



WINTERIZING YOUR CAR AND CAMPER

SAL-02021

Introduction

It is important to winterize vehicles to keep them in proper starting and running condition throughout the winter in the colder areas of Alaska. This work can be done by a commercial repair garage or by car owners if they have the ability to do this type of work.

Vehicles should be winterized in September or early October before cold weather sets in.

DON'T DELAY—DO IT NOW!!

If you plan to do this work yourself, purchase a repair manual for your car. Manuals are available at bookstores and auto supply stores at varied prices ranging from \$8.00 to \$25.00.

Cost

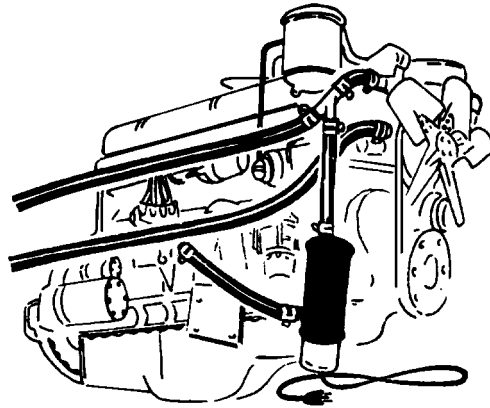
Winterizing costs vary, depending on the type of automobile and the services required. If done commercially, the cost can vary from \$100 to \$350. A do-it-yourselfer may save up to 50 percent.

WINTERIZING YOUR CAR

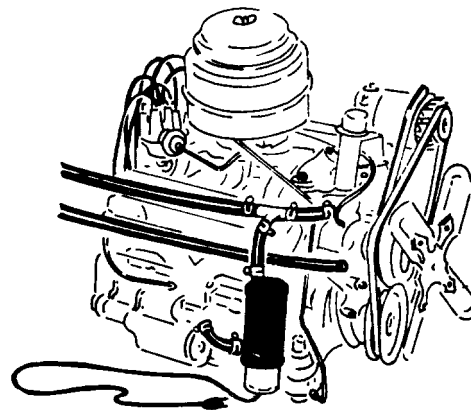
The following steps apply to both gasoline- and diesel-powered cars and pickup trucks.

1. **Normal maintenance.** Do the normal maintenance required as recommended in your owner's manual.
2. **Cooling system.** Check the cooling systems for leaks and replace any broken, cracked, brittle radiator or heater hoses.
3. **Fan belts.** Check fan belts and other power belts and replace any that are worn or cracked.
4. **Thermostat.** Most modern cars are equipped with a cooling system that has a 195° opening range. If there is an indication that the engine is not operating at normal temperatures, remove the thermostat and check the heat range stamped into the metal. You can check the thermostat in hot water, using a thermometer. The thermostat should begin to open at the temperature stamped on it. If the thermostat does not open properly, replace it with one having the highest temperature recommended for your engine.
5. **Install an engine preheater.** Two main types of engine heaters work well in Alaska, the tank type circulating heater and the frost plug heater. Most well maintained engines need only two to three hours of heating to start, even in the coldest weather. Leaving a car plugged in longer than this can increase your electric costs. Energy saving products are available that can help you save money and energy, when heating your engine: timer – turns on electricity to your engine block or frost plug heater at the time you specify; thermostatic cord – the t-cord mounts to an engine's heater hose and has a switch that is temperature sensitive allowing electricity to flow through the cord only when the engine is

TYPICAL THERMO-SIPHON INSTALLATIONS

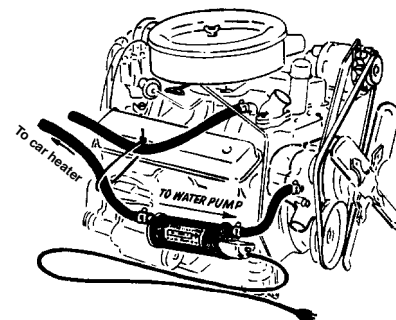


Overhead valve engine. The circulating heater inlet is connected to the block drain and discharges heated coolant through a Y-connection into the top heater hose at the water pump.



V-8 Engine. The heater inlet can be connected to the block drain on either side of the engine. The top of the heater must be at least six inches below the top of the engine.

TYPICAL THERMO-PUMP HEATER INSTALLATIONS



The thermo-pump heater is installed simply by cutting out a section of heater hose, but may not work on some types of systems and may not provide sufficient heat in extremely cold weather.

cold. The engine is maintained at a coolant temperature of 40°F. Be sure to keep in mind that air pollution is reduced from automobile emissions, if cars are plugged in at 20°F and colder. This reduces cold start emissions which are a major cause of air pollution in cities. A thermocord enables plugging in at any time the temperature is 20°F or colder and optimizes electric use.

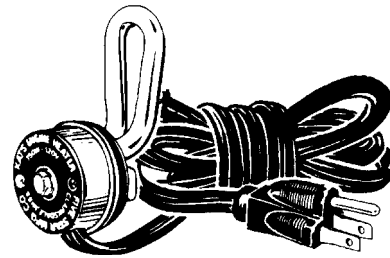
Tank-type circulating heaters. There are two types of circulating heaters. The most popular is the thermo-syphon type which must be installed vertically. This type draws coolant from the bottom of the engine (usually from a block drain), heats the coolant and returns it to a heater hose at the top of the engine. This type is fairly easy to install, but the coolant must be drained from the engine and a fitting installed in the block drain.

Unfortunately tank-type heaters are no longer recommended because they are prone to leakage and hardening of hoses.

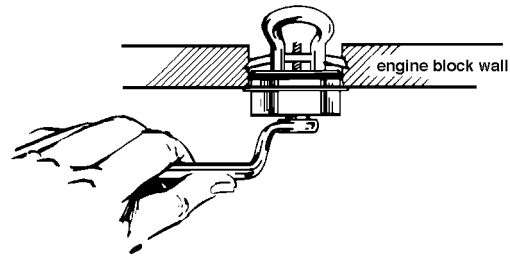
Frost plug heaters. Frost plug heaters are difficult to install in some engines, but seem to be the most efficient because the engine block is heated directly. It may be necessary to remove some engine accessories before you can gain access to the frost plug, which must be removed, before the frost plug heater can be installed. These heaters range in size from 400W freeze-plug heater or an 850W thermo-syphon type circulating heater. Larger six-cylinder engines or V-8 engines may need two 650W or 750W freeze-plug heaters or a 1000W or 1500W circulating heater. Two heaters provide a backup system in case one heater should fail during extremely cold weather. Large 2500W circulating heaters should be used only on large trucks

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FROST PLUG ENGINE HEATER

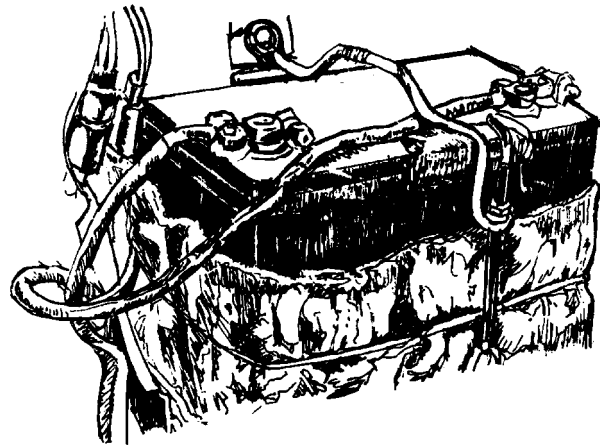


Frost plug heaters are rated at 400, 600, 750, and 1000

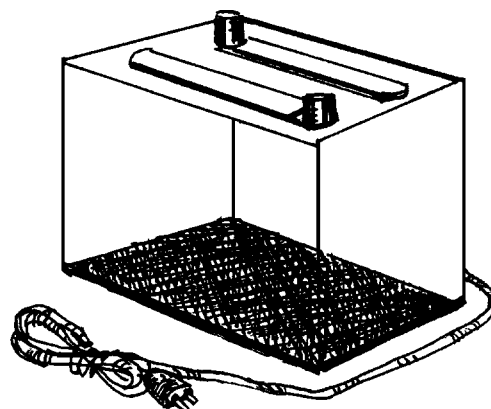


Typical installation of frost plug heater in engine block.

BATTERY WARMING DEVICES



Typical battery blanket.



Typical battery plate.

**ESTIMATED DAILY COSTS FOR OPERATING
ENGINE HEATERS OR THERMOCORDS**

**Estimated Costs of Engine Heater Operation
Table 1—Engine Heater**

		Hours				
		2	4	6	8	10
WATTS	100	\$0.02	\$0.04	\$0.07	\$0.09	\$0.11
	800	\$0.18	\$0.35	\$0.70	\$0.70	\$0.88
	1200	\$0.26	\$0.53	\$0.79	\$1.06	\$1.32
	1500	\$0.33	\$0.66	\$0.99	\$1.32	\$1.65

This table shows the cost for various hours of operation for an engine heater system. For instance, if your heater system size is 1200 watts, row 3 applies. Using a 1200 watt engine heater for six hours a day costs 79 cents. Costs based on 11 cents per kwh electric costs.

**% of Cord on vs. Temperature
Table 2—ThermoCord**

% On Time	Degree Temperature
0	32
3	23
7	14
10	5
18	-4
29	-13
48	-22
72	-31
100	-40
100	-49
100	-58

This table reflects the temperature-controlled operation of a “ThermoCord”, a thermostatic plug-in cord for which the outside temperature determines its operation. The control on the “ThermoCord” keeps the engine antifreeze temperature at 40°F, so the colder the outdoor temperature, the more hours the “ThermoCord” operates.

Chart Courtesy of Golden Valley Electric Association

or heavy equipment engines. The larger heaters reduce warm-up time but increase power costs. All of these heaters operate on 115-volt household current.

Small or air-cooled engine may be heated with an oil pan heater. Oil pan heaters are also recommended due to lack of oil pressure at cold start from too thick oil at severe temperatures.

NOTE: Follow manufacturer's instructions when installing any of these heaters.

6. **Drain and flush cooling system.** Install the engine heater according to manufacturer's directions. Fill cooling system with the proper mixture of permanent type ethylene glycol antifreeze and water to provide protection to **below** the lowest expected temperature. Protection to -60 °F (-51 °C) is required in many areas of Alaska. Check the owner's manual for coolant system capacity. A mixture of two-thirds antifreeze and one-third water provides maximum protection. Antifreeze solutions with more than two-thirds antifreeze do not provide additional protection against freezing and may even cause other problems. Use a cooling system tester (hydrometer) to confirm that the engine is fully protected against freezing. A pre-mixed solution of two-thirds antifreeze to one-third water should be used to replenish the cooling system liquid. **Do not use water only.**
7. **Check condition of battery.** Most new batteries are sealed and no longer need to be checked for water level. Clean and tighten battery cable connections each fall.
8. **Install a battery warming device.** Battery plates are installed under the battery; battery blankets are wrapped around the battery. Some people also install battery trickle chargers, but many low-cost models are not built to withstand the constant vibration while driving.

9. **Wheel bearing and chassis lubrication.**

Wheel bearings. Pack wheel bearings with winter-type low temperature grease that is available from any major petroleum distributor.

NOTE: Some of the newer vehicles have lifetime lubricated bearings that cannot be repacked. Check owner's manual or car dealer for lubrication specifications.

Chassis. Lubricate chassis with the same low temperature grease used in wheel bearings.

NOTE: Some vehicles are built with lifetime lubricated chassis and cannot be greased. Check owner's manual to be sure.

10. **Engine lubrication.** Change engine oil to winterweight. An SAE 5W-30 oil provides the best lubrication at cold temperatures, but SAE 10W-30 oils are widely used. Oils may be either a petroleum or a synthetic type.

NOTE: Check your owner's manual or car dealer for recommended oil specifications. Change engine oil at the recommended intervals in your owner's manual to keep your warranty valid and avoid engine damage.

Diesel engines require special attention to oil quality and type. Check owner's manual or dealer for recommended specifications.

11. **Drive axle lubricant.** Change drive axle lubricant to winter type. For standard drive axles an SAE 75W or SAE 75W-90 multi-viscosity oil should be used. These oils are either petroleum or synthetic. SAE 75W-90 is suitable for heavy duty use year-round. Oils are available from any major petroleum distributor.

Limited slip axles. Use gear oil as specified in owner's manual for below zero temperatures.

Front-wheel drive vehicles. Front-wheel drives generally use a transaxle type drive with a common lubricant for transmission and differential. Check owner's manual or dealer for proper winter lubricant specifications.

Boots. Boots are the rubber sheaths that fit over the constant velocity joints in the front-wheel drive vehicles and four-wheel drives that primarily use the front wheel for standard two-wheel operation. These fail easily, and are not very durable fixtures in our cold weather environment in the Interior of Alaska, particularly. They should be checked annually to make sure that they are not broken and dysfunctional. If so they need to be replaced.

Four-wheel drive vehicles. Four-wheel drives differ because they have a front drive axle as well as a rear drive axle and a transfer case. There are many types of transfer cases on the market requiring many different types of winter lubricant. Check owner's manual or dealer for recommended lubricants.

12. Transmission.

Standard transmissions. These generally use either SAE 75W or SAE 75W-90 gear oil. SAE 75W-90 is suitable for heavy-duty use year around.

NOTE: Some cars, especially those of foreign manufacture, may require special lubricants. Check owner's manual or dealer.

Automatic Transmission. Automatic transmissions generally use the same fluid year round. However, we suggest

transmission pan heaters for ATF freezes at -30°F.

NOTE: There are also synthetic oils that can be used in automatic transmission but check with the dealer for approved lubricants to keep warranty valid.

13. STEERING.

Manual steering gears. Many standard steering gears today are filled at the factory with lubricants that may make steering difficult in cold weather. The factory installed lubricants may be thinned with one or two ounces of light oil such as Rislone®, Frigidgo® 5W-20. Marvel Mystery Oil®, or Conoco DN-600® or other arctic type fluid.

Power steering. Generally, the same fluid is used for all seasons. Automatic transmission fluid is recommended for many cars. Use fluid as specified in the owner's manual. Some of the synthetic lubricants specified for power steering systems may also be used.

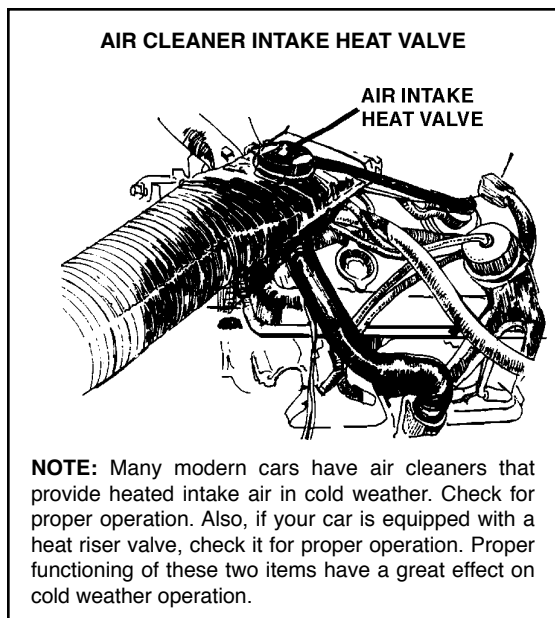
Tune-up. Have your vehicle properly tuned before winter.

14. **Fuel injection systems.** Fuel injection cleaner needs to be used in the system 2 or 3 times a year. Check owner's manual for more specific details.

15. **Exhaust system.** Check exhaust system for leaks every fall.

16. **Air leaks.** Make sure seals and grommets are tight around holes in the fire wall.





17. **Windshield washer.** Drain or winterize windshield washer container with washer fluids recommended for below zero temperatures.
18. **Wiper blades.** Replace windshield wiper blades if worn. Booted blades provide more efficient windshield cleaning in winter.
19. **Brakes.** Brakes should be cleaned and checked once a year or every 40,000 miles, whichever comes first. Check fluid level; brakes use same fluid year-round.
20. **Windows.** Install frost shields on windows where necessary. Check electric defrosters if car is equipped with them.

Other Tips

1. Add gasoline antifreeze (Heet[®], Ban-ice[®], Prime[®], Peak[®], or other brand) to fuel tank. One can to a tank of fuel is usually sufficient. Gasoline antifreeze is especially important if your car is kept in a warm garage. The change in temperature cause moisture to condense and may possibly freeze in the fuel system. Adding gasoline

antifreeze to your fuel tanks is only advisable if your car is kept indoors. If your car is kept outside, you should not need to use gasoline antifreeze. It's only when you cycle the car in and out of doors that condensation in the fuel tank becomes an issue.

2. In extremely cold weather below -25 °F (-32 °C) warm up your car for 5 to 15 minutes before driving, especially if the car has an automatic transmission. Put the automatic transmission in the neutral position so transmission parts receive better lubrication from the transmission fluid. Some transmissions can be damaged if warmed up while in the park position during extreme cold.

Do not leave the car until the engine is at normal idle to avoid engine damage caused by idling a cold engine at high speed.

CAUTION: Do not sleep in idling cars. Deadly carbon monoxide fumes can leak into an idling car.

3. Tires must have good traction on ice and snow. Many types of winter tires are available such as all season radials, mud and snow, and studded mud and snow tires. Radial tires seem to offer better traction in winter than standard tires. Tire chains are handy during extremely poor driving conditions.

NOTE: In extremely cold weather, it is a good idea to over inflate your tires 5 to 10 pounds above normal pressure. When the weather warms up in spring, be sure to reduce the tires to normal air pressure.

NOTE: If you use studded tires, by law they must be removed between May 1 and September 15 each year.



Be prepared for the worst. A well-stocked trunk is a must for winter driving.

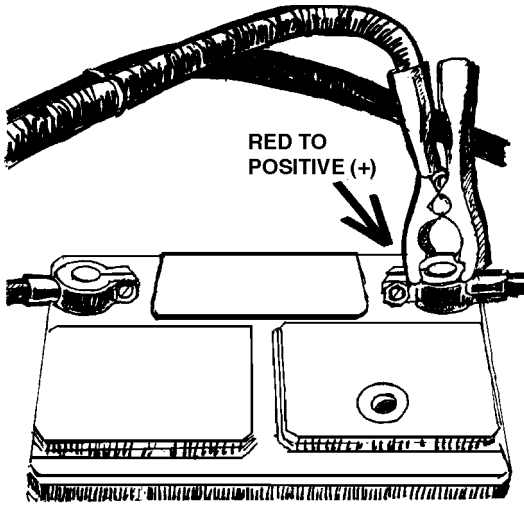
4. Turn on the heater defroster while your car is warming up. A sudden rush of hot air on an extremely cold windshield can cause it to crack.
5. Keep all lights clear of snow, ice and sand, and in good operating condition.

***CAUTION:** Use headlights on low beam during ice fog conditions.*

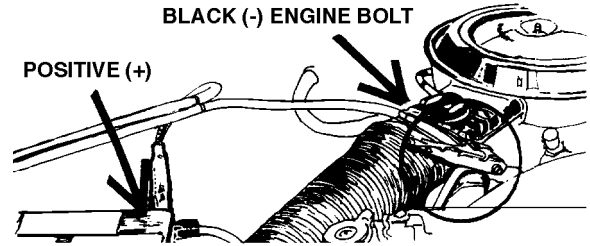
Supplies to Carry in Your Car

1. A can of gasoline antifreeze (Heet®, Prime®, etc.) In case of a fuel system freeze up, add to the fuel tank if engines balks or stops. Gasoline antifreeze is also suitable for use in diesel fuel systems.
2. Booster cables. Use care to avoid battery explosions or electrical damage to your car. The owner's manual should contain the proper instructions to jump start your
3. Tire chains, jack, lug wrench and a good spare tire (also overinflated 5 to 10 pounds) should be standard equipment in your car.
4. An extra fan belt (some cars require 2). An extra power steering belt if car has power steering. Belts can freeze and crack during extremely cold temperatures.
5. Tow rope or chain.

BOOSTER CABLE CONNECTIONS



Positive (red) cable connected to positive (+) terminal on top post-type battery.

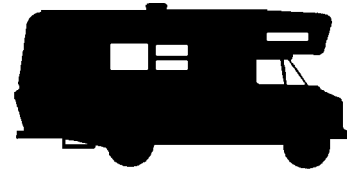


Positive (red) cable connected to positive (+) terminal inside post-type battery.
Negative (black) cable connected to bolt on engine.

6. Reflectors or flares. Flares are preferable.
7. Flashlight. (Carry it in your coat pocket to protect the batteries against freezing). There are also good lights that work when plugged into your car's cigarette lighter socket.
8. Shovel.
9. Sandbags. Some people like to carry these in their car for extra weight or to use for extra traction when stuck on ice.
10. Blankets or sleeping bags.
11. Extra clothing. Boots or mukluks, warm socks, mittens, hood or cap with ear flaps, scarf, and a heavy coat or parka should be kept in the car for emergencies. A pair of heavy wool slacks or snow pants are also helpful. Snowmachine suits are ideal for emergency clothing.
12. Snow brush and window scraper.

If Your Car Should Stop

1. Before the car comes to a complete stop, get it as far to the right of the roadway as possible.
2. Use emergency flasher lights, signal lights, or parking lights. If your battery has failed, put out road flares during ice fog or darkness.
3. In most cases, it is best to stay in your car until help comes (especially when far from town), but if you leave your car to seek assistance, put on the extra clothing. To keep warmest, make sure your head, hands, neck and feet, as well as the rest of your body are covered. The more skin that's exposed, the faster the heat drains from your body, increasing the danger of frostbite or hypothermia.



Winterizing Recreational Vehicles

Types-trailers, slide on campers for pickup trucks, tent trailers and motor homes.

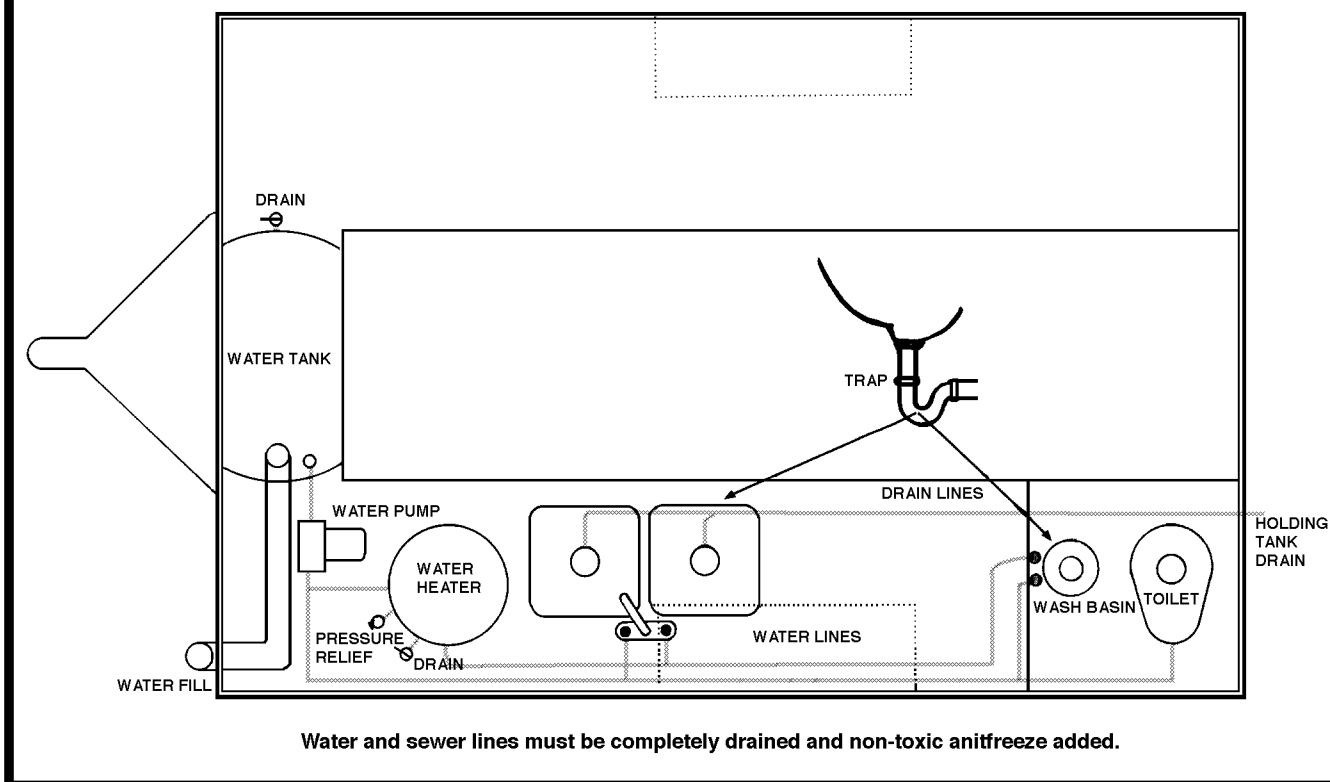
1. Drain water tanks and lines. If the camper has a hot water heater, drain it. The sewer holding tank should be drained and washed thoroughly. A small amount of antifreeze should be added to the tank.
2. After the water tanks have been drained, run non-toxic antifreeze through the tanks and lines. Be sure antifreeze is in all the drain traps. For a source of non-toxic antifreeze, check with a recreational vehicle dealer. Units without hot water heaters will need about one gallon of antifreeze. If the unit does have a hot water heater, check with an R-V dealer for a water heater bypass.
3. Shovel snow off the roof during winter as needed.
4. If the trailer or camper is not being used in the winter, remove the battery and store it in a warm place. This will prevent freezing and possible cracking.

Winter Trips with Campers

1. Check signal and clearance lights for proper operation.
2. Make sure there are no leaks in the propane line. Check by putting soapy water over each fitting and watching for bubbles. When not in use, propane should be turned off at the tank valve.
3. Don't try to use the water system in the winter.
4. If the trailer or camper is not being used in the winter, remove the battery and store it in a warm place, thus preventing freezing and possible cracking.

A WORD OF WARNING: A catalytic heater **should not be used** in a camper because it draws oxygen from inside. A propane heater and/or stove, if tended properly, draws oxygen from outside and also exhausts outside. Charcoal burners produce deadly carbon monoxide.

FIGURE 8. WINTERIZING RECREATIONAL VEHICLES.



Thanks to Sam Johnson, Service Manager for Aurora Motors, Fairbanks for review and suggestions for this publication.

The use of trade names in this publication does not imply endorsement by the Cooperative Extension Service.

The information in this publication is based on experience collected over many years by Linwood Ayotte (Retired) and Fred Toman, Transportation Motor Pool, Fort Wainwright, Fairbanks, Alaska. It was originally written by Ellen Ayotte, Extension Home Economist in 1983 and revised by Lydia Wirkus, Extension Home Economist in 1990. This revision was done by Richard Seifert, Extension Energy Specialist in August 2004.



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