



The RVers' Corner

For the Recreational Vehicle Owner

Buying a Pre-Loved RV

Congratulations on your recent decision to purchase a pre-loved recreational vehicle. We wish you many years of enjoyment and we strive to provide you with expert assistance and guidance in the selection process.

This booklet is designed with the novice RV buyer in mind, however, even the well seasoned camper will find many useful tips and suggestions.

The purchase of a Recreational Vehicle is a major financial and lifestyle decision. Careful inspection and evaluation of the prospective unit will pay off immensely, in the long run. Regardless of the type of RV you eventually chose, this booklet will prove to be invaluable to you.
Step by Step ...

Step by step inspection is the only way that you can determine the physical condition and overall road-worthiness of your chosen home away from home.

There are many things to inspect on a used RV. We will proceed in a step by step manner to be sure to cover all the systems and structural components involved. A checklist is an excellent aid and one is enclosed within.
Ready, Set, Go ...

When selling a used RV, the vendor should have it **ready to show**. That means a battery installed for electrical power, water in the storage tank for testing and propane in the tanks to fire up the appliances. Also, ask to see any maintenance records or receipts that the vendor may have regarding the unit.

If these elements are not available it will be impossible to complete your inspection and you should assume that some thing is wrong with one or more of the systems that you are unable to test. Unless you know and trust the seller completely, the old adage "Let the buyer beware" applies and plumbing, electrical and appliance repairs can be expensive.

Been there, done that ...

Don't fall for the "well it was working just fine the last time we used it" line. That may have been literally years ago, and things deteriorate at an astonishing rate. Seals dry up and get hard, rodents might have infiltrated and chewed up the wiring, insects seem to be attracted to propane and may build nests in the appliance burners or other spaces, bearings in the various motors may seize up - all this adds up to many dollars of repairs. It is up to you to inspect all this and more, because you are the one who will be stuck with the bill after your money is paid.

This book is presented to you by the RVers Corner - an RV owner's do-it-yourself paradise!

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- * RV Maintenance Articles
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- * ... and much, much more!

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RV Construction 101 - The Basics

General Overview:

In order to see the whole picture, it is necessary to comprehend just how the majority of RV's are constructed. The metal frame, including the running gear, the wheels and tires, suspension and springs etc. from the hitch to the back bumper, is rolled into the factory. This frame is made at an entirely different plant or is purchased from a separate manufacturer.

Upon this platform, the floor is laid, with the lino and carpet installed, and the interior appliances, cabinets, and interior partitions are fastened directly to the floor through the finished flooring material. Next the walls are put on as complete units or ready to have the siding installed, depending on the construction method. Finally, the roof is laid onto the top of the walls and is fastened to them and to the top structures of interior cabinets.

What all this means is: to completely replace any of the major parts, the subsequent and overlying parts must first be removed.

Most recreational vehicles are constructed by two main construction methods - the bonded wall system or the framed "stick and staple" system. There are advantages and disadvantages to either. You need to decide which of these construction methods are the best for you or if it just doesn't matter one way or another.

To get proficient at recognizing the different constructions at a glance, go out to your local RV sales lot and view the units on hand. Ask the salesperson for information or take in a dozen do-nuts at coffee break time, and pick the technicians brains. Make mental notes of all pertinent information that you gather and write these down in a notebook as soon as you can. Everything you learn now will benefit you when you go out to purchase that pre owned "castle of the road".

RV Construction 101 - The Basics

Framed "stick and staple" construction

This construction is similar to the way houses are built in that there is a frame of wood or metal that provides the structural form. Paneling is stapled and/or glued to the inside and aluminum siding is stapled to the exterior framework. Insulation is contained within the cavities of the framing members and is normally fiberglass wool. The various window and door openings, and all the appliance access openings are framed with wood members as part of the structure.

Pros:

- * The frame will flex somewhat on rough roads to relieve stresses. Interior fixtures can be attached easily to the wood framework.
- * Relatively easy to repair exterior damage and to replace exterior metal siding panels.

Cons:

- * More wood members susceptible to dry rot problems.
- * Air gaps may be caused by the settling of the fiberglass wool insulation.

Things to look for:

Look down the length of the trailer from the side. Any obvious bulge in the siding could indicate that the staples holding the siding have pulled loose. This is generally an indication that the staples have rusted away in that particular area and you should look for other telltale signs of deterioration in this vicinity. As with the roof, check for rusty screw heads or molding that has become loose, and if you see a lot of additional chalking in one or more areas, suspect a leak and examine closely.

Open the outside storage compartment doors and examine the condition of the wood framing in this area. Are the compartment doors, themselves, in good repair?

Check around the window frames, door frames and other openings in the outer walls and pay close attention to the areas around the water heater and water fill inlets, as these areas are the most susceptible to water leak damage.

Bonded Wall Construction

The bonded system is a sandwich of the interior paneling, the rigid insulation (usually Styrofoam) and the outer skin of aluminum or fiberglass sheeting. These components are bonded together with adhesive and pressure is applied to form a strong and durable structure. The entire wall is formed as a solid sheet, run through rollers (or otherwise pressed together) and then the various window and door openings are cut out where needed. Wood or metal framing is included where required, for example, where the awning will be attached or where the entry door is located.

Bonded walls can be identified by the flatness of the surface, typically very straight from top to bottom. The exterior siding may be completely flat or have a profile formed into the surface and the wall will have a very firm "feel" to it.

Pros:

- * Very strong and rigid
- * Smooth exterior appearance
- * Small dents, scrapes or holes can be easily repaired if the exterior is fiberglass
- * Consistent insulation characteristics

Cons:

- * Possible delamination problems
- * Lack of framing to attach interior things to
- * Has less "give" or flexibility on rough roads
- * Difficult to repair major damaged areas

Things to look for:**Delamination**

Since the bonded wall method of construction relies on the strength of the adhesive to hold everything together, any failure of the glue presents a serious problem. Delamination of the exterior layer will show as a bulge in the siding and will be loose to the touch. Check for stress cracks in the siding, especially over doorways or window openings. Check where the walls attach to the floor for possible separation at the joint.

Dry rot damage

Water stains on the interior walls or ceiling indicate a leak and possible dry rot problem and any apparent delamination can be a very expensive problem to fix.

A leak in the ceiling usually shows up on the inside of the coach some time after the initial leak. Often, long after the leak has occurred! In that case, there will likely be some dry rot damage to the wooden roof structural members. A fungus that attacks the wood, weakening it, and eventually turning it to powder causes dry rot. The fungus thrives in damp, warm areas and the RV roof is an ideal place for it to start. It will work outward in all directions, from the source of the leak, and may extend for several feet or more. Dry rot shows up as dark or blackened wood and the wood may be soft and spongy or starting to powder. Often, the ceiling panel is the last part to show a stain from a leak and the dry rot may be extensive by that time.

Some indications of hidden dry rot are obvious – stained and sagging ceiling panels, loose or wavy panel coverings – while other indications take a little investigation. Screw heads, nails or staples that are rusty on the exposed surface are mostly completely corroded from the inside out. Remove the light covers; pull out one or two screws that hold it in place to check the length of the screw for rust. Remove the bezel that covers the inside opening of roof vents for a similar inspection and check the visible wood for signs of dry rot.

If the affected area is small and easily accessible, it may be possible to repair it from the inside of the coach, although it may be impossible to find an exact match for the paneling. If the area is in the bathroom, for example, a panel with a similar texture and color could be used with a border edge to separate it from the rest of the ceiling. If the area were in the living room section, a panel replacement would be very obvious.

From the Top Down - Roof, Roof!

The first step in any roof inspection is to get out the step ladder and take a good look at the roof condition. If the roof is metal, especially if it is the seamed type, (has crosswise seams every 48" or so), then lay a plywood strip or some wide boards (lengthwise) to walk on. This way the boards span the roof rafters and distribute your weight evenly over several supports. A rubber covered roof has an underlying layer of material, usually a 3/16th to 1/2 inch plywood or particle board sheeting that evenly supports your weight.

The membrane on a rubber or metal roof is made of a very tough and durable material but it is fairly thin and can be punctured by a sharp object. Yes, you can carefully walk on the surface, however first check your shoes for embedded stones and such, that could do damage to the roof covering.

Natural weathering will occur on a roof of any material and various contaminants will discolor all or portions of the surface. Aluminum will "age" to a slate colored state and a rubber roof may present a chalky residue. In any case be prepared with casual work clothing and footwear to conduct a proper inspection. You WILL get dirty.

First check out the general condition of the roofing material. It may be metal, fiberglass or rubber and it should be fairly smooth and even without unnatural bulges, humps, dips or other obvious deformities. Any scrapes or abrasions should be closely scrutinized.

One of the most devaluating things in a used RV is the leaky roof syndrome. A leaking roof will cause major damage in a short period of time and most of it will be invisible to an un-trained and un-informed person.

Water penetration between the roof covering and the inner ceiling causes the wood framing members to develop a condition called "dry-rot". This can happen without any outward visible sign. Dry-rot will reduce the wood to a powdery substance that crumbles easily, provides very little or no support and will release the wood's grip on screws, staples and other fasteners. Water that has entered under the roof membrane is collected by the insulation, heated by the sun and provides an ideal growing medium for the fungus that causes dry-rot to develop. Surprisingly little water is required to start this process.

Things to look for:

Interior:

Visible stains and water marks on the inside ceiling, around the roof vent openings or on the edges of the walls, is a sure indication of a serious water leak. Any rust showing on the nails or screws or staples that hold up the ceiling is another bad sign. Check these areas very carefully. Look inside the overhead cabinets for any hidden problems. Pop off some light covers and check for rust on the screws that attach the fixture to the ceiling. Any warped or de-laminated panels are a good giveaway of a leakage problem, past or present. Mildew stains show up as black spots concentrated in a certain area and even if the roof seal problems have been repaired, mildew indicates that water has entered the area and dry-rot problems will eventually manifest themselves.

Also look for signs that the ceiling panels have been painted over or recovered with a second layer of paneling from the inside. Often these are indications of a previous problem that has been disguised as renovation.

Exterior:

Carefully check the condition of the roof coat around all the openings in the roof membrane. The roof coat is the material that is applied to the seams of all the fixtures that protrude through the roof itself, providing a seal to cover the edges and the fastening screws. The roof coating should be fairly smooth in appearance and should adequately cover the joints and screw heads. Small hairline cracks show that the roof coat is due to be redone - large, deep cracks (or freshly covered large, deep cracks) show a serious lack of roof maintenance. "Touched up" spots of a different color and aged appearance or an obvious applications of a silicone type of roof sealant in any area, may be someone's attempt at a temporary leak "fix". If any of the above are the case, a more intense inspection is required.

Most RV's have a molding installed where the roof and the walls meet, sometimes the screws holding this molding on are exposed or more often covered by a vinyl insert strip that can be removed to show the condition of the screw heads. This vinyl insert deteriorates after several years of exposure to the weather and may be very brittle and may shatter or split easily. Care must be taken when removing a portion of it to inspect the screws beneath.

Screw heads that show a slight discoloration may be a normal indication of surface rust but if the rust deposit is heavy or has a grainy appearance, the screw is literally rusting from the inside out. Remove any suspect screws to get a deeper "look" into things. A screw that is rusty for it's entire length or has corroded off shows that water is present or has been present inside the wood framing member and that dry-rot has gotten a foothold. Screws that are missing or loose have probably lost their grip on the wood beneath due to dry-rot damage.

Check the roof vent lids, the plumbing vent stacks and the other plastic components for deterioration from age and the sun. The plastic will become very brittle over time and while not a major chore to replace, their condition could become a future bargaining point. Any opening in the roof is a potential water penetration point, and very careful inspection in these areas is well worth the effort.

Cost of Repairs:

If the problem is minor roof coat deterioration, the fix is an entire roof coat application. Be aware that this might entail scraping off all the old roof coat which is a time consuming and tedious job.

If the problem is of a more serious nature, such as evident dry-rot or stained ceiling panels, then the entire roof will probably need to be removed. A ceiling panel cannot be effectively replaced from the inside, the roof structure rests upon the edges of these panels and is fastened through them to the walls below. This is a major repair and depending on what damage is disclosed, will run to \$100 and up per running foot. In other words, for a roof that is 20 feet long the repair costs could exceed \$2000.00. Therefore, close examination of the roof condition is very much in your best interest.

Renewing the roof coat ...



This photo shows a very neglected roof - the roof coating is cracked and actually has been lifted away from the surface by heat and moisture. This area is very liable to be a source of leaks and needs immediate attention! The old roof coating must be scraped away - some old fashioned elbow grease is needed. A stiff putty knife, similar to a mechanics gasket scraper, is used to scrape away the old material. An electric heat gun will soften the material for easier removal, although this still remains a tedious job.



The roof coat has been re-newed and this vent is again sealed.

The finished roof. Depending on the original state of repair, this job would take between one and six or eight hours. The roof coating should be inspected at least once a year and touched up or re-newed as needed.



What Floor Plan do I need?

The floor plan that you choose will depend greatly on your finances and planned usage of the RV.

Occasional weekend use with only two people would require a far different floor plan than a family of five on a cross-country trip!

The layout of choice is one that varies from person to person. Everyone has differing preferences and that is the reason for the multitude of floor plans available in RVs.

There are four main areas in an RV, the sleeping area, the kitchen, the bathroom, and the living area.

In smaller RV's such as Camper vans and truck campers (slide ins), these areas are combined to make maximum use of the available space. Sofas convert to sleeping accommodations, kitchen sinks are also the wash-up areas and some even have fold-away shower enclosures that make use of the aisle walkway when needed. Obviously these compact units are not the answer for everyone but they make the small space into adequate living quarters for weekend and occasional use by one or two people. This "coziness" has advantages in that the small RV is very maneuverable, fuel efficient and can be used as a second vehicle, in the case of camper vans and small motor homes.

The larger the RV, the most space is available for amenities. Conversely, these larger units cost more to purchase, maintain, and transport. These are trade-offs that must be considered when shopping for an RV.

Front kitchens, rear kitchens, side kitchens ... what works the best?

Well, that depends on circumstances. Does the cook need uninterrupted access, without many little feet running through to the bathroom? A kitchen at one end of the RV is the obvious choice. This floor plan dictates that the bath be located on the side of the RV, which limits the size of the bathroom area. However, this location is more convenient for quick in and out trips to the "loo".

Side kitchens floor plans allow the bath, bedroom or living room to be located at one end of the RV.

The floor plan is a matter of choice. It's configuration depends on the available space, of course, but personal preference and special needs come into play. Consider the use and activity your family will be engaged in. The floor plan that suits two people on an extended cross-country trip may well be most inconvenient for a family of five at the lake for a weekend.

It is advisable to sit in a prospective RV and imagine what life would be like with that floor plan on a rainy day, or a day at the beach, or after a long days travel. Think carefully about what your particular needs are and look for the best layout that will accommodate those needs.

Get to the Bottom of Things - Floors & Under Things

General Overview:

The floor of an RV is the first component to be installed when a new RV is built. That means that every thing else is installed on top of the floor and therefore it is very difficult and costly to replace the structural parts.

Sections of the floor can be cut out in certain areas and new plywood installed , but this will usually mean that the entire flooring material will also have to be replaced. This can only be done in areas that are free of installed cupboards, dinette seats or other fixtures as removing these fixtures is a very involved process. Usually, in the factory, the finished floor is laid on the undercarriage, then the various inside components are installed and fastened to the floor before the walls are added. This obviously indicates that the entire floor will be very difficult to access for repairs.



Things to look for:

The most common problem is the entry area. If the floor is soft in this spot, the entry step will sag and feel "mushy" when stepped on. Other areas of concern are where the water storage tank and pump are located. Water leaks are most likely to be the cause of rot in the floor in these places.

The floor should obviously be flat and level with no dips or sags and no bulges evident. A long straight board can be used to check for unevenness. Lay it edgewise on the floor in as many different directions as you can and check to see how much it will "rock" up and down along its length.

Look under the dinette seats, sofa and cupboards. Check the place where the wall panel meets the floor for water marks, separation or other visible damage. The corners of an RV are the most susceptible to leakage problems. This is where two walls, the roof and the floor meet so there are many joints, moldings and other coverings that must be water tight.

If the floor structure is solid and in good condition, the floor covering material can be replaced by cutting out around the various walls, cabinets and fixtures. However,

major floor damage can be difficult and costly to repair. If the coach you are inspecting is plagued with this problem, keep this fact in mind.

Rollin', Rollin' Rollin' - Running Gear

General Overview:

Frame

The running gear is a general term referring to the suspension system, axles, brakes, bearings, wheels and tires. Each of these components need to be examined to fully determine the road worthiness of the coach. While some mechanical skills are involved, nothing is overly complicated with the inspection. This chapter will cover the steps needed to evaluate all of these components.

There are several suspension systems in use on trailers, with the most common being the leaf spring type. This arrangement can be visualized as the horse and buggy type of suspension. Other systems have been used including a torsion type of suspension where many of the components will not be visible.

Things to look for:

Suspension

Visually inspect the suspension components for looseness, bent or broken parts and other obvious problems. The leaf spring suspension system utilizes nylon bushing in all the joints that will wear out over the miles and should be replaced periodically. Any leakage from the shock absorbers, if so equipped, indicates that they are due for replacement.

Tires

Examine the RV tires closely, looking for cuts or other visible damage on both sides of the sidewall and inspect closely for sun-checking damage. This refers to the small cracks that occur due to constant exposure to the sun and other weathering agents. Check the tread for uneven wear on one side or the other and for other irregularities in the wear pattern that would indicate a possible alignment or wheel balance problem.

Wheel Bearings

You can check for excess wheel bearing play by first jacking the wheel off the ground, then, facing the wheel, grasp it from both sides and check for in and out "wobble". It's normal for the wheel to move slightly, maybe up to 1/8" or so, but more than that is excessive. Because of the intermittent use and long periods of storage, wheel bearings on a trailer should be inspected and re packed with grease on a yearly basis.

You can check the brakes on this wheel for operation by pulling the break away pin on the hitch (you must have a charged battery hooked up). The brakes should apply firmly and you will not be able to rotate the wheel by hand once the brakes engage.

To check the condition of the brake linings and the brake magnets it will be necessary to remove the wheel and tire, the bearing dust cap, cotter pin and nut. the hub and drum assembly will now slide off to expose the brake components. The brake drum surface and the drum magnet surface should be smooth and free from worn in grooves or other irregularities. Inspect the surface for a blue tint that indicates overheating. Check the brake shoes for wear and overheating damage. The shoes should have at least 1/8 in. thickness and heat damage will show up as cracking or flaking of the shoe material.

If the drum and shoes are covered with grease the bearing seals have failed. In this event it will be necessary to have the drums machined to remove the grease contaminated layer. The shoes will also have to be replaced as trying to clean them will not be effective. Figure on about 100 dollars per wheel for parts and labor to repair.

The brake magnet surface should be smooth and not worn on one side more than the other. If the magnets and shoes need to be replaced, it is often more economical to replace the backing plate as a whole. This is all of the brake components that are mounted to the plate including the magnet, the shoes, the springs and retainers, and the actuating mechanism. You simply unbolt the old backing plate and replace it with the new.

Water, Water Everywhere – Plumbing

General Overview:

The RV water system has gone through many changes since the early 70's - from copper tubing water supply lines and air pressurized storage tanks to today's plastic piping and demand type water pumps.

The typical RV fresh water system is a combination of advanced technical accomplishment balanced by the economic principles of profit and loss. The manufacturer desires a functional water supply system at a "cost effective" level, and generally this is the case.

Most of the components are fairly simple and a visual inspection will generally reveal any apparent problems. This chapter details the steps to be taken to ensure that the water system is functional and problem free.

Modern RVs are equipped with pressure demand type automatic pumps, polyethylene fresh water storage tanks, and polybutylene water lines. The various and innumerable joints and connections are of the compression ring type which are very quick and economical to assemble at the factory level when everything is exposed and in the open.

These systems are designed to be operated at a certain maximum water pressure level in the neighborhood of 35 to 45 pounds per square inch. The on-board pump has a built in pressure switch that shuts off the power to the pump when this pressure has been reached. So far, so good, and everything is as it should be.

However, (and there always seems to be a "however"), there is a city water connection to supply water at home or at the RV park via a hose connection. Often, the pressure at these facilities, exceeds 80 pounds per square inch or more, sometimes much more, in certain situations. This high pressure can and does cause leaks to develop where none had come before and by the Law of Murphy, you are either out to dinner or it's 3 in the morning.

A simple device is available and necessary for your peace of mind. A water pressure regulator should be used whenever connecting to an outside water supply source. This device controls the incoming water pressure to supply a continuous and regulated 45 PSI maximum. It is connected at the supply end of the hose to protect the hose and the RV at the same time.

A basic pressure test can be performed in the field by utilizing the on-board water pump. Be sure that the system has water in the storage tank. Close off all the taps, turn on the water pump and let it build up pressure until it shuts itself off (about 2 to 10 seconds). Let it sit in this situation as long as possible. If the pump cycles at any time then you have a drop in pressure, and this means that you have a leak in the water supply system. While these minor leaks are usually easily repaired, they can sometimes be hard to find, and a pump that cycles once per hour is very hard to sleep with.

The pump should supply a healthy water flow when a tap is turned on and should stop running within a second or two, after turning off the tap. Often, however, air gets trapped in the lines and the pump will continue to run for several seconds as it pressurizes this air. The water will spit out of the faucet, if this occurs.

Operate the toilet flush mechanism and check behind the toilet for supply water leaks where the water connection is attached. A leak here indicates a faulty ball valve in the toilet and will cost about \$100 to replace.

Check for excessive mineral buildup in the water system. Minerals will show up as a hard white deposit on the ends of the spouts and collects in the water heater tank. Since RV's are filled with water at varying locations in their travels, with varying qualities of water, just because your current location has good water doesn't mean the RV has used that water consistently.

Waste Water Systems:

Early water disposal systems often did not have a black water holding tank or had a small tank that was used for both sink and toilet waste water. More modern RV's are equipped with separate tanks for these different functions and have capacities of 30 gallons or more. This is adequate for two or three days of conservative use.

Checking the Waste Water System:

If possible, and this is recommended highly, fill the holding tanks completely with fresh water. Run the sink and shower taps until water comes up through the shower drain, and fill the black water tank until the toilet fills up to the slide valve. This is the only way that it is possible to check for any and all leaks.

It will be necessary to dump the tanks after this procedure, so be sure that it is okay with the owner to do this.

If it is not possible to fill the tanks, carefully look over the bottom and sides of the tank for cracks and repaired areas. A chronic leak will leave stains and other evidence.

Check the dump valves for smooth operation if you are dumping the tanks and check for cracks or other damage.

Many holding tank leaks develop where the vent pipes and drain pipes enter the TOP of the tank. Once all the waste water lines are completely filled, then check under all cupboards etc. for telltale dripping water at all the waste water plumbing joints.

Cost of Repairs:

Some plumbing problems are simply a loose fitting or a seal that is not sealing properly. A drip or two at one of the interior drain fittings is usually not a major problem (depending on the access available). However, as an RV ages, the plastic holding tanks become brittle, the joints and pipes are constantly exposed to vibrations and extreme temperature changes, and deterioration is inevitable.

The cost of the tanks is relatively cheap, but the cost of the fittings needed, the labor time involved and the inaccessible location of many of these tanks adds up to a sizable sum. A previously repaired and patched tank will most likely leak in the future. There have been literally hundreds of tank configurations used in the past and many are no longer available. Custom work will be needed to replace an odd ball tank and sometimes this will lead to many hours of work, and many dollars of your RV money.

Water System Components

Fresh Water Tank

Most modern RV water systems use a plastic water storage tank of between 20 to 50 gallons of potable water with a hose leading to an electrical demand type water pump. The tank is normally equipped with a valve or plug to allow the tank to be completely drained for winterizing.

The operation of the demand type water pump is automatically controlled by a pressure sensitive switch that shuts off the pump when the system pressure reaches a preset limit. When a tap is turned on, the resulting water flow reduces the system

pressure, causing the pressure switch to turn the pump on, thereby maintaining the system water pressure. When the tap is turned off, the pump continues to run for a few seconds until the system pressure is built up to the preset limit, whereupon the pressure switch again turns the pump off. All components located beyond the demand pump are part of the pressure side of the water system.

In most recreational vehicles, immediately after the water pump, is the "city" water inlet which is a connection to allow the system to use the water and pressure from an external water source. (i.e. the faucets supplied in an RV park etc.)

The pressure side of the water system consists of the various distribution lines, the hot water heater (if so equipped) and the terminal points of the system. (Sinks, shower, toilet etc.)

In some RV's, especially older models, an air compressor takes the place of a pump - the compressor forces air into an air tight water storage tank and it is this air pressure that forces water through the lines whenever a tap is opened.

The hot water system doubles the plumbing in an RV. Beyond the pump and the city water valve, are the hot water tank and a complete separate plumbing system to each sink and shower installation.

For winterizing the unit in cold climates most modern RV's are equipped with a bypass valve arrangement that allows the hot water tank to be drained without affecting the rest of the system. The bypass consists of one, two or three valves, depending on the configuration, plus the necessary plumbing needed to isolate the tank from the rest of the water system. It is a simple matter to position these valves for proper operation and winterization.

On units without the bypass installed, it will be necessary to either install a permanent bypass as described above or to connect a temporary set-up to circumvent the hot water tank. The various fittings and connections will depend on the particular application. You will encounter a wide variety of plumbing configurations, necessitating some close examinations to ensure adequate antifreeze installation. Remember that the cold water enters the hot water tank through the bottom of the tank and exits through the top. Since the pump (or outside water pressure) forces the water into the bottom of the tank, all lines exiting from the top fitting are hot water lines and will need to be protected with antifreeze.

Propane system:

Propane is stored in portable and detachable cylinders, such as those used on your barbecue or sitting on the front of your travel trailer. Permanent tanks are affixed to a motor home and the vehicle must be driven to a supply outlet to be refilled.

Cylinders are filled by weight and the pertinent information for each individual cylinder is stamped on the protective flange surrounding the valve. This information includes the empty weight of the cylinder (tare weight) and the water capacity in pounds and allows the re-filling attendant to calculate the exact amount of propane to put into the cylinder. This is the approved method for filling cylinders in most areas.

Some cylinder valves are equipped with a bleed valve, that when opened, shows when the cylinder is filled to 80%. However, the present valve on the cylinder may not be the original valve and may or may not be the proper valve for that particular cylinder, possibly resulting in an over filled condition.

New propane cylinders must be equipped, by law, with an overfill protection device (OPD) and any cylinder that you want to have refilled will be required to have this valve in 2002.

A motor home tank is filled by volume using the 80% bleed valve to indicate the proper fill level. Modern tanks are equipped with an automatic valve that shuts off the propane flow at the 80% capacity level.

By law, it is an offense to fill a propane cylinder or tank beyond 80% of it's capacity and that law is in place for a very good reason. Propane is stored in a liquid state by compressing it in a cylinder or tank. At 80% full there is the remaining 20% of the storage capacity to allow for expansion of the liquid due to temperature changes.

If the tank is over filled this expansion room is decreased to the point that the built in pressure relief valve will vent off enough propane to avoid tank rupture. If the cylinder is lying on it's side when this happened it would vent off enough liquid propane to reduce the internal pressure to below the preset pressure of the relief valve. When liquid propane is released, it will expand to 270 times it's volume. Propane is heavier than air and tends to collect at the lowest spot, such as the lowest deck of a ferry, where enough can be present to cause an explosion.

An LP gas re-certification on a recreational vehicle should only be preformed by a licensed RV class Propane Gas Fitter.

In short, propane gas is a clean, efficient and convenient fuel source and very safe to use when all safety precautions are observed.

In most jurisdictions, a propane tank must be recertified every ten years. This usually involves changing the outlet valve and a thorough examination of the condition of the cylinder, including the paint, amount of dents or rust, and any other evident damage. It is normally more economical to replace the tank with a new one, than to refurbish the old.

Things to look for:

Check the propane cylinders for a date stamp - this should be on the protective collar by the valve. Since propane cylinders must be recertified every ten years, if the cylinders are close to the expiry date, you should figure in this cost. Usually the cost of re certification is close to the cost for a new cylinder. Motor home tanks are not required to be re-certified but inspect the condition of the tank. Some surface rust is inevitable due to the under slung mounting of these tanks, but deep rust pitting, dents and other external damage may require tank replacement.

Check the condition of the cylinder for dents and gouges, rust and corrosion and deterioration of the paint. A refueling depot has the right to refuse to fill any damaged cylinder, regardless of the test date.

The propane system should not be altered in any way and all components must be in usable and safe condition. Check the hoses that lead from the cylinder(s) or tank(s) for cracking or other damage. Check beneath the RV for damage to the propane supply lines - any kinked or crushed lines will have to be replaced. These lines should be black iron pipe with copper tube branch lines to the appliances.

Test fire each appliance to make sure for yourself that they are in operating condition.

It's a Gas – Appliances

General Overview:

The appliances include the furnace, the refrigerator, the stovetop and oven, and the water heater. The gas system is the means of delivering the propane to the appliances in a controlled and safe manner.

Take the time to fire up each appliance and observe the special notes contained within this booklet to determine the condition of the device. Appliances can be expensive to repair and although the coach in general may appear to be in excellent shape, it's up to you to see that every system is in a working state. Remember that this purchase is a major investment and it is in your best interest to "see for yourself". Once the seller has your coins in his pocket you lose the advantage!

The following information is meant as a guideline only, to point out obvious problems that will help you decide on your RV purchase. After the purchase of any used RV, you should have the propane system inspected and approved by a certified propane gas fitter. This is for your safety and piece of mind and you should definitely budget for this expense when purchasing a used RV.

Furnace:

Modern RV furnaces are a forced draft unit, meaning they use a blower fan to induce combustion air and to expel the exhaust gases. The blower motor is also used to move the heated air throughout the interior spaces. Therefore, they need electrical power to operate and a fully charged battery is required to properly evaluate the furnaces performance.

The furnace may be a pilot model or the newer DSI (direct spark ignition) type. The pilot is a small, continuously burning flame that provides an ignition source when the thermostat calls for the main burner to light. This pilot must be lit each time the RV has reached it's destination and is to be setup for use. While not a major chore, this can become an inconvenience at times. The DSI furnace, on the other hand, has an auto ignite system, where your turn on the furnace, set the temperature and it takes care of the rest.

The blower motor has to operate in a dusty and hostile environment and the usual life span of this component is five to ten years. If the coach is over ten years old

then plan on replacing this motor soon. Any squeaks or squeals when the fan is running indicate that the motor is on it's last legs.

If the furnace is equipped with the DSI auto ignition, it seems that the life span of the circuit board is five to ten years.

At a cost of about \$100 to \$150, each, for these components, plus installation charges, the hassle of lighting the pilot flame on a manual furnace becomes fairly minor.

With many models, the burner flame cannot be seen. You must rely on the sound of the flame and the general appearance of the outside vent to determine the proper operation of the furnace. The sound of the flame should be a "firm" sound, that is it should sound fairly steady without any popping or other odd noise, especially when the flame is starting or stopping. The outside vent should be free of soot and unobstructed in any way.

Refrigerator:

The typical RV refrigerator will take several hours to reach it's operating temperature (4 to 6 Hrs.) Ask the seller of the unit to have the refrigerator operating on it's 110 volt setting for at least this amount of time before you do your inspection of the RV. In this way, you can be certain that the cooling unit is fully operational.

The cooling unit is the various pipes, tubing and vessels connected to the back of the refrigerator, and is the heart of the appliance. All the rest of the components are used to control the cooling rate and to "keep the cool in". A replacement cooling unit will cost between \$500 to \$800, and a new refrigerator comes in at \$1200 to \$1800, so it is imperative that this appliance be inspected closely.

An ammonia smell around the refrigerator anywhere, or a yellow powdery substance on the cooling unit coils, indicate that a leak has probably occurred and the cooling unit is about to fail.

Older models have manual controls to switch between the fuel sources, while modern refers rely on a circuit board to accomplish these functions. In any case, make sure that the refer operates in all the modes available. These modes are the 110 volt mode, the propane gas mode, and on three way refrigerators, the 12 volt mode.

If the seller has operated the unit on the 110 volt mode in advance, and the freezer compartment is freezing, with the food compartment at it's proper temperature, then the cooling unit can be safely considered to be operating properly.

Set the automatic controls to operate in the gas mode, or manually light the gas system, as the case may be, and physically inspect the gas flame located at the right hand side of the cooling unit on the exterior of the refer. It may be observed through a view port that can be swung out of the way, or there may be one or more sheet metal panels that have to be removed to see the condition of the flame.

The refrigerator burner flame is a relatively small flame, compared to the furnace and the water heater flames, but has similar characteristics. The proper flame should

be a hard, blue color that is fairly vigorous, and steady, and should not waver about the burner head. A weak and floating flame will indicate a problem in the gas supply and may be a minor fix, but it also indicates that the propane system is functioning to a certain extent, and most likely a thorough cleaning of the orifice and the burner itself will resolve the problem.

On units with an electronic control system, the circuit board controls all operations of the refrigerator, and must be supplied with an adequate 12 volt supply to function when on the gas mode. A low battery will adversely affect the operation of this type of refrigerator, that means that if your battery goes dead, your refrigerator will cease to operate. These particular circuit boards have been plagued with problems. The usual life expectancy of these circuit boards, at this time, is about 5 years. Improvements in the circuit board design are weeding out this problem, but be aware that on units more than 1 or 2 years old, this bug will more often than not crop up. At a cost of \$100 or more, these circuit boards can be expensive to replace.

Water Heaters

There are basically two manufacturers of RV water heaters and one or the other of these will be found in the majority of used RV's. The Atwood water heater uses an aluminum water storage tank to combat corrosion.

Another manufacturer, Suburban, uses a glass-lined steel tank in their brand of water heaters. The steel tanks require a "sacrificial" anode rod that attracts the corrosive elements in the water to itself, thus helping to extend the life of the water heater tank. This anode rod needs to be replaced on a regular basis.

Water heater tanks will last 10 to 15 years depending on the corrosiveness of the area water, the flushing schedule of the owner, and periodic maintenance. It is normal to replace the whole water heater, once the tank needs replacing, as the cost of a replacement tank and the labor cost to install it, will be close to the cost of a new unit. A new unit comes with a warranty, etc.

The ignition system on the water heater may be a pilot system or a DSI (direct spark ignition). The DSI ignition model has a convenient electrical switch inside the RV to turn it on. The pilot model must be lit manually on the exterior of the coach.

Some water heaters may be equipped with a 120 volt AC heating element that will heat the water using the shore power electrical supply. Other models, in motorhomes, may be equipped with an engine assist option. This system heats the water using excess engine heat when the motorhome is running, giving you immediate hot water upon arrival at your destination.

Things to Look For:

A pilot model water heater uses a constant pilot flame to ignite the main burner when the thermostat calls for heat. The pilot flame must be steady and strong enough to satisfy the thermocouple. A weak pilot flame will not stay lit when the pilot button is released. A DSI (direct spark ignition) model lights the main burner with an electric spark.

Be sure to operate the water heater to check its function. If the water heater is not filled with water, do not operate the main burner flame for more than a minute or so, to prevent damage to the components. On a pilot model, make sure that the pilot will light and stay burning, and that the main burner will light when required. There is usually a temperature adjustment on the main gas valve inside the water heater access door. On a DSI model, the thermostat is usually pre-set and not adjustable. The main flame will only light when the water temperature is below the pre-set value.

Water heater flame

The water heater propane burner should light immediately, when the thermostat calls for more heat. The flame should be a strong blue color with no yellow components. It should make a slight roaring sound. When first firing up the appliance it may take several tries in order to get the gas supply to the appliance. It is often advisable to first light a burner on the stove top to get the gas flow to displace any air that may be in the system. Then light the other appliances. This will shorten the delay time for the gas to get to those appliances. If the appliance is located a long distance from the propane cylinders it will take some time for the propane to get to it. The ignition sequence may have to be repeated several times before the burner will light. After that time, however, the burner should light without delay.

Look for a carbon build up on the exterior of the coach, above the water heater (or any other appliance). This indicates an improper flame that may be producing excess carbon monoxide and other dangerous combustion products.

Look for signs of water leakage around the inlets to the water heater (on the inside of the coach) and beneath the unit. The water heater tank is subject to varying amounts of corrosive products from the water source and pinhole leaks may develop on the bottom of the tank. Since the tank is usually mounted flush to the floor, a leak beneath the unit may be hard to notice. If the tank insulation is surrounded by a cardboard covering a leak will be evidenced by stains on the cardboard surface.

The RV Stove/Oven

The RV stove uses propane gas from the trailers propane tanks as the fuel source. The top burners may have a pilot light, a piezo ignition device, or may have to be lit with a match. Check to see that the burner flame is blue and even all around the burner with no wavy yellow flame present.
RV Stovetop/Oven

The oven is equipped with a pilot light that is manually lit when preparing the oven for use. After the pilot light is lit, turning the oven control knob to a higher temperature setting causes the pilot light to increase in size. This higher flame causes the main oven burner valve to open, thus igniting the main burner flame. This process may take thirty seconds or so. The main burner flame should be blue in color and be steady all along the burner surface.

The stove/oven is usually a very reliable appliance and not often are repairs required for this device.

Light Up My Life - The Electrics

General Overview:

Modern RV's have two separate electrical systems, the 120 volt AC system and the 12 volt DC system. Since these are totally different electrical systems, we will discuss each in turn.

120 VAC

The 120 volt AC refers to normal household type of alternating current electricity. This is supplied by the shore power electrical cord and AC electrical power is available when the unit is plugged into the campground electrical outlet. 120 volt AC power is used to run the air conditioner, microwave, television, and other household type of appliances.

Other sources of 120 VAC power include an on-board motor driven generator which converts the mechanical energy of the fuel it uses to electrical energy required by the coach. Generators, or gensets, as they are commonly referred to, are used when shore power is not available. Gensets come in various capacities, depending on what devices they are required to run. The larger the power needs, the larger the generator capacity. This means more fuel consumption, more maintenance costs and added weight to be carried by the RV chassis.

The type of camping that you generally do, will determine the need for a genset. If you rarely, or never, camp away from the facilities of a full hookup RV park, then a generator is redundant. If you often camp in remote locations for extended periods of time, then a generator may well be a good thing to have. Other alternatives to a generator are becoming more viable, such as solar panels combined with an inverter and battery bank.

An inverter is a device that converts the 12 VDC current from a battery bank (chemical energy) to useable 120 VAC electricity. Inverters are available in various wattage outputs, from a small 150 watt unit, to the larger 2500+ watt devices, depending on your camping requirements.

The amount of power available to an inverter is limited by the battery, or battery bank capacity and also by the battery recharging system. The specifics of a suitable inverter/solar panel/battery for a particular application is beyond the scope of this booklet.

12 VDC

The 12 volt DC system is the low voltage direct current that your coach battery supplies to operate the 12 volt lights, the water pump and furnace, and for other low

voltage requirements. This electrical power is limited by the capacity of the on board storage battery.

The converter converts 120 VAC electrical power to low voltage 12 VDC when the coach is plugged in to shore power. This provides the 12 volt power to run the 12 volt system and also has a built in battery charger to recharge the on-board battery. Batteries

The battery (or batteries) supply your RV with 12 volt DC electrical power to operate the lights, water pump, furnace and other appliances. They should be viewed as a storage tank for electricity and as such they have certain limitations. The capacity of the battery relates to the amount of electrical power that the battery can store and that capacity will determine how long your lights will burn and how long your furnace will operate, before the battery will need to be recharged.

An RV battery differs from a chassis battery. A chassis battery is designed to give a large amount of current for a short time, as when starting the engine of a motor home. The battery is then immediately brought back up to full charge by the vehicles charging system.

RV batteries, also called coach batteries, are required to deliver a moderate amount of electrical power for extended periods of time before they are recharged. They are called deep cycle batteries for this reason and have a very different internal construction. Normal starting batteries will have a very short usable life when used in a deep cycle situation.

You can increase the storage capacity of your battery by installing a larger size or by installing multiple batteries, depending on your camping requirements. If you normally travel from RV park to RV park, where hookups are available, then one battery will be sufficient. However, if you "dry camp" at remote locations for more than a day or two, you will need more storage and some way to refill that storage capacity.

When batteries are stored in a discharged state for more than several days, lead sulfate forms, making the plates very hard and dense. When this happens the battery loses some of it's capacity to be recharged. Also, a discharged battery will freeze readily when exposed to cold temperatures. When the active material in the plates can no longer sustain a discharge current, the battery "dies".

Recharge a deep cycle battery as soon as possible after each use. Maintaining the correct electrolyte levels, tightening loose hold-down clamps and terminals, and removing corrosion is normally the only preventative maintenance required for a battery.

Conclusion:

Buying a used RV is easy! Buying one that is roadworthy and will give you years of trouble free enjoyment will require some "homework" on your part. I hope this guide has been a help to you.

Recommended Resources:

[RV Buyers Survival Guide](#)

[RVers Guide to Internet Access On The Road](#)

[RV Living Tip & Hints Vol 1](#) – free e-book

[RV Living Tip & Hints Vol 2](#) – free e-book

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