

Use and Care Guide

400 Series



AHE-450-DE5



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: Comfortable Hot Water

Take showers knowing that your tank-less Aqua-Hot is ready and waiting to deliver hot water. 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: Large Service Networks

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 coach 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. 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 system.

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



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



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



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 should be observed.

Read all instructions before operating 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 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 standards it has been tested, and important safety notices.
- 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.
- Have your dealer show you the location and operation of all switch functions and valve settings.
- Propylene glycol “Generally Recognized As Safe” by the FDA, must be utilized for the antifreeze 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 & Marine antifreeze specifically for “winterizing” application only.



- At maximum operating temperature, the coolant will be very hot and scalding. Hot vapor or coolant may cause in serious burns or injury. Be aware of hot surfaces.
- The hot water temperature is set at the mixing valve to 120°F 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 element without antifreeze and 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.
- 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.



Safety Features

Low-Voltage Shutdown

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

Over-Current

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

Over-Temperature

An over-temperature fault will occur if your Aqua-Hot heating system has reached 218°F. The Reporter will deactivate the heater and display an over-temperature fault on the display screen.

Low-Level Cutoff

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

Reporter “Heartbeat Function”

The Reporter units with firmware 1v5 and later and all Reporter 2.0 units are equipped with a “heartbeat” function that establishes a signal between the RV-C system and the Reporter. The Reporter constantly awaits for a signal from the RV-C network indicating to the Reporter that it is to continue normal operation. Loss of 6 consecutive signals from the RV-C network will trigger the Reporter to deactivate the Aqua-Hot. Once power is restored to the coach and the Reporter, “BATTERY DISCONNECT SWITCH OFF” will be displayed in the fault log, indicating that the Reporter lost connectivity with the RV-C network.

Manual Mode

The 2.0 Reporters with CFG 1.9 and greater come with a manual mode in case the general coach RV-C network fails. It will allow for limited operation while the larger network/module problem is addressed.

Interlock Switch

The Aqua-Hot 450D is equipped with an interlock switch that prevents the heater from operating when the cover is not installed in the correct position or if it is not properly secured in place. This is a safety device to ensure the burner will not ignite if the service panel is not properly secured.

System Overview

The Aqua-Hot 450D is a Hydronic (water-based) Heating System, a tank-less hot water system, and a diesel engine preheating system.

The heating system provides moist, quiet, comfortable, interior heat with up to 5 separate, thermostatically-controlled temperature zones, and prevents tank and line freezing in the bays.

The tank-less hot water system produces 90 gallons per hour of continuous, on-demand hot water.

The diesel engine preheating system circulates the engine's antifreeze solution through an internal heating loop in the Aqua-Hot and pumps it back through the engine, raising the engine's temperature from 30°F to 90°F in about 1 hour.

The same heating loop that preheats the diesel engine allows the Aqua-Hot system to take surplus heat generated by the motor home's diesel engine while running, and use it to heat the Aqua-Hot system.

This TribridHot™ designated system uses one or a combination of heat sources to heat FDA-Approved Generally Recognized As Safe ("GRAS") **Propylene Glycol**-based antifreeze solution in the Aqua-Hot's boiler tank.

The 450D has multiple heating sources: the motor home's engine's surplus heat (while driving), one 120V AC - 1650W Electric Element (when plugged into shore power), and a 12V DC powered diesel burner (when dry camping). These heat sources can be used separately or simultaneously.



New Low Emissions Technology virtually eliminates smoke and odor from the exhaust by reducing total hydrocarbon emission by 82%, making Aqua-Hot the cleanest burning diesel-powered hydronic heating system available.

Should additional assistance be needed, please contact the Technical Support at 574-AIR-XCEL (574-247-9235), Monday through Friday, between 7:00am and 4:00pm MST.

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 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.
- This heating system has been certified for installation only in recreational vehicles, not certified for use in boats.
- The Aqua-Hot heating system operates independently of the vehicle engine and is connected directly to the electrical system of the vehicle.
- Please read this manual and follow instructions to avoid injuries during installation and/or operation.

Hot Water Priority System

The Aqua-Hot 450D is a Hot Water Priority heating system. Meaning that the 450D cannot heat the interior of the coach and produce hot water simultaneously. When hot water is being used, the interior heating system will shut off temporarily, until hot water is no longer being used.

When hot water is requested, domestic water from the coach's fresh water tank is transported through a copper coil in the Aqua-Hot's boiler tank where heat is transferred 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.



Figure 1

System 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 a 4-in-1 system

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

1. **120V AC Electric Element:** When plugged into shore power, the element lets you use the power you are already paying for to provide heat and light duty hot water.
2. **Diesel Burner:** This is the Aqua-Hot's most powerful heat source and provides all of the 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 **574-AIR-XCEL (574-247-9235)**, or visit the web site at **www.aquahot.com**.

NOTE: Service parts and accessories are available through Aqua-Hot Factory Authorized Service Centers or 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.
THIS APPLIANCE OPERATES ON BOTH AC AND DC POWER.
USE COPPER CONDUCTORS ONLY!
 Use a 25-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.

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

Minimum Heater Clearances
 Front - Open Access
 Back - 0 Inches
 Top - 0 Inches
 Sides - 0 Inches

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



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
Max Watts (DC)	174
Max Watts (AC)	1650
Nozzle Size/Angle	.35/60
Volts	12 VDC
Volts	120VAC, 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 Number: 106642
 Model Number: AHE-450-DE5
 Heater Serial Number: A450D-1850005

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

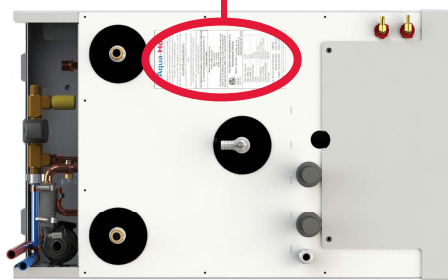


Figure 2

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

1. Drain Valve	14. Wiring Harness Port
2. Zone 1 Circulation Pump	15. Aqua-Hot Reporter
3. Zone 2 Circulation Pump	16. Domestic Water Coil
4. Diesel Burner Controller	17. Heating Loop Coil
5. Combustion Air Sleeve	18. Engine Preheat Outlet
6. Diesel Burner	19. Air Release Valve
7. Diesel Fuel Lines	20. Engine Preheat Circulation Pump
8. Interlock Switch	21. Engine Preheat Inlet
9. VAC Access Panel	22. Domestic Cold Water Inlet
10. AC Terminal Block	23. Domestic Hot Water Outlet
11. AC Terminal Port	24. Tempering Valve
12. Heating Zone 1 Outlet	
13. Heating Zone 2 Outlet	



Figure 3

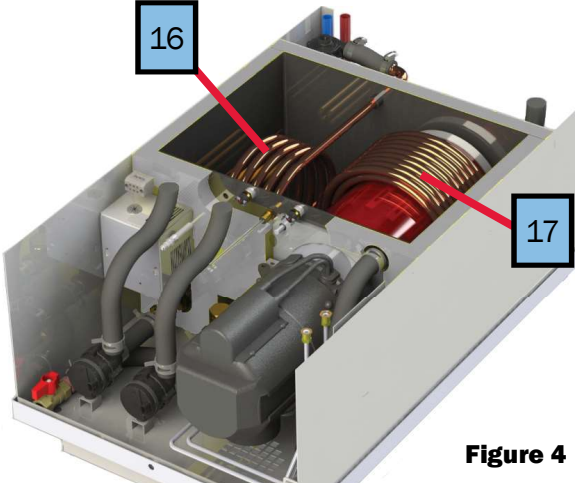


Figure 4

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

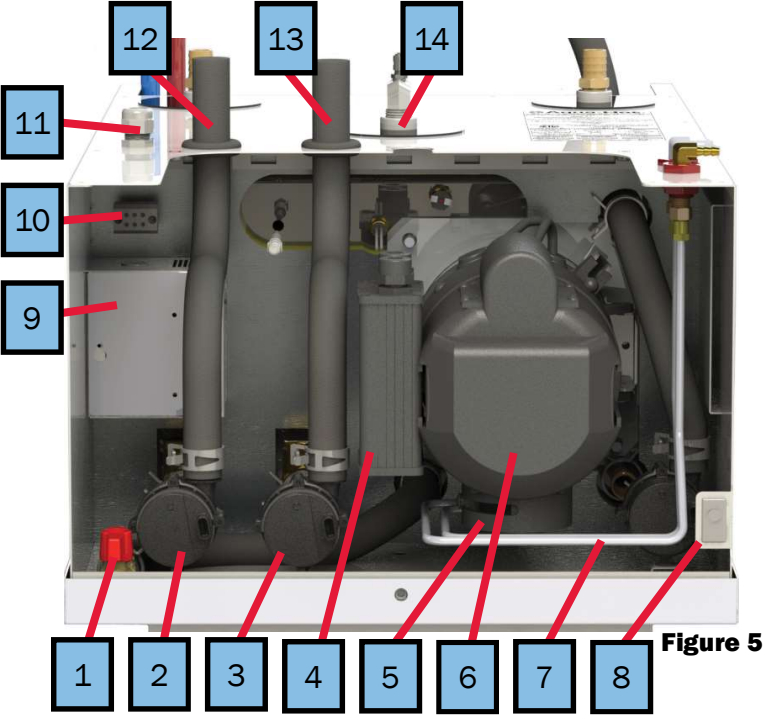


Figure 5

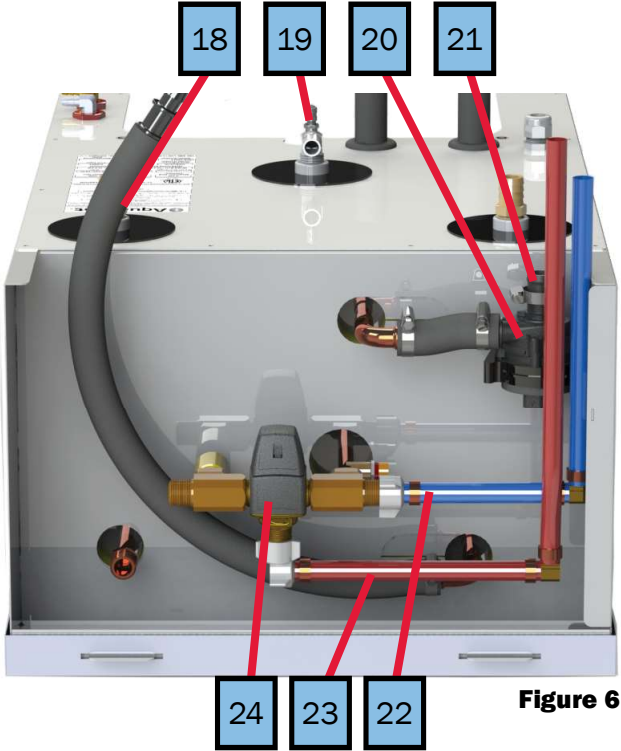


Figure 6

Controls Overview

NOTICE

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

Coach Control Panel Screen:

Newer Aqua-Hot units that come equipped with the Reporter may have a coach touch-screen display instead of the interior switch panel. Please confirm with your coach dealer or vehicle manufacturer the location and functionality of your interior control screen.

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 motor home dealer for the exact location of switch operations. See below for an example of the interior switch panel.



Figure 7

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 coach dealer for exact location of thermostat controls.

Heating Operation:

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

- **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 or by tapping the burner to ON on the coach display screen.
- **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, or by tapping the electric to ON on the coach display screen.
- **Engine Preheat** - In order to use the Engine Preheat element on the Aqua-Hot system, both the diesel-burner AND the engine preheat must be turned ON. Allow the engine preheat element to function for one hour before starting the vehicle's engine.

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 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 coach.

NOTICE

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

Domestic Hot Water 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 coach. Instead, when the burner and/or electric element is ON and the Aqua-Hot is at operating temperature, the water is automatically heated as it is being used. Therefore, simply open a hot water faucet once system is up to operating temperature, and a continuous supply of hot water will be present within a few seconds.

To operate the Aqua-Hot hot water system, you will need to locate the interior switch panel or coach control panel located inside your coach. If you are unable to locate the interior panel, contact your dealer to guide you in the location and operation of all switch operations. Once you have located the interior control panel, turn the burner to ON. This action will activate the diesel-burner. 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 ON. This action will activate the 120 Volt-AC electric heating element. 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.

Some coaches may be equipped with touch-screen panels in lieu of the Aqua-Hot three-switch panel. If you are unsure if your coach is equipped with touch screen controls, please contact your coach manufacturer.

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 as shown in Figure 8.

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 574-AIR-XCEL (574-247-9235) for additional assistance or visit our web site at www.aquahot.com.

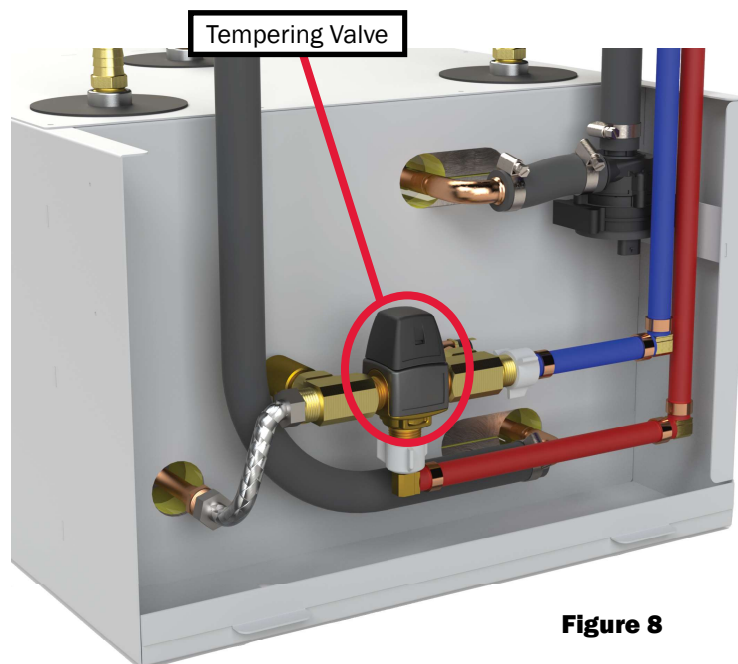
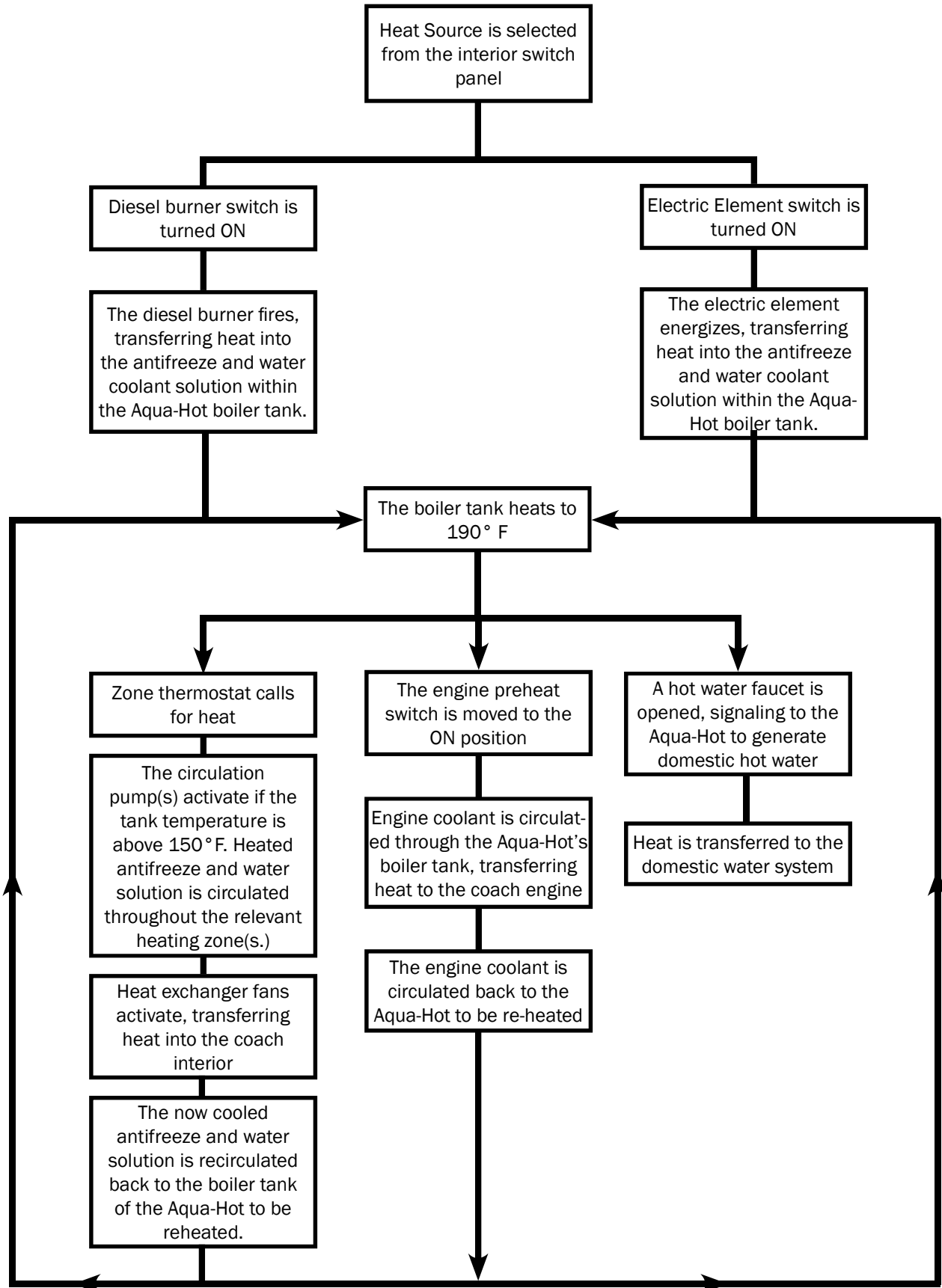


Figure 8


Operational Flow Chart



Maintenance Schedule

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 coach 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 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.


Monthly:

It is extremely important to check the Aqua-Hot's antifreeze 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.

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.

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.



WARNING

DO NOT operate the diesel 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.

Overheat Protection

Every Aqua-Hot is equipped with at least two overheat protection devices. These are commonly known as the high-limit thermostats. These thermostats operate by maintaining a circuit while the unit is below 218° F (103° C).

In the event of an overheat condition, the high limit thermostats will cut the operating signal to the diesel burner and/or the electric element. When this signal is interrupted, the electric element and diesel burner will immediately disengage. Contact Aqua-Hot Heating Systems LLC for assistance in locating a qualified person to service this heater.



WARNING

DO NOT attempt to reset the high-limit thermostats after an overheat condition until the unit has been serviced by a qualified technician. Failure to do so could result in damage to the unit, personal injury, or death.

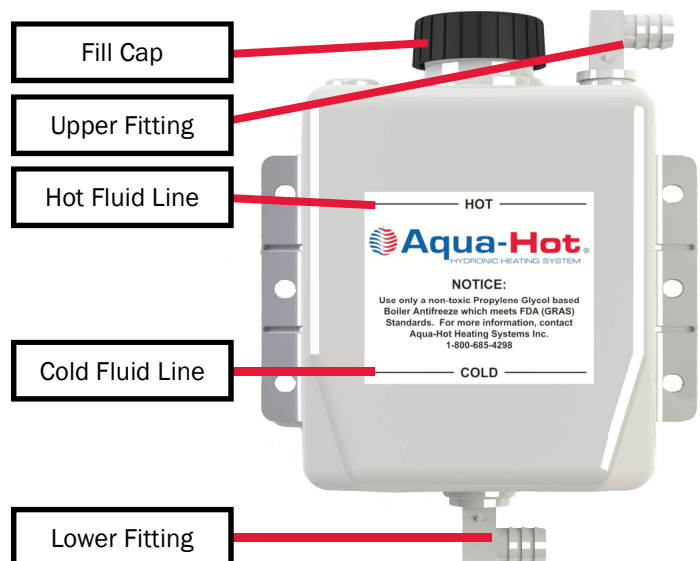


Figure 9

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.

Please follow these instructions when winterizing the Aqua-Hot domestic water heating system. Reference Figure 10 for a system overview.

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

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" Generally Recognized As Safe 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 only non-toxic RV antifreeze (FDA approved "GRAS" antifreeze) rated for winterization is used when winterizing this unit. The warranty does not cover freeze damage.

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.

NOTICE

Disinfecting the Domestic Water System

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 system, be sure to follow NFPA 1192 Standard on Recreational Vehicles "Instructions for Disinfection of Potable Water Systems" or any other applicable local standards for 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.

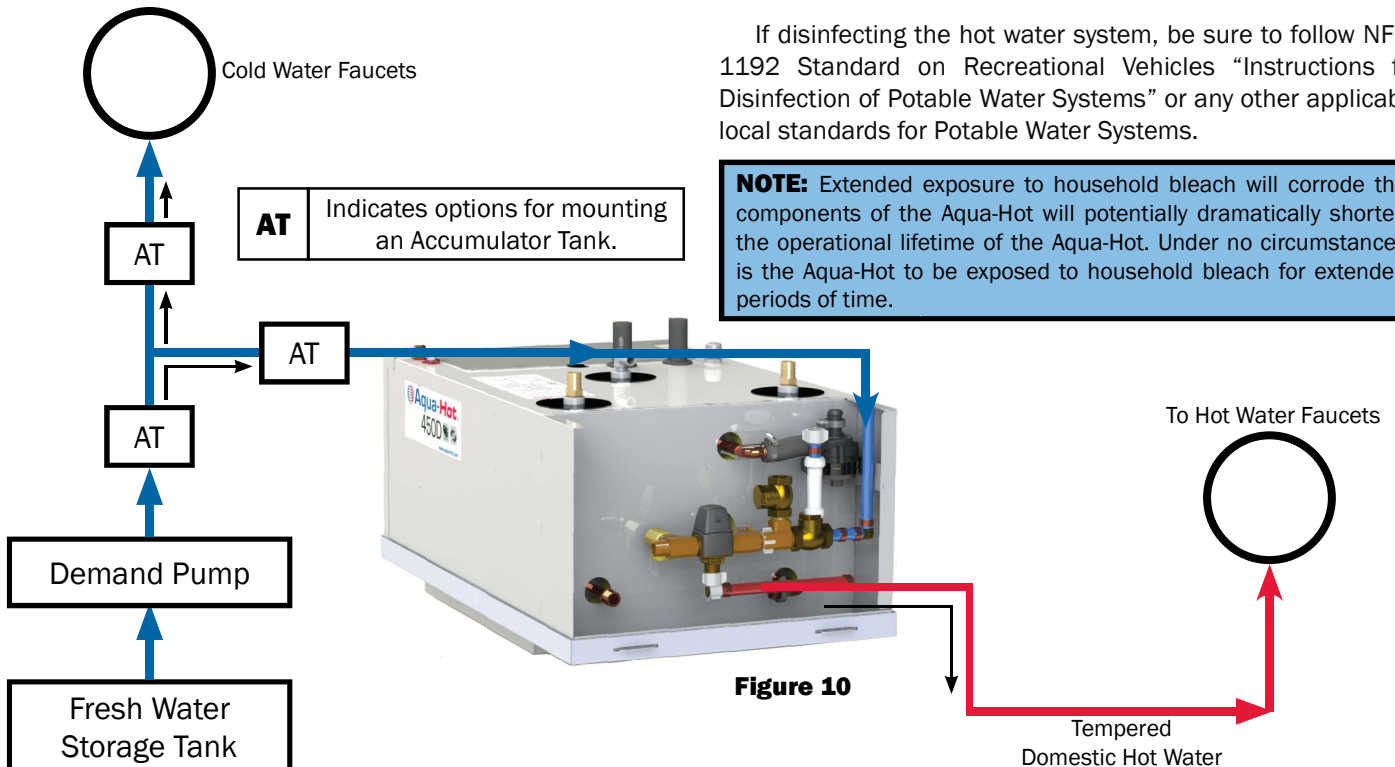


Figure 10

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.

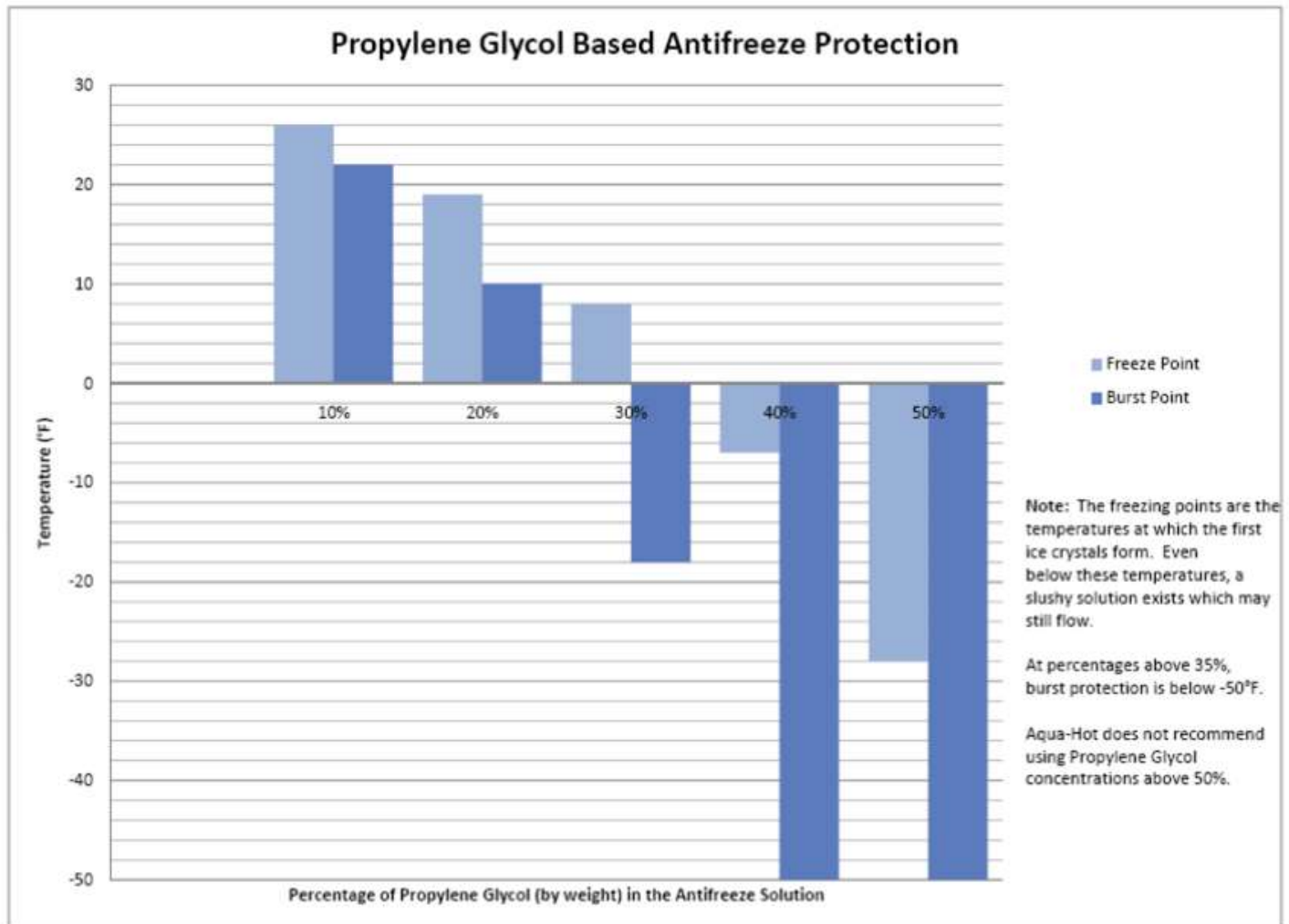
Summary

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

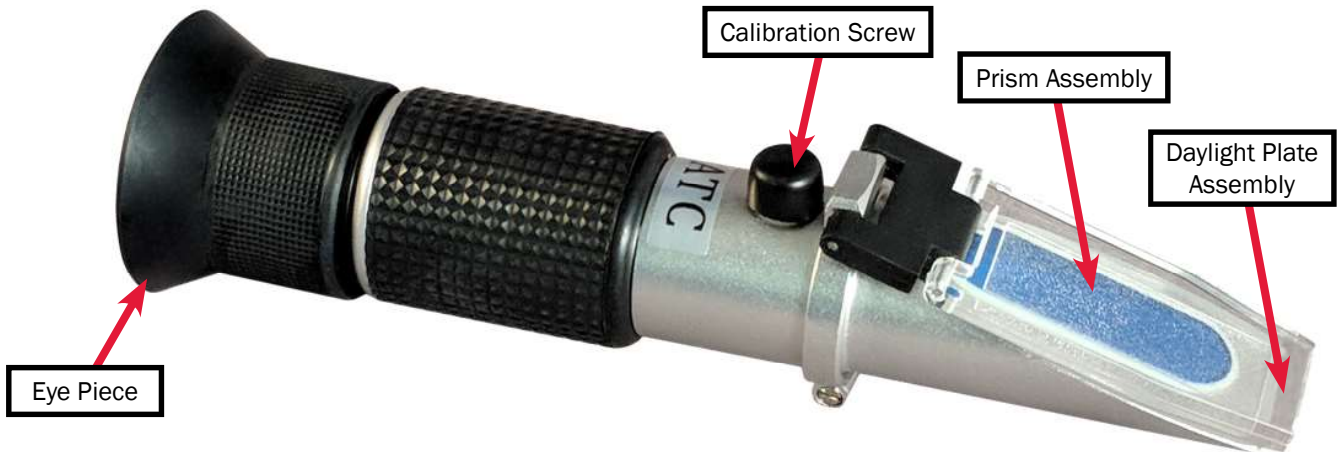
Propylene glycol antifreeze solution is also primarily responsible for heat transfer; however, propylene glycol itself does not possess acceptable heat transfer characteristics.

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

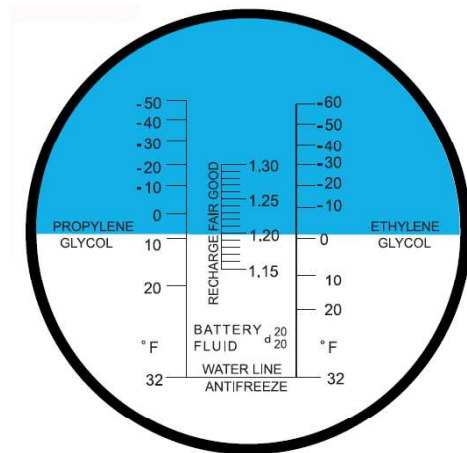


Properly Apply Antifreeze to the Prism Assembly

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.

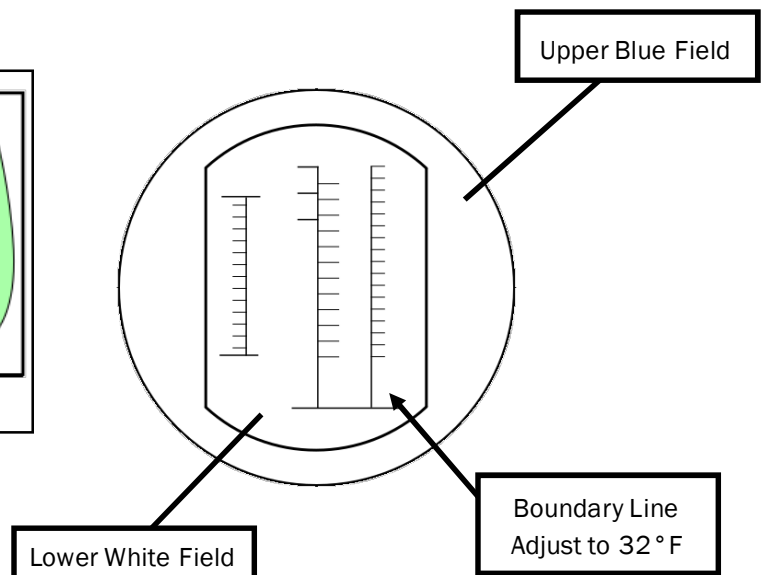
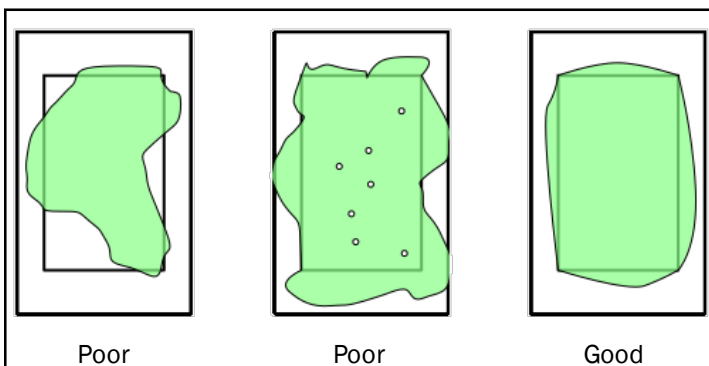
Adjust the Boundary Line

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



General Troubleshooting

NOTE: The Reporter 2.0 (CFG 1.9 or higher) comes with Manual Mode in case of a network failure. Please refer to Page 19 for more information regarding use and operation.

Your new Aqua-Hot 450D contains the Aqua-Hot Reporter, a replacement for our previous electronic controllers.

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 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 $\frac{1}{4}$ 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 for any faults, 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 574-AIR-XCEL (574-247-9235) for additional assistance or visit our website at www.aquahot.com.

If the Aqua-Hot's diesel burner switch "light" (on the interior switch panel) does not illuminate and the diesel burner is not functioning, locate the Reporter and check the following items.

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

Reporter Diagnosis:

1. Check the Reporter fault screen for any fault conditions associated with this unit. Record these conditions.
2. Check for loose wire connections on the Reporter by removing the four bolts/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. Do NOT remove the circuit board from the housing.
3. Remove the Reporter and ensure that all connections are secured, and that the wires are in good condition Reference Figure 11.
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 574-AIR-XCEL (574-247-9235) 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 reset or power-cycled. The fault log cannot be cleared and it can contain up to four historic fault conditions, not necessarily related to a present issue.

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

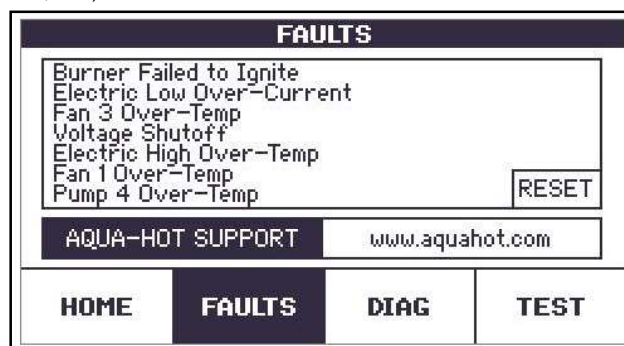


Figure 12

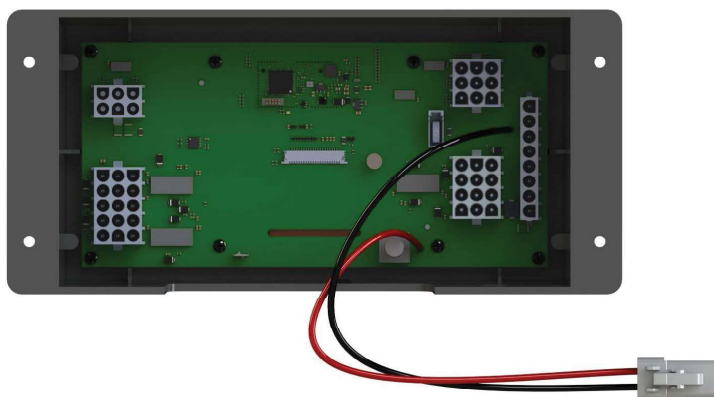


Figure 11



Figure 13

Testing Functionality

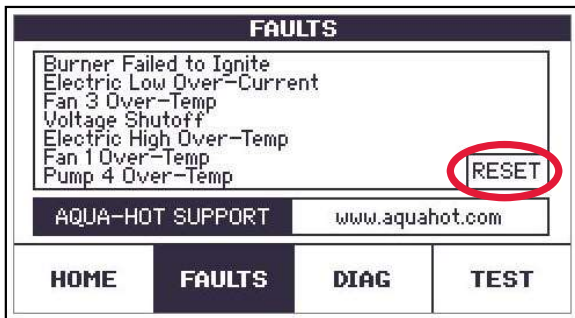


Figure 14

Reset Feature

The RESET button shown above on the Reporter fault screen can be used to reset the Reporter after a component has been changed or modified. Some components will require a full power-cycle in order to fully reset the Aqua-Hot system.

Over-Current

An over-current fault condition occurs when too much current is drawn by a component (output channel), usually a fan or pump. When an over-current condition occurs, the Reporter will deactivate the over-current component as a safety measure to prevent damage. This fault can only be cleared once the Reporter has been reset. Please note, that if the responsible component is not repaired or replaced, it can continually cause over-current fault conditions, thereby impacting the functionality of the Aqua-Hot unit.

Over-Temperature (Reporter 2.0)

The Over-Temperature fault condition occurs when the tank temperature sensor indicates that the unit has overheated. An overheat is realized when the antifreeze and water heating solution within the Aqua-Hot exceeds 210°F.

Low-Voltage

The Reporter is designed to operate between 11V Direct Current (DC) and 16V DC. If the Reporter detects that it is receiving less than 11.8V DC, it will display a low-voltage fault. If the Reporter drops below 11.2V DC for more than 30 seconds, a safety mechanism will activate, shutting down the Aqua-Hot.

Low-Level Cut Off

Aqua-Hot units require a minimum amount of antifreeze in order to function correctly. Keep in mind that the exact fluid volume may differ depending on the layout of your coach. If the heater drops below the minimum fill level as indicated on the expansion bottle, the Reporter will shut down all fans,

pumps, and heat sources until the unit has been refilled and the Reporter has been reset.

Ignition Failure

Ignition failure fault conditions will occur if the burner inside the heater fails to ignite. This is all the fault condition will display. Precise diagnosis herein will require in-depth troubleshooting.

Testing Functionality

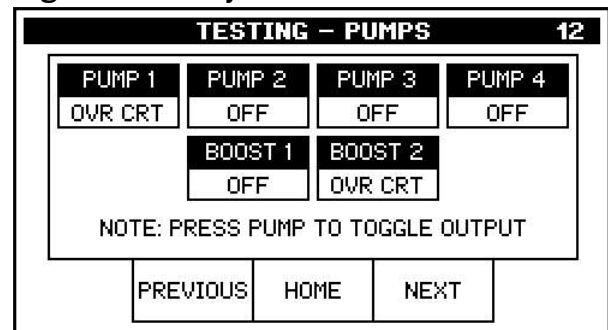


Figure 15

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 the 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.

Pump and Zone Fans

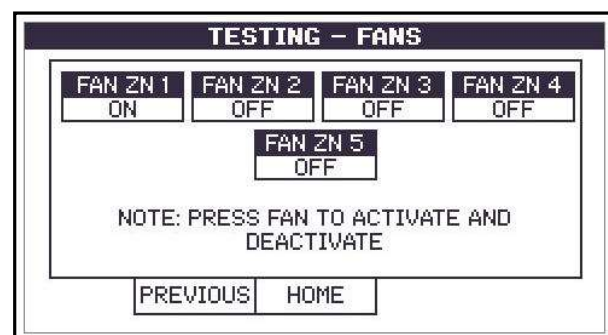


Figure 16

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

Heating Subsystems

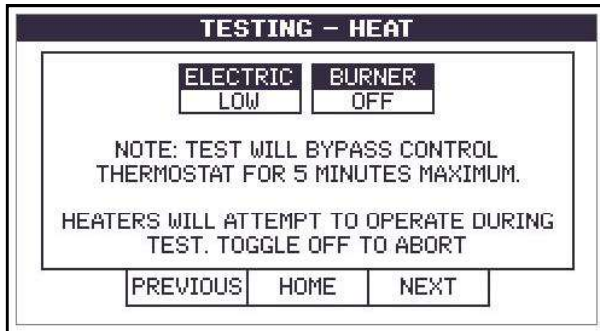


Figure 17

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 and the heating subsystem test is NOT a replacement for standard unit operation. If you have any questions, please don't hesitate to contact the Aqua-Hot technical support department at 574-AIR-XCEL (574-247-9235).



Heartbeat Function

Aqua-Hot Reporter units with firmware 1v5 and later and all Reporter 2.0 units are equipped with a "heartbeat" function that establishes a signal between the RV-C system and the Reporter.

The Reporter will be constantly awaiting a signal from the RVC network indicating to the Reporter that it is to continue normal operation. Loss of 6 consecutive signals from the RVC network will trigger the Reporter to deactivate the Aqua-Hot. This serves as a safety feature to ensure that the Aqua-Hot does not continue to operate if the coach loses power. Once power is restored to the coach and the Reporter unit, "BATTERY DISCONNECT SWITCH OFF" will be displayed in the fault log, indicating that the Reporter has lost connectivity with the RVC network.

RVC Network Connectivity



Figure 18

The Aqua-Hot 450D comes equipped with the Reporter. The previously used electronic control board has been retired on new units in favor of the Reporter. The Reporter is designed to interface with the coach-side RVC network to aid in the Aqua-Hot's integration into the on-board RVC network.

There is an indicator light on the back of the Reporter which shows the current status of the Reporter's connection to the RVC network. This will be useful when diagnosing potential problems with the coach-side RVC network.

LED Activity		Status
		Solid Green Reporter is connected to network and communicating properly
		OFF Reporter has no power, or has failed completely
		Solid Red Reporter has gone offline and is not connected to network
		Flashing Green (4/second) Reporter is attempting to make an initial connection to the network
		Flashing Green (1/second) The Reporter is online, but it has not received a valid network message for at least 5 seconds
		Alternating Red and Orange Reporter has gone offline and is attempting to re-connect (within 30 seconds)
		Alternating Green and Orange Reporter is currently online but has gone offline 2 or more times.

Manual Mode

The 2.0 Reporters with CFG 1.9 and greater come with a manual mode in case the general coach RVC network fails. It will allow for limited operation while the larger network/module problem is addressed.

To determine the version of Reporter, the Reporter 2.0 modules are shipped with version decals affixed to the back of the circuit board, OR shown on the home screen - "FW: 2.0".

This mode can be accessed under the test page of the Aqua-Hot Reporter (see below).

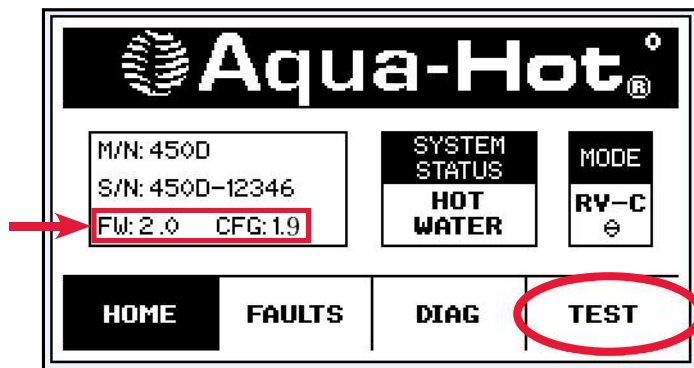


Figure 19

Once the test page is open, select the MANUAL MODE and select "NEXT". Manual mode will continue to run for up to 3 days without any user intervention. Pressing the reset button at any time while enabled will reset the timer, and run for an additional 3 days.

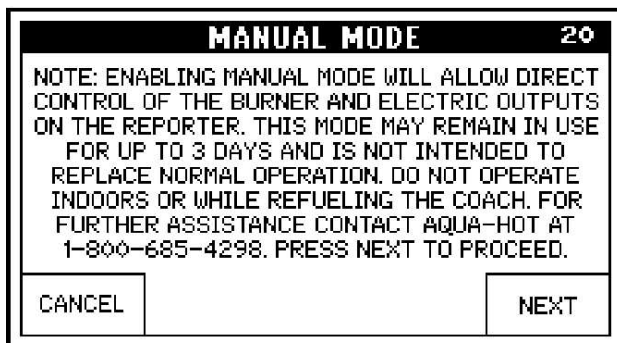


Figure 20

All heating zones are linked together and can be run at 25%, 50%, 75%, and 100% (as shown below). The burner and electric can be enabled or disabled. For all levels, there is a 10 minute duty cycle period that will allow Cozy fans to be on for the specified percentage of 10 minutes. Example, 25% would be on for 2.5 minutes, and then off for 7.5 minutes. It always starts with the on-cycle, then shuts off for the remainder of the 10 minute period.

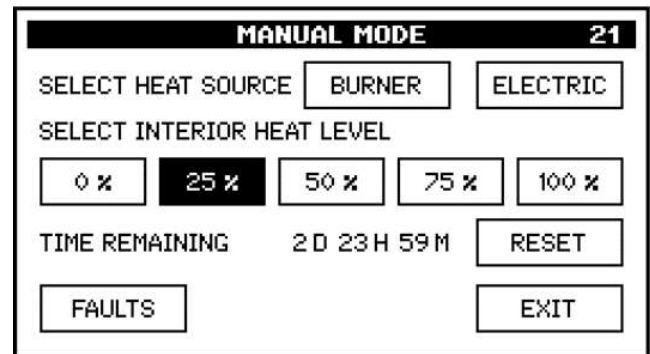


Figure 21

If the system power is cycled, the manual mode will be disabled and must be manually reactivated. Leaving the manual mode page will also disable manual mode and restore normal operation. Leaving manual mode should be done once the system failure has been resolved and normal operation can resume.

NOTE: If using the rocker switches, burner & electric switches must be toggled on/off after leaving Manual Mode.

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-100-100

400 SERIES

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An AIRXCEL Brand



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