

RV SYSTEMS

RV Electrical

Introduction

One of the best things about an RV is the self-contained power system that allows us to have all the comforts of home without being plugged into an electric outlet. This 12-volt system can be a joy or a headache, depending on how you maintain and utilize it. If you ignore basic maintenance, it will let you down at the worst possible time! Below is a simplified block diagram of a typical RV 12-volt system.

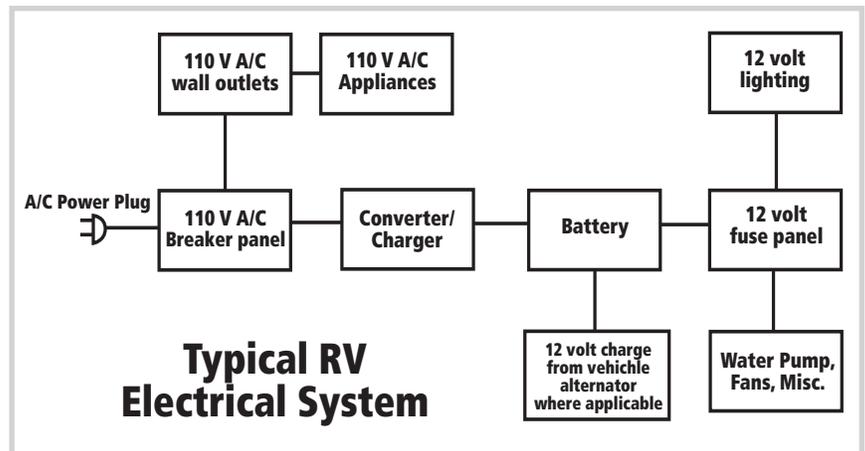
In the simplest terms, you have lights and other equipment such as water pump, fans, stereo, and appliance controllers that run on 12-volts, a battery that supplies the 12-volt power, and some sort of charger to replenish the energy that you use from the battery. In motorhomes, the RV or “house” batteries are electrically isolated from the vehicle engine 12v system and starting battery to prevent running down the starting battery and extending your stay.

What’s a Battery?

Sure, we all know what a battery is. It’s that thing that goes dead when you leave the headlights on overnight! Actually, there is a little more to it than that, so perhaps a review of battery basics is in order here.

A battery is an electrical storage device. Batteries do not make electricity; they store it, just as a water tank stores water for future use. As chemicals in the battery change, electrical energy is stored or released. In rechargeable batteries, this process can be repeated many times. Practically all batteries used in RV applications are lead-acid-type batteries.

“A battery is an electrical storage device. Batteries do not make electricity; they store it, just as a water tank stores water for future use.”



Care of Your Batteries

In order to get the most from your batteries, you can’t just ignore them and expect them to work for you forever. Maintaining the correct electrolyte levels, tightening loose hold-down clamps and terminals, and removing corrosion are normally the only preventative maintenance required for a battery. You must periodically add water to maintain the electrolyte level in the batteries. Electrolyte is lost whenever

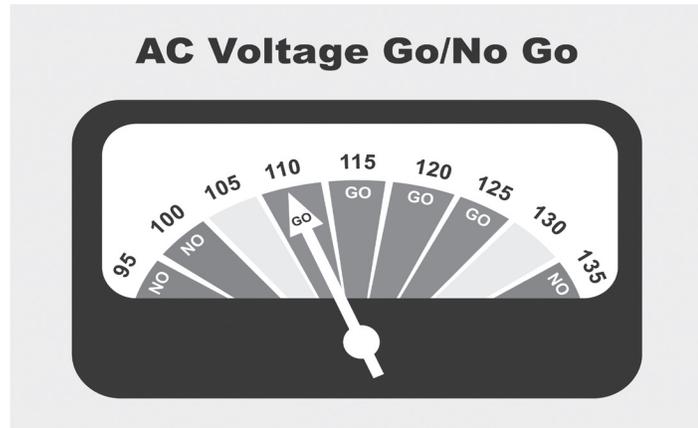
Continued on next page =>

Battery State of Charge

Voltage	State of Charge
12.6+	100%
12.5	90%
12.42	80%
12.32	70%
12.20	60%
12.06	50%
11.9	40%
11.75	30%
11.58	20%
11.31	10%
10.5	0%

the batteries are charged and also when the batteries are discharged heavily. You should check the level in each cell of your batteries regularly, at least once a month. To replenish the electrolyte, add distilled water as required. Never add acid, just distilled water, and do not overfill.

You should recharge a deep-cycle battery as soon as possible after each use. It is hard on a deep-cycle battery to sit for extended periods in a partially charged state. To charge the battery, you can use a wide variety of methods. Most RVs provide some sort of converter/charger to charge the batteries when you're plugged into an A/C source. Most rigs also have some sort of provision to charge the house batteries from the motorhome or tow vehicle engine.



110V - 125V | You're OK
105V or 130V | Marginal
Below 105V Or Above 130V | Time to unplug!

A word of caution: Batteries contain a sulfuric-acid electrolyte that is a highly corrosive liquid. In case of a spill or splash, immediately flush the affected area with lots of cold water to dilute the acid. A mixture of baking soda and water can also be used to neutralize the acid. Avoid sparks, smoking, or open flames in the vicinity of batteries. Batteries produce flammable hydrogen gas (remember the Hindenburg?) and can explode violently if the gas is ignited. This is especially important when batteries are housed inside any sort of compartment.

Winter Storage

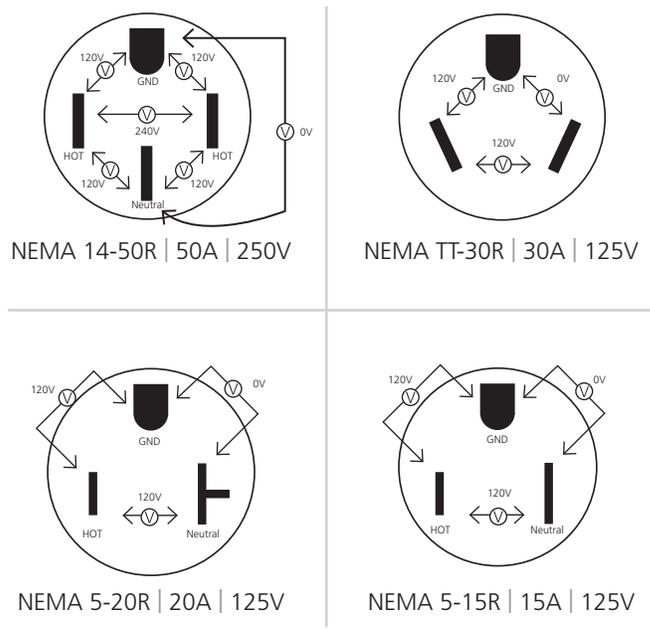
Most RVs used for recreation are stored for long periods of time in the winter months. This storage can be very hard on your batteries if you don't take care of them. Batteries in storage self-discharge over time. This is a natural phenomenon and will cause your batteries to slowly go flat. Extremely cold temperatures can cause your batteries to freeze if they aren't adequately charged. To avoid problems, keep your batteries charged during the storage period. It may be easiest to remove the batteries and store them in a warm place, like a garage. Once a month, do an overnight recharge and check the electrolyte levels. If removing the batteries just isn't possible, then there are several things you must do when the rig is put into storage:

- Ensure that ALL electrical loads are disconnected from your house batteries. There are lots of things in your RV that may put a tiny load on your batteries even though everything is "off." Most stereo receivers, electronically controlled refrigerators, smoke, CO2, and propane detectors are tiny drains on the batteries.
- Provide for some sort of charging to offset the batteries' tendency to self-discharge. This can be provided by a small

RV Power Outlets

Here are some diagrams of the standard RV outlets you'll find in most campgrounds. If you have a meter, and are so inclined, you can easily test the outlet on the hookup pedestal before you plug into it. The diagrams show the typical meter readings you should get when you probe across the receptacle openings.

If you get into the habit of checking the outlet before you plug in, you'll go a long way toward protecting your RV from electrical damage. It's amazing how many RV hookups are damaged or mis-wired.



solar panel or trickle charger or the converter in your RV. If using the converter, it is best to let the batteries discharge slightly over a few weeks or a month and then do a full recharge overnight. If your RV has a standard converter, do not leave it plugged in constantly to keep your batteries up! That converter can boil your batteries DRY in a few months! If you must leave your RV plugged into A/C power over the storage period, make sure to either unplug the converter or switch it off at the breaker. It's far better to run the converter overnight every three or four weeks or so as needed to charge the batteries. Another possibility would be to put the converter, or the whole RV, on a simple plug-in timer and set it to be "on" for about one hour a day.

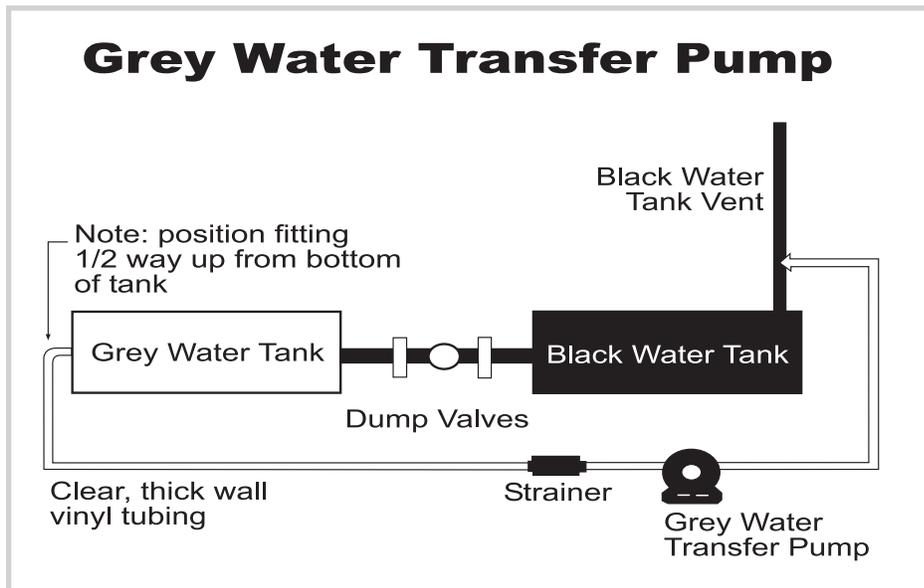
- Check on the batteries from time to time during the storage period. Stop by at least once a month and check battery voltage and electrolyte levels. Don't walk away from your RV batteries in November and expect them to still be ready to go in May. Folks that adopt the "out of sight, out of mind" approach to battery maintenance are usually the ones buying a new set of batteries at the start of every camping season!

AC Power

Most large appliances in your RV operate from AC power, either supplied by a utility outlet or a generator. The power passes through a breaker panel similar to the one in your house. This allows you to use microwaves, TVs, air conditioners, and other household appliances. Your refrigerator and, often, your water heater can operate on either AC power or propane. Be aware that many propane-powered appliances need 12v power as well to operate. Incoming AC power also charges your batteries and operates your 12v lighting through the RV's converter, which converts 110v AC to 12v DC.

Inverters

If you like to camp away from power hookups, one of the most useful items that you can add to your RV is an inverter. Inverters make 110-volt AC power from your 12-volt battery system. This will allow you to operate many of your appliances and accessories that require AC power without the noise and cost of a generator. Inverters range from simple portable units that plug into your cigarette lighter to larger, hard wired units that are permanently installed. AC wattage ratings are available from 100 watts up to 4000 watts or more. The only thing that you won't be able to operate with a suitably sized inverter is your air conditioner.



RV Grey Water Transfer Pump

Ever notice how the grey-water tank fills up in a hurry when dry camping, but the black-water tank never gets very full? I plumbed in a water pump to move grey water from the grey-water tank to the black-water tank.

I used a standard RV Shur-Flow pump with a strainer on the inlet. It picks up the grey water from about halfway up the side of the grey tank and pumps it to a fitting on the black-water tank vent pipe about one foot above the black tank. This guarantees that black water can't be siphoned back into the grey tank.

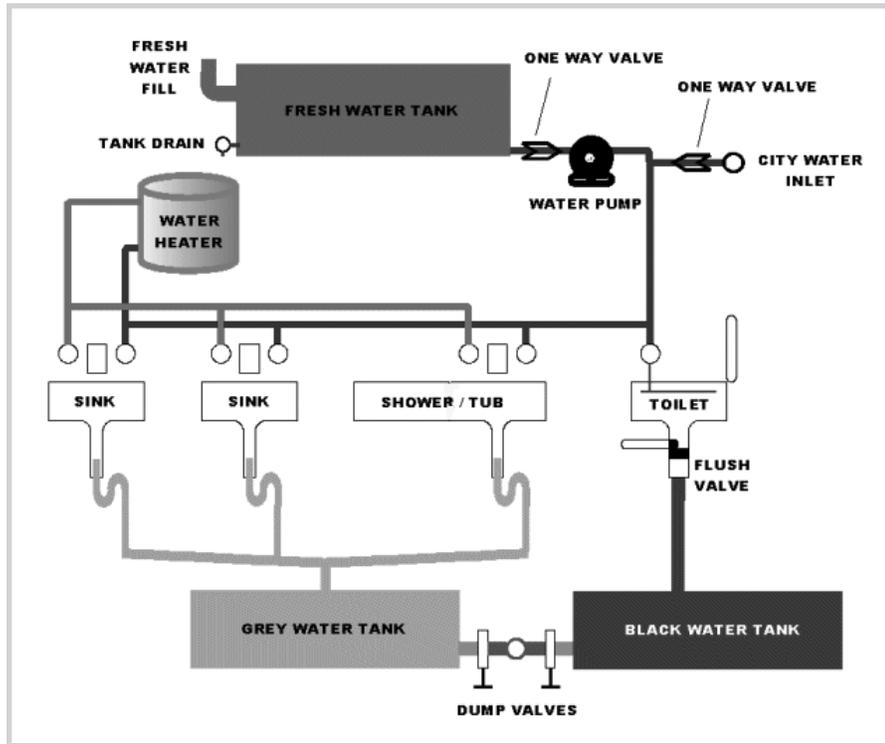
I mounted the pump in the back of a compartment and installed a switch near the rig's monitor panel. The pump output is routed through clear vinyl tubing to a fitting drilled and tapped into the black-water tank vent. This ensures that black water cannot be back-siphoned to the pump. It is important to monitor the black-water tank level when using the pump as it is possible to overfill the tank. Be careful!

The pump inlet is connected to a fitting solvent-welded to the grey-water tank. Most of these tanks are ABS plastic, and standard ABS fittings and glues are usually available at hardware and plumbing stores. If you can't find them locally, J.C. Whitney sells a kit of water tank fittings and glue to be used with the camper water tanks they sell, and this will work just fine. The reason I placed the fitting halfway up the tank is to avoid sucking up either the scum on top of the grey water or the sludge on the bottom of the tank. This has been a great mode for me, and it allows me to extend a dry-camping stay significantly. Good luck with it!

RV Plumbing

Block Diagram

Modern RVs are equipped with complete, miniaturized equivalents of the household plumbing that we all take for granted. Even small RVs have partial or complete self-containment capabilities, and the basic design of the plumbing systems is pretty much the same from a pop-up camper all the way up to a big class-A motorhome. This is pictured below:



Some Notes

There is a one-way valve built into the city water inlet, and the water pump has a one-way valve built into it. The valves are shown here separately for clarity. Some rigs have separate sewer connections for the black tanks and grey tanks and a few rigs even have two different grey-water tanks, but the basic system is still the same.

Getting Water into Your RV

First of all, you will like the taste and smell of your water a lot more if you use a hose designed for drinking water rather than just any green garden hose. NEVER, NEVER, NEVER use your fresh water hose for any other purpose! Don't use it to wash the car or (God forbid!) to flush out your holding tanks! That hose needs to be treated carefully and kept as sanitary as possible. After all, you're DRINKING this water, right? RV plumbing was designed to operate at pressures of 40 to 60 psi. Unfortunately, unregulated city water can have pressures as high as 150 psi or more. The best bet here is to always install a pressure regulator on the line coming to your city water connection.

Taking Your Water Along for the Ride.

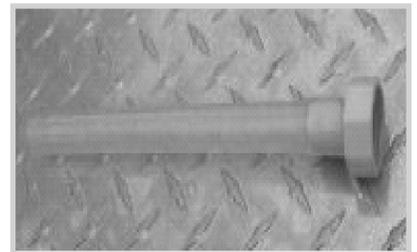
If you won't be having the convenience of a fresh-water spigot at your destination, then you'll have to take water with you, using your rig's fresh-water holding tank. Filling the tank is as easy as hooking your fresh-water hose to a nearby faucet and running water into the water tank fill opening on your rig.

These fresh-water fills come in many shapes and sizes. Here's a typical example: Make sure that the tank drain valve, if there



is one, is closed before starting to fill the tank. If your tank has a vent valve, it's best to open it to allow the tank to fill faster. If your tank glugs, chuffs, and spits water back at you when filling, then it's likely that it has no vent or the vent is plugged or shut off somewhere. Simply slow down and let

the tank fill at its own rate. You can make the task easier by using a little fill adapter like this. It fits on the end of the hose and then slips down into the filler. A handy little device to have. Once the tank is full, or as full as you want it, shut off the water and stow your hose. Don't forget to secure the fill cap and close any vents, if you have them, before heading down the road.



Getting Water to the Fixtures

If city water is available, just hook up the hose to your city water inlet, turn on the faucet and open a faucet inside the rig to allow any air to escape. If you are in a boondock or dry-camping situation, you must rely on the 12v water pump in your rig to supply water under pressure to the fixtures. To get started, open a cold-water faucet in the rig and turn on

the pump. Having a faucet open will help the pump prime quickly. When the water is flowing nicely, close the faucet. It's a good idea to purge all of the sink and tub fixtures and to make sure that the water heater is filled. Once this is done, the pump should stop running after you close the last faucet and shouldn't run again until you open a faucet somewhere. You are all set. Just remember that your supply of fresh water is limited, and you must conserve it!

We're in Hot Water Now!

Unlike the water heater in your house, which requires little or no intervention, operating the typical RV water heater requires you to pay attention to a couple of things.

- First and most important, before lighting the water heater gas pilot or turning on any electric heating function, make sure that the water heater tank is filled with water!!! Check to be sure that the water heater inlet and outlet lines are not bypassed with a winterization bypass kit and that water flows from the hot faucet in the sink or shower.
- Once you're sure, go ahead and turn on the heater. Some heaters utilize an electric heating element in addition to the standard gas burner. Some heaters require a pilot and some are direct-spark ignition. Check the manual that came with your RV or the data plate on the water heater itself for proper lighting and operating instructions.
- Most RV water heaters allow some adjustment of the water temperature. Gas models will have a temperature adjustment right on the gas valve. Gas/electric units will also have a separate thermostat for the electric side, but locations and accessibility will vary. Best to consult the manual unless you like to play detective. Be careful not to set the temperature too high; it's easy to get severely scalded by water heated beyond 140 degrees.
- It is not uncommon to see some seepage from the pressure relief valve on the outside of the water heater when initially heating a tank of cold water. This is caused by the expansion of the heated water and indicates very high pressure within the water system. You can open a faucet briefly to relieve the pressure.
- If you have a water heater that utilizes a pilot light, you may be amazed to find that the pilot light will heat your water nicely all by itself. Just light the pilot and leave the gas valve in the "pilot" position when you park, and overnight the water will heat up and be ready for your shower in the morning. This doesn't work well in high usage situations but can be a real propane saver for the frugal RVer!

Where Does It Go from Here?

In a non-mobile house, once the water disappears down the drain, we can forget about it. Not so in an RV. Every drop winds up in the holding tanks, and then we must, at some point, deal with it again. Let's look at that block diagram again. The waste water from the sinks and shower are transported to the grey-water tank. The toilet dumps directly to the

black-water tank through a foot-or lever-operated valve. In most cases, the black and grey tanks are sized slightly smaller than the fresh-water tank, usually somewhere between 20 and 50 gallons each. Most folks agree that the grey-water tank can be dumped anytime, no matter how full or empty, and when you are hooked up to a sewer connection, the grey-water dump valve can be left open at all times. This allows the water from your sinks and shower to flow directly out of the rig and into the campground sewer system. However, it is not a good idea to treat your black tank the same way. Black water contains a lot of, well, call them "solids." RV toilets flush with very little fresh water, so these "solids" are quite concentrated. If you were to leave the black-water dump valve open while hooked to a sewer connection, these solids would tend to build up in your tank and then dry into a disgusting form of concrete. To avoid this, always keep the black-water tank dump valve shut. Let the black water build up until the tank is at least 1/4 full and then dump it, rinsing with lots of fresh water. After you dump the black tank, you can then dump the grey tank to flush out the hose and help carry the whole mess down the sewer pipe to wherever it ultimately ends up.

Don't Put This Stuff Down your Drains!

- Grease or oil. It will congeal in the tanks and pipes and require dynamite to remove!
- Caustic cleaners or solvents. Tanks are ABS plastic and solvents can destroy them!
- Flammable liquids. Duh!!!
- Toxic wastes. More duh!!!
- Food scraps. Even small scraps can build up in your tanks. Consider a drain screen!
- Don't flush anything down the toilet unless you've eaten it first!! No Tampax, paper towels, bottle caps, toys, Q-tips, cotton balls, etc., etc., or you'll be SORRY!
- Don't use that quilted 3-ply toilet tissue you love. Sorry! It's best to use either an inexpensive one- or two-ply tissue you can get at your local food store or stick to RV toilet paper. Both work about the same, but the RV stuff is about 4 times the cost! Whatever you use, it needs to dissolve fully in your tank. If in doubt, always do the jar test: Take a sheet or two of your TP, put it in a jar 1/2 full of water, and give it a shake. Safe TP will dissolve readily; bad stuff won't and shouldn't be used in your RV!
- Toilet chemicals containing formaldehyde or any other ingredient that ends in "dehyde." Don't use this stuff! It plays havoc with sewage treatment plants and septic systems alike.
- Pine oil. Favorite ingredient of home-brew tank treatments, it can cause damage to the seals on the tank gate valves, leading to expensive and disgusting repairs down the road.

Toilet Chemicals

I'm really going to step WAAYYY out on that proverbial limb and talk about a very controversial subject: What to put down your toilet to help control "odors." The reason that this is such a scary topic is that absolutely everyone has a favorite toilet chemical. They are also certain that the inferior substitute you are using is nowhere near as cheap, effective, safe, or easy to use as their favorite. OK, I'm joking—a little. If you ever want to start a lively discussion around a campfire, ask what your neighbors are using for their toilet!

Personally, until recently, I rarely put any kind of chemical in my black-water tank. I simply dumped my tanks more often when it was hot to avoid serious odor problems. In the winter, when cold weather reduced the odors anyway, I never bothered with chemicals at all. Most of the commercially available chemicals are bad for the environment, tough on sewer treatment plants, expensive, and only marginally effective at best. I figured that it was "money down the drain" and just didn't use any of it.

"Probably one of the least enjoyable tasks associated with RVing is getting rid of the waste water that accumulates. It's really not so unpleasant if you do it right."

Nowadays, there are a number of enzyme and bacterial tank treatments on the market. These products are designed to stimulate aerobic bacterial action and break down the waste and kill the odors, kind of like having a miniature sewage treatment plant onboard. They carry an added benefit in being completely biodegradable and highly beneficial to RV park septic tanks and sewer treatment plants as well. If you decide to stick with old-fashioned toilet chemicals, please use them sparingly and avoid using any product with formaldehyde as the active ingredient. Most home-brew toilet treatments should be viewed with a skeptical eye. Don't even consider using a home-brew remedy that has pine oil or Pine Sol in it. Pine oils can harden the seals on the dump valves and eventually cause leaks.

Dealing with Dumping

Probably one of the least enjoyable tasks associated with RVing is getting rid of the waste water that accumulates. It's really not so unpleasant if you do it right.

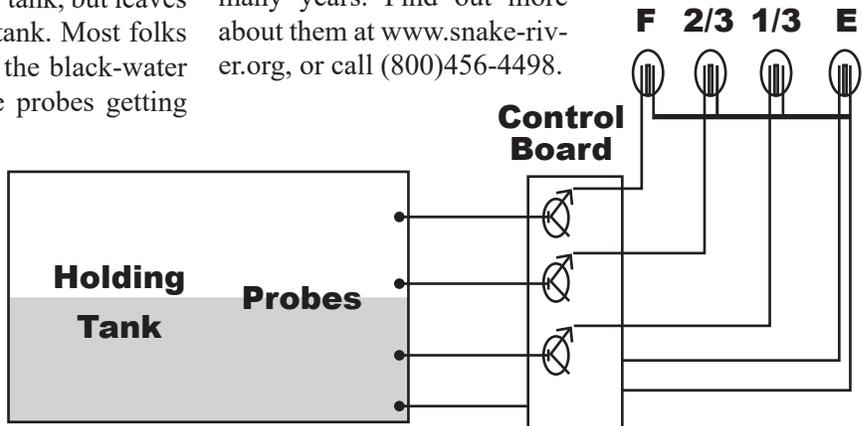
- First of all, buy good-quality hoses and fittings. The heavy-duty sewer hoses cost a little more but will last a lot longer and are more resistant to springing leaks. It's a good idea to have both a 10-foot and a 20-foot sewer hose. Equip each hose with the correct fitting to attach it to your rig's dump connection. It is also a good idea to have at least one

Monitor Panels

All RVs come equipped with some sort of monitor system that is supposed to tell you how much "whatever" is in your tanks. These systems haven't changed significantly in the last 30 years, and most still rely on physical conductive probes inside the tanks. Here is a simplified diagram to show you how this is all supposed to work.

For the most part, this system works pretty well for the fresh-water tank and the grey-water tank, but leaves something to be desired for the black tank. Most folks find that, after a while, the sensors in the black-water tank stop working. This is due to the probes getting coated with yuck in the tank, and yuck interferes with the accuracy of the monitor. There are literally dozens of expensive tank cleaning ideas out there; some work better than others, but nothing will fix the problem permanently. You can either put up with it, do a regular cleaning of the tank probes and hope that it helps, or

invest in a replacement tank-monitoring system. There are a couple of different ones out there on the market, and they work without any probes inside the tank. One popular system uses capacitance and simply requires that a couple of sensors be placed on the outside of the tank body. When I got fed up with my own tank monitors, I installed an Acu-Gage system, manufactured by Snake River Electronics. It has worked flawlessly for many years. Find out more about them at www.snake-river.org, or call (800)456-4498.



Sanitize Your Tank

To sanitize the tank and the fresh-water system, follow your RV manufacturer's instructions, or you can do the following:

- Prepare a chlorine solution by adding a 1/4 cup of Clorox or Purex household bleach (5% sodium hypochlorite solution) per each 15 gallons of tank capacity, into a gallon jug. Fill the jug with water, then pour the solution into the fresh-water tank.
- Complete filling of tank with fresh water. Turn on the pump. Open each faucet and let it run until all air has been released from the pipes and the entire fresh-water system is filled. You should be able to smell chlorine strongly at each faucet. Allow to stand for at least four hours.
- Drain and flush the tank and system with potable fresh water.

set of sewer adapters to connect your sewer hose to the sewer fitting in an RV park.

- At the dump station or sewer connection, park the rig close enough for your dump hose to reach. Connect the hose to the rig first, then place the other end into the sewer opening in the ground. If it doesn't want to stay put, you can place a small rock or brick against it to hold it in place.
- Pull the black-water tank dump valve first. This way, you will dump the black water through the hose first, then follow it with the grey water to flush out the hose. Once the black-water tank is empty, you should rinse out the tank with clean water whenever it is possible.
- Once the black tank is empty and flushed out, close the black-water dump valve. Now open the grey-water dump valve. As the grey water runs through the hose, you can shake it around a bit to help rinse out the inside of the hose, but be careful not to shake too hard and dislodge the hose from either the rig or the dump. Once the grey tank is empty, shut the valve and wait a few moments before disconnecting the hose from the rig. Disconnect the rig side first and lift the hose up so that any residual water drains into the dump fitting. Now's the time to rinse out the sewer hose, if you like, using a water hose. **DO NOT** use your freshwater hose to do this!!!
- Put all the caps back on. Cap off the dump connection on your rig and replace the cover or plug that belongs with the

“Traveling around the country, you will find that the taste and purity of the available water changes as much as the scenery. Thankfully, most of the water you encounter in your travels won't kill you or even make you sick...”

park sewer connection or dump station connection. Shake out your sewer hose and stow it and its adapters. Make sure that you rinse away any spilled waste or mess, especially at a public dump station, and stow your rinsing hose and close all compartments. OK, you're ready to go! Now, that wasn't so bad, was it? Oh, it's a great idea to wash your hands at this point. Some folks like to use disposable plastic gloves. They put them on before starting and then just discard them afterwards. I keep a small bottle of liquid hand soap right in the same compartment where the hose and stuff are stowed.

Water Quality Issues

Traveling around the country, you will find that the taste and purity of the available water changes as much as the scenery. Thankfully, most of the water you encounter in your travels won't kill you or even make you sick, but you can improve your odds by remembering a few simple tips:

- Only hook your hose up to a potable water source. Never use faucets at dump stations.
- Use only drinking water-safe hoses to supply water to your rig.
- Never use your drinking-water hose for any other purpose. Stow the drinking-water hose empty, and connect the ends together to keep them clean.
- Don't drag the end of your drinking-water hose on the ground.
- Always let the water run for a bit at the spigot before connecting it up.
- Sanitize your fresh-water tank at the start of the season, and drain it if it will be unused for more than two weeks.

Filtration

Another great way to improve the taste and appearance of your water is to use an inline water filter. Inline filters simply attach between the park's water hookup and your city water connection. Inexpensive disposable filters are available, as well as filters that use replaceable cartridges. You can even put the filter on the end of your hose when you fill your fresh-water tank! Activated carbon filters will remove most tastes and odors, leaving you with tastier water. However, most inline filters will not protect you from unsafe water, so be careful when you hook your hose.

Trailer and 5ver Check Lists

Check List for Breaking Camp

First, hitch truck to rig, then:

External

- Jacks up and locked
- Chocks removed and stowed
- Check lights and brakes
- Pull rig off levelers, then stow
- Check tires
- Awning secured
- Water heater off (gas)
- Chairs secured
- Window awnings secured
- Satellite dish stowed
- Drain/fill hoses stowed, caps on
- Electric disconnected and stowed
- Cable/phone disconnected
- Water pressure regulator stowed
- Campsite policed
- All compartments locked
- Folding steps stowed

Internal

- Furnace off
- Fridge off/lock door
- Water pump off
- Pilot lights off
- TV antenna down
- Water heater off (elec)
- Close all windows & vents
- Secure all loose items for road
- Sliding doors locked open
- All cabinets closed and locked
- Secure shower doors
- Stow shower supplies
- Empty and stow trash cans
- All lights and fans off
- Slides in and locked
- Lock entry door

RV Maintenance Check List

Monthly

- Check/adjust tire pressure
- Check pressure in spare tires
- Check running lights/headlights
- Check engine/trans. fluid levels
- Check coolant/brake fluid levels
- Check battery fluid levels
- Check toolbox/spare oil, etc.

Semi-annual

- Visually inspect frame/suspension
- Check/lubricate jacks and hitch
- Sanitize & flush fresh-water tank
- Drain/flush water heater

Annual

- Inspect brakes and tires
- Check wheel lug nuts
- Inspect belts/hoses
- Clean batteries/connectors
- Test/replace radiator coolant
- Repack wheel bearings
- Check for loose/damaged parts
- Inspect propane tanks/hoses
- Inspect/seal roof and vents
- Lubricate TV antenna mechanism
- New batteries CO, smoke alarms

VBC RV Systems Checklist 131d-0420

Motorhome Check Lists

Check List for Breaking Camp

External

- Jacks up and locked
- Chocks removed and stowed
- Check lights and brakes
- Drive rig off levelers, then stow
- Check tires
- Awning secured
- Water heater off (gas)
- Chairs secured
- Window awnings secured
- Satellite dish stowed
- Drain/fill hoses stowed, caps on
- Electric disconnected and stowed
- Cable/phone disconnected
- Water pressure regulator stowed
- Campsite policed
- All compartments locked
- Folding steps stowed

Internal

- Furnace off
- Fridge off/lock door
- Water pump off
- Pilot lights off
- TV antenna down
- Water heater off (elec)
- Close all windows & vents
- Secure all loose items for road
- Sliding doors locked open
- All cabinets closed and locked
- Secure shower doors
- Stow shower supplies
- Empty and stow trash cans
- All lights and fans off
- Slides in and locked
- Rearview camera on
- Seats locked/seat belts

RV Maintenance Check List

Monthly

- Check/adjust tire pressure
- Check pressure in spare tires
- Check running lights/headlights
- Check engine/trans. fluid levels
- Check coolant/brake fluid levels
- Check battery fluid levels
- Check toolbox/spare oil, etc.

Semi-annual

- Visually inspect frame/suspension
- Check/lubricate jacks and hitch
- Sanitize & flush fresh-water tank
- Drain/flush water heater

Annual

- Inspect brakes and tires
- Check wheel lug nuts
- Inspect belts/hoses
- Clean batteries/connectors
- Test/replace radiator coolant
- Repack wheel bearings
- Check for loose/damaged parts
- Inspect propane tanks/hoses
- Inspect/seal roof and vents
- Lubricate TV antenna mechanism
- New batteries CO, smoke alarms

VBC RV Systems Checklist 131d-0420

RV Basic Systems

Hookups

- Use a special drinking-water hose, not a garden hose, and keep it clean. Don't use it to wash out your sewer hose!
- Stow your fresh-water hose empty with the ends connected together to keep it sanitary.
- Protect your RV plumbing by using a pressure regulator when you hook up to city water.
- Turn circuit breakers off on the pedestal before plugging your power cord in.
- If you need to use a Dogbone or power adapter, remember that such adapters will limit the amount of current you can draw.
- Keep the black-water tank dump valve closed. Only dump the black tank when it is 1/3 full or better to make sure that all solids can flow out easily.
- Dump black water first, then grey water: the grey water will help flush out your sewer hose.
- Make sure to close all valves and replace caps after dumping your tanks.

Parking the rig

- Use chocks to prevent rig movement while parked.
- Level your rig before extending slides, and beware of soft surfaces when using levelers.
- Avoid using your refrigerator if the rig is significantly off-level.
- Generally, if you can walk around inside comfortably, you are level enough.
- Always stow your awning before you leave the rig or when bad weather is expected.
- Keep your awning rod and strap in plain sight outside your rig, just in case a storm comes up and your neighbor needs to roll up your awning for you.
- Make sure you have enough clearance outside to open slides, and eyeball the slide area inside to make sure nothing will interfere with the slide while it is moving.

- Always know your slide's emergency retract procedures, and keep the proper tools and handles in the rig where you can find them.
- Know how to operate your LP gas sensor, smoke detector, and CO detector.
- Keep alarms clean, test regularly, and replace batteries at least once a year.

Electrical

- Remember that large appliances run on AC, and lighting, fans, and water pump run on 12v DC.
- Know where the breaker and fuse panels are, and keep spare fuses handy.
- Think of your battery system as a "bank account." You must put back what you take out.
- Keep your batteries charged, and check the water level at least once a month.
- If you have a generator, check the oil level before each use and after eight hours of operation.
- Replace generator oil and filters according to manufacturer's recommendations.

Water

- Conserve fresh water by limiting use when you are away from hookups.
- If your fresh-water pump cycles intermittently when no faucets are open, check the system for possible leaks.
- Always make sure your water heater is filled before you operate it.
- Remember the differences between grey water and black water and keep them in their places.
- Don't flush anything down the toilet that you haven't eaten first.
- Select appropriate toilet paper and use it sparingly.
- Drain all tanks and the fresh-water system before storing the rig. Follow manufacturer's winterizing procedures when storing the rig in subfreezing weather.

Continued on next page ⇒

Appliances

- Start your refrigerator the night before you load it to give it a chance to cool down.
- Make sure the refrigerator door locks are engaged before you drive.
- Turn off pilot lights and gas appliances before you drive.
- Shut off main gas valve and turn off all flame or spark-producing appliances before you approach a gas pump!

Pre-flight

- Visually check your tires and all lights before you hit the road each day.
 - Walk all around the rig. Look up! Look underneath!
 - Retract everything you extended; stow everything you unpacked.
 - Don't forget to lower the TV antenna, stow your steps, and close all roof vents!
- Travel safe and have fun!

RV Website Resources

RV Discussion Forums

- www.rvnetwork.com The Escapees discussion forum. Includes an RV marketplace area
- www.rv.net The Open Road Forum.
- www.rvusa.com RV classifieds, RV forums, RV campgrounds, RV guides.
- www.rvforum.net Forums, virtual campfire chat, links.
- www.IRV2.com Forums, chat room, classifieds, and links.
- www.rvtalk.com RV Talk - online RV forum.
- www.myrvparks.com Forum, campground guide, social networking.

RV Parking Resources

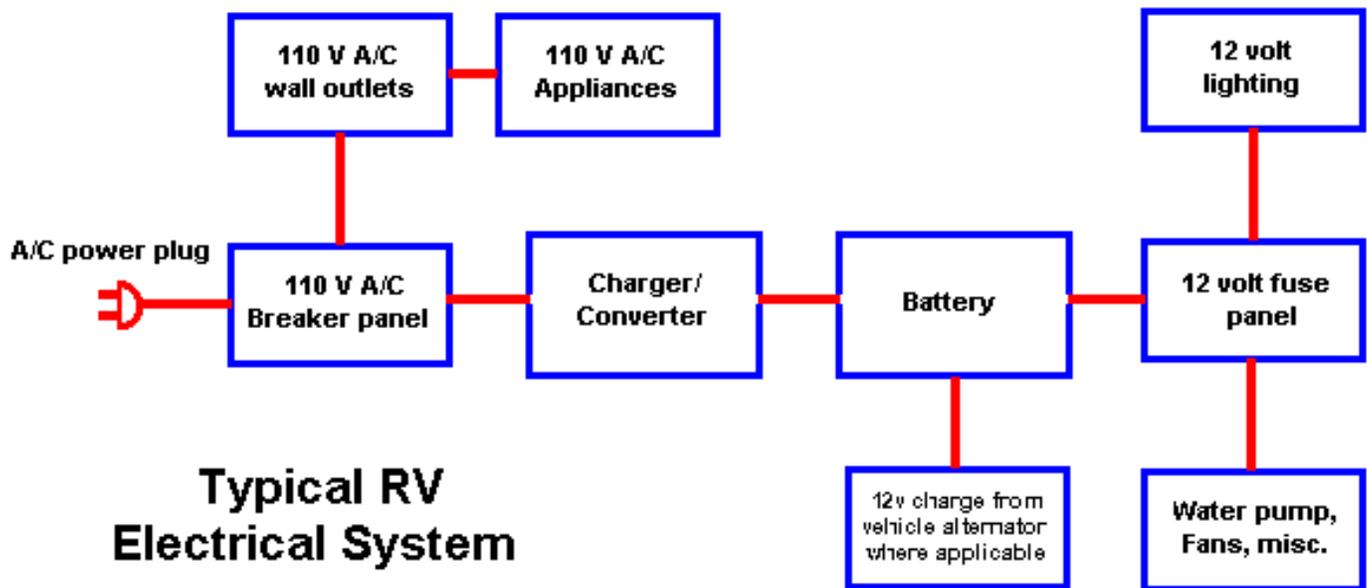
- www.rvparkreviews.com RV park reviews—RV park ratings.
- www.camprate.com Campground ratings, comparisons, tips, pictures, and reviews.
- www.campsitereports.com Ratings, and reviews of State and National Parks, RV Parks and campgrounds.

RV Magazines Online

- Escapees Magazine* www.escapees.com/magazine
- Family Motor Coaching* www.familyrvingmag.com
- Gypsy Journal* www.gypsyjournal.net
- Motorhome Magazine* www.motorhome.com
- Trailer Life Magazine* www.trailerlife.com
- Workamper News* www.workamper.com
- RV News and Newsletters www.rvtravel.com

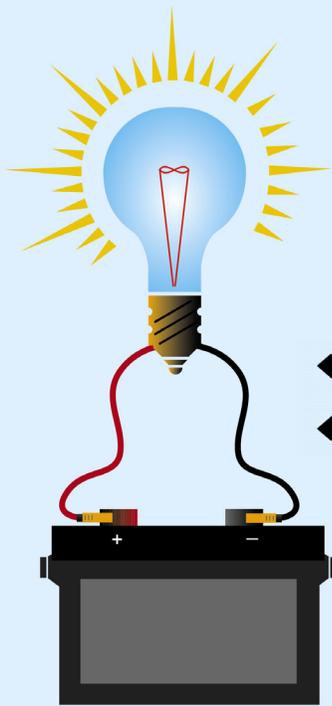


THE 12 VOLT SIDE OF LIFE



Design	Pros	Cons
AGM	Completely sealed Mount anywhere Good lifespan in RV apps	Cost \$\$\$\$ Needs well-regulated charging
Gel / VRLA	Maintenance free	Critical charging requirements Shorter service life Low availability
Flooded	Inexpensive Tough, will handle vibration and unregulated charging Good lifespan in RV apps	Regular maintenance <u>req'd</u> Must be mounted upright in vented compartment

Amp/Hour Concept



2 amp load

×



Operated
continuously for
5 hours

=

10

amp/hours

(2 amps x 5 hours)

“Withdrawn”
from Battery

Continued on next page ⇒

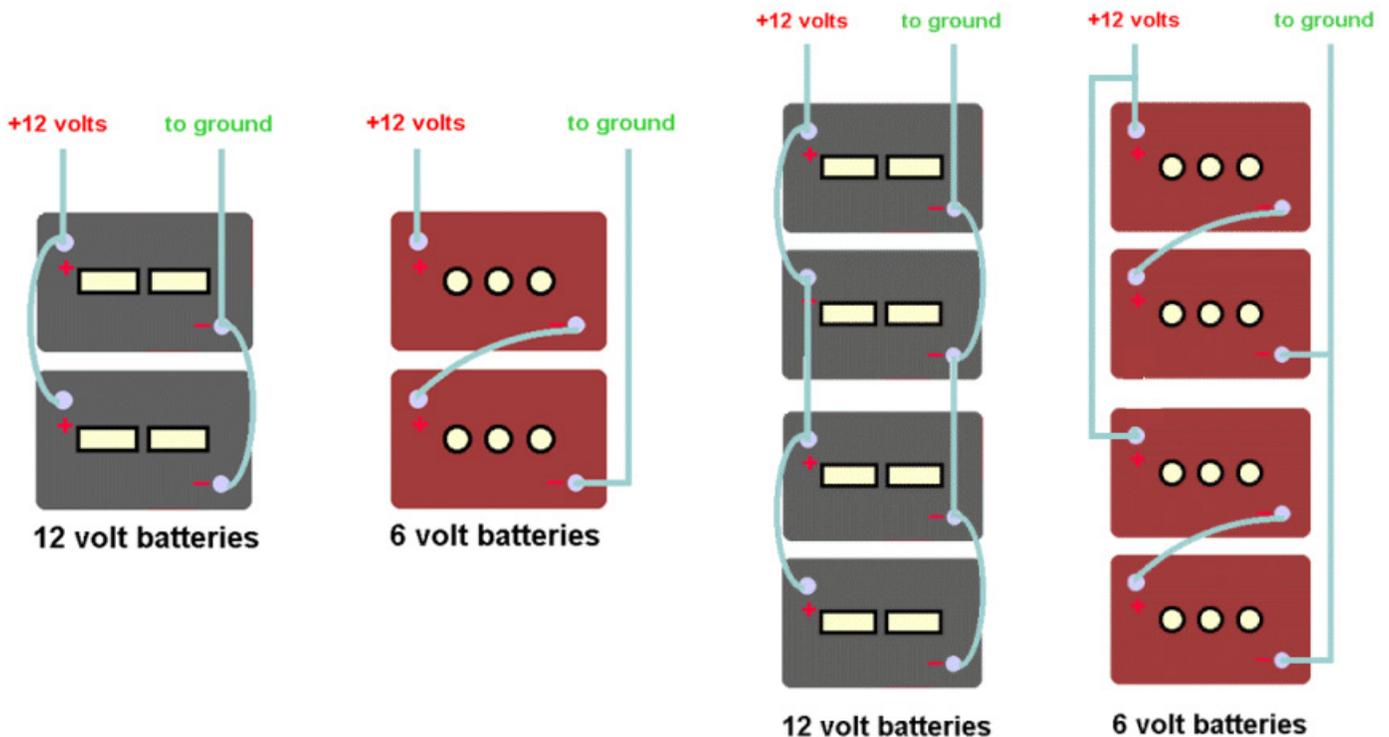
Voltage	State of Charge
12.6+	100%
12.5	90%
12.42	80%
12.32	70%
12.20	60%
12.06	50%
11.9	40%
11.75	30%
11.58	20%
11.31	10%
10.5	0%

Open Circuit Battery Voltage	Approximate State-of-charge	Average Cell Specific Gravity
12.70 / 6.35	100%	1.265+
12.45 / 6.23	75%	1.225
12.24 / 6.12	50%	1.190
12.06 / 6.03	25%	1.155
11.89 / 5.95	0%	1.120

Continued on next page ⇒

Battery Type	Dimensions in inches (L x W x H)	Weight	Capacity	Voltage
Group 24	10.87 X 6.58 X 9.97	53 lb.	70-85 Amp hours	12 volts
Group 27	12.60 X 6.60 X 9.97	63 lb.	85-105 Amp hours	12 volts
Group 31	12.94 X 6.74 X 9.88	68 lb.	95-125 Amp hours	12 volts
4-D	20.73 X 8.66 X 10.27	130 lb.	180-215 Amp hours	12 volts
8-D	20.62 X 10.95 X 10.17	158 lb.	225-255 Amp hours	12 volts
Golf cart & T-105	10.37 X 7.13 X 11.57	61 lb.	180 to 220 Amp hours	6 volts
L-16	11.69 X 7.13 X 16.69	114 lb.	340 to 380 Amp hours	6 volts

12V to 6V Conversion



PLEASE FOLLOW YOUR POWER AMPERAGE GUIDE USAGE

Take a minute and see how many amps you could be using in your RVs 30 or 50 amp electrical system. It is surprising how fast the amps add up which causes you breaker or the RV Park's breaker to "trip". Knowing the amps of all the electrical appliances in your RV can help you manage electrical use and prevent the inconvenience of "my electricity went out". This list is the typical appliance used and the average amps required to operate them:

Air Conditioner	15-17 amps
Refrigerator	5.7 amps
Electric Water Heater	12.5 amps
Microwave Oven	12.8 amps
Electric Coffee Pot	9 amps
Toaster	10 amps
Hair Dryer	10 amps
TV	2 amps
Dirt Devil Hand Vacuum	2 amps
Electrical Power Converter	2-3 amps
Electric Fry Pan	10 amps
Iron	10 amps
Food Processor	6 amps
Crook Pot	1.5 amps
Heating	0.5 amps
1,100 Watt Heater	10 amps

In the morning, you start your air conditioner and the hot water heater is on, then you start your coffee pot, make some toast, watch some TV – you are pulling 50 amps when all appliances are operating at maximum. If you cook something in the microwave at the same time – A BREAKER WILL TRIP!

Most electrical products show how many watts or amps it takes to operate the appliance printed on the appliance itself or on the instructions. If it shows the watts – divide the watt by 120 (volts) and that gives you the amps. To get the watts – multiply the amps by 120 (volts).

It is worth your time to take inventory on the "amps" each of your electrical appliances uses, then you can manage your total usage at one time and this greatly reduces the anxiety of "My electricity went out".

50 Amp Plug

Ground Wire

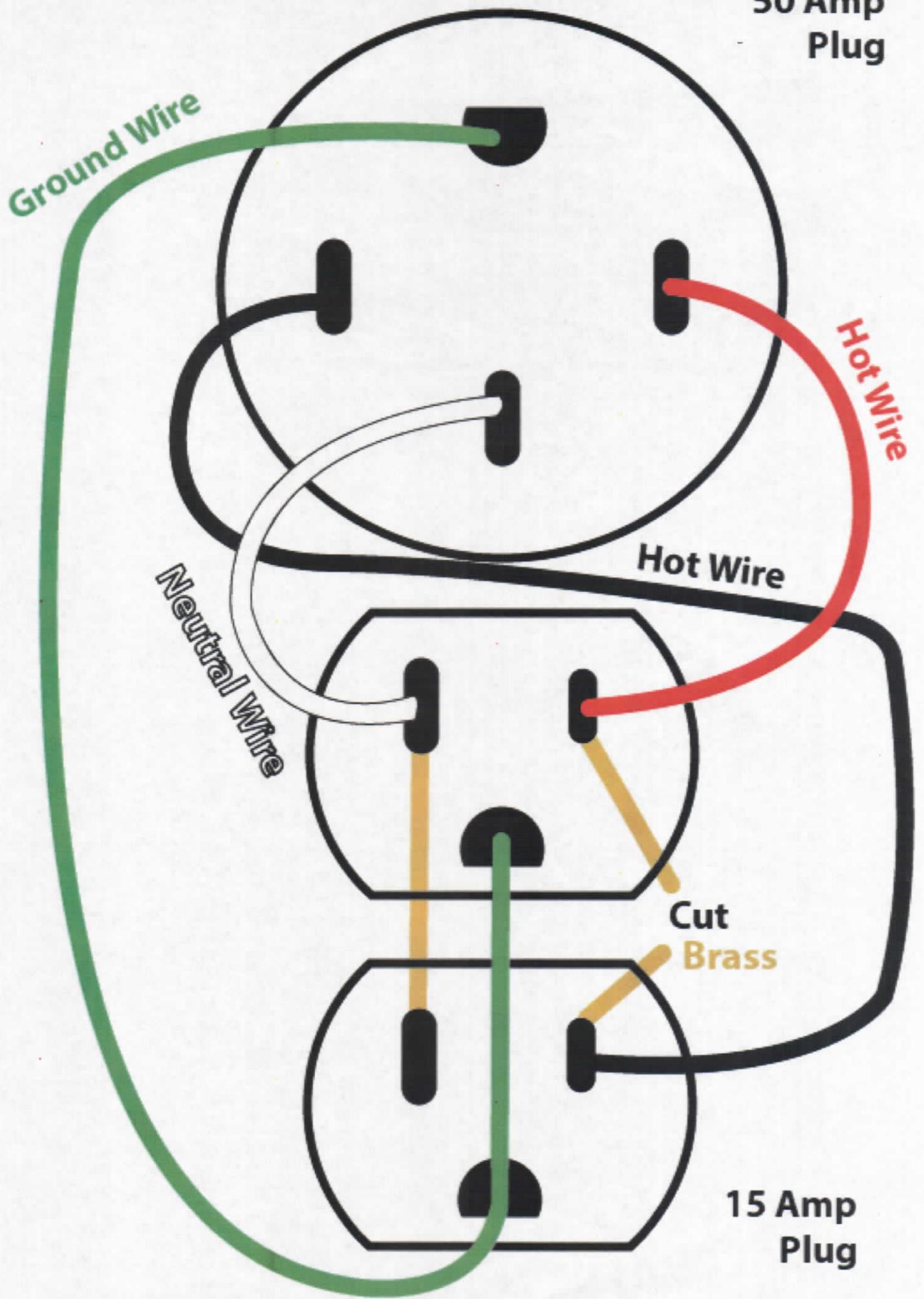
Hot Wire

Hot Wire

Neutral Wire

Cut Brass

15 Amp Plug



Solar & Batteries II (Lithium vs Lead-Acid)

Advantages of Lithium vs Lead-Acid

Much smaller & lighter

Safely discharge up to 90+% (vs. 50%)

No voltage sag

Less self-discharge during storage

Fast/efficient charging – bulk to 100%
(vs. 3-stage bulk/absorb/float)

Charging to 100% each cycle not required

No sulfation, so no equalization required

Great for high current discharging

(vs. “Peukert’s Law” = up to 40% capacity loss under heavy loads)

Fully enclosed (no venting)

Extended life (2000-5000 cycles vs 300-600)

Disadvantages of Lithium vs Lead-Acid

Up-front expenses

\$1K-\$10K for 100-800 AH

“drop-ins” now on the market, but...

Less established technology

Different charge profile than lead-acid

Programmable inverter/chargers

May have to upgrade meters/charging systems

Availability & servicing problems

Battery Management System vampire draw

Temperature sensitivity (cold & heat)

Can’t be charged below 32 degrees F

100% discharge = dead battery

Solar: How much do I need?

Enough to fully charge your batteries -- and not much more!

Remember that TriMetric Battery Monitor?

Do a power audit or...GO CAMP!!

Rough Rule of Thumb = 100 watts of solar = 30 AH / day

Start small, fully plan/wire for expansion

1 watt solar (or more) per 1 AH battery capacity (lead-acid)

Maximizing the Juice

Watch that installation!!

- Partial shading = BAD
- Big wires, short runs = GOOD
- Charge controller near batteries
(voltage drop calculator)

To tilt or not to tilt?

Portable or roof install?

PWM vs MPPT solar charge controllers

PWM = Pulse-Width Modulation

MPPT = Maximum Power Point Tracking

More Info:

Technomadia.com (blog + YouTube)

FitRV.com (blog + YouTube)

AMSolar.com

StarlightSolarStore.com

LithionicsBattery.com

VoltaPowerSystems.com

RV builders who offer lithium battery packs:

Advanced-RV, Pleasure Way, Hymer (RoadTrek, Carado), Winnebago (Travato),
Liberty Coach

MarxRV.com (general 12v system info)

HandyBobSolar.wordpress.com (lead-acid & solar)

JackDanMayer.com (lead-acid & solar)

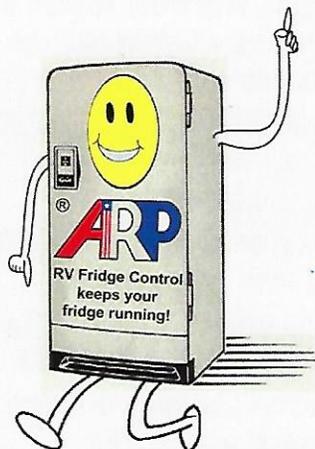
Batteryuniversity.com

PVWatts.NREL.gov

KEEP YOUR FRIDGE RUNNING SAFE

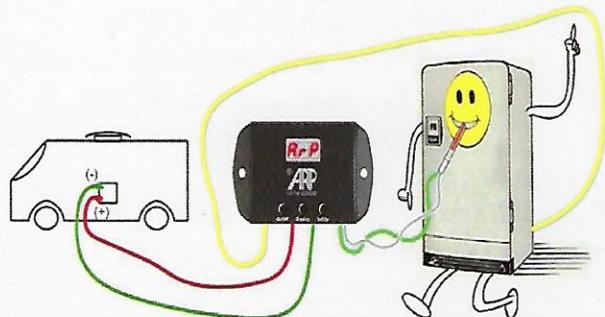
www.ARPrv.com

ARPrvSafe@gmail.com



The ARP solves most of the issues that RVers have had to face for years! Such as off-level and venting issues that lead to overheating that can result in fridge failure or even worse, a fridge fire.

How's that for failure insurance?



RV Power & Ground

ARP Controlling Fridge by Vital Temperature

The ARP is easy to install!

The ARP automatically keeps your fridge safe and running like new.

What does it do?

The ARP Control keeps the fridge running safe even when the RV is not leveled properly.

Will I need to do anything after it is installed?

No, the ARP is automatic. If the fridge has a problem the ARP will warn you.

How did the ARP control come to the market?

The ARP Control was designed by an RVer for RVers. The inventor is a professional controls system and mechanical engineer.

How do I know it will work?

The product has been extensively tested by both part time and full time RVers.

Can anyone install it?

Yes, with limited mechanical and wiring experience, anyone can install the control. It is as easy as 1-2-3 using the instructions online:

1. Decide where to locate the control.
2. Install the temperature sensor.
3. Follow the wiring instructions.

How much does it cost?

\$135.00, a small investment yielding high returns when compared to refrigerator replacement and damage to the RV as the result of a failure or even worse, a fire!

ARPC L.L.C.

E-Mail: ARPrvSafe@gmail.com

Telephone: (406) 494-1959

WebPages: www.ARPrv.com

The **SEELEVEL II**™ Tank Monitor



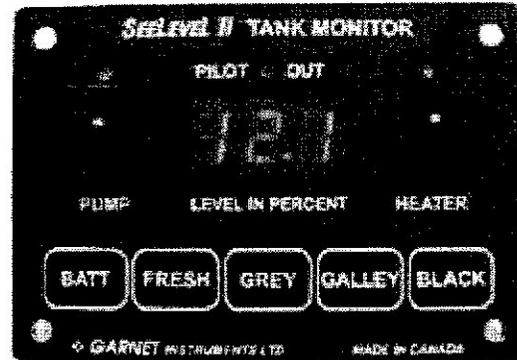
Model 709-PH



Model 709



Model 709-4



Model 709-4PH

Features

- Full featured system designed specifically for OEM's
- Provides accurate tank level information using percentage of full readout
- Tanks are monitored using Garnet's proprietary external level sensing technology. This ends fouling problems caused by debris build-up in the holding tank. Detailed diagnostic information monitors sender operation.
- Measures tanks up to 12 inches tall with a single sender or 24 inches tall with dual senders
- Tank senders connect to display via a one wire bus which saves wiring costs
- LPG tank connection compatible with existing electric senders
- Calibrate LPG at first fill of tank or it can be factory calibrated
- Multiple versions meet the needs of differing configurations:
 - 709PH: Three holding tanks, LPG tank, water pump/heater switches
 - 709: Three holding tanks, LPG tank
 - 709-4: Four holding tanks
- Uses common industry connector for ease of installation and servicing

IT'S THE 21st CENTURY...WELCOME TO IT!

Resolution:	3/8 inch (10 mm)
Accuracy:	+/- 10% or better, limited by resolution and tank shape
Operating temperature range:	+32 to +140 °F (0 to + 60°C)
Sender materials:	0.008" thick glass epoxy circuit board with conformal coating for circuit protection. Laminated on the back with 3M 300LSE Bonding Adhesive.
Display mounting panel:	Black panel, approximately 4" wide by 2.8" high by 1" deep (102mm wide X 71mm high X 25mm deep). Panel screws to wall. Required cutout size is 3" wide by 1.8" high.
System power requirements:	Display requires 12 volts from the RV battery, the system will function from 11 volts to 16 volts. Current drain is less than 200mA.
Wiring:	Common two wire conductor (signal and ground) required from the display to each sender. 12 V power and ground required for display. Single wire required for LPG sender if sender grounded at tank.
LPG sender characteristics:	Display will work with an LPG sender maximum resistance of 50 ohms to 500 ohms. Display shows increasing level as resistance increases. System must be calibrated with the LP tank full, or can be factory calibrated.

Personal Safety on the Road

With development of the recreational vehicle, it has provided us the opportunity to travel and enjoy these United States. RVers travel for many reasons; business, weekend trips to the lake or living in the RV full-time. Everyone is concerned with safety and while RVing, it is no different.

Campgrounds:

When picking a campground to stay at you can use RV Parks Review. The web site is www.rvparksreviews.com. The reviews are made by follow RVers after they have stayed at that RV Park. Just remember that what is important to you at that RV Park, may not be the same for the person who reviewed the park. Another site to use is the app called Allstays Camp & RV. This app must be purchased but gives locations for the campground, fuel locations, Walmarts, Propane locations, Cracker Barrel Restaurants, low bridges, and repair facilities.

Alarm Systems:

Businesses and houses are alarmed against burglars. For the RV, we can use a passive alarm system that is designed to scare off the burglar who is trying to enter your RV illegally. Swann Home Series makes a Motion Alarm system that can be installed in the RV. It cannot be used if you have an animal inside the RV.

Motion Lights:

These are great for when you forget to turn on the porch light and arrive home at night or you have a guest come over late at night. Smart Light 1000 RV Motion Sensor Light makes a great light to replace

your outside door light. It has a LED light bulb, the housing comes in white or black and it is easy to install. The light is available through RV part dealers or Amazon.

The CH751 Key:

When most RVs are shipped from the manufacturer, the outside storage compartments are keyed to the CH751 key. It is a cost savings measure by the manufacturer, but other non-RV manufacturers use the same key. These would include file cabinets and tool boxes. For RVers the “other people” with the CH751 key can be a problem. It is suggested that you have the locks changed. Most locksmiths can change the locks for you or you can go to www.ch751.com.

Hide a Cans:

These mini safes are great to hide small valuable items or money in your pantry or refrigerator. The cans come in different cans such as Dr. Pepper, A&W Root Beer, 7Up, Barbasol Shaving Cream or Ajax cans. Also consider using a Tank Top Closet Safe. This looks like a tank top that hangs in the closet but has pockets to hold your valuables. These items can be purchased from the Container Store or on the internet.

Continued on next page ⇒

Personal Safety on the Road

Cell Phone Booster:

Most everyone today has a cell phone but they don't always work in fringe coverage areas. In order to boost the signal, consider using a cell phone booster. The boosters will help boost the cell phone signal if there is a signal available. The popular boosters are Wilson Cell Phone Booster and zBoost. Both are available through Amazon.

Weapons:

The decision to carry a weapon is an individual choice. Weapons would include OC Pepper Spray, Tasers and handguns. All of these may not be legal in the states that you travel. If a handgun is a choice for you to carry, then consider getting a concealed handgun license in your legal residence. For an all around effective weapon that is legal to carry, consider purchasing a can of Wasp Spray. It is legal to carry in all 50 states, Canada and Mexico, it shoots over 20 feet and you never know when you will run into some angry wasps!

Weather Radio:

The weather radio is a must for all RVers. We all know that the weather can change very rapidly. The weather radio can warn you have watches and warning while you are traveling. These can be purchase at Walmart or Amazon.

The most important safety tip to consider is to not put yourself in a position where you do not feel comfortable. RVing is a wonderful way to see this great country, so come on out and join your fellow RVers as we travel down the road.

Camp Review Websites

RVParkReviews.com
FreeCampsites.net
Campendium.com
OvernightRVParking.com

Shorepower Guard

RVAutomations.com

GPS Trackers/Beacons

TheTileApp.com
Whistle.com
Info.DeLorme.com
FindMeSpot.com

Alarm Systems

Canary.is
SimpliSafe.com

Cell-WiFi-Internet Advice

RVMobileInternet.com
FB Group: Internet for Rvers
TechnoRV.com

Apps

Rego
CoPilot
AllStays
RV Park Reviews
Overnight RV Parking
Ultimate Public Campgrounds
USFS & BLM Campgrounds
Find My Friends
Familonet
Glympse
Where Am I At?
CCW

Attention All RV Owners!

Do you know who has the keys to your RV storage compartments?
If it's a CH751 key, just about everyone.

Replace your CH751 locks and keys with custom made high security locks from
INDUSTRIAL LOCKS & HARDWARE, INC.
661-224-1010 • WWW.CH751.COM



Thousands of people, good and bad, have a key to your RV. Perhaps 60% or more of all travel trailers have been manufactured using the CH751 or ES201 key system on their storage compartment doors.

If you have a CH751 or ES201 stamped on your storage compartment keys, please consider replacing them with High Security Tubular Locks from Industrial Lock & Hardware. We custom manufacture all RV lock orders which guarantees that we will not duplicate your key codes. (In your geographical area).



High Security Tubular Cam locks

FOLLOW US ON



YouTube

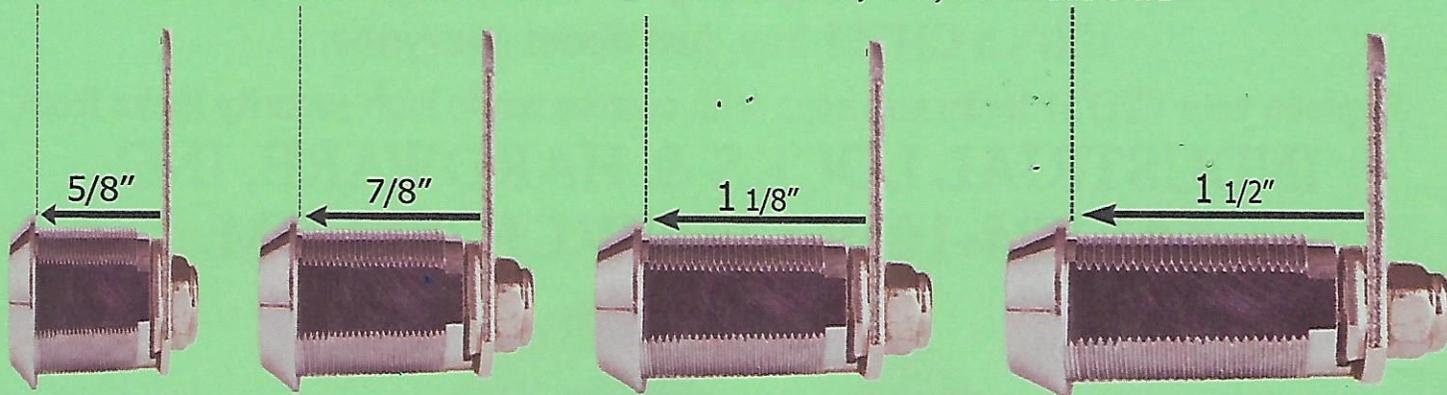


LinkedIn

Replacing your RV storage locks made simple.

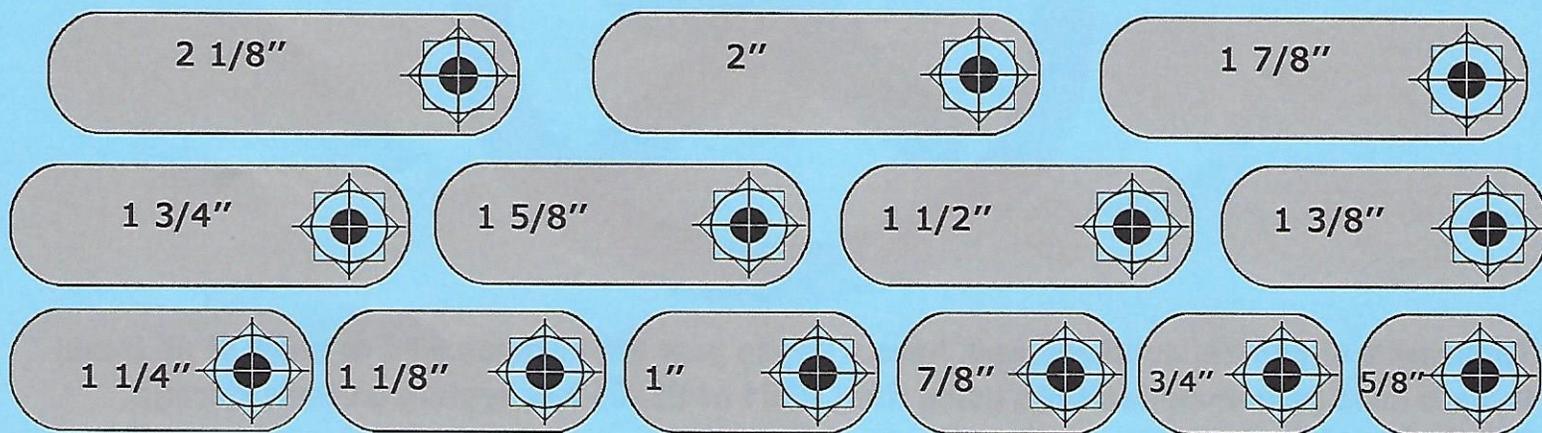
STEP 1 LOCKS

Determine what size lock you're replacing by placing your current lock on the image below. Tubular standard lock sizes are manufactured in 5/8", 7/8", 1 1/8" and 1 1/2"



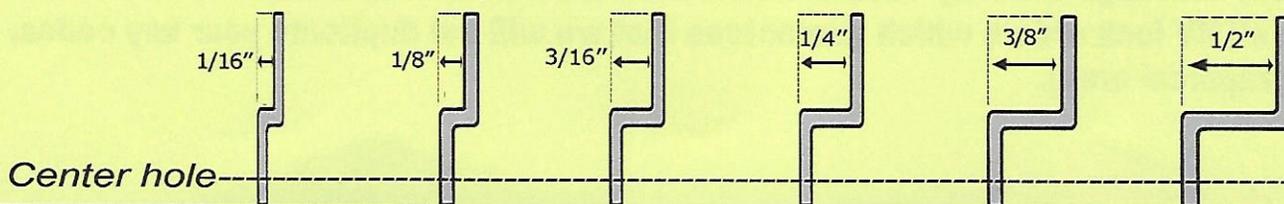
STEP 2 CAMS

Determine what size cam/locking arm is required by placing your current cam on the image below. (PLEASE NOTE: cams are measured from center of hole to furthest outside radius).



STEP 3 BENDS

Some locks are manufactured with offset/inset cams. Determine the offset/inset dimension by placing your current cam/locking arms on the image below. NOTE: Not all cams/locking arms are manufactured with 90° angles; however all offset/insets are measured in the same way.



ORDERING INFORMATION

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIPCODE _____

PHONE _____

E-MAIL _____

CREDIT CARD# _____

CREDIT CARD HOLDER'S NAME _____

QTY	LOCKS SIZE	CAMS SIZE	BENDS SIZE	TOTAL AMOUNT

EXPIRATION DATE _____ CVC# _____ VISA MASTERCARD AMERICAN XPRESS DISCOVER

WWW.CH751.COM

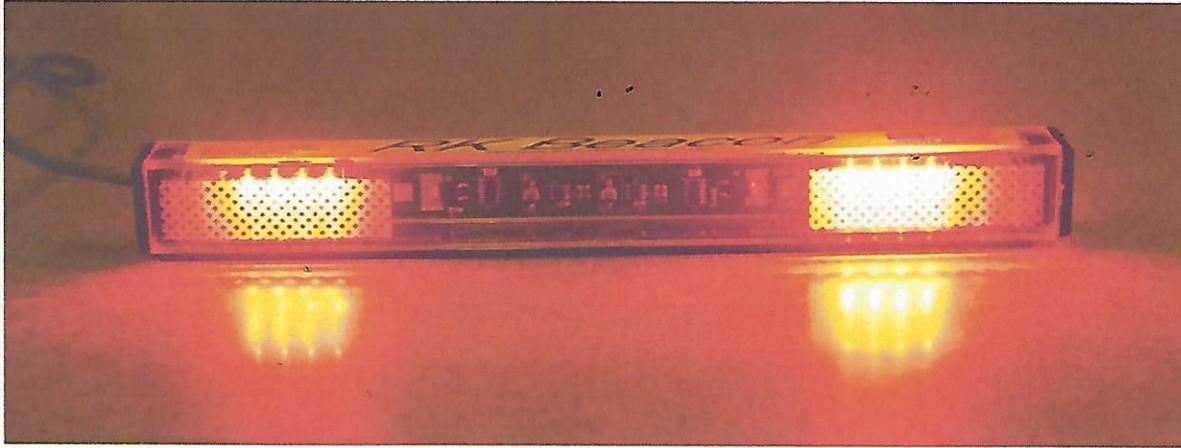
SUB-TOTAL _____

STATE TAX (CA ONLY) _____

SHIPPING/HANDLING _____

TOTAL _____

Complete this form and fax it to **661-224-1011** or mail to:
40222 La Quinta Lane, #B 101, Palmdale, CA 93551



RK Beacon

The RK Beacon flashes and alternates back and forth to get the attention of other drivers when used as an emergency safety device.

The RK Beacon is a manufactured with high quality components and designed and manufactured in the USA and has a two-year warranty.

Hi power LED's and durable solid-state electronics

Visible over a mile away during the night

Visible a mile away during the day

Magnet on one side.

Suction cup included for non- magnetic surfaces

Laser cut lens in the housing

Power: 12 Volts Vdc (Operates 9 Vdc to 13 Vdc) Plugs into cigarette lighter outlet

Draws: 280 ma max.

20' Power doubled jacketed cable with the unit (30" extension cable available up to, two 30" extension cables can be used at once, for total of 80')

Double Moisture Protection, outside housing and Acrylic Coated Printed Circuit Board

Dimensions: 11.75" long X 1.25" wide X 1.25" deep

Web Site: PhotoBallisticSystems.com

Use the coupon code ***Boot Camp*** at check out to buy a RK Beacon for \$99.95

StanFikel@PBSLighting.com 602-702-6822 PBS Lighting 3938 E. Pershing Ave, Phoenix, Az 85032

RV Weight and Load Management

Weight

As RVers traveling down the road, we like to carry all of our stuff. Data shows that 57% of RVs that are traveling down the road have exceeded a weight rating. Overloading our RV is a major problem and it causes a majority of our problems when we travel. RVs are the only vehicle on the road operating at 100% of its capacity 100% of the time. When you properly weigh your RV for total load and proper distribution of that load is essential.

GVWR

Gross Vehicle Weight Rating is established by the manufacturer. It is the maximum weight including all passengers, fuel, water, cargo and supplies at which the vehicle may be operated. This information is located on the Federal Data Plate for the vehicle.

GAWR

The Gross Vehicle Weight Rating is also established by the manufacturer and is located on the Federal Data Plate. The GAWR is the maximum weight allowed to be carried by the components, such as tires, wheels, bearings, suspension and axles.

GCWR

The Gross Combination Weight Rating is the total combined weight of the tow and towed vehicle as it is traveling down the road. Unfortunately, this information is not on the Federal Data Plate. The GCWR will be in the owner's manual or in a towing guide for the year of the vehicle.

CCC

For the late model RVs on the road, the manufacturers have started including the Cargo Carrying Capacity. This will be on a yellow sticker located near the entrance door of the RV. If any aftermarket equipment is installed on the RV, it will subtract from the Cargo Carrying Capacity.

An overloaded or overweight RV can have braking, acceleration, bearing, axle, frame, tires or engine problems.

In order for your RV not to exceed any of the weight ratings, the RV needs to be weighed by individual wheels. When truck scales are used to weigh the RV it will only give you the axle weights and not the individual wheel weights.

Asymmetry is the side to side weight of a vehicle and it is extremely important for RVers. In order to correct asymmetry is to redistribute the weight or remove excess weight. To redistribute the weight in an RV, simply move light items to the heavier side and heavier items to the lighter side. You may not fully correct the asymmetry completely due to the RV design.

Four important aspects when your RV is overloaded:

1. Personal safety is jeopardized
2. Reduced durability & reliability of your RV
3. Loss of warranty coverage
4. Legal liability

RV Weight and Load Management

Where to get your RV weighed

When you have your RV weighed it must be weighed on the individual wheels on a level surface. Because we are worried about asymmetry and RVs carry fluids, a level surface is important when we start fine tuning our cargo. There are several traveling scales that travel across the United States. You can type in “RV mobile weighing scales” into your favorite search engine to locate traveling scales. Consider using the Escapees SmartWeigh Scales located at Livingston, Texas, North Ranch, Arizona, or Bushnell, Florida. Visit www.escapees.com/smartweigh for more information.

In order to have “Piece of Mind” while traveling, get your RV weighed. Why take a chance, get correctly weighed ASAP!



Escapees **SmartWeigh** is an RV weighing program created by the Escapees RV Club to enhance your safety. We provide accurate individual wheel weights for your RV, toad, and tow vehicle, and a complete weight analysis.

Escape with Peace of Mind.
Schedule Your RV Weigh Appointment Today!

Four reasons why proper RV weight is important:

1. Protects the reliability and durability of the RV.
2. Enhances the personal safety of the RVer, passengers, and others on the road.
3. Guards warranty coverage.
4. Gives you freedom from the liability of operating the RV beyond the federal and manufacturer's limitations.

186-0413

Complete weight analysis starting at just **\$45**

888-757-2582 • smartweigh@escapees.com

www.escapees.com/smartweigh

Continued on next page ⇒

RV Pre-Purchase Check List

If you've narrowed down the choices or are looking at a particular rig with intent to buy, it's time to get serious and do a full functional checkout. DON'T take anyone's word for it! Test all the RV's systems yourself. Most RV dealers are set up to do this, and it is an expected part of taking delivery on a rig. Whether the rig is new or used, make sure that your agreement with the dealer states that any nonfunctional items will be fixed before you will take possession of the rig. Then test everything.

When purchasing a rig from a private individual, it may be a little more difficult to do this checkout, but I highly recommend that you find a way to do it before money changes hands. The following is an attempt to provide a check list of items that should be tested for functionality. When buying a motorhome, it's like buying a car as well as an RV. You have to take into account all the things that are specific to any motor vehicle, like the motor, transmission, etc. That's a bit more than I feel qualified to get into here. This list will mostly concentrate on things that are specific to the "traveling house" function of any RV. For smaller, simpler rigs, some of the following won't apply.

Plumbing

Take a hose and fill the fresh-water tank. Check for:

- Leaks
- Gauge panel reading correct
- Tank drain functions
- Turn on an inside faucet and then turn on the pump. The pump should prime immediately and water should flow. Try both cold and hot on faucet. If the water heater tank isn't full, let the pump fill it by leaving hot water faucet open. Once you have water flowing from both hot and cold faucets, turn off the faucets. The pump should shut off automatically. Wait a minute or two; the pump should not cycle again. If it does, suspect a leak in the plumbing system.
- Check all faucets and shower for operation. Make sure the drains drain.
- Flush the toilet
- If possible, run enough water into both gray and black tanks to verify gauge operation.

Electrical

- Plug the rig into AC power; then test all AC outlets.
- Test DC outlets (if any).
- Test all lighting.
- Turn refrigerator on and select the AC (or verify automatic operation if so equipped). Turn temp adjustment to max. It may take a while to begin to cool. Feel the freezer compartment for first signs of cooling.
- Turn on the air conditioner(s), if any, and check that the unit cools. Listen for unusual noises.
- Test any fan-equipped roof vents.
- Find the main breaker panel. Turn on several nearby 12v lights, then turn off the main breaker. The 12v lights should dim slightly. Turn the breaker back on, and they should get brighter. This tests to see if the converter is working. (Note, it's not really a very good test, but it's quick and nontechnical.)
- Test the microwave, if present.
- Test the stereo and/or TV, if present.
- Raise, rotate, lower the TV antenna and test for function, if present.
- Test any smoke, propane, and/or CO detectors that are present.
- Test any electric jacks or leveling devices.
- Test any other appliances present.
- If the rig has additional optional electrical equipment (solar panels, inverter, generator, etc.) ask that the owner or dealer show functionality.

Propane systems

- Make sure the gas is on and that there are no leaks. Please don't use a match to test this!
- Switch the refrigerator to gas and light the burner (automatic models may not switch to gas until you unplug the rig from AC power).
 - Burner stays lit?
 - Fridge cools on gas?

Continued on next page ⇒

- Make sure that the water heater is not bypassed with a water heater bypass kit (used to bypass water heater for winterization. If you're not sure, ask.) and is full of water. Light the water heater. Check for:
- Pilot light (if so equipped) stays lit.
- If direct spark ignition, make sure the control switch works.
 - The main burner works.
 - Leaks (especially at drain plug and pressure release valve)
 - If electric-equipped, check for operation.
 - Let it heat up and check for shutoff, if possible.
- Check oven and range for operation. Do pilots work?
- Turn on furnace and check for operation. Most are pretty automatic and do not have a pilot light. Make sure you get warm air at all registers.
- Test additional heater or appliances for proper operation on propane.

Interior

- Check all cabinet doors and closets, etc., for functional latches.
- Look carefully for any signs of leaks. Discolored paneling or small stains can be just the tip of the iceberg.
- Do all the roof vents work? Are the covers intact? Screens?
- Open and close every window. Make sure that the cranks all work and windows close properly and seal. Are the screens all intact?

Exterior

- Check whole exterior of rig for damage.
- Pay attention to the quality of the exterior finish. Are there any stains, rust spots, or areas of corrosion?
- Climb up the ladder and look at the roof. Pay attention to leading and trailing edges of the roof, as that's where damage from low-hanging trees, etc. is most likely. Is the roof in good shape? Is the air conditioner cover intact? How about the TV antenna? Are all plumbing vents intact? Is the refrigerator vent intact? Roof vents? Skylights?
- Sight down the sides of the rig and look for uneven surfaces. The sides of the rig should be flat. Watch for bubbles or delaminations of rig sidewalls.
- Check the lighting. Do all lights work? Are all lenses intact?
- Check windows for damage and the quality of weather seals.
- Are all compartment doors functional? Does the seller have all the keys?

Rolling Stock

Crawl under the rig for this one. Look at all axles and suspension components.

- Are there any bent or broken parts? Major rust? Dangling wires? Missing shock absorbers?
- Check the tires. Any signs of uneven wear? Are all the tires the same brand and apparent age? Are any tires more worn than others? Are the tires in good shape? Sidewall cracks?
- Does the rig sit level on level ground? No listing or leaning?
- Brakes. This is a hard one. You can pull the wheels and inspect the brakes visually (best, but not easy to do) or you can test them by driving / towing the rig and checking that they work. The rig should stop smoothly, without pulling or jerking, and the brakes should be fairly effective. It should be possible to lock the wheels of a trailer with the brake controller set to "max."

Capacities

- What are the GVWR (gross vehicle weight rating), GAWR (gross axle weight rating), and dry weight of the rig? If possible, weigh the rig empty, as most commonly added accessories (air conditioners, awnings, etc.) are not allowed for in the manufacturer's dry weight. Pay close attention to the numbers. The difference between GVWR and the actual dry weight is your payload capacity.
- Check the weight ratings of the tires to be sure that they are rated to carry the weight of the rig when it is loaded to GVWR.
- Get specific info on the capacities of the water and holding tanks and propane tanks. If you plan to travel with fresh water on board, figure approximately 8 lb. per gallon and deduct that from your payload capacity. You also have to do this with propane at approximately 4.5 lb. per gallon. All this stuff adds to the vehicle's weight and must be taken into consideration.
- Is there enough load capacity left over for your intended use? Better plan on somewhere between one and two tons of additional stuff if you are going to live in your rig full-time. I know that sounds like an awful lot, but you would be surprised how much stuff weighs!

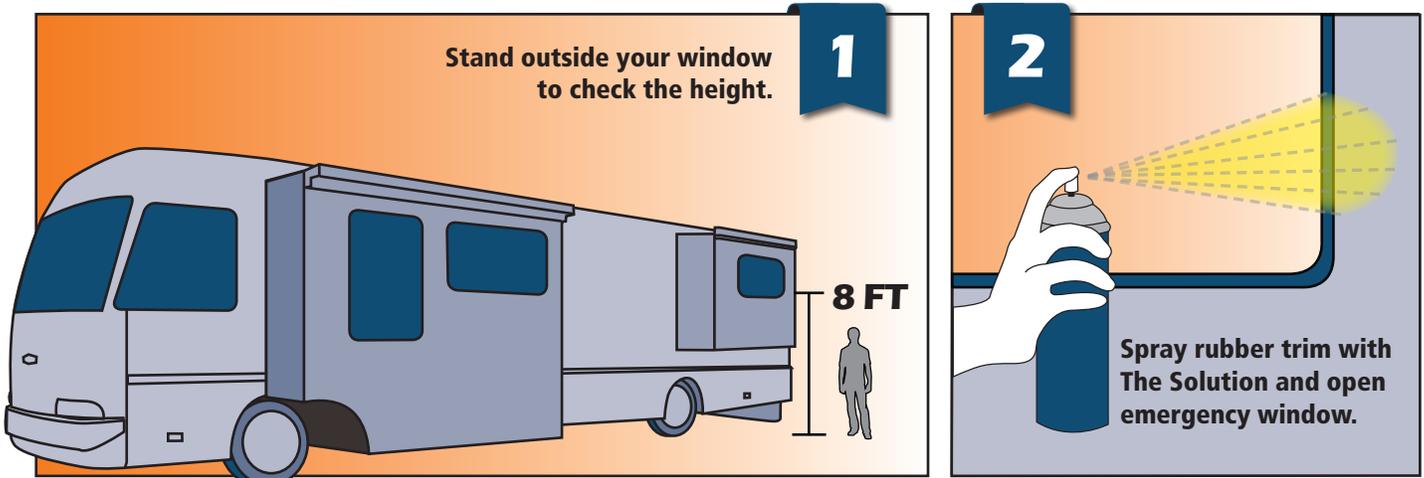
ESCAPING AN RV Fire



www.escapees.com/url/015
Visit and view a video showing you how to get out of your coach using the emergency window.



By "Mac the Fire Guy" McCoy #48271 CM#310 • www.macthefireguy.com



Article originally published in the November/December 2012 issue of *Escapees* magazine • www.escapees.com/magazine • 888-757-2582

Recently, an RV fire took the lives of John and Sue Thomas, long-time American Coach owners. The fire started from a front right tire blowout, and they were forced to the rear of their coach. We will never know why they couldn't escape the fire, but maybe this would be a good time to practice your egress in case of an emergency.

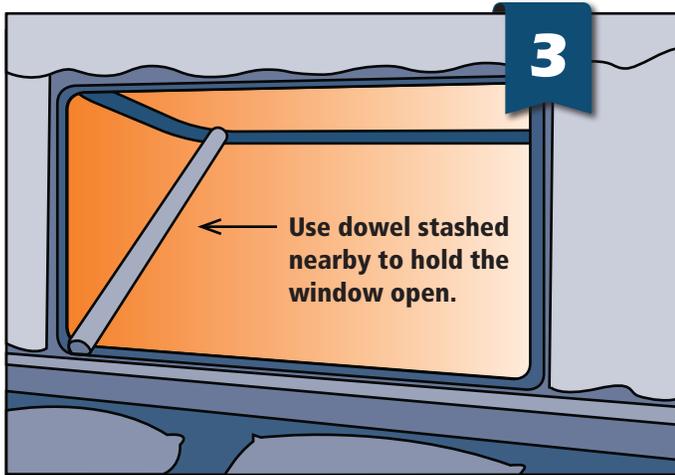
As many of you know, I am a fire safety instructor. After a regional rally in August, Jane and Jerry Lihou #106840 and I made a video showing how to get out of your coach, using the emergency window. You can view this video at www.escapees.com/url/015.

It is important that everyone who stays with you in your coach, including your grandchildren, know how to get out in case of a fire.

The first thing you need to do is stand outside your window to check the height. How far can you expect to drop? For the purpose of practicing, you might push the RV park's picnic table under the window.

Next, open your emergency window. This was difficult for Jane and Jerry as they had never opened the fire escape window, and it was stuck shut. After much pushing and prodding, it finally came open. They sprayed the rubber trim with The Solution, a simple dry wash containing polymer wax, detergent and UV protectant. You can also use 303 Lubricant. This will make it open easily, and you will want to do this a couple times every year.

The emergency window in their American Coach is large and heavy. You will want to have a dowel stashed nearby



to hold the window open. It would be quite difficult to slide through the window space with the weight of a heavy window hanging on top of you.

The window sills are metal, so throw a blanket over the edge, corner to corner, and use it for padding on the way out. The stronger person can hold one end of the blanket, letting the other use it to slide down. This blanket will also come in handy to cover up in inclement weather or if you are under-dressed.

Getting out through the window can be difficult for some of us because we tend to lose upper body strength as we

age. As Jane said, “Once my butt was past the sill, the rest of my body just went with it.” She looked at the bruises on her arms as the cost of knowing they will be able to get out when the time comes.

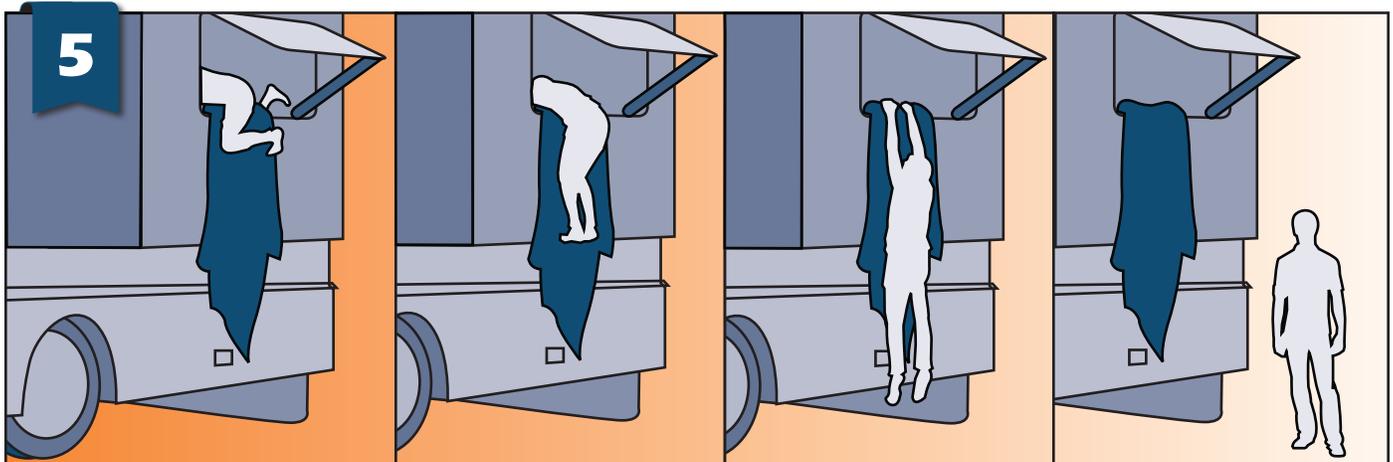
It might be a good idea, if you are parked along the highway, to throw a flare out the window and a few feet away from the coach so cars and trucks will drive around you and you won’t get run over while escaping. These flares are small and won’t take up much room next to the bed.

How much preparation you can do will depend on your emergency situation. You may not have time to throw out a flare or even a blanket, but having a solid fire escape plan may help you replace panic with logical, life-saving actions if a fire occurs. 🚒

“How much preparation you can do will depend on your emergency situation...but having a solid fire escape plan may help you replace panic with logical, life-saving actions if a fire occurs.”

Mac McCoy served 33 years in the fire service. He holds a BS degree in fire science and a master’s degree in fire administration. Mac has served as a firefighter, paramedic, captain, assistant chief of training, deputy sheriff and for 12 years as the fire training coordinator of Oregon’s Fire Marshall’s Office and Public Safety Academy. During his tenure with Oregon Fire Marshall’s Office, Mac helped pioneer the state’s HAZMAT program. He has taught civilians, military, firefighters and law enforcement fire fighting skills and techniques in the United States and abroad.

Exiting through the RV window.





SS20

16oz. aerosol hand held system A foam 16oz. hand held fire suppression system, our **SS20** is perfect to keep in your glove box, on the counter in your galley, next to the seat or basically anywhere you will be that you may need something to quickly knock down a small fire. Charged with nitrogen, this distilled water based non toxic, non corrosive organic suppressant is the same fire fighting chemical used in our larger systems but in a convenient, small hand held format. At its modest price, you can have several of these spread out where you can get to one. **\$30** each you should never be without one of these by your side.



<http://www.firefightmarine.com/ffproducts/>

FireAde Foam Fire Extinguisher



Available from Amazon

When Seconds Count...



THE FIREMAN

Can Knock Out
4 Kinds of Fire
in 22 Seconds
or Less!

When FIRE strikes, any attempt to put the fire out has to be quick, easy & correct! When you need **THE FIREMAN**...

1. Pull off red tab on top
2. Squeeze the trigger
3. Direct the spray back and forth at the base of the flame.

In an emergency, Cover your eyes and spray the contents on your unprotected areas to reduce the risk of fire burns.

**Power Packed to Stop Fire Fast...
Two Ways!**

Environmentally safe freon rapidly absorbs fire's heat (No Heat = No Fire) while non-toxic, non-conducting foam seals off the oxygen (No Oxygen = No Fire) to retard re-ignition.



What's in Your Fire Extinguisher?

20,000 RVs a Year Die by Fire!

YOU are the most important Fire Safety Factor in your RV. A little knowledge, an ounce of prevention coupled with a cool head and right reactions can save lives, rigs, contents and memories.

Fire Class Caution: There are 5 kinds of fire, A, Combustibles (wood, plastic, fiberglass), B. Fuels (gas, oil, alcohol), C. Electric (shorts), D. Metals (lithium, magnesium), K. Kitchen (grease, frying oil). Most extinguishers are limited as to the fires they can safely handle. Water should not be used on Class B, C or K fires. Class D fires need different agents for different metals.

On The Road: Heat, Fuel and Oxygen combine to run an engine... or start a fire. Check for signs of leaking fuel or fluids, excess grime or debris on the engine or turbo. Something as simple as an unreleased parking brake, a dry wheel bearing or under inflated tires can quickly put your whole rig in danger. Keeping electrical and fluid connections tight, batteries secured & corrosion free, and turning off propane tanks while driving are RV words to the wise.

Absorption Refrigerators: Formerly a major source of RV fires. The increase in residential refrigerators in RVs along with safer manufacturing techniques for gas/electric units have reduced risks in newer RVs. U.S. Patent Pending systems like Proteng provide self-contained fire detection and suppression 24/7 without human or electromechanical intervention.

"Standard" Handheld Fire Extinguishers: The NFPA regulations only require RV fire extinguishers to be rated for Class B and Class C fires with sufficient capacity to put cover 10 sq. ft. in a motorized RV and only 5 sq. ft. in a towable. Most new RVs come with such minimal extinguishers filled with a toxic corrosive powder that is often exhausted in 10-15 seconds! They should be stored horizontally and shaken monthly to keep the powder loose and ready.

"Modern" Handheld Fire Suppressors: Aerosol based, non-toxic, environmentally friendly, Class A, B, C & K fire extinguishers are lighter weight, easy-to-use by non-fire fighters, are easy to clean up after discharge, and the better ones cool the fire below flash points and use wetting agents to cover the burning area to deny oxygen and reduce hazards of re-ignition.

"Automatic" Fire Suppression Systems: To protect expensive RVs, some owners add high pressure systems with electro-mechanical sensors and sprinkler heads. It is advisable test such systems frequently as bumps and potholes tend to loosen high pressure connections. The Proteng system of heat sensitive nylon tubes filled with a Dupont non-toxic fire suppressant gas only develops high pressure with fire present and bursts through the tube putting the fire out in milliseconds.



An RVer's Friend
Call or Text 408-603-0600
Contact@AnRVersFriend.com
www.AnRVersFriend.com
Alpswest.com LLC dba An RVer's Friend

PROTENG®

Automatic Fire Protection

On average, there are more than 6,000 RV fires per year.

This revolutionary system automatically activates to put out the fire at the start, at the source.

There is no button to press, no pin to pull, NO human action required.

www.PROTENG.com



PROTENG®

15074 Park of Commerce Blvd.

Jupiter, FL 33478

561-PROTENG (776-8364)

info@protengusa.com

www.PROTENG.com

Do you have 100% confidence in your current fire protection?

**FREE ASSESSMENT & QUOTE
MOBILE INTSALLATION &
DELIVERY**

**ALL YOU HAVE TO DO IS CALL
US – WE WILL DO THE REST!!!**

PROTENG® is the most cost-effective solution in fire suppression that is non-toxic and non-corrosive that does NOT require any action from a person.



BOESHIELD®
T-9

Rust & Corrosion Shield Waterproof Lubricant



BOESHIELD®

T-9

**RUST & CORROSION
PROTECTION**

**WATERPROOF
LUBRICATION**

NET WT 12 OZ (340G)

*Developed by The Boeing Company

DANGER:

EXTREMELY FLAMMABLE.

HARMFUL OR FATAL IF SWALLOWED. CONTENTS UNDER
PRESSURE. ADDITIONAL CAUTIONS ON BACK PANEL



THE T-9® STORY

Boeshield T-9® was developed by The Boeing Co. for long-term protection of aircraft. Their research proved that none of the teflon, silicone, or synthetic sprays held up for long when exposed to a corrosive environment. So they engineered a new product designed to:

- Penetrate deeply into fasteners and fixtures.
- Displace moisture and stop existing corrosion.
- Dry to a clean waxy film.
- Lubricate and protect for months.

It will also loosen rusted parts and will not harm paints, plastics, vinyl or rubber.

APPLICATION

- For heavy film, spray on and allow to dry.
- For lighter film, spray on and *wipe off*.
- To remove coating, use any solvent or emulsifying cleaner.

RV USES

Awning Hardware
Steps and Linkage
Trailer Hitch & Tow Bar
Control Cables
Window Tracks
Shower Doors

Long Term Storage Protection

Electrical Connectors
Wiring & Terminals
Generators
Undercarriage Protection
Slide Outs & Jack Stands
Locks, Latches and Hinges

GUARANTEE

We feel we have the best product of its type on the market. If you can find a better penetrating lubricant and protectant, let us know, and we'll refund your purchase price.

BOESHIELD*
T-9

PMS PRODUCTS INC.
76 Veterans Dr. #110
Holland, MI 49423
800-962-1732

LOCAL 616-355-6615
FAX 616-355-6675
WEBSITE www.boeshield.com
E-MAIL sales@boeshield.com

*Trademark and technology licensed by THE BOEING CO.

Driving Your RV Safely

Most important note – Do everything in slow motion

Safe driving principles

- Get the big picture – look and see at least a mile in front of you.
- Keep your eyes moving especially in heavy traffic
- Anticipate what others may do and be prepared. Don't "Drive From Behind" – do what insures YOUR SAFETY and don't let other's horns, gestures or "road rage" of others affect your safe driving.
- **Separation** – NEVER tailgate, and try to maintain a gap all around your RV.

Lane Control – Centering up in the driving lane.

Dimensional Issues – posted on your dash readily visible as you drive.

- Height exactly – from your RV's advertising brochure if you are uncertain.
- Weight in tons – most ideally gross weight, but more ideally by axle and corners of the RV.
- State Weigh Station Rules - State rules at https://drivinglaws.aaa.com/tag/weigh-stations/?fbclid=IwAR0eW70JoCWbjnxTItJ5EHp5aN_gnJDkKxANQCsubu05-F05rLwN3V9z7oY

Mirrors and cameras

- Regular mirror – seeing traffic behind
- Convex
 - To aid in making corners
 - Identifying where you are in the driving lane

Taking corners – always go deep into the intersection before turning

Yellow warning signs – always pay attention to them

GPS – highly recommended and make sure to buy one that includes height and weight considerations.

Accommodation - the expected help from other drivers in tight situations. If you don't have or can't get others to give you room, you STOP and WAIT until there is accommodation for your needs.

Braking

- Deceleration devices
 - Jake brake
 - Exhaust brake
 - Transmission downshifts

Driving Your RV Safely

- Brakes
 - Air brakes
 - Hydraulic
 - Mechanical
 - Electrical
- Distance largely dependant on your time behind the wheel

Backing – identify the “key wheel” on your RV and where you want it to go.

- ALWAYS have someone on the ground directing you into a spot.
- Backing a towable – On your towing vehicle’s steering wheel ;
 - Turning the trailer - Place hand on the bottom of the steering wheel and move your hand left or clockwise to make the trailer go in a left direction. While holding on the bottom of the steering wheel, you can make the trailer go right by moving your hand to the right, turning the steering wheel counter clockwise.
 - Getting you towing vehicle to follow you into a parking space. Reach to the top of the steering wheel, and turn the wheel counter clockwise or left to have the towing vehicle follow you into a spot on the left. Using the opposite direction of the steering wheel will cause the a right turn of the towing vehicle.

Double-check everything before driving an RV

George W. Mayleben
Director

MOTOR COACH BRAKE CHECK- OUT PROCEDURE FOR AIR BRAKE SYSTEMS

AIR GOVERNOR TEST

Start engine and build air until compressor cuts out. Depress service (foot) brake until the air compressor cuts in (should be about 85 psi). Let air build until it cuts out (should not exceed 130 psi). Wait for compressor to cut in between brake applications.

STATIC BRAKE TEST

Start in a level location, or block a wheel to keep from rolling. Place transmission in neutral. Turn engine off and release parking brake. Keep your foot off of service brake. Air loss should not exceed 2 psi in one minute.

APPLIED BRAKE TEST

Depress (step on) the service brake and keep it fully depressed for one (1) minute. After the air pressure has stabilized, the air loss should not exceed 3 psi in one (1) minute (tap gauge occasionally).

LOW AIR WARNING DEVICE

Turn ignition on (master switch). **DO NOT START ENGINE.** Observe the air pressure gauge and pump service brake until you can see the warning light come on and/or hear the warning buzzer. The low air warning must come on around 60 psi.

EMERGENCY BRAKE SYSTEM TEST

Turn off ignition and then reduce the air pressure by pumping the brake pedal until emergency (parking) brake handle pops up (should be below 45 psi).

Start engine and try to move coach slowly against the emergency brake with low air pressure. Caution should be used so as not to apply too much pressure against the brakes and drive train.

EMERGENCY BRAKE TEST

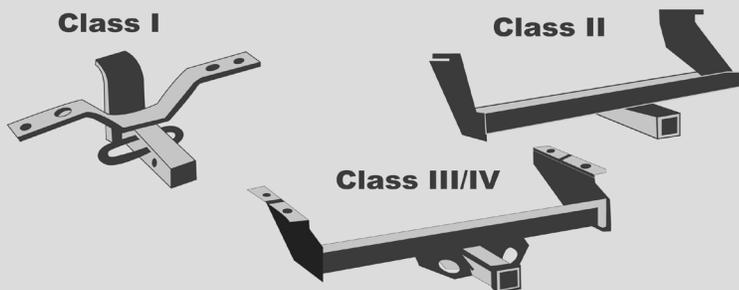
Allow air pressure to build until it cuts out. Put coach in gear. Release parking brake. Move the coach and apply the emergency (parking) brake. Ascertain if the emergency brake works manually.

CHECK SERVICE BRAKES

Set coach in motion slowly and apply the service (foot) brake firmly to see if the steering wheel pulls to the left or right.

Focus on Towable RVs

Hitch Classes Chart



Class	GTWR (Pounds)	Ball	Receiver
I	<2000	1 7/8"	2" x 5/8" bar
II	<3500	1 7/8"	1 1/4" x 1 1/4"
III	<5000	2" - 2 5/16"	2" box
IV	<10,000	2" - 2 5/16"	2" box

Make sure that the ball is the proper size for the hitch receiver. Common sizes are 1-7/8, 2-inch and 2-5/8. The sizes will be stamped on both the ball and the receiver.

Some Conventional Hitch Tips

- For extra safety and security, replace the stock hitch pin with a locking hitch pin. This will prevent any possibility of your hitch or pin coming up missing!
- Make it easier to attach and tension your spring bars; first, lower the coupler onto the ball and secure the coupler latch. Then use the trailer jack to raise the hitch above level.
- Generally speaking, your trailer should have at least 10% of its total weight resting on the hitch. In fact, 12-15% may be better for some rigs. Proper balancing of the load will help

Conventional Trailer Hitches

It's very important to match the tow vehicle to the trailer that you are going to tow. Never exceed vehicle weight ratings or tow ratings. Also, be sure that the hitch is rated for the load.

Most hitches suitable for RV towing will be class III or IV. These hitches are bolted or welded to the tow vehicle frame and have receivers designed to accept standard hitch components.

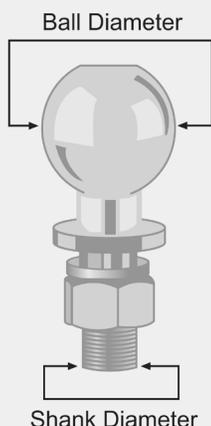
prevent or minimize trailer sway.

5th Wheel Hitch Location



Common Hitch Ball Sizes

Ball Size (Inches)	Shank Diameter	Capacity (Pounds)
1 7/8"	3/4"	2000
	1"	2000
2"	3/4"	3500
	1"	6000
	1 1/4"	6000
	1 3/8"	10,000
2 5/16"	1"	6,000
	1 1/4"	10,000



5th Wheel Hitches

The best mounting position for the hitch is to locate it directly above, or slightly forward of, the rear axle. This mounting position works well with long-bed trucks.

It is also possible to install a 5th-wheel hitch in a short-bed truck, but it must either be placed behind the axle, or a special "sliding hitch" must be used. Never exceed vehicle weight ratings or tow ratings. Also, be sure that the hitch is rated for the load.

Continued on next page ⇒

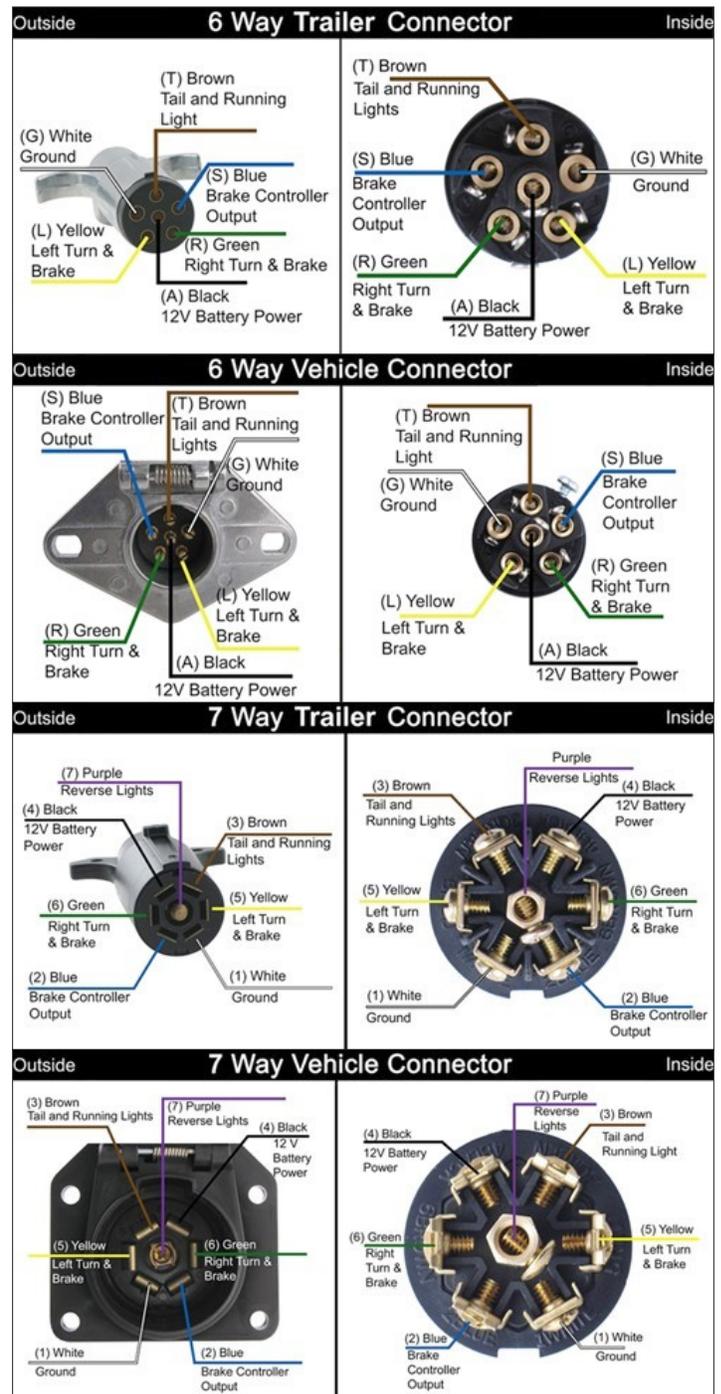
Some 5th-Wheel Hitch Tips

- Remember to lower the tailgate before backing up, to prevent a costly and embarrassing interaction between the hitch pin and the tailgate.
- Always make certain that the hitch is fully locked. If it isn't, the trailer pin can slip out of the hitch and the front of the trailer can fall on the truck, causing major damage to the truck bed.
- When hitched up, it's important to have adequate clearance between the top of the truck bed rails and the trailer. Check to be sure that you have at least 5-6 inches. If the truck is too tall for the trailer and you can't obtain adequate bed-to-trailer clearance, you may need to have the trailer suspension height changed. This is commonly called an "axle flip" and should be done by a qualified trailer-service shop.
- When unhitching, if you find that the release handle is difficult to move, simply move the tow vehicle back slightly (in reverse gear) to take the load off the hitch.

Typical Hitch Ratings

Hitch Class/Rating	Max Trailer Weight	Max Pin Weight
12K	12,000 lbs.	3,000 lbs.
14K	14,000 lbs.	3,500 lbs.
15K	15,000 lbs.	3,750 lbs.
16K	16,000 lbs.	4,000 lbs.
18K	18,000 lbs.	4,500 lbs.
20K	20,000 lbs.	5,000 lbs.
22K	22,000 lbs.	5,500 lbs.
Goose Neck 25K	25,000 lbs.	6,250 lbs.
Goose Neck 30K	30,000 lbs.	6,250 lbs.
Air Ride 32K	32,000 lbs.	Up to 7,000 lbs.

Trailer Lighting Connector Pin-outs



Some Links and Contact Information for Hitch and Tow Bar Manufacturers.

Manufacturer	Web Site	Telephone
Blue Ox	www.blueox.com	888-425-5382
Reese	www.reeseprod.com	800-326-1090
Pullrite	www.pullrite.com	877-PULLRITE
Hidden Hitch	www.hiddenhitch.com	Online only
Draw-Tite	www.draw-tite.com	313-722-7800

Manufacturer	Web Site	Telephone
Roadmaster	www.roadmasterinc.com	800-669-9690
Curt	www.curtmfg.com	877-287-8634
B&W	www.turnoverball.com	800-248-6564
e-Trailer.com	www.etrailer.com	800-298-8924

Focus On Towables

January 20, 2019

Suspension

Basically suspension components haven't changed in 100 years. A flexible flat piece of steel suspended between two points so that pushing in the center due bumps or other jarring action is cushioned by the flexing of the steel strap

Problem with leaf springs

- One end of the leaf has to flex using shackles
- Multiple axles need equalizer to even the load on the axles
- Axles are solid steel beams causing actions on one end of the beam to be acted on by the other end.
- Generally poor construction of shackles with limited lubrication and vulnerable to the elements.

Recommended upgrades

- Replace shackles and other flexing parts with grease zerker equipped components.
- Change suspension system to torsion bar independent suspension
- Add Air Center Point Suspension
- Replace drum brakes with disks.

Brake Controllers.

- Time delay - least expensive, generally not recommended
- Proportional - better but costlier
- Direct Link or comparable products - most elaborate and are feature laden.

Inspections

- Visual done often, at least before trips and if not moved, annually
 - Look for broken springs
 - Broken or severely worn shackles and flexing points for damage
 - Leaks in the bearing seals causing visual splattering on interior and exterior wheel surfaces
 - Physical damage to the shock absorbers.
- Bearings
 - Repack if configured for tear down and manual repack.
 - If each bearing has a zerker use grease gun sparingly only until old grease is apparent coming out by the seals.
 - If non repack able, check for any visible signs of damage. Damage usually shows up as brown patches on the rim due to overheating.

Focus On Towables

January 20, 2019

- Drum brakes
 - Test braking action on gravel going abt 5 mph and then activate the trailer breaks. Look proper equal displacement on the gravel behind each wheel.
 - Adjust brakes periodically. Never tighten the adjustment all the way until they bind.
 - Worn components don't try to fix, replace.

Bumper Towed trailers

- Weight carrying hitch - drop or rise versions so the trailer and pickup are level as viewed from a side angle.
- Weight Distribution hitches - goal to have a visual level appearance when viewed from the side of the pickup and trailer.
- Make sure all components used meet manufacturer's specifications for the actual loads.

5th Wheel Hitches

- Static hitch - variety of manufacturers with various load bearing capacities
- Slider hitch - used for short bed pickups allowing the hitch plate to move backwards during parking. thus avoiding the severe jack-knife turns causing a collision between the cab of the pickup and the body of the trailer.
- Placement of pin box should be directly over, or within an inch or so forward of the rear axle of the pickup when traveling.

Wiring between pickup and trailer

- It is the opinion of the RV Driving School that the wiring should be done by a professional RV technician. However there are inexpensive tools and equipment available to accomplish this task on your own.

Double-check everything before driving an RV

George W. Mayleben

Director

Motorhome Towing a Vehicle

Terms

Four Down a.k.a. Flat Tow
Dolly Rowing
Four Up a.k.a. Trailer Towing

Issues

Combined length
Heavier
Less maneuverable
Vehicle is isolated from towing unit

Towing Laws can be found at:

<http://www.hitchemup.com/statetowinglaws.htm>
Or <http://drivinglaws.aaa.com/tag/trailer-brakes/>

Towing four down – the three major manufacturers are:

1. Blue Ox
2. Roadmaster
3. Demco

Equipment needed:

1. Vehicle that can be towed four down
<http://www.motorhome.com/download-dinghy-guides/>
2. Base plate
3. Draw bar
4. Tow bar
5. Electric cable
6. Safety chains
7. Break away cable

Need a rear camera to watch the vehicle behind you

Tow bar must be as close to level

Do not exceed the draw bar rating

Do not exceed the tow bar rating

Do not exceed the “GCWR”

Towed vehicle must have turn, tail and brake lights

Supplemental braking – generally needed – check the laws for your state

Two types of braking systems

1. Hidden – SMI, Roadmaster, M&G
2. Portable – Roadmaster, RVibrake, plus others

Batteries issues

Vehicles must have the key in the accessory position to allow the steering wheel to turn – This could drain the battery – May need to install a “Towed Battery Charger”

Dolly Towing

Towing vehicle with the front wheels off the ground

Advantage – Can tow almost any vehicle

Disadvantage – Cost, storing, driving onto dolly

Use Rayon Straps

Uses surge brakes

Trailer Towing

Towing your vehicle on or inside a trailer

Advantages - Vehicle not on ground, no wear on vehicle, protection

Disadvantages – Cost of trailer, GCWR, more tires, storage, drive onto or into a trailer

Because the vehicle is isolated from the driver – consider using a TPMS system and a signal booster.

Trailer and 5ver Check Lists

Check List for Breaking Camp

First, hitch truck to rig, then:

External

- Jacks up and locked
- Chocks removed and stowed
- Check lights and brakes
- Pull rig off levelers, then stow
- Check tires
- Awning secured
- Water heater off (gas)
- Chairs secured
- Window awnings secured
- Satellite dish stowed
- Drain/fill hoses stowed, caps on
- Electric disconnected and stowed
- Cable/phone disconnected
- Water pressure regulator stowed
- Campsite policed
- All compartments locked
- Folding steps stowed

Internal

- Furnace off
- Fridge off/lock door
- Water pump off
- Pilot lights off
- TV antenna down
- Water heater off (elec)
- Close all windows & vents
- Secure all loose items for road
- Sliding doors locked open
- All cabinets closed and locked
- Secure shower doors
- Stow shower supplies
- Empty and stow trash cans
- All lights and fans off
- Slides in and locked
- Lock entry door

RV Maintenance Check List

Monthly

- Check/adjust tire pressure
- Check pressure in spare tires
- Check running lights/headlights
- Check engine/trans. fluid levels
- Check coolant/brake fluid levels
- Check battery fluid levels
- Check toolbox/spare oil, etc.

Semi-annual

- Visually inspect frame/suspension
- Check/lubricate jacks and hitch
- Sanitize & flush fresh-water tank
- Drain/flush water heater

Annual

- Inspect brakes and tires
- Check wheel lug nuts
- Inspect belts/hoses
- Clean batteries/connectors
- Test/replace radiator coolant
- Repack wheel bearings
- Check for loose/damaged parts
- Inspect propane tanks/hoses
- Inspect/seal roof and vents
- Lubricate TV antenna mechanism
- New batteries CO, smoke alarms

VBC RV Systems Checklist 131d-0420

Motorhome Check Lists

Check List for Breaking Camp

External

- Jacks up and locked
- Chocks removed and stowed
- Check lights and brakes
- Drive rig off levelers, then stow
- Check tires
- Awning secured
- Water heater off (gas)
- Chairs secured
- Window awnings secured
- Satellite dish stowed
- Drain/fill hoses stowed, caps on
- Electric disconnected and stowed
- Cable/phone disconnected
- Water pressure regulator stowed
- Campsite policed
- All compartments locked
- Folding steps stowed

Internal

- Furnace off
- Fridge off/lock door
- Water pump off
- Pilot lights off
- TV antenna down
- Water heater off (elec)
- Close all windows & vents
- Secure all loose items for road
- Sliding doors locked open
- All cabinets closed and locked
- Secure shower doors
- Stow shower supplies
- Empty and stow trash cans
- All lights and fans off
- Slides in and locked
- Rearview camera on
- Seats locked/seat belts

RV Maintenance Check List

Monthly

- Check/adjust tire pressure
- Check pressure in spare tires
- Check running lights/headlights
- Check engine/trans. fluid levels
- Check coolant/brake fluid levels
- Check battery fluid levels
- Check toolbox/spare oil, etc.

Semi-annual

- Visually inspect frame/suspension
- Check/lubricate jacks and hitch
- Sanitize & flush fresh-water tank
- Drain/flush water heater

Annual

- Inspect brakes and tires
- Check wheel lug nuts
- Inspect belts/hoses
- Clean batteries/connectors
- Test/replace radiator coolant
- Repack wheel bearings
- Check for loose/damaged parts
- Inspect propane tanks/hoses
- Inspect/seal roof and vents
- Lubricate TV antenna mechanism
- New batteries CO, smoke alarms

VBC RV Systems Checklist 131d-0420

Tool List

Folding ladder – GP Logistics SLDD7 Compact Folding Ladder
Square head screw driver
Slotted screw drivers 3 sizes
Phillips head screw drivers 3 sizes
Pliers
Needle Nose Pliers
Wire cutters
Small socket set (Metric and Standard)
Volt meter
Thermal gun
Channel lock pliers 2 sizes
Crescent wrench 2 sizes
Extra fuses (12 volt assorted sizes)
Battery operated drill
Drill bits
GFI circuit tester
Level
Washers for hoses

Claw hammer
Tape measure
Mini hacksaw w/extra blades
Folding tree saw
Duct tape
BoeShield T-9
AeroSpace 303 – RV and Marine
LED flashlight w/extra batteries
Spare light bulbs
Leather gloves
Disposable gloves
Teflon tape
Tool box
Air gauge
Hobby knife
Vise grips
Rags
Combination Wrenches

RV Maintenance List

Monthly

- Clean A/C Vents
- Test Propane Detector
- Test Smoke Detector
- Test CO Detector
- Check battery water
- Check hydraulic fluid
- Check propane level
- Check tire pressure
- Check generator oil level
- Run generator under load
- Check engine oil
- Check transmission oil
- Check radiator level
- Check windshield wiper fluid
- Check belts
- Lube slide out tracks
- Check slide out seals
- Lube steps
- Lube jacks
- Check 7 pin connector
- Check all lights
- Wash RV
- Inspect tow bar and lube
- Check base plate on vehicle

Every 4 months

- Change water filter
- Check escape hatch & lube seals
- Change refrigerator water filter
- Lube all gaskets
- Check all seals on roof
- Drain water heater
- Check A/C shroud and condenser fins

Every 6 months

- Change all batteries in all detectors
- Empty vacuum
- Replace wiper blades
- Lube key locks – Dry lube
- Wash roof

So You Want to Full-Time

There will be a range of emotions.

Excitement to fear!

Don't worry you will second guess yourself – everyone does to some point.

Make a plan and a timeline.

You can full-time RV and keep your house.

Rent your house out or sell.

People will think you are crazy or they wish they could do that.

Kids and grandkids will worry about you – or they should.

Start new traditions!

What to do with all your stuff? Estate sale, garage sale, give away.

Major decisions:

- Domicile
- Vehicle insurance
- Health insurance
- Mail service
- Banking
- Phone / Internet
- Voting
- Roadside assistance

Paperwork to carry in a small safe:

- Vehicle titles
- Passports / Birth Certificates
- Wills
- Military discharge papers
- Other important papers

Remember your emotions are real.

You can make money on the road.

- Work Camping
- eBay
- Disney
- Amazon

But a bad day at RVing is better than a good day at work!

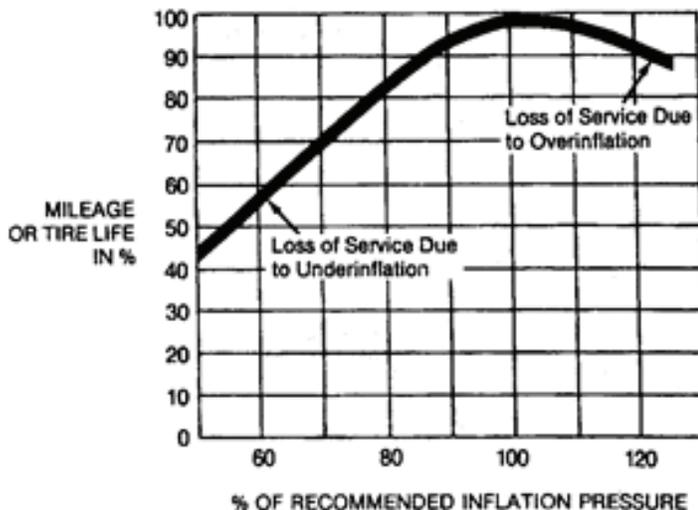
RV Tire Safety

Tire Safety

The most common RV problem is associated with tires. Tires are the most vulnerable component on the RV relative to “overweight/overloaded” issues. Unfortunately, tires are the most neglected maintenance item on the RV. The five primary issues adversely affect the tires of an RV are; 1) most demanding application, 2) routinely overloaded, 3) intermittent usage, 4) poor maintenance practices, and 5) we are non-professional drivers.

Loads are carried by the air pressure in the tires. Overloaded and under inflation is the same to a tire. Under inflated tires have reduced load carrying capacity.

EFFECTS OF INFLATION PRESSURE ON TIRE LIFE



Tire damage is not self-healing; therefore, tire damage is cumulative. Tires deteriorate or are damaged until

they can no longer withstand the load demanded of them. The distinct lack of “cause and effect” creates a false sense of security. Tire failure will occur at the most inopportune time!

Today’s RV tires tell RVers everything they need to know. A common tire is the LT235/85R16E.

LT – Light Truck

235 – “Nominal Section Width” in mm – widest point on side walls

/ - Character separator

85 – Aspect Ratio of the sidewall height as a % of the total width of the tire. 85% of its width – the lower the ratio, the smaller the side wall height, better cornering, rougher ride.

R – Radial

16 – Diameter in inches

E – Load Range E

Tires do not last forever. They are made primarily of rubber and rubber ages and deteriorates over time. This is why you need to know the DOT age code for all your tires.

Continued on next page ⇒

RV Tire Safety



This code is only required on one side of the tire and will be the last digits after the DOT code. In this example, you can see that the last digits are 1404. This means that the tire was made during the 14th week of 2004. RV tires will age out before they wear out. Tires should be replaced in 5 to 7 years after the DOT date code. Use caution with tire chemicals. Do not use petroleum, silicone or alcohol products on the tires. If the RV will be parked on asphalt or concrete for an extended amount of time, use a protective pad.

Before starting your trip for the day, you need to check your tire pressure. It is important to that your vehicle's recommended tire pressure is its cold tire inflation pressure. It should be checked before you drive more than a few miles or the sun heats up the tire. Instead of checking tires every day before traveling, consider purchasing a tire pressure monitoring system. It will notify you of a tire with low air pressure or a tire failure.

RVers need to have a good, accurate tire gauge. This will ensure that you are not over or under inflating your tires. Another piece of equipment you should consider to purchase is the infrared thermal gun. This can be used to check for hot tires or wheel bearings.

There is only one proper inflation pressure for your tires. To establish this, you will need to know the weight that the tire is carrying. All tire manufacturers offer help resources. To access these visit www.escapees.com/smartweigh and click on the links to the respective tire manufacturers.

Continued on next page ⇒



Tire Pressure Monitoring Systems



TechnoRV
www.technorv.com

TST TPMS

- Reports temperature and psi on the same screen
- Auto-scrolls through tire positions
- Monitors up to 38 tire positions on each screen
- Monitors up to 4 trailers totaling 110 tire positions
- Only color monitor on the market
- User-replaceable batteries in sensors
- Sensors auto-code to the color monitor
- GE circuitry and double insulated sensors
- 2 sensor types to choose from: cap or flow-thru
- Sensors have anti-theft features
- Pressure activated - no need to be in motion to get new readings
- Comes with a signal repeater
- 3-year comprehensive warranty
- Learning Series (when purchased through TechnoRV)

Sensor Specs

Operating Temperatures: -4 to 176 degrees
 Pressure Range: 0 - 218 PSI
 Battery Life: 1 - 1.5 years
 Cap Sensor Measurements: 0.9" H x 1.06" Diameter
 Flow Thru Sensor Measurements: 2.2" L x 1.0" W x 0.9" H
 Cap Sensor Weight: 0.54 oz. / 15.4 grams
 Flow Thru Sensor Weight: 0.77 oz. / 22 grams

You can get more TPMS information from TechnoRV through our website or from your phone. Open up your texting app, enter "TIRE" into the message bar and send the message to 251-220-3454. It's as easy as that!

Save \$25 when you spend \$200 or more at TechnoRV.com when you use the code BOOTCAMP



Eric and Tami are full-time RVers and the owners of TechnoRV. They not only use TST 507 cap and flow thru sensors on their motorhome and Jeep, but they also work closely with TST to ensure the products not only meet but exceed the demands of being on the road full time.



Contact Us:
866-324-7915
info@technorv.com

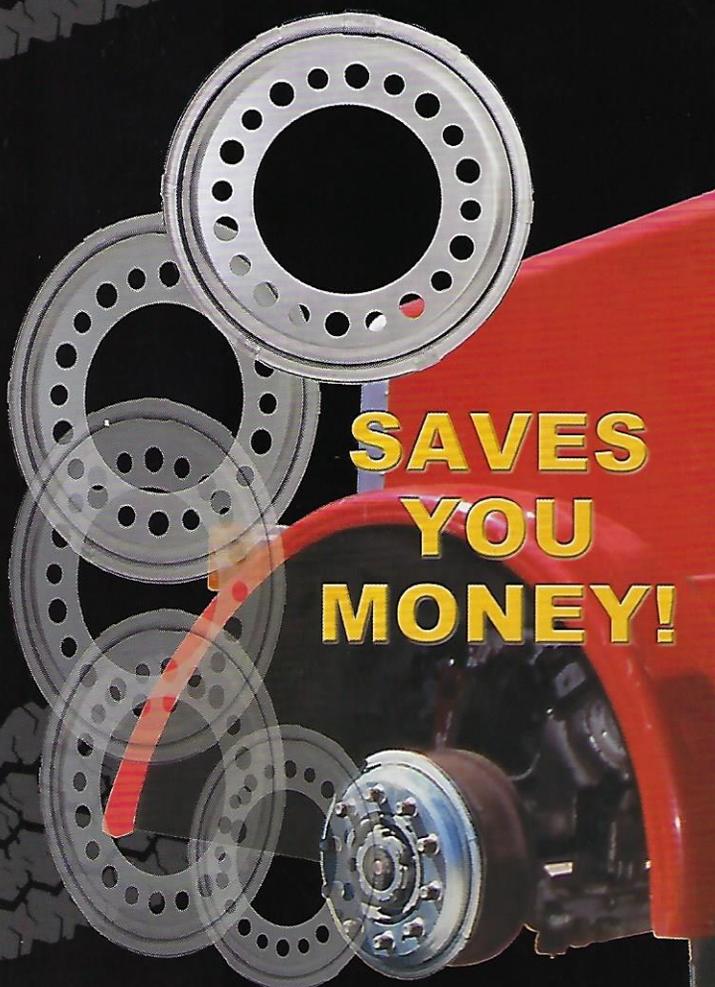




CENTRAMATIC

BALANCERS

**The World Leader
In Balancing
Technology!**



**SAVES
YOU
MONEY!**

1-800-523-8473

Savings examples

	ACTUAL TIRE COST	NUMBER OF TIRES	TOTAL COST	TYPICAL INCREASE	SAVINGS
Steer Axle	\$ 350 X	2 =	700 x	35% =	\$ 245
Complete Tractor	\$ 350 X	10 =	3,500 x	35% =	\$ 1,225
Trailer	\$ 250 X	8 =	2,000 x	35% =	\$ 700

Centramatic has over
2000 dealers nationwide.
Call for the dealer
nearest you!

Video demonstration
at www.centramatic.com

Corporate Headquarters
5345 South I-35W
Alvarado, Texas 76009

1-800-523-8473

817-783-6396

Fax: 817-783-3267



CENTRAMATIC

www.centramatic.com

info@centramatic.com

Camp Review Websites

RVParkReviews.com

FreeCampsites.net

Campendium.com

OvernightRVParking.com

Shorepower Guard

RVAutomations.com

GPS Trackers/Beacons

TheTileApp.com

Whistle.com

Info.DeLorme.com

FindMeSpot.com

Alarm Systems

SimpliSafe.com

Canary.is

Cell-WiFi-Internet Advice

RVMobileInternet.com

FB Group: Internet for RVers

Apps

AllStays

RV Park Reviews

Overnight RV Parking

RV Parky

Ultimate Public Campgrounds

USFS & BLM Campgrounds

Find My Friends

Familonet

Glympse

Where Am I At?

CCW



*Preserve the privilege of overnight parking.
Follow the code and encourage others to follow it, too!*



Overnight Parking Etiquette

RVERS GOOD NEIGHBOR POLICY

Dear Fellow RVers,

The Good Neighbor Policy was created in the early 90s by Escapees RV Club. Since then, it has become the industry standard code of conduct for overnight parking. We hope that the Good Neighbor Policy serves as a reminder that RVers must be respectful of the communities they visit.

Some of the most respected RV consumer clubs have joined Escapees to support your privilege to park on private businesses' property overnight under the following code of conduct:

Industry-sanctioned Code of Conduct (RVers Good Neighbor Policy)

1. Stay one night only!
2. Obtain permission from a qualified individual.
3. Obey posted regulations.
4. No awnings, chairs or barbecue grills.
5. Do not use hydraulic jacks on soft surfaces (including asphalt).
6. Always leave an area cleaner than you found it.
7. Purchase gas, food or supplies as a form of thank you, when feasible.
8. Be safe! Always be aware of your surroundings and leave if you feel unsafe.

If your plans include touring the area, staying for more than one night, or necessitate conduct not within the code, please relocate to a local campground. It's the right thing to do!

Most of the complaints lodged regarding RV parking on business parking lots have to do with aesthetics and perceived abuse of the privilege. There are a variety of competing interests that were balanced to arrive at this industry-sanctioned code of conduct. As you can see, the code of conduct is nothing more than an RVers "Good Neighbor" policy.

Not following the code has serious consequences and is detrimental to the rights of all RVers. Already, some municipalities have passed ordinances to prohibit parking on private business property overnight.

Please do not take offense to this letter; it is only provided as a reminder that RVers must be perceived as good neighbors or there will be more pressure to institute state, county and local ordinances to prohibit parking on private business property.

We wish you safe and happy travels,

ESCAPEES RV Club®



RVERS BOONDOCKING POLICY

Dear Fellow RVers,

As thousands of new RV enthusiasts join us on the road, it is more important than ever to be good stewards of our environment. Protecting and preserving our public lands should be our honor and must be our pledge. Whether we choose a national park, national forest, Bureau of Land Management (BLM) site, or other public lands, these practices always apply.

Remember, camping on public lands is a privilege, not a right. Abuse can create tighter regulations, raise maintenance fees, and have an overall negative impact on public lands and our ability to use them in the spirit in which they were intended. With the help and support of our advocates, the Escapees RV Club has created a condensed list of “Best RVing Practices” to ensure that our public lands will remain beautiful treasures that we can retreat to as we travel.

Public Lands Parking Etiquette RVers Boondocking Policy

- 1. Respect the Rules of the Land.** Observe posted signs, obtain permits when necessary, follow usage limits, and camp only in designated areas and pre-established campsites, which vary depending on agency and state regulations. Bear in mind, some of these lands fall under federal laws, not state laws.
- 2. Treasure the Terrain.** Camp on durable surfaces. Avoid damaging surfaces or modifying terrain by digging, moving large rocks, cutting plants, etc. Stick to predesignated paths without widening them or creating new ones. Remember, there are native plants, organisms, and ecosystems that interplay here and can be easily damaged.
- 3. Respect Your Neighbors.** Avoid overcrowding an area or blocking your neighbors' view. Orient your RV so that your generator isn't directed at them and respect quiet hours. Rules vary but are generally between 10pm-8am. Maintain a tidy campsite. Keep noise to a minimum so everyone has a peaceful experience. Drive at a campground speed and be aware of kids, wildlife, pets, and your dust trails.
- 4. Respect Nature and Wildlife.** Keep pets under control and clean up after them, even in the wild. Don't entice, feed, or approach wildlife. Limit and eliminate use of pesticides. Check for burn bans; be mindful of firewood rules and make sure your fire is fully extinguished. (Remember, exhaust pipes on vehicles and generators can trigger fires.) Consider a propane fire pit that you can carry with you and snub out easily.
- 5. Pack it In, Pack it Out.** Keep your holding tanks closed! Secure fresh water from approved sources and dispose of trash respectfully in public trash receptacles. Lower your impact with bio-degradable products.

Always leave the area cleaner than you found it!

Take only memories, leave only footprints.

As RVers, we should be good stewards of the land to protect this privilege for future generations. Not following these practices can have serious consequences and could be detrimental to all RVers. Public lands can be closed to camping because of overcrowding, damage to the land, and guests overstaying the time limits. Following the best practices will help ensure that we all remain good neighbors to each other and the land. If you feel that someone is unaware of these practices, share these resources with them in a positive way.

We wish you safe and happy travels,

ESCAPEES *RV* Club[®]

