



TURN UP THE HEAT!

Serious winter RVers and those who enjoy traveling during the chilly months of spring and fall understand the importance of having a functioning motorhome heating system. If you've never had the opportunity to experience the benefits of a fully operating heating system, spend just one night in near- or below-freezing temperatures without heat and you will have a much greater appreciation of this vital appliance. It won't take long for you to realize how quickly the temperature inside the motorhome drops. Unlike the cozy warmth of a well-insulated and heated conventional home, the typical motorhome lacks the residential-style insulation and the advantage of multiple layers of construction materials separating you from the rage of a cold, wintry night.

All too often, I receive pleas for help from travelers whose motorhome has a malfunctioning furnace. They're shivering under a blanket; relying perhaps on a small, inefficient space heater; and wondering what they can do. At that point, my sage but simple advice is to add another blanket —

and call the nearest service center. However, with a little forethought and a few preventive steps — performed before Old Man Winter awakens from his respite — you can enjoy those crisp mornings and evenings in comfy warmth, year after year.

Through the course of RV history, several different types of heating systems have been employed. Today's

Other antiquated permutations that date back to the 1970s include a combination heater/stove/oven and a heater/water heater amalgamation. Both appliances were nightmares to service, because of their compactness and individual quirkiness. I'm sure young RV technicians today are dumbfounded when one of these old combo units rolls into the service bay.

Simple maintenance procedures owners should perform to make sure their motorhome's forced-air heating system will work when they really need it.

coaches typically are equipped with at least one direct-spark-ignition (DSI) forced-air furnace or a hybrid system that uses hydronic heat for both domestic hot water and comfort heating. Earlier motorhomes were outfitted with radiant heaters, often better quantified as gravity heaters, or, in the case of much smaller RVs, catalytic units. Catalytic heating is still a viable option for small pickup campers and towables.

The first thing to understand is that all LP-burning RV appliances require some degree of annual maintenance for optimum performance. Read any user's guide from an RV appliance manufacturer and it will state, in so many words, that very sentiment. And because of its design and operational characteristics, regular maintenance of the RV heating system is a must.

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Some owners of larger motorhomes can enjoy never-ending hot water and multiple heating zones provided by hydronic heating units. Hydronic heating systems (Aqua-Hot and PrecisionTemp are two main suppliers) provide a continuous supply of hot water for the fresh plumbing system plus comfort heat for the interior. Employing a diesel-fired or propane

burner combined with 120-volt-AC heating elements, these types of “on-demand” systems are much appreciated for those slightly chilly mornings. The diesel or propane burner can be bypassed using heat supplied by the electric heating element, thereby conserving onboard fuel.

Regular maintenance required by the owner is to check the water/

antifreeze solution level in the reservoir tank. In addition, diesel units require an annual cleaning of the fuel nozzles and a new fuel filter. Propane-fired units require an annual cleaning, servicing, and delivery pressure testing as performed on other LP appliances. Aside from checking the coolant level, most other maintenance tasks typically are performed by a trained RV service technician. However, both Aqua-Hot (www.aquahot.com) and PrecisionTemp (www.precisiontemp.com) have posted their respective installation and operation manuals online.

While hydronic heating is a nice option for many owners, the main focus of this article will be about forced-air furnaces, the most common heating appliances used in motorhomes today.

At the root level, a forced-air furnace draws in fresh air from outside the vehicle, mixes it with propane, and burns the mixture in a sealed combustion chamber (or “firebox,” to us old-timers). A blower then pushes interior air over the heated chamber and into the living portions of the motorhome through a system of ducts. In some smaller Type C motorhomes, the heated air is blown directly out of the front of the furnace grille (blow-through design). Most RV furnace manufacturers use the same design strategy. They may employ slightly different components and possibly a different sequence of operation, but most follow this basic premise.

From a comprehensive annual maintenance standpoint, a detailed clean-and-service procedure involves removal of the furnace from the motorhome; partial or complete disassembly; new gaskets; and a full bench evaluation. These procedures are outside the mechanical ability of the typical motorhomer and should be performed by a professional technician. In addition, a threefold testing process of the main propane pressure regulator and distribution system (including setting the correct

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delivery line pressure) should be performed by a trained tech.

From a user's standpoint, the average RV handyperson can perform many tasks to help preserve the integrity of the motorhome heating system and keep it operating efficiently. Four key areas come to the fore: cleanliness, voltage, ducting, and return air.

CLEANLINESS

A clean furnace is a happy furnace. A trite statement, perhaps, but it's true. As air moves in, out, and around the furnace, dust, lint, and other particles in the air will naturally accumulate on the various parts. Too much accumulation, and furnace failure is all but guaranteed. Each furnace typically is equipped with two blower wheels, sometimes referred to as "squirrel cages." One brings fresh air into the combustion chamber to mix with the propane, and the other is used to "force" the interior air over the heated chamber and push it through the coach ducting to warm the living area. Excess dirt and lint can become wedged inside the blower assembly, essentially weighing it down.

In a normal operation sequence, the spinning of the main blower wheel closes a device called a sail switch, so named because it is outfitted with a large sail or paddle that catches the air moved by the blower wheel. Even though adjusting the wall thermostat actually initiates the heating cycle, it's the closing of the sail switch that starts the internal electrical sequence of furnace operation. If the blower wheel is weighted down with excess dust and lint, it will not spin fast enough to create the air velocity necessary to close the sail switch. (The sail switch also is called an "air prover" switch, as it "proves" the fans are spinning sufficiently to bring in the required air to support combustion.) If there is too much weight on the blower, it will spin too slowly to create the air velocity necessary to close the sail switch and ignite the furnace.

So it's important to keep the furnace and surrounding area as clean as possible. Here's how to start. With the thermostat in the off position, turn the LP-gas container service valve completely off and allow some time for the furnace to come to room temperature. Once this is accomplished, remove the front cover or access panel and vacuum in and

around the furnace.

If you have an air compressor available, blow out all of the internal sections of the furnace while vacuuming. Be sure to wear the appropriate eye protection, as dust and dirt certainly will be blown about. The goal is to keep the inside of the furnace assembly as clean as possible.

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Clear the furnace's intake and exhaust vents of any debris that would restrict fresh air from entering the combustion chamber and exhaust from exiting it (above). A main blower wheel weighted down with dust and dirt (right) may be too heavy to turn with adequate speed, thereby keeping the furnace from firing. Check the interior air ducts for blockages, such as rodent nests (opposite), that could keep the heated air from warming the motorhome.



Once you are finished vacuuming, wipe down all surfaces with a damp shop rag.

Where the circuit board can be accessed easily, take the time to clean the board contacts. You can brighten the contact strip with a pencil eraser or, better yet, use an electrical cleaner/preservative to chemically remove oxides from the contacts. At the very least, unplug and replug the connector a few times. Quite often, a simple "scraping" of the terminal contacts by plugging in and unplugging will restore a heating cycle.

If the wall thermostat is the older mechanical type, it still is possible to clean and preserve the contact points as you would the circuit board. There are multitudes of these simple, bimetallic types of thermostats out there. Depending on the type, it may be necessary to remove a plastic cover to expose the two contact points.

Cleanliness of the warm air ductwork is also crucial. Some heating systems incorporate a central mani-

fold ducting system either in the floor or the ceiling. Others have individual ducts running above the floor, under the cabinets, and through partition walls to the major sections of the motorhome. Regardless of the type of delivery ductwork in your coach, remove each register and vacuum into each duct as far as possible. Take care not to rip or tear the 4-inch round flexible ducting, if so equipped. Ducts often can be used by mice and other pests as locations for nests. Not only can these nests be fire hazards, they certainly will contribute to erratic heating operation.

On the exterior of the motorhome, inspect the intake and exhaust vents carefully, using a flashlight if necessary. If the coach has been inactive for a period of time, it's common to find mud dauber or wasp nests inside the cozy confines of the vent tubes. Blockages in the intake tube can result in an overly rich fuel mixture, creating operational faults. Blockages in the exhaust tube can result in over-

heating or short cycling of the furnace and pose a fire hazard. To give the air system a good cleaning, apply compressed air to the fresh air intake while covering the exhaust tube with a running vacuum cleaner.

VOLTAGE

Probably the number one cause of flawed heating cycles in forced-air systems is low battery voltage. Furnace fan motors can create a relatively large amp draw on a malnourished battery bank. Add the excess weight of filthy blower wheels, and current usage can ramp even higher.

When dry camping, the minimum voltage requirement for most 12-volt-DC forced-air furnaces is 10.5 volts, measured at the furnace. Conversely, when plugged into shore power and running off converter output, excessively higher than normal DC voltage (above 13.5 volts DC) can create its own palette of problems for the delicate components found on some circuit boards. Maintaining a prop-



erly charged battery bank is critical for optimal furnace operation. Low voltage will cause the blower wheels to spin at a reduced rotation. Remember that earlier progression? Not enough blower speed and the sail switch will not close, regardless of how clean those squirrel cages may be. Maintaining a healthy battery bank assures that you'll have enough electrical current on hand to operate the heating system.

DUCTING

Aside from the cleanliness issues mentioned above, coach owners with individual 4-inch flexible ducts should inspect and straighten all sharp bends or turns whenever possible. Shorten any ductwork that appears too long. One of my pet peeves about the way some motorhomes are produced centers on how installers simply snake excess ducting back and forth under cabinets rather than taking the time to cut it to the proper length. Excess duct lengths eventually will create an overheating situation within the furnace housing and prohibit sufficient heat delivery throughout the living sections. Thankfully, this is usually not a concern for floor or ceiling ducts.

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Beyond The Scope

The accompanying article mentioned certain tasks that are typically outside the realm of most motorhome owners and should be performed only by a trained certified or master certified RV service technician. But I do think it's important that motorhome owners have some awareness of other components involved in the forced-air furnace.

Because the majority of forced-air furnaces are direct-spark-ignition (DSI) units, I omitted any mention of the pilot models — those that employ a separate pilot flame. I address a couple of the pilot components in this supplement.

In addition, since the forced-air furnace employs a sealed combustion chamber, many of the following components are installed using some type of gasket. Gaskets cannot be reused. A professional service tech should install new gaskets after servicing the following components, when so equipped.

Here are several other furnace components that need annual attention.

ELECTRODE ASSEMBLY. Carbon deposits should be brushed off and the electrodes brightened with steel wool or emery cloth. The ceramic insulators should be closely inspected, if so equipped. Should cracks or chips be found, the electrode must be replaced. In instances of extreme neglect, carbon deposits can render the electrode assembly unusable (Photo 1) and it must be replaced with a new one (Photo 4).

PILOT ASSEMBLY (Photo 2). If the furnace is a pilot model, the pilot orifice and pilot burner should be cleaned before winter use. The orifice is soaked in a solution of acetone and then air-dried. Never insert anything into or through the orifice.

THERMOCOUPLE (Photo 3). The thermocouple hot junction should be cleaned regularly by lightly brushing or brightening it with fine steel wool.

MAIN BURNER (Photo 5). Dust, lint, and other debris should be cleaned from the main burner and the main burner orifice at least once a camping season.

LP PRESSURE. For optimum performance of all LP-gas-fired appliances, the main pressure regulator must be set to 11 inches of water column (WC). In addition, the entire motorhome propane system should be checked for leaks prior to using any LP appliance.

— Gary Bunzer

Although it appears the furnace compartment door was cut too short, the reason for the gap is that the mesh screen had restricted the return airflow and the opening was necessary for effective operation.



Also realize that furnace manufacturers mandate a minimum number of ducts, based on the Btu rating (size) of a particular furnace. Take the time to look up the requirements of your furnace and ensure the heating system is sufficiently ducted. I've seen the simple addition of another duct eliminate a short-cycling condition of a seemingly faulty furnace. That said, I find that it's common for inexperienced service technicians (or owners) to blame a furnace component (and the furnace manufacturer by default) for a comfort-heating failure caused by something other than the appliance itself. An informal poll once found that the clear majority of "faulty" circuit boards returned to the factory under warranty had absolutely nothing wrong with them. If you're having trouble with your furnace, trust troubleshooting and repair procedures only to certified or master certified service technicians.

RETURN AIR

While keeping the heated air ducts clear from obstructions is important for efficient operation, it is mandatory that there be a clear path of return air to the furnace enclosure for optimal performance. A furnace is literally a "breathing" appliance, meaning it must inhale fresh breaths of return air as the warm air is circulated throughout the motorhome. You're probably aware of at least one interior vent located near the furnace compartment. This is the pathway of return air back to the furnace compartment.

Some motorhome owners mistakenly install a filter in this vent space — a definite no-no. Unlike a home heating appliance, a filter never should be installed anywhere in the path of the return air. In addition, never stow gear or supplies in the furnace compartment or in front of a return air vent. Aside from being a fire hazard, it may inhibit the path of the necessary return air. Just like the required number of ducts, furnace makers calculate the volume of return air that's necessary for a specific unit to operate properly. The size of the return air grille is further deduced to ensure the return air passage meets the minimum number of square inches of free-flowing air as specified for that particular model of furnace. In some cases, motorhome manufacturers may have to modify the cabinetry to meet these minimum requirements.

So, as the approaching fall months lure us out to see the beauty, proactive motorhome owners will be diligent about having clean heating system components. They also will maintain a healthy battery system in order to power the furnace properly; inspect their ductwork for obstructions; and assure that the furnace compartment and/or return air vent is not blocked.

Keep these four keys to preventive maintenance in mind and in practice, and you, too, can enjoy many years of warmth from your motorhome's heating system. Remember, RVing is more than a hobby; it's a lifestyle! **FMC**



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