareil pour déceler une odeur de gaz. Renifliez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE SI VOUS SENTÉZ UNE ODEUR DE GAS :

 - Ne pas tenter d'allumer d'appareil.
 - Ne touchez à aucun interrupteur ; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information to the left on this label. If you don't smell gas, go to the next step.
2. This appliance is equipped with an ignition device, which automatically lights the burner. Do **not** try to light the burner by hand.
3. Ensure that the gas control valve is turned on. Follow "B" in the safety information to

the left on this label. If you don't smell gas, go to the next step.

4. Refer to the Owner's Manual for information regarding normal operation of this heating system.
5. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" below on this label and refer to the Owner's Manual troubleshooting section or call the technical support department at 1-800-685-4298.

INSTRUCTIONS DE MISE EN MARCHÉ

1. **ARRÊTEZ!** Lisez les instructions de sécurité sur la portion à gauche de cette étiquette.
2. Cet appareil est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
3. Assurez-vous que la soupape de contrôle de gaz est bien ouverte. Passez à l'étape B des instructions de sécurité sur la portion à gauche de cette

étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.

4. Référez au Manuel du propriétaire pour des informations au sujet du fonctionnement normal de ce système de chauffage.
5. Si l'appareil ne fonctionne pas, veuillez suivre les instructions « Pour couper le gaz vers l'appareil » ci-dessous sur cette étiquette et référez à la section Dépannage du Manuel du propriétaire ou appelez le service de soutien technique au 1.800.685.4298.

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Set all interior thermostats to their lowest setting.
3. Turn the gas control knob located on the heater's propane inlet port clockwise to the "OFF" position.

COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
2. Réglez tous les thermostats intérieurs à leur réglage le plus bas.
3. Tournez le bouton de contrôle du gaz, situé sur le port d'entrée de propane du chauffe-eau, vers la droite à la position « OFF » (Arrêt).

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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 equipment.

NOTICE

NOTICE signals a situation where potential damage to the equipment 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 you do not follow instructions

⚠ DANGER

DANGER signals a situation where immediate risk of serious injury or death will result if you do not follow instructions

NOTE: In addition, this manual may indicate an **IMPORTANT NOTE** that highlights information that is especially important.

400-LP Features

The Aqua-Hot Heating System is a Low Emissions Hydronic Heating System (heating with hot water) 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 three systems in one:

1. Interior Heating System: provides quiet, comfortable interior heat with independent temperature zones that provide cabin-wide even temperatures.
2. Bay Heating System: keeps pipes and tanks from freezing in the bay storage area.
3. Tank-less Hot Water System: provides a steady flow of continuous hot water.

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

1. **The 120-Volt AC Electric Element:** When plugged into shore power, the electric element lets you use the power you are already paying for to provide heat and meet your light duty hot water needs.
2. **The Burner:** This is the Aqua-Hot's most powerful heat source and provides all of heating and hot water needs in cold temperatures or dry camping.

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, please the Care & Maintenance Section of this guide, contact the Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298**, or visit the web site at www.aquahot.com.





Aqua-Hot
HYDRONIC HEATING SYSTEM

For installation only in a compartment that is completely closed off from living quarters and accessible only from the outdoors.
The Exhaust System **MUST NOT** terminate beneath the vehicle or under an openable window or vent.
Combustion Air **MUST BE** supplied from outside the vehicle.

CAUTION: THIS APPLIANCE OPERATES ON BOTH AC AND DC POWER.

USE COPPER CONDUCTORS ONLY!

Use a 20-Amp fuse for over-current protection for the DC power supply.
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.

WARNING: DO NOT OPERATE APPLIANCE WITH ACCESS COVERS REMOVED.

Minimum Heater Clearances:
Front - Open Access
Back - 0 inches
Top - 0 inches
Sides - 0 inches

Install in strict compliance with local codes, NFPA 1192, and the manufacturer's instructions.

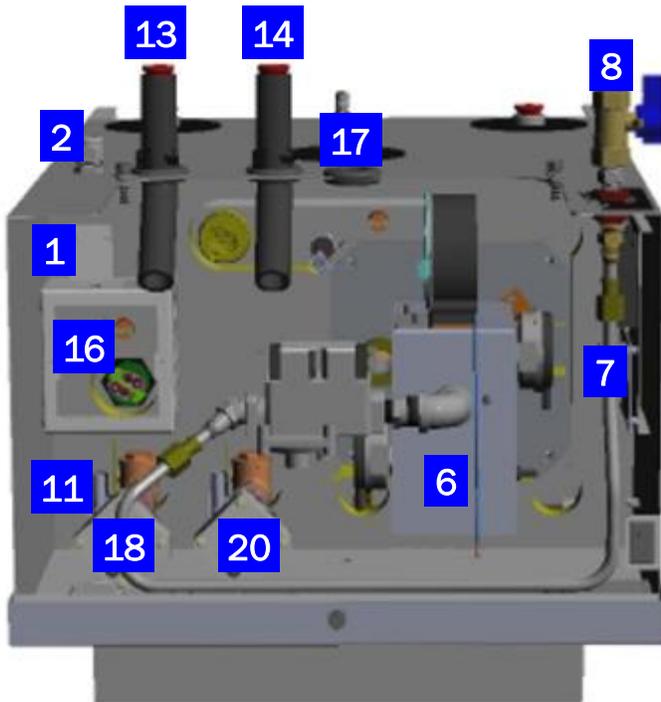


Certified for use in a Recreational Vehicle ONLY!
Direct Vent Appliance

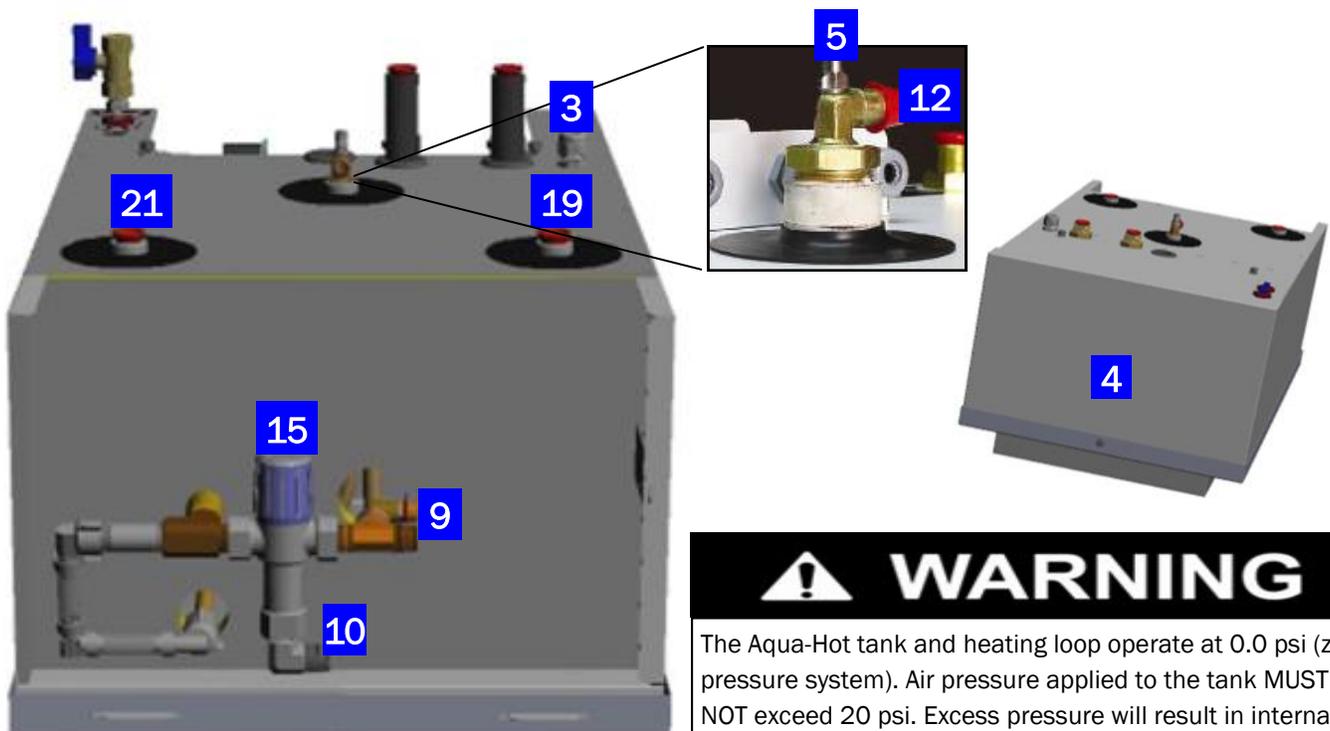
0 PSI	174	1650
Maximum Tank Pressure	Max Watts (DC)	Watts (AC)
.35 / 60	12 VDC	120 VAC, 60 Hz
Nozzle Size/Angle	Volts	Volts
56,000 BTU / 16.4 kWh	145 PSI / 10.0 bar	
Input Firing Rate	Pump Pressure	
WEBASTO		DIESEL
Diesel-Burner Model Number	Diesel-Burner Serial Number	Fuel Type
AHE [] - []		
Model Number	Serial Number	Manufactured Date

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Cut-Away Diagrams



1. AC Terminal Block
2. AC Terminal Port
3. AC Wiring Port
4. Access Cover
5. Air Release Valve
6. Propane Burner
7. Propane Burner Controllers
8. Propane Inlet Ball Valve
9. Domestic Cold Water Inlet
10. Domestic Hot Water Outlet
11. Drain Valve
12. Expansion Tank Connection
13. Heating Zone 1 Outlet Port
14. Heating Zone 2 Outlet Port
15. Tempering Valve
16. VAC Access Panel
17. Wiring and Harness Port
18. Zone 1 Circulation Pump
19. Zone 1 Inlet Port
20. Zone 2 Circulation Pump
21. Zone 2 Inlet Port



⚠ WARNING

The Aqua-Hot tank and heating loop operate at 0.0 psi (zero pressure system). Air pressure applied to the tank **MUST NOT** exceed 20 psi. Excess pressure will result in internal damage.

Controls Overview

NOTICE

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

Switches:

The Aqua-Hot heating system is controlled by two switches, the burner switch and the electric element switch. When one or both the burner or electric element switches are in the ON position, it will supply the necessary heat to the boiler tank. Keep in mind that the Aqua-Hot must be at operating temperature for the heating zones and hot water to function properly. Please contact the specific motorhome dealer for the exact location of switch operations.

Thermostats:

The interior room thermostat can be set at the desired temperature; therefore, whenever the interior of the room "calls for heat", the Aqua-Hot's circulation pump and interior heat exchanger fans will be activated. The fresh water thermostat controls the bay heating area and should NOT be set below 40°F, to prevent freezing of the domestic water storage system. Please contact the specific motor home dealer for exact location of thermostat controls.

Interior Heating Operation

Heating Operation

Overview:

The heating features are powered by a 12 Volt-DC propane burner and a 120 Volt-AC electric heating element. These two heating elements maintain the temperature of the Aqua-Hot's antifreeze and water heating solution to provide hot water and heat to the motor home.

- **Propane Burner**– The propane 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 switch in the ON position. Reference Figure 1 on following page.
- **Electric**– The electric element is the Aqua-Hot's *secondary* heat source and can be used when plugged into shore power. The electric element provides heat when moderate temperatures exist (50°F or higher) and/or when there is a low demand for hot water. It can be activated by turning the electric switch in the ON position. Reference Figure 1 on following page.

Controlling Heat Levels:

The interior room thermostat can be adjusted at the desired temperature and will automatically be activated to maintain the temperature of the interior. Keep in mind that the diesel and/or electric element switch on the interior switch panel must be in the ON position for the heat to operate.

Control/Balancing Heating Zones:

Set the interior room thermostat for each independent heating zone at the desired temperature. This feature allows you to customize various temperatures on each heating zone throughout your motor home.

Using the Water Heating System

General Information:

The Aqua-Hot system is known as an on-demand hot water heating system because hot water is not stored within the motor home. Instead, when the burner and/or electric element switch is ON and the Aqua-Hot is at operating temperature, the water is automatically heated as it is being used. Therefore, simply open an hot water faucet once system is up to operating temperature, and a continuous supply of hot water will be present within a few seconds.

NOTICE

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

⚠ WARNING

The Aqua-Hot's exhaust is HOT! Do NOT park in areas where dry conditions exist (i.e., grassy, dry fields). Do NOT operate the burner inside an enclosed building. The heater must be switched OFF when refueling.

Operation Instructions:

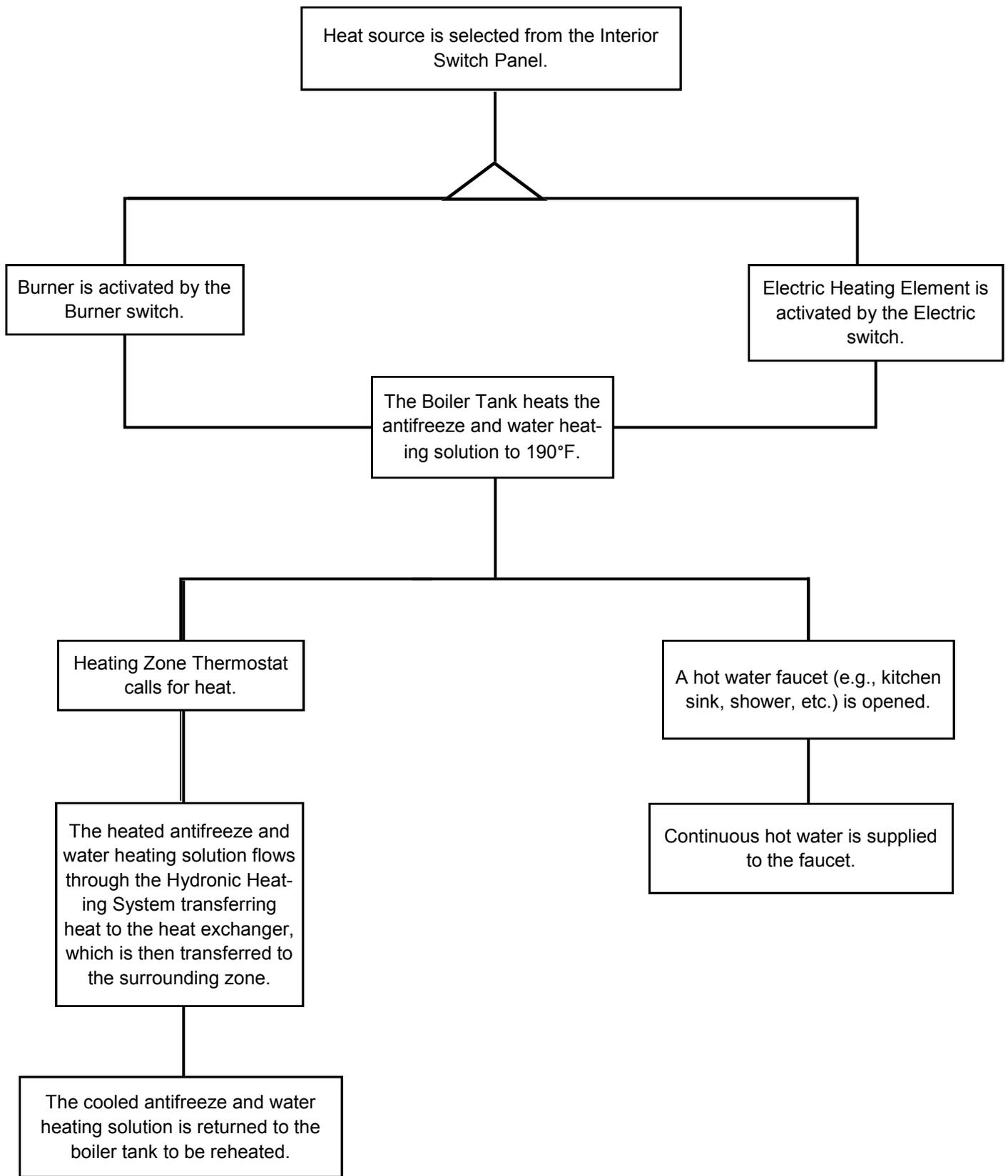
To operate the Aqua-Hot hot water system, you will need to locate the interior switch panel located inside your motor home. If you are unable to locate the switch panel, contact your dealer to guide you in the location and operation of all switch operations. Once you have located the interior switch panel, turn the burner switch ON. This action will activate the burner and the indicator light located adjacent to the burner switch. Allow 10-20 minutes for the Aqua-Hot system to reach operating temperature. Please note that the burner is the *primary* heat source for heating the interior and hot water.

To operate the electric heating element, turn the electric switch ON. This action will activate the 12 Volt-AC electric heating element and the indicator light located adjacent to the electric switch. Allow 1-2 hours for the Aqua-Hot system to reach operating temperature. Be sure to activate the electric element switch for *maximum* water capacity. Figure 1 is an example of an interior switch panel.

Figure 1



Aqua-Hot Operational Flowchart



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 3.

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 Burner cycles OFF.

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 the heat exchangers. This will prevent the zone check valves from failing prematurely.

Run the Burner once a month. This will ensure proper operation of the Burner.

Replenishing the Antifreeze and Water Heating Solution

If the antifreeze and water heating solution needs replenishing, remove the Expansion Tank's cap and fill the Expansion Tank to the "HOT" level mark.

When refilling, open the Air Release Valve located on the Expansion Tank to release air pockets; reference page 6 (part #5 and #12). Hold the valve open until all the air is released. If necessary, refill the Expansion Tank again. Be sure the valve is closed when finished by hand-tightening. Reference Appendix A through C in order to determine the correct ratio antifreeze to water, the proper type of antifreeze, and the water quality recommendations for the Aqua-Hot Hydronic Heating System's antifreeze and water heating solution. Reference Appendix D for the proper tool and instructions for usage in measuring the system's antifreeze mixture ratio.

Annual Maintenance

No annual maintenance is required above the normal monthly maintenance. Reference the Aqua-Hot's Service and Parts manual for spare parts information and detailed replacement instructions. Contact the Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298** for assistance. Otherwise, locate the nearest Aqua-Hot Service Center, or visit the web site at www.aquahot.com.

DANGER

When the Aqua-Hot is at maximum operating temperature, the coolant will be very HOT! If the Aqua-Hot's heating system is accessed, scalding by hot vapor or coolant could result. Before cleaning or servicing, disconnect all power supplies.

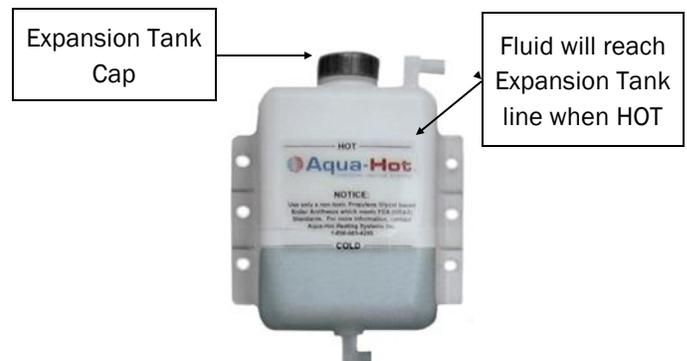
WARNING

DO NOT operate the Burner and/or the Electric Heating Element without the antifreeze and water heating solution 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 heat 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 Appendix A, contact Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298**, or visit the web site at www.aquahot.com.

Figure 3



Winterizing the Domestic Water Heating System:

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.

Please follow these instructions when winterizing the

NOTE: The Aqua-Hot can continue to be used for interior zone heating once the domestic water heating system has been drained and winterized.

Aqua-Hot's Domestic Water Heating System; reference Figure 4.

1. Completely drain the fresh water storage tank.
2. Disconnect the domestic water demand pump's 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 FDA-approved "GRAS" RV antifreeze and allow this 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 hot and cold 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 temperature are present will result in **SERIOUS** damage to the Aqua-Hot's Domestic Water Heating System. Also, be sure to use the FDA approved, "GRAS" rated antifreeze for winterization.

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.

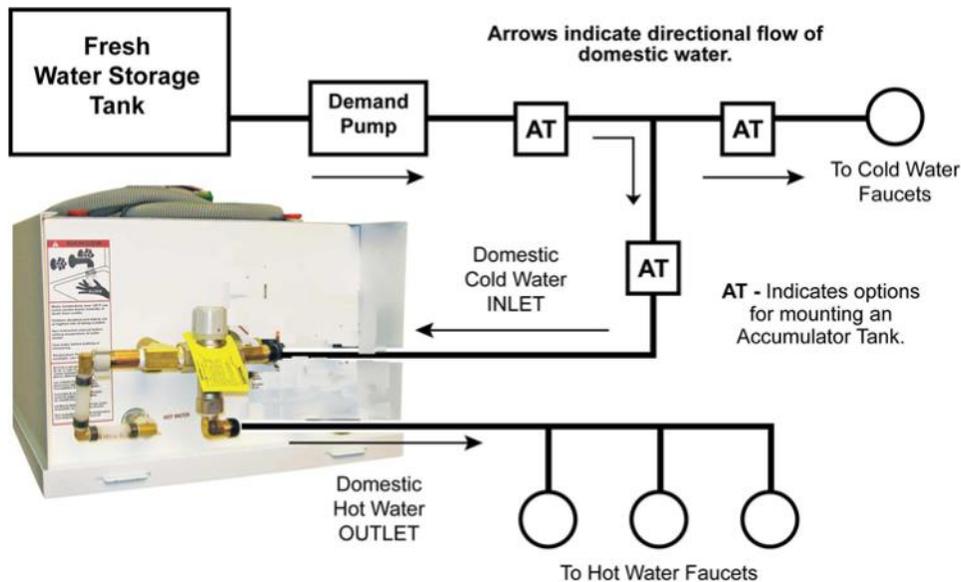
Disinfecting the Domestic Water System:

NOTICE

Aqua-Hot 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 coil, 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."** These instructions can be found by visiting the National Fire Protection Association online at www.nfpa.org.

Figure 4



Appendix A: Antifreeze Types

The following information addresses the necessary usage of 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 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 of various types of antifreeze 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” application 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 the RV & Marine antifreeze can be utilized to winterize the Aqua-Hot’s Domestic Hot Water Heating System.

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 characteristic. 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 Aqua-Hot’s Hydronic Heating System.

Appendix B: Antifreeze Mixture Water 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, de-ionized, or soft water in combination with concentrated propylene glycol for the Aqua-Hot’s anti freeze and water heating solution. Please note that this is only necessary when mixing concentrated propylene glycol antifreeze with water; suppliers of pre-mixed antifreeze are responsible for the use of high-quality (distilled, de-ionized, 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 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, de-ionized, or soft water which is 80 ppm 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.

Appendix C: Antifreeze Terms and Mixture Ratio

The following information addresses the process of selecting a propylene glycol based antifreeze solution that provides adequate freeze, boiling, and rust/anticorrosive protection. A 50/50 mixture ratio is recommended, which will result in a freeze point of approximately -28 °F and a boil point of approximately 222 °F.

The following information should be utilized for the purpose of clarifying some terms commonly associated with antifreeze.

Freeze Point and Burst Point:

Antifreeze solution lowers the freezing point of any liquid to which it has been added by preventing the formation of 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 by the “freeze point”. Although the water in the solution has begun to freeze, producing a “slushy” consistency, the antifreeze in the solution will continue to combat the

Appendix C: Antifreeze Terms and Mixture Ratio

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 the water heating solution is dependent upon the brand of propylene glycol antifreeze employed.

Boiling Point:

The Aqua-Hot utilizes the propylene glycol based (PPG) antifreeze and water heating solution as a transportation means for the heat produced from the internal processes. The PPG antifreeze solution absorbs the heat created until its boiling point is reached. It is at this point when the liquid turns to a gas and is expelled to prevent the heating system from overheating. Each time the boiling point is reached, a loss of efficiency occurs because the heat produced is expelled rather than utilized for the function of the heating system. Therefore, a higher boiling point is desired in order to combat the loss of efficiency, which allows the antifreeze to transport the heat created from the internal process throughout the motorhome where it can be utilized productively rather than dissipating due to its change from a liquid to a gas.

Rust and Anti-Corrosive Inhibitors:

Another major function of antifreeze solution is to provide protecting 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.

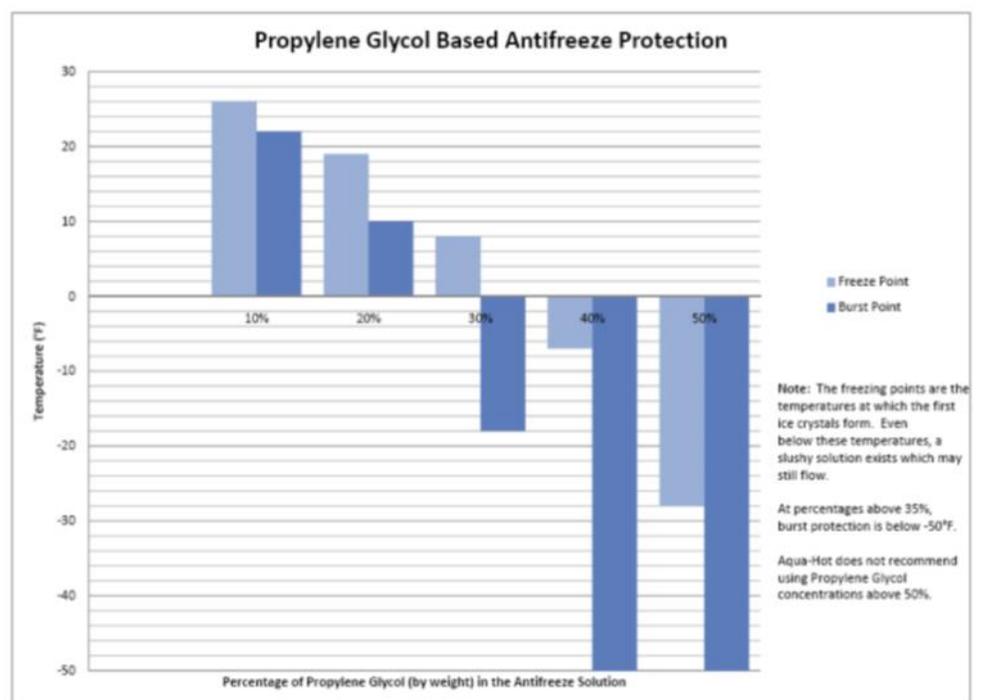
Summary:

Antifreeze solution has three basic functions:

1. Freeze Protection
2. Boil-over Protection
3. Anti-Corrosion and Rust Protection

PPG Antifreeze solution is also primarily responsible for heat transfer; however, propylene glycol itself does not possess acceptable heat transfer characteristics. Therefore, water is added to the mixture because it is an excellent heat conductor. PPG antifreeze solution, mixed with water that is 35% to 50% propylene glycol is recommended to provide the best performance combination of the aforementioned functions. If excess propylene glycol exists within an antifreeze and water heating solution, the water’s heat absorption properties are compromised. This could ultimately 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 Propylene Glycol Using a Refractometer

Calibrate the Refractometer

Aqua-Hot Part Number MSX-907-162



Calibration Operation

The diagram illustrates the calibration process in three stages:

- Left Panel:** Shows a pipette adding liquid to the refractometer's prism. Below are three circular field views: the first two are labeled "Poor" and show irregular, blurry boundaries; the third is labeled "Good" and shows a clear, straight boundary line.
- Middle Panel:** Shows the refractometer being held to the eye. A circular inset shows the internal scale with a "W" mark.
- Right Panel:** A detailed view of the scale. The scale has two main sections: the "Upper Blue Field" at the top and the "Lower White Field" at the bottom. A horizontal "Boundary Line" is shown, with a label indicating it should be "Adjust to 32°F". The scale includes markings for "PROPYLENE GLYCOL" and "BATTERY FLUID".

General Information

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. Reference page 6 (part #4). The Aqua-Hot Hydronic Heating System will not operate if the access cover is not fully installed.
2. Ensure that the vehicle's fuel tank contains a sufficient level of fuel. The Aqua-Hot system will not operate if the fuel level is at or below 1/4 tank.
3. Ensure that the Aqua-Hot's 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.
4. Check the Aqua-Hot's electronic controller for any RED lights indicating a fault condition.

If the Aqua-Hot Heating System's failure to operate is not resolved with the aforementioned checks, please contact the Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298** for additional assistance or visit the web site at **www.aquahot.com**.

If the Aqua-Hot's Burner switch "Indicator Light" does not illuminate and the Burner is not functioning, locate the electronic controller and check the following:

1. Check the Aqua-Hot's electronic controller for any RED lights indicating a fault condition. Reference Figure 2.
2. Check for loose wire connections on the electric controller's terminal strips/plugs. When checking for loose terminal strips/plugs, remove the electronic controller faceplate by unscrewing the four cover screws.
3. Remove the Aqua-Hot's access cover and check for loose plug connections on the Burner controller unit. Reference page 6 (part #7).

NOTE: An interlock switch prevents the Aqua-Hot from operating when the cover is not installed and properly in place.

4. Ensure the vehicle's fuel tank has a sufficient level of fuel.
5. If the Aqua-Hot still fails to operate, please contact the Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298** or visit the web site at **www.aquahot.com**.

Electronic Controller Diagnosis

Low Tank-Level Cutoff Indicator Light:

This indicator light will illuminate RED when either the 120 Volt-AC electric heating element and/or Burner have automatically shut down due to low antifreeze and water heating solution level inside the Aqua-Hot's boiler tank. This fault will automatically reset when the low level condition is corrected.

Low Battery Voltage Fault Indicator Light:

This indicator light will illuminate RED and the Burner will shut down whenever the 12 Volt-DC voltage level is too low for the Aqua-Hot to operate properly. This fault must be manually reset after the voltage level has been restored to the 12 Volt-DC battery system. Reference "Low Voltage Fault Indicator Light and Reset Button" information below.

Low Voltage Fault Indicator Light and Reset Button:

The Aqua-Hot's electronic controller must be manually reset whenever the low battery voltage fault indicator light has been activated.

The electric controller can be reset by turning OFF the Burner switch on the interior switch panel for approximately 60 seconds, then turning the switch back ON by pressing the "Low Voltage Reset" button located on the electric controller (use a thin, straight, non-metallic object to access the reset button through the small hole on the faceplate).

Overload Fault Indicator Light:

This indicator light will illuminate RED whenever one of the following conditions have occurred:

1. The Aqua-Hot is off due to an electrical overload (i.e., short) in the main 12 Volt-DC power supply circuitry.
2. The Aqua-Hot is off due to a combination of high electrical 12 Volt-DC power loads and a high surface temperature of the electronic controller.

The Aqua-Hot will automatically restart once the electrical overload (i.e., short) and/or high-heat condition is corrected.

Heating Zones Status Indicator Lights:

These five indicator lights (separately) will illuminate GREEN whenever a zone thermostat, for each particular zone, is calling for heat. The GREEN indicator lights also indicate that 12 Volt-DC power is being supplied to the particular interior heating zone's heat exchangers (i.e., fan motors).

If any of the five indicator lights illuminate RED, it indicates that an electrical overload condition (i.e., short) has occurred in a particular heating zone's circuitry.

NOTE: The Low Temp Cutoff Light must be illuminated and the heater must be up to operating temperature for the heating zone status indicator lights to illuminate red or green.

Pumps #1, #2, and #3 Indicator Lights:

These indicator lights (separately) will illuminate GREEN whenever a circulation pump is operating. If any of the three indicator lights illuminate RED, it indicates that an electrical overload condition (i.e., short) has occurred in the particular component's circuitry.

NOTE: Zone circulation pumps #1 and #2 are activated whenever a zone thermostat "calls for heat". The #3 boiler tank stir pump is activated whenever the domestic water is being used on a continuous basis or the heater is not up to operating temperature.

Electric Heating Element Status Indicator Light:

This indicator light will illuminate GREEN whenever the Aqua-Hot's electric heating element is operating and providing heat to the Aqua-Hot's boiler tank.

Please note that this light will only be active if the electric element switch is ON. If this indicator light illuminates RED, it indicates an electrical overload condition (i.e., short) has occurred in the electric heating element's 12 Volt-DC.

NOTE: The Aqua-Hot's VDC/VAC Control Thermostat will automatically activate the Burner and/or the electric heating element ONLY if the Burner and/or electric element switch is in the ON position.

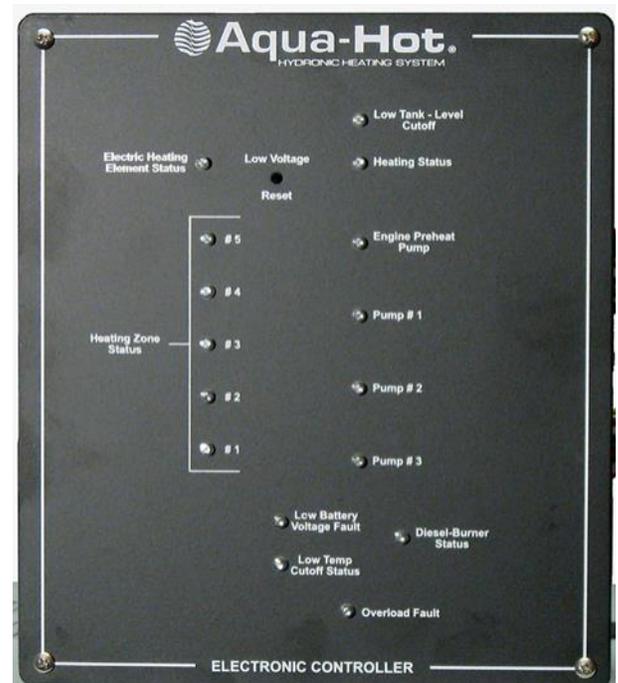
Tempering Valve

The Tempering Valve for the Aqua-Hot mixes the heated domestic water from the boiler tank with cold domestic water at the present ratio to reduce the risk of scalding. This valve is located in the back of the Aqua-Hot unit. Reference page 6 (part #15).

Locate the pink paint witness mark to verify that the Aqua-Hot is set at the correct factory setting and did not get tampered with during shipping or installation.

Verify that the Tempering Valve is set at the proper temperature by using a digital thermometer at one of the hot water faucets. The water temperature should range between 115°F to 123°F. If the correct temperature cannot be set, follow the instructions to replace the Tempering Valve in Section 5 of the Service Manual.

Figure 2



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 1-800-685-4298 (8:00 AM to 5:00 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-400-000 Rev. A

400

SERIES



400-LP



7501 Miller Drive, Frederick, CO 80504

Visit us on line at www.aquahot.com
Call us at (800) 685-4298 or (303) 651-5500

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