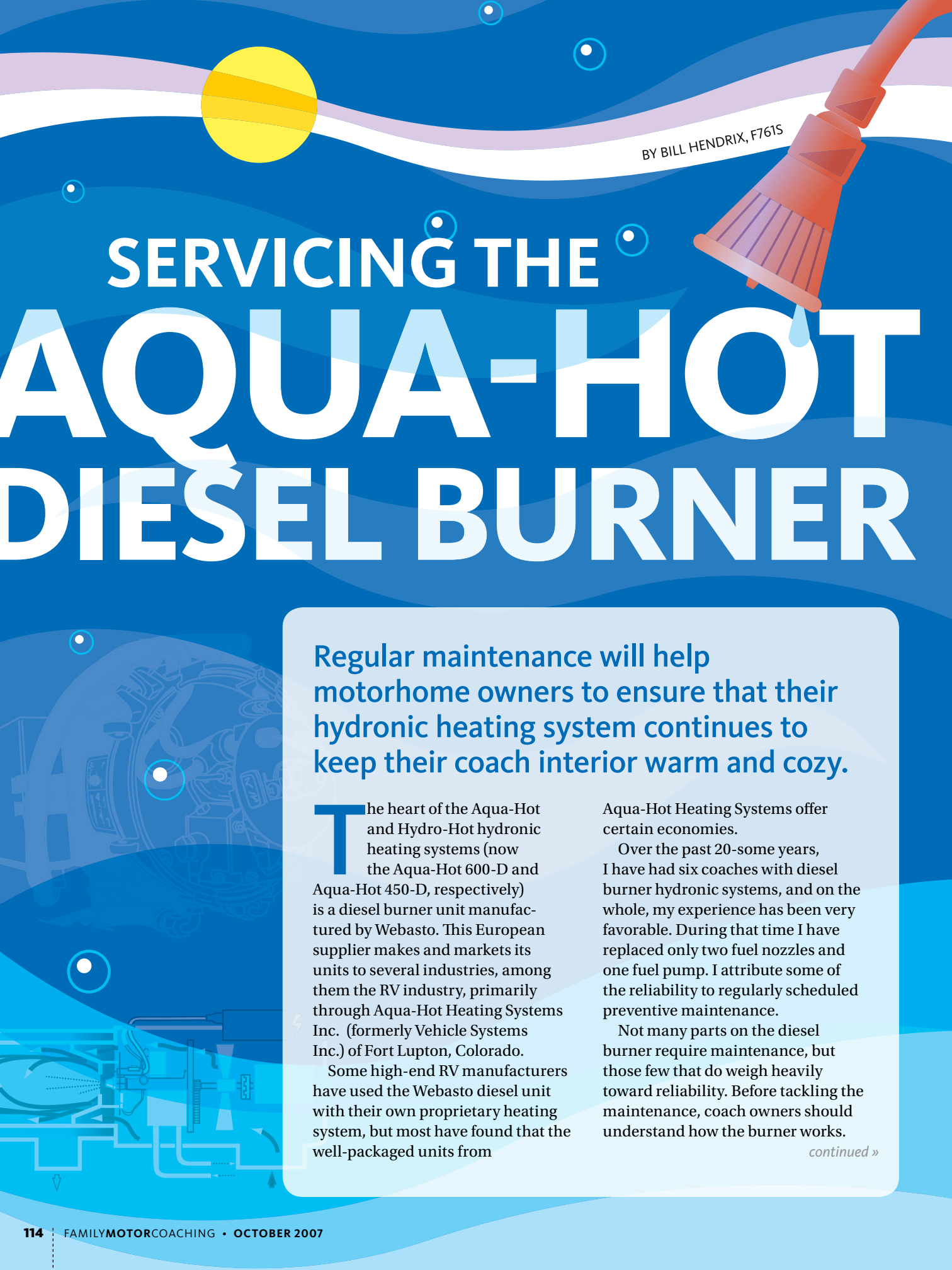




BY BILL HENDRIX, F761S

SERVICING THE AQUA-HOT DIESEL BURNER

Regular maintenance will help motorhome owners to ensure that their hydronic heating system continues to keep their coach interior warm and cozy.

The heart of the Aqua-Hot and Hydro-Hot hydronic heating systems (now the Aqua-Hot 600-D and Aqua-Hot 450-D, respectively) is a diesel burner unit manufactured by Webasto. This European supplier makes and markets its units to several industries, among them the RV industry, primarily through Aqua-Hot Heating Systems Inc. (formerly Vehicle Systems Inc.) of Fort Lupton, Colorado.

Some high-end RV manufacturers have used the Webasto diesel unit with their own proprietary heating system, but most have found that the well-packaged units from

Aqua-Hot Heating Systems offer certain economies.

Over the past 20-some years, I have had six coaches with diesel burner hydronic systems, and on the whole, my experience has been very favorable. During that time I have replaced only two fuel nozzles and one fuel pump. I attribute some of the reliability to regularly scheduled preventive maintenance.

Not many parts on the diesel burner require maintenance, but those few that do weigh heavily toward reliability. Before tackling the maintenance, coach owners should understand how the burner works.

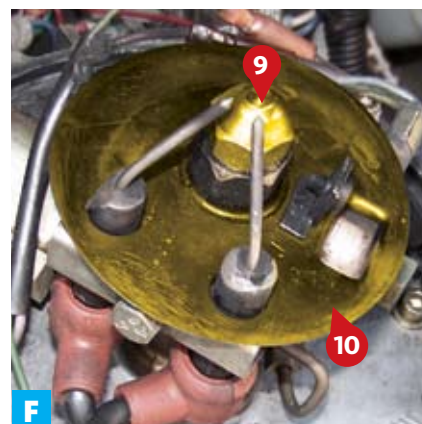
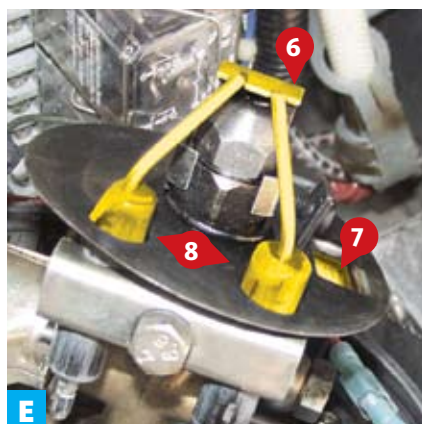
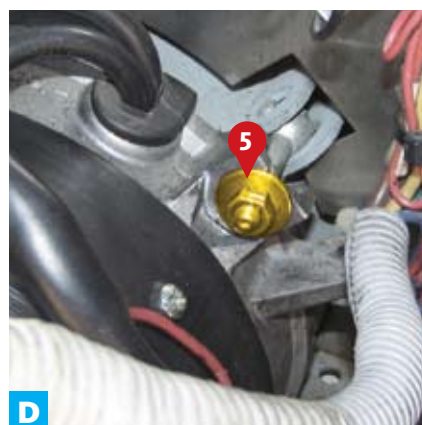
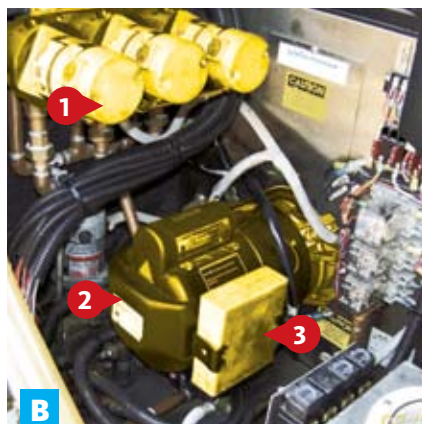
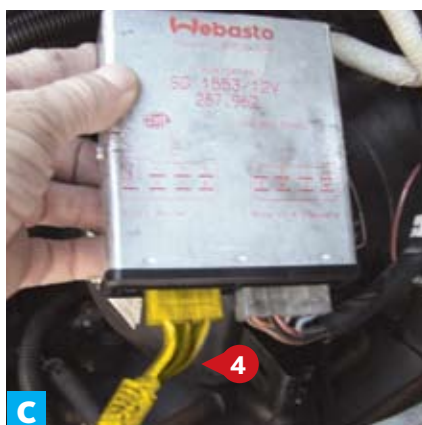
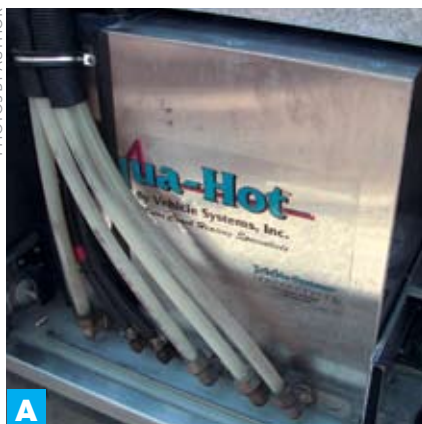
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Regular maintenance will help to ensure

that the Aqua-Hot system (photo A) functions properly. Among the parts that require maintenance is the diesel burner, visible in photo B (2) with the system's cover removed. This photo also shows the three zone pumps (1) and the controller (3).

The controller is a rectangular-shaped silver can, shown in photo C detached from the burner (item 4 is the left-side plug B, which must be disconnected to remove the diesel burner head from the combustion chamber). Next step is to loosen two nuts, one on either side; photo D shows the right-side eyebolt (5). The burner head (photos E and F) houses the gauge (6), flame sensor (7), electrodes (8), fuel nozzle (9), and photo disc (10).

When the unit is switched on, the diesel burner controller starts the combustion air blower motor, referred to in the owners manual as the "prime cycle." The blower motor shaft also drives the fuel pump at the same time, and during the first 10 to 25 seconds, the fuel pump will build pressure against the fuel solenoid valve, which initially is closed. Pump pressure is approximately 145 pounds (psig); this high operating pressure is necessary for fine atomization of the fuel so it may ignite promptly. The fuel solenoid valve is then opened, and diesel fuel is sprayed through the fuel nozzle into the combustion chamber. At the same time, current is sent to the ignition coil to produce a high-voltage spark across the electrodes that are placed just in front of the fuel nozzle. This produces combustion, and the resulting illumination is detected by the flame sensor. This tells the controller that a flame has been established, and current to the coil is interrupted, as the electrodes no longer need to produce a spark.



The heat from the combustion chamber in turn warms the water for the hydronic system as well as the domestic water and the engine coolant preheat, if so equipped.

Most hydronic systems have two to three heating zones, with a pump for each zone plus a pump for the engine preheat. The domestic water heater feature needs no pump, as it is pressurized by the RV's water system.

Built into the controls are safety features to prevent overheating, and other safeguards that should not be

tampered with. Leave such things to a trained technician.

The Aqua-Hot manual suggests an annual tune-up consisting of a new fuel filter (10-micron) and a new fuel nozzle, along with a thorough cleaning of the combustion chamber. However, a couple of other maintenance items need to be discussed.

Before starting the project, turn off the unit, disconnect all power, and let it cool down if it has been operating. Remove the main access

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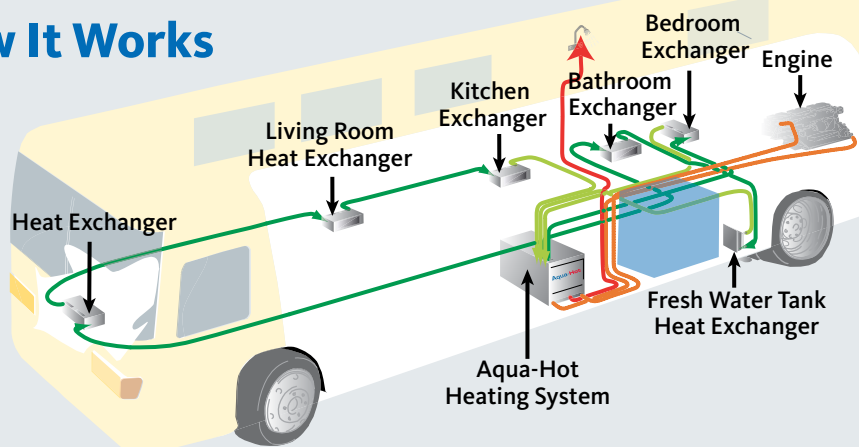
The Aqua-Hot: How It Works

The Aqua-Hot hydronic (hot water based) heating system provides interior heat for diesel-powered motorhomes and has zones that can be independently controlled. The system is similar to a residential boiler system. A solution consisting of hot water and antifreeze circulates through interior heat exchangers (akin to radiators) inside the coach to supply heat to each area as specified by individual thermostats.

The Aqua-Hot system also is designed to provide an unlimited supply of domestic hot water through a tankless on-demand system. Water is heated as it is used, which eliminates the need for storage of hot water.

Finally, the system allows for engine preheating to facilitate starting in cooler climates. It preheats the coolant before the engine is started and also transfers heat back to the heating system to warm the interior while the coach is moving down the road. During periods of low demand, the 120-volt heating element can be used to supply interior heat and hot water.

The Aqua-Hot 600-D is an enhanced version of the company's original Aqua-Hot system and supplies up to two



gallons per minute of hot water. It comes with two 2,000-watt electric heating elements and features three heating zone circulation pumps.

Formerly known as the Hydro-Hot, the Aqua-Hot 450-DE is the company's most compact system and is designed for motorhomes with less generous bay space. It provides up to 1.5 gallons per minute of hot water and has a single 1,650-watt electric heating element. It is equipped with two heating zone circulation pumps.

Both models are available with engine preheating and offer a two-year parts and labor warranty.

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cover that protects the working parts of the system. Removing the cover reveals the diesel burner, the large item in the middle. The unit controller is the rectangular silver can on the right side of the burner. Under the controller are two rectangular electrical plugs. Disconnect the plug on the left (plug B) as you view the controller from its exposed side. Now

you can remove the diesel burner head from the combustion chamber by loosening the two 10-millimeter nuts on the right and left sides of the burner and swinging the eyebolts away from their cleats. (You may need a socket wrench and a couple of extensions for the nut on the left side.) Don't remove the nuts — just back them off a few turns until they

clear their cleats. With both hands, pull the diesel burner head to the rear, away from the combustion chamber approximately 5 inches. This is far enough to tilt the burner upright for good access. Now you have a good view of the front of the burner head, which houses the electrodes, the fuel nozzle, and the flame sensor, among other things.

Next inspect the electrodes. They usually will have some baked-on carbon deposits. Use a fine abrasive pad to remove the deposits from the tips. The tips should now have a bright luster. On the left side of the burner is a gauge for properly positioning the electrode tips. The position of the electrodes in front of the fuel nozzle is very critical for reliable ignition of the fuel.

I do try to change
the filter annually ...
inspect the
electrodes and
clean the combustion
chamber ...

Remove the electrode adjustment gauge and carefully place it over the fuel nozzle manifold hex. If the tips of the electrodes are not exactly positioned in their respective slots, loosen the retaining clamp bolt and reposition the tips of the electrodes. Tighten — but don't overtighten — the clamp bolt.

Do not attempt to bend the electrodes, as you might crack or chip the ceramic insulators. Carefully remove the gauge and secure it back to the burner housing.

Next, inspect the flame sensor, which is located just behind the window in the photo disc. Brush away any soot from the sensor with

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a soft cloth. If any heavy carbon deposits exist, remove the sensor and clean it using brake cleaner. The combustion chamber may be cleaned with a wire brush and a vacuum cleaner. Any loose soot will be discharged through the exhaust when the unit is back in service.

Replacing the fuel filter is pretty straightforward. I like to fill the bowl with clean diesel fuel for faster pickup of the fuel by the pump. Install the new gasket and tighten the keeper firmly.

If you chose to replace the fuel nozzle, use a 5/8-inch wrench on the nozzle and a 3/4-inch wrench as a

backup on the manifold hex. Handle the new nozzle carefully so it will not become contaminated when out of the container. Firmly tighten the new nozzle, back off 1/4-turn, and retighten for a good, seated fit. Don't use Teflon tape or pipe dope on the threads, as the machine fit will give a good seal.

To return the burner head to the unit, be careful not to hit the nozzle or the electrodes when rotating the burner back to horizontal. Also be sure the burner is properly fitted into the retainer. Rotate the burner slightly left and right to snug into the housing. When the burner is properly positioned, you will not be able to

make any rotation movement.

Any slight misalignment will produce a lot of black smoke as a result of incomplete combustion caused by the improper air-fuel mixture.

Swing the eyebolts back into position and snug the nuts. Once you are satisfied with a good alignment, alternately tighten the nuts of the eyebolts to 20 to 40 inch-pounds. Do not overtighten the nuts, as that could damage the burner housing. Next, reconnect plug B to the controller.

After the unit has been completely reassembled, the manual suggests that the fuel system be purged by turning it on for 5 seconds and then turning it off. This will activate the prime cycle for two to three minutes and flush the fuel system. Do this twice before returning the system to normal operation.

Before replacing the cover, inspect all the hose connections to check for tightness and look for any other potential problems.

Note: On the very bottom of the burner head is an air shutter for fine-tuning the air supply. Don't attempt to make any adjustment, as this has been factory set and a CO₂ analyzer is needed to make proper adjustment.

I do try to change the filter annually, and I do inspect the electrodes and clean the combustion chamber, but I must admit that if I am getting good, reliable ignition, I don't change the nozzle.

Aqua-Hot Heating Systems Inc. has an excellent Web site that includes an 82-page shop manual that is available for viewing or downloading. Plus, the company maintains a technical support crew available by telephone. If there is anything about the maintenance procedure that you are not comfortable with, a network of service centers is available for your maintenance or repair needs.

Do this when the weather is nice, and you won't be out there in the dark on a cold night trying to play catch-up. Good maintenance builds reliability.

For more information, visit www.aqua-hot.com, or call (800) 685-4298. **FMC**

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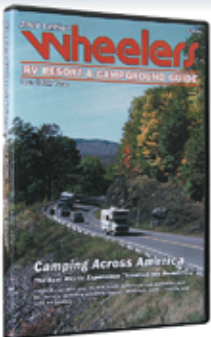
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