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INTRODUCTION

Valterra Products, Inc. is pleased to welcome you to the world of recreational vehicles. We manufacture many fine accessories available at your local RV store. Our motto is "Making Recreation Easy" and, in an effort to do so, we have teamed up with Bill Bryant to provide you with information that will help you get the most enjoyment out of your new RV.

This booklet is intended to help you understand your new pride and joy. It leads you logically through the more important features of your RV, allowing you to learn and get acquainted at your own speed. It also helps you analyze the problem if and when something goes wrong.

For fast information on any part of your motorhome, read the hint section first. Here lies the most important information organized in a simple to read Hint-by-Hint layout.

Hints marked with a << symbol cover general information. SAFETY HINTS are marked with a caution {{ symbol. Valterra and Bill hope that this truly is, EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT YOUR RV.

The HINTS are nowhere complete, because there is no limit to the unusual things that can happen, either at home or on the road. So, don't think that the HINTS will cover every eventuality. If there are any contradictions between HINTS and manufacturer's manuals, FOLLOW THE MANUFACTURER'S INSTRUCTIONS.

In preparing this book, Bill extends special thanks to his brother, Barney, a fellow RV'er, Dick Saal, a good neighbor who drags a 5th wheel trailer, and to Prince and Polly Wiginton, of Wiginton's RVs in Pensacola, Florida. Their suggestions and comments were of great value in completing this book.

Take a look at the back pages or, visit our website at www.valterra.com to see Valterra's Best Selling RV Accessories, recognized by RV'ers everywhere for making their RV experience a more enjoyable one. If you see something of interest, our products can be found at RV retailers throughout the U.S. and Canada.

Now, go out and enjoy that RV!!

Valterra Products, Inc.

George Grengs, President

WHO IS BILL BRYANT?

Bill and his late wife Bonnie were RV'ers for more than 45 years. Bill probably has camping in his blood. Before he was born, his parents traveled on their honeymoon by team and covered wagon to homestead in Wyoming. What a trip it was! His mom wrote the story for him years later. It was early spring. They rode through rain, snow, and dirt covered roads. The trip took weeks. Bill jokingly calls that the original RV trip! His mom called it something different.

Bill's first RV in 1957 was a used 15 ft. Oasis travel trailer, a major step up from the canvas tent they had used before. Rained out campouts, drove them "indoors". The Oasis had the latest things for camping luxury; a small ice box (not a refrigerator), a single propane gaslight, and a tank of fresh water (with a hand pump to get water to the single faucet). The water heater was a teakettle sitting on the stove.

There was no toilet, and the sink drained into a bucket strategically placed below the open drain hose, which extended through a hole in the floor, below the cabinets. To heat the trailer, you lit the oven and left the oven door open. We've come a long way in 40 + years!

Through those years Bill and Bonnie and their two sons moved up to larger trailers, with more room and more features. With the boys on their own, they bought their first motorhome in 1977. Together they wore out three motorhomes. Bill is well on his way to wearing out a fourth, traveling from Maine to California and from Canada to Key West. Most of BILL'S HINTS included in this book are based on personal experience (some rather painful) or from observations of others learning about their RV's the hard way. He won't tell you which of the "learning experiences" are his!

If you spend a little time reading the various sections of the book, paying special attention to BILL'S HINTS, he guarantees that you will get far more enjoyment and a lot less grief from YOUR motorhome.

By the way, don't hesitate to ask your fellow campers for advice if you are uncertain about something. As a group they are fine folks, and helpful to the last degree. And one of the favorite topics at campground get-togethers is talking about how to get more fun out of your RV.

SAFETY HINTS

Even though Recreation Vehicle manufacturers incorporate many safety features, improper operation can create dangerous conditions of which every user should be aware. Many of them will be covered in subsequent sections of Bill's Hints. In some cases, these hazards are the same as those that you face at home, but in other cases, you are doing things in an RV that you don't even DO at home. Take a few minutes to review the HINTS below. They can literally be lifesavers.

FIRE

{{ Fire in a confined space can be very serious or even fatal. When camping or while traveling, you may not have professional fire protection, so you must use extra care.

{{ Check your fire extinguisher for proper charge before every trip. If you can't check it, replace it annually. Make certain that everyone knows where it is stored.

{{ Make sure that you keep flammables away from the stove and oven when they are in use. The oven exhaust is to the rear of the burners. Keep that area clear when the oven is lit.

{{ NEVER travel with the stove, oven or water heater burners lit.

{{ NEVER refuel your vehicle with the engine running, or with refrigerator or water heater operating on propane (LPG) gas.

{{ ALWAYS shut off main valve when refilling the propane tank.

{{ NEVER carry containers of gasoline, propane, or other liquid flammables inside the RV, or in the storage bins.

{{ When opening fuel lines (like when changing filters), make sure that you have good ventilation and that no open flames are present.

{{ Test your smoke and carbon monoxide detectors before every trip. Replace the batteries at least annually.

{{ Propane is highly flammable in concentrations of 2% to 10%.

FUMES

{{ CARBON MONOXIDE (CO) results from the incomplete burning of fuels that contain carbon (gasoline, natural gas, LPG, kerosene, diesel fuel, etc.) Although you sometimes can smell unburned fuel in engine exhausts, the CO itself is tasteless and odorless.

{{ A CO detector is a must. Install one and test it regularly.

{{ In case of fire, remember that burning plastics produce toxic fumes.

{{ An optional LPG detector can detect flammable vapors. Some are built-in and automatically shut down the LPG system when flammable/explosive vapors are present in the coach. Others simply sound an alarm to warn you. If you don't have a built-in model, buy a portable model and use it.

{{ At the first hint of unexplained propane (LPG) fumes, vacate the coach and turn off the main propane valve until the source is identified. Leave the doors open.

ELECTRIC SHOCK

{{ The electric power in a RV is no different than the electricity that you use in your home. When used properly, electricity is safe. When used improperly, it can be dangerous. You must think about what you are doing.

{{ ALWAYS test for proper polarity before plugging into a strange campground receptacle. Testers cost less than $6 and take only a minute to ensure that the polarity is correct. If the polarity is wrong, don't

plug in (contact your campground manager).

{{ Monitor campground voltage with an inexpensive meter. Voltages below 108 Volts can damage motors, such as air conditioners, through overheating. If you don't use a meter, and the power cord and/or the extension cable feels hot to the touch, you probably have a low voltage source. Then reduce the load on your electrical cords by reducing your load consumption or disconnect.

{{ If you use extension cords (always of the proper rating), make all connections to the RV before finally plugging into the campground power. Then you won't expose yourself to "hot" connectors.

((Before plugging into the campground power be sure that the breakers are turned off, then after you plug in turn the breakers back on.

{{ If the ground is damp, don't handle power cables that are plugged in without rubber gloves. Make sure you wear dry, rubber-soled shoes.

{{ If circuit breakers repeatedly "pop" without an identifiable reason, leave them OFF until a qualified electrician has found and corrected the problem.

{{ NEVER use a two conductor (two bladed) extension cord in a RV. (Be sure that all extension cords have three blades, two flat blades and one round blade. The round blade is your grounding connector).

FALLS

{{ The roof of a Recreation Vehicle can be up to 12 feet above the ground. A fall from that height would be just like falling off your roof at home; at the least, dangerous or maybe fatal.

{{ Get on the roof only when absolutely necessary. It will hold you, but there are no safety rails.

{{ Never wear hard-soled shoes on the roof.

{{ Never get on the roof if it has any moisture on it.

{{ Children should NEVER be allowed on the roof.

{{ The metal ladder rungs leading to the roof can be very slippery if the steps are wet. Shoes with hard soles can cause you to slip. If you need to get on the roof for cleaning, use rubber soled shoes.

{{ If you need to use a ladder to reach some part of the RV, use only a step ladder.

{{ Never stand on the top 2 steps of a ladder. If your ladder is too short, get a taller one. If you have to stretch, you are close to falling.

{{ Never lean a ladder against the side or front of the RV. RV surfaces are very slick. When your weight shifts to the top half of the ladder, the legs of the ladder can "kick out", dropping you to the ground via the bumper or other appendage. Real fun!

{{ Always check the position of the electric step before exiting a motorhome. It's always possible that the master switch is OFF and the step will not extend when the door opens. ***Most new models extend the step even if the switch is OFF.***

THE MAIN ENTRANCE DOOR

Everybody knows how to open doors, but there are a couple of things you need to know about keeping them closed. First of all, most motorhome doors have a model L300 or similar combined handle/lock combination that provides a flush surface when the door is closed. To open it, you just pull out the handle. If the door is unlocked, it swings open. Unlocking the door is straightforward; you insert the key, rotate it clockwise 1/4 turn, rotate it back to the vertical position and remove the key. To close the door, you push it closed (or slam it) until it latches. Then lock it.

You cannot tell if the door is properly closed by just looking at the handle. It is spring loaded to return to the flush position whenever you release it. Even when you turn the key to the "locked" position, there is no assurance that the door is both closed and latched. The lock is somewhat like a deadbolt in that, to lock it, you rotate the key counter-clockwise (toward the frame) approximately 1/4 turn - then back to the vertical position to remove the key. To ensure that it is indeed locked, test it by pulling the flush handle. If the handle will not pull out, the door is properly closed and locked. If the handle pulls out and/or the door opens, it means that you tried to lock it when the door was not completely closed (or that you turned the key the wrong way). What usually happens is that the latch does not fully engage the striker plate. The door will look closed, but it is in danger of springing open if any force is applied to it.

Unfortunately, you will not get any warning from the key/lock combination. It may feel as if you locked it, but in reality, if the key did not turn quite as far (maybe 85 degrees instead of the required 90 degrees) as needed to lock the door, it isn't locked. You MUST test the handle. Now, if you know your door ALWAYS closes properly, you can skip the test, but smart money says to give it a quick check every time you lock it. After all, you are locking it because you don't want anyone else to OPEN it, right?

Just one more note on the door. Always lock the door from the inside when traveling or when retiring for the night. When traveling, the lock serves the same purpose of ensuring that the door is properly closed. If you can't lock it, it probably isn't latched right. The inside lock does not require a key, and you don't have to rotate anything. There is just a short pin above the inside handle that locks and unlocks the door. Push on the pin (after the door is closed) to lock it. Pull the pin to unlock it. If the pin won't push, the door is not fully closed. If it does, you're OK. Locking the entrance door while traveling serves a second purpose; it will prevent someone from entering your RV while you are stopped (like at a traffic light). The door will not close at all if the handle is locked while the door is still open, so you can't lock yourself out accidentally.

BILL'S HINTS about MAIN ENTRANCE DOOR

<<Always lock all doors from inside when retiring for the night.

<<Spray locks twice a year with WD 40 in the keyhole to keep them operating.

<<A small amount of paraffin on the striker plate will make closing smoother.

<<The striker plate provides a two-dimensional adjustment, but if you loosen it, make certain that it is

properly tightened when you are done.

THE ENTRANCE STEP

A powered step (either electric or hydraulic) is a necessity for a motorhome. On basement model motorhomes, a 2 or 3 step style may be used. All are electrically powered and are functionally identical. The step has no manual mode of operation. There is a master control switch located either adjacent to the door or on the vehicle's dash panel. With the switch in the "ON" position (and the engine ignition "OFF"), the step is controlled by a spring-loaded switch similar to the courtesy light switch on a car door. When the motorhome door is opened, the step extends to the DOWN position. (Watch your shins.) When the door closes, the step RETRACTS.

While the automatic mode is ideal for traveling, it gets to be a nuisance when you are camped, or when loading for a trip. Turning the master switch to the "OFF" position while the step is DOWN disables the door switch, and the step will stay in the DOWN position, whether the door is opened or closed.

Great! But what if you forget to turn the master control switch to the “ON” position before you drive off? (Shame on you for not using your check-off list.) Most steps have a second wire connected to the ignition circuit that in effect "by-passes" the master control switch. This causes the step to RETRACT when the ignition switch is ON and the door is closed. Neat, huh? Smart money will turn the master control switch "ON" before moving. If the step stays down, you are almost certain to tear it off on a narrow bridge, or when parking too close to a high curb. It can also spoil the day for any pedestrians that walk too close to the roadway. Oh, yes, there is a courtesy light below the step that comes on whenever the master switch is "ON" and the step is down.

BILL'S HINTS about ENTRANCE STEPS

<<If you leave the master switch OFF when you drive away, the step should retract when you turn the ignition key ON. But when you park and turn the ignition OFF, guess what? The step is UP and the master switch is still OFF. The step may NOT extend until the master control switch is turned back ON. Watch that first step: it's a big one! Newer steps “remember” to extend the step, even if master switch is OFF, after driving.

<<Two or three times a year a few drops of oil on the friction points on both sides of the step keep it operating smoothly. Be careful not to get oil on the non-skid surface of the step(s).

<<Find out where the fuse for the step is located. NOW!

<<A bad “ground” connection will keep the step from extending. This ground connection is usually immediately adjacent to the step itself.

THE MASTER CONTROL PANEL

The Master Control Panel (MCP) provides a lot of information. It is usually conveniently located in the kitchen area, and consists of a series of labeled switches, most with one or more LED lights. The lights report the status of the tank or device when the appropriate switch is activated. Some of the switches are

spring loaded, returning to the OFF position when released. Others are 2 or 3 position switches that remain in the last position selected. Some of the newer MCP's have a single momentary TEST switch that performs most of the tests discussed below. There is nothing standard about the many MCP's installed in RVs, but they share most of the following functions:

Fresh Water Supply	(momentary)
Fresh Water Pump	(on/off)
Gray Water Holding Tank	(momentary)
Black Water Holding Tank	(momentary)
Water Heater	(on/off) (electric or gas)
Propane Supply	(momentary)
Coach Battery Condition	(momentary)
Exhaust Fan Switch	(Hi/off/low)

Occasionally you will find the generator start/stop switch on or nearby the MCP.

DEFINITIONS

Some of the terms above may be new to you, and will be explained below. You may find some of the switches located independently, but they serve the same function.

Fresh Water Supply. This switch shows you through illuminated LED lights the approximate (1/4, 1/2, 3/4, Full) quantity of water stored in your fresh water tank. The tank is gravity filled through an external fitting.

Gray Water Holding Tank. Gray water refers to the waste water from your kitchen sink, bathroom sink, and shower. The holding tank is beneath the living area of the RV; held for later disposal. LED lights show status of the tank when the switch is pressed (1/4, 1/2, 3/4, Full).

Black Water Holding Tank. Black water refers to the combination of human waste, chemicals, and water flushed through the commode. Black water is held in a separate holding tank for later disposal. LED lights show status of the tank when the switch is pressed (1/4, 1/2, 3/4, Full). The switches for the holding tanks will probably be labeled Tank 1 and Tank 2. If they are not labeled it is important to establish which is which. Check your owner's manual.

Water Heater. When it is propane fueled, the water heater switch has a companion light (sometimes the switch itself has an embedded light) that illuminates briefly when the switch is turned ON. If the propane burner ignites, the light goes out. If the propane fails to ignite (or later goes out) the water heater light will remain ON. When the water heater is working normally, the light is NOT on, even though the switch IS. Many newer units allow you to switch from propane to AC, when 110V AC power is available.

Propane Supply. The propane switch, like the water tank switch, shows approximate quantities of propane in the tank by illuminating lights when the switch is pressed (1/4, 1/2, 3/4, Full). The propane is the liquefied gas stored in a supply tank accessible only from outside the RV. There is also a hard-to-read manual gauge mounted on the tank itself.

Batteries. There is a dedicated battery(ies) that supplies 12V to all lights, fans, pumps, and other devices used in the living space of an RV. Activating the switch shows the general status of the battery charge;

green = high level of charge, amber = partly discharged, red = almost completely discharged. If the engine is running, or the batteries are being charged from any source, the test is meaningless. However, if you are "dry camped" with no external power, you can use the test switch to avoid the unexpected depletion of your batteries.

Exhaust Fan. A two-speed fan is located in the hood above the cooking stove. There are usually no lights associated with this switch, but you don't need one! You will hear it running if it is on. This is a three-position switch, with center OFF.

Dry Camping. Self contained camping without water, sewer and/or electric hookups.

MANAGING YOUR CONSUMABLES

When you are at home, managing your utilities is limited to getting the kids to turn off the lights, and fixing faucets that are dripping. Beyond that, your management comes down to paying the bills. That changes when you move into your motorhome for an outing. All of your utilities become consumables and you must make them last: fresh water, battery, propane, waste water storage, gasoline, and refrigeration.

When you are traveling or parked where replenishment is not available, you will have to conserve some or all of the above to keep your RV fully functional. Now that isn't as scary as it sounds, but it does require that you have a good understanding about how these systems operate. Your Master Control Panel becomes your information center. You can quickly assess the status of most of your consumables (except for gasoline) from the indications given there. If you seldom stay where hook-ups are available, you must practice strict conservation to keep everything working. Because your consumables are inter-related, they will be explained as a group in the next few pages. It will become obvious how to trade off a small amount of gasoline to recharge batteries. And how to conserve waste tank capacity by minimizing water use, etc.

FRESH WATER

There are only two sources of water in your RV: water pumped from the fresh water tank that you previously filled; or water delivered from a campground faucet through your hose. You can gravity-fill your tank through a spout in the side of your RV. It normally has a locked cover to prevent anyone from tampering with your water supply. Monitor your Master Control Panel while filling. Since water weighs 8 lbs/gal, carry no more than you think you need. Experience will show you how long 1/2 tank will last. If you are careless, it won't last a day. If you are careful, it will last 4 or 5 days. Always use a special tasteless, non-toxic white or blue coiled hose, available at all RV stores. Keep it scrupulously clean, and NEVER use it for waste water applications.

The water pump is a demand type device, running only as required to maintain pressure, drawing water from the fresh water tank. If a faucet is open when the switch is turned on, the pump will run until the supply is exhausted (or until you turn the faucet off). There is a light that shows that the SWITCH is ON. It does not indicate that the PUMP is (or is not) running. The pump runs on 12V DC. There may be an additional switch in the bathroom. Either one, when turned on, will energize the pump.

BILL'S HINTS about FRESH WATER

{{ Keep everything about your water supply CLEAN.

<<For your water supply hose most RV stores sell a threaded plug to close your external pressure fitting. This keeps out dirt and bugs. If you don't have one, get one and use it.

<<Use an adapter with a flexible tube to facilitate gravity filling. Keep it in a clean plastic bag when not in use. These adapters are available at any RV store.

<<When done with your hose, coil it up and screw the ends together tightly to keep out bugs and dirt while it is stored. Flush it thoroughly before use.

<<While parked where there is a good source of water, you may choose to connect directly to that source through your pressure fitting. This fitting includes a simple one-way valve that lets water enter your distribution system but prevents losing water when the hose is disconnected and your pump is again turned on. Water entering through the pressure fitting will NOT automatically refill your fresh water tank, unless you have a special manually operated diverter valve that makes this possible.

<<If your water pump runs a few strokes and then stops, only to repeat the sequence a few minutes later, you probably have a dripping faucet or a leak. In addition to all faucets, check the pressure fitting for a drip and the water heater drain plug for leaks. If no leaks are found, you probably have a malfunctioning pump pressure cutoff switch.

<<Your internal water system is rated for only about 50 pounds of water pressure. Unless you are certain that you have a pressure regulator built-in, always add one to your hose before connecting it to your pressure fitting. Install it on the water source end of your hose.

<<Always turn your pump OFF before pressurizing the system with a hose from an external source. Use only a special hose that is safe to leave pressurized.

<<Carry a minimum of two 25' hoses. Not all spigots are handy to your parking spot, but a 50 footer is a nuisance when you are parked close to the faucet.

<<Always TASTE water before adding to your fresh water tank from an unfamiliar source. It's a lot easier to keep bad water out than to GET it out.

<<If you want to maximize your on-board water supply, fill your water heater before topping off your storage tank. This is needed only if the water heater tank has been emptied.

<<Your fresh water tank (full) may contain 30 or 40 gallons of water. While that sounds like a lot, at home you probably use several HUNDRED gallons a day. Obviously, you will have to learn new habits or buy a very long hose, so you can stay connected while you travel.

<<There is a double purpose to saving water. In addition to the limited supply, remember that everything that goes down any drain ends up in one of your holding tanks. And you can't just open those tanks to drain out on the ground. That is not only unsanitary, but in most places, illegal.

<<Showers are water wasters but they don't have to be. Most RV showers have "telephone" type showerheads (on flexible hoses) with a built in shut-off valve.

<<Adjust your water temperature, divert it to the shower, then turn water on and off at the showerhead. Practice the Navy way – wet down; soap up; rinse off. Use just enough water to wet down, then shut it off. Soap up your suds and scrub as required. Quickly rinse off.

<<Wash your dishes in the smallest container practical. Using only as much soap as needed minimizes rinsing. Do NOT rinse by using a running stream of water. Use a second container to rinse. This water can then be carried outside to irrigate trees or plants, if the park allows, saving your holding tank capacity. (Always check with the RV Park before discharging any gray water).

<<When brushing your teeth, do not let the water run. Use a small paper cup of water to wet and rinse your brush. Refill to rinse your mouth.

<<Flush toilet only long enough to carry away waste material. Keep a toilet bowl brush handy to help clean the bowl.

<<Children have a hard time learning how to conserve water (and so do some adults). Supervise them carefully until they have learned how to do it.

BATTERY POWER

Motorhomes have two battery systems that are electrically isolated from each other. The battery used to start the engine and operate the electric fuel pump, lights, radio, horn, etc., is called the Vehicle battery. The batteries (usually two) that operate interior lights, blowers, fans and pumps, are called Coach batteries. Although isolated, the two systems share two features. Through the isolator, all batteries are charged when the vehicle engine is running; and there is a special emergency start switch that temporarily joins all three batteries in parallel for starting the motorhome engine, if required.

There is a small battery charger that converts 110V AC power (from whatever source) to 12V DC, charging the Coach batteries, while at the same time supplying the Coach with 12V DC power. There are two sources of 110V AC power: the auxiliary generator and the 25' power cable that can be plugged into an appropriate external receptacle. Both sources will be discussed in detail in a later section. The battery charger/power converter is always activated when 110V AC power is present. Some units charge all batteries. Ask about yours.

The second source of battery charging is the motorhome engine alternator. When the engine is running, all batteries are being charged. This is several times faster than charging with the power converter. When all charging systems are inactive, the built-in isolator prevents interaction between the two independent systems. The Coach batteries can be run down without any effect on the Vehicle battery, and vice versa. This protects the Vehicle battery for starting the motorhome engine. If the Vehicle battery is dead, for whatever reason, the emergency start switch permits starting the engine from the Coach batteries. In either event, you can always get going again. If you regularly deplete the Coach batteries, you should ensure that they are "deep discharge" batteries with large capacities. Conventional batteries are very short-lived if they are repeatedly discharged. Two, 6 volt batteries connected in series will give you 12 volts, but with more capacity.

BILL'S HINTS about BATTERY POWER

<<The biggest single load on the batteries is the gas furnace blower. Try to hookup, or run your generator, if you are using the furnace heavily. Even then the built-in charger may not keep up.

<<Keep all battery terminals clean, bright, and tight. Check battery water level at least monthly if the RV is connected to a 110V source. The power panel is supposed to prevent overcharging of the batteries, but if it fails to do so, you can burn up the batteries. If you need to add water regularly, you are probably overcharging.

<<When adding water to batteries, use distilled water if possible.

<<Clean battery tops regularly with baking soda in water. Do not let soda water get into the cells.

<<The power converter panel contains circuit breakers for 110V AC and fuses for 12V DC circuits. It also has the built-in battery charger, but its capacity is limited.

<<If "dry camping" (no hookups) the auxiliary generator should be run for several hours whenever your battery test switch (on the Master Control Panel) shows an amber light. The small amount of gasoline used will ensure that your batteries stay charged. A separate 20-30-amp charger, powered by the generator and connected directly to the batteries will do the job faster.

<<When dry camping, do not leave lights on unnecessarily. Make certain that the step is down and the step control switch is OFF.

<<Always keep your batteries fully charged in freezing weather. Battery voltage drops rapidly when used in cold weather. A low battery is susceptible to rupture when frozen.

<<Overcharging can destroy batteries. Battery disconnect switches can be installed to temporarily remove individual batteries from the charging system. These switches permit leaving the RV plugged in to 110V for refrigeration, microwave, coffee makers, air conditioning, etc. Short camping trips are not a problem, but long-term storage can be.

<<The Coach batteries power numerous devices even when the RV is stored. Some have ON/OFF switches; others do not. Turn off all switches. Pulling fuses on the fuse panels for those that do not have switches will prevent depletion of these batteries.

<<When your RV is stored, the Vehicle battery will slowly discharge because of clocks and other devices that are always powered. You might want to disconnect the Vehicle battery.

FUSES AND BULBS

Coach fuses and circuit breakers for original equipment are normally located in the power distribution panel. Add-on accessory fuses may be located in unusual places. Note where they are and what styles

are used. The very nature of RVs, with various add-on options, makes it difficult to find a blown fuse in the dark and in the rain. When else would you have a problem? Some critical fuses are fresh water pump, auxiliary generator, electric step, and propane furnace blowers.

Make sure that you have identified all of the essential fuses on your RV. Label them if you can. At least, make a written record for yourself. Carry a good supply of the sizes and styles of spare light bulbs for all of your inside and outside lights, as well as the type fuses used in your motorhome.

PROPANE

Propane is a liquefied petroleum gas (LPG), stored under pressure in a ventilated external tank on your motorhome. Through permanently installed piping, propane is furnished to the refrigerator, water heater, stove, oven, built-in furnace, and in some cases, to the auxiliary generator. There is a manual shut-off valve and a direct reading gauge on the propane storage tank. In some motorhomes there is a vapor detector inside the coach that cuts off the propane electronically while sounding an alarm in the coach. The vapor detector will activate on propane fumes, gasoline fumes, hair spray, and some after shave lotions and perfumes. It's a great safety device, but it can be very frustrating, because as long as it “thinks" there are dangerous fumes around, the propane is shut off at the tank. Keep a fan handy to clear the area around the sensor if it shuts down on a false alarm. By itself, it can take quite a while. If an alarm sounds without an obvious reason, do not flip any switches. Get outside immediately. Leave the door open, and turn off the propane at the tank. Re-enter only after all LPG fumes are gone.

Managing your propane is very straightforward. Refill it whenever the level reaches 1/4 or whenever you are planning cold weather operation (heaters use a lot of propane), or dry camping (especially if you have a propane fueled auxiliary generator). All other uses of propane are moderate and you will find you can operate for extended periods on a full tank.

BILL'S HINTS about PROPANE

{{ All flames, such as the refrigerator and oven pilot light, should be turned off before refilling either the RV gasoline tank or the propane tank itself.

{{ If you smell propane at any time (except briefly while lighting the cook-stove), vacate the coach and turn propane off at the tank until the source is known. Leave doors open.

{{ There is a small valve (sometimes called the 20% valve) that should be left open while the tank is being filled. Stop the filling when liquid fuel starts spraying from this valve: the tank is full. This provides a safety expansion of 20% to protect the tank (and you) from increased pressures caused by sunlight on the tank(s).

<<In extremely low temperatures, propane vapor pressure may be so low that flames cannot be kept lit. Check with suppliers about minimum usable temperatures and the use of electric tank warmers, if you are going to operate in severe conditions.

<<If your refrigerator doesn't have a 12V capability, propane is critical to maintaining refrigeration while

driving. The only other source of power for refrigeration would be running the auxiliary generator, which provides 110V AC.

<<In general, your refrigerator will be colder when operating on propane.

<<Many private campgrounds sell propane. Others have sources that can deliver propane to your campsite.

<<Most state parks do not sell propane. National campground guides usually contain at least a partial list of propane service centers.

<<Propane is unavailable within some city limits. Your best bet is to inquire at your campground to find a source.

<<Unless you are using your oven a lot, leave the pilot light turned off when you are not cooking. It uses a surprising amount of propane.

REFRIGERATION

Most people would not consider refrigeration a consumable, but I list it that way because, without it, the RV doesn't function very well. And, of course, getting refrigeration DOES deplete other consumables. Early RV refrigerators used propane gas for fuel, which was a great improvement over the simple icebox. A few years later the capability was added to operate the refrigerator on gas **or** 110V electricity. The user has a manual switch to select the mode. Later models automatically select 110V when available.

You may wonder how burning gas or running an electric heater can cause your ice to freeze and your food to stay cold. There is a sealed evaporator unit on the RV refrigerator in which fluid/gases are circulated using thermal heat exchange principles. Either a gas flame or an electric heater adds heat. The mixture is cooled by circulation up the back of the refrigerator. When these gases condense inside the box, heat is absorbed from the contents. Of course, the process is somewhat more complex than this, but you get the idea. The process is slow, but is extremely efficient and efficiency is the name of the game in RVing, remember? Once the box is cooled down, it requires a very small amount of heat to keep the process going.

Since heat exchangers work on the DIFFERENCE in temperatures in the two media, the amount of cooling is directly related to outside air temperature. At 100 degrees in the shade your box may only be able to hold a 50/60-degree temperature. It will work better while traveling because of the increased airflow around the cooling unit. When stopped, opening the external access vent door (which is at the bottom) increases airflow. An electric fan can be blown into the lower vent to force an increased airflow. Most times the unit works fine without heroic measures, but you will find that in hotter weather you may have to move the dial to a colder position to maintain the desired temperature inside the box. In cool weather you will find your eggs and lettuce frozen if you forget to move the thermostat to a warmer position. A small battery-powered fan inside the refrigerator will help prevent the concentration of cold air at the bottom (where the lettuce is). They are sold at all RV stores.

In some models, there is a third type of heater built into the heater section - 12V DC. This heater can only be used with the motorhome engine running, enabling the excess capacity of the engine alternator to be used to run the refrigerator. The control board for a three-way RV refrigerator uses logic to control the

heat source. If the switch on the refrigerator is ON, the following logic is used:

• If 110V is available, it will be used.
• If no 110V is available, check motorhome ignition switch.
• If ignition is ON, the 12V DC heater will be used.
• If ignition is OFF, the propane burner will be used.

When you shut down the motorhome engine, the refrigerator, which has been running on 12V, goes into a delay mode. The propane is supposed to remain off, giving you time to refuel without a fire hazard. But you can't always control how long it will take to refuel, and if the delay period expires while you are refueling, **THE PROPANE BURNER WILL COME ON**.

Regardless of your refrigerator type, before you pull into the gas pump area, **TURN *OFF* THE REFRIGERATOR, STOVE, WATER HEATER, and FURNACE.**

After you have pulled clear of the gas pumps, turn the refrigerator back ON and the logic board will choose the appropriate mode of operation.

If the 12V heating element burns out, the computer still senses that the ignition switch is ON. The computer will prevent the propane from taking over while you drive, which is not good. You need to have the refrigerator fixed. In the meantime you have food that will spoil if not refrigerated. If you want to save your food this is what you need to do.

Remember the computer prefers 110V AC most of all:

(1) You can plug into an external power source and it will start operating on 110V, but then you can't get to a repair shop.
(2) You can run your auxiliary generator to provide 110V, but you just might be days from getting a repair made.
(3) Before you have a problem, search the back of the refrigerator through the outside access door to identify the ignition sensing wire. It will be labeled IGN or IGN LOCK. If you can't identify this wire, ask your dealer's mechanic to point it out to you. Mark it with a strip of tape for future reference. If you disconnect this wire and cover the bare end with tape, guess what? The computer doesn't know that the vehicle ignition is ON, so it lights the propane. Now you have a 2-way refrigerator, 110V AC or Propane. Whenever you get the 12V heater replaced, have them reconnect the IGN wire.

Now I've spent a lot of time on the refrigerator, but few things are as urgent as loss of refrigeration. Understanding how it works lets you make intelligent decisions about alternatives available to you.

By the way, you will find that most refrigerators installed today are the old reliable two-way propane/AC electric models. You can force propane operation by way of a switch on the refrigerator control panel. The refrigerator really uses only a small amount of propane, anyway.

BILL'S HINTS about REFRIGERATION

<<Above all else, your refrigerator MUST be fairly level to operate properly.

<<Before your first trip, level your motorhome (using jacks or blocks of wood) so that the freezer SHELF is as level as you can get it both front-to-rear, and side-to-side. Position your level inside the refrigerator. Once you're sure the refrigerator is level you can remove the bubble level from the refrigerator and find a location outside the refrigerator that is both level and convenient for permanent installation. Make sure the bubbles are absolutely centered before you permanently fasten them down. After that, you can always level your RV without opening the refrigerator doors.

<<If your 110V heater burns out, just unplug the 110V cord at the rear of the refrigerator (accessible from outside). The computer, which is powered by 12V, will switch you to propane.

<<If you have trouble getting your propane burner to light or stay lit after long storage, clean the burner with a thin bottle brush to get rid of rust flakes and carbon particles that are blocking the orifice.

<<If the burner doesn't light, or blows out, the gas control will automatically shut off the propane flow.

<<There are usually mechanical locks for the freezer and main refrigerator doors. Use them always, and make sure they are on your check-off list before leaving camp. Without the locks both doors will fly open on bumpy roads and in hard turns.

<<If you smell ammonia, either inside or outside the motorhome, especially around the refrigerator, you may have developed a leak in the sealed cooling loop. Monitor your temperatures carefully. It is a major problem to service a leaking unit.

<<If you are not getting the cooling that you expect, check the vent at roofline for birds' nests, or other obstructions.

<<Long periods of storage can cause problems for RV refrigerators. It's possible for chemical contents of the cooling unit to settle out and not mix when the refrigerator is started. If at all possible, run the refrigerator for 3 days once a month. Use either 110V or propane. Manufacturers say that on their new units this isn't necessary, but it can't hurt.

<<Very few campsites are actually level. Without leveling jacks, you must carry short lengths of 2"x6" boards or commercial wheel lifts in order to obtain proper level while camped. Operating the refrigerator for long periods while out of level can stop the evaporation process. It takes care of itself while driving. If you must park unleveled for a brief time, turn the refrigerator OFF.

<<The term UP or DOWN is ambiguous when talking about refrigeration. Think of it as turning it COLDER or WARMER. To that end, the thermostat control may display a white streak that gets wider as you rotate the knob. It represents how thick the ice will get, (thick ice is the coldest setting; thin ice is the warmest). Newer units have a temperature control on the outside labeled 1-5, which is much handier, but not quite as flexible. Number 5 is the coldest setting.

<<The refrigerator light is 12V operated, so just because the light comes on doesn't mean that 110V power is available.

<<Monitoring temperature in the refrigerator/freezer can be done with an inexpensive thermometer. This will help avoid food spoilage from temperature extremes.

<<Any shade you can provide for the back of the refrigerator will improve performance when parked in hot weather. If you regularly camp in very hot weather, install a thermostatically controlled 12V fan that improves air circulation around the cooling coils in the back of the refrigerator. They are available at all

RV stores.

<<Don't let frost get too thick in your freezer. Ice is a good insulator, preventing the refrigerator from cooling properly.

<<If your RV is stored with the refrigerator turned OFF, turn it ON several hours before putting food into it.

<<Make your ice at night. The box works better. Besides, unfrozen water will splash out of the trays if you are traveling.

RV TOILETS

The marine-style toilet installed in your motorhome is designed to conserve fresh water. A foot pedal or handle opens the bottom drain to let waste drop into the black water tank, which is located directly beneath the toilet. Pressurized water is used to rinse the toilet bowl. The most common toilets have two valves. One opens the drain AND rinses the bowl; the other valve only adds water to the bowl.

When either valve is released, water flow stops. By design, and unlike your toilet at home, a minimum of water is used in the flushing process. If you hold the valve open, thinking you are getting a better flush, all you accomplish is filling your black water tank. Kids are great at this.

If the bowl is still soiled after flushing, there may be a hand-held spray similar to the spray found in your kitchen at home, which is connected to the fresh water supply for the stool. It is pressurized only when the water valve is held open. Use this spray, together with a toilet bowl brush, to quickly clean the bowl.

Read the sections on Holding Tanks, Waste Treatment and Odors, and Sewer Hook-up and Dumping so you understand the complete waste system.

BILL'S HINTS about RV TOILETS

<<Most toilets are made from some form of plastic, and have a highly polished finish. Do not use abrasive cleaners. Once the finish has been dulled, waste will be hard to clean off without hard scrubbing.

<<Minimize paper products and other solids flushed down the stool.

<<The holding tanks have limited capacity. Don't flush excessive amounts of water into them.

<<Keep the lid closed to prevent foreign objects from falling into the toilet. It is a major job to retrieve anything from the holding tank.

<<If a water leak develops behind the toilet it's most likely the fresh water ball valve. Improper winterization of the toilet is one of the main causes of ball valve leaks. Although easy to replace it will usually entail the removal of the toilet because of the tight work space.

<<Most mechanical seal toilets have a paddle that creates the gas seal between the inside of the RV and the tank. Odors can infiltrate the RV if this seal is leaking so periodically check for any build up on the paddle seals. The other toilet seal is at the floor which is seldom a problem.

WASTE WATER HOLDING TANKS

Black and gray water holding tanks were defined earlier. Both holding tanks, black water (waste) and gray water (sink & shower) are located below floor level. The two tanks have drain pipes that terminate into sliding gate valves. The cleaner the waste tank remains the better off you are. A clean tank with clear roof vents will eliminate most problems with odor and expensive service work. Remember that most tanks are very functional and drain properly but some will take more work. For a complete understanding of the waste system review the sections on Toilets, Waste Treatment & Odors, and Sewer Hook-up & Dumping.

BILL'S HINTS about HOLDING TANKS

{{ If you decide to use any tank-flushing product that hooks up to a fresh water hose and connects to the tank or valve system, always install an anti-siphon valve onto your fresh water faucet. This under $5 investment will protect your fresh water supply from contamination.

<<There are three types of tank cleaning devices; those that connect to the valve system and flush fresh water into the system cleaning the exit to the tank; those that attach to the tank and spray fresh water into the tank; and spray wands that are placed into the tank through the toilet. All have their plusses and minuses but at the end of a trip any extra tank cleaning is recommended.

<<Clear fittings are available for attachment to the valve system so you can see when the tank is clean.

<<Remember to always use RV Safe toilet paper that breaks down easily. Paper can be big trouble in an RV waste tank causing trouble with monitor panel sensors. Paper is also difficult to breakdown. It can add tremendously to clogging problems. Minimize the amount of paper used. Don't put Kleenex or other disposable products down the toilet. Don't put any insoluble material down the toilet that will contribute to clogging or jam your dump valve in the OPEN position.

<<Don't let waste dry up in your black water tank. Before storing your motorhome it's best to get the best possible flushing action when dumping the tank for the last time each season. To do this fill the tank and if your unit has been stationary for a long period, drive it around to help agitate the tank prior to dumping.

<<Gray water tanks that accept water from the sink and shower need little maintenance but will occasionally need a deodorizer (use the same one you use for the black water tank). Enzyme waste digesters can be used for the gray tank and have the added benefit of keeping the p-traps clear under the sink and shower.

WASTE TREATMENTS & ODORS

Waste Treatment products can be classified into two general categories: chemical and natural. Chemical treatments are inexpensive and provide a perfume-mask of odors but do little to breakdown waste and clean your tank. Natural enzyme based products are effective for both odor control and keeping the tank clean by quickly digesting waste and paper products in the tank. Keeping the tank clean is the secret to never having odor or service problems.

Formaldehyde, the most common ingredient in chemical treatments, is a poison and EPA recognizes it as a cancer causing agent. It's lethal to the naturally occurring enzymes and bacteria needed to breakdown waste in septic systems. For this reason, many RV parks with septic systems are no longer accepting formaldehyde treated waste.

In general, odor should not be a problem if you have a relatively clean waste tank, the tank roof vent is clear, and the seal to your toilet is sealing off the tank gases from the inside of your unit. Your gray water tank (sink & shower water) will occasionally need treatment for odors (sometimes they're worse than the waste tank). Use of an enzyme tank treatment product will have the added benefit of keeping the p-traps clear under the sink and shower.

For a complete understanding of the waste system, review the sections on Toilets, Waste Water Holding Tanks, and Sewer Hook-up & Dumping.

BILL'S HINTS about WASTE TREATMENT & ODORS

{{ Do not mix different types of tank deodorants and cleaners. You may create a dangerous or deadly combination.

<<When buying holding tank treatments always check how many treatments are in the bottle. Treatment doses range from 2oz. to 8oz. Don't be fooled by big jugs that may have less treatments than you think.

<<When using holding tank treatments remember you can vary the dose to some degree based on the sensitivity of your own nose.

<<Some treatments require a dose every few days and some require only one dose per tank. Read the directions and remember in either case if you smell a hint of odor you should add more treatment product. This is especially true in extreme heat.

<<Some treatments become less effective over time. If you have an old bottle, consider doubling up the dosage or buying a fresh one.

<<Odors can be caused by a tank vent pipe that is not clear which will force gases up through the toilet. This can happen with bird nests in the vent pipe at the roof or paper stuck to the top of the tank covering the vent pipe opening (you let the tank get too full).

<<Odors can also creep into the RV interior if the toilet paddle that opens when you flush is not sealing correctly. Check for buildup on the paddle seals if you suspect a problem.

<<Some waste treatment products become less effective in hard water. If this is the case you will need to increase the dose based on what your nose is telling you.

SEWER HOOK-UP & DUMPING

Hooking up to the sewer is accomplished by using flexible sewer hose. Before connecting your hose, remove the twist-on bayonet waste cap that is on the valve assembly. One end of the hose attaches to the valve outlet with a twist-on bayonet hose adapter. The other end attaches to a sewer fitting for connection to the ground level sewer. Some sewer fittings fit loose while others form a gas tight seal which is now required in many states. Once the hose is properly connected on both ends, dumping of holding tanks requires only pulling the handles of the slide valves to the open position. Some of these valves are hard to access and use because they are low to the ground and the direction of opening can be awkward. For your first try do a test while the tanks are empty to see what you have to do to get them open. Sometimes a kneeling pad for your knees will be required. In general, basement models are easier to operate, because the tanks are higher off the ground. Slide valves should always be kept fully closed or fully open. A partially opened valve will allow for solids to dry on the valve track or in the drain pipes both which can lead to problems.

Always dump black water first which is the larger of the two valves. Ideally, dumping the black water should be delayed till the tank is more than half full. This ensures a strong flushing action to carry solids out of the tank and through the flexible drain hose. When the black water tank is empty, open the gray water valve. This relatively clean water (from the sink and shower) will then flush clean the valve and flexible sewer drain hose. When it stops running, close both dump valves. Disconnect the drain hose from your waste connection on the RV, and rinse the inside with clean water. **Do not use your white fresh water hose for this purpose.** Drain and remove the flexible hose from the ground sewer connection and store it**. REMEMBER TO REPLACE THE OUTLET TWIST-ON CAP.**

For a complete understanding of the waste system review the sections on Toilets, Waste Water Holding Tanks, and Waste Treatments and Odor.

BILL'S HINTS about SEWER HOOK-UP & DUMPING

{{ Find out for certain which light on the master control panel (1 or 2) designates black water so you can monitor it. Then you can decide when and where to dump.

<<Keep either disposable or reusable waterproof gloves handy to wear while dumping. Even though you seldom come in contact with wastewater, the hose is often dirty and wet after dumping.

<<Always close dump valves before storing the motorhome. In warmer weather, leave a gallon of water and some tank treatment product in the black water tank. In cold weather, add some anti-freeze.

<<Carry a spare waste outlet cap. If you fail to put the cap back on after dumping, it will probably be torn off while driving.

<<Special waste tank outlet caps are available for draining gray water (**NOT** black water) through a standard garden hose, leading out of the campsite. Use this only when such discharge is permitted. Carry a colored hose for this purpose. (Do not use your white drinking water hose.)

<<Do not leave the black water dump valve open when connected to a sewer. Liquids containing the deodorizer will drain away, leaving smelly solids behind, which can then solidify. In extreme cases you may have to replace the tank, a very expensive proposition.

<<Gray water dump valves may be left open when connected to a sewer, since no solids are involved.

<<If you dump black water every night, you will waste a lot of chemicals, and will generally get a weak flush of the tank. Unless you are heading into a situation where you need maximum holding tank capacity, dump only when the tank is at least half full.

<<Carry an extra 10 or 20 foot length of sewer hose, with appropriate fittings installed, just in case the sewer is located too far from your waste outlet for your regular drain hose to reach.

<<Flexible sewer drain hose comes in many grades. The most important feature is the vinyl mil thickness over the wire and this is the best determinate of hose quality. Mil thicknesses vary between 8 and 21 mil. Terms like heavy duty and standard can be misleading, so just focus on the mil thickness.

<<Protect your drain hose by supporting it. Don't drag it over rough surfaces. Even then, it will not last forever. At the first sign of brittleness, or pinhole leaks, replace it! It is not a pretty sight when the hose ruptures while you are dumping a full black water holding tank!

<<If your waste valves are hard to open, spray the shaft of dump valve handles with silicone each time the valves are in the open position to ease operation.

<<There are many different sewer hose fittings on the market. The black ones are inexpensive but must be used with hose clamps. Colored fittings are the upgraded versions. Whichever you decide on just make sure they're easy to install, won't come off during dumping, and create a good seal.

<<Clear fittings allow you to determine when the tank is clean. Use them – otherwise you will be cleaning longer than you need to and wasting water.

<<Sometimes the people who design and/or build dump stations have never used one. They slant the paving the wrong way and you can't completely empty your tanks. Use your jacks (or boards under your right-side wheels) to tilt your vehicle toward the sewer connection.

>>If the sewer connection is on the wrong side, or is too far to reach from your campsite, check to see if the campground has a dump station to use as you depart. Or, drive through any empty campsite when you leave, pausing long enough to dump your tanks in an accessible sewer pipe.

GASOLINE

Gasoline or diesel fuel is carried to operate the motorhome engine and (in most cases) the auxiliary generator. Most motorhomes have a single large fuel tank. Some may have a second smaller tank with an electric switch that selects which tank the engine draws from. It is important to know your total fuel

capacity in order to manage your fuel stops. With most motorhomes getting 6-8 miles per gallon, you can't afford to misjudge your refills by much.

Fuel management includes ensuring that there is an adequate supply for your auxiliary generator. If you have a small second tank, the generator usually runs from that tank. Otherwise, the auxiliary generator shares the fuel in the main tank with your motorhome engine. In either event, fuel to the generator is provided through an open ended vertical pipe in the appropriate tank. When the fuel level drops below the intake to the vertical pipe, the generator quits.

This feature ensures that you will have a few gallons left to drive the motorhome to a filling station. Obviously, to keep the availability of your auxiliary generator, you must ensure that your tank(s) are more than one fourth full before stopping to camp.

BILL'S HINTS about GASOLINE

{{ Turn off ALL OPEN FLAMES when you are filling your gasoline tank(s). 100 gallons of burning gasoline makes an impressive sight, after the explosion.

{{ On engines with carburetors, if your electric fuel pump (located near your main gas tank) fails, you will have problems with vapor lock on hills. The line from the engine driven fuel pump to the tank is too long to pull the gas forward at the rate required for hard pulls.

{{ The electric fuel pump pushes the gasoline from the tank, through a canister- type filter to the engine driven pump. In fuel-injected vehicles, the electric pump may be the only fuel pump. These electric pumps run whenever the ignition key is ON. They are usually located near the main fuel tank.

{{ When changing this canister filter, you will spill some gas. Make certain that you are in a well-ventilated spot, with NO OPEN FLAMES.

{{ The canister filter looks somewhat like a small oil filter. To remove, simply unscrew the outer case from its base. Instead of a total replacement, you replace only the removable cartridge inside the case and then screw the case back onto the base. Make certain that it is tight enough to prevent leaks, since it will be pressurized when the pump runs.

<<Keep your fuel tank(s) full when not on the road. Moisture in the form of water vapor can enter by way of tank vents as evening temperatures drop. When the vapor condenses, it forms water. The more empty space, the faster water collects. Water rusts fuel tanks and rust flakes clog up your filters.

<<With new pollution laws, fuel can differ by state, so see your local dealer about effects of long term storage.

<<When your motorhome is stored, operate both your main engine and your auxiliary generator under a load for 30 minutes at least monthly. This will circulate oil and pump a fresh supply of gas through carburetors and fuel injectors. Small engine repair shops sell gasoline additives that keep varnish from forming in carburetors. For long-term storage, use it in recommended amounts. It is somewhat expensive, but wait till you see what a carburetor replacement costs if you don’t use the additive.

<<I've never found anyone who could tell me at what fuel gauge reading the auxiliary generator will fail

to operate. You can determine this for yourself by running through the following procedure and avoid getting surprised on some dark and stormy night when your heat and light depends on your auxiliary generator. While driving, watch your fuel gauge as it approaches 1/4 tank. At 1/4, start your generator and run it for 10 minutes, then shut it down. When the needle shows midway between 1/4 and 1/8 tank, run the generator again for another 10 minutes. Repeat at 1/8 tank. At some point, the generator will fail to start, or will quit within a few minutes. You then have a pretty good idea about where your critical fuel supply level is.

<<The auxiliary generator has its own electric fuel pump, so the main electric pump is not needed.

<<If you have two fuel tanks, the switch on the dash panel selects the tank to be used. Tanks should be switched while running at highway speeds to overcome any "slug" of air that could be in the newly selected gas line. A momentary "stumble" is not unusual.

<<Gasoline octane varies from one part of the country to another. Know what octane is best for your RV so you don't end up with an engine that "pings".

AWNINGS

Awnings vary by manufacturer and model, and so do the procedures for using them. Make certain that you get thorough instructions from your dealer on how to extend, retract, and store your awning before you try to use it. Small window awnings add to your inside comfort, and help reduce air conditioning loads.

BILL'S HINTS about AWNINGS

<<Always leave one end of the extended awning lower than the other. If both ends are the same height, rainwater will collect, causing the canvas to sag. When the collected water gets heavy enough it will destroy the fabric, or the metal frame, or both.

<<Sometimes you have to roll up the awning while it is still wet. Remember to extend it later to dry the canvas and prevent mildew from forming.

<<Don't leave the awning out when thunderstorms are in the area. It will tear off.

<<In moderate winds, it is recommended to use an awning tie down or anchor on the outer corners to protect awning and reduce wind noise. When you leave the RV unattended for extended periods, roll up the awning.

JACKS, LEVELING, LEVELING AND STABILIZATION

Leveling is done for comfort (especially during sleep) and also for the proper operation of your

refrigerator. Stabilization stops the Motorhome from tilting and swaying when you use the entrance step, extend one or more slide-outs, or just walk around inside the unit. This movement is not only annoying and uncomfortable but can also be a safety hazard with hot liquids on the stove.

Do your best to pick a campsite that is as level as possible and after finding the right spot chock the wheels in both directions. Motorhomes have two main systems for leveling either automatic jacks (electric or hydraulic) and manual plastic levelers or boards that you drive up onto. The automatic jacks also perform stabilization but remember to keep your wheels chocked to protect the extended jacks.

Plastic drive-on levelers stack on top of each other in an interlocking manner providing a solid base for the tire. Make sure that the tires are fully supported if you drive onto boards which can do the same thing in a pinch.

When leveling with drive-up levelers remember that the weight of the Motorhome is being supported by the springs on the axle so if you level first before extending the slide-out you will have to make an adjustment a little higher to compensate for the added weight of the slide out. A little practice and this adjustment can easily be made. Without stabilizers, the Motorhome springs will compress somewhat when weight changes occur inside the unit; more so with side to side changes and less so with front to back weight changes. Wayne's RV Stabilizer is especially good at stabilization when using these drive-up levelers because they're quick to set up and secure the unit to the ground. One of these stabilizers placed to the side of the entrance door eliminates all back to front shifts as well as any up and down movement when entering or exiting the entrance door. A second one at the rear bumper locks down the unit in all directions creating a home-like feel to RV living.

BILL'S HINTS about LEVELING and STABILIZATION

<<Don't consider using a jack to lift a wheel off the ground to change a flat. They are not strong enough for that purpose.

<<Jacks greatly facilitate the dumping of holding tanks. Just tilt the rig toward the sewer connection.

<<Jacks have an additional benefit: they stabilize the coach while parked. People stepping into a motorhome without jacks can actually "slosh" water out of a pan on the stove. Boards under the wheels don't add any stability.

<<Make sure that jacks are on your checklist. AND USE IT! There's a saying that is a takeoff on a well-known credit card: "Jacks, don't leave camp without them". If you move your motorhome with the jacks down, you are in for major problems and expense. If they are damaged, they may not retract. Even if they retract, they may be unusable and your trip will be spoiled.

<<Special "jack pads" are available to put down beneath jacks when parked on soft soil. They spread the load, but require that you get down on the ground to get them in position.

<<Jacks are very handy, but understand that they do not solve every problem in leveling. When they work, they're great. Otherwise, you're back to boards under your wheels.

SLIDEOUTS

The design and layout of RV interiors has always been a compromise; trying to incorporate all of the features wanted by users, while leaving room for more than one person to move around. Usually the result was a narrow aisle down the middle, with cabinets, closets, furniture and bathrooms on both sides. Slideouts have changed all that. They greatly increase interior space without increasing length. Most units sold today have one or more slideouts. Each slideout is a powered segment of floor and wall that are self-supporting. They are 12V powered, either hydraulic, cable, or rack and pinion gear driven. There are pluses and minuses for each of the power choices, but with the technical improvements being constantly introduced, it is impossible to pick one that is clearly better. Slideouts are a valuable addition to a motorhome. Regardless of the type, use care in the operation of the slideout that you have.

Newer units use limit switches to stop the motion, but there are a lot of the old units out there. Even with limit switches, care should be used when the slideout approaches full extension. A combination of operator error and engineering failures can still cause a lot of damage. Holding a finger constantly on the OUT or IN button without paying any attention to the position of the slideout can still cause damage if the stop is out of adjustment. The mechanism may continue to push on the sidewall until it fails.

Owners who tried to make their own limit switch or equalizing valve adjustments to correct actual or perceived problems have caused many unnecessary failures. Factory-trained technicians should make ALL adjustments to slideouts. No manufacturer can honor a warranty when the operating mechanism has been tampered with.

Still other problems involve maintaining the alignment of the rails as the room is extending. Any misalignment will cause a jam, and the slideout cannot be extended or retracted. This can occur with both hydraulic and cable driven systems. Much engineering effort has been applied to eliminate these problems, but only time will tell whether one or the other is superior. The rack and pinion systems evolved as yet another solution to smooth, perfectly aligned extension and retraction, with positive stop control to avoid structural damage. While this solution seems promising, success depends on the strength of the operating parts. Any failure of the drive system (such as stripped gears) could leave the slideout stalled in some degree of extension. Both hydraulic and cable driven systems have a release mechanism and a hand-cranked emergency retract that should ensure that the slide-out can be positively retracted. Rack and pinion systems have cranks for manual retraction, but any problem with the gears themselves may prevent manual retraction. In an extreme case, I have seen a “come-along” used to retract the side with stripped gears, while the other side was closed electrically! Very tricky!

Most of the early problems with slideouts have been solved, but even if the slide mechanism is perfect, the application design of the motorhome builder must be equally good. Look for a builder that has high enough volume to provide a well-engineered and tested design. Those units will most likely be more trouble-free. Of course the weather seals, both extended and retracted, must be tight enough to exclude both wind and water. This may require some adjustment by trained technicians after the slideout has been in use for some period of time. The mechanism should be smooth and relatively quiet in operation.

BILL'S HINTS about SLIDEOUTS

{{ Don't permit anyone on the slideout while it is in motion.

{{ Always have an outside observer with good communications while extending a slideout.

{{ Don't permit children to operate the slideout.

{{ Make certain that when you park your RV, the slideout area is clear of obstructions, trees, or other RVs. Always look up!

{{ Make certain that the slideout has the safety pin in before driving off.

<<Raise the front of the vehicle VERY slightly to minimize the collection of moisture on the roof of the slideout. Don't overdo it. Remember the refrigerator needs to be as level as possible.

<<Use an outside observer while extending the slideout to ensure that the area remains clear. Radio headsets are great, here. See next section.

<<Observe the movement of the slideout carefully while it is being extended or retracted. Stop extending the slideout if it is jerky or makes unusual noises.

<<Before retracting, make certain that there are no obstructions INSIDE the motorhome (like open drawers in the path of the slideout).

<<Inspect hydraulic systems occasionally for any sign of hydraulic fluid. There should never be any oily spots below the mechanism. Repairs should be made at the first sign of a leak.

<<Two things will slow down the slideout movement: lack of lubrication and weak batteries. Clean and grease the rams, if appropriate. If batteries are weak, run the vehicle engine until the slideout is properly positioned, replace the batteries.

<<Do not use jacks on the outer edge of extended slideouts. Any upward force at this point will cause the weather seal at the top to leak.

<<When you check the roof seals on your motorhome (annually), don't forget to check the roof of your slideout, too.

<<When moving the slideout and approaching the limit, stop the motion by releasing the switch. Continue the action by short momentary actuations. This will minimize the impact with the stops and/or your wall. Stop when seals are in full contact.

<<Before retracting the slideout, check for dew, snow, tree leaves, or other debris on the slideout roof. Remember that the roof will be inside your vehicle when it is retracted.

<<Special awnings are available that automatically extend and retract as the slideout is moved. These will minimize, but not eliminate, the debris/water accumulation on the slideout roof.

<<Vehicle jacks are essential for stabilization with rooms extended. Level and stabilize before extending the slideout.

<<Find out the exact procedures for emergency manual retraction before you need to use them. Write them out in language that you can understand and keep them where you can find them. You probably will never use them, but Boy Scouts have a good motto: Be Prepared!

BACKING YOUR RV

Probably the most dangerous part of driving your new motorhome is backing into a campsite. Most sites were designed for tents or very short trailers, with narrow access roads, tight turns and lots of obstacles. Most campgrounds now offer optional "pull-throughs" for parking. You drive into one end, hook up for parking, and then drive out the other end. No backing. Handy for overnight stops, but little sense of "camping", with the privacy and atmosphere that campground back-ins provide.

As RVs have become much larger, fitting one into the back-in campsite requires two people—the driver (who needs both hands), and a safety observer/director who is outside, watching for obstructions (above, behind, and on both sides), while watching for kids, other pedestrians and animals; a very demanding job. To make the observer meaningful, there must be a very reliable and fast, two-way form of verbal communication with the driver. Shouting to (or at) each other just doesn't make it!

Various methods have been tried, with varying degrees of success. Hand signals, carefully practiced and memorized, work well for some, but only in daylight. Light signals, at night, generally only add to the confusion. CB and other hand-held "Family" radios are susceptible to interruptions (always at critical times), and require button pushing and other distractions, including the operator who forgets to let up on the transmit button when done speaking. Or the one that forgets to PUSH the button **before** speaking.

After 40 years of trying ideas, I found what, to me, was the ideal solution. Light-weight, battery-powered, hands-free radio headsets, worn like earmuffs, with no wires or buttons to push; no volume or frequency controls, operating on two frequencies (each transmitting on one, and listening on the other), permitting either party to interrupt and ask questions at any time. After finding a source, at reasonable prices, I started to sell them to other RV'ers. After selling more than 10,000 of them, I now have them manufactured and sell them by mail order, for well under $100 per pair. I call them ESP, for Easy, Safe, Parking. I have two slogans; "Park your RV using ESP", and "Save your marriage!" The complimentary letters that I receive confirm those slogans!

Other uses include extending jacks & slide-outs, raising and aiming TV antennas, etc.

To get info on current price and availability, contact me at:
Bill Bryant, P. O. Box 916, Bowling Green, VA, 22427 Email: billbryant@pobox.com

AC ELECTRIC POWER

The internal Power Distribution Panel (PDP) contains the circuit breakers for all 110V functions and the fuses for the 12V Coach system AC Power is supplied to the motorhome by way of a 30 or 50 amp power cable plugged into a special campground outlet or from the auxiliary generator. Both sources feed into the PDP. There is usually an automatic switching relay that prevents feeding power from both sources simultaneously. It defaults to external power, if available. NEVER plug into external power while the generator is carrying a heavy load (like two air conditioners). The switching relay will be destroyed. Shut down the load and/or the generator before plugging in.

The PDP also has a relatively small battery charger that feeds a few amps directly to the Coach batteries

when 110V power is available. More power is available from the generator than from a 30-amp campground outlet. Two air conditioners can be operated from the generator (5KW or more) while only one can be operated from campground power. NEVER plug into campground power while the generator is carrying a heavy load.

Most motorhomes with 30- amp service are marginally wired for 110V AC. Too many outlets are on a single circuit breaker. You will find that breakers trip frequently when you simultaneously operate multiple devices, like toaster, coffee pot, space heater, electric skillet, and the 110V heater in your refrigerator.

BILL'S HINTS about AC POWER

{{ NEVER use an ungrounded (two wire) power cable.

{{ If you get any kind of shock or "tingle" when you grab the door handle while standing on the ground, UNPLUG your power cable. On rare occasions campground power is found to be improperly wired. In wet weather it could be fatal.

<<Carry a "polarity tester", available in RV stores. Use it before plugging in at a strange campground. It is small, inexpensive, and displays two green or amber lights when plugged into a properly wired outlet. Using one of your adapters, you can test the campground outlet before you plug in.

<<Use the shortest power cable possible. Voltage drops result from long cable runs. Most permanently attached power cables are 25 feet long and are rated at 30 or 50 amps. Buy and carry a 25-foot extension with appropriate RV connectors.

<<If campground power is more than 50 feet away, you can use additional extensions, but you must reduce your electrical load to 15 or 20 amps.

<<A 14-gauge extension cable should be no longer than 25 feet. A 12-gauge extension cable should be no longer than 40 feet. Do not use any extension cord smaller than 14 gauge. (The higher the "gauge" number, the smaller the wire).

<<When plugged into a circuit rated at 15 amps, do not run even one air conditioner.

<<Learn to "stagger" your electrical loads. Shift the refrigerator to gas while fixing breakfast.

<<You will need a variety of power adapter plugs/receptacles. RV receptacles are distinctive, whether 30 or 50 amp, both in size or shape. If your campsite does not have 30/50 amp receptacles, you can't just plug your RV cable directly into a conventional 15 or 20 amp receptacle. You need an adapter, RV female to 15-amp male. The better ones incorporate several inches of heavy 30-amp cable and are commonly called "dogbones".

<<If your 30 amp cable(s) won't reach the campsite receptacle, you will need to use one of your longer (smaller) extension cords. Since these cords have conventional 15 amp male ends, you need another adapter - 15-amp female to 30-amp RV male. Most (but not all) campgrounds have both 30/50 and 20-amp receptacles.

<<Occasionally you may stay in a park where only 50-amp receptacles are available. For this you may need another adapter: this one is 50-amp male to 30- amp RV female.

<<As you can see, the variety of combinations goes on and on. Be prepared (or be prepared to go without electricity).

AUXILIARY GENERATOR

An auxiliary generator makes any type of RV capable of independent operation. Your batteries can be kept charged by generating your own electric power. In addition, without the need for an outlet plug your generator will keep all 110V appliances operating as well as your heat and air conditioning. In the case of a motorhome, these things can be operated even while traveling.

All the generator needs is a tank of gasoline (or a tank of propane, for some), a battery for getting it started, and a storage compartment large enough to accommodate it. The generator package consists of a self-contained two-cylinder engine, complete with fuel pump and governor, a 110V generator (driven directly by the engine) and the accessories to get it started. Generators typically feed into a power panel where distribution and 12V DC conversion are performed.

There is a momentary 2-position start/stop switch on the unit itself, as well as a remote start/stop switch (with an indicator light) so the generator can be managed from inside the RV. There is also an hour meter that shows accumulated operating time on the unit. There is a winter/summer lever on the unit, which is the only operational adjustment to be made without tools.

To start the generator, hold down the start switch until the light illuminates. Do not exceed 30 seconds. Give the starter a rest! Release the switch after the engine starts, and within approximately 1 minute, the time delay will connect the generator to the PDP and power can be used for any purpose. Some units transfer to the generator automatically. Others require you to plug the power cable into an outlet connected directly to the generator. To stop the generator, simply hold down the stop switch until the light goes out.

BILL'S HINTS about AUXILIARY GENERATORS

{{ Any device that burns fuel may produce Carbon Monoxide (CO), a very dangerous gas to inhale in any concentration. Make sure the wind does not carry the generator exhaust (yours or anybody else's) in through your windows.

{{ Check your generator exhaust system regularly for leaks.

{{ Make sure that you have a CO detector in your coach, that it is turned on, and that it works.

<<Do not stop the generator with the air conditioners running. Doing so can damage the air conditioners' motors.

<<NEVER plug in external power while the generator is running and carrying a heavy load. The transfer switch will most often fail, leaving you without any AC power capability.

<<Most generators will stop if they run out of oil (low oil pressure), so they don't require a monitoring oil pressure gauge.

<<Check the 110 Volt AC with a meter. It should be 110-115V and steady under all loads.

<<Change oil and filter at recommended intervals and have the generator serviced annually, or every 200 operating hours.

<<When operating at altitudes above 5000 feet, it may be necessary to make an adjustment to the automatic choke on the generator engine. Learn how to do this before you need to do it.

<<The power cable for starting the auxiliary generator can be connected to either the Coach batteries or the vehicle battery. I prefer hooking it to the vehicle battery; then I can start the generator even if the Coach batteries are low.

<<Be considerate of your neighbors as generators can disturb the quiet serenity of a campground. Some campgrounds have rules limiting or prohibiting generators.

WATER HEATER

The classic RV water heater is a 6-gallon, propane-fueled device that draws outside combustion air through a grill, and exhausts combustion gases through the same grill. Early models had to be lit by long matches or strikers from the outside of the vehicle; a difficult task in the wind and rain.

Newer models have some form of electronic ignition, requiring only the activation of an ON/OFF switch on the Master Control Panel. Some higher priced units have an alternative, selectable, 110V heating option. Larger water heaters are available, but are not very popular. The 6 gallon units are preferred because they hold less water, are significantly lighter, are faster heating, cheaper, and less storage space is sacrificed to accommodate them.

Water heaters have a thermostat on the units themselves, which is secured by a setscrew. Water must be manually drained from the tank (through a drain valve or threaded nylon drain plug) to empty it to protect it from freezing temperatures. Since the heater is exposed to outside temperatures through the grill, it is very vulnerable to freezing conditions.

You MUST install a water heater bypass kit if you plan to camp in freezing weather. If not installed, you must keep water heater lit at all times when camped (empty when traveling or stored).

BILL'S HINTS about WATER HEATERS

{{ Don't EVER light the water heater when the tank is empty. It could explode from steam pressure. There is a pressure relief valve, but don't depend on it, since it is seldom tested. Once activated, it often tends to leak because of mineral deposits or dirt on the seal.

{{ Don't set thermostat higher than you need it. High settings waste propane and increase the possibility of scalding in showers and wash basins.

<<When the switch is turned ON, the monitor light will blink ON and then turn OFF. If it stays OFF, the propane is ignited and the thermostat will control the heater until you manually turn it off. If the light comes back on, the pilot light has gone out. Check to see why. Sometimes the gas does not reach the burner in time to prevent an automatic shutdown. Turn the switch OFF and start over. If it doesn't light correctly in 3 or 4 tries, make sure that the propane is not turned off at the tank. If this isn't the problem, something is wrong and the heater should be left off until checked.

<<To refill the water heater after it has been drained, just open a hot water faucet, and pressurize your water system. When the faucet runs a steady stream, the tank is full. Turn the faucet off and refill your supply tank. (This is only necessary if the hot water heater has previously been drained.) Draining the fresh water tank does NOT drain the hot water tank. To drain the water heater, open the drain valve (or unscrew the plug) and open all hot water faucets. The water distribution system must NOT be pressurized or the tank will be refilled as fast as it is drained.

<<Inexpensive adapters are available that screw into the external pressurized water hose fitting. They incorporate a Schrader tire valve that lets you pressurize your water system with air, helping to expel the water from pipes and the hot water heater while faucets and drain valves are open. Use these cautiously, since it would be easy to exceed safe pressures in the system. They are especially useful to expel the last water from the hot water tank, when gravity draining is only producing a trickle.

<<If you use air pressure to drain the pipes, make certain that you have one or more faucets/drain valves open.

<<Hot water is produced very quickly, so you don't normally have to keep the heater lit. Plan ahead.

<<If the flame blows out, the propane is automatically turned off. The light on the Master Control Panel will come on.

FURNACE

The thermostatically controlled furnaces installed in motorhomes are fully automatic. There is an on/off switch associated with the thermostat. With the switch ON and the thermostat set to a temperature above ambient, the 12V blower will start blowing. If there is an adequate flow of combustion air, electronic ignition is automatic and within one minute warm air should be felt from heater outlets.

After reaching the set temperature, the thermostat will turn the flame OFF, but the fan will continue to run until the combustion chamber and heat exchanger have cooled to a predetermined temperature. Since there is no pilot light, each time the furnace comes on, the same procedure is repeated. AC power is not required, but watch your batteries. Furnace blowers draw 8 to 10 amps, maybe more than the capacity of the battery charger. If battery power is low, the furnace will not get enough combustion air to permit a start. In severely cold weather this could be a real problem.

The furnace is another producer of Carbon Monoxide. A CO detector is a necessity for safe operation of this type of heater, especially since you will usually be closed up tight in cold weather.

BILL'S HINTS about FURNACES

{{ The combustion air intake and carbon monoxide exhaust are external to the Coach directly adjacent to the furnace. These must be kept free of obstructions. Wasps and "mud-daubers" like to build mud nests in these protected areas, and this will stop the unit from functioning. Keep the outlets covered when the weather is warm, and the furnace is not being used. Be sure to uncover them before a trip. Watch out for the furnace exhaust cover when it's running. It gets very hot!

{{ Do not run the furnace if all the occupants are asleep.

<<The furnace will not start if the DC voltage AT THE FURNACE is less than 10 Volts. A bad connection or a bad ground connection will prevent ignition. Low air pressure caused by an obstruction in the intake vent or from weak batteries will also cause the furnace not to start.

<<If the furnace won't start, remove the intake/exhaust cover, clean out the two tubes leading into the furnace and try again. If it still won't start, start the motorhome engine. If the furnace then starts OK, you have a low battery voltage problem, not a problem with the furnace itself.

<<A small electric space heater should be carried. It can be used, when AC power is available, to supplement the furnace and make your heating more "even". By itself, it provides safe heat while you are sleeping. If the furnace won't start, at least you have some heat. Many air conditioners have a heat strip or heat pump capability, but require AC power.

<<The furnace blower will slowly deplete your Coach batteries. It usually draws more amps than your PDP battery charger can supply.

<<Many air conditioners incorporate “heat strips” that use 110V AC to warm the motorhome. Heat pump models are now available to give both heat and cooling.

ROOF AIR CONDITIONERS

Roof air conditioners are rated by BTU and are limited to about 13000 BTU by power considerations (15-amp circuits). Unless you have an extremely well insulated RV, you will need the largest sizes available in most climates. Most large motorhomes need two. These units combine multi-speed blowers with thermostatically controlled compressors for cooling. Heat strips are optional, and when present, are operated by the same switches and thermostats. With the older models, both fan speed and thermostat controls were at ceiling level, which was hard to reach for some. Also, on the older units, once the fan speed was selected, it did not vary, regardless of what the thermostat did. Latest models have wall mounted controls and thermostats. A few installations also use air ducts instead of a direct blast below the unit. These improve the comfort level for the occupants.

When plugged into 30-amp campground power, only one air conditioning unit can be operated. Switches let you select which unit that will be. One unit will use up to half of the capacity (12-15 amps) of the campground service, leaving only a few amps for the other things you want to use, including the refrigerator and battery charger. RVs with 50-amp service can use two air conditioners at the same time.

When plugged into 15-amp power, neither unit should be turned on. To be sure, measure voltage at the campground box with your compressor running. If measured voltage is less than 110V, turn the air conditioning OFF. Not only are you in danger of tripping the campground breaker, but also your air conditioner motor is in danger of overheating from operating at the lower voltages that may occur. As the outlet box and associated wiring heats up, voltage will continue to drop. As long as your power cables are rated at better than 15 amps, there will be no danger to RV wiring itself, but overheating will occur in the campground power lines and in the compressor motor.

When powered by an auxiliary generator of more than 5000 watts, both air conditioners can be operated, since the generator has more amperage available. Special switch settings enable simultaneous operation of the two units. You must be unplugged from campground power for the generator to assume the load. Unplug before starting the generator.

BILL'S HINTS about ROOF AIR CONDITIONERS

<<Air conditioners are made to fit through the square vent holes built into the roof of the RV. If the seal fails, you will have leaks and they will not always appear to come from the air conditioners. If you have roof leaks and have checked all other sources, they probably come from one of the units. The seal is quite thick and if it starts to leak, there are 3 or 4 adjustment bolts (accessible with inside cover removed) that can be tightened down to reseal the air conditioner. Don't over-tighten. If you clamp them down tight, you will have no future adjustment capability. All you want to do is stop the leaks.

<<Change/clean your air filters often. They are accessible inside, without removing the cover.

<<Try to shade the walls and roof of your RV to reduce the heat load.

<<Awnings help a lot, but choose how and where you park to get the maximum benefit. Tinted windows also help, as do shade screens and awnings.

<<Keep drapes and blinds closed.

<<Cover operable roof vents with inside opaque covers. Some covers include insulated inserts as well.

<<Air conditioners make a great load for the generator when you are giving it your monthly “run”, even in the winter.

TIRES

Manufacturers equip their vehicles with the proper tire rating for the specified gross vehicle weights—GVWR, remember? With add-ons, full tanks, camping and travel gear, it is safe to say that most RVs on the road are close to being maxed out. You can (and should) calculate your weight carefully. Gasoline weighs 6 pounds per gallon, and water weighs 8 pounds per gallon. Consider the weight of water in your full water tank, the water heater, and possibly your waste tanks. They could easily reach 700 or 800 pounds. That is before canned goods, beer, soft drinks, etc. are added.

Keep loading in mind when deciding how much fresh water to carry. Dump your gray water regularly. Don't carry all of the tools necessary to rebuild your motorhome or to overhaul the engine. And remember—you can buy soft drinks and canned goods when you are close to your campsite. Don't haul around a lot of "stuff" just in case you might need it.

Tires suffer from overloading, under-inflation, high temperatures, high speed, and lack of balance. Some combination of the first three probably wipes out most motorhome tires that fail. The effects of sun beating down on your tires while stored will eventually break down the sidewalls and harden the tread, but you can prevent most of that by buying tire covers, and using them when you come in off the road. When storing the motorhome, try to raise the axles on blocks to remove the load on the tires, and to keep tires from contact with porous materials. Expect to replace tires every seven or eight years, even if they have plenty of tread. Very few motorhomes are driven far enough to wear down the tread before they reach the time limit for safe operation.

If you have been careful about taking care of your tires and still have problems, you should consider upgrading, especially on the rear, where most failures occur. Eight ply rated radial tires, running at 70 psi, sound like real brutes, but 12-ply rated radial, running 90 psi will carry far more weight. Nevertheless, stay within the Gross Vehicle Weight Rating for your vehicle. Expect to replace ALL tires after seven or eight years, regardless of tread wear.

BILL'S HINTS about TIRES

<<Get a good tire gauge and check your inflation regularly.

<<Under-inflated tires reduce GVWR to an unknown level and uneven pressures may cause swaying.

<<Don't forget to check the spare.

<<Watch tread wear for axle alignment problems.

<<Balance your tires. Uneven wear, once it is severe, can't be stopped by balancing. Replace worn tires before starting a long trip. You don't need the aggravation of replacing one on the road.

<<High speed on a really hot day severely stresses tires. Slow down to reduce the stress, especially if you are fully loaded.

<<If your tires develop a problem called "cupping", you have a spring or loading problem. A tire that does not stay in contact with the road will wear unevenly. Once started, cupping cannot be stopped, and the tire should be replaced or moved to the spare. You don't need a failure on the road.

<<An on-the-road tire change is more than most motorhome drivers can deal with. The tires and wheels are extremely heavy and placing the jacks (which are also heavy) is a real chore. I recommend that you treat your tires well and buy a good road service policy that includes tire service.

AUXILIARY AIR BAGS

Most motorhomes with air suspension (all with Chevrolet P 30 chassis) have two or more auxiliary air bags installed. Air bags soften the ride somewhat, but mainly they reinforce (or replace) the original springs. Some, like the Jet Air system, not only replace the rear springs, but also are self-adjusting to compensate for load changes. They keep your headlights properly aimed at all times. Jet Airs also are manually adjustable from the driver's seat to help level the RV in a campground.

Air bags, like tires, should be checked regularly. Pressures vary, but 20 to 50 psi is a normal range. Check your technical specifications, or call the manufacturer, to be sure. Some replacement bags specify 60 psi minimum. Front bags are intended to supplement front springs. Running with less pressure than the specified air pressure can destroy the bag, but at reduced speeds and loads will not hurt the vehicle itself.

BILL'S HINTS about AUXILIARY AIR BAGS

<<Be careful when inflating air bags. They inflate very quickly: much faster than tires.

<<If your air bags lose pressure, it may be one of three things. The bag may have a leak, in which case it must be replaced; the inflation valve may have a defective core; or there may be a leaky connection between the inflation valve and the bag. To identify the leak, use a paintbrush to soap up every joint and fitting, including the Schrader inflation valve itself. The bubbles will tell the tale. Tighten or replaced the valve core. They are exactly the same stems as those used in tires and tubes.

TOW INSURANCE

Good tow insurance is a "must" if you want peace of mind in your RV. Commercial towing can cost up to $10 per mile, or more, and getting to a service area may take a lot of miles. A cellular phone can be invaluable, but only if you are within range of a tower. Tow insurance is worthless if you can't place a trouble call.

Tow insurance is available from several RV "clubs", RV accessory chains, Allstate, and others. Shop carefully for features and costs.

BILL'S HINTS about TOW INSURANCE

<<Make sure that there is no maximum on your towing charges. My first policy covered only the first $100. Luckily, I didn't need to use it.

<<If you tow a car, make sure that it is covered too.

<<Most policies provide an 800 number to call. You give them your location and problem and they

dispatch the nearest available assistance that can handle your size rig. You have NO "up front" costs. You just validate the bill with your signature.

SPRING CLEANING

Except in very warm climates, Recreation Vehicles tend to be neglected during late fall, winter, and early spring. Hopefully, you will heed the earlier advice about keeping batteries charged, and refrigerators periodically activated. But these are preventative measures, intended to avoid mechanical problems. They don't really prepare your vehicle for that first trip of the season.

In all probability, any motorhome stored outside will be badly in need of a bath, and maybe even a wax job. At the very least, the sides will need a special cleaning to remove the black streaks that develop below windows, etc. Anyway, you need it clean to make a good inspection for potential leaks. Check the slideout, too.

There is a tendency for motorhomes that are closed up tightly to develop stale and unpleasant odors. It is not surprising, considering that you cook inside, at least some of the time, and food odors and grease can permeate curtains and upholstery. A good airing out will literally "clear the air." But it may not be enough. A quick washing of the curtains, and a thorough washing of counter tops and other kitchen surfaces will help. Vacuuming, or even cleaning, the rug will most certainly help. Remember that catsup you spilled on the carpet last time out? Clean the windows. Pour some drain cleaner down the kitchen sink to flush out the small amount of waste water and anti-freeze that remains in the trap. This is a source of odors often overlooked. For this purpose, you can leave your gray water drain valve open and let the relatively clean water drain on through. Catch it in a bucket for proper disposal.

If you thoroughly cleaned out your black water tank before storage, you need only flush it out with clean water and add a little water and some deodorant to prepare it for the first trip. If you failed to clean it last fall, add the water and deodorant, and take the vehicle for a short spin. The agitation will help break up any solids stuck to the inside of the tank, allowing you to go to a dump station and drain out the contents. Add fresh water and deodorant and remember to clean it next time.

Fill and flush your fresh water tank several times. Add some chlorine (bleach) in one of the early fills. You can drain it through the outside drain valve. Refill it with fresh water, and turn on your water pump. Open each cold faucet in turn, and let the air escape. Then open one hot water faucet and leave it open until it runs a steady stream of water. If available, use a hose connected to your pressure fitting for this step. Briefly open each hot water faucet until a steady stream is obtained. Now light the water heater and ensure that it stays lit.

Run both air conditioners, turning thermostats to full cold to force the compressors to run. Hold your hands directly in front of the cold air outlets. The air should be cold enough to make your hands uncomfortable. While you're at it, and while the coach is cold, check out the furnace(s). See that they light and produce heat.

After ensuring that the motorhome is level, start the refrigerator on propane, and let it run for several hours. If possible, switch it to electric mode, and again ensure that the cooling continues. Leave the refrigerator running overnight, and check temperatures in both the freezer and refrigerator compartments.

A short campout (even in a nearby campground) will give you the final checkout. Operate all of the accessories, and check your storage spaces to see, first of all, that you have what you need. Second, to see what you have that you DON'T need. Keep your weight down. On the way to your campsite, pay special attention to steering, brakes, and transmission shifting patterns on your RV.

Of course, you should check your roof for potential leaks on a regular basis. This is one of those times. Re-seal any obvious or suspicious water entry points. (You cannot see the air conditioner seals.) Literally, the life of your RV depends on a watertight roof and tight seams between windows, doors, and other entities that penetrate the skin of the vehicle. If in doubt, re-seal them.

Make yourself a little check-list, like the one below. Check everything thoroughly. A day or two spent getting everything done will pay great dividends. You want your first outing of the year to be a pleasant experience—not a disaster.

• Change smoke, CO detector, and vapor detector batteries.
• Check engine fluids (coolant, transmission, brake, power steering).
• Change the engine oil and filter.
• Check engine air filter, belts, and hoses.
• Check mufflers (vehicle and aux. generator).
• Check tires for tread and pressure (remember the spare).
• Change generator oil and oil/air filters, if required.
• Check lights (head, stop, turn, tail, and backup).
• Check batteries (clean connectors; use baking soda to clean battery tops; check water).
• Clean/replace roof air conditioner filters.
• Check out all internal lights and fixtures for proper operation.

COLD WEATHER OPERATING & STORAGE

Moderately cold weather does not seriously affect RV operations, but you should not attempt to use your motorhome in severe weather until you have considerable experience with normal operations. Even then, careful planning will be required to avoid problems. Cold weather makes everything harder and taxes the systems that are installed in your RV. RV manufactures began offering cold weather packages as an option the last few years, which include tank heaters and other cold weather upgrades.

BILL'S HINTS about COLD WEATHER OPERATION

{{ For storage, if draining of the fresh water pipes is not possible, RV stores sell special non-toxic antifreeze that can be poured into the fresh water tank, and carefully pumped through all pipes and faucets. Don't forget the water supply to the toilet. REGULAR ENGINE ANTIFREEZE MUST NOT BE USED FOR THIS PURPOSE. IT IS POISONOUS. Don't forget to pour antifreeze in all sink and shower drains.

<<Propane vapor pressures drop in cold weather. At some point, furnace and hot water heaters will stop working.

<<Water heater plumbing is exposed to outside air and may freeze and burst.

<<Batteries are hard to charge in cold weather. They charge slowly and discharge quickly.

<<Battery loads are high in cold weather. The furnace blower is the heaviest user of battery power. If the blower does not operate fast enough, you cannot get the furnace to work.

<<Starting vehicle engine or auxiliary generator requires more battery power in cold weather.

<<Water supply hoses will freeze if left pressurized and connected to the RV pressure fitting. For prolonged fresh water hook-ups in cold weather use a stiff high pressure polyethylene hose that can be used with low voltage “heat tape” to keep from freezing.

<<Holding tanks can freeze, particularly while driving in subzero weather. Dumping valves can (and will) freeze and become unusable until thawed. A hair dryer is most useful for this.

<<Internal plumbing, including the fresh water tank, is usually protected from outside temperatures, but in severe weather, could still stop functioning. Keeping electric heat on in the RV, with cabinet and storage doors open should protect plumbing. Do NOT insulate inside pipes from the warm air. In really severe weather conditions, leave the water system drained or filled with anti-freeze, and carry potable water in jugs for cooking and drinking. Protect your holding tanks with automobile anti-freeze. Replace anti-freeze after dumping.

<<Storing your motorhome for severe cold requires draining the fresh water AND the water heater. Install a water heater bypass kit and then drain the water heater. The entire water distribution system should be drained through a low point drain or by blowing the pipes clean, using compressed air. Don't forget the water supply to the toilet. Kitchen, shower, and washbasin traps should be filled with nontoxic antifreeze. Batteries should be removed or kept fully charged.

<<Most auxiliary generators are air-cooled and require no special attention. For long-term storage, the carburetor should be full of fuel treated with a stabilizer.

<<If camped in below freezing weather, make sure that you have a propane torch and a "heat tape” that can be used to safely thaw pipes and fittings. An electric hair dryer works fine.

<<Talk to several experienced cold weather campers before you venture out on your own. You need all of the information that you can get in order to stay out of trouble.

<<Even non-toxic antifreeze IS TOXIC in concentrated form. Make sure that you flush well when preparing your RV for use after winter storage.

DRIVING SKILLS

Almost anyone is capable of driving a motorhome. A few adjustments in driving habits are required to allow for slower acceleration, increased stopping distances, reduced maneuverability, and most of all, decreased visibility to the sides and rear. Motorhomes fit comfortably into the marked traffic lanes on US and Interstate highways. Very narrow roads, with shoulders in poor condition, are best tackled only after

becoming comfortable with driving the larger vehicle. Without a doubt, the most important factor in driving a motorhome is the caliber of the driver.

A GOOD MOTORHOME DRIVER…

• Above all else, is a courteous driver. He/she knows the bad habits of poor drivers, and drives defensively.

• Recognizes that poor drivers will do anything to avoid getting behind a motorhome.

• Avoids abrupt, unexpected changes in speed or position.

• Ensures that all lights and turn indicators are working properly.

• Knows (by checking mirrors regularly) the location of other vehicles in his/her vicinity and what they are doing.

• Drives the right hand lane, except for passing or making room for vehicles merging from on-ramps.

• Changes lanes only when there is plenty of room/time.

• Signals lane changes and intentions well in advance.

• **IS PATIENT!!**

Motorhomes towing other vehicles should never attempt to back up. Towed cars, unlike trailers, tend to "jackknife", or to have their steering wheels "reverse" when the tow vehicle backs up. Both results cause damage to the tow-bar, the hitch, and or the towed vehicle. Motorhomes without a towed car can be readily backed up, allowing for longer wheelbase and the restricted visibility. An outside assistant is a MUST in most situations; ALWAYS in a populated area like a campground. Hands-Free two-way radios greatly improve the safety for backing. Be sure to read the safety hints in the Section on Backing Your RV. A few CAUTIONARY HINTS should be all that is required for good drivers.

BILLS' HINTS about DRIVER SKILLS

{{ There is one phenomenon, common to all vehicles, that most drivers are not conscious of; when you turn the steering-wheel sharply to the RIGHT, the portion of the vehicle behind the rear wheels "swings" LEFT (and vice-versa). In a car, you will seldom be close enough to anything to cause a problem, but remember that a motorhome has a lot more sticking out behind the rear wheels. You must not be too close to a vehicle or obstacle when you turn away from it, because the "swing" is much more pronounced.

{{ When making a right turn from the right-hand lane, especially when towing a car or trailer, you must make a "wide" turn, just like trucks do. This will cause you to turn into the inside lane of a 4 lane road, or into the ONCOMING lane of a 2 lane road. Obviously, sharp right turns must be carefully planned and executed. Left turns do not create these problems, since you are aiming to the far lane anyway.

{{ When descending steep grades, don't let your speed build up. Shift to a lower gear range to let your

engine keep your speed down. Diesel engines are less effective for this, unless they have some form of exhaust brake. Don't keep your foot on the brakes to keep the speed down, the brakes will overheat and become ineffective when you need them most.

{{ When approaching a red signal, reduce your speed in advance, and try to catch the signal after it has turned green. This will save you fuel and help you keep up with traffic.

{{ Of course, there is much more to driving than what I have covered, but mainly you need practice. If you are really uncomfortable about your driving, contact your local RV dealer for RV driving schools or seminars.

SPECIFICATIONS FOR YOUR RV

Record this information as it becomes available. It will save you a lot of time in the future. And it's no fun to crawl under to drain the oil, and find you have the wrong wrench!

Vehicle Engine

Oil Drain Wrench Size_____

Oil Capacity (w/filter chg)_____ Quarts Oil type_____ SAE_____
Oil Filter Brand_____ Part # _____ Other _____
Air Filter_____ Gas Filter_____
In-Line Filter (at elect pump) Model # _____
Replacement Cartridge#_____
Spark Plugs
Mgfr._____Part#_____
Water pump/belt_____ A/C belt_____ P.S belt_____

Auxiliary Generator

Oil Capacity (w/filter chg)_____QT Oil type_____ SAE _____
Oil Filter Mgfr._____Part#_____
Air Filter_____ Gas Filter_____
Spark Plugs AC_____
Mgfr._____Part#_____
Oil Change date_____Mileage_____
Oil Change date_____Mileage_____
Oil Change date_____Mileage_____
Oil Change date_____Mileage_____
Oil Change date_____Mileage_____
Oil Change date_____Mileage_____
Chassis Lube_____
Wheel Bearings _____
Wheel Balance _____

EMERGENCY EQUIPMENT LIST

Remember to carry a jack, lug wrench, simple tools, and jumper cables. In a pinch, you can use your tow-car BATTERY to start the RV.

Keep at least 6 emergency flares where you can get to them. Carry a set of reflectors (or reflective triangles) similar to those carried by truckers. (Truck stops carry a variety of them).

DATA SHEET

Use the information from your manuals to fill in this sheet. You will find it useful to have.

Item	**Model**	**Manufacturer**	**Capacity**
Refrigerator	_____	_____	_____cu ft
Water Heater	_____	_____	_____gal
Furnace(s)	_____	_____	_____btu
Air Conditioner	_____	_____	_____btu
Power Panel	_____	_____	_____amps
Generator	_____	_____	_____watts
Water Pump	_____	_____	_____gal/hr
Toilet	_____	_____	n/a
Water Tank	_____	_____	_____gal
Hold Tank 1	_____	_____	_____gal
Hold Tank 2	_____	_____	_____gal
Which one is black water?		_____	
Propane Tank	_____	_____	_____gal
Gas Tank 1	_____	_____	_____gal
Gas Tank 2	_____	_____	_____gal

Which fuel tank supplies generator? Tank 1 Tank 2
Fuel gauge generator when generator can't access fuel E / / / /