



***Keystone RV
Company***[™]

Owner's Manual

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Introduction

Dear Keystone Owner,

Congratulations on the purchase of your new Keystone recreational vehicle. As you may know, Keystone RV Company is the #1 selling RV brand in North America. We don't take that position for granted and want the experience with your new travel-trailer or fifth-wheel to be enjoyable.

To help get you started, please take a few minutes and review the Owner's Manual thoroughly. There are multiple components, appliances, and equipment unique to a recreational vehicle and understanding how they function will be important to your overall enjoyment and safe operation. The Owner's Manual not only contains the Keystone limited warranty, but it will help you understand many of the functions along with the required maintenance of your RV. If you have any questions please contact your selling dealer or the Keystone Customer Service Group at 866-425-4369.

Again, on behalf of everyone at Keystone RV Company we want to thank you for purchasing a Keystone product. Enjoy camping in your new recreational vehicle.

Sincerely,

Your Keystone RV Team

This manual is based on the latest information available at the time of publication. Due to continuous product development and improvements, Keystone RV Company reserves the right to make changes in product specifications and components without prior notice. The most recent version of the owner's manual can be found on our web site www.keystonerv.com under the Customer Service heading.

Important Safety Information

Danger, Warning, Caution and Note Boxes

We have provided many important safety messages in this manual. Always read and obey all safety messages.



DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.



NOTICE is used to address practices not related to personal injury. This applies to hazardous situations involving property damage only.



Important information regarding the maintenance of your recreational vehicle.

Terms and Symbols Used

(Optional) This denotes items that may be an option on all or particular models. Additionally, some optional items can only be included during the manufacturing phase and cannot be added. The inclusion of optional items does not imply or suggest the availability, application suitability or inclusion for any specific unit.

Important Safety Precautions

Riding in Trailer

Do not allow passengers to ride in the trailer during travel. The trailer does not have seat belts and is not designed to carry passengers. This may also be prohibited by state law.

Tire Safety

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Under inflated tires and overloaded vehicles are a major cause of tire failure. For more information on tire safety, please see Chapter 3.

Towing and Weight Distribution

Weight distribution is an important factor when loading your fifth wheel and travel trailer. A recreational vehicle with the cargo distributed properly will result in efficient, trouble-free towing. See Chapter 4 for more information.

Controlling Sway or Fishtailing

Sway or fishtailing is the sideways action of a trailer caused by external forces. Excessive sway of your travel trailer can lead to the rollover of the unit and tow vehicle resulting in serious injury or death. Be sure to follow the instructions and warnings in Chapter 4 page 27.

Lug Nut Torquing

Being sure wheel mounting nuts (lug nuts) on trailer wheels are tight and properly torqued is an important responsibility that trailer owners and users need to be familiar with and practice. Inadequate and/or inappropriate wheel nut torque (tightness) is a major reason that lug nuts loosen in service. Loose lug nuts can rapidly lead to a wheel separation with potentially serious safety consequences (see Chapter 3).

Generator Safety

Do not operate the generator in an enclosed building or in a partly enclosed area such as a garage. Nor should the generator be operated while sleeping. Be sure to follow all instructions and warnings in this manual and the manual provided by the generator manufacturer (see Chapter 6).

Appliances and Equipment

The appliances (stove, refrigerator, outdoor grills, etc.) and equipment (water heater, furnace generator, etc.) typically operate on propane. Propane is flammable and is contained under high pressure. Improper use may result in a fire and/or explosion. Be sure to follow all instructions and warnings in this manual (see Chapter 6) as well as the specific owners' manuals of the appliances and equipment.

Contact Keystone

For assistance with your recreational vehicle we suggest the following steps to insure customer satisfaction:

1. Contact your Sales Representative or Service Advisor at your selling dealership.
2. For further assistance contact the Sales Manager or Service Manager at the dealership.
3. If the concern cannot be resolved at the dealership, please contact Keystone.

2642 Hackberry Dr

PO Box 2000

Goshen, IN 46527

Phone (866) 425 4369

Fax (574) 534 9057

www.keystonerv.com - Customer Service Link

Reporting Safety Defects

If you believe your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform National Highway Traffic Safety Administration (NHTSA) in addition to notifying Keystone RV Company.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Keystone RV Company.

To contact NHTSA, you may call the Vehicle Safety Hot line toll-free at 1-888- 327-4236 (TTY; 1-800-424-9153); go to <http://www.safercar.gov>; or write to: Administrator, NHTSA, 1200 New Jersey Ave. SE, Washington, DC 20590. You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

Chapter 1: Warranty and Dealer Service

As the owner of a new recreational vehicle, you are responsible for regular care and proper maintenance. Proper maintenance will help avoid situations where the Limited Warranty will not cover items due to neglect. Maintenance services should be performed in accordance with this manual, as well as, the corresponding manufacturer's manuals on components included within your coach.

As the owner it is your responsibility and obligation to return the recreational vehicle to an authorized dealer for any repairs and service that may be required. Your Keystone dealer is responsible for proper service before delivery and will have a continued interest in your satisfaction. Therefore, we recommend that warranty and maintenance services be performed by your Keystone Dealer.

Owner's Responsibilities

1. Reviewing the information contained within this manual and all supplied component manuals.
2. Proper care and maintenance as outlined by this manual and the corresponding component manuals.
3. Returning your vehicle to an authorized dealer for any warranty repairs or service that is required.
Note: Prior authorization from Keystone is required for repairs performed by a non-Keystone dealer. Without prior authorization from Keystone, you may be responsible for all or a portion of the cost of repairs.

Dealer Responsibilities

1. Perform a Pre-delivery inspection in conjunction with the requirements established by Keystone RV Company prior to the delivery of the unit to the retail customer.
2. Thoroughly orient and familiarize the customer with the operation of all systems and components.
3. Thoroughly explain Keystone RV Company's Limited One (1) Year Warranty.
4. Instruct the customer on how to receive local and out of town service on the vehicle and its separately warranted components, whether in or out of warranty.
5. Register the sale of the unit with Keystone within ten (10) days from the date of delivery.

Get To Know Your Unit Before Heading Out

Throughout the manufacturing process, your recreational vehicle has been inspected by qualified inspectors and then again at the dealership. As the owners, however, you will be the first to camp and extensively use every system. Keystone RV Company wants the first camping experience to be happy one and recommends a "trial camping experience" before heading out. Plan a weekend in the yard or driveway and really camp in your unit.

By camping for several days, full-time in your unit, you will have the opportunity to use and become accustomed to the systems within your unit and find out what items are needed or not needed while camping. Note any questions that arise, difficulties encountered or problems that occur. After your trial, call your dealer and ask any questions that have arisen. Getting to know your unit before the first adventure can save frustration and leave more time for fun!

Obtaining Warranty Service

Keystone RV Company recommends obtaining all service from your selling dealer. While in transit, an authorized Keystone Service Center can assist with any "Emergency" service needed (issues affecting use, value or safety). Should you encounter an Emergency while traveling and need to locate an Authorized Keystone Service Center, a dealer locator can be found at www.keystonerv.com or contact Keystone Customer Service Monday - Thursday 8-5, Friday 8-3 Eastern Time at 1-866-425-4369.

Making an Appointment

Please note that in almost every situation, you will need to make an appointment with the dealer. We recommend following these steps whenever possible:

Call Ahead - Give thought to an appointment time and call ahead. Mondays and Fridays are generally the busiest times at a dealer's service center, as are right before seasonal holidays.

Be Prepared - If warranty work is to be done, please have a copy of your warranty paperwork available and provide the service center with any helpful information on past repairs that may pertain and help the technicians in diagnosing the problem.

Make a List - Have a detailed list ready to review with the dealership service personnel when making the appointment. The more information provided up front, the more accurate the dealership can advise on repair expectations and time lines. Some repairs may require special order parts that will need to be manufactured which can delay the process.

While Waiting - If you choose to wait, do not be surprised if you cannot enter the repair area. Many insurance policies prohibit customers or non-personnel from entering into the work area for safety reasons.

Inspecting Your Repairs

Keystone RV Company and your dealer want you to be satisfied with any repair. After a repair is performed, inspect thoroughly. Check off your list and go over the repairs with the service center representative. Once satisfied, sign the repair order. In the event a problem should reoccur after you have left the dealership, contact the repair center or Keystone RV Company as soon as possible, so that the situation can be resolved expediently.

Component Information & Warranties

Keystone RV Company has provided this manual solely for the purpose of providing instructions about the operation and maintenance of its recreational vehicle. Nothing in this manual creates any warranty, either express or implied. The only warranty offered by Keystone RV Company is set forth in the Limited Warranty applicable to your vehicle.

Your RV, as well as all components and appliances, require periodic service and maintenance. The failure to provide these services and / or maintenance may result in loss of warranty coverage. The owner should review Keystone RV Company's Limited Warranty and the warranties of all other manufacturers prior to use.

This manual is NOT intended to be inclusive of every operational aspect of your unit, but to work in conjunction with the manuals supplied by the different component manufacturers of the components in your unit. Please note that some components may be optional or not available for specific models.

In addition to this Owner's Manual, any manuals supplied to us by a specific component manufacturer for products installed in your unit are supplied with the unit. You may be entitled to additional warranties beyond the Keystone's Limited One (1) Year Warranty on individual components. Any warranties other than Keystone's Limited One (1) Year Warranty are offered and administered directly from the manufacturer of the component and NOT by Keystone RV Company. Individual product warranty registrations may be required by each component manufacturer. If supplied to Keystone, they are passed on in the unit at the time of manufacture. We recommend these be completed and mailed promptly if applicable.

NOTICE

Tow Vehicle Disclaimer

In connection with the use and operation of Keystone recreational vehicles, Keystone customers and owners of Keystone recreational vehicles are solely responsible for the selection and proper use of tow vehicles. All customers should consult with a motor vehicle manufacturer or dealer concerning the purchase and use of suitable tow vehicles for Keystone products, Keystone further disclaims any liability with respect to damages which may be incurred by a customer or owner of Keystone recreational vehicles as a result of the operation, use or misuse of a tow vehicle.

NOTE: KEYSTONE'S LIMITED WARRANTY DOES NOT COVER DAMAGE TO THE RECREATIONAL VEHICLE OR THE TOW VEHICLE AS A RESULT OF THE OPERATION, USE OR MISUSE OF THE TOW VEHICLE.

Limited One Year Warranty (Three Pages)

Except as specifically excluded below, Keystone RV Company (hereinafter "Keystone") WARRANTS for a period of one (1) year from the date of purchase that the recreational vehicle manufactured and assembled by Keystone shall be free from defects in materials and workmanship supplied and attributable to Keystone. Keystone, at its sole discretion, reserves the right to substitute parts or components of substantially equal quality, repair cosmetic flaws, make design and/or manufacturing improvements, or in the event the unit cannot be repaired, provide a replacement unit as the exclusive remedy under this Limited Warranty. All owners (original or subsequent) must be properly registered with Keystone RV Company to be considered for eligibility.

This Limited Warranty may be transferred during the one (1) year term by the original consumer purchaser to a subsequent purchaser. The limited one (1) year warranty, however, shall in no way be extended beyond the one (1) year from the original date of purchase by reason of the transfer from the original consumer purchaser to any subsequent purchaser(s). The subsequent purchaser(s) also has an obligation to notify Keystone immediately upon the transfer of the warranty and to further provide proof of purchase within the one (1) year.

Warranty Disclaimers

This warranty is expressly in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for any particular purpose, and in lieu of all other obligations or liabilities on the part of Keystone. Implied warranties, including implied warranty of merchantability or fitness for a particular purpose, if any, given by law, shall be limited to and not extend beyond the duration of the written limited warranty periods set forth herein. No person has the authority to enlarge, amend, or modify this limited warranty.

Keystone will not be responsible or liable for loss of use of the recreational vehicle, on-site service calls or service charges, loss of time, inconvenience, expenses for gasoline, towing charges or transportation costs, rental of substitute equipment, telephone, travel, lodging, damage or loss to personal property, loss of revenues, or other commercial loss, or any other special or consequential damages, of any kind or nature resulting from any defect in the recreational vehicle.

Any action to enforce this limited warranty or any implied warranty shall not be brought more than one (1) year after expiration of the one (1) year term of this limited warranty.

Some states do not allow limitations of how long an implied warranty lasts, or allow the exclusion of limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you.

Some states do not allow the reduction in the statute of limitations, so they may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Warranty Exclusions - This Limited Warranty Shall Not Apply To:

- Equipment, products, components, appliances, or accessories not manufactured by Keystone whether or not warranted, including but not limited to, tires, batteries, generators, washer, dryer, electronics and other installed equipment or accessories;
- Trailers used for business, rental, commercial, residential, or disaster relief purposes, or any purposes other than recreational travel and family camping;
- Trailers which are not originally sold through an authorized Keystone dealer and those sold through auction, repossession, salvage or an otherwise damaged or distressed condition;
- Damage or loss caused in whole or in part by the acts or omissions of any kind by any party other than Keystone;

- Damage or loss caused in whole or in part by the misuse, abuse, neglect, theft, vandalism, product modification, improper customer or dealer installation, improper stowing of equipment, incorrect line voltage, unauthorized repair or failure to follow instructions supplied with the recreational vehicle;
- Routine maintenance including, without limitation, caulking, re-caulking and waxing of the body of the recreational vehicle, tightening screws, brake squeak/lock-up/adjustment, latches, locks, combustion systems, changing fuses, or light bulbs, and maintaining the air conditioning and heating systems;
- Adjustments to all doors, drawers, locks, latches, slide outs, awnings and window treatments beyond 90 days after retail sale;
- Damage or loss caused in whole or in part by the unauthorized attachments, modifications or alterations to the structure, body, pin box, or frame of the recreational vehicle including but not limited to trailer hitches for towing, or platforms for supporting cargo;
- Any upholstery damage including, but not limited to tears, punctures or misuse;
- Any fading or die lot changes of fabrics or carpet;
- Cosmetic issues with the rubber roof or its installation;
- Damage or loss caused in whole or in part by exposure to natural or atmospheric elements, corrosive chemicals, ash or fumes generated or released by vehicles, collision, road hazards, rock chips, condensation, or any other source;
- Damage or loss caused in whole or in part by any animals, including such things as rodents and/or insects;
- Damage or loss caused in whole or in part by the overloading or the improper balancing of the load;
- Damage or loss caused in whole or in part by the willful or negligent acts of the driver of the vehicle pulling the recreational vehicle, an accident involving the recreational vehicle, the condition of any road surface over which the recreational vehicle is pulled, or the striking or driving over a curb or any other object;
- Damage or loss to the recreational vehicle caused in whole or in part by the tow vehicle selected by the owner to pull the recreational vehicle including but not limited to the improper selection or installation of towing hitch on tow vehicle, weight distribution or equalizer equipment;
- Any injury, loss or damage, beyond warranty repairs, due to mold or fungi;
- Damage or loss caused in whole or in part by the owner's operation, use, or misuse of the tow vehicle;
- Any and all damage or loss to the owner's tow vehicle;
- Rust or broken glass damage;
- Wheel or axle alignment;
- Re-design/Re-construction;
- Damage to electronics due to voltage issues are not covered under warranty;
- Representations made by any person (including your dealer) beyond those stated in this Limited Warranty;
- Any trailer licensed, registered, or primarily used outside the USA or Canada; and
- Any incidental and consequential damages including, but not limited to, transportation, fuel, food, lodging, telephone calls, towing charges, bus and taxi fares or car rentals, on-site service calls (except units with detachable hitches designed for permanent site use), as well as commercial use and loss of use. Further, any performance of repairs after the warranty coverage period has expired or any performance of repairs to component parts and appliances that are excluded from coverage shall be considered "good will" repairs, which shall not alter the express terms of this limited warranty.

Keystone's Responsibility

Please note the distinction between “defects” and “damage” as used in this Limited Warranty: “defects” are covered because Keystone is responsible; on the other hand, we have no control over “damage” caused by such things as collision, misuse and lack of maintenance which occurs after the recreational vehicle is delivered to the owner. Therefore, “damage” for any reason which occurs after the recreational vehicle is delivered is not covered under this warranty. Maintenance services are also excluded from the warranty because it is the owner’s responsibility to maintain the recreational vehicle.

Keystone does not undertake responsibility to any owner beyond the original cost of the recreational vehicle to Keystone or for any undertaking, representation, or warranty made by any dealer beyond those expressed herein.

Owner Responsibility

It is the responsibility of the owner to maintain the recreational vehicle as described in the Care and Maintenance section of the Owner’s Manual including taking whatever preventative measures necessary to maintain the exterior sealants of the unit and to prevent foreseeable secondary moisture or water damage to the unit from rain, plumbing leaks, condensation and other natural accumulation of water in the unit. Owners should not leave a unit unattended while attached to an internal or external water source which could lead to a ‘flooding’ condition. Examples of secondary damage include, but are not limited to, stained upholstery, carpeting or drapes, mold formation and growth, furniture cabinetry or floor deterioration, etc. Mold is a natural growth given certain environmental conditions and is not covered by the terms of this Limited Warranty.

How To Obtain Warranty Service

To obtain warranty service the owner must deliver the recreational vehicle to an authorized Keystone dealer (with proof of purchase and freight prepaid) within a reasonable time after discovery of the defect within the warranty period. All shipping or towing expenses incurred in transporting the recreational vehicle for warranty service shall be owner’s responsibility (units with detachable hitch designed for permanent site use may qualify for on-site service call assistance). Upon requesting the warranty services you will be asked for:

- (a) Your name
- (b) Date of purchase
- (c) Keystone vehicle ID number
- (d) An explanation of the anticipated warranty claim

Appliance And Component Warranty Service/Administration

Appliance and component manufacturers may or may not provide their own warranties. These warranties are separate from the Keystone Limited Warranty and constitute the only warranty for those specific appliances and components. The terms, conditions and warranty periods of these items may vary from the Keystone Limited Warranty. For the appliance and component manufacturers providing warranties, Keystone does, however, administer those warranties during the term of this one year Limited Warranty except for tires, batteries, generators and washer, dryer. All warranty service claims on components must therefore be directed during the one year of this Limited Warranty to Keystone. After the one year period, all appliance and component warranty claims must be directed to the respective appliance and component manufacturers. Keystone is not warranting any appliance or components and is only representing that it is authorized to administer the services for such products. In no way shall Keystone’s Limited Warranty be modified or amended by Keystone providing service for appliances and components.

If the dealer is unable to resolve any warrantable issues or for assistance in arranging repairs, please contact: Customer Service Department Keystone RV Company 2642 Hackberry Drive Goshen, Indiana 46526. Telephone Number (866) 425-4369. Upon receipt of notice of a claim, where the dealer was unable or unwilling to resolve the problem, either an alternate dealer or the manufacturing plant will repair or replace any parts necessary to correct defects in material or workmanship or will take other appropriate action as may be required.

Chapter 2: Indoor Air Quality



Introduction

Good indoor air quality is essential for long term enjoyment of your Keystone recreational vehicle. To maintain good air quality you need to be attentive to proper ventilation of your recreational vehicle, keeping the RV clean, and avoiding unnecessary air pollutants. Common indoor air pollution sources include molds, pollen, dander from pet fur, secondhand smoke, carbon monoxide from burning propane and other fuels (and charcoal), and household cleaners. Inadequate ventilation can increase indoor pollutant levels by not bringing enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants outside. High temperatures and humidity levels can also increase concentrations of some air pollutants. Those people most at risk for poor indoor air quality include: people with asthma, people with allergies, people who have chronic lung diseases such as bronchitis and emphysema, people with pre-existing heart disease, children, and the elderly.

Improving Indoor Air Quality

CDC Recommendations: The Centers for Disease Control and Prevention (CDC) recommends the following steps to improve indoor air quality:

1. **Breath Fresh Air**

- Open Windows
- Spend as much time outside as you can, in fresh air

2. **Control Mold**

- Clean your bathroom and kitchen often to fight mold
- Fix any water leaks
- Clean up any mold you see or smell with a mix of no more than 1 cup of bleach mixed with 1 gallon of water. *Never mix bleach with ammonia*
- Close windows and run your air conditioner (AC) or your dehumidifier to help control mold

3. **Other ways to improve air quality**

- Clean often to get rid of dust and pet fur which can bother your nose and throat
- Try not to use bug spray inside your trailer
- **DO NOT SMOKE INSIDE YOUR TRAILER**

EPA Recommendations: There are 3 basic strategies recommended by the Environmental Protection Agency (EPA) to improve indoor air quality:

- **Remove Sources:** The most effective way to improve indoor air quality is to eliminate sources of pollution or reduce their emissions. Pollutants that this strategy can have an impact upon are: (i) Biological Contaminants such as bacteria, molds, mildew, viruses, animal dander, and pollen, (ii) Household Products such as paints, varnishes, cleaning and disinfecting solutions, cosmetics and hobby products, and (iii) Pesticides.
- **Ventilation:** Increase the amount of outdoor air coming indoors. Typically, RV Furnaces & Air Conditioners **DO NOT** mechanically bring fresh air into the unit. Simultaneously opening doors and windows to allow fresh air in along with turning on exhaust fans such as the bathroom, ceiling and range hood to take inside air out is an effective way to improve Indoor Air Quality. If too little outdoor air enters an RV, pollutants may accumulate to higher levels.
- **Air Cleaners:** Air cleaners are designed to remove particles from the air. There are many types and sizes of air cleaners on the market. However, air cleaners are not generally designed to remove gaseous pollutants. The effectiveness of an air cleaner depends on how well it collects pollutants from indoor air and how much air it draws through the cleaning or filtering element.
- For more information about Indoor Air Quality and its effects, please refer to www.epa.gov/iaq.

Formaldehyde & Recreational Vehicles

Formaldehyde is a naturally occurring substance. Formaldehyde may be released from smoking, cooking, use of soaps and detergents such as carpet shampoos, cosmetics, and many other household products. It is also a by-product of combustion and certain other natural processes. Thus it may be present in concentrations both indoors and outdoors. Formaldehyde is also an industrial chemical used in the manufacture of some of the components used in the construction of recreational vehicles and is also contained in some holding tank chemicals. Some people are very sensitive to formaldehyde while others may not have any reaction to the same levels of formaldehyde. Formaldehyde is a colorless, pungent-smelling gas that can cause watery eyes, burning sensations in the eyes and throat, nausea, and difficulty breathing.

As recommended by the CDC and the EPA, improving the air quality can be accomplished by actions such as opening windows, opening roof vents, operating fans and vents, running the air conditioner, or some combination thereof. In particular, to the extent that formaldehyde is contained in some of the components used to construct your RV or holding tank chemicals, you should properly ventilate your RV to maintain good indoor air quality in the RV. Recreational vehicles are much smaller than homes and therefore the exchange of air inside a recreational vehicle is significantly less than a home. Therefore, ventilation should occur frequently before, during and after use, and at times when the temperatures and humidity are elevated. Decreasing the flow of air by sealing the recreational vehicle may increase the presence and/or concentration of indoor air pollutants, such as mold, household chemicals and formaldehyde.

Finally, we recommend that you do not smoke inside your recreational vehicle. In addition to causing damage to your recreational vehicle, tobacco smoke releases formaldehyde and other air pollutants.

If you have any questions regarding the health effects of formaldehyde or any other air pollutants, please consult your doctor or local health department.

California Air Resource Board (CARB) Notice

Formaldehyde is used widely in building materials such as pressed wood products, particleboard, hardwood plywood paneling, medium density fiberboard (MDF), and plywood which are commonly used throughout the Recreational Vehicle Industry. As mandated by the RV Industry, Keystone recreational vehicles contain composite wood products (hardwood plywood, particle board, and MDF) that comply with the California Air Resource Board (CARB) [Phase 2] formaldehyde emission standards under California Code of Regulations § 93120.2(a).

Effects of Prolonged Occupancy



Your recreational vehicle was designed primarily for recreational use and short-term occupancy. *Long-term occupancy can create conditions, which if not managed properly, can be hazardous to your health and/or cause significant damage to your recreational vehicle.*

Unlike a home which can be thousands of square feet in size, your RV is only a few hundred square feet. The relatively small volume and tight compact construction of modern recreational vehicles means that the normal living activities of even a few occupants (or animals) will lead to rapid moisture saturation of the air contained in the RV. Estimates indicate that a family of four can vaporize up to three gallons of water daily through breathing, cooking, bathing and washing.

Unless the water vapor is carried outside by ventilation or condensed by a dehumidifier, it will condense on the inside the unit. It may condense out of sight inside cabinets, closets, etc. where the air temperature within may be slightly different. This can not only cause damage to your RV but also your personal belongings. Appearance of these conditions can be misconstrued as a water leak.

Tips to Avoiding Condensation

- When bathing, washing dishes, hair-drying, laundering, cooking and using appliances and non-vented gas burners always turn on the nearest exhaust fan.
- Keep the bathroom door closed and the vent open (if equipped, exhaust fan on) when bathing/showering and for a period of time after you have finished.
- Do not hang wet clothes in the coach to dry.
- In hot weather, start the air conditioner early as it removes excess humidity from the air while lowering the temperature.
- Manage the inside temperature during cold weather. The higher inside temperature along with colder outside temperatures will cause condensation to form on areas that are not insulated as well as others (windows, vents, wall studs, etc).
- Poor air circulation inside the unit can cause condensation to form inside closets and cabinets. Allow air to circulate inside closets and cabinets (leave doors partially open) so the temperature inside the cabinet is the same as in the rest of the unit. Please keep in mind that a closed cabinet full of stored goods prevents circulation and can cause condensation.
- The natural tendency would be to close the vehicle tightly during cold weather. This will actually compound the problem. Simply put, you need to get the moisture in the air that is created from normal use outside. The most effective way is utilizing your vents and vent fans.
- Use fluorescent ceiling lights and minimize prolonged use of incandescent lights, which produce heat and contribute to condensation in the roof above the ceiling lights.

If the tips presented here are not effective in controlling condensation, it may be necessary for you to invest in a dehumidifier to reduce the health risk to you or your family as well as prevent damage to your RV.

Where There Is Moisture, There May Be Mold

Molds, which are pollutants, are microscopic organisms that naturally occur in virtually every environment, indoors and out. Outdoors, mold growth is important in the decomposition of plants. Indoors, mold growth is unfavorable. Left unchecked, molds break down natural materials such as wood products and fabrics.

For mold growth to occur temperatures must be between 40 degrees and 100 degrees Fahrenheit and there must be a source of moisture such as humidity, standing water, damp materials, etc. Indoors, the most rapid growth occurs with warm and humid conditions.

By controlling relative humidity (moisture), the growth of mold and mildew can be inhibited.

- In warm climates, use of the air conditioner will reduce the relative humidity.
- Opening vents and operating exhaust fans when introducing high levels of moisture to the inside of the unit (bathing, showering, cooking, washing dishes, etc.) will help control the environment needed for mold to grow.
- Clean any spills immediately
- Avoid leaving damp towels, cloths, etc. out to dry inside the unit
- On safe surfaces, use mold or mildew-killing cleaning products.
- Check sealants regularly and reseal when necessary to avoid water leaks. Proper preventive maintenance to the RV and its accessories, as described both in this manual and in accompanying literature, will provide the best protection for your unit.
- In extreme conditions, a dehumidifier may be necessary.

Web Sites of Interest

We also recommend that you visit the following web sites which maintain information about indoor air pollutants, including molds and formaldehyde, along with ways to improve indoor air quality:

- <http://www.epa.gov/iaq/pubs/insidest.html>
- <http://www.atsdr.cdc.gov/tfacts111.html>
- <http://www.epa.gov/iaq/molds/moldguide.html> (Applies to controlling mold in the home, but the same recommendations would apply to trailers)
- <http://www.formaldehyde.org/> (Formaldehyde Council's Web site)
- <http://rvia.org/> (Recreational Vehicle Industry Association's Web site – Under the Technical Information & Training tab, click on Facts about Formaldehyde)

Chapter 3: Tires, Axles & Weights

Tire Safety Information

This portion of the Owner's Manual contains tire safety information as required by 49 CFR 575.6(4) and is based in part on the National Highway Traffic Safety Administration's Brochure entitled "Tire Safety-Everything Rides on It". It can be obtained and downloaded from NHTSA, free of charge, from the following web site:

http://www.NHTSA.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires.

These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires.

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

Safety First – Basic Tire Maintenance

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Under-inflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

Recommended Tire Pressure and Load Limits

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Cargo weight (the maximum cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR– the maximum weight the axle systems are designed to carry).

Both placards and certification labels are permanently attached to the trailer. See "Weight Ratings - Labels" in this chapter for location and detailed information.

Understanding Tire Pressure and Load Limits

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure—measured in pounds per square inch (psi)—a tire requires to be properly inflated. (You will also find this number on the vehicle information placard expressed in kilo pascals (kPa), which is the metric measure used internationally.)

Vehicle manufacturers determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's tire size. The proper tire pressure for your vehicle is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.)

Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the “maximum permissible inflation pressure” on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Checking Tire Pressure

It is important to check your vehicle’s tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking
- With radial tires, it is usually not possible to determine under-inflation by visual inspection

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

Steps for Maintaining Proper Tire Pressure

1. Locate the recommended tire pressure on the vehicle’s Tire and Loading Information label located on the exterior front left side wall.
2. Record the tire pressure of all tires.
3. If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
4. If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These “missing” pounds of pressure are what you will need to add.
5. At a service station or using an air compressor, add the missing pounds of air pressure to each tire that is under-inflated.
6. Check all the tires to make sure they have the same air pressure.

If you have been driving your vehicle and think that a tire is under-inflated, fill it to the recommended cold inflation pressure indicated on your vehicle’s Tire and Loading Information label. While your tire may still be slightly under-inflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the vehicle manufacturer’s recommended cold inflation pressure than to drive with a significantly under-inflated tire. Since this is a temporary fix, don’t forget to recheck and adjust the tire’s pressure when you can obtain a cold reading.

Tire Safety Tips

Preventing Tire Damage

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway or when parking.







Tire Safety Checklist

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.

- Make sure your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the Tire Information and Loading Label.

Tire Tread

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in tread-wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear “even” with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln’s head upside down and facing you. If you can see the top of Lincoln’s head, you are ready for new tires.

	Condition	Possible Cause	Remedy
	Even Center Wear	Over-Inflation	Check & Adjust Pressure When Cold
	Inside & Outside Wear	Under-Inflation	Check & Adjust Pressure When Cold
	Smooth Outside Wear (One Side)	Loss of Camber or Over-Loading	Check & Unload as Necessary and / or Have Alignment Checked
	“Feathering” Across the Face	Axle Not Square to Frame or Incorrect Toe-In	Square Axles and / or Have Alignment Checked
	Cupping	Loose Bearings or Wheel Balance	Check Bearing Adjustment and Wheel & Tire Balance
	Flat Spots	Wheel Lock-Up	Adjust Bakes

Tire Size

To maintain tire safety, purchase new tires that are the same size as the vehicle’s original tires or another size recommended by the manufacturer. Look at the Tire and Loading Information label, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

Tire Labeling

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

Tire Size and Type Designation

The tire may be marked with a designation of ST225/75R15.

ST - The “ST” indicates the tire is for trailer use.

Next number - This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number - This two-digit number, known as the aspect ratio, gives the tire’s ratio of height to width.

R - The “R” stands for radial.

Next number - This two-digit number is the wheel or rim diameter in inches.

US DOT Tire Identification Number (TIN)

This begins with the letters “DOT” and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer’s discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used

The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum Load Rating

This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum Permissible Inflation Pressure

This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Speed Rating

Typically tires with ST designation are speed restricted to 65 mph under normal inflation and load conditions.

Vehicle Load Limits

Determining the load limits of a vehicle includes more than understanding the load limits of the tires alone.

On a trailer, there is a Federal Certification Label that is located on the forward half of the left (road) side of the unit.

The certification label will indicate the vehicle’s gross vehicle weight rating (GVWR). This is the most weight the fully loaded vehicle can weigh. It will also provide the gross axle weight rating (GAWR). This is the most a particular axle can weigh. If there are multiple axles, the GAWR of each axle will be provided.

In the same location as the certification label described above, there is a vehicle placard. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity.

Cargo Capacities

Cargo can be added to the vehicle, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded vehicle can not exceed the stated GVWR.

Water and propane also need to be considered. The weight of fully filled propane containers is considered part of the weight of the RV before it is loaded with cargo and is not considered part of the disposable cargo load. Water however, is a cargo weight and is treated as such. If there is a fresh water storage tank of 100 gallons, this tank when filled would weigh about 800 pounds. If more cargo is being transported, water can be off-loaded to keep the total amount of cargo added to the vehicle within the limits of the GVWR so as not to overload the vehicle. Understanding this flexibility will allow you, the owner, to make choices that fit your travel and camping needs. For more information on cargo weight distribution, see the section “Weight Distribution” in Chapter 4.

How Overloading Affects Your RV and Tires

The results of overloading can have serious consequences for passenger safety. Too much weight on your vehicle’s suspension system can cause spring, shock absorber, or brake failure, handling or steering problems, irregular tire wear, tire failure or other damage. An overloaded vehicle is hard to drive and hard to stop. In cases of serious overloading, brakes can fail completely, particularly on steep hills. The load a tire will carry safely is a combination of the size of tire, its load range, and corresponding inflation pressure. Excessive loads and/or under-inflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. Since RVs can be configured and loaded in many ways, air pressures must be determined from actual loads (determined by weighing) and taken from the load and inflation tables provided by the tire manufacturer. These air pressures may differ from those found on the certification label. However, they should never exceed the tire limitation for load or air pressure. If you discover that your tires cannot support the actual weights, the load will need to be lightened.

Steps For Determining Correct Load Limit

1. Locate the statement “The weight of cargo should never exceed XXX KG or XXX LBS” on your vehicles Cargo Carrying Capacity label. See “Weight Ratings - Labels” in this chapter.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

Weight Ratings & Definitions

GVWR (Gross Vehicle Weight Rating)

The maximum permissible weight of this trailer when fully loaded. It includes the maximum allowable weight at the trailer axle(s) plus the hitch (tongue/pin) weight.

UVW (Unloaded Vehicle Weight)

The weight of this trailer as manufactured at the factory. It includes all weight at the trailer's axle(s) and hitch. If applicable, it also includes full generator fluids, fuel, engine oil and coolants.

CCC (Cargo Carrying Capacity)

U.S.-Equal to GVWR minus the UVW and LP gas weight. (Water is considered a component of cargo)

Canada-Equal to GVWR minus the UVW, full fresh (potable) water weight (including the water heater) and full LP gas weight.

GAWR (Gross Axle Weight Rating)

The maximum permissible weight on an axle(s) when fully loaded.

Hitch (Tongue/Pin) Weight

The weight of the trailer that is transferred to the hitch of the tow vehicle when hooked up.

Weight Ratings - Labels

There are four labels that use weight information. They are the Federal tag, Tire and Loading Information label and the Cargo Carrying Capacity label and, in the case of a Canadian unit, a different Cargo Carrying Capacity label.

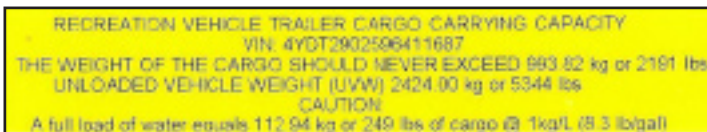
- Federal Certification Label - This label specifies maximum capacities for GVWR, GAWR and tires. It is located on exterior left front of vehicle.

MANUFACTURED BY/FABRIQUE PAR:	Keystone RV Company	DATE: 10/23/2008
	2642 Hackberry Drive	
	Goshen, IN 46526	
GVWR/PNBV	3435.96 KG (7575.00 LB)	
GAWR (EACH AXLE)/PNBE(CHAQUE ESSIEU)	1587.57 KG (3500.00 LB)	
TIRE/PNEU	205/75R14C RIMS/JANTE 14x5	
COLD INFL. PRESS/PRESS. DE GONFL. A FROID	344.74 KPA (50.00 PSI/LPC)-Single Axle	
THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. THIS VEHICLE CONFORMS TO ALL APPLICABLE STANDARDS PRESCRIBED UNDER THE CANADIAN MOTOR VEHICLE SAFETY REGULATIONS IN EFFECT ON THE DATE OF MANUFACTURE. - CE VEHICULE EST CONFORME A TOUTES LES NORMES QUI LUI SONT APPLICABLES EN VERTU DU REGLEMENT SUR LA SECURITE DES VEHICULES AUTOMOBILES DU CANADA EN VIGUEUR A LA DATE DE SA FABRICATION.		
V.I.N./N.I.V.:	4YDT2902596411687	TYPE/TYPE: TRAILER TRA/REM: PP290BH09

- Tire and Loading Information label - This label specifies the maximum amount of cargo that can be safely added to the trailer. It is located on the exterior front left of vehicle.

TIRE AND LOADING INFORMATION			
The weight of cargo should never exceed 993.82 KG or 2191 LBS			
TIRE	SIZE	COLD TIRE PRESSURE	SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION FD-235
FRONT	205/75R14C	345 KPA /50 PSI	
REAR	205/75R14C	345 KPA /50 PSI	
SPARE	205/75R14C	345 KPA /50 PSI	

- Cargo Carrying Capacity (CCC) label (US) - This label supplies the CCC information for the customer. It is located on the backside of the screen door of the main entry into the trailer.

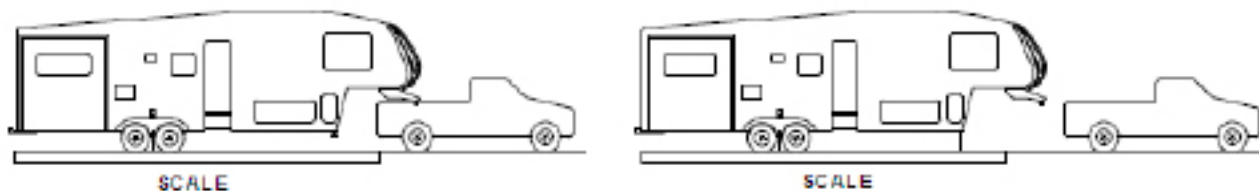


- Cargo Carrying Capacity label (Canada) - This label supplies the CCC information for the customer. It is located on the exterior front left of the vehicle, next to the Federal Certification label.

CARGO-CARRYING CAPACITY: CALCULATED WITH THE FRESH WATER TANKS FULL (COLD HOT AND THE WASTE WATER TANKS EMPTY	KG. KG. KG.)	CAPACITÉ DE CHARGEMENT: CALCULÉE AVEC LES RÉSERVOIRS D'EAU DOUCE PLEINS (FROID CHAUD ET LES RÉSERVOIRS D'EAUX USÉES VIDES.	KG. KG. KG.)
MASS OF WASTE WATER TANKS FULL:	KG.	MASSE DES RÉSERVOIRS D'EAUX USÉES PLEINS:	KG.

Weighing Your Unit

- Pull on the scales until only the trailer axles are on the scale. Record axle weight.
- Unhook the trailer on the scale to get a total weight of the trailer.
- To determine hitch weight subtract the axle weight from the total weight.
- Note: To calculate suspension weights/ratings, it is necessary to subtract the hitch weight. This weight is being carried on the tow vehicle, not by the suspension of the trailer.



If the total weight of the trailer exceeds the GVWR, the unit is overloaded. Operating your trailer while exceeding the specified weight ratings increases the risk of a crash, personal injury and death. It is necessary to remove payload (equipment, personal belongings, water, etc) until the total weight of the trailer no longer exceeds the GVWR before operating the unit.

If the weight on the trailer axles exceeds the GAWR, the axles are overloaded. Operating your trailer while exceeding the specified weight ratings increases the risk of a crash, personal injury and death. It is necessary to remove or rearrange payload (equipment, personal belongings, water, etc) until the axle weight no longer exceeds the GAWR before operating the unit. Not operating your RV within the designed weight ratings can damage to your recreational vehicle which is not covered under warranty.

Axles & Suspension

Keystone selects the axles, suspension, tires and wheels applicable to the specific application of the unit. In addition to the Gross Vehicle Weight Rating (GVWR), each of these components have specific weight ratings and limitations for proper operation.



Exceeding the established weight ratings for the axles, running gear, tires and wheels can lead to failure that can affect motor vehicle safety and lead to property damage or damage to the trailer.

Please refer to the axle manufacturer instructions supplied with the unit for care, maintenance and operation of the axles and suspension.

Suspension

In most cases, there are two types of suspension used on Keystone units, Leaf Spring or Rubberized suspension. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Shock Absorbers

If equipped, shock absorbers may provide a “ride enhancement” to the trailer. They do not affect the stability or towability of the trailer.

Spare Tire

If equipped, can be utilized in an emergency if a trailer tire loses air pressure or goes flat. Certain brands use different wheels than original with the intent for the spare to be temporary.

Tire Changing Basics

1. Use emergency flares when near a road or highway.
2. Block the wheels on the opposite side from the tire you wish to change to prevent accidental movement.
3. Position a hydraulic jack on the frame close to the spring hanger. (Never attempt to use a stabilizer jack to lift the unit)
4. Raise the trailer until the tire clears the ground.
5. Set a jack stand under the frame just to the rear of the tire being changed.
6. Follow the Wheel Nut Torque and Wheel Reinstallation instructions provided in this section.

Wheel Nut Torque

The information contained in these printed instructions outlines the most recently recommended processes involving Lug Nut Torque and takes precedent over any information regarding Lug Nut Torque shown in your Lippert, Dexter or AL-KO Owners' Manuals.



Always torque wheel nuts to the wheel manufacturer's specifications. Over or under-torqued wheel nuts can cause the wheel to separate from the wheel mounting surface during operation, causing property damage, personal injury or loss of life.

The axle and wheel assemblies of your RV are designed differently than those on your car. The overall size, weight and center of gravity of a recreational vehicle subject the wheels to pressures unique to trailering. During normal cornering, the tires and wheels experience a considerable amount of stress called “side-load”. Therefore, the lug nuts on your recreational vehicle require periodic torque maintenance.



These instructions will show you how to maintain proper lug nut torque by following these important steps:

1. Check torque before every trip
2. Use proper tools
3. Follow the appropriate star pattern sequence
4. Torque lug nuts in the correct stages and follow-up intervals after any wheel reinstallation.

Torque is the amount of rotating force applied to a fastener, such as a lug nut. Proper torque of lug nuts can only be achieved by using:

- Torque wrench (Dial indicator or Adjustable dial, not supplied by Keystone)
- 7/8” or 13/16” socket (Not supplied by Keystone)

STEP 1	Wheel Reinstallation	STEP 2	Follow-up
1	20-30 ft/lbs 50-60 ft/lbs (Cambridge)	3	110-120 ft/lbs 140-150 ft/lbs (Cambridge)
2	55-60 ft/lbs 90-100 ft/lbs (Cambridge)		
3	110-120 ft/lbs 140-150 ft/lbs (Cambridge)		

Re-torque after first:
10 miles → 25 miles → 50 miles



Some wheel assemblies require an extension. DO NOT USE a flexible extension. Also, DO NOT USE a 4-way socket or any other type of wrench which does not measure the actual pressure applied to the lug nut.

Using Torque Wrenches

- Most torque wrenches are required to be set at “0” when not in use to maintain calibration.
- Please refer to the manufacturer’s instructions for further information on care and use.

Setting Torque Value on a Dial Indicator Wrench

1. Make sure your indicator needle is set to “0”.
2. As you apply clockwise pressure to the lug nut, both needles will show the current amount of torque being applied.
3. When you reach your desired torque value, stop applying pressure and your indicator needle will stay at the highest torque value reached.

Setting Torque Value of Adjustable Dial Wrench

1. Unlock the handle and set the dial to your desired torque value.
2. Lock the handle back in place.
3. As you apply clockwise pressure to the lug nut, you will hear an audible “click” when the desired torque wrench value is reached. Do not apply further pressure once you hear the “click”.

Pre-Trip Maintenance

Always remember

- Check lug nut torque before every trip. Keystone RV recommends this maintenance procedure to ensure proper torque has been applied to lug nuts before heading out on the road.
- Lug nuts should be torqued to 110-120 ft/lbs on all units except for the Cambridge, which requires 140-150 ft/lbs. This is due to the use of a 9/16” stud versus a 1/2” inch stud used on other units.
- Always follow the appropriate star pattern as indicated in these instructions or in your axle manufacturer’s owner’s manual to assure proper torque.

Pre-Trip Procedure

1. Set your torque wrench to 110-120 ft/lbs (140-150 ft/lbs for the Cambridge).
2. Begin with the appropriate bolt for your wheel (12 o'clock position for 8 and 6 hole wheels and 2 o'clock position for 5 hole wheels, as illustrated) and apply torque to all lug nuts following the star pattern indicated.
3. Complete the procedure on each wheel. Before moving to each new wheel, be sure to verify your preset torque wrench value.



Always torque wheel nuts to the wheel manufacturer's specifications. Over or under-torqued wheel nuts can cause the wheel to separate from the wheel mounting surface during operation, causing property damage, personal injury or loss of life.

Wheel Reinstallation

After removing a wheel from your RV for any reason, you must carefully follow a 2 step process:

1. Wheel Reinstallation
2. Follow-up

Step 1) Wheel Reinstallation

During wheel reinstallation, the lug nut torque must be applied in 3 stages. This will ensure the wheel studs are centered in the wheel holes, and will help the lug nuts maintain proper torque.

Start all lug nuts by hand.

Stage 1: Set your torque wrench to 20-30 ft/lbs (50-60 ft/lbs for the Cambridge).

Begin with the appropriate bolt for your wheel (12 o'clock position for 8 and 6 hole wheels and 2 o'clock position for 5 hole wheels, as illustrated) and apply torque to all lug nuts following the star pattern indicated.

Stage 2: Increase your torque wrench setting to 55-60 ft/lbs (90-100 ft/lbs for the Cambridge).

Begin with the appropriate bolt for your wheel and apply torque to all lug nuts following the star pattern indicated.

Following stage 2, the wheel can support the weight of the trailer and can be lowered off of the jack stand.

Stage 3: Increase your torque wrench setting to 110-120 ft/lbs (140-150 ft/lbs for the Cambridge).

Begin with the appropriate bolt for your wheel (as illustrated) and apply torque to all lug nuts following the star pattern indicated.

Step 2) Follow-Up: Retorque after 10, 25, and 50 miles:

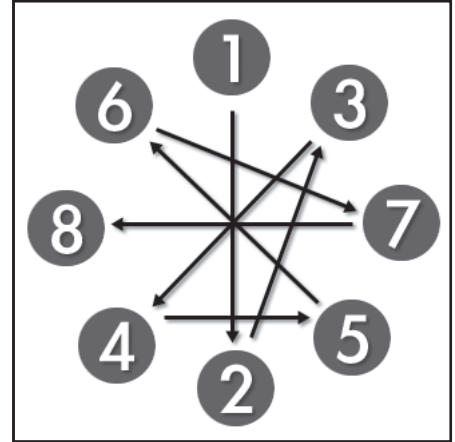
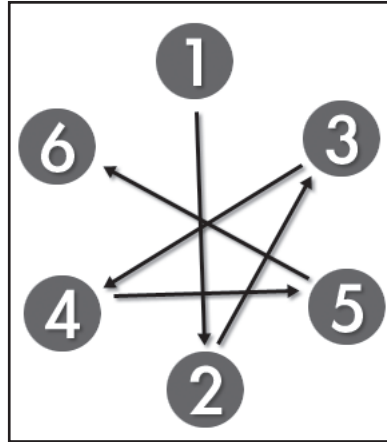
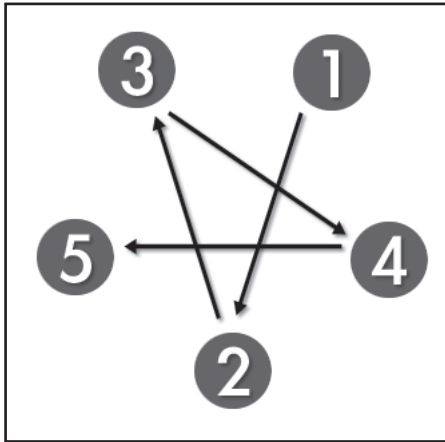
1. After the first 10 miles of your trip, pull your recreation vehicle off the road into a safe work area.
2. Set your torque wrench to 110-120 ft/lbs (140-150 ft/lbs for the Cambridge).
3. Begin with the appropriate bolt for your wheel and apply torque to all lug nuts following the star pattern indicated.
4. Reapply torque (at 110-120 ft/lbs or 140-150 ft/lbs for the Cambridge) and repeat steps 1, 2, & 3 again at 25 miles and at 50 miles of your first trip.

The follow up process is complete and you should refer to the general lug nut torque maintenance process described in "Pre-Trip Maintenance".

3 Stage Installation

- 1 20-30 ft/lbs
50-60 ft/lbs (Cambridge)
- 2 55-60 ft/lbs
90-100 ft/lbs (Cambridge)
- 3 110-120 ft/lbs
140-150 ft/lbs (Cambridge)

Wheel Nut Torque Sequence



If you are uncertain or unfamiliar with any procedure, please contact your local dealer.

Summary

1. Check torque before every trip
2. Use proper tools
3. Follow the appropriate star pattern sequence
4. Torque lug nuts in the correct stages and follow-up intervals after any wheel reinstallation.



Do not tow the trailer with missing lug nuts or faulty lug bolts. An increased risk of wheel separation will occur.

Installation of wheels which are not compatible with the manufacturer installed axle assembly could result in wheel separation, which can lead to property damage, serious injuries or loss of life.

Chapter 4: Towing Considerations

Getting Started

Tow Vehicle Selection

We recommend the tow vehicle selected have a trailer weight rating to handle at least the Gross Vehicle Weight Rating (GVWR) of the RV you have selected. Please consult with your tow vehicle's dealer for more information about the specific ratings of your tow vehicle.

Hooking up to the Tow Vehicle

Fifth-Wheel

1. Adjust the landing gear jacks until coach is at level for hooking to the tow vehicle.
2. Place wheel chocks behind fifth-wheel's tires.
3. Lower the tailgate on truck.
4. Release the fifth-wheel lock handle on the tow vehicle.
5. Back up slowly to line up the tow vehicle so the fifth-wheel will accept the kingpin.
6. Close and latch tailgate.
7. Back truck slowly until kingpin engages the fifth-wheel and automatically locks.
8. Engage the hitch lock and secure with a padlock or pin.
9. Connect the power cord between the tow vehicle and the fifth-wheel.
10. Connect the emergency breakaway switch cable.
11. Check all lights on trailer and tow vehicle (running, turn signals, brake, back-up).
12. Completely raise the landing gear and store the wheel chocks.
13. Pull forward and check the operation of the trailer brakes with the hand control to assure proper operation. Refer to manufacturer specifications on setting the brake control.

Travel-Trailer

1. Crank the tongue of the trailer jack up until the hitch coupler is high enough to clear the tow vehicle.
2. Back the tow vehicle to the trailer until the hitch ball is directly under the coupler on the trailer.
3. Set the parking brakes, raise the locking latch on the coupler and crank it down on the ball.
4. Move the locking latch down to lock it on the ball. Secure with a padlock or pin.
5. Connect the power cord between the tow vehicle and the trailer.
6. Connect the breakaway switch to the tow vehicle.
7. Install the weight distribution bars and sway control. Refer to the hitch manufacturers directions for proper hook up and adjustment.
8. Crank the jack all the way up.
9. Install and adjust side mirrors.
10. Check all lights on the trailer and tow vehicle (running, turn signals, brakes, back-up).
11. Pull forward and check the operation of the trailer brakes with the hand control to assure proper operation. Refer to manufacturer specifications on setting the brake control.

Tow Vehicle Set up

Weight Distribution

Proper weight and load distribution is absolutely essential to safe towing. Before your first trip, load your unit with the weight distributed evenly (front to rear, side to side) with all personal belongings, equipment, food, water, etc. you feel are needed and weigh the unit as shown in Chapter 3 “Weighing Your Unit”. Compare the weights of the unit to the weight ratings of the RV. **Keep the loaded tongue weight between 10% and 15% of the total weight for travel trailers and between 20% and 25% of total weight for fifth wheels.** More detailed information for Ramp Trailers can be found in Chapter 11 under the heading “Ramp Trailer Weight Distribution”.



Locate and secure cargo and vehicles to maintain safe weight distribution in the cargo area and throughout the trailer.

Improper weight distribution or overloading could lead to loss of vehicle control during travel resulting in serious injury or death.

Follow all guidelines contained in this manual for loading and weighing procedures. Maintain the loaded hitch weight within the percent levels stated above. Where applicable, a hitch with built in sway control is recommended. Do not exceed the GVWR (gross vehicle weight rating) or the GAWR (gross axle weight rating) of either the tow trailer or tow vehicle.

Brake Control

A brake control is a device that is installed in the tow vehicle that activates the electric trailer brakes. Your trailer brakes should work in synchronization with your tow vehicle brakes. Never use your tow vehicle or trailer brakes alone to stop the combined load. Your brake controller must be set up according to the brake control manufacturer's specifications to ensure proper synchronization between the tow vehicle and the trailer. Additionally, you may have to make small adjustments occasionally to accommodate changing loads and driving conditions.

Hitch Selection

The hitch must be rated over the GVWR and the hitch weight of the trailer. Weight specifications can be found at www.keystonerv.com. Keystone RV does not supply the tow vehicle hitch, weight distribution bars or the sway control. Your RV dealer will be able to help with proper hitch selection for your tow vehicle.

Weight Distribution Bars - Travel Trailer

Weight distribution bars transfer weight from the rear axle of the tow vehicle to the front axle and the trailer axles. Properly set up, they will control up and down oscillation at the hitch while towing. Weight distribution bars do not control sway. Keystone recommends weight distribution bars for safe towing. Your dealer will be able to assist with proper selection for your specific tow vehicle and travel trailer setup.

Sway Controls - Travel Trailer

A sway control device is installed by dealers as part of the hitch set up and prevents sway (or fishtailing) while towing. Keystone recommends a sway control device that will prevent sway (or fishtailing) for safe towing. If you experience sway while towing, contact your dealer immediately for corrective action. Some less expensive brands of sway control are not adequate to control sway in larger travel trailers. The sway control must be properly set up for it to be effective. Your dealer will be able to assist with proper selection for your specific tow vehicle and travel trailer setup.

Safety Chains - Travel Trailers

Safety chains are included with every travel trailer and, in most states, are required when towing a travel-trailer. Hook them to the safety chain loops provided on the tow vehicle's hitch, crossing them under the trailer tongue. Inspect the length of the chains once attached to the tow vehicle frame. They should be long enough to allow for turns, but short enough to avoid any drag.



Always use safety chains when towing. They maintain the connection between the travel trailer and tow vehicle in the event of the trailer becoming detached during travel.

Breakaway Switch

The breakaway switch is another safety device as it provides a means of automatically slowing and stopping your RV if it should become detached from the tow vehicle during transit. The cable from the breakaway switch should be attached to the tow vehicle and if a separation occurs, the pin is pulled out of the switch which activates the brakes of the trailer to slow and eventually stop the trailer. The breakaway switch is only powered by a 12 volt RV battery on the trailer. The RV battery is not supplied by Keystone. Please consult your RV dealer to purchase the proper battery.

How to Test the Breakaway Switch

1. Disconnect the 7-way trailer cord from the RV to the tow vehicle
2. Pull the lanyard pin out to the first stage
3. Brakes should audibly engage
4. Double check by moving the tow vehicle forward slightly to be sure the RV brakes have locked and are operating correctly

NOTICE

Disconnect the seven-way trailer cord from the tow vehicle prior to testing the breakaway switch. Failure to do so may cause damage to the brake controller.

Lights

Check all electrical connections to ensure all lights on the tow vehicle and travel-trailer are functioning properly. The brake lights, hazards and turn signals should be in synchronization with the tow vehicle. See "7-way Plug" in Chapter 7.

Mirrors

Adjust the mirrors on the tow vehicle prior to departure. Having someone to assist you will make this safety step quick and easy. First line up the tow vehicle and trailer. Next, sit in the driver's seat and adjust the left mirror to where you can see the entire left side of the trailer and well beyond. Finally, while still sitting in the driver's seat, have someone adjust the right mirror until the same result is achieved. Some vehicles may require the use of mirror extensions to properly see down the side of the trailer. See your Keystone dealer for recommendations.

Also to consider

- Crank the TV antenna down into the travel position.
- Disconnect all park connections and securely store.
- Close and secure all doors, windows, awnings and roof vents
- Return the entry step to the travel position.
- Refer to the "Pre-Travel Checklist" located in the Appendix

Towing

Towing a recreational vehicle can be enjoyable if special attention toward safety is applied every time you tow your trailer. Before heading out on your first camping trip practice turning, stopping and backing in low traffic areas or large parking lots.

Driving with a trailer in tow is different. Start out slowly, checking the traffic after signaling and being sure the road is clear. Accelerate slowly and evenly, checking the mirrors frequently as you move into the proper lane. Try to drive with an anticipation of problems that may occur way ahead and prepare for them, even though they may never happen.

As a motorist sharing the road, you are taller, heavier, longer and require more time and distance to stop. Weather and road conditions will require adjustments to speed. Anticipate dips, gutters, and depressions in the road, slowing down well in advance, these are the hardest jolts of any kind on your vehicle, hitch, recreational vehicle and items stored inside the unit. Take dips and bumps slowly and be certain the trailer wheels have passed the point before accelerating.

Controlling Sway or Fishtailing

Sway or fishtailing is the sideways action of a trailer caused by external forces. It is common for travel trailers to sway in response to strong winds or crosswinds or when passed by or passing a semi-tractor and trailer or driving downhill.



Excessive sway or fishtailing of your travel trailer can lead to the rollover of the trailer and tow vehicle. Serious injury or death can occur. It is important that you read and understand the information in this section.

Sway or fishtailing of your recreation vehicle can be controlled and is primarily impacted by four factors:

- Equipment
- Tongue weight
- Driving
- Corrective measures

Equipment – When hitched together, the trailer and the tow vehicle must be level. The tires of both the trailer and tow vehicle should be in good condition and inflated to the pressure recommended as noted on the tire placards of the trailer and tow vehicle. See “Hitch Selection”, “Weight Distribution Bars”, & “Sway Controls” in this chapter for more information on equipment to control sway.

Tongue Weight - See “Weight Distribution” in this chapter for information on maintaining proper tongue weight.

Driving – This is the most important component. The tendency for the vehicle to sway increases with speed therefore, obey all speed limits and reduce speed during inclement weather or windy conditions.

Corrective measures – If sway occurs the following techniques should be used:

1. Slow down immediately, remove your foot from the accelerator. Avoid using the tow vehicle brakes unless there is a danger of collision. Reduce speed gradually whenever possible. If you can do so safely, use the brake hand controller (independent of the tow vehicle brakes) to gently and progressively apply the trailer brakes. This will help to keep the vehicles aligned. Practice using the brake hand controller on a deserted parking lot. Don't wait until an emergency occurs before using it. Location of the brake hand controller is important and should be made easily accessible.
2. Steer as little as possible while maintaining control of the vehicle. Because of natural reaction lag time, quick steering movements to counter trailer sway will actually cause increased sway and loss of control. Keep both hands on the wheel. Hold the wheel as straight as possible until stability is regained.
3. Do not jam on the brakes or attempt to press on the accelerator to speed your way out of the fishtailing. Both actions make the situation worse and could cause severe injury or death.

4. Once the swaying is under control, stop as soon as possible. Check tire pressures, cargo weight distribution and look for any signs of mechanical failure. Travel at reduced speeds that permit full control until the problem can be identified and corrected.

Backing

Back with care. Having a person outside to assist is a good idea. If no one is available to help, the driver should inspect the area behind the vehicle to avoid any unseen obstacles and unpleasant surprises.

Braking

Start braking sooner than you would if driving without a trailer in tow. Stopping distances are increased while towing a trailer. See “Brake Control” in this chapter.

Passing and Accelerating

Remember when you pass another vehicle that it takes longer to accelerate and additional time must be allowed due to the added length of the trailer. Passing should be done on level terrain and downshift, if necessary for added acceleration. Whenever deciding to pass another vehicle, exercise caution and always use the turn signals.

Sharply Winding and Narrow Roads

Keep well to the center of the lane, equally away from both the center line and pavement edge. This allows the trailer to clear the edge of the pavement without the likelihood of the wheels dropping onto the shoulder, causing potential dangerous sway. Do not crowd or cross the center line.

Steep or Long Grades

Down shifting into a lower gear or range in advance assists braking on descents and adds power on the climb. Avoid situations that require excessive and prolonged use of the brakes. Apply and release brakes at short intervals to give them a chance to cool.

Slippery Pavement

On slippery and icy pavement, reduce speed and drive slowly. Hydroplaning can occur with little water on the pavement. If skidding begins, remove your foot from the throttle and gently apply the trailer brakes only.

Freeways and Highways

Try to pick the lane in which you want to move and stay in it, preferably keeping to the slower lane on the right.

Turning Corners

Here is where you find a first basic difference when towing. The trailer wheels do not follow the path of your tow vehicle's wheels. The trailer will make a closer turn than the tow vehicle. Compensate by pulling further into the intersection so that the trailer will clear the curb or clear any parked vehicles along the road. Left turns require a wider than normal swing into the new lane of traffic to keep the trailer from edging into the opposing lane. Use the turn signals early to communicate to traffic behind and slow down well in advance.

Mud and Sand

Let the momentum of the tow vehicle and trailer carry you through. Apply power gently and stay in the tracks of the previous vehicle. If stuck, tow the trailer and tow vehicle out together without unhitching.

Additional towing safety information can be found at the National Highway Traffic Safety Administration's web site.
<http://www.nhtsa.dot.gov/Cars/problems/Equipment/towing/Towing.pdf>

Chapter 5: Unit Set Up at Destination

Site Requirements and Selection

Electrical

Do you need 30 or 50 amp service? What will you be running in the camper will help decide this. If you will be running one roof a/c, refrigerator and converter most of the time and the microwave periodically, we would recommend at least 30 amp service. You may not be able to run the microwave and roof a/c at the same time, but it is easy to adjust the thermostat of the roof a/c so it will not be running while the microwave is. Two roof a/c's will need 50 amp service. Please refer to Chapter 7 Electrical Systems for an amperage consumption chart which will help decide your needs.

Antenna/Satellite

If equipped, be sure your selected site will allow you to set-up to get these signals.

Sewer

Holding tank sizes can vary significantly by brand and floor plan. How large are your holding tanks? How long and how many people will be using the facilities? How much water is typically used? Answering these questions will help you decide if you should go for the added cost of a sewer hook up at your campsite. You might just consider a site closer to the campground facilities. If you do choose a site with a sewer hook up, DO NOT leave the valves open. Please refer to Chapter 9 Plumbing for more detail.

Water

In most instances, water and electric come in combination. Should you be without a water source for city water, you can fill your water tank and utilize the on board water pump. Once again, holding tank sizes can vary significantly by brand and floor plan so know how many gallons your fresh water tank is and monitor how many people are using the facilities and how often so you don't leave yourself dry.

Campsite

Many campsites offer 'pull through' sites that require no backing up. When you do not have this option and backing will be required, set yourself up to back into the site from the left. This allows you to see the entire "Drivers Side" while you are backing into your site. Backing in from the right can be done, you are just not able to see as well. Before beginning, safely park and survey the campsite for fire pits, stumps, posts, trees, low tree branches, etc and decide where you want the camper to end up. Use a spotter to help guide you into position. If you are alone, ask a neighbor for some help, you might meet a new friend.

While entering and exiting your campsite, be careful not to cut your turn short and clip something. Once again, we recommend a spotter to assist.

Unit Set Up

Once you have arrived and parked in your campsite, before removing the camper from your tow vehicle, your camper needs to be leveled to assure proper operation of certain features (refrigerator, slide-outs, etc.)

Leveling Procedures

1. Choose a site that is as level as possible (Some sites are equipped with a prepared surface such as concrete or asphalt). Ensure the ground is not soft and will support the weight of jacks and/or other support devices.
2. Before uncoupling, level the unit from side to side with suitable lengths of 2" x 6" wood blocks under the tires. Place the wood blocks on the ground forward of the wheels and tow the unit onto the blocks. Use wheel chocks to be sure the unit cannot roll.
3. Use a small level in the refrigerator, on a counter top or floor of the trailer to make sure it is level.
4. Lower the A-frame jack (Travel Trailers) or landing jacks (Fifth Wheel) onto wood blocks (or other).
5. Once the unit is level, put wheel chocks or blocks in place so the unit can't move, uncouple the unit from the tow vehicle.
6. If equipped, lower the stabilizing jacks onto blocks until they firmly engage. Be sure all 4 jacks have about the same pressure on them as to not put the unit in a twist. Doing so can cause slide-outs, doors, etc. to bind and/or operate intermittently. DO NOT attempt to lift the unit with the stabilizer jacks. These are not designed to bear weight, only help stabilize the unit from movement.
7. Before resuming travel, be sure the stabilizer jacks are fully retracted.

Stabilizing Jacks

Dependent upon the type (travel-trailer / fifth-wheel), product and model purchased, the stabilizer jacks included will vary. Although stabilizer jacks come in different types and sizes, all perform the same function: To stabilize the front and rear of all recreational vehicles while parked for camping. DO NOT attempt to lift the unit with the stabilizer jacks. These are not designed to bear weight, only help stabilize the unit from movement.

Hook Ups

1. Once the unit is safely leveled and stabilized, continue with set-up;
2. Connect the shore-line cord
3. Open the step.
4. Inside, set the Thermostat to the desired temperature (air conditioning/furnace), open a roof vent and turn on the fan (if applicable) to create air exchange, turn on the refrigerator then complete the remainder of the set up.
5. Turn on the LP
6. Connect the water hose
7. Connect the sewer hose, park cable, (if applicable)
8. Open slide-outs
9. Set up the remaining features as needed

Chapter 6: Appliances and Equipment

NOTE: In this section of the manual, we rely on the component manufacture manuals that have been supplied with the RV for detailed operating instructions. Keystone can only provide a summary operational description and recommend you review each of the component manuals before use of the component.



IF YOU SMELL PROPANE

- 1. Extinguish any open flames, pilot lights and all smoking materials.*
- 2. Do not touch electrical switches.*
- 3. Shut off the propane supply at the container valve(s) or propane supply connection.*
- 4. Open doors and other ventilating openings.*
- 5. Leave the area until the odor clears.*
- 6. Have the propane system checked and leakage source corrected before using again.*

FAILURE TO COMPLY COULD RESULT IN EXPLOSION RESULTING IN DEATH OR SERIOUS INJURY.

Portable fuel-burning equipment, including wood and charcoal grills and stoves, must not be used inside the recreational vehicle. The use of this equipment inside the recreational vehicle may cause fires or asphyxiation.

Safety

Always follow the manufacturers' instructions on the use of all appliances and observe all safety warnings and instructions included.

Before camping, all campers should review and understand the locations of all safety equipment inside the coach and all emergency exit windows as well as doors. An escape plan for emergencies whether at home or camping is always a good idea.

Propane Appliance Maintenance

Follow the instructions and warnings noted in the appliance and equipment owner's manual as well as the ones listed below:

- Annual maintenance should be conducted on the propane appliances and equipment by an authorized dealer or repair facility.
- Insects can build nests in the burners of the various appliances and equipment. The burner and burner orifice of the propane appliances and equipment should be cleaned out by an authorized dealer or repair facility anytime circumstances or conditions warrant, but no less frequently than on an annual basis.

Air Conditioner (Optional)

For those units equipped with roof mounted air conditioners, they operate on 110V AC power. There are different sizes and variations available depending on the unit. An air conditioner takes a sizable amount of power to run. Most RV electrical systems are designed with 30 amps of available power with some having 50 amp capability (See Chapter 7, Electrical Systems). It may be necessary to reduce other loads when using air conditioning to reduce the chance of overload and possibly tripping the main breaker. (For thermostat operation on the air conditioner, see "Thermostat" in this section).

In climates that experience high temperatures, a second air conditioner may be necessary to maintain a comfortable indoor temperature on larger trailers. A second air conditioner requires 50 amp service.

Capability vs. Environment

At best, a properly functioning roof air conditioner will cool the intake air it receives by 20 degrees F. The capability of the air conditioner to maintain the desired inside temperature is directly effected by the heat gain of the RV.

During extreme high outdoor temperatures, the heat gain of the vehicle may be reduced by:

1. Parking in a shaded area
2. Keeping blinds down or drapes shut
3. Operation on High Fan/Cooling mode will provide the maximum efficiency in high humidity or high temperatures
4. Using awnings to block direct sunlight exposure on the unit
5. Avoiding use of heat producing appliances
6. Giving the A/C a “head start” by turning the air conditioner on early in the morning



Never run the A/C without the filter. This could plug the unit evaporator substantially effecting performance.

Antenna (TV)

The two (2) primary components are the Antenna and the Booster. The booster will be typically located near one of the TV locations and has switch to turn it on & off. The booster is designed to amplify the TV (Air) signal. The antenna is designed to capture the best signal available by moving it to the optimal position. If your unit is equipped with “Cable”, the booster must be off for the “Cable” signal to reach your desired TV locations.

Before raising the TV Antenna, be sure the area is clear of any electrical wires or other obstructions. Also, be sure to properly stow the antenna before moving the unit. Please refer to the Antenna manufacturer instructions supplied with the unit for care and operation.



Do not raise TV antenna near overhead electrical wires as contact may cause injury or death.

Awning, Patio

If equipped, Keystone RV Company uses a variety of styles and sizes of awnings. They are primary designed as a sun/rain protection. During any rain it will be necessary to tilt one end of the awning for proper water run off and/or store the awning. Typically the end farthest away from the entry door is tilted so the door won't hit and damage the awning fabric when it is opened and closed. Awnings that experience damage from wind or rain are not considered warrantable. Please refer to the Awning manufacturer instructions supplied with the unit for care and operation.



It is best to close the awning when unattended. Damage to the awning due to wind, rain or any weather condition is not covered under warranty by Keystone or the awning manufacturer.

Awning, Electric Patio

If equipped, this awning can be extended and retracted electrically. This awning may or may not have tilt functionality. Awnings without tilt functionality will need to be stored during any rain. For awnings equipped with tilt functionality, during rain, it will be necessary to tilt one end of the awning for proper water run off and/or store the awning. Please refer to the awning manufacturer instructions supplied with the unit for care and operation.



An awning damaged from wind or rain is not covered under warranty even if it was tilted. The safest way is to put it away if you are unsure.

Awning, Slide-Out (Optional)

If equipped, a slide-out awning will automatically open and close along with the slide-room. Fully extended the awning is level, which may cause water to puddle on top of the canopy. As the slide-room is closed, the awning will roll up and cause any puddles to spill over the sides of the awning. Before retracting the slide-room, check to make sure the slide out awning is free of any debris (leaves, twigs, etc.), which can damage the awning or slide-room components. Please refer to the manufacturer instructions supplied with the unit for care and operation.



DO NOT attempt any repairs to any awning. The awning roller tube is under extreme spring tension. Repairs should only be performed by an authorized dealer / repair center.

Backup Monitor

If equipped, the back up monitor will allow you to see directly behind your trailer. Please refer to the manufacturers instructions supplied with the unit for care and operation.

Cable Hook-Up

If equipped, locate the exterior hookup on the side of the recreational vehicle. Attach the cable source to the cable jack on the unit. The TV Antenna booster must be off for the cable signal to reach the TV location.

Carbon Monoxide (CO) Detector

For your safety, a carbon monoxide (CO) detector is installed in every unit. The CO detector is wired so that it will be powered by an RV battery (if equipped) or by 12V power from the converter when plugged in or with the generator running. Please refer to the manufacturer instructions supplied with the unit for Care & Operation.

Common sources of CO are malfunctioning or misuse of gas appliances, vehicle engines, generators and many other fuel burning products.

Some indications of CO poisoning include (but not limited to) the following:

Mild Exposure

- Symptoms of the flu (minus a fever)
- Slight Headache
- Dizziness
- Fatigue



If the alarm sounds, exit the vehicle immediately. The CO build-up may dissipate before help arrives, but may be only temporarily solved. It is crucial that the source of the CO is determined and repaired.

Medium Exposure

- Severe Throbbing Headache
- Drowsiness
- Confusion
- Fast Heart Rate

Gasoline generators and LP generators and appliances produce carbon monoxide. Carbon monoxide can be fatal! When the device detects carbon monoxide in the air it will sound. Consult the individual detector's user manual for specific instructions and / or audible warning meanings.

Extreme Exposure

- Unconsciousness
- Convulsions
- Cardio-respiratory Failure
- Death

The CO alarm can only warn you in the presence of CO. It does not prevent CO from occurring nor can it solve an existing CO problem.

For your safety and to keep your carbon monoxide alarm in good working order, follow the steps below.

- Verify the unit alarm, lights and battery operation by pushing the "Test" button weekly
- Vacuum the CO alarm cover with a soft brush attachment once a month to remove accumulated dust

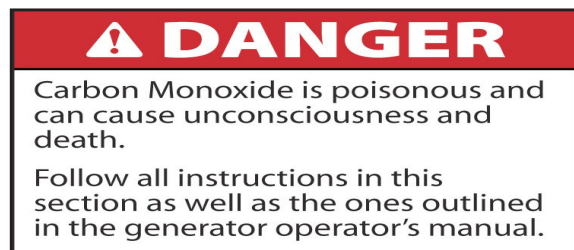
- Instruct children never to play with the CO alarm. Warn children of the dangers of carbon monoxide poisoning
- Never use detergents or solvents to clean the carbon monoxide alarm
- Avoid spraying paint, hair spray, air fresheners or other aerosols near the CO detector
- Do Not paint the CO detector. Paint will seal the vents and interfere with the sensor ability to detect CO.
- Do not place near a diaper pail.
- Test the alarm operation after your coach has been in storage, before each trip and at least once a week during the camping season.
- Replace the CO detector when recommended by the manufacturer (typically every five years).

Generator (Optional)

IMPORTANT: MAKE SURE TO READ AND UNDERSTAND THE GENERATOR OWNER'S MANUAL BEFORE OPERATING THE GENERATOR. Observe all operating instructions and warnings as well as all recommended maintenance schedules and procedures.

If equipped, a generator can provide you flexibility when you are unable to plug your shoreline cord into a power source. When running, the generator supplies 120V power to the unit very similar to having your shoreline cord plugged in to the campground. In order to operate, it requires 12V power and a fuel source to burn (gasoline or propane depending on the application). Please refer to the manufacturer instructions supplied with the unit for care and operation.

The onboard generator makes your RV fully self-contained. It allows you access to 120 volts when there is no shore power available, but keep in mind that carbon monoxide is deadly! NEVER sleep in the RV with the generator running! Before you start and use the generator inspect the exhaust system. Do not use it if the exhaust system is damaged. Test the carbon monoxide detector every time you use the RV. Know what the symptoms of carbon monoxide poisoning are. See “Carbon Monoxide Detector” section for further information.



If you or anyone else experience any of these symptoms get to fresh air immediately. Shut the generator down and do not operate it until it has been inspected and repaired by a professional. If the symptoms persist seek medical attention.

1. DO NOT operate the generator while sleeping. You would not be aware of exhaust entering the recreation vehicle, or alert to symptoms of carbon monoxide poisoning.
2. Never store anything in generator compartment. Always keep compartment clean and dry.
3. DO NOT operate the generator in an enclosed building or in a partly enclosed area such as a garage.
4. Review the safety precautions for fuel and exhaust fumes elsewhere in this manual.
5. DO NOT operate the generator when the recreation vehicle is parked in high grass or brush. Heat from the exhaust could cause a fire in dry conditions.
6. Never operate your tow vehicle or generator engine, or the engine of any vehicle, longer than necessary when the vehicle is parked.
7. DO NOT simultaneously operate generator and a ventilator which could result in the entry of exhaust gas. When exhaust ventilators are used, we recommend that a window on the opposite side of the unit “upwind” of exhaust gases be opened to provide cross ventilation.

8. When parked, orient the vehicle so that the wind will carry the exhaust away from the vehicle. DO NOT open nearby windows, ventilators, or doors into the passenger compartment, particularly those which can be “down wind”, even part of the time.
9. DO NOT operate the generator when parked in close proximity to vegetation, snow, buildings, vehicles, or any other object could deflect the exhaust under or into the vehicle.
10. DO NOT touch the generator when running, or immediately after shutting off. Heat from the generator can cause burns. Allow the generator to cool before attempting maintenance or service.

Furnace

The furnace is a propane gas appliance that requires 12 volt power to electronically light. New furnaces sometimes emit smoke and an odor during the first 5 - 10 minutes of initial use due to paint burning off the heating chamber. Do not mistake this for a malfunctioning furnace. Follow the suggestions in Chapter 2 regarding maintaining Indoor Air Quality if this occurs. Please refer to the manufacturer instructions supplied with the unit for care and operation.



ALL PILOT LIGHTS, APPLIANCES AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS) SHALL BE TURNED OFF BEFORE REFUELING OF FUEL TANKS AND/OR PROPANE CONTAINERS. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

Do not store gasoline or any other flammable vapors or liquids in the vicinity of any appliance.

Thermostat - Wall Mounted

If equipped, a wall mounted thermostat can be for furnace only or a combination air conditioner / furnace thermostat. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Thermostat - Remote Control

If equipped, a remote control thermostat can control the furnace and air conditioner. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Fireplace (Optional)

If equipped, a fireplace requires 120V to operate. Please refer to the manufacturer instructions supplied with the unit for care and operation. **DO NOT** leave the fireplace unattended while in operation.

Microwave / Convection Oven (Optional)

If equipped, microwaves operate on 120V power. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Oven Or Cooktop (Range)

If equipped, the oven and/or cooktop can be used for general baking. It requires propane gas to operate. Some models require a pilot to be lit while others light electronically using 12V. Please refer to the manufacturer instructions supplied with the unit for care and operation.



IT IS NOT SAFE TO USE COOKING APPLIANCES FOR COMFORT HEATING. Cooking appliances need fresh air for safe operation. Before operation:

1. *Open overhead vent or turn on exhaust fan.*
2. *Open window.*

FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

Range Hood

The range hood operates on 12V power and should be used to ventilate when cooking. Operational switches for the fan and / or light are on the front panel of the range hood. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Range / Cook-Top (outside)

If equipped, this feature typically is located behind a compartment door and slides out or folds down. There is a quick disconnect LP connection near the frame in the vicinity of the appliance. Please refer to the manufacturer instructions supplied with the unit for care and operation.



DO NOT leave the cook top unattended while in use. If windy conditions cause the flame to invert into the cook top, stop using immediately. Continued use will result in heat build up in the cook top causing damage to the cook top and increased risk of fire.

DO NOT use oversize cookware. The cookware should not be more than one inch larger than the burner grate. The maximum size cookware is 10 inches in diameter. Oversize cookware will result in heat build up in the cook top causing damage to the cook top and increased risk of fire.

DO NOT use cookware that covers more than one burner at a time. Oversize cookware will result in heat build up in the cook top causing damage to the cook top and increased risk of fire.

FOLLOW all warning labels on the cook top and in the manufacturers instructions supplied with the unit.

Refrigerator

The refrigerator can operate on 120V or on LP gas (requires 12V to light). The unit must be level to operate properly. Please refer to the manufacturer instructions supplied with the unit for care and operation. The refrigerator will operate most efficiently when:

1. The unit is level
2. It is allowed 4 hours to cool prior to putting items in it.
3. The items are already cold or frozen before putting them in the refrigerator



ALL PILOT LIGHTS, APPLIANCES AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS) SHALL BE TURNED OFF BEFORE REFUELING OF FUEL TANKS AND/OR PROPANE CONTAINERS. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

Do not store gasoline or any other flammable vapors or liquids in the vicinity of any appliance.

Refrigerator-Residential Style

By design, these refrigerator's will not operate properly when indoor air temperatures exceed approximately 110 degrees Fahrenheit. In addition, operating the refrigerator in these conditions could cause compressor failure which may not be considered warrantable. Leave the air conditioner set at a temperature below this if the refrigerator is left running in a vehicle that is not being used or shut it off.

Remote Control System

If equipped, the remote control fob will operate any or all of the following: slide out, jacks, awning, ramp door, and lights. Use caution when operating these items with the remote and always watch the component being operated to be sure adequate clearance is available to open or close the component. Individual remote controls may also be provided with the stereo, TV, DVD, & etc.

Roof Vents (Power/Manual)

If equipped, a powered ceiling vent fan runs on 12V. This equipment is an excellent tool in help manage indoor air quality (See Chapter 2). Please refer to the manufacturer instructions supplied with the unit for care and operation.

Satellite

If equipped, please refer to the manufacturer instructions supplied with the unit for Care & Operation. When selecting your campsite, make sure you have a clear line of site (no obstruction from trees, etc) to the southwest so you can obtain the satellite signal.

Televisions

If equipped, please refer to the manufacturers instructions included in the unit for care and operation. The typical operation temperature range for a LCD TV is 41 deg F (5 deg C) to 104 deg F (40 deg C).

Washer/Dryer Ready

If equipped, there are 3 ways this option can be plumbed to drain.

1. It could be routed into the Gray water holding tank.
2. It could be routed into the Black water holding tank.
3. It could be routed directly to a termination valve and not to any holding tank.

This is determined floor plan to floor plan so be sure to verify which scenario applies to you should you have a dealer install a Washer/Dryer in your unit. Some Washer/Dryers will cycle as much as 30 gallons of water for one load of laundry. Be sure to know your holding tank sizes and holding tank levels prior to operating the Washer/Dryer if routed into a tank. If routed directly to a termination valve, be sure the sewer hose is connected (to an approved dump station) and the termination valve is open before operating.



Operating a Washer/Dryer without opening the termination valve or without ample storage capacity in a holding tank can lead to the unit being flooded with gray water and damage to the trailer which is not considered warrantable.

Egress Windows

Egress or “Emergency Exit” Windows are labeled from the factory with the word EXIT. All Egress windows can be distinguished by red operational handles or levers. Dependent upon the window type, an egress window may be a large section or an entire window. Review the locations and operational instructions posted upon the window with all people staying in the trailer.

Fire Extinguisher

Each recreational vehicle includes a fire extinguisher, which is located near the main entry door. The fire extinguishers are rated for Class B (gasoline, grease, and flammable liquids) and Class C (electrical) fires. Please refer to the manufacturer instructions supplied with the unit for care and operation.

Smoke Detector

For your safety a smoke detector is installed in every unit. Most detectors are powered by a 9-Volt battery that requires replacement periodically. Please refer to the manufacturer instructions supplied with the unit for care and operation.



TEST SMOKE ALARM OPERATION AFTER VEHICLE HAS BEEN IN STORAGE, BEFORE EACH TRIP, AND AT LEAST ONCE PER WEEK DURING USE. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

Elevated Beds And Electric Bed Lift Systems



Each vehicle with elevated beds has a warning label listing the maximum load capacity. Failure to comply with the load capacity could cause bed failure which may result in injury.

Bed(s) must be stowed in the up position during travel.

Elevated beds may present a fall hazard which may result in injury. Please follow the guidelines below regarding elevated beds and the use of bed rails.

Standard Elevated Beds – Various Keystone RV products are equipped with standard built-in elevated beds or bed loft areas. These beds can be upwards of 4 to 5 feet above the floor level and are often enclosed on one, two, or three sides and sometimes even partially on a fourth side. Because there are so many potential users and different types of elevated bed designs, elevated beds are not equipped with bed rails.

Electric Bed Lift Systems – Many of the Keystone RV Sport Utility Trailers/Ramp Trailers come equipped with rear cargo area electric bed lift systems. (See the label in the Ramp Trailer for proper operation of the rear cargo area electric bed lift systems). The bottom beds in some floor plans also can be converted to dual sofas. Again, like the standard built-in elevated beds, because of the design and the various uses, the rear electric beds are not equipped with a bed rail system.

Use of Bed Rails – We feel that you, as the customer, are best equipped to determine if a bed rail system is necessary or best for you based on your intended uses, the actual users of the elevated beds, and the comfort level of the users. For those customers who would prefer using an elevated bed with a bed rail, there are numerous bed rail styles, sizes, heights, and designs available, even in the style of bumpers, which can be purchased at various retail locations and/or on the internet.

When installing a bed rail please make sure that you follow the manufacturer's installation instructions carefully and that you take in to account the size and height of the mattress (either originally installed by Keystone RV or later replaced by you) so that the rails are the appropriate height above the top of the mattress. This is important because residential mattresses differ in size from the RV mattresses originally installed by Keystone RV. Please also make sure that the bed rail you select allows for adequate room to get in and out of the elevated bed after installation, especially in the event of an emergency.

Tips for Safe Usage:

- Please use sound judgment when allowing children to sleep in any style of elevated bed. Generally, it is not suitable for children under the age of 6 to sleep in an elevated bed or bed loft area.
- Discuss proper usage of any elevated bed/electric bed lift system with your children and make sure they are supervised if playing in the bedroom/sleeping area of the trailer with elevated beds. Please do not allow horseplay on or under the elevated beds and no items such as hooks, belts, jump ropes, or towels should hang from any part of the elevated bed.
- Place a night light in the bedroom/sleeping area so users can see at night when getting in and out of the beds.
- No more than one person should be in an elevated bed at once and make sure you follow the weight restrictions posted on the warning label near the beds.
- Do not allow children to operate the rear cargo area electric bed lift systems in Ramp Trailers. The lowering and raising of the electric beds should be only conducted by an adult. No person should be on the electric beds when being lowered or raised.

If you have any questions about elevated beds, Ramp Trailer electric bed lift systems, or bed rails please contact Keystone RV Customer Service.

Chapter 7: Electrical System

The electrical system in your unit is a combination 12 Volt DC (Direct Current) and 120 Volt AC (Alternating Current) system. In simpler terms, the 12 Volt system is what an automobile uses and the 120 Volt system is what most households use. Every facet of the electrical system is built to the Recreational Vehicle Industry Standard (RVIA) which complies with the “American National Standard #A119.2” and the “National Electric Code.”

12 Volt System - DC

The 12 Volt system can be powered in three different ways: a RV battery (not included by Keystone), the converter changing 120V AC to 12V DC or by the tow vehicle’s 12 Volt system. Almost all equipment except the microwave and roof air conditioner operate using 12V.

RV Battery

The heart of the 12 Volt system is the RV battery so choose yours wisely. Your battery is essentially a storage device for electrical energy. We recommend a RV / Marine Deep Cycle battery for our applications. Before you select your battery, define your camping needs thoroughly. For example, if you will typically camp with access to 120V to plug in the shoreline cord, a standard deep cycle battery should suffice. If you will be camping without access to 120V and will rely heavily on battery to run the many features in your unit, you need to consider a deep cycle battery that has considerable amperage available or possibly installing 2 batteries for your needs.

A well charged and maintained battery is critical for proper operation of the appliances and features within your unit. A battery which is not well charged and maintained can cause intermittent or failure of operation with most of the 12V components in your unit. Follow the charging and maintenance instructions closely for the battery you select.

Your Keystone RV will charge your RV battery when plugged into the tow vehicle and when the shoreline cord is plugged into a 120V power source.

120 Volt System - AC

The 120 Volt system is supplied by plugging the Shore line cord (power cord) into an outside power source (campground, house, etc.) or running the generator if equipped. Once connected or powered, the unit is furnished with power to operate the roof air conditioner(s), microwave, and 120V receptacles throughout the unit. If equipped, some refrigerators and water heaters can run from 120V power in addition to 12V and LP.

Shore Line Cord / Power Cord

The shore line cord is a heavy-duty cable with a 3 or 4 prong grounding plug on one end and connects directly to the power converter inside the unit on the other end. This cord is used to plug into an external 120V source. Depending on the application, we use a 30 amp (3 prong) or a 50 amp (4 prong) shore line cord.

30 Amp Service

30 amp service is the most common in the RV industry and used widely in campgrounds. 30 amp service is 120 Volt service limited to a total of 30 amps of power at one time if your shore line cord is plugged into a 30 amp service. With this service, you will be able to run any single appliance in the unit, however, you may not be able to run a certain group or equipment/appliances at the same time.

For instance, most air conditioners will draw up to 15 amps and a Microwave about 10 amps. While running the air conditioner if you turn the microwave, it may blow a breaker either in the trailer or at the pole. This is because the air conditioner and the microwave draw 25 amps combined and the converter (which runs continuous) is drawing an additional 5 - 13 amps depending on the 12V load (battery charging, lights, etc.). Also consider common loads such as the refrigerator, water heater, coffee maker, and other appliances.

Following is a reference chart to show typical amperage draw on common appliances. It is recommended to operate the water heater on gas only when using other high amp draw appliances to prevent tripping of breakers.

50 Amp Service

If equipped, a 50 amp shore line cord utilizes four wires. With the 50 amp service, two of the four wires carry 120 Volts at 50 amps each when plugged into a true 50 amp power source. 50 amp service gives the versatility to operate more components simultaneously because more power is available. Keep in mind, it is not unlimited and it still may be necessary to choose between your equipment based on the power available. Please use the chart supplied as a reference.

Do not plug any shore cord in while under load. Make sure all appliances are turned off prior to connecting shore cord.

APPLIANCE	AMPERAGE CONSUMED
Roof Air Conditioner (Continuous)	13 - 15
Convection Microwave	16
Electric Water Heater	10
Microwave	10
Converter 55 Amp Output	5 - 13
Space Heater	10-15
Washer/Dryer	10
Refrigerator	3 - 4
TV or VCR	1
Hair Dryer	9
110 Volt Light	1
Curling Iron	3 - 4
Toaster (2 slice)	7 - 13
Coffee Maker	7

Available Power

The power system in your RV is only as good as the power supply feeding it. If the campground has only 30 amp service available, an RV with 50 amp service will only be able to use 30 amps of service. Some campgrounds have only 15 amp service available which is not adequate to properly run an air conditioner or certain other appliances. The best way to know what amperage is available is to call ahead to the campground. There are special adaptors available through your local Keystone dealer to make these connections to campgrounds with lower service ratings.

Adapters/Reducers

These devices connect to the shore line cord to allow it to plug into a lesser power supply. When using adapters, your available electrical power for the entire unit is reduced to the rating of the adapter. 50 amp to 30 amp, 30 amp to 20 amp and 30 amp to 15 amp are the most common. Use the reference chart supplied to manage what you can effectively use in your unit at one time should you choose to utilize this type of after market equipment.

Extension Cords

If it is necessary to use an extension cord to extend your recreational vehicle shore cord to the available campground electrical outlet, the correct size of the extension cord must be utilized i.e. 30 amp service- 30 amp 10 gauge extension cord not to exceed 50 feet. Adapters/Reducers are not to be used when using an extension cord and do not plug multiple extension cords together. Your local Keystone dealer can assist you in obtaining the proper extension cord for your needs.



The use of incorrect size or length extension cords, adapters, reducers will increase the risk of fire, personal injury or property damage.

Power Center/Converter

Once connected to a power source (Shore line/Generator), the Power Center/Converter serves 3 primary purposes: 1) Power distribution-all the incoming power is distributed to the unit through the 120V circuit breakers and 12V fuses within the Power Center. 2) Converting 120V to 12V power - In essence, utilization of the converter will reduce the usage of the RV battery. 3) Battery charger-It will charge the RV battery.

When plugged in to a power source for long periods of time, it will be necessary to maintain your RV Battery more frequently. Because the battery is being charged constantly, checking battery water levels (if applicable) is critical to properly maintain your RV battery.

120V Circuit Breakers

The 120V circuits are protected by circuit breakers and can handle from 15 to 30 Amps depending upon the circuit. The most common cause of a circuit breaker to open is an overloaded circuit. An example of an overloaded circuit is when a space heater is plugged into the same outlet as the toaster. The circuit is protected by a 15 amp breaker and the combined amp draw of the space heater and toaster is at least 17 amps. If this happens, reduce the load on the circuit and reset the breaker.



Never replace circuit breakers or fuses of higher current rating than those originally installed. This could overheat the wiring and start a fire.

12V Fuses

The fuses that protect the 12V system are located in the distribution panel next to the 120V breakers. Typically, the fuse panel is labeled to indicate fuse size and which components are on each circuit.

GFCI – (Ground Fault Circuit Interrupter)

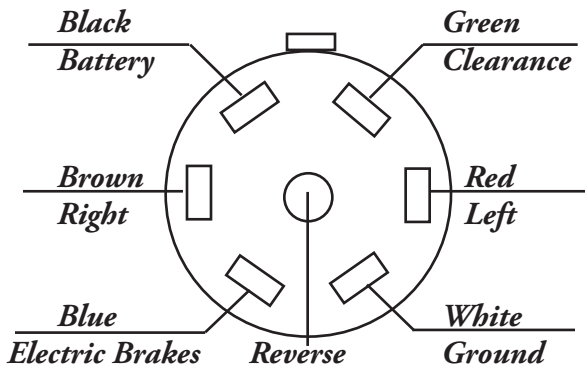
Bathroom, kitchen and exterior receptacles are protected by a highly sensitive device, known as a “Ground Fault Circuit Interrupter”, which is designed to sense the slightest electrical “short” at those receptacles and instantly disconnect the current before a person can be injured. This works like a circuit breaker and has a reset button on the face of the receptacle. Typically, they are located in the bathroom or kitchen.

GFCI-Testing

The GFCI receptacle should be tested at least once a month or prior to every trip. To test the GFCI, push the TEST button. The RESET button will pop out. Power is now off at all outlets protected by the GFCI receptacle. Push in the RESET button in to restore power. The test is complete when the reset button remains pushed in. If the RESET button does not pop out when testing, the GFCI is malfunctioning and no outlets should be used on this circuit, as protection is lost. Call your dealer if the GFCI malfunctions.

7-Way Trailer Plug

A 7-pin plug supplies the electrical connection between the tow vehicle and the RV. This plug connects into a receptacle on the tow vehicle to allow operation of the RV's marker lights, taillights, brake lights and electric brakes. When connected, the tow vehicle alternator will also charge the RV battery in the unit. Typically, the wires within the 7-Way trailer plug are color-coded as identified in the graphics on this page.



No.	Color	Item
1	White	Common Ground
2	Blue	Electric Brake
3	Green	Tail Lights and Clearance
4	Black	Battery Charge
5	Red	Left Stop and Turn
6	Brown	Right Stop and Turn
7	Yellow	Reverse (if equipped)

Brakes, Electric

Keystone units are equipped with electric brakes. These brakes are designed to work in conjunction with a properly installed brake controller which would be installed in the tow vehicle. Please refer to the axle manufacturer instructions supplied with the unit for care & operation.

Breakaway Switch

See Chapter 4.

Chapter 8: Propane Gas System

Read all manufacturer appliance literature, including the information on the propane bottles and regulator, provided within the unit packet and follow any instructions given.

General Information

Propane gas is a clean burning dependable fuel for operating all propane gas appliances when utilized properly. Propane gas is highly flammable and is contained under high pressure. Improper use may cause fires and/or explosions. Propane gas is colorless and odorless in its natural state. An odorant, similar to rotten egg smell, has been added for consumer safety purposes to help detect leaks and provide warning. If a sulfur or “rotten egg smell” is detected in or around the trailer, perform the following steps immediately:



IF YOU SMELL PROPANE

- 1. Extinguish any open flames, pilot lights and all smoking materials.*
- 2. Do not touch electrical switches.*
- 3. Shut off the propane supply at the container valve(s) or propane supply connection.*
- 4. Open doors and other ventilating openings.*
- 5. Leave the area until the odor clears.*
- 6. Have the propane system checked and leakage source corrected before using again.*

FAILURE TO COMPLY COULD RESULT IN EXPLOSION RESULTING IN DEATH OR SERIOUS INJURY.

Propane Gas System

The propane gas system is a closed system made up of bottles (also referred to as cylinders), regulators, valves, supply lines and appliances. Propane tanks contain liquid under high pressure which is vaporized into a gas. The gas is regulated into a low-pressure and distributed through the supply lines to provide the fuel for propane appliances to burn.

Consumption of propane gas depends upon the frequency and duration of use of the propane appliances. The furnace and oven have the highest consumption rates. During cold weather it is advisable to check the bottles often and always keep one full. Safety must be observed at all times when using the propane gas system.



ALL PILOT LIGHTS, APPLIANCES AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS) SHALL BE TURNED OFF BEFORE REFUELING OF PROPANE CONTAINERS. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.



DO NOT FILL PROPANE CONTAINER(S) TO MORE THAN 80 PERCENT OF CAPACITY. FAILURE TO COMPLY COULD RESULT IN A FIRE OR PERSONAL INJURY.

Propane gas containers shall not be placed or stored inside the vehicle. Propane gas containers are equipped with safety devices that relieve excess pressure by discharging gas to the atmosphere.

Regulator

The regulator is the heart of the propane system. Propane is under high pressure in the bottle and the regulator reduces this pressure to allow safe use with the appliances in recreational vehicles. The lower pressure is distributed to the appliances. The lever on the automatic gas regulator will point to the gas bottle in service. When the red flag appears in the inspection glass, this indicates that bottle is empty. The lever should be then turned toward the other bottle and the empty filled as soon as possible.

The regulator has a vent that allows it to breathe. Check the vent frequently to keep the vent clean and clear of any debris, corrosion or obstruction. A clogged regulator can result in higher pressures, loss of fuel and/or component failure. The vent can be cleaned by using a toothbrush and should be checked periodically for correct pressure output by a qualified propane service center.



DO NOT attempt to adjust or repair regulator. Adjustments and repairs require specialized training and tools. Contact a qualified Propane Service Technician. Failure to follow these instructions could result in a fire, explosion and / or injuries, including loss of life.

Split-Bottle Systems – (Primarily on Fifth-Wheels)

Some Keystone fifth wheels use a split-bottle system where there is one propane bottle located on each side of the unit. There are some instances where this system may inadvertently activate the “excess flow device” located in the propane pigtail.

The “excess flow device” is a safety feature that is designed to detect a large leak in the propane system such as a broken gas line and reduce the flow of propane from the bottle. It also activates when the propane bottle service valve is turned on and the propane system is not completely closed such as when the range burner is left on. The device is not designed to completely stop the flow of propane, but to reduce it to approximately 20,000 BTUs/hr. When activated, one appliance at a time may operate normally, however, when a large demand is placed on the system such as turning on several appliances or the furnace, they will not receive sufficient propane pressure to operate properly. Follow the procedure below to avoid inadvertently activating the “excess flow device” and to operate the split bottle propane system.

Follow this procedure for the following conditions: After refilling either or both bottles; After any part of the propane system has been disconnected; Appliance burners are not operating correctly; Low operating pressure exists downstream from the regulator when operating heavy demand appliances such as the furnace.

1. Verify both propane bottles contain sufficient propane. Refill if necessary.
2. Close both propane bottle service valves.
3. Attach the propane pigtails to the service valve.
4. Close manually operated gas valves on the range or water heater.
5. Turn the indicator on the regulator to the bottle closest to it.
6. Slowly open the service valve on the bottle closest to the regulator. This is typically the bottle on the entry door side. Open the valve all the way.
7. Slowly open the service valve on the bottle that is furthest from the regulator until you can hear gas start to flow through. Do not open the valve all the way. Wait 1 minute.
8. Re-close the service valve and then slowly re-open it all the way. The system is now ready to operate.

Propane Gas Pigtails

Keystone propane systems are equipped with a Type I cylinder connection, the same as you see on current gas grills. The Type I connection system uses the Excess Flow Pigtail Hose, distinguished by the large green nylon swivel nut. The green swivel nut attaches to the outside of the cylinder valve with right hand threads. Tighten the swivel nut by hand. DO NOT use tools.

The safety features of this system prevent gas from flowing unless the connection is tight and will limit excessive gas flow. In cases of extreme heat, 240° to 300°F, at the connection, the connection to the cylinder will be shut down.

Propane Gas Lines

The primary manifold is a black pipe located beneath the unit. Copper tubing, with flare fittings, are used as secondary lines running to the gas appliances. If repairs are needed to these lines or any component of the propane system, DO NOT ATTEMPT to repair yourself and follow the steps listed under the warning “IF YOU SMELL PROPANE” in this chapter.

Although your propane gas system was thoroughly inspected for leaks before delivery the propane gas system should be inspected and checked for leaks by a RV dealer at least once a year or any time the system is opened.



THE PROPANE PIPING SYSTEM IS DESIGNED FOR USE WITH PROPANE ONLY. DO NOT CONNECT NATURAL GAS TO THIS SYSTEM.

Propane Gas Leak Detector

Please refer to the manufacturer instructions supplied with the unit for care & operation of the propane gas leak detector. Keystone RV installs an propane gas leak detector unit. It is a safety device that is permanently mounted near the floor and is powered by 12V (the RV battery and / or converter). The detector is operational only as long as 12V power is available. If the power is disconnected, the monitor will not operate.

Should a propane leak occur, the detector will sound an alarm and continue until the gas has dissipated or until a mute button is pressed. The mute button will only stop the alarm from sounding for 60 seconds and alarm will reoccur if gas is still present. The alarm may sound at times when no propane is present when household products are in use such as aerosol hair spray, cleaners, adhesives, alcohol etc. Be sure to air out the trailer thoroughly after delivery and when using these products.

The propane gas leak detector has a self check circuit which runs at all times while receiving 12 Volt power. In the event that the circuitry fails, a failure alarm will sound and the operating indicator will cease to light. Replace the detector when recommended by the manufacturer (typically every five years).



Propane gas may be present in other areas before it can reach the detector's location. The detector only indicates the presence of propane gas at the sensor. Never check for leaks with open flame. Use only a mild soap and water solution. Do not use products that contain ammonia or chlorine.

Propane powered appliances produce carbon monoxide. Carbon monoxide can be fatal! When the CO alarm detects carbon monoxide in the air it will sound. Consult the individual detector's user manual for specific instructions and/or audible warning meanings.

If the Alarm Sounds...



1. *Extinguish any open flames, pilot lights and all smoking materials.*
2. *Do not touch electrical switches.*
3. *Shut off the propane supply at the container valve(s) or propane supply connection.*
4. *Open doors and other ventilating openings.*
5. *Leave the area until the odor clears.*
6. *Have the propane system checked and leakage source corrected before using again.*

FAILURE TO COMPLY COULD RESULT IN EXPLOSION RESULTING IN DEATH OR SERIOUS INJURY.

Chapter 9: Plumbing System

Your RV plumbing consists of two primary systems: The fresh (potable) water system and the waste water system.

Fresh (Potable) Water System

Potable fresh water is supplied to the unit in two ways: 1)By filling the fresh water tank and pumping the water through the system with the water pump. 2)Connecting a potable water hose to the “City Water Fill” which automatically pressurizes the system.



USE POTABLE WATER ONLY IN THE FRESH WATER SYSTEM. SANITIZE, FLUSH AND DRAIN BEFORE USING. SEE INSTRUCTIONS UNDER HEADING “SANITIZING THE FRESH WATER SYSTEM. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

Water Pump

The 12 V water pump installed is self-priming and operates upon demand. In simpler terms, when you open a faucet, the pump will turn on and pump the water from the tank to that faucet. For the pump to operate, please note the following:

1. The fresh water tank must have sufficient water in it.
2. The pump on/off switch must be in the on position. Typically located on the monitor panel.
3. There must be sufficient 12V power (battery or converter) to operate the pump.
4. The water heater has a by-pass valve that can prevent water from entering the water heater.
5. The water pump should prime itself and stop running after the open faucet(s) is closed.
6. Pump should now run on demand when a faucet is opened, and stop when the faucet is closed.



***Never let the water pump run while the fresh water tank is empty.
Damage to the pump and/or a blown circuit may occur.***

Fresh Water Tank

All Keystone units are equipped with a fresh water tank. Tanks vary significantly in size by unit brand & model.

Keystone RV units use 2 different methods to fill the fresh water tank depending on the brand & model.

Gravity Water Fill - Remove the cap, on the exterior connection labeled “Fresh Water Connection”, and insert the hose from your water source and turn on the water. While filling the tank, periodically check the monitor panel to determine the level of water in the tank. When full turn the water source off. If overfilled, water will “spit” back out of the gravity fill as there is no automatic shutoff. **DO NOT** leave the unit unattended while filling the fresh water tank. Overfilling the tank can cause damage to the system components which may not be considered warrantable.

Pressure Water Fill - Hook a potable water supply to the city water fill valve, turn the valves to the tank fill position and turn on the water supply. While filling the tank, periodically check the monitor panel to determine the level of water in the tank. When full turn the water source off immediately. **DO NOT** overfill and **DO NOT** leave the unit unattended while filling the fresh water tank. Overfilling the tank can cause damage to the system components which may not be considered warrantable.

All units are equipped with “Low-Point” drains that are designed to drain water from the water tank and all lines. These are located underneath the unit, typically near the water tank. These drains must be closed or the water system will drain itself of any water entering.

Water should be drained from the fresh water system when not in use. Over time, water quality can degrade which can contaminate the plastic used in the water system and/or cause ill health affects.

Fresh Water is considered “Cargo”, therefore, your Cargo Carrying Capacity (CCC) is reduced by the weight of the water you choose to carry.

City Water Fill

The city water fill allows a pressurized potable water line connection (water spigot) direct to the unit. Because the connection is pressurized, there is no need to use the water pump. This method also bypasses the water tank and feeds the entire water system directly. Connect the city water fill by using a hose manufactured for potable water use and turn on the source. When in need of water, open the desired faucet or spigot. Air will purge itself when the faucet is opened.

Each time this connection is made, we recommend inspection of visible water connections for leaks. DO NOT leave the unit unattended when hooked to City Water fill for extended periods of time. Always use a water pressure regulator to control the water pressure entering the trailer.

City water fills may be in a combination housing with the gravity water fill or stand alone.

Although the fresh water system was thoroughly inspected for leaks before delivery, fittings can loosen over time and with normal use. Periodically check the fittings at the faucets and all other visible connections and tighten as necessary.

Water Supply and Odor

Local water supplies (well or city) sometimes contain high levels of sulphur or other chemicals which can cause unpleasant odors. Some, like sulphur, can be very unpleasant. Sanitizing the water system, as described and allowing the sanitizing solution to remain for a few days, should eliminate the odor.

Sanitizing the Fresh Water System

Keeping the fresh water system clean and free of any potential contaminations should be a top priority. Sanitizing the system before initial use and thereafter annually, or whenever water remains unused for prolonged durations, is recommended. This will help keep the water system fresh and discourage harmful bacterial or viral growth. To sanitize your system, perform the following:

1. Drain the tank by opening the low point drains. Close the drains after water has drained.
2. Prepare a chlorine bleach solution of $\frac{1}{4}$ cup to one gallon of water for every 15 gallons of tank capacity. *Example:* Use $2\frac{3}{4}$ gallons of the solution for a 40-gallon tank. If using Ultra bleach concentrations, reduce bleach to $\frac{1}{8}$ cup to one gallon of water.
3. Add solution to tank and fill with water. Open each faucet/fixture until a distinct chlorine odor is smelled. Close faucets and let stand 4 hours.
4. Drain system and flush with fresh water until chlorine odor and smell is gone. (If a water filter has been added, change it at this time).

Water Heater

Please refer to the manufacturer instructions supplied with the unit for care & operation of the water heater. The water heaters used in Keystone products range in size from 6-12 gallons depending on the brand and model. There are 2 types used: 1) Operates only on LP gas (utilizing 12V to light) 2) Operates on LP gas or 120V electric. The on/off switches for both types are mounted inside the unit either on the wall or in the monitor panel. DO NOT start the water heater unless it has water in it. To verify there is water in the water heater, open the relief valve located on the outside of the water heater. If water is present at the relief valve, you can be sure there is sufficient water in the water heater to operate. Then verify the by-pass valve located on the back side of the water heater is set to the use position and open a "hot" water spigot on any faucet. The water will travel from the source, into the water heater and then present itself at the spigot when the water heater is full.



ALL PILOT LIGHTS, APPLIANCES AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS) SHALL BE TURNED OFF BEFORE REFUELING OF FUEL TANKS AND/OR PROPANE CONTAINERS. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

Water Heater By-Pass Kit

If equipped, a by-pass kit allows winterization of the fresh water system without putting RV anti-freeze into the water heater. The by-pass valve(s) are located on the back of the water heater (which is inside the unit) and in by-pass mode, allow water to travel through a “cross-over” line connecting the input and the output lines of the water heater. BE CAREFUL, if in by-pass mode, turning on a “hot” water spigot, WILL NOT put water in the water heater and lighting the water heater with an empty tank could damage the tank which may not be warrantable.

Water Heater Storage & Draining

When not using the unit, drain the water from the water heater tank. Over time, water quality can degrade which can permanently contaminate the lining of the water heater tank. Also, drain the water heater during cold weather to avoid damage from freezing.

To Drain the Water Heater:

1. Turn off power to the water heater at the switch or the main breaker.
2. Shut off the gas supply and the water pump.
3. Open all fixtures, both hot and cold throughout the unit.
4. Remove/open the exterior access door to the water heater.
5. Remove the drain plug (or anode rod if equipped) from the tank.
6. Open the pressure relief valve to allow air in and water will drain out tank.

Winterization

RV components can be damaged from the effects of freezing. Protection of the plumbing system and related components is crucial. Damages due to weather are not covered under warranty at any time. Many recreational vehicle owners choose to have their units winterized by their dealer, while others choose to do it themselves.

Following are descriptions of two methods used to winterize:

1. Compressed Air (Dry) Method - Uses compressed air to blow out any remaining water in the system after draining the system of all water. This method requires an air compressor and appropriate adapters.
2. RV Anti-Freeze (Wet) Method - Uses RV approved, nontoxic, potable, anti-freeze in the system and does not require any special tools.

Many Keystone products include an optional by-pass kit that allows the plumbing system to bypass the hot water heater, reducing the amount of anti-freeze that will be needed (by-pass kits are available at most RV service centers for a reasonable expense and can be installed during winterization). Without a by-pass kit installed, an additional 6 – 10 gallons of anti-freeze will be required.

On the following page are the procedures for both methods. Your local dealer is best suited to answering any questions as well as providing information on winterization and storage that may be particular to the climate in your area. If using the compressed air method, a special adapter should be purchased to allow compressed air to be delivered through the city water fill. These adapters are available at most RV supply stores.

Method 1 - Compressed Air (With By-Pass Kit Installed)

1. Purchase 1-2 gallons of RV non-toxic anti-freeze.
2. Use compressed air (max 30 psi) to blow out the black tank flush system if equipped.
3. Drain the fresh water tank and empty the waste water holding tanks.
4. Drain water heater.
5. Turn water heater by-pass valve to by-pass position. (The by pass valve is located near the water heater incoming lines – an access panel may have to be removed depending upon the model.)
6. If installed, remove water filter from assembly and discard. Install diverter if included.
7. Open all faucets, including shower head sprayer, toilet flushing device and water line drains. Remember the outside shower if equipped.

8. Turn on the water pump for 30 seconds to clear out any water in the suction line.
9. Connect an air hose with an adapter to the city water fill connection.
10. Set the pressure no greater than 30 pounds and blow out the water lines until no water can be seen coming out of the fixtures and lines.
11. Close all drains.
12. Pour about one quart of RV anti-freeze into drains, p-traps, toilet, and tanks.

Method 2 - RV Anti-Freeze (With By-Pass Kit Installed)

1. Purchase 4 -6 gallons of RV approved, non-toxic, anti-freeze.
2. Use compressed air (max 30 psi) to blow out the black tank flush system if equipped. An alternate method is to pump antifreeze into the inlet with a hand pump available from your RV dealer.
3. Drain all tanks, fresh water and sewage tanks.
4. Drain water heater. Close the drains after water has drained.
5. Turn water heater by-pass valve to by-pass position. (The by pass valve is located near the water heater incoming lines – an access panel may have to be removed depending upon the model.)
6. If installed, remove water filter from assembly and discard. Install diverter if included.
7. Pour an amount of RV non-toxic anti-freeze into the fresh water tank to fill the tank above minimum water pump operating level. (Use of a long funnel may be helpful) Add more, if necessary, during procedure. An alternate method is to install a bypass hose on the suction side of the water pump and pull direct from the anti-freeze container. See your RV dealer for necessary hose and fittings.
8. Turn on pump switch and open the cold water side of all faucet fixtures. Leave open until the anti-freeze comes out (generally, pink in color). Repeat for hot water side. Remember the outside shower if equipped.
9. Flush toilet until anti-freeze begins to flow into the bowl and then pour one quart of anti-freeze down the toilet to winterize the black tank. Leave a small amount of antifreeze in the toilet to cover the seals.
10. Pour about one quart of anti-freeze down each shower/tub, lavatory sink, and kitchen sink to fill p-traps.



DO NOT USE Automotive Anti-Freeze. Automotive Anti-Freeze is poisonous and not for use in potable water systems.

De-winterization / Removal of Anti-freeze

If purchasing a coach which is winterized with RV anti-freeze, or having had an existing unit winterized before winter storage, the plumbing system must be flushed and sanitized prior to use. Do not attempt to turn on water heater if system is winterized. Perform the following prior to attempting to operate the water heater or use the plumbing system.

1. Drain all tanks, fresh water and sewage. Close the drains after water has drained.
2. Attach garden hose to fresh water fill and fill tank.
3. Turn on pump switch and open cold water side of all faucet/ shower fixtures. Leave open until water runs clear. Repeat for hot water side.
4. Flush toilet until clear water runs into bowl.
5. Dump tanks again. Close the drains after water has drained.
6. Sanitize water system.
7. If a water filter is installed, drain lines, remove filter assembly, clean and reinstall with new filter.
8. When ready to use the water heater, turn by-pass valve to open position to allow water to enter hot water heater tank and fill according to instructions

Waste Water System

The wastewater system is self-contained within the unit. There are 2 primary waste systems in a unit: Black Water Waste and Gray Water Waste. In some floorplans, a sink(s) or shower may empty into the Black Water Tank. Components are the toilet, holding tanks and termination valves. As in residential households, the drainage system has drain lines, p-traps and plumbing vents that route gases/odors out through the roof assembly.

Black Water Waste

This system consists of the toilet, drains lines, black water tank, and termination valves.

Toilet

The toilet operates with fresh water supplied by the fresh water tank or city water fill. When flushed, the toilet drains into the black water tank. Please refer to the manufacturer instructions supplied with the unit for care & operation.

Drain Lines

The drain lines carry the waste from the toilet to the tank and from the tank to the termination valves where it will be drained from the unit.

Black Water Tank

The term “black water” refers to the by-products of using the toilet. Once the black water tank reaches the desired capacity, the contents can be dumped from the termination valve into an approved dump station. We recommend using a tank deodorizer to help control odors and breakdown solids, available from dealer.

Solid Build-Up in the Black Water Tank

When camping and using a “Full Hook-up” (includes a dump station at the site), DO NOT leave termination valves open. When “solids” are flushed, the water will run into the dump station and the “solids” will stick to the bottom of the tank and build up. Leave the termination valves closed until the tank level warrants dumping.

Not using enough water when flushing “solids” can also cause build up. To prevent this from occurring, add plenty of water to the bowl prior to using/flushing the toilet when solids will be involved. Only use toilet paper approved for use in recreational vehicles.

Should you ever have a build up of solids, close the valves, fill the tanks about $\frac{3}{4}$ full with fresh water, drive a distance to agitate the solids and drain the tanks. If the problem continues, it may be necessary to purchase a waste water digester from your local RV dealer which can be added to the tank to help break down solids. Follow the instructions of the digester. Depending on the severity of the situation, it may be necessary to repeat this procedure.



Do not put these items in toilet or drains

1. Facial tissues, paper towels, sanitary products (including those labeled flushable).
2. Detergents or bleach.
3. Automotive antifreeze, ammonia, alcohols, or acetones.
4. Grease from cooking, table scraps or other solids that may cause clogging.

Termination Valve

Typically, there is a termination valve for each waste holding tank in the unit and they are located on the roadside. The termination valves are closed to hold waste in the waste tank and open to drain it. See “Dumping Instructions” to drain the waste water system.

Dumping Instructions

1. Twist off the termination outlet cap.
2. Connect the sewer hose by turning counterclockwise, locking the end levers over the termination end.
3. Place the other end of the sewer hose into an approved dump station.
4. Open the black tank termination valve first and drain.
5. After the black tank is almost empty, open the gray tank termination valve and drain. This will use gray water to help flush any remaining solids from draining the black tank through the sewer hose (If unit has 2 gray tanks, drain one at a time).*
6. Close termination valves.
7. Disconnect sewer hose, rinse and store.
8. Replace termination cap on the outlet.
9. Add chemical deodorant / breakdown agent approved for RV use.
10. Wash hands with approved soap/hand sanitizer.

**If unit is equipped with the No-Fuss Flush System, perform flush at this time.*

Tank Flushing

Periodically for correct monitor panel function and to control odor, it is necessary to fill all waste water tanks (black or gray) with fresh water and repeat the dump procedure to help flush any remaining residue from usage. The intervals for this need vary based on amount of use, type of use, holding tank chemical usage, etc.

Gray Water Waste

Typically, this system consists of all sink/shower drains, gray water tank(s) and termination valves. Gray water is the wastewater from the sinks, tub/shower drains and is stored within one (or more) gray tank(s). Gray water is drained through a termination valve on the roadside of the unit. On some floorplans, some of the gray water waste will empty into the black water tank.

No Fuss Flush (Optional)

If equipped, the no fuss flush kit has been installed to assist in rinsing the black water tank after dumping. Similar to the city water fill, it is located on the exterior of the unit and a fresh water hose can be hooked to it. To operate, drain the black tank as outlined previously, Connect a potable water hose (garden hose will work) to the inlet labeled “Sewer Valve Must be Open When Using This Inlet” OR “Black Tank Flush.” Open the water supply to full pressure to flush tank. When water runs clear from sewer hose, shut off water supply and disconnect garden hose from source. Do not disconnect hose from flush inlet until water has drained from system.

NOTICE

DO NOT leave the unit unattended during this process and make sure the black tank termination valve is open and your sewer hose is connected to an approved dump station. Overfilling the black water tank will result in water overflowing into the interior of your RV from the toilet and the resulting damage is not covered by warranty.

Odor Control

The secret to good air quality in (and around) your RV lies with finding an effective holding tank chemical and applying the proper amount based on use and ambient temperature. It is important to note some brands work more effectively than others! If you are experiencing unpleasant odors from your holding tank(s), try switching brands to something proven to work before thinking something may be wrong with the plumbing. The gray tank can produce offending odors as well as the black tank. Follow the guidelines supplied with the chemical for usage directions.

Monitor Panel

The monitor panel is designed to give approximate liquid levels of the fresh, gray and black water tanks at a given moment as well as a charge value (based on voltage) of the battery.

Operation

Depress the button for the desired reading (tank or battery.) The levels readout for the tanks will read at Empty (E), 1/3, 2/3, or Full (F). All lights will be lit when full. The battery conditions are as follows (+ or - 5%):

- C Charge <12.7V
- G Good 12.1V-12.7V
- F Fair 11.6V-12.1
- L Low 6V-11.6V

Erroneous Readings

The monitor panel displays readings from sensors attached to the tanks. These sensors can send false readings when:

1. Water with low mineral content. Minerals in water help conduct the electrical signal to the monitor display.
2. Contamination-Residue remaining on the inside of the tanks after dumping (caused by normal use or putting grease, oils, etc. in the tanks). Refer to Tank Flushing.
3. Low Battery
4. Loose wiring connections (bad ground)

Chapter 10: Slide Out Systems

Keystone uses two (2) basic types of slide-room systems depending on the product application, Electric and Hydraulic. Please refer to the manufacturer instructions supplied with the unit for care & operation of the system in your unit.



Stand clear of the slide room's interior path and verify that there are no exterior obstructions before extending or retracting the slide-out. Also, there are hard, sharp metal edges under the slide-out(s) and in the slide-out mechanisms. Children should be monitored at all times, and not allowed to play under the slide-out(s) when extended. Keep all people, pets and objects away from the slide-out room and mechanism during operation. The mechanism assembly may catch loose clothing or pinch or crush appendages. Failure to follow these warnings could result in serious injury or death.

Basic Slide-Out Tips

Before operating any slide-out:

1. The unit must have a fully charged RV battery (having the shore-line cord plugged in may NOT be enough)
 2. Turn off all necessary lights and 12V components prior to extending/retracting
 3. The unit must be leveled and stabilizer jacks extended.
 4. Make sure the room has clearance, inside and outside, to extend/retract.
 5. Make sure water and debris are removed from the top of the room before retracting
 6. Avoid injury by keeping all body parts out of the way of the slide-room
 7. Make sure other parties are clear of the slide-out before extending/retracting
 8. DO NOT ride in the slide-out when extending/retracting
 9. DO NOT step on the floor of the slide out when the room is retracted. The slide out floor is not supported by the main floor and stepping on the floor may cause structural damage to the slide room.
- Weather and atmospheric conditions will cause rubber to deteriorate over time. Inspect seals around slide-rooms regularly and replace at the first sign of a problem.
 - Periodically, during the normal course of operation, Slide-out systems and rooms will require adjustment. This is covered under warranty the first ninety (90) days after original retail sale.
 - Slide-out rooms should be stored retracted.
 - Keep mechanical components clean of road debris, salt, etc using a mild soap and water.
 - Rooms that will be extended for long periods of time should be actuated 1-2 times a week.
 - Failure to follow these basic steps can lead to intermittent operation of the slide-out system, improper sealing, personal injury and damage to the unit which is not warrantable.



Electrically Operated Systems

Keystone uses 2 different styles of electric Slide systems: 1) Rack and Pinion 2) Cable driven. For both systems, the RV battery drives a motor to actuate the room in and out.

Please refer to the manufacturer instructions supplied with the unit for the care & operation of this system.

DO NOT apply any petroleum products (grease) to the slide system. This will attract dirt and can cause damage to the functional components of the slide system.

Manual Override

These systems include the ability to manually retract the room in the event of a mechanical failure. Please refer to the manufacturer instructions supplied with the unit for detailed instruction on this feature.

Hydraulically Operated Systems

System Operation

The HydraGear™ Slide-Out System uses a 12 Volt DC hydraulic pump which powers the double-acting hydraulic cylinder to move the room(s). Electricity for the pump assembly is supplied by the RV battery. Normal operation is performed by pressing the wall mounted slide-out switch to extend or retract the room.

Please refer to the manufacturer instructions supplied with the unit for care & operation of the system in your unit.

The pump uses type A automotive transmission fluid (ATF) and the see-through reservoir makes checking the level easy. For the best performance the fluid level should be within ½” of the top with the room retracted (closed).

The system is designed so that the slide-room with the least resistance will extend/retract.

The Hydraulic pump is wired to an auto reset breaker that is typically within 18” of the RV battery. If overloaded, this breaker will interrupt the operation of the slide-room temporarily which can be perceived as intermittent operation. Causes for this to occur:

1. Low Battery
2. Loose or corroded battery terminal or ground wire
3. Slide-Room binding (unit not level, sticks/leaves or other wedged between the room and the wall)
4. Slide-Room/system out of adjustment
5. Something blocking extending/retracting the slide-room

Individual Room Control (IRC)

If equipped, this control panel allows each room to be operated independently.

Manual Override to Retract or Extend the Slide-Out Room

The HydraGear™ system can be manually overridden in cases of hydraulic system failure or when electrical power is either interrupted or unavailable. Please refer to the manufacturer instructions supplied with the unit for instruction for this feature.



The slide-out room and mechanism are a potential crush hazard. Disconnect the batteries to disable power to the slide-out(s) before working on or under the slide-out(s). Failure to do so could result in serious injury or death.

Chapter 11: Sport Utility Recreational Vehicles

This chapter deals with trailers equipped with cargo loading ramps and fuel transfer systems. These recreational vehicles are sometimes referred to as “ramp trailers” or “toy haulers”. These trailers combine RV living quarters with a large cargo area and special consideration must be given to the topics in this chapter.

Bed Lifts

See Chapter 6 under the heading “Elevated Beds And Electric Bed Lift Systems” for complete information including use and safety.

Ramp Trailer Weight Distribution

All loaded trailers must remain within GVWR and GAWR limits. However, proper load distribution is of particular importance for ramp trailers. These trailers are designed to carry a variety of vehicles and cargo in the cargo storage area. These cargo items are typically heavy and consideration must be given to how they are loaded. Because most storage areas are at the rear of the vehicle the biggest concern is maintaining the correct hitch or pin weight percentage. Vehicles loaded incorrectly can have too little weight resting on the hitch or pin and can become unstable when towing. **Therefore, a hitch weight percentage of 10 – 15% for travel trailers and 20 – 25% for fifth wheels must be maintained.** For example, if the loaded vehicle weighs 8000 pounds, the hitch weight for a travel trailer should be between 800 – 1200 pounds (10 – 15% of the 8000 pound total). For a fifth wheel this same 8000 pound vehicle should have a pin weight of 1600 – 2000 pounds (20 – 25%). By maintaining the correct hitch percentage and staying within the limits of the GVWR and GAWR you can help insure a safe towing experience with your trailer.



Locate and secure cargo and vehicles to maintain safe weight distribution in the cargo area and throughout the trailer.

Improper weight distribution or overloading could lead to loss of vehicle control during travel resulting in serious injury or death.

Follow all guidelines contained in this manual for loading and weighing procedures. Maintain the loaded hitch weight within the percent levels stated above. Where applicable, a hitch with built in sway control is recommended.

Do not exceed the GVWR (gross vehicle weight rating) or the GAWR (gross axle weight rating) of either the tow trailer or tow vehicle.

Cargo Placement

Load vehicles and heavy cargo items in the cargo area as far forward as possible. Big, heavy items should be loaded where they can be securely tied down. Start with top heavy items if you have them. That’s usually a good place to start because you must have plenty of room available to properly tie them down. Tying them straight down is not secure enough. They need to be tied off at several angles or they could fall over in an abrupt change in speed or direction. You need room to accomplish this. Smaller items can be used to fill the spaces around them later.

Once you have the heavy items located, check the hitch weight. If the hitch weight is significantly more or less than the guidelines in section “Ramp Trailer Weight Distribution”, make the changes necessary to get close. Then the smaller items can be placed to bring the hitch weight into the recommended range. They should be located so that they will not move during travel. Placing them next to items that have already been tied down helps, but your main concern should be to not lose the balance of the trailer. Don’t forget you can also get one side of a trailer heavier than the other without a little planning. This can cause tire failures from overloading an individual tire or tires. This can also cause a very serious problem when cornering, even causing the trailer to turn over in a sudden turn.

Top heavy loads can cause problems not only in cornering but also in hard braking. They have a tendency to make the trailer “dive” in hard braking conditions. This suddenly increases tongue weight and can decrease tow vehicle front axle loading just when you need steering and brakes the most. Arrange the remainder of the load to act as a counter weight to minimize this effect. Never place heavy objects on add-on devices hung on the rear bumper or placed across the tongue frame. This places heavy objects where they will dramatically effect handling in corners or bumps. Heavy weights placed well behind the axle can also reduce stability. A bicycle may be fine to hang out in back, but not a motorcycle. Use good common sense and to always allow plenty of margin for safety.

Ramp Trailer Loading Safety

The cargo door/loading ramp gives you complete access to the trailer cargo area. When lowered, the loading ramp allows you to easily load rolling cargo, bicycles, small motorcycles and ATVs, and small vehicles. This section outlines the safety precautions you should take when loading and unloading cargo and vehicles, as well as loading/unloading procedures, techniques and tips.

Use caution when using the loading ramp/door area of your trailer. This area has many uses and some things to be aware of are:

- Ramps and inclines
- Dissimilar surfaces that may be wet and slippery
- Awkward, heavy or unbalanced loads

Continuous attention to safety measures will help prevent accidents and possibly serious injuries and property damage. You can help minimize these risks, avoid hazards, and enjoy your recreational activities safely by using an effective decision-making strategy as follows:

- **Identify hazards** or specific problems in your path. Equipment, materials, debris, other vehicles, children, pets, or any number of other things may be in your way when you load or unload cargo or vehicles.
- **Predict what may happen** and think of the consequences of your actions. Be sure you are physically capable of handling the load safely and keeping it under control.
- **Decide what to do** based on your capabilities and the capabilities of your equipment.
- **Be sure** your cargo does not exceed the capacity of your loading ramp and the trailer.

Loading Equipment

The loading equipment furnished with your trailer is the ramp door and the tie down attachment points in the cargo area floor. The rated capacity of the ramp door is 3000 pounds. Each tie down D-ring attachment is rated at 1,500 pounds. Typically no tie down straps, cables, hooks, chains, wheel chocks, blocks, etc. are supplied with your trailer.

Chocks And Blocks

Wheel chocks are wedge-shaped blocks placed in front of and behind the rear tires of a trailer to prevent the trailer from moving while it is being loaded. Always hitch the trailer to the tow vehicle, and use wheel chocks or other vehicle-restraining devices when loading and unloading the trailer. When chocking, use wheel chocks of the appropriate size and material to securely hold the vehicle. Don't use lumber, cinder blocks, rocks, or other make-shift items to chock.

Tie downs

Use tie downs rated for the weight of the object to be secured. Be sure to attach and secure each tie down so that it cannot come loose, unfastened, opened or released while the trailer is in motion. Also, use edge protection whenever a tie down could be damaged or cut at the point where it touches an article of cargo. **Note: Do not over tighten tie downs as this will cause damage to the attachment hardware, floor structure and cargo.**

The working load limit of a tie down, associated connector, or attachment mechanism is the lowest working load limit of any of its components (including any tensioner device), or the working load limit of the anchor points to

which it is attached, whichever is less. When you choose tie down hardware, choose items that are strong enough to hold the load you are securing. The load limit of each tie down used should be at least one-half the working load limit of each tie down that goes from an anchor point on the trailer to an attachment point on an article of cargo. Check the tie down manufacturer's specifications to determine working load limits. ***NOTE: Tie down hardware is typically not supplied with your trailer.***

When an article of cargo is not blocked or positioned to prevent movement in the forward direction, the number of tie downs needed depends on the length and weight of the articles. In all cases, use enough tie downs to secure the cargo from moving in any direction. Heavy tool chests or cabinets may require tie downs around bottom, middle and top to secure them. Be sure to lock or secure drawers in these chests or cabinets so they can't open while traveling. Keep handle bars, mirrors, etc. away from the trailer interior walls. The walls can be damaged by contact with hard, sharp objects.

Loading Ramp Operation

1. Hitch the trailer to a tow vehicle before loading and unloading the rear cargo area. Select a parking site where the edge of the rear door/loading ramp will rest entirely on a flat, level surface, and the corners of the door will be supported. Avoid soft sand or mud surfaces. When the trailer is loaded, the added cargo weight may cause the trailer and/or tow vehicle to become stuck.



Always hook the trailer to the tow vehicle before moving cargo or using the loading ramp. Failure to do so could cause the trailer to tip back as the load is shifted to the rear of the cargo area causing property damage, personal injury, and/or death.

2. Set the parking brake on the tow vehicle and install wheel chocks in front and behind the tires on one axle on each side of the trailer. DO NOT use the emergency brake away switch on the trailer.
3. Lower the front and rear jacks on the trailer to stabilize it.
4. Unlock the rear door loading ramp and carefully lower it to the ground. If equipped, extend the ramp extension and install the supporting hardware.
5. If equipped with a power bunk, raise both bunks fully.
6. Move things out of the way of your cargo, whether you are loading, or unloading. Have an idea where your cargo will be positioned after your load/unload activities.
7. Use caution and proper lifting techniques when loading and unloading items from the cargo area.
8. Use extreme caution when loading/unloading ATVs, motorcycles, or other vehicles ("motorized cargo" or "vehicle(s)"). These machines are generally heavy, and may be hot from operation and/or covered with dirt, oil, or other substances that may make them slippery. See the section "***Loading and Unloading Motorized Cargo***" for more details.
9. Make certain that the door seals and hinge area are free of any debris, such as sand or snow before closing the rear door loading ramp.
10. Inspect the hinges, assist springs, and latch mechanism before each trip for signs of wear or damage, and make any needed repairs for safe operation and towing.

Loading And Unloading Motorized Cargo

Many recreation ATV or motorcycle accidents and injuries happen while loading or unloading. Steep inclines, unstable ramps, power and a short stopping area can make loading motorized cargo difficult. There is no absolute safe way to drive your motorized cargo into the trailer. Take the following steps to aid in reducing the risks associated with transporting, storing, or occupying the trailer with motorized equipment and vehicles.

- Wear personal protective equipment while loading and unloading vehicles to/from the trailer. This includes but is not limited to, an approved motor vehicle helmet, leather boots, appropriate gloves, and eye protection.
- Never stand in the path of equipment when loading/unloading with the ramp, and keep bystanders away from the ramps.
- Keep body parts completely clear of the ramp door hinge pinch area at all times.
- Check parking brakes on the vehicle(s) you are loading/unloading, and on the tow vehicle.
- Inspect ramp and trailer floor/loading area for cracks, damage, oil or other debris that may cause slippage.
- Remove carpet from section where fueled vehicles or motorized equipment will be stored.

⚠ WARNING

Any motorized vehicle or any motorized equipment powered with flammable liquid can cause fire, explosion or asphyxiation if stored or transported within the recreational vehicle. To reduce the risk of fire, explosion or asphyxiation:

1. *Do not ride in the vehicle storage area while vehicles are present.*
2. *Do not sleep in the vehicle storage area while vehicles are present.*
3. *Close doors and windows in walls of separation (if installed) while any vehicle is present.*
4. *Run fuel out of the engines of stored vehicles after shutting off fuel at the fuel tank.*
5. *Do not store, transport, or dispense fuel inside the vehicle.*
6. *Open the windows, openings, or air ventilation systems provided for venting the transportation area when vehicles are present.*
7. *Do not operate propane appliances, pilot lights, or electrical equipment when motorized vehicles are present.*

FAILURE TO COMPLY COULD RESULT IN AN INCREASED RISK OF FIRE, EXPLOSION, ASPHYXIATION, DEATH, OR SERIOUS INJURY.

⚠ WARNING

CARBON MONOXIDE GAS CAN KILL YOU. *Fuel burning devices such as ATVs or motorcycles that burn gasoline, diesel, or other fuels produce carbon monoxide when they are operating. Carbon monoxide gas is invisible, odorless, and colorless. Dangerous levels of carbon monoxide gas can accumulate in a trailer which cannot be detected by sight, smell, or taste. Even small quantities of carbon monoxide can cause carbon monoxide poisoning and suffocation, which will cause death, serious injury, or permanent disability. Exposure to high concentrations of carbon monoxide for even a few minutes will also cause death, serious injury, or permanent disability. DO NOT start ATVs, motorcycles, or other fuel burning devices while they are located in your trailer.*

There is a hazard of serious personal injury when using a loading ramp. If the motorized cargo loses traction and spins sideways, it may slip sideways off the ramp, tipping sideways, and possibly falling on the rider causing injury. Always follow the ramp loading instructions in the owners manual for the motorized cargo.

Ramp Positioning

The ramp angle from the trailer floor to the ground affects the risk when loading/unloading cargo. If the ramp angle is reduced, and all other conditions remain the same, risk is reduced. Always try to reduce the loading ramp angle; the shallower the ramp angle, the easier cargo loading will be. Position the trailer to take advantage of any terrain

features that will help reduce the ramp angle. In all cases, be sure the ends of the ramp door can be fully supported. Always position the loading ramp so the ends in contact with the ground are level or at the same height. An uneven ramp may cause the cargo to tip over sideways during loading/unloading.

Loading Under Power

Always follow the instructions in the owner's manual for the motorized cargo. If not available, following are generalized suggestions for loading motorized cargo. **At no time should these instructions over-ride the instructions contained in the motorized cargo owner's manual.**

1. Shift into lowest gear before ascending ramps.
2. Align wheels with ramps both loading and unloading.
3. Approach straight on, not on an angle. If you are off to one side and the ground is uneven where the ramp touches the ground, an unbalanced situation can occur.
4. The operator should apply throttle smoothly and climb the ramp at low speed. Too much or sudden increases in throttle will cause the vehicle to be harder to control and may cause the vehicle to impact the front of the trailer cargo area or over-turn.
5. Stop when fully in the trailer. Keep handle bars, mirrors, etc. away from the trailer interior walls. The walls can be damaged by contact with hard, sharp objects.
6. After loading, close the fuel valve and run the engine until it stops (motorcycles and ATVs). Turn the ignition key off and remove it. Set the parking brake. For manual clutch machines, leave the machine in gear.
7. Secure the vehicle with tie downs. The attachment points you select on your equipment must be strong enough to support the weight of the equipment. Usually attachment points that are low and centered on the equipment frame will be good. An attachment to a decorative piece of chrome or plastic will usually not be a good tie-down point. Consider any leverage action that may occur. An attachment point past the center of the equipment could cause the equipment to either swing around or flip over, causing damage to the equipment, or personal injury. If you have any doubt about the attachment point you have selected, stop and find a better attachment point.

Secure The Load

Install blocking devices in the front, back, and on both sides of the wheels to keep it from rolling. This block is strictly an additional safety precaution and does not reduce the need for strapping the vehicle in securely.

Use a minimum of three tie downs to secure the vehicle to the trailer. Use one tie down to secure the front of the vehicle to the trailer. Use two tie downs to secure the rear of the vehicle to the trailer, four tie downs (one at each corner) are preferred.

Attach tie down hooks to the vehicle's frame, not to an accessory such as a mirror, handle bar, pedal, etc. Hooks on the other end must be attached to vehicle cargo anchors installed in the trailer.

For transport, motorized cargo with manual transmissions should be left in first gear. Vehicles with automatic transmissions should be in the Park position. The vehicle's ignition key should be turned off and removed, the parking brake set, the run/stop switch in the stop (or off) position and the fuel lever turned to the off position.



Failure to properly secure cargo could cause, property damage, injury, and/or death.

Unloading Motorized Cargo

The safest method of unloading is to push the vehicle down the ramp, carefully braking to ensure control of the vehicle. If you loaded your vehicle forward (front in) that means you will unload it in reverse. Driving a motorized

vehicle in reverse down the ramp is not recommended. A slight turn of the handle or a slip of the wheel can cause your vehicle to fall, tip or roll sideways. If you are on or in the vehicle you can be injured or killed. Unload the vehicle safely as follows:

1. Be sure the back tires of the vehicle are aligned with the ramp, and there are no people, pets or obstructions in the unloading area at the end of the ramp. Assure that the ground surface will support the vehicle, and that the vehicle cannot roll away uncontrolled.
2. Stand at the front of the vehicle.
3. Push the vehicle backward in line with the ramp.
4. As the rear tires start down the ramp let it roll slowly backwards braking enough to control the speed but not so much as to skid and loose control.

Fuel Transfer System

A fuel transfer system allows you to store gasoline for use in motorcycles, snowmobiles, ATVs or other vehicles and equipment while at a campsite. This system consists of a fuel tank, fuel tank filler, fuel gauge, fuel transfer pump, fuel transfer valve and hose with fill nozzle. Some vehicles will be equipped with a switch at the battery and a switch at the pump. Other vehicles will be equipped with a timer switch allowing the pump to run for five minute intervals. A bonding jumper wire reduces the possibility of static electricity discharge between the fuel station and the equipment being fueled. To fill the tank, remove the fuel filler cap and fill the tank with the grade of gasoline required by your equipment. When replacing the fuel fill cap, be sure it seats squarely and turn it firmly to lock it on the fill pipe neck.



NO SMOKING.

BEFORE DISPENSING OF FUEL, TURN OFF ALL ENGINES, FUEL BURNING APPLIANCES, AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS). CONNECT THE BONDING JUMPER WIRE TO THE VEHICLE RECEIVING FUEL. GROUND THE RV. DO NOT DISPENSE FUEL WITHIN 20 FEET OF AN IGNITION SOURCE OR WITHIN 10 FEET OF ANOTHER RECREATIONAL VEHICLE OR STRUCTURE. FAILURE TO COMPLY COULD RESULT IN FIRE, DEATH OR SERIOUS INJURY.

Fuel Transfer System Safety

Static electricity-related incidents when refueling are extremely unusual. They appear to happen most often during cool or cold and dry climate conditions. In rare circumstances, these static related incidents have resulted in a brief flash fire occurring at the fill point. You can minimize these and other potential fueling hazards by following safe refueling procedures.

A build-up of static electricity can be caused by reentering a vehicle during fueling, particularly in cool or cold and dry weather. If you return to the fuel fill pipe during refueling, the static may discharge at the fill point, causing a flash fire or small sustained fire with gasoline refueling vapors.

Here are some additional refueling safety guidelines when refueling your vehicle or filling up gasoline storage containers:

- Turn off vehicle engines. Disable or turn off any auxiliary sources of ignition: the trailer furnace, water heater, cooking unit, and any pilot lights. Turn off main propane valve.
- Do not smoke, light matches or lighters while operating the refueling system, or when using gasoline.
- Use only the refueling latch provided on the gasoline dispenser nozzle.
- Never jam or otherwise try to lock the refueling latch on the nozzle open.
- Do not re-enter your vehicle during refueling. If you cannot avoid reentering your vehicle, discharge any static build-up BEFORE reaching for the nozzle by touching something metal with a bare hand, such as the vehicle body or frame, away from the nozzle.

- In the unlikely event a static-caused fire occurs when refueling, leave the nozzle in the fill pipe and back away from the vehicle. Turn off the fuel pump master switch immediately.
- Do not over-fill or top-off your vehicle tank, which can cause gasoline spillage.
- Never allow children under licensed driving age to operate the pump.
- Avoid prolonged breathing of gasoline vapors, Use gasoline only in open areas that get plenty of fresh air. Keep your face away from the nozzle or container opening.
- Never siphon gasoline by mouth, Never put gasoline in your mouth for any reason, Gasoline can be harmful or fatal if swallowed, If someone swallows gasoline, do not induce vomiting, Contact a emergency medical service provider immediately.
- Keep gasoline away from your eyes and skin; it may cause irritation. Remove gasoline-soaked clothing immediately.
- Use gasoline as a motor fuel only. Never use gasoline to wash your hands or as a cleaning solvent.

Fuel Transfer System Operation

To operate the fuel transfer system (also see the “Fuel Pump Owner’s Manual” in your Owner’s Information Package):

1. Lower the tongue jack or 5th-wheel jacks to the ground. This will electrostatically ground the trailer to reduce the possibility of static discharge while refueling.
2. Set the master disconnect switch to ON. This will either be located at the battery or at the fuel pump area.
3. Close the vents in the side of the trailer to prevent fuel vapor from entering the trailer.
4. Attach the ground clip securely to a bare metal part of the equipment to be fueled (frame, handle bar, axle bolt, etc.)
5. Turn the fuel transfer pump switch ON. For vehicles equipped with a timer, turn the timer to on and this will allow the pump to run 5 minutes. When the pump stops, turn on again if necessary for another 5 minute run.
6. Remove the fuel hose and nozzle from its compartment. An automatic bypass valve prevents pressure buildup when the pump is on with the nozzle closed.
7. Place the nozzle into the equipment fuel filler and squeeze the handle to allow fuel to flow. Be careful not to overfill the equipment fuel tank. Wipe up any spilled fuel.
8. When finished release the nozzle handle and return the nozzle to its compartment and shut off the pump switch.
9. When you are finished with all fueling, turn off the pump master switch either at the pump or at the battery if equipped.
10. Lock the fuel transfer nozzle compartment to prevent unauthorized use. The nozzle compartment must be locked at all times when not dispensing fuel.

 **WARNING**

If a fuel spill occurs in the storage area of the trailer, open the windows and sidewall vents, and wipe up the fuel with cloth or paper towels. Dispose of the towels in a suitable hazardous waste container. Do not hose out the trailer with water. Clean the fuel spill areas with a grease/oil dissolving cleaner such as 409®. Thoroughly dry the spill areas.

Fuel-soaked rags or other materials contain flammable and/or explosive fuel vapors and other hazardous substances. Clean up materials should be temporarily stored in a nonflammable, vapor-tight container until proper disposal facilities are available. Do not store flammable clean up rags or materials inside the trailer, inside any other vehicle or near any source of flame or ignition.

All parts of the fuel transfer system including but not limited to the hoses, pump, nozzle, fittings, and tank have been selected for their quality, safety, and intended application. Any alteration or replacement of any part by other than Keystone Original Equipment Manufacturing parts could jeopardize the integrity of the system and may result in serious injury or even death.

If your fueling system is not working properly or you need additional information on the use of the system contact your authorized Keystone dealer immediately or call Keystone directly.

Chapter 12: Care & Maintenance

The instructions and recommendations in this manual are meant to be used in conjunction with the individual component manufacturers manuals accompanying the unit. Be sure to thoroughly review each component manual to avoid any specific requirement not reviewed here.

Care and maintenance of the recreational vehicle is an important step in maintaining the safety, dependability and the appearance, both interior and exterior, of the unit. Keep good records of all maintenance performed as these may be necessary for warranty information or may assist in possible repairs needed.

Operational usage and climates may affect the frequency of maintenance needed on certain components. Preventative maintenance is important to the life and enjoyment of any recreational vehicle as many problems can be caught before they occur. Please do not hesitate to call your dealer with a question on the care and maintenance of any item.

Exterior

Frame/Chassis/Attachments

The frame and frame components will corrode and it is normal. When and how much depend on the environment the unit is subjected to, how often it is subjected to it and the preventative maintenance performed. The more exposure to snow, rain, road salt, road chemicals, salt water, etc. the more accelerated and more severe the corrosion will be. Diligence on the part of the owner when a unit is subjected to these elements can significantly reduce the severity and how quickly this occurs.

When your unit is exposed to a known corrosive (road salt, road chemicals, salt water, etc) take the time to rinse off the frame, frame components, under carriage, axles & running gear as soon as possible after reaching your destination. Wash the exterior. Taking these simple steps will greatly reduce the extent and slow corrosive action significantly.

Inspect the frame and frame components periodically. If a spot of rust is developing or the frame was nicked or scratched by road debris, sand (or wire brush) and touch it up with rustproof enamel paint. Think of it as a tooth with a cavity developing. Take care of it before it gets too deep and causes bigger issues.

Steps

Keep clean of dirt, salt, mud, etc. and lubricate pivot points with a dry lubricant spray every 30 – 60 days.

Hitch Couplers (Travel Trailers)

Inspect prior to each trip. The ball socket and clamp should be cleaned and lubricated monthly with wheel bearing grease. If coupler or coupler components appear damaged or worn, contact your dealer immediately.

Pin Box (Fifth-Wheel) & Hitch Equipment

Inspect monthly or prior to each trip. The hitch plate and locking mechanism should be generously lubed with a high temperature rated grease at all times. Consult the hitch manufacturer's manual for the brand you selected.

Safety Chains (Travel Trailers)

Safety chains should be inspected before every trip and if damaged or weakened, replace immediately. Never tow without use of the safety chains.

Tongue Jacks, Manual/Power (Travel Trailers)

When preparing to travel, inspect the jack for any damage and test operation. If jack is difficult to operate, clean and oil lightly (Manual). If jack is still difficult to operate or freezes, it should be serviced or replaced by a qualified RV technician.

Fifth-Wheel Jacks

When preparing to travel, inspect the inner/outer arms (legs) and be sure they are not bent. Check the operation and if the jacks are difficult to operate, have them service by a qualified RV technician.

Siding & Sidewall Attachments

“Black streaks” are caused when pollution, rain, dirt and sealant deterioration mix. We are not aware of any way to prevent “black streaks”. However, keeping your exterior washed and waxed often will make them much easier to remove. There are many products in the market that are effective in removing “black streaks”. Consult your dealer for these products.

Fiberglass / Gel Coat Finish

Care of the Filon™ finish is similar to caring for a new car. Exposure to extreme sunlight, pollutants, and excessive moisture can cause dulling, fading and yellowing. Regular washing and periodic waxing will help maintain the glossy new look. When washing, use a mild, automotive or RV wash solution, available at your dealer, being sure to rinse off any loose debris first. Waxing the Filon™ areas twice a year is recommended. Wax with a non-abrasive automotive wax or polish developed for fiberglass (boats, RV's) and follow the directions closely.

Metal

The aluminum exterior has a baked on enamel finish. Washing frequently with an automotive or RV wash solution will help avoid staining from debris and soil build up. Always rinse unit with clear water prior to washing to remove any loose dirt. Waxing two to three times a year with a good automotive paste wax will help preserve the finish

DO'S and DON'TS

- DO Use Automotive / Marine grade non-abrasive waxes.
- DO Use Soft cloths to clean and wax
- DO be careful around graphics. Wax and wash with the graphic, not against it.
- DO NOT use products containing ammonia or caustic harsh cleaners as they may cause discoloration to the fiberglass surface.
- DO NOT use high-pressure washers, rotating brushes, such as in car washes, and power buffers. Use of these products can damage graphics and/ or paint finishes.
- DO NOT dry wipe surfaces
- DO NOT use rubbing compounds

ABS Plastic / Molded Parts

Some components are constructed of strong ABS molded plastic. A mild solution of soap and water should be used when cleaning. When using any product, make sure the product is recommended for use on plastics. Avoid harsh abrasive cleaners, ammonia or citric-based products as discoloration may result.

Windows

The seals/sealants used to seal the windows to the sidewall of the unit are subject to deterioration over time. Every six months, inspect the area between the window frame and the side wall for sealant gaps/voids, cracks, shrinkage, etc. and reseal as necessary. In addition, after a rain, inspect the interior of the unit around windows for any evidence of water penetration. If any interior leaks are noticed, contact an authorized dealer immediately. If caught early, it may save you much time, frustration and money.

To ensure window operation, adjust and lubricate latches and any moving parts annually. A light oil or powdered graphite can be used for lubrication. Periodically use a vacuum attachment to clean any debris out of the window weep holes, which are necessary to drain any condensation or moisture from hard driving rains that may collect.

Corner Moldings

A corner molding is the trim that covers the joint between a front/rear wall and a sidewall. The sealants used here are subject to deterioration in time. As sealants dry out and the unit twists and turns during normal operation, these areas are subject to leaks. This area is very important because a leak may not manifest itself inside the unit where it is easily identifiable. This type of leak may take time to be evident and by then, there could be substantial damage. Every six months, inspect these areas for sealant gaps/voids, cracks, shrinkage, etc. and reseal as necessary. Please consult your local Keystone dealer for assistance if needed.

Moldings

There are a variety of other moldings used on the exterior of our applications that include but are not limited to floor line, awning rail, roof line, flat trim with screw cover. Every six months, inspect these areas for sealant gaps/voids, cracks, shrinkage, etc. and reseal as necessary. Please consult your local Keystone dealer for assistance if needed.

Other Wall Attachments

These can include but are not limited to compartment doors, door holders, range vent, refer vent, lights, awning feet, water fills, cable hatches, furnace vents, grab handles, speakers, receptacles, water heater, etc. Every six months, inspect these areas for sealant gaps/voids, cracks, shrinkage, etc. and reseal as necessary. Please consult your local Keystone dealer for assistance if needed.

Slide-out's

Don't forget this important feature when it comes to maintenance. A slide-out has it's own roof, end walls, rear wall, floor with similar moldings and attachments as the rest of the unit. The sidewall opening moldings and all components of the slide-out room "box" should be inspected every six months for sealant gaps/voids, cracks, shrinkage, etc. and resealed as necessary. Please consult your local Keystone dealer for assistance if needed.

CAUTION ABOUT SEALANTS - Be careful when selecting a sealant, as it is not recommended to use 2 different sealants on top of each other. It may appear sealed, but water may be able to slip between the 2 sealants if they do not bond to each other. It is recommended to use the same type/brand sealant as was used originally or to remove all old seal, clean the area/component and install all new fresh sealant. Please consult your local Keystone dealer for assistance if needed.

Roof

In most cases, the roof assembly consists of the interior paneling, a truss system, insulation, roof decking (plywood, OSB) and a rubber roof which is glued to the roof decking. Because of the manufacturing process, air pockets and/or visible spots may be seen in the rubber roof. These visible spots can be caused by debris (wood, staples, screws, etc.) that are between the rubber roof and decking or by imperfections occurring during the rubber roof manufacturer. In most cases, these are considered cosmetic in nature and seldom require any corrective action.

Rubber Roof

The rubber roof is a polymer membrane that will not rust or corrode and is very strong and durable. Other than periodic washing, the rubber roof material itself does not require maintenance or coatings. However, be advised that any attachment, seams or joints in the rubber roof requires maintenance often!

The roof material can, however, be punctured, snagged or cut by contact from other objects. Know the height of your unit and avoid contact with overpasses, trees, etc. If the rubber roof is damaged, it is designed to be patched. "Rubber roof patch" kits are available through your local dealer. If done correctly, these kits are designed extremely reliable.



*The rubber roofing material, when wet, may be slippery.
Always use caution when working on top of the RV.*

Roof Seams and/or Joints

Roof sealants will deteriorate which can lead to leaks. Deterioration can be accelerated in heavy sun, changes in climates (expansion/contraction with aggressive temperature change), and cold climates. Once the unit leaves our manufacturing facilities, we can no longer maintain the sealants, that becomes your responsibility. We hope you take this seriously because it can help prevent a very frustrating situation that can be very expensive to remedy (damage from water leaks).

Inspect the roof at least every 90 days, paying close attention to all seams and/or joints and attachments where sealant is used. Look for cracks, shrinkage and/or gaps/voids in the sealants. These must be carefully cleaned and resealed. It is necessary to use the same sealant as originally installed if touching up cracks, shrinkage and gaps/voids. There is no way to know if 2 different brands of sealant will seal to each other. DO NOT use any type of silicone product on the rubber roof material.

If there any doubt in your mind in performing this maintenance, please contract with your local dealer to have it done.

Please refer to the manufacturer instructions supplied with the unit for Care & Maintenance of this product.

Brake Adjustment

The electric brakes are of the drum and two-shoe type and adjust the same as most automotive brakes. Adjust brakes after the first 200 miles. Every 3 months or 3000 miles, test the brake drag and adjust if required. Full procedures are outlined in the component manufacturer's guide, included in the unit packet. Never adjust just one brake. When adjusting brakes on any vehicle, either replace or adjust all brakes at the same time, or at least both brakes on the same axle.

Battery

Please refer to the battery manufacturer instructions for the product you selected for the detailed safety and maintenance requirements.



Before performing any maintenance on the battery, always disconnect the battery, removing the negative (-) cable first and then disconnecting the positive (+).

The acid in batteries is highly corrosive and hydrogen gas is produced which is extremely flammable. Avoid placing near a possible ignition source such as open flame or potential spark producing wiring.

General Information

Never place batteries in any compartment or near anything that could spark, even a 12 Volt switch. Never smoke or use open flames anywhere near the battery. Secure batteries in a battery box or in a compartment specially designed for battery storage. Wear safety glasses and appropriate clothing when performing any maintenance on a battery. In case of a spill or splash, immediately flush the affected area with cold water for 15 minutes and call the poison control center for further instructions.

If the shore line cord will be plugged in for long periods of time, battery water will evaporate quicker and maintenance will be required more often (does not apply to maintenance free battery).

Keep battery terminals clean of corrosion and tightened.

When storing the RV for an extended period, fully charge the battery before storage. Batteries will self-discharge over time and are subject to freezing, especially if in a discharged condition. We recommend removing the fully charged battery and storing in a cool dry place. Periodically check the charge of the battery while in storage and recharge as needed.

Interior

Appliances: See Chapter 6

Bedspreads

Refer to the label attached to the bed spread by the manufacturer. Dry-clean only unless the care instructions on the label indicate otherwise. Washing a dry-clean only bedspread could cause premature deterioration, fading, shrinkage and / or possible damage.

Blinds and Shades

Venetian blinds and day/night shades should be vacuumed regularly with a soft brush attachment. Use of a soft cloth and mild cleaner on blinds will help keep them new looking. For fabric shades, upholstery cleaners are not recommended. Instead, spot clean when necessary, using a mild soap and water solution on area.

Cabinet Doors and Drawers

The cabinet doors and drawer fronts should be cared for similar to the fine furniture in your home. Using a quality furniture polish will help maintain the beauty and luster of the wood as well as keep the wood from drying out. The accidental scratches can be covered satisfactory with a good quality commercial furniture scratch remover.

Carpeting

The carpeting installed is made of nylon and is easy to maintain. Vacuum regularly to remove abrasive grit. Water based spills and spots should be removed immediately with a damp cloth. Grease or oil based stains and spots should be spot cleaned with a good commercial spot cleaner made for this purpose. If complete shampooing is desired, it is best to have it done by a competent professional carpet cleaner. Never soak or water-log your carpeting.

Ceilings and Walls

Clean only with a mild detergent in warm water, using a damp cloth to clean the ceiling. Never use strong chemicals or excessive water / moisture, as either can damage the ceiling or walls.

Countertops

Most countertops are made of high-pressure plastic laminates and are highly resistant to normal spills and scuffs. Soap and lukewarm water or a mild, non-abrasive cleaner are recommended. Avoid use of abrasive pads and scouring powders, which can dull the surface and make it more stain-prone. Always use a chopping block or cutting board when using knives. Pots and pans straight from the burner or oven should be placed on lined hot pads and not directly on the counter surface.

Solid Surface Countertops

The solid surface composite countertops can be cleaned with soap and mild detergents, which will remove most stains. DO NOT use products containing bleach. Stubborn stains may require the use of a white Scotch Brite pad and a non-abrasive cleaner like Soft Scrub. Scratches may be removed carefully using a green Scotch Brite pad and an abrasive cleaner like Ajax or Comet. Cover an area large enough to blend the area needing repair, using a circular motion while applying. Most defects in solid surface countertops can be repaired without replacement.

Draperies

Draperies and upholstery fabrics are treated with fire-retardants and are dry-clean only unless the manufacturer label indicates otherwise. When dry cleaning, be sure to inform attendant of fire retardant items. Spots and stains should be removed with a non-water based commercial spot remover manufactured for this purpose.

Faucets and Fixtures

To protect the finishes on your kitchen and bath faucets and fixtures, use only a damp soft cloth or sponge. Do not use abrasive cleaners or materials as they can damage the finish.

Flooring, Vinyl

For routine cleaning, sweep or vacuum regularly. Follow by using a damp mop with warm water and clean a small area at a time. Rinse the mop frequently as to not redistribute the dirt picked up. If washing is needed, use a quality product designed for no-wax flooring. To polish the floor, do not use solvent-based waxes or polishes as damage to the flooring may result. Use only polishes recommended for no-wax flooring.

Glass and Mirrors

Clean glass and mirrors as you would at home using a cleaner designed for glass. To reduce “spotting” on outside windows, use a squeegee promptly after rinsing with water. For stubborn spots, cleaning with a mixture of vinegar and water is recommended and is safe for most finishes.

Fabric and Upholstery

Do not laundry upholstery fabrics. Blot up stains promptly and use an upholstery cleaner or mild solvent, depending on the stain. Never soak the fabric and use as little water as possible. Blot rather than rub. Towel dry or have professionally cleaned. Upholstery can be vacuumed regularly using a soft brush attachment.

Sinks, Tubs and Toilets

Many of these products are made of acrylics, plastics or composite materials and use of non-abrasive cleaners is recommended to protect the finish. Use of harsh cleaning products can cause premature deterioration and/or yellowing of the surface finish.

Appendix

For assistance with this manual, warranty information or information on Keystone Products, please visit us on the web or contact Keystone RV Company Retail Customer Service.

Address:

Keystone RV Company Customer Service Dept.

2642 Hackberry Drive

Goshen, IN 46526

Fax: 574-537-3990

Toll Free Phone: 866-425-4369

E-Mail: www.keystonerv.com

Business Hours:

8:00AM - 5:00PM (EST) Monday - Thursday

8:00AM - 3:00PM (EST) Friday

Exterior Pre-Travel Checklist

- Fill the LP bottles
- Empty the holding tanks
- Connect the trailer to the tow vehicle and test all of the exterior lights
- Inspect the awning and ensure that it is properly retracted and secured for travel
- Inspect all exterior baggage doors and hatches ensuring they are locked
- Inspect the tires and check the pressures. Refer to Chapter 3
- Check the wheel nut torque. Refer to Chapter 3
- Connect the breakaway switch and test the brakes on the trailer. Adjust the tow vehicle brake controller in accordance with the manufacturer's recommendations
- Secure the rear leveling jacks in the "up" position
- Position the battery disconnect to the on position
- Ensure the steps are retracted

Interior Pre-Travel Checklist

- Close all vents and windows
- Place the television antenna "down" position
- Retract the slide rooms
- Inspect the interior of the unit ensuring that all cabinet, interior, and the shower doors are closed and secured
- Secure all loose items in storage compartments
- Ensure that the refrigerator door is closed and latched
- Verify the smoke, carbon monoxide and LP alarms are in working condition

Glossary of Common RV Terms

AC ELECTRICITY: Alternating Current. Standard Household 120V AC current.

ANODE ROD: Part of the water heater that attracts impurities in the water that cause corrosion.

BLACK TANK: The holding tank into which the toilet directly drains.

BLACK WATER: The term associated with sewage contained within the black tank.

BRAKE CONTROLLER: Device located in the tow vehicle that activates the trailer brakes.

BTU: The measurement of the amount of heat required to raise the temperature of one (1) pound of water, one (1) degree F.

COLD INFLATION PRESSURE: The pressure in the tire before it is driven.

CITY WATER: Refers to exterior water source, not water from the fresh water tank that you hook up to at campgrounds. "City Water" refers to pulling water from a central source (like in a city).

CONDENSATION: The result of warm humid air coming in contact with cold glass also known as 'Sweat'.

CONVERTER: Device that converts 120V AC to 12V DC.

COLD INFLATION PRESSURE: The pressure in the tire before you drive.

CURB WEIGHT: The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine.

CURBSIDE: Term used to refer to the side of your coach, which faces the curb or shoulder when parked. Also called DOOR SIDE (the main entrance door) or OFFROAD SIDE.

DC ELECTRICITY: Direct Current. Also termed Battery Power. Used to run all 12 Volt powered systems or lighting.

DRY CAMPING: Refers to camping using only the resources within your unit and without amenities such as city water hook-ups, electrical hook-ups, etc., often provided at commercial campsites.

DSI IGNITION: Direct Spark Ignition – The method of lighting a main burner on a LP fired appliance.

DUCTED AC: Air conditioning distributed through a ducting system.

DUCTED HEAT: Warm air distributed through a ducting system.

DUAL ELECTRICAL SYSTEM: Trailer equipped with appliances and lights, which operate on 12V power when self-contained, and with a converter, on 120V AC when in campgrounds or run off of a generator.

DUMP STATION: Term used for locations to drain the waste holding tanks (gray and black tanks). In most states, it is illegal to dump your tanks anywhere except at dump stations.

DUMP VALVE: Another name for the T-Handle used to drain the black and gray tanks.

EGRESS WINDOW: Term for the emergency exit windows within recreational vehicles: Usually identified by a red handles or levers.

FULL HOOK-UP SITE: A campsite that offers full amenities: city water, sewer, and electrical hook ups – many have cable and phone available.

GALLEY TANK: A gray water holding tank used specifically for the kitchen waste water.

GENERATOR: Powered by LP gas, generates 120V power.

GRAY TANK: the waste holding tank into which water from the kitchen and bath sinks, shower and tub drains.

GRAY WATER: Water drained into the gray holding tank.

GROSS AXLE WEIGHT RATING (GAWR): Maximum amount of weight (in lbs.) that can be placed on the axle.

GROSS COMBINED WEIGHT RATING (GCWR): Maximum load weight (in lbs.) allowed for the coach and tow vehicle.

GROSS VEHICLE WEIGHT RATING (GVWR): Maximum load weight (in lbs.) allowed for the vehicle.

HITCH WEIGHT: Amount of a trailers weight that rests on the tow vehicle's hitch. See also pin weight.

HOLDING TANKS: Refers to the tanks typically known as fresh water, gray and black, where the water is held.

HOOK-UPS: Where you connect to a campground's facilities.

LOAD RATING: The maximum load that a tire is rated to carry for a given inflation pressure.

LOW POINT/LOW POINT DRAIN: Low point in the plumbing system.

LP GAS: Liquefied Petroleum Gas used to fuel appliances. Propane is a LP gas.

MAXIMUM LOAD RATING: The load rating for a tire at the maximum permissible inflation pressure for that tire.

MAXIMUM PERMISSIBLE INFLATION PRESSURE: The maximum cold inflation pressure to which a tire may be inflated.

PILOT: Small flame that is used to ignite the main burner of a LP-fired appliance.

PIN WEIGHT: The vertical trailer load supported by the king pin of a fifth- wheel hitch. Also called hitch weight.

PRIMITIVE CAMPSITE: Campsite that offers limited connections. May have city water or electrical available but not both.

PULL-THROUGH SITES: Camp sites that you can pull your recreational vehicle through, eliminating the need to back in.

RADIAL PLY TIRE: A pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the center line of the tread.

RECOMMENDED TIRE INFLATION PRESSURE: This is the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification / VIN tag.

ROADSIDE: Refers to the side of the unit that faces the road when parked. Also commonly referred to as "Off DOOR SIDE."

RV: Short for Recreational Vehicle.

RVIA: Recreational Vehicle Industry Association

SHORE LINE: The electrical cord that connects 120V from an exterior outlet (such as campgrounds) to the RV. Also called 'Power Cord'

SHORE POWER: The 120V outlet that connects to the Shore Line.

UNLOADED VEHICLE WEIGHT (UVW): Weight of the unit without adding fuel, water, propane, supplies and passengers. Also referred to as 'Dry Weight'