

USE & CARE GUIDE

600 SERIES



600-D04 and 675-D04
with



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.

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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.

The Unit

IMPORATANT NOTE: Read all instructions before using this appliance.

- Read this Use & Care Guide before using your Aqua-Hot Heating System to reduce the risk of injury to persons or damage to equipment.
- Have your dealer show you the location and operation of all switch operations and valve settings.
- Do not repair or service the system, unless specifically recommended in the literature accompanying the Aqua-Hot product. All service should be referred to a qualified technician.
- An interlock switch prevents the Aqua-Hot heater from operating when the cover is not installed in the correct position.
- Propylene glycol based antifreeze, “Generally Recognized as Safe” by the FDA, must be utilized for anti-freeze and water heating solution.
- Interior heat can still be used once the water heating system has been drained and winterized.
- Use propylene glycol “Generally Recognized as Safe” RV and Marine antifreeze specifically for “winterizing” application ONLY.

CAUTION:

- The hot water temperature is set at the mixing valve to 120 °F/ 48.9 °C at the factory.
- DO winterize the heating system when freezing temperatures are expected to avoid serious damage to the hot water system.
- DO NOT operate the burner or electric heating element without antifreeze or water heating solution in the boiler tank to avoid damage to the heater.
- Aqua-Hot’s exhaust is hot. DO NOT park in dry areas when operating to avoid fire and injury to persons.
- At maximum operating temperatures, the coolant will be very hot and scalding hot vapor or coolant may result in serious burns or injury.
- Before cleaning or servicing, disconnect all power supplies.
- The heater must be switched OFF when refueling.
- DO NOT operate the Aqua-Hot’s diesel-burner inside an enclosed building.

600D and 675D 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 to your RV.

The Aqua-Hot Heating System is three systems in one:

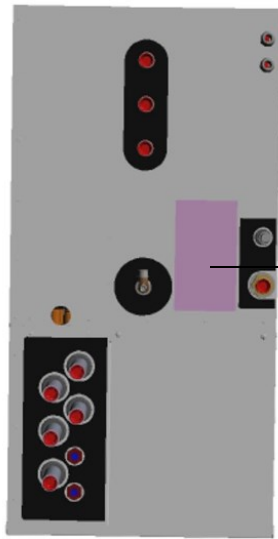
1. Interior Heating System: provides quiet, comfortable interior heat with independent temperature zones that provide cabin-wide even temperatures.
2. Bay Heating System: keeps pipes and tanks from freezing in the bay storage area.
3. Tank-less Hot Water System: provides a steady flow of continuous hot water.
4. Engine Preheating System: reduces engine wear caused by cold starting by preheating the engine from 30°F to 90°F in one hour.

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 Diesel 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.
3. **The Vehicle's Engine:** When driving or idling, the engine's surplus heat is transferred to the Aqua-Hot providing interior heat and limited hot water without burning any other fuel.

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 reference 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**.

NOTE: Service parts and accessories are available through Aqua-Hot Factory Authorized Service Center or at **www.aquahot.com**.



The product label attached to the Aqua-Hot provides a ready reference to specifications, test standards, and important safety notices.



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.



Intertek
3069328

Certified for use in a Recreational Vehicle ONLY!

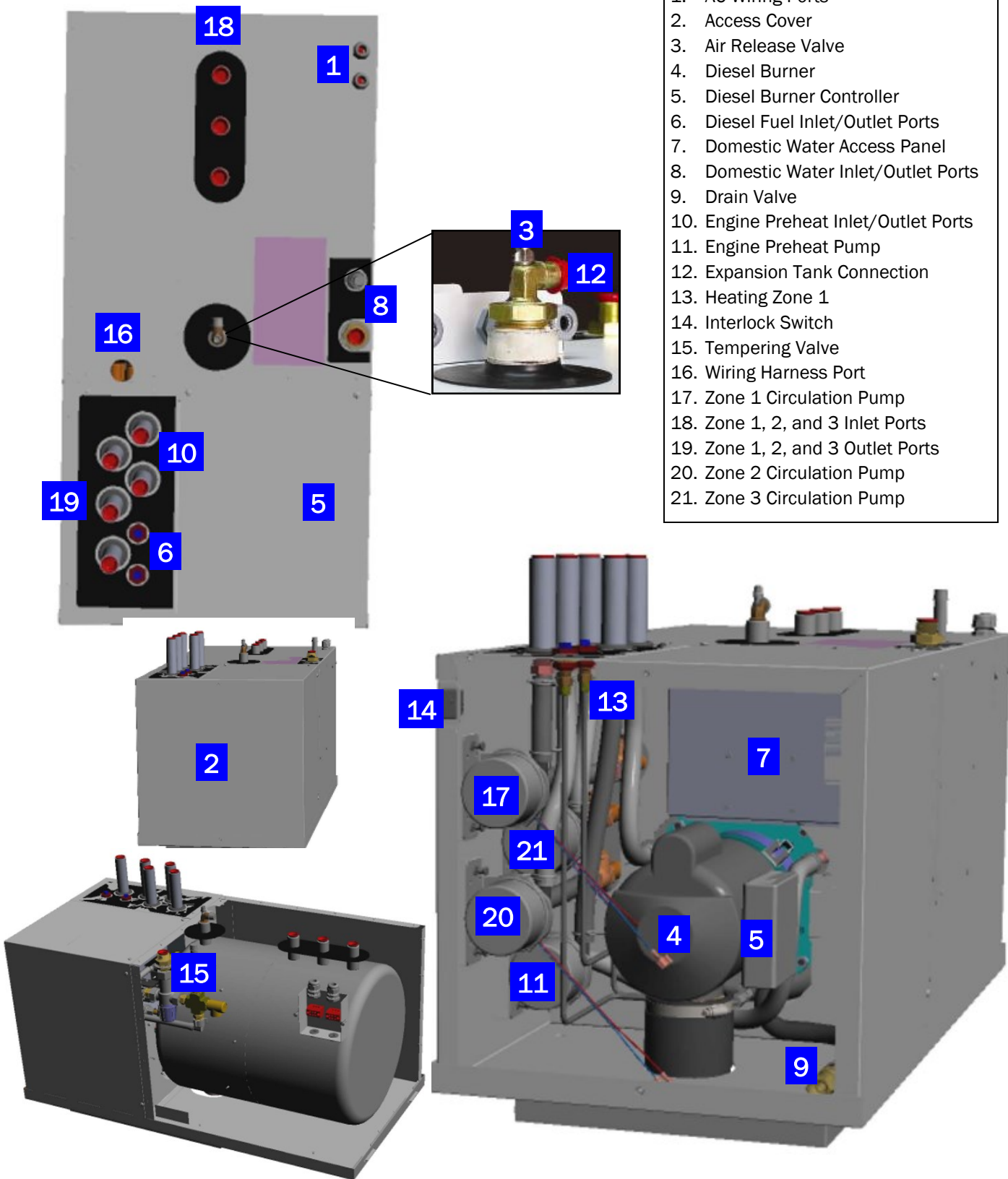
Direct Vent Appliance

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

15549 East Highway 52 • Fort Lupton, CO 80621 • 1.800.685.4298 • www.aqua-hot.com

Cut-Away Diagrams

1. AC Wiring Ports
2. Access Cover
3. Air Release Valve
4. Diesel Burner
5. Diesel Burner Controller
6. Diesel Fuel Inlet/Outlet Ports
7. Domestic Water Access Panel
8. Domestic Water Inlet/Outlet Ports
9. Drain Valve
10. Engine Preheat Inlet/Outlet Ports
11. Engine Preheat Pump
12. Expansion Tank Connection
13. Heating Zone 1
14. Interlock Switch
15. Tempering Valve
16. Wiring Harness Port
17. Zone 1 Circulation Pump
18. Zone 1, 2, and 3 Inlet Ports
19. Zone 1, 2, and 3 Outlet Ports
20. Zone 2 Circulation Pump
21. Zone 3 Circulation Pump



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. This style of Aqua-Hot is equipped with an Engine Preheat element as well. 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.

The Aqua-Hot interior switch panel has a high/low switch that works in conjunction with the electric element switch.

- **Low Switch-** Turn the electric element switch ON in conjunction with the high/low switch placed in the LOW position. Reference Figure 1. This procedure will activate one of the two 120 VAC Electric Heating elements and the indicator lights located on both the electric ele-

ment and the high/low switches. Allow 1-2 hours for the Aqua-Hot system to reach operating temperature.

- **High Switch-** Turn the electric element switch ON in conjunction with the high/low switch placed in the HIGH position. Reference Figure 1. This procedure will activate both the 120 VAC Electric Heating Elements and the indicator lights located on both the Electric Element and the high/low switches. Allow half an hour to an hour for the Aqua-Hot System to reach operating temperature. The electric heating elements are a secondary heat source for heating both the interior and the domestic hot water during low heating demand situations. This heat source should be used when moderate temperatures exist and/or when there is a low demand for domestic hot water.

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.

Figure 1



Heating Operation

Overview:

The heating features are powered by a 12 Volt-DC diesel -burner and two 120 Volt-AC electric heating elements. 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.

- **Diesel**– 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 switch in the ON position. Reference Figure 1.
- **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.

NOTE: The motor home must be connected to shore power or the generator must be running in order to activate the electric heating element.

- **Engine Preheat**- In order to use the Engine Preheat element on the Aqua-Hot system, both the diesel-burner AND the engine preheat switch must be turned ON. Allow the engine preheat element to function for one hour before starting the vehicle's engine. Reference Figure 1.

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.

Hot Water Operation

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.

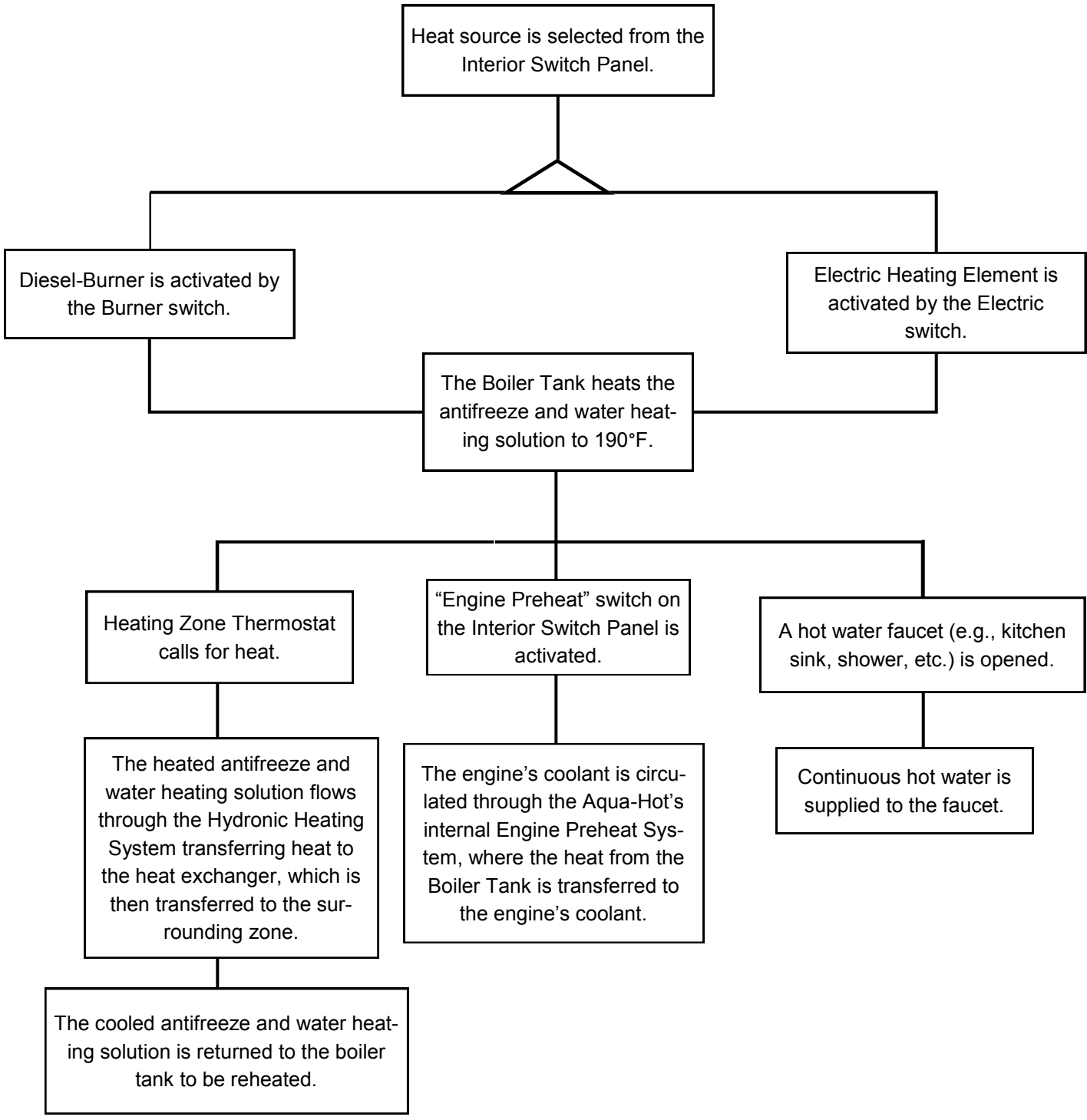
WARNING

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 diesel-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 diesel-burner and the indicator light located adjacent to the diesel-burner switch. Allow 10-20 minutes for the Aqua-Hot system to reach operating temperature. Please note that the diesel-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.



General Information

Your Aqua-Hot 600 series unit will contain a Reporter unit, which serves to replace the electronic controller in all new units.

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

1. Verify that the Aqua-Hot's access cover is securely installed. Reference page 7 (part #2). 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 Care & Maintenance section of this guide for refilling instructions.
4. Check the Aqua-Hot Reporter faults screen and if any, record all fault conditions which have occurred.

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 our web site at www.aquahot.com.

If the Aqua-Hot's diesel-burner switch "Indicator Light" does not illuminate and the diesel-burner is not functioning, locate the Reporter and check the following:

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

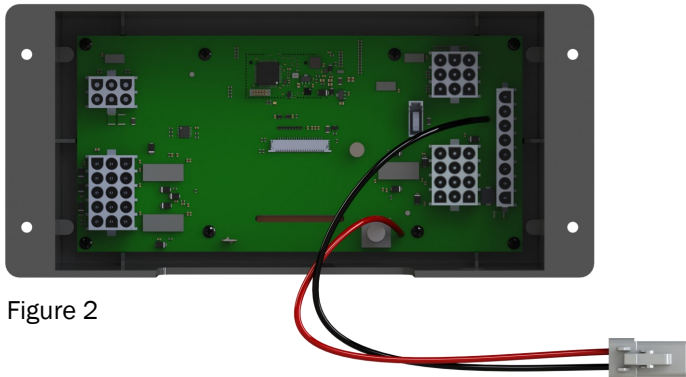


Figure 2

Reporter Diagnosis

1. Check the Reporter fault screen for any fault conditions associated with this unit (Figure 1.) Record these conditions.
2. Check for loose wire connections on the Reporter by removing the four bolts or screws securing the housing to its mounting position. It may be necessary to check with your coach manufacturer to determine the best way to remove the Reporter.
3. Remove the Reporter and ensure that all connections are secured, and that the wires are in good condition Reference Figure 2.
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 our web site at www.aquahot.com.

The Aqua-Hot Reporter contains both a fault page, and a fault log. The fault page contains information on faults that have occurred since the last time the Reporter was

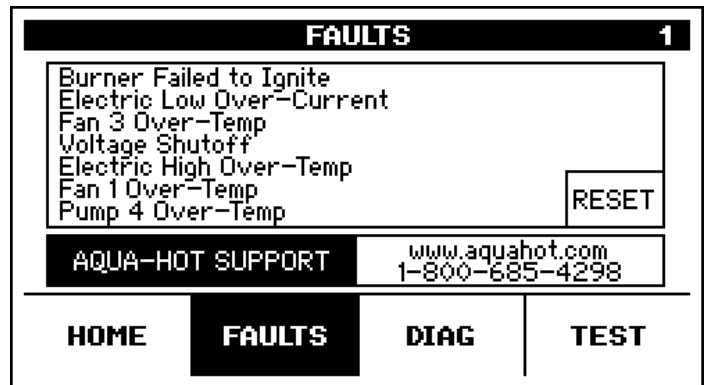


Figure 1

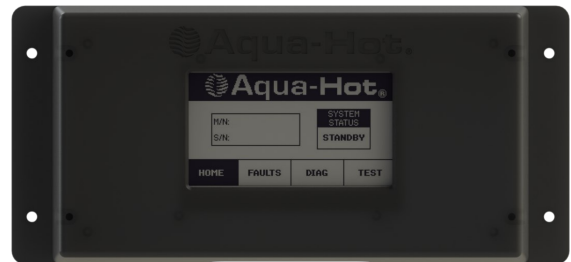


Figure 3

Testing Functionality

reset or power cycled. The fault log cannot be cleared and can contain up to four historic fault conditions not necessarily related to a present issue.

Fault Conditions

The Reporter will display the following fault conditions accompanied by the component which caused the fault (pump, fan, burner, etc.)

Over-Current

An Over-Current fault condition occurs when too much current is drawn by a component, usually a fan, or pump (output channel.) When this fault is triggered, the output channel is shut off until the Reporter has been reset or power cycled.

Over-Temperature

An over-temperature fault will occur only if your Aqua-Hot heating system has reached 210°F, triggering an over-temperature condition. The Reporter will deactivate the heater and display an over-temperature fault on the Reporter screen

Low Voltage

The Reporter is designed to operate between 11V Direct Current (DC), and 16V DC current. If the Reporter detects that it is receiving voltage below 11.8V DC, a System Voltage fault will trigger, and display on the screen. If the Reporter system drops below 11.2V DC for thirty (30) seconds, it will discontinue operation of your Aqua-Hot heating system.

Low Level Cut Off

If the system senses low fluid level, the heating system will shut down all fans, heat sources, and pumps until the unit is refilled.

Ignition Failure

An ignition failure fault occurs if for some reason the burner fails to ignite.

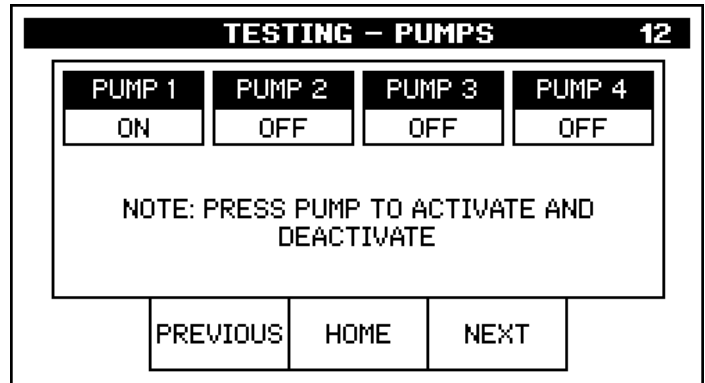
Test Functionality

The Reporter has been designed to include a host of test features allowing for quicker diagnosis and repair of components. Using the “PREVIOUS” and “NEXT” buttons on the test screen, it is possible to cycle between it is possible to activate burner and electrical subsystems, zone fans, and pumps. The tests are sorted into different screens; TESTING—PUMPS, TESTING—HEAT, TESTING—FANS. Only one screen of tests may be used at any one time. Starting a pump test, then switching to the TESTING—FANS screen will deactivate the pump test. In addition, the Reporter will “time-out” after five minutes of non-interaction, returning to the

home screen. This will disengage any tests currently in progress.

Pumps and Zone Fans

Pumps and zone fans are activated individually, and remain so until the Reporter times out, or the test is manually ended.



Heating Sub-systems

The Reporter will allow the electric and burner sub-systems to be activated and run for a maximum of five minutes to verify functionality of those systems. Please note that if used improperly, this testing tool could cause damage to your Aqua-Hot unit. If you have any questions, please don't hesitate to contact the Aqua-Hot technical support department at **1-800-685-4298**.

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 7 (part #15).

To locate the Tempering Valve, remove the access cover page 7 (part #2) and then the thermostat access cover located above the burner. Reference page 7 (part # 15). The pink paint witness mark verifies 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, please contact Aqua-Hot Heating Systems Technical Support Department at **1-800-685-4298** for additional assistance or visit the web site at www.aquahot.com.

Overview:

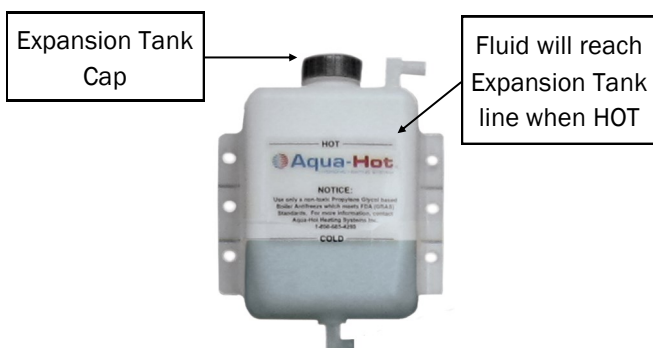
The Aqua-Hot system requires minimal maintenance if monthly, annual, and proper winterization procedures are followed accurately. It is extremely important to follow the instructions below precisely and carefully to receive the best results and promote the longevity of your Aqua-Hot. Monthly maintenance to the Aqua-Hot requires a visual check of the antifreeze and water solution to make sure it's at the correct operating level. Annual maintenance to the Aqua-Hot requires a replacement of two parts on the diesel-burner, the fuel nozzle and fuel filter. Winterization of an Aqua-Hot system prepares a motor home for storage during the winter months to prevent freezing pipes and other critical damage.

⚠ 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 hot vapor or coolant could result. Before cleaning or servicing, disconnect all power supplies.

Monthly:

It is extremely important to check the Aqua-Hot's anti-freeze and water heating solution to ensure it is at the proper level for operation. This task can be done by visibly checking the coolant level in the Aqua-Hot's expansion tank. At maximum operating temperature, the antifreeze and water heating solution should be at the level marked "HOT" on the expansion tank. The coolant level should be checked ONLY when the Aqua-Hot is at maximum operating temperature. Therefore, this procedure should be done immediately after the diesel-burner cycles OFF. Reference figure below. If it needs refilling, reference "Fluids" in the Care & Maintenance section.

**Annual:**

In order to keep the Aqua-Hot running at its full potential, it's highly recommended to have the diesel-burner tuned up annually. This tune up consists of a new fuel nozzle (Part Number: WPX-886-41A) and fuel filter (Part Number: FLE-120-100). To ensure maximum diesel-burner performance, always use the recommended fuel nozzle and fuel filter when replacing these parts. Reference the Aqua-Hot's Service and Parts Manual for spare parts information and detailed replacement attachments.

Winterization:

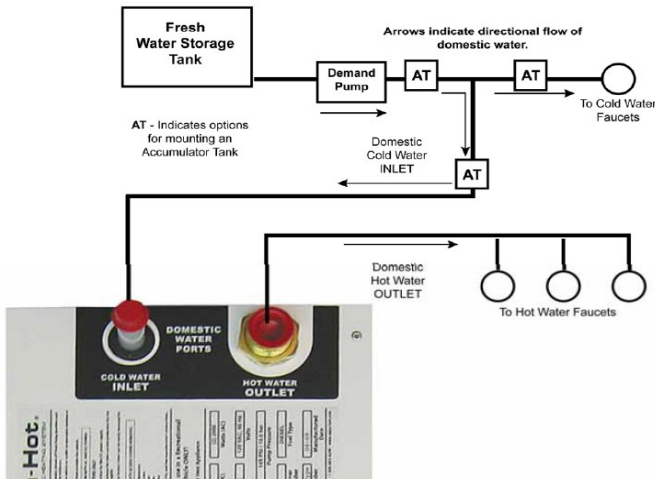
When it's time to store a motor home for the winter months or when freezing temperatures are expected, it's crucial to properly winterize the Aqua-Hot to avoid serious damage, requiring a complete system replacement not covered under the Aqua-Hot Limited Warranty Statement. The process of winterization consists of completely draining the domestic water from the system and pumping RV winterization antifreeze through to flush out the system.

⚠ WARNING

*Not winterizing the Aqua-Hot when freezing temperatures 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.*

Please follow these instructions carefully when winterizing the Aqua-Hot's hot water heating system:

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 pump.
4. Place the opposite end of the hose into an adequate supply of the RV antifreeze, "GRAS" by the FDA and allow this to pump through the system.
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 from the RV antifreeze and reconnect the domestic water demand pump's suction line to the fresh water storage tank.



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 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.

Fluids:

Overview:

When the antifreeze and water heating solution needs replenishing, remove the expansion tank's cap and fill to the "HOT" level mark. When refilling, open the air release valve located on the expansion tank connection to release air pockets. Be sure the valve is closed when finished by hand tightening.

Types:

Due to the significant impact of various types of antifreeze on the Aqua-Hot system, it is necessary to provide a thorough explanation regarding what should and should not be used. It's very important use the correct type of antifreeze for adequate operation and condition of the Aqua-Hot System. The necessary type of antifreeze is propylene glycol based "boiler" type deemed "Generally Recognized as Safe" by the FDA. Propylene glycol is a safer alternative to the more toxic ethylene glycol antifreeze.

RV and Marine antifreeze types are propylene glycol based, but formulated specifically for "winterizing" application ONLY. Although RV and Marine antifreeze are often "Generally Recognized as Safe" by the FDA, it should never be used in the Aqua-Hot System because it's not formulated to transfer heat, which is absolutely essential for the functionality of the Aqua-Hot.

Automotive Antifreeze/Coolant types of antifreeze are propylene glycol based and formulated specifically to protect the automotive engines against, corrosion, freezing temperatures, and overheating. In addition, they have excellent heat transfer and thermal conductivity characteristics. Although these types of antifreeze are considered less toxic and safer than ethylene glycol, they are not "Generally Recognized as Safe" by the FDA. Therefore, they must be marked with "harmful if swallowed" warning label. Due to the potentially hazardous properties, Automotive Antifreeze/Coolant should NEVER be used in an Aqua-Hot System.

Mixture Recommendations:

To ensure maximum performance and longevity of the Aqua-Hot system, it has been determined to use distilled, de-ionized, or soft water in combination with concentrated propylene glycol for the antifreeze and water heating solution. Concentrated propylene glycol should be diluted with high-quality (distilled, diluted, or soft) water, which is 80 ppm or less in total hardness. In order to find this information, the local water agency should have up-to-date water quality reports, which will indicate if the local tap water meets the requirements.

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 turn acidic, which can corrode the Aqua-Hot's boiler tank and associated components premature-

ly. Keep in mind that using high-quality water is only necessary for mixing concentrated propylene glycol antifreeze with water. Suppliers of premixed antifreeze are responsible to use distilled, de-ionized, or soft water when preparing their antifreeze, so consumers shouldn't have to worry about it.

Mixture Ratios:

Technical Information:

Propylene glycol based (PPG) antifreeze has three major functions including freeze, boiling, and rust/anti-corrosive protection. PPG antifreeze solution is also primarily responsible for heat transfer; however, propylene glycol itself does not have 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 30-50% propylene glycol is recommended to provide the best performance combination. If the antifreeze and water heating solution contains over 70% propylene glycol, the freezing point is actually increased, resulting in less freeze protection. A perfect 50/50 mixture of water to propylene glycol, "GRAS" by the FDA antifreeze is recommended, which will result in a freeze point of -28°F and a boiling point of approximately 222°F. Please reference the graphical representation regarding the percentage of antifreeze to water and how it directly affects the solution's freezing point.

Freeze 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 ambient temperature continues to decline, the water in the solution will attempt to attain a solid state. The point at which the water begins to solidify is called the "freeze point". Although the water solution has begun to freeze, producing a "slushy" consistency, the antifreeze in the solution will continue to combat 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 and other components. The burst point of the antifreeze and the water heating solution is dependent upon the brand of propylene glycol antifreeze employed.

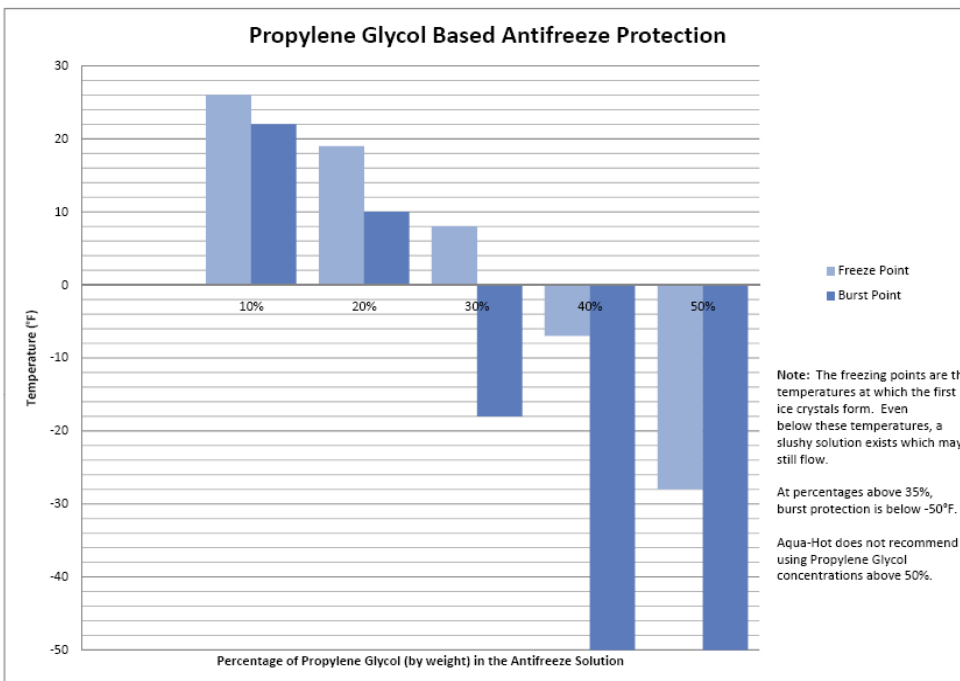
Boiling Point:

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. At this point, the liquid turns to 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 motor home 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 protection to the internal metal components of the Aqua-Hot hydronic heating system for 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.



Using the Refractometer to Test Antifreeze Sample

Aqua-Hot Part Number MSX-907-162



! WARNING

Use extreme caution in gathering your antifreeze sample. When draining the Aqua-Hot heating system, extremely hot liquid may be in the boiler tank and could cause personal injury.

NOTE: Refractometers may have more than one scale. Make sure you are reading the scale marked "Propylene" for measuring the antifreeze solution in the Aqua-Hot System.

Basic Operation

The diagram illustrates the basic operation in three parts. On the left, a pipette is shown adding liquid to the refractometer's prism. Below this are three small diagrams labeled 'Poor', 'Poor', and 'Good' showing the spread of the liquid on the prism. In the middle, a light source is shown illuminating the instrument, with a circular field of view shown below it. On the right, a detailed view of the circular field shows two scales: 'BATTERY FLUID' on the left and 'PROPYLENE GLYCOL' on the right. A horizontal 'Boundary Line' is drawn across the scales, with a note 'Adjust to 32°F'. The field is divided into an 'Upper Blue Field' and a 'Lower White Field'.

Step 1:

Open daylight plate, and place 2 to 3 drops of the sample on the main prism. Close the daylight plate so the liquid sample spreads across the entire surface of the prism without air bubble or dry spots. Allow the sample to rest on the prism for approximately 30 seconds before going to step 2. (This allows the sample to adjust to the ambient temperature of the refractometer).

Step 2:

Hold daylight plate in the direction of a light source and look into the eye piece. You will see a circular field with graduations down the center (you may have to focus the eye-piece to clearly see the graduations). The upper portion of the field should be blue, while the lower portion should be white.

Step 3:

Take the reading where the boundary line of the blue and white cross the graduate scale. The scale will provide a reading of the freezing point of anti-freeze solution and the propylene glycol concentration. Clean the prism carefully using a damp soft cloth. Do NOT immerse in water.

DATE	SERVICE PERFORMED	SERVICE CENTER

DATE	SERVICE PERFORMED	SERVICE CENTER

Warranty

600 SERIES



600D04 and 675D04

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-907-900 Rev. A

600 SERIES



600D04 and 675D04
with



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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