

## MONACO RV TOWABLE LIMITED WARRANTY - 2012

### WHAT THE PERIOD OF COVERAGE IS:

The Limited Warranty provided by Monaco RV, LLC (“Warrantor”) covers those components, assemblies and systems of your new towable product not excluded under the section “What The Warranty Does Not Cover” and when sold by an authorized dealer, for twelve (12) months from the original retail purchase date. However, this Limited Warranty covers the internal steel or aluminum structural support frames inside the walls and roof (excluding slide-outs) for sixty (60) months from the original retail purchase date. If you use your towable product for any rental, commercial or business purposes whatsoever, the Limited Warranty provided by Warrantor covers your new towable product when sold by an authorized dealer for ninety (90) days from the original retail purchase date, and it covers the internal steel or aluminum structural support frames inside the walls and roof (excluding slide-outs) for twelve (12) months from the original retail purchase date. A conclusive presumption that your towable product has been used for commercial and/or business purposes arises if you have filed any tax or other form claiming any business use, ownership, or tax benefit related to your towable product.

This Limited Warranty is limited to the original consumer purchaser and is not transferable.

### LIMITATION AND DISCLAIMER OF IMPLIED WARRANTIES:

**IMPLIED WARRANTIES, IF ANY, ARISING BY WAY OF STATE LAW, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY AND ARE LIMITED IN SCOPE OF COVERAGE TO THOSE PORTIONS OF THE TOWABLE PRODUCT COVERED BY THIS LIMITED WARRANTY. WARRANTOR DISCLAIMS ALL IMPLIED AND EXPRESS WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ON COMPONENTS AND APPLIANCES EXCLUDED FROM COVERAGE AS SET FORTH BELOW.** There is no warranty of any nature made by Warrantor beyond that contained in this Limited Warranty. No person has authority to enlarge, amend or modify this Limited Warranty. The dealer is not the Warrantor’s agent but is an independent entity. Warrantor is not responsible for any undertaking, representation or warranty made by any dealer or other person beyond those expressly set forth in this Limited Warranty. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

### WHAT THE WARRANTY COVERS:

Warrantor’s Limited Warranty covers “mechanical defects” in the manufacture of your towable product. “Mechanical Defect” means a nonconforming condition that substantially impairs the use and operation of the towable product. Also see the section “What the Warranty Does Not Cover” set out below.

### WHAT WE WILL DO TO CORRECT PROBLEMS:

Warrantor’s sole and exclusive obligation is to repair and/or replace, at its option, any covered defect if: (1) you notify Warrantor or one of its authorized servicing dealers of the defect within the warranty coverage period and within five (5) days of discovering the defect; and (2) you deliver your towable product to Warrantor or Warrantor’s authorized servicing dealer at your cost and expense. It is reasonable to expect some service items to occur during the warranty period. The performance of warranty repairs shall not extend the original warranty coverage period. 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. If the repair or replacement remedy fails to successfully cure a defect after Warrantor received a reasonable opportunity to cure the defect(s), your sole and exclusive remedy shall be limited to Warrantor paying you the cost of having an independent third party perform repair(s) to the defect(s). Warrantor may use new and/or remanufactured parts and/or components of substantially equal quality to complete any repair.

Imperfections and/or damage to interior and exterior surfaces, trim, upholstery and other appearance items may occur at the factory during manufacture, during delivery of the towable product to the selling dealer or on the selling dealer’s lot. Normally, any such imperfections are detected and corrected at the factory or by the selling dealer during the inspection process performed by the Warrantor and the selling dealer. If, however, you discover any such imperfection or damage when you take delivery of the towable product, you must notify your dealer or Warrantor within thirty (30) days of the date of purchase to have repairs performed at no cost to you in accordance with this Limited Warranty. If not reported within this time, such imperfections are conclusively presumed to be the result of normal wear and tear.

If a servicing dealer is unable or unwilling to solve a problem you are convinced is covered by the Limited Warranty, or that concerns the safety of your towable product, or that may involve local consumer protection or “lemon” laws, then you **must**, to the extent permitted by law, **notify Warrantor directly in writing** of the failure to successfully repair the defect(s) so that Warrantor can become directly involved in performing a successful repair.

### HOW TO GET SERVICE:

The “Acknowledgement of Receipt of Warranty/Production Information” form must be returned to Warrantor promptly upon purchase to assure proper part replacement or repair of your towable product. Failure to return the “Acknowledgement of Receipt of Warranty/Production Information” form will not affect your rights under the Limited Warranty so long as you can furnish proof of purchase. For warranty service simply contact one of Warrantor’s authorized service centers for an appointment, then deliver your towable product (at your expense) to the service center. If you need assistance in locating an authorized warranty service facility, contact Warrantor’s Warranty Department (1-877-466-6226).

**HOW TO GET SERVICE (cont'd):**

The Warrantor's mailing address is:

**91320 Coburg Industrial Way  
Coburg, Oregon 97408**

Because Warrantor does not control the scheduling of service work by authorized servicing dealers, you may encounter some delay in scheduling and/or in the completion of the repairs.

**WHAT THE WARRANTY DOES NOT COVER:**

This Limited Warranty does not cover: any towable product sold or registered outside of the United States or Canada; exterior fiberglass and gel coat; items which are added or changed after the towable product leaves Warrantor's possession; items that are working as designed but which you are unhappy with because of the design; normal wear and usage, such as fading or discoloration of fabrics, or the effects of moisture inside the towable product; defacing, scratching, dents and chips on any surface or fabric of the towable product; owner maintenance, including by way of example resealing exterior sealant areas; appliances and components covered by their own manufacturer's warranty including, by way of example the tires, batteries, gauges, microwave, refrigerator, ice maker, stove, oven, generator, roof air conditioners, jacks, VCR, television(s), water heater, furnace, stereo, radio, compact disc player, washer, dryer, inverter and cellular phone; flaking, peeling and chips or other defects or damage in or to the exterior or finish caused by road hazards, airborne pollutants, salt, tree sap, hail, or any other cause. Component part and appliance manufacturers issue limited warranties covering portions of the towable product not covered by the Limited Warranty issued by Warrantor. To learn more on what specific component parts and appliances are excluded from the Limited Warranty issued by Warrantor please contact your selling dealership or Warrantor directly or review the warranty packet inside the towable product.

**EVENTS DISCHARGING WARRANTOR FROM OBLIGATION UNDER WARRANTY:**

Misuse or neglect, accidents, unauthorized alteration, failure to provide reasonable and necessary maintenance (See Owner's Manual), damage caused by off road use, collision, fire, theft, vandalism, explosions, and overloading in excess of the rated capacities, or other utilization of the product contrary to its design, instructions, or intended uses shall discharge Warrantor from any express or implied warranty obligation to repair any resulting defect.

**DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES:**

THE ORIGINAL PURCHASER OF THE TOWABLE PRODUCT AND ANY PERSON WHO IS AN INTENDED OR UNINTENDED USER OR BENEFICIARY OF THE TOWABLE PRODUCT, SHALL NOT BE ENTITLED TO RECOVER FROM WARRANTOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE TOWABLE PRODUCT, INCLUDING BY WAY OF EXAMPLE FUEL AND TRANSPORTATION EXPENSES TO DELIVER THE PRODUCT TO THE SERVICING DEALER, HOTEL ROOMS, LOST WAGES AND MOISTURE DAMAGE SUCH AS MOLD AND MILDEW. THE EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES SHALL BE DEEMED INDEPENDENT OF, AND SHALL SURVIVE, ANY FAILURE OF THE ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above exclusions may not apply to you.

**LEGAL REMEDIES:**

THESE LIMITED WARRANTIES ARE NOT INTENDED TO, AND DO NOT "EXTEND TO FUTURE PERFORMANCE." ANY ACTION SEEKING REMEDIES FOR BREACH OF WARRANTY OR SEEKING TO ENFORCE THIS LIMITED WARRANTY OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN ONE (1) YEAR AFTER THE EARLIER OF: (i) THE EXPIRATION OF THE WARRANTY COVERAGE PERIOD DESIGNATED ABOVE; (ii) THE FAILURE OF THE WARRANTOR TO REPAIR THE DEFECT AT ISSUE; OR, (iii) THE DATE ON WHICH THE BUYER'S ACTION ACCRUED UNDER APPLICABLE LAW. UNLESS PROHIBITED BY LAW, THE PERFORMANCE OF REPAIRS SHALL NOT SUSPEND THIS LIMITATIONS PERIOD FROM EXPIRING. THESE TERMS AND ALL WRITTEN AND IMPLIED WARRANTY DISPUTES BETWEEN WARRANTOR AND PURCHASER SHALL BE GOVERNED BY THE SUBSTANTIVE LAWS OF THE STATE OF OREGON, WITHOUT REGARD TO CONFLICTS OF LAW RULES. Some states do not allow the reduction in the statute of limitations, so the above reduction in the statute of limitations may not apply to you.

**THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.**

**LARGER PRINT VERSION AVAILABLE WITHIN THE OWNERS MANUAL AND UPON REQUEST ADDRESSED TO YOUR SELLING DEALER OR WARRANTOR'S WARRANTY DEPARTMENT.**

# *2012 HOLIDAY RAMBLER*

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The information contained in this document is intended to reflect standard and optional equipment included in a typically equipped model at the time of delivery to the initial retail owner. Your actual unit may vary from this document as a result of optional equipment that is not generally offered on this model. In the case that you are not the initial retail owner of the unit, this document will not reflect modifications that may have been performed by previous owners.

Product information and specifications are shown herein as of the time of printing. The manufacturer reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligation.

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Check online for Addendums or Tech Tips that may apply to your recreational vehicle.

**MANUAL ADDENDUMS & TECH TIPS**

**[www.monaco-online.com](http://www.monaco-online.com)**

Click on the **brand** logo, then click on **SERVICE** link and choose either **MANUAL ADDENDUMS** or **TECH TIPS** from the menu.

# General Information

## Section 1

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### **CALIFORNIA PROPOSITION 65 WARNING:**

Most vehicles, including this one, contain and/or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. A wide variety of vehicle fluids, components, and parts—including building materials used in the interior furnishings in this vehicle—contain and/or emit these chemicals, including formaldehyde. In addition, battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling. Consult with your doctor or other health professional for further advice concerning exposure from this vehicle to chemicals known to the State of California to cause cancer and reproductive harm.

## WARRANTY INFORMATION FILE

In addition to the Owner's Manual, a Warranty Information File can be found in the recreational vehicle. This file contains valuable documents about the recreational vehicle systems and equipment. Also contained in the file are OEM manuals and component manufacturer warranty registration cards. The component warranty registration cards will need to be filled out and mailed. Be sure to read and understand all the information in this file to safely operate, maintain and troubleshoot those items.

### Additional Information:

Changes, additions and supplemental information in the form of Manual Addendums and "Tech Tips" can be obtained by visiting our Web Site at [www.monaco-online.com](http://www.monaco-online.com). Select one of the products from the product lineup. Go to the Service menu. A submenu will appear.

It may also be helpful to browse the "Tech Tips" menu for the other product lines. The tips may not completely apply to every model; however, information contained therein can be useful.

## REPORTING SAFETY DEFECTS

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

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

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 Avenue, SE, Washington, DC, 20590. You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

## SAFETY TERMS

Many of the safety terms are personal safety instructions. Definitions for the terms are listed below. It is important to thoroughly read and understand the safety instructions displayed throughout the manual. Failure to comply with specific instructions may result in personal injury or death. Many instructions are required by National Safety Associations.

### WARNING:

Warnings contain information regarding personal safety and/or pertaining to potential extensive or permanent damage to the recreational vehicle or its components by means of hazards or improper use.

### CAUTION:

Cautions pertain to potential damage to the recreational vehicle and/or its components.

### POISON:

A warning or caution pertaining to safety and/or use of a poisonous substance or harmful chemical.

### NOTE:

Information and reminders concerning proper operation of the recreational vehicle and/or its components.

### INSPECTION:

Inspection of the recreational vehicle and/or its components is required. Additional instruction may follow.

### LUBE:

Lubrication, or addition of a lubricant product, to the recreational vehicle and/or a specified component or part is required. Additional instruction may follow.

### ASSEMBLE or REPAIR:

Assembly, disassembly or installation of a component or part, and/or repair to the recreational vehicle may be required. Assistance of Technical Support or Technician may be necessary.

### INFORMATION:

References to additional information regarding operation of the recreational vehicle and/or its components found in additional sources, other than the Owner's Manual. Also refers to the Warranty Information File found in the recreational vehicle.

**TIP:**

Tips contain information, helpful hints and/or suggestion for ease of operation of the recreational vehicle or its components.

**GLOSSARY OF TERMS**

**AC Electricity** - Alternating current also known as household power.

**Alternating Current (AC)** - A current that varies periodically in magnitude and direction. A battery does not deliver alternating current. Also referred to as shore power, utility power, generator power, etc.

**Ampere (Amp)** - The unit of measure of electron flow rate of current through a circuit.

**Ampere-hour (Amp-hr. AH)** - A unit of measure for a battery electrical storage capacity, obtained by multiplying current in ampere by time hours of discharge. (Example: a battery which delivers 5 Amp. for 20 hours delivers 5 Amp. times 20 hours, or 100 Amp-Hr. of capacity.)

**ANSI** - American National Standards Institute.

**ASTM** - American Society for Testing and Materials.

**Black Water** - Term associated with the sewage holding tank. The toilet drains directly into this tank.

**British Thermal Unit (BTU)** - Heat required to raise or lower temperature of one pound of water by 1° F.

**Circuit** - Electric circuit: path of an electric current. Closed circuit: complete path. Open circuit: broken/disconnected path.

**City Water** - A term associated with the water supply used at campgrounds. It is called city water because water is pulled from a central source (like in a city) and not the fresh water tank.

**Curbside** - Refers to the recreational vehicle side facing the curb when parked. Also called door side or passenger side.

**Current** - The rate of flow of electricity or the movement rate of electrons along a conductor. It is comparable to the flow of a stream of water. The unit of measure for current is the ampere.

**Cycle** - In a battery, one discharge plus one recharge equals one cycle.

**DC Electricity** - Direct current also known as battery power.

**Direct Current (DC)** - Power that is stored in a battery bank or supplied by photovoltaics, chargers and DC generators. Direct current is also known as battery power. Current only flows one way.

**Drain Trap** - A curve in all drains. Water is trapped in the curve, creating a tank odor barrier, preventing odor escape.

**Dry Camping** - Camping in the recreational vehicle when there is no city water hook-up or shore power. In other words, using only the water and power that is in the recreational vehicle and nothing from another source.

**Dump Station** - Sites used to drain waste (grey) and sewage (black) tanks. In most states it is illegal to drain waste tanks anywhere except at dump stations.

**Dump Valve** - Another name for the T-handle valve used to drain the sewage (black) and waste (grey) tanks.

**Escape (Egress) Window** - The formal name for the emergency window in the recreational vehicle. Egress windows can be easily identified by their red handles.

**Full Hook-Up Site** - A campground that has city water, shore power and sewer hook-ups or connections available.

**Grey Water** - Term associated with the waste water holding tank. Water from sink drains, shower and washer/dryer (if equipped) go in this tank.

**House Battery** - Powers 12 V lights and accessories inside recreational vehicle.

**LED** - (Light Emitting Diode) Indicator light.

**LLA Battery** - A Liquid Lead Acid battery that uses liquid as an electrolyte. This type of battery (Wet Cell) requires periodic maintenance, such as cleaning the connections and checking the electrolyte level.

**Low Point Drain** - The lowest point in the plumbing. Drains are placed here allowing water to drain out of the lower end of the recreational vehicle. These drains must be closed when filling the water tank.

**OEM** - Term for Original Equipment Manufacturer.

**OHM** - A unit for measuring electrical resistances.

**Ohm's Law** - Expresses the relationship between volt (E), ampere (I) in an electrical circuit with resistance (R); expressed as follows:  $E = IR$ . If any two of the three values are known, the third value can be calculated by using this formula.

**Potable Water** - Water that is safe for human consumption.

**Pounds Per Square Inch Gauge (psig)** - Pressure measured with respect to that of the atmosphere. This is a pressure gauge reading in which the gauge is adjusted to read zero at the surrounding atmospheric pressure. It is commonly called gauge pressure.

**Roadside** - Refers to the recreational vehicle side facing the road when parked. Also called off-door side or driver side.

**Shore Line** - The electrical cord which runs from the recreational vehicle to the campground 120/240 Volt electrical supply.

**Volt** - The unit of measure for electric potential.

**Watt** - The unit to measure electrical power (rate of doing work) in moving electrons by or against an electric potential.

**Wet Cell Battery** - A type of battery that used liquid as an electrolyte and requires periodic maintenance.



## CHANGE OF OWNERSHIP/ADDRESS INFORMATION

Mail to:

**MONACO RV, LLC.  
CUSTOMER SERVICE  
91320 COBURG INDUSTRIAL WAY  
COBURG, OREGON 97408**

*Please read terms and representations below before signing.*

**Submitted By: (Please Print)**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: ( \_\_\_\_\_ ) \_\_\_\_\_

**Current Owner Information: (Please Print)**

\_\_\_\_\_  
First Name                      Initial                      Last Name

\_\_\_\_\_  
Vehicle Identification Number                      Unit # (15 digits)                      (6 digits)                      Model/Year

Change of Address                       Change of Ownership

\_\_\_\_\_  
First Name                      Initial                      Last Name

( \_\_\_\_\_ )  
Phone Number                      Street Address                      City                      State                      Zip

\_\_\_\_\_  
Date of Transfer (If Applicable)

(Please Print)

**Signature(s):**

\_\_\_\_\_  
(New) Owner's Signature                      Selling Dealer's Signature (If Applicable)                      Date

**Terms & Representations**

**By your signature(s) on this form you represent the following:**

<ol style="list-style-type: none"> <li>1. You understand that the unit is to be used only for family camping and cross country travel on improved roads.</li> <li>2. All information provided by you on face side of this form is true and correct.</li> <li>3. You understand that you are purchasing a pre-owned recreational vehicle and Monaco RV LLC does not make any representation as to its present condition.</li> </ol>	<ol style="list-style-type: none"> <li>4. You understand the Monaco RV, LLC Limited Warranty on this recreational vehicle is not transferrable and only the original owner will have warranty coverage from Monaco RV, LLC.</li> </ol>
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**TEAR OFF PAGE. MAIL FORM TO:**

**MONACO RV, LLC.  
CUSTOMER SERVICE  
91320 COBURG INDUSTRIAL WAY  
COBURG, OREGON 97408**



# Driving & Safety

## Section 2



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## DRIVING & SAFETY

Section Two contains information on driving tips, emergency situations, towing, safety devices, weighing the recreational vehicle and tires.

### **WARNING:**

**DO NOT OCCUPY, OR ALLOW OTHERS TO OCCUPY, THE RECREATIONAL VEHICLE WHILE IT IS BEING TOWED. Seat belts are not installed in the recreational vehicle because recreational vehicles are not designed or intended to carry passengers while in transit. It is recommended that pets do not occupy the recreational vehicle during travel. The recreational vehicle manufacturer is not responsible for injury or harm resulting from persons or pets occupying the recreational vehicle during travel. Many states prohibit person(s) from riding inside the recreational vehicle during travel.**

## TOW VEHICLE

It is extremely important the tow vehicle and related towing equipment is rated in capacity for the load of the recreational vehicle. A tow vehicle with an inadequate gross combined weight rating (GCWR) may experience mechanical failures and not provide adequate towing stability. The frame and drive train of the tow vehicle must be at least rated equal to or greater than the weight of the recreational vehicle. Towing a recreational vehicle with inadequate tow vehicle ratings can cause premature wear, fractures and/or breaks in the recreational vehicle and/or tow vehicle frame.

Consult the dealer for assistance in selecting the proper rated vehicle hitch and related hitching accessories.

## DRIVING TIPS

Due to the length of recreational vehicle, turning radius will be much wider than an automobile. Always pay close attention to the perimeters: front, sides, rear, roof and undercarriage. Make sure the surrounding area is clear of any obstacles.

Use driving mirrors to observe traffic and the area of the recreational vehicle: tires, compartment doors, blind spots, etc. Use a push-pull method of steering, with both hands parallel on the steering wheel. Swerves and sharp turns, especially performed at high speeds, could result in the loss of control of the tow vehicle and the recreational vehicle. Keep in mind the combined size of the tow vehicle and recreational vehicle. Drive with extra caution to avoid situations which might require quick momentum changes. Increase reaction time by paying attention to traffic and road conditions 12 to 15 seconds ahead. When passing another vehicle, allow extra time and space due to the additional length and weight. Practice using the brakes away from traffic to get the feel of the distance required to stop the tow vehicle and recreational vehicle.

When traveling, make sure bridges can support the combined weight of the tow vehicle and recreational vehicle. Tonnage limits for bridges should be posted at entrances. Check the posted height of overhead clearances. Keep in mind road surfaces may have been repaved or become packed with snow.

Therefore, the actual posted clearance height would not apply. When descending a long hill, manually shift to a lower gear and begin the descent at a slow speed. Do Not gain too much momentum before trying to slow down. Down shift the transmission to lower gears using the engine to help control downhill speed and can extend the service life of the brake lining. Distance required to stop will be greater.

If a sudden bumping or swaying occurs, it may indicate a flat tire. Do not apply the brakes suddenly or accelerate in an attempt to drive out of it. Instead, come to a slow stop while driving as straight as possible. If conditions permit, coast to a very slow speed and try to avoid braking, except when the wheels are pointing straight ahead and the recreational vehicle and tow vehicle are in line with each other. If the recreational vehicle begins swaying when accelerating to highway speed, back off the accelerator. This should reduce or eliminate swaying. If it begins again when speed increases, stop and check the load. It may not be distributed evenly from side to side or there may be too much weight located behind the axles. Tongue weight recommendations for travel trailers are that 10 to 15% of the gross trailer weight be on the hitch ball. Redistribute the load as necessary before continuing.

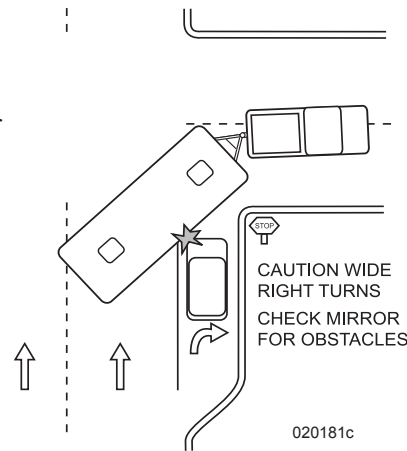
### **Driving Cautions:**

- Avoid getting too close to the edge of the road. A soft shoulder may not support the weight of the recreational vehicle.
- Side spacing is best maintained by keeping the recreational vehicle centered in the lane.

- Driving lanes in work zones can be uneven, congested and more narrow than usual.
- Be cautious of road debris that can damage the undercarriage of the recreational vehicle or cause damage to the tires, wheel rims or recreational vehicle.
- On back roads and single divided roads, tree branches and shrubbery can protrude into the roadway. Watch for low hanging branches, especially during inclement weather. Rain and snow will cause branches to hang lower than usual.
- Remember that posted speed signs are for passenger automobiles. Therefore, use extra awareness of the driving conditions and an appropriate speed for a vehicle pulling a recreational vehicle, especially on corners and mountain roads.
- Downgrade speed should be at least 5 mph less than upgrade speed, or downgrade speed should be attainable within three seconds of a brake application.
- Use a four second rule when following other vehicles at speeds under 40 mph. Use a five second rule when following at speeds over 40 mph.

**Right Turns:** Negotiating a right-hand turn while pulling a recreational vehicle can be difficult. Many drivers fear they can not make the turn without entering into the other lane or jumping the curb. A right-hand turn can be negotiated using these tips:

- When approaching a turn, look into the mirror to ensure the lane to the left is clear, then move wide to the left.
- Prior to the turn; the left rear wheel should touch the centerline of the road and driver's hip should be parallel to the roadside curb of the corner being turned. This will aid in avoiding a premature turn.
- Slowly make the turn.
- Check mirrors frequently. Be aware of necessary clearance and space management for the recreational vehicle while negotiating the turn.



**Left Turns:** The turn should be made when the driver's hip reaches the center of the intersection. If two lanes are available, take the right hand lane. A vehicle or object located on the left-hand side is easier seen.

#### **Ascending a Grade:**

When approaching an uphill grade, assess the grade and length before beginning the climb. Prepare early for long climbs.

#### **IMPORTANT SAFETY TIP:**

**Turn on the four way flashers if road speed decreases significantly under the posted speed. Use pullouts if traffic is building.**

#### **Descending a Grade:**

Prepare to descend a grade at the crest of the hill. Observe any signs indicating grade angle and duration. The sign may suggest maximum downhill speed according to Gross Combined Weight (the combined weight of the tow vehicle and recreational vehicle).

#### **Night Driving:**

- Be well rested and alert when driving. If necessary, find a safe stopping place to rest until ready to continue.
- Avoid using any interior lights that create a glare on the windshield. This will decrease visibility.
- Dim the dash lights to a comfortable level to reduce the level of glare.

#### **Extreme Heat and Hot Weather Conditions:**

- Check tire pressure frequently when traveling in hot conditions. Tire air pressure increases with heat. **Do not** let air out of a hot tire. The tires will return to correct/previous tire pressure when cool.

#### **Winter and Cold Climate Conditions:**

- The recreational vehicle should be prepared for cold weather use.
- Keep speeds slow and steady; make moves gradually and increase the visual distance for a gain in reaction time.
- If the road or weather conditions are treacherous, find a safe stopping place and wait for conditions to improve.
- Remove any ice build-up from the entry step to avoid accidental slipping.

- During cold weather, tire pressure can decrease. Check and ensure tires are at proper inflation pressure.

**Wet Conditions:**

- The risk of hydroplaning is increased if tires are worn or improperly inflated.
- Be aware that heavy rain or standing water can affect brake effectiveness, causing them to apply unevenly or grab.

**Refueling:**

- Be aware of the fuel port location on the tow vehicle. There may not be adequate space to turn around in the parking lot in order to reposition for the pump.
- Check overhead clearance before pulling through the fuel island.
- Be aware of the concrete/steel posts installed around the fuel island.
- Avoid running over the fuel hose as it can get caught and cause damage to the tow vehicle or recreational vehicle.
- Use of gloves is recommended for refueling.

**⚠ DANGER**

ALL PILOT LIGHTS, APPLIANCES AND THEIR IGNITORS (SEE OPERATING INSTRUCTIONS) SHALL BE TURNED OFF BEFORE REFUELING OF MOTOR FUEL TANKS AND/OR PROPANE CONTAINERS. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.020155i

**⚠ WARNING**

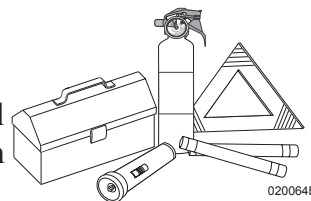
DO NOT FILL PROPANE CONTAINER(S) TO MORE THAN 80 PERCENT OF CAPACITY. FAILURE TO COMPLY COULD RESULT IN A FIRE OR PERSONAL INJURY.

**⚠ CAUTION**

THIS PROPANE PIPING SYSTEM IS DESIGNED FOR USE WITH PROPANE ONLY. DO NOT CONNECT NATURAL GAS TO THIS SYSTEM.  
Securely cap inlet when not connected for use. After turning on propane, except after normal cylinder replacement, test propane piping and connections to appliances for leakage with soapy water or bubble solution. Do not use products that contain ammonia or chlorine. DD-37

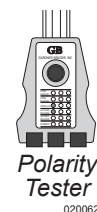
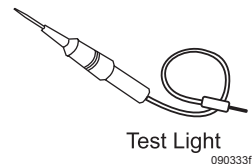
**TRIP PREPARATION**

The following suggestions are a general guideline to follow when preparing for a trip.



**Items to Carry:**

- An emergency road kit containing a flashlight, road flares, warning signs and a fire extinguisher.
- Local, State and National Maps, as well as a ‘Motor Carrier’ road atlas (for refueling station and truck repair facility locations).
- Hand tools, a 120 Volt AC polarity tester, battery hydrometer and an assortment of spare fuses.
- Potable and non-potable water hoses, a water pressure regulator and various termination connectors for sewage.



**Inspection:**

- Ensure all exterior items are stored or secured (i.e. antenna, ceiling vents and windows).
- Evenly distribute and secure cargo. Store heavy items near the rear axle and lighter items toward the front to prevent uneven stress and handling problems.
- Check all tires for accurate pressure and physical condition. Look around, above and under the recreational vehicle for obstructions or leaks. Test all exterior lighting: taillights, brake, license plate and clearance lights.

- Inside the recreational vehicle store and secure heavier objects in the lower cabinets to maintain a low center of gravity for sway reduction. Secure loose items to prevent weight shifts. Store lighter items in the overhead cabinets. Close and secure all cabinet doors and drawers and shower door. Turn off interior lighting.

**CAUTION:**

**Open compartment doors slowly. Cargo may shift during travel.**

**TIP:**

**Multi-purpose items, versatile clothing and periodic removal of unused cargo will streamline compartment storage space.**

**HITCHING THE TRAVEL TRAILER**

Tow hitches come in a variety of shapes and sizes for various applications. Generally, hitches are classified either weight carrying or weight distributing. A weight carrying hitch connects the recreational vehicle to the tow vehicle using a ball mount and hitch ball. Weight distributing hitches use an adjustable ball mount, hitch ball and spring steel levers that redistribute tongue weight. A weight distributing hitch is used in applications when the suspension of the tow vehicle prohibits use of a weight carrying hitch. In all cases, never exceed the tow vehicle manufacturers Gross Combination Weight Rating (GCWR).

### Tow Capacity and Class Ratings

Several components comprise a tow hitch system. The weight rating of individual components that are part of the towing system must be greater than the gross weight of the load being towed. To help define weight capacity of towing equipment, components are classified into weight groups. Maximum tow capacity is limited to the component with the lowest weight rating in the tow hitch system. Example: a ball mount may have a weight rating of 5,000 lbs. but the hitch ball is rated 3,500 lbs. Maximum tow capacity is reduced to 3,500 lbs. Many times a component will have a Class weight rating. These groups are shown in the chart:

**WARNING:**

**Be sure the weight ratings of the ball mount, tow ball and safety chains are equal to or greater than the load. The use of an extension to the receiver or extended ball mount will significantly reduce hitch receiver weight ratings. Modifications to the hitch receiver, or use of the hitch receiver other than intended, can void the warranty of the hitch receiver, tow vehicle chassis or both.**

**CAUTION:**

**Never exceed the tow vehicle manufacturers GCWR. Damage to the tow vehicle suspension, frame, drive train and/or tires can occur. Inadequate GCWR of a tow vehicle can lead to poor handling, mechanical failure or unexpected sudden loss of control leading to accident, injury or death.**

**CAUTION:**

**It is highly recommended to install a frame mounted hitch receiver on the tow vehicle. A rear bumper is not suitable in towing strength compared to a frame mounted hitch receiver.**

**WARNING:**

**DO NOT tow a trailer or vehicle that exceeds the rated capacity of the hitch receiver. Overloading the hitch receiver can cause unusual handling characteristics and overstress the hitch receiver and chassis. It could also void the warranty.**

### Terms Used to Describe the Typical Travel Trailer Hitch Components:

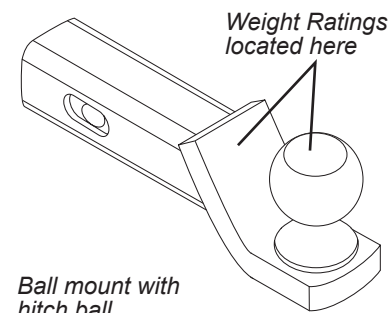
- Hitch Receiver: Component fitted to a tow vehicle that receives a ball mount.
- Ball Mount: A removable component the hitch ball is bolted to that fits into the receiver.
- Sway Control: Device that fits between the trailer frame and tow vehicle hitch to reduce trailer sway.
- Trailer Coupler: The socket and lock assembly located at the front of the trailer frame that receives and secures the hitch ball.
- Spring Bars: Spring steel levers that affix between the trailer frame and ball mount used to absorb and distribute tongue weight.
- Tongue Weight: Weight exerted on the hitch ball by the trailer coupler.
- Break Away Switch: Engages trailer brakes if trailer uncouples in transit.

**WARNING:**

**Ensure the weight ratings of ball mount; hitch ball and safety chains are equal to or greater than the load. The use of an extended ball mount will significantly reduce hitch receiver weight ratings.**

	CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V
Weight Carrying Hitch	TW - Up to 200 lbs.	WC TW - Up to 350 lbs.	TW - Up to 500 lbs.	TW - Up to 750 lbs.	TW - Up to 1,200 lbs.
	GTW - Up to 2,000 lbs.	WC GTW - Up to 3,500 lbs.	GTW - Up to 5,000 lbs.	GTW - Up to 7,500 lbs.	GTW - Up to 12,000 lbs.
Weight Distributing Hitch	---	---	---	TW - Up to 1,200 lbs.	TW - Up to 1,400 lbs.
	---	---	---	GTW - Up to 12,000 lbs.	GTW - Up to 14,000 lbs.

- **GTW** = Gross Trailer Weight. Weight of trailer fully loaded.
- **TW** = Tongue Weight. Weight pushing down on Tow Ball.
- **WC** = Weight Carrying. Weight carrying capacity of the Ball Mount.
- **WD** = Weight Distributing. Weight carrying capacity of a weight distributing hitch.



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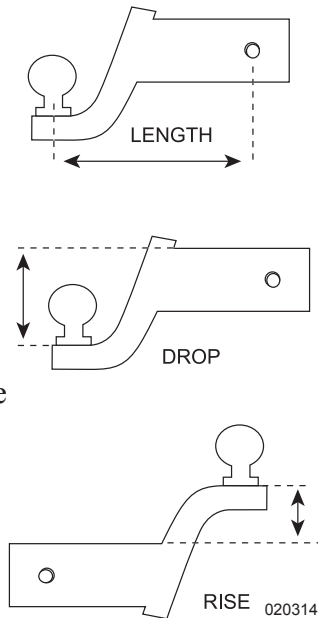
## Types of Hitches

### Weight Carrying Hitch:

A weight carrying hitch relies on the tow vehicle suspension, axles and tires to support the added weight of a recreational vehicle. As recreational vehicle weight and tongue weight increase, the suspension on the tow vehicle is adversely affected. Tongue weight will cause the tow vehicle rear suspension to sag, also transferring weight from the front suspension to the rear. This negatively affects front end alignment geometry, handling and braking characteristics. Tow vehicle tires must be rated and properly inflated to support any added weight while towing.

### Ball Mount:

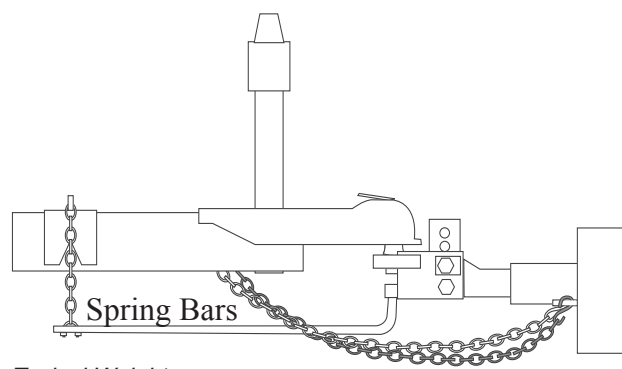
Ball mounts come in various configurations and weight limitations. Three things should be considered when selecting a ball mount: weight rating, pin to ball center length and rise/drop. The weight rating of the ball mount, tongue weight and tow weight must meet or exceed the total load weight. Pin to ball center should not exceed 8". Ball mounts of longer length will significantly reduce the weight rating of the hitch receiver.



Observe weight reduction percentages that may be listed on ball mounts longer than 8". Selecting how much rise or drop for a ball mount is relative to hitch receiver height on the tow vehicle and height of the coupler with the recreational vehicle level.

### Weight-Distributing Hitch:

Weight distributing hitches use spring bars to absorb and re-distribute tongue weight to all axles of the tow vehicle and trailer to help offset tongue weight on the tow vehicle's rear suspension. Spring bars are made of spring steel. They are an independent suspension component. Spring bars are rated in pounds capacity. Example, spring bars rated 500 lbs. have half the capacity of 1000 lbs. spring bars. Which weight rating to select is best left to a professional to determine as selection is determined by tongue weight, tow vehicle suspension, any additional loads and to some extent GCWR. Setting hitch ball height and head angle will determine how much weight the spring bars will offset. A weight distributing hitch that is correctly setup should sufficiently offset tongue weight so the tow vehicle's suspension does not vary more than  $\frac{3}{4}$ " from its stock ride height.



Typical Weight Distributing Hitch

The spring bars should be parallel to the trailer frame and tow vehicle and recreational vehicle should be near level. It is recommended to have a professional perform the initial setup. Improper adjustments and unlevel ride angles can cause sway or other undesirable towing characteristics.

### Sway Control

Trailer sway (a.k.a. fishtailing) is when the back of the trailer oscillates left and right and can potentially become quite severe. There may be one or a combination of reasons that can cause trailer sway.

- **Tongue weight** – Tongue weight should be 10-15% of Gross Trailer Weight. Ensure adequate tongue weight.
- **Ride Attitude** – The assembly of the trailer and tow vehicle should be level. Correct as necessary.
- **Load Balance** – The load of the trailer should be balanced left to right.
- **Tire Pressure** – Check tire inflation pressure on the trailer and the tow vehicle. Weigh the assembly (See Weighing) then adjust tire pressures accordingly.
- **Environmental Conditions** – This can be a cross wind, large vehicles (trucks or busses) passing in the same direction or opposite direction. Going downhill can also exacerbate a sway condition depending on grade, driving style and road conditions.

If all these factors have been eliminated as potential causes of sway, there are mechanical sway control devices available. These devices affix between the hitch system and the trailer.



## Trailer Coupler

Information regarding coupler classification, weight rating and hitch ball diameter is permanently marked on the trailer coupler. The coupler uses a “clamp” to secure the hitch ball inside the coupler socket. Open the coupler latch prior to making the connection. After lowering the coupler onto the hitch ball, close the latch. Confirm the clamp has secured the hitch ball into the socket by using the tongue jack to slightly raise up on the hitch ball. When properly secured, the tongue coupler will attempt to lift the back of the tow vehicle. Never place fingers around or inside the socket while making the connection.

## Hitch Ball

Hitch balls are available in three common diameters: 1-7/8”, 2” and 2-5/16”. The larger the diameter of the hitch ball, the higher the weight rating. The diameter of the hitch ball shank also factors into weight rating. Match shank diameter with the hole in the ball mount or weight distributing head. Shank clearance should not exceed 1/16”. There should be at least two additional threads extending past the nut when the hitch ball is secure.

## Safety Chains

Safety chains are required by law when towing any load. Chains and fasteners must be rated for the load being towed. Attach chains to crisscross under the towing equipment. Allow just enough slack in the chains to make sharp corners without dragging on the road surface.

If towed load should become uncoupled from the hitch ball, the towing equipment will be cradled by the safety chains. If the towed load does uncouple, do not attempt to make a sudden stop and aggravate the situation. Apply the brakes with gentle, steady pressure. Pull over to a safe location.

### **CAUTION:**

**Never loop safety chains around the ball hitch. Use the provisions in the hitch receiver to attach safety chains.**

## Connecting the Trailer

### Weight Carrying:

An assistant will ease this process by guiding the tow vehicle operator until the hitch ball is located under the coupler socket.

- Inspect all hitch related hardware for safety integrity, tightness and damage.
- Lower the tongue jack until the coupler socket clears the hitch ball.
- Open the coupler latch.
- Back up the tow vehicle until the hitch ball is directly under the coupler socket.
- Lower coupler until it is seated on the hitch ball then close the latch.
- Confirm the connection to ensure the coupler clamp is below the ball and not riding on top.
- Raise the tongue jack completely. If a footpad or wheel is removable, stow at this time.

- Attach break away cable to the tow vehicle. Allow enough slack for tight turns. The break away switch cable should be positioned on the tow vehicle separate from the hitch assembly.
- Attach the safety chains to proper location on the hitch receiver. Never loop chains around the hitch ball.
- Connect trailer wiring harness to the tow plug connection on the tow vehicle.
- The next step is checking the trailer brakes. Close vents, windows and doors and secure items before performing this test. Drive forward and check the trailer brakes by using the manual feature on the brake control.

### Weight Distributing:

An assistant will ease this process by guiding the tow vehicle operator until the hitch ball is located under the coupler socket.

- Inspect all hitch related hardware for safety integrity, tightness and damage.
- Lower the tongue jack until the coupler socket clears the hitch ball.
- Open the coupler latch.
- Back up the tow vehicle until the hitch ball is directly under the coupler socket.
- Lower coupler until it is seated on the hitch ball then close the latch.
- Confirm the connection to ensure the coupler clamp is below the ball and not riding on top.

- Lower the tongue jack until the jack is supporting the tongue weight and some tow vehicle rear suspension weight. This will reduce tension when installing the spring bars.
- Select equal number of chain links so spring bars carry equal tension. Hook chains to spring bar clamps on trailer frame. Use a tool to pry clamps over center. Engage safety clip mechanism on spring bar clamps. Spring bars should be parallel with trailer frame when complete.
- Raise the tongue jack completely. If a footpad or wheel is removable, stow at this time.
- Attach break away cable to the tow vehicle. Allow enough slack for tight turns. The break away switch cable should be positioned on the tow vehicle separate from the hitch assembly.
- Attach the safety chains to proper location on the hitch receiver. Never loop chains around the hitch ball.
- Connect trailer wiring harness to the tow plug connection on the tow vehicle.
- The next step is checking the trailer brakes. Close vents, windows and doors and secure items before performing this test.
- Drive forward and check the trailer brakes by using the manual feature on the brake control.

**NOTE:**

**Confirm the hitch is properly locked before towing. Confirm spring bars are adjusted for proper weight distribution.**

**Ride Angle**

The recreational vehicle must be level when hooked to the tow vehicle. If the hitch is too low, the nose of the recreational vehicle may drag on high spots in the road. If the hitch is too high, the tail end of the recreational vehicle may drag. Either of these conditions will affect towing stability.

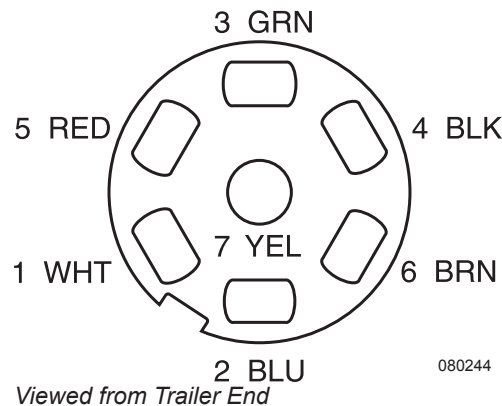
When the tow vehicle and recreational vehicle are level, the suspension will work properly and within the design limits. If instability is still present, an “Anti-Sway” device may be necessary to ensure a smooth safe ride and predictable towing.

**NOTE:**

**The recreational vehicle should be in a level position when hitched to the tow vehicle.**

**TOW PLUG CONNECTION**

The recreational vehicle is equipped with a wire harness located near the coupler. Current draw should not exceed ten amps for each designated light circuit.

**The Tow Harness Wires are Color Coded:**

1. White, 10 gauge - Ground
2. Blue, 12 gauge - Electric Brake
3. Green, 14 gauge - Tail, License & Running Lights
4. Black, 10 gauge - Battery Charge
5. Red, 14 gauge - Left Turn & Stop Lights
6. Brown, 14 gauge - Right Turn & Stop Lights
7. Yellow, 14 gauge - Auxiliary Circuit or Backup Lights.

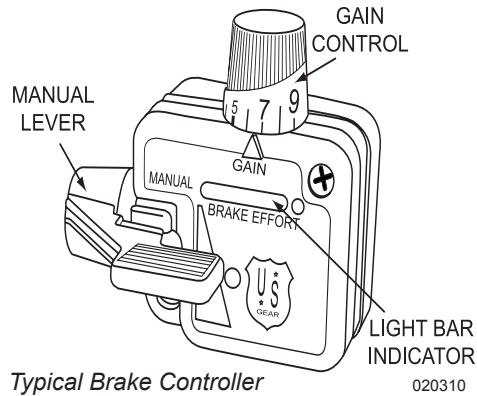
**Taillight Configuration:**

Taillights come in different configurations referred to as a 2-wire or 3-wire configuration. A 2-wire configuration has all red lenses. A 3-wire configuration usually has red and amber lenses. Amber is used for turn signals only and red for taillight and brake light. These systems are electrically different. Whenever hooking a 2-wire system to a 3-wire system, or vice versa, a converter box must be installed for correct taillight function. A taillight converter is available from auto and RV supply stores. Do not attempt to wire a tow plug connector if unfamiliar with these systems. A trained technician will install the proper converter so the taillights and turn signals work correctly on the tow vehicle and the recreational vehicle.

## BRAKES

### Brake Controller

The recreational vehicle brakes are controlled electrically. This requires a brake controller be mounted inside the tow vehicle. The brake controller varies voltage output to change braking force.



Increasing voltage (gain) increases the amount of braking force. To ensure safe brake performance and timely reaction of the recreational vehicle brakes, the brake controller will need to be synchronized so the tow vehicle brakes and recreational vehicle brakes react progressively in unison.

Brake controllers come in two basic configurations; Proportional and Time Delayed. While both systems have adjustable gain control, the difference is how and when the control signal to the brakes is generated.

- Proportional controllers use an adjustable pendulum that senses the amount of braking inertia. Changing pendulum angle changes inertia sensing and when the control signal is generated.

- Time Delayed controllers use a timer. The control signal is generated shortly after the brake lights illuminate.

Both gain and synchronization (Proportional controller) adjustment will require practical application testing. Thoroughly review the brake controller manufacturer's instructions to properly adjust controller settings. Testing will involve increasingly aggressive stops on dry pavement, free of sand and gravel. Optimum synchronization and gain settings are correct when the driver does not get the sensation the recreational vehicle is pushing the tow vehicle or the recreational vehicle is over-braking. Gain settings will change based on load. Refer to the instructions in the OEM brake control manual on how to synchronize the brake control system.

**NOTE:**  
Refer to brake controller OEM manual for further information and adjustment settings.

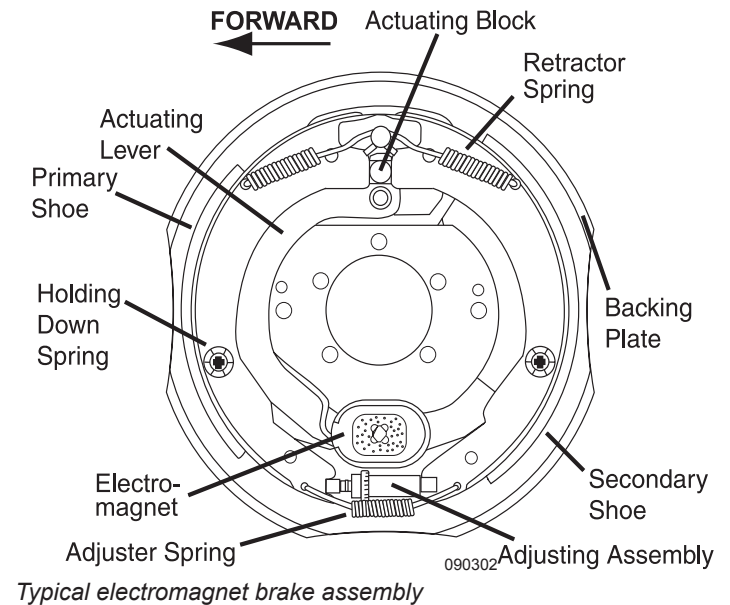
**CAUTION:**  
Verify the area is clear of vehicular and pedestrian traffic before performing a brake synchronization test.

**NOTE:**  
Minimum stopping distance is achieved when wheels approach lock-up. Wheel lock-up results in poor vehicle stability and control. Not all recreational vehicle brakes are capable of wheel lock-up. This depends on the load, brake type, tire to surface traction. Gain settings will change based on load.

## Electromagnets

The brake controller charges an electromagnet. The magnet rides against a machined surface of the brake drum. When energized, it moves an actuating lever that expands the brake shoes against the drum. Increasing gain (voltage) to the electromagnets causes the magnet to grip the machined surface more firmly resulting in increased braking force. It is normal for the electromagnets to click when applying the brakes

The electromagnets and the machined surfaces of the brake drum are inspected during routine wheel bearing maintenance or when brake performance declines. This is an indicator either the electromagnet is worn or the brakes are out of adjustment or both. The electromagnet is replaced as a component.



### Bedding the Brakes

New brakes will require a “bedding” process to properly seat and cure the brake shoes and electromagnets. The process involves making several brake applications (between 10 and 20) after which brake performance should increase. When performing the bedding process, select a road with limited or no traffic and safe road conditions.

- With the recreational vehicle properly hitched including spring bars, accelerate to approximately 40 mph.
- Using the manual brake lever on the brake control, apply only the trailer brakes with brake control initially set to approximately 50% gain. Slow to approximately 20 mph.
- Increase gain to work the trailer brakes. Decrease gain if the wheels lockup.
- Repeat the process several times. Allow a cool down period between applications to avoid overheating of trailer brake components.
- The brakes are now bedded. The process will need to be repeated when shoes and/or magnets are replaced.

### Brake Adjustment

The brakes on the recreational vehicle are not self-adjusting and require periodic manual adjustment to maintain satisfactory performance. Loss of braking performance regardless of gain setting is an indication of brakes needing adjustment. While loss of performance can be caused by non-functioning electromagnets, brake adjustment must also be checked.

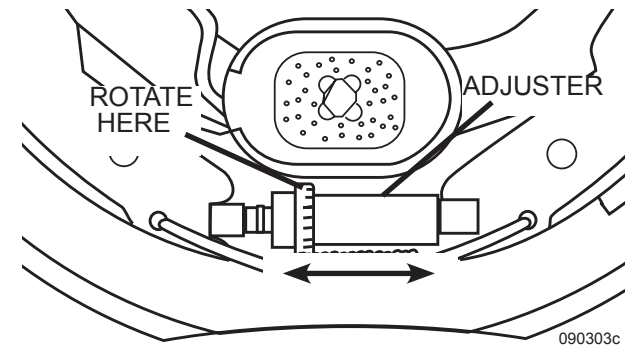
It is recommended to check brake adjustment after the first 200 miles if the recreational vehicle is new or after brake shoes and/or electromagnets are replaced. Regular adjustments should be performed every 3,000 miles thereafter.

#### **WARNING:**

**Brake adjustment requires elevating the wheels and possible removal of the brake drum for further inspection. Improper technique in jacking and supporting the frame and axles can result in damage, injury or death. Use only sufficiently rated heavy duty hydraulic jack and jackstands whenever elevating any wheel position.**

#### **WARNING:**

**Do Not go under the recreational vehicle unless it is resting on properly placed jack stands. Reference axle and brake OEM manual for detailed instructions.**



Rotate adjuster to expand or retract brake shoes

1. Carefully elevate and securely support the wheel with suitable rated jackstand(s).
2. Remove adjuster inspection plug located on reverse side of backing plate opposite adjuster.
3. Rotate adjuster with screwdriver or suitable tool until brake shoes expand making wheel difficult to turn by hand.
4. Rotate adjuster the opposite direction until shoes have enough clearance to allow wheel to turn freely with very slight drag.
5. Uniformly adjust brake shoe clearance on all wheels

If brake performance remains unsatisfactory, the cause may be mechanical or electrical. Have a qualified professional inspect and test the system.

**WARNING:**

**Do not continue operation if brake performance is unsatisfactory. Have a qualified professional inspect and repair the braking system. Continued operation can result in accident, injury or death.**

***Brake Inspection***

Recreational vehicle brakes must be inspected at least once a year or more frequently depending on use or anytime brake performance declines. Replace magnets and shoes when worn or scored as this affects brake performance. Inspect the backing plate, magnet arm, magnet and brake shoes. If disassembled, all parts must be reassembled to the same brake and drum assembly.

Inspect the magnet arm for any loose or worn parts. Check shoe return springs, shoe hold down springs and the adjuster spring for stretch or deformation. Replace worn components as necessary.

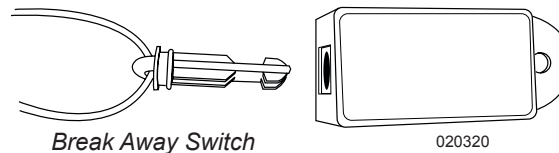
**WARNING:**

**ASBESTOS DUST HAZARD!**  
Some brake shoe friction materials contain asbestos. Observe all safety protocols when servicing brakes:

1. Avoid creating or breathing dust.
2. Avoid machining, filing or grinding the brake lining.
3. Do not use compressed air or a dry brush for cleaning. (Dust can be removed with a damp brush.)

***Break Away Switch***

The break away switch is located on the front of the recreational vehicle. The break away switch is a mandatory safety device that activates the recreational vehicle brakes should the recreational vehicle become unhitched from the tow vehicle. Attach switch cable to the tow vehicle framework. Ensure cable has a direct line of pull should the recreational vehicle become unhitched. The onboard battery supplies power for the brakes. The battery must be charged and in good condition. Periodically test the break away switch to assure the safety system is working.



**CAUTION:**

**Attach break away cable in direct line of pull to tow vehicle framework. Do not attach cable to hitch ball, safety chains or other compromising location.**

**To Test:**

- Hitch tow vehicle and recreational vehicle. **Do Not Connect Tow Plug!** Damage to the brake controller will result if the break away system is activated.
- Pull out the break away switch pin then attempt to drive forward. The recreational vehicle will resist movement if the break away system is operating correctly.

**CAUTION:**

**Unplug the tow connection before testing the break away system! Damage to the brake controller will result!**

**NOTE:**

**Lubricate the switch pin periodically to ensure pin separation. Make sure the pin is securely in place each time the recreational vehicle is used. Do not use the break away switch as a parking brake. Continuous operation will damage brake magnets and drain the battery.**

**SAFETY BREAK AWAY SWITCH WILL NOT OPERATE**  
unless hooked to a power source equivalent to or greater than an automotive type 12 Volt, 12 amp-hour wet cell battery.

**WHEEL BEARINGS**

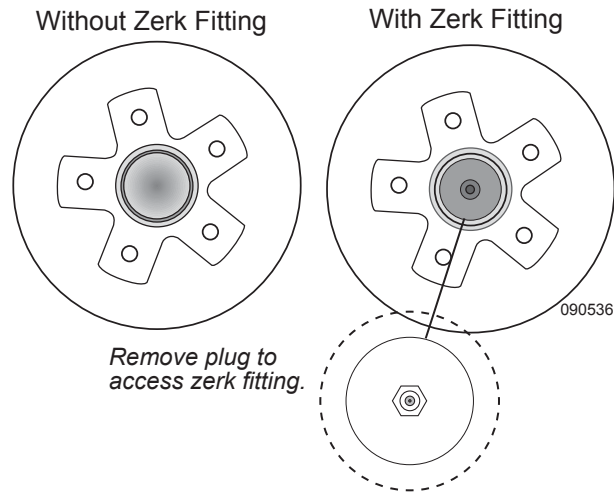
Wheel bearing dust caps can be equipped with or without a grease zerk fitting. Regardless of dust cap style, the wheel bearings should be inspected every year or 12,000 miles, whichever occurs first. Wheel bearings are adjusted with a small amount of axial end float. Correct end float is essential to maximize bearing service life. While dust caps with a zerk fitting may help with serviceability, inspection is required to ensure the bearings are in acceptable condition for continued service.

**NOTE:**

**The recommended lubricant is Lithium grease with NLGI rating GC-LB.**

**Dust Caps with Zerk:**

These caps provide serviceability with a grease gun. Use a hand grease gun only when servicing. Over-pressurization can damage the grease seal contaminating the brake linings.

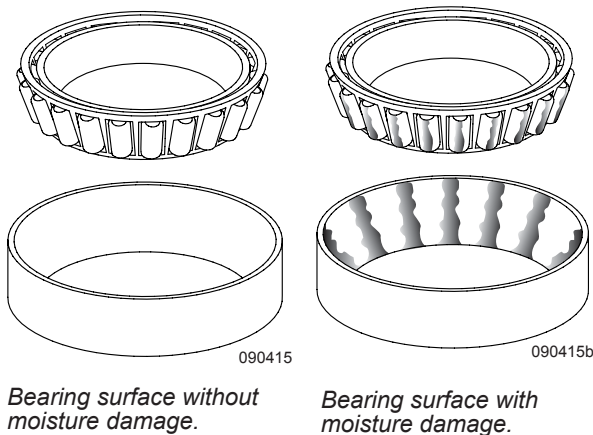


**NOTE:**

**Do not mix grease base types. Thoroughly remove old grease from all surfaces when servicing the bearings.**

**INSPECTION:**

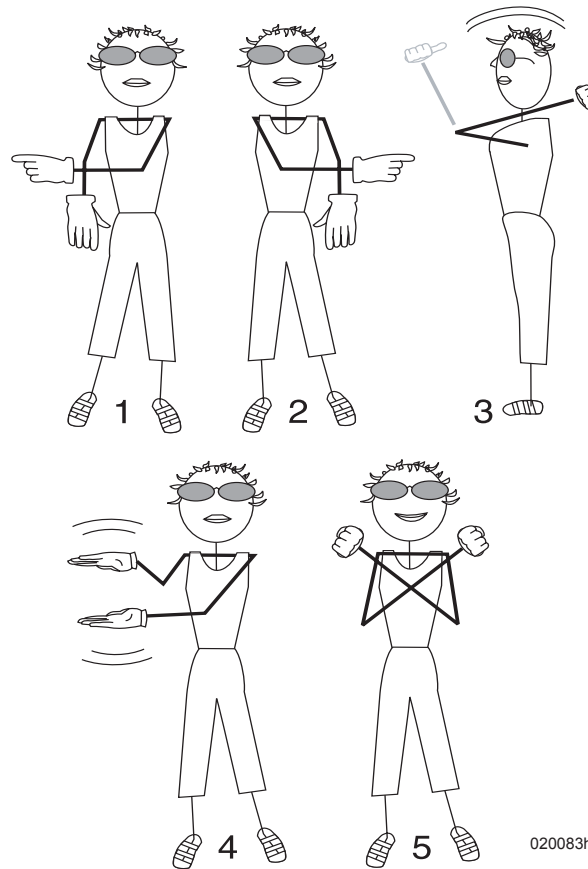
**Inspect the wheel bearings every year or 12,000 miles, whichever comes first.**



**BACKING UP THE RECREATIONAL VEHICLE**

The driver should be comfortable using the mirrors and/or the co-pilot's directions for assistance. Practice backing up in a large, unobstructed parking lot. Select a solid, level site located on the roadside with a direct field of vision from the roadside mirror.

If the site is on the curbside, the driver will have a blind spot when backing up. Stop before backing into a site. Get out and observe the area for soft ground, posts, large rocks, low hanging tree limbs or other obstacles. When site conditions are satisfactory, prepare to back in carefully.



Make a wide turn then turn back the opposite direction to set the recreational vehicle in a position to maneuver into the space.

The driver may become disoriented by the direction of the steering wheel in relation to the direction of the recreational vehicle when backing up. Move the bottom of the steering wheel in the desired direction of the recreational vehicle.

Example: If the desired direction of the recreational vehicle is left, rotate the bottom of the steering wheel left. If the recreational vehicle moves in an undesirable direction, pull forward just far enough to realign the recreational vehicle with the space.

The co-pilot should stand safely at the left rear corner of the recreational vehicle, within view of the driver in the roadside mirror, and use the hand signals for directing travel of the rear of recreational vehicle. If the desired direction of the recreational vehicle is left, the co-pilot points left. This type of directional signal is easily discerned in the mirror by the driver. Keep directional signals steady until movement is done.

**The Five Directional Signals are:**

1. Co-pilot uses left hand and arm held horizontal with forefinger pointing right, to direct rear of recreational vehicle right.
2. Co-pilot uses right hand and arm held horizontal, with forefinger pointing left, to direct rear of recreational vehicle to the left.

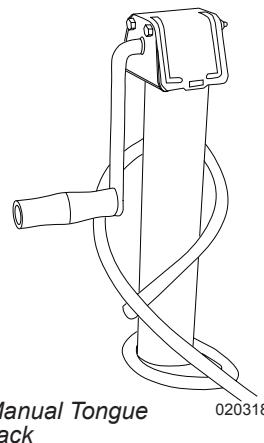
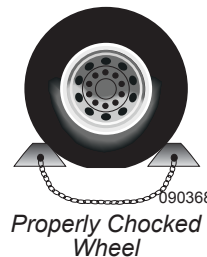
3. Co-pilot uses both arms and hands parallel with thumbs pointing up and to rear in a waving vertical motion. This signals driver to maintain a straight back direction.
4. Co-pilot holds arms vertically, hands open with palms facing one another. Start with a wide separation of the hands. Gradually close the distance between them in a rate appropriate to vehicle speed to indicate the amount of distance to a stopping point.
5. Closed fists indicate STOP.

## LEVELING

Leveling the recreational vehicle will require an assortment of wooden blocks be placed under the tires to level side to side. The tongue jack is used to level the recreational vehicle front to rear. Affix a pair of leveling gauges, available at RV supply stores, to a front and side corner of the recreational vehicle to simplify the process. If a side is low, place an appropriate amount of blocks in front of or behind the tires on the low side. Use the tow vehicle to pull the recreational vehicle tires onto the blocks. See **“Supporting Tires When Leveling”** in this section. It may be necessary to build a ramp of wooden blocks. The blocks must support tires across the entire width of the tread to prevent tire damage. Once side to side leveling is satisfactory, the tow vehicle can be unhitched.

### Operation:

- Securely chock all wheels of the recreational vehicle to prevent movement.
- Unhook the tow plug connection and break away switch from the tow vehicle.
- Adjust the tongue jack to rest on the ground or on a wooden block. Wooden blocks may be placed under the jack to gain additional height.
- Release the coupler-locking device and raise the recreational vehicle coupler to clear the hitch ball.
- Move the tow vehicle away from the recreational vehicle.
- Adjust the jack to level the recreational vehicle front to rear.
- Once leveling is complete, lower stabilizing jacks (optional equipment) until the jacks contact the ground or wooden blocks. **Do not** use the stabilizer jacks for leveling on uneven ground or to change tires.



### NOTE:

In extreme cases, the use of leveling ramps under the tires may be necessary to level the recreational vehicle.

### WARNING:

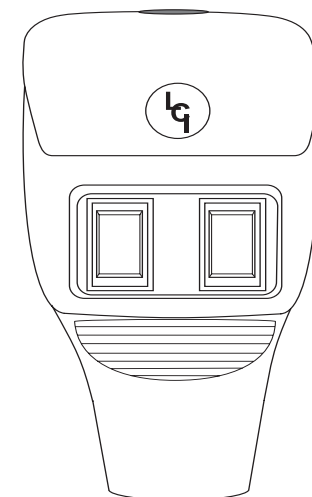
Do not use the stabilizing jack(s) for leveling on uneven ground or to change tires. Do not use the front jack to change tires or elevate any wheel off the ground. Damage to the front jack, stabilizer jack(s) and recreational vehicle may occur.

### Electric Tongue Jack

A 12 Volt DC gear motor provides quick hitching and unhitching of the recreational vehicle. The operation is controlled by a single push button. Manual operation can be used if battery power is lost.

### Power Extend/Retract:

- Battery must be fully charged.
- Press the extend/retract switch until the desired height is obtained.
- Release the switch.
- The other switch activates the light.

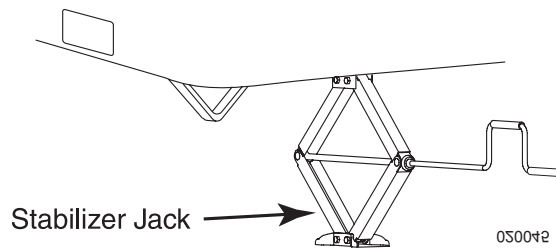
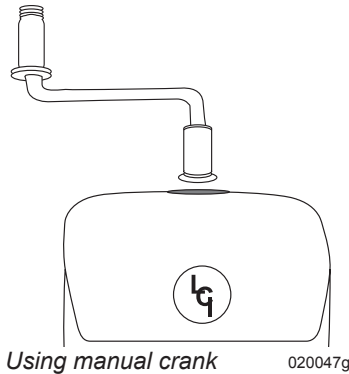


Electric tongue jack 020047g

### Manual Extension/Retract:

- Insert the crank handle.
- Rotate the crank handle in the desired direction until the desired height is obtained.
- Remove the crank handle.

**WARNING:**  
**The handle can cause injury if the electric motor is activated. Remove handle before activating motor.**

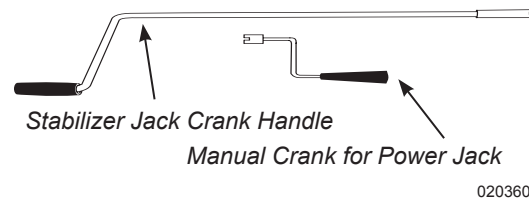


### **CAUTION:**

**Do not use the stabilizing jack(s) for leveling on uneven ground or to change tires. Never use jack(s) to elevate any wheel off the ground. Damage to the stabilizer jack(s) and recreational vehicle main frame can occur.**

### CRANK HANDLES

There are various crank handles used to operate such items as the front power jack, stabilizer jacks (optional), and the spare tire carrier. The crank handles are located within the interior living area.



### SET-UP PROCEDURE

The set-up procedure has information on hooking up the utilities and preparing the appliances for use. Specific information on the slide room, awning and leveling operation is discussed in other sections. The set-up procedure is only a guide as not all models and floorplans are equally equipped. Locations of some items will vary with options and floorplans.

### 1. Level the Recreational Vehicle:

- Follow the procedures and guidelines for “Leveling” in this section. The parking surface needs to accommodate the weight placed on the tongue jack.
- If applicable, unlock any slide locks which may secure the slide room. Check for lateral clearance before extending the slide out room.

### 2. Hook up utilities and prepare appliances for use:

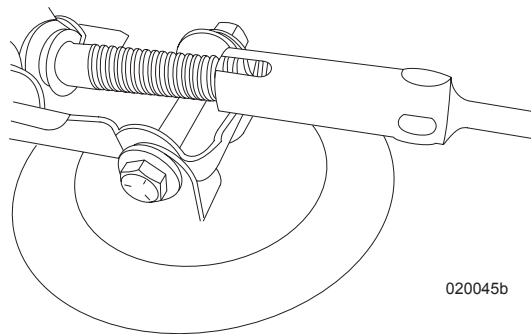
- Open the primary propane tank valve.
- Prepare the shore power cord for connection. Uncoil and inspect the cord. Perform necessary cord maintenance. Install proper electrical adapters if necessary. Operate electrical appliances in sequence when hooked to limited shore power service. Turn shore power circuit breaker Off prior to plugging in the shore power cord. (See “Shore Power Hook-up” in Section 8.)
- If possible, begin appliance operation on propane for the first 60 minutes. Switch refrigerator operation to propane, start the water heater and furnace (if needed).

### **CAUTION:**

**If shore power service is limited to 15 or 20 Amps, use of light duty extension cords and electrical adapters will create a voltage loss through the cord and at each electrical connection. Line voltage loss and resistance at each connection can overheat electrical connections. Damage to sensitive electronic equipment may result.**

### Stabilizer Jacks (Optional)

The stabilizer jacks are mounted on the front and rear roadside and curbside of the recreational vehicle. These jacks are for **stabilizing** only. Primary leveling is performed with blocks under the wheels and the tongue jack. Lower the stabilizing jacks after leveling by using the crank handle until they firmly contact the ground. Place wooden blocks under the pads if necessary. Raise jacks by turning the cranks counterclockwise.





**CAUTION:**

Do not remove cover from the shore power supply to troubleshoot electricity to the recreational vehicle. Serious personal injury or death may occur. If there is no power to the recreational vehicle inform the park manager. It is the park manager's responsibility to fix any problems with the shore hook-up at the site.

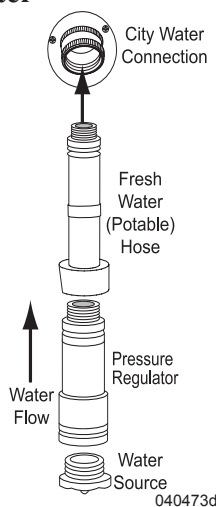
**NOTE:**

To avoid shore power overload when hooked to 30 Amp service, determine the current load prior to turning on appliances or using interior outlets.

- If cable service is provided, connect a 75 Ohm RG59 or RG6 cable to the cable connection located on roadside of the recreational vehicle.
- Hook a potable water hose to the city water connection.

**CAUTION**

It is recommended to place a pressure regulator at the water source to protect the potable water system from over-pressurization. Some water sources have high water pressure, particularly in mountainous regions. High water pressure is anything over 55 psi (pounds per square inch). Excessive water pressure may cause leaks in water lines and/or damage the water heater. Excess pressure can cause the water hose to swell and burst.



**WARNING:**

Hose and hose fittings not manufactured for potable water can contain unsafe levels of lead. It is highly recommended to use only fresh water supply hoses manufactured for potable water use.

- Attach the sewer hose. Sewer drain pipe diameters are generally either 3" or 4". Proper sewer hose adapters will ensure against leaks or spillage. With the sewer hose properly connected open the grey water valve. The black water valve remains closed until the tank is full or until time of departure.

**DRY CAMPING**

Below are suggestions to follow when staying at a location that does not have electrical, water or sewage hook ups. Plan ahead and conserve resources.

Before arriving at the site, ensure batteries are fully charged and properly maintained (See *"Battery Maintenance"* in Section 8), the fresh water tank and water heater are full and waste holding tanks are empty.

**Setting Up for Dry Camping:**

- Switch refrigerator operation to propane (gas).
- Turn on the water heater using propane about an hour before hot water is needed.
- If the furnace is required, set the thermostat temperature lower to prevent excess cycling.

- Check on small items that use battery power, such as the porch and compartment lights, etc. Even one light accidentally left on reduces battery reserves considerably.
- Build a campfire when spending nighttime hours outdoors. Extinguish the flames before retiring for the evening. Many campgrounds place wood or cement barriers between the site space and fire pit.
- Keep flashlights handy. If interior lights are needed, use one light in a central location.
- During the day it is still important to conserve on energy. Turn on the water pump only when using water.
- Check the monitor panel frequently. Keep track of water usage and battery consumption.
- Routinely check the propane level. Remember the furnace uses more propane in cold weather.
- Leave shoes outdoors or at the entry step to avoid tracking in dirt. Open windows during the day instead of using the roof air conditioner.
- Plan what is needed from the refrigerator prior to opening.
- If no picnic table is available, eat at the dinette table by candlelight.
- Careful management of water is critical when dry camping. Know the tank capacities.
- Do not fill the sink full of water to wash a few dishes. Use disposable dishes whenever possible.

## BREAKING CAMP

Preparing the recreational vehicle for travel will require several tasks. Properly secure and store items to prevent them from getting lost or damaged. Below is a checklist to reference when preparing to break camp.

### Outside Checklist:

- Disconnect the cable TV, lower the television antenna (if applicable).
- Retract the awnings and secure them for travel.
- Close propane tank valve.
- Drain and flush the holding tanks.
- Disconnect the sewer hose. Flush hose with clean water. Store the hose. Fill the fresh water tank. Disconnect and store the fresh water hose. Remove any hose protected water pressure regulator from the city water faucet.
- Turn shore power breaker off and disconnect the power cord. Wind up and store the power cord.
- Secure all compartment doors and entry door.
- **Inspect** tires and wheels.
- If applicable, raise all stabilizer jacks.

### Interior Checklist:

- If applicable, clear the slide room path and clean the floor. After confirming compartment doors are closed, retract the slide room. After the slideout is fully retracted, install locking bar mechanism (if equipped) and secure.
- If applicable, secure and fasten the bi-fold and pocket doors. Lock the shower door.

- Close roof vents and windows.
- Secure any loose, heavy or sharp objects in case of a sudden stop.
- Close all cabinet doors and drawers.
- Turn off water heater, water pump and furnace.
- Turn the interior lighting off.
- Walk through the interior and check for any unsecured items.



### Departure Checklist:

- Check items in storage compartments to ensure shifting or damage does not occur.
- Check above and under the recreational vehicle and tow vehicle for obstructions.
- Close and lock outside compartment doors.
- Check operation of all exterior lights, taillamp, brake, license plate and clearance lights.
- **Inspect** tires and wheels.
- Secure and lock the entry door for travel.
- Secure all awnings and travel locks, if applicable.
- Carefully pull forward out of the campsite. If necessary, clean the site and check for any forgotten items.

## EMERGENCY ROADSIDE PROCEDURES

If an emergency situation occurs, carefully apply the brakes and pull off the roadway a safe distance from traffic (if possible). Set the parking brake and turn on the hazard warning flashers, especially when parked alongside traffic lanes.

An emergency road kit should include at least three reflective warning signs, road flares, a flashlight, spare automotive fuses and an assortment of hand tools. The recreational vehicle is equipped with a fire extinguisher inside, near the entry door. For added safety, consider a separate fire extinguisher. Display road flares or reflective warning signs if the recreational vehicle is alongside the road for any length of time.

Guidelines for placing the warning triangles depend upon the road characteristics and visibility. For example: The standard placement is 10', 100' and 200' from the rear of the recreational vehicle when on a divided highway or one-way road.

### **WARNING:**

**In case the recreational vehicle requires towing, ensure all precautions are followed. The manufacturer WILL NOT cover damage to the recreational vehicle caused by a towing company. Never allow anyone to go under a recreational vehicle while it is being lifted by towing equipment. Severe injury or death can occur.**

CONTACT INFORMATION		
Equipment	Provider	Phone Number
Recreational Vehicle	Monaco Customer Support	1-877-466-6226
Tires	Duro	1-800-537-2925
	Freestar/Geostar, H188	1-800-537-2925
	Goodyear	1-877-484-7376

### In Case of Flat Tire

In the event of a flat tire, it is recommended to call for roadside assistance. Proper equipment is necessary to change a tire due to the size and weight of the recreational vehicle. A professional service technician will have the equipment and training needed to repair or replace the tire.



### In the Case of Sudden Tire Failure:

- Avoid heavy braking.
- Slowly move to a firm, level spot safely away from oncoming traffic.
- Turn hazard flashers on.
- Set up flares or triangular reflectors to alert passing motorists.

### Changing A Flat Tire

#### **WARNING:**

Tire changing is extremely dangerous. It is highly recommended that this procedure be performed by a qualified professional service technician with proper training and tools.

### Tools Needed to Change Flat Tire:

- Hydraulic Jack with at least half the capacity of GVWR (found on the Federal Certification Label on the recreational vehicle).
- 2" x 12" x 3' plywood.
- Jack stand.
- 3/4" thick plywood block.
- Lug wrench.
- Torque wrench and socket.
- Flares or triangular reflectors.

#### **NOTE:**

Hydraulic jack, lug wrench, jack stand, 3' plywood, 3/4" plywood block, torque wrench, flares and triangular reflectors are not supplied with the recreational vehicle.

#### **WARNING:**

Never allow anyone to crawl under the recreational vehicle while being lifted by the hydraulic jack or if a wheel has been removed. Severe injury or death can occur. Always remain a safe distance from the road and oncoming vehicle traffic.

#### **WARNING:**

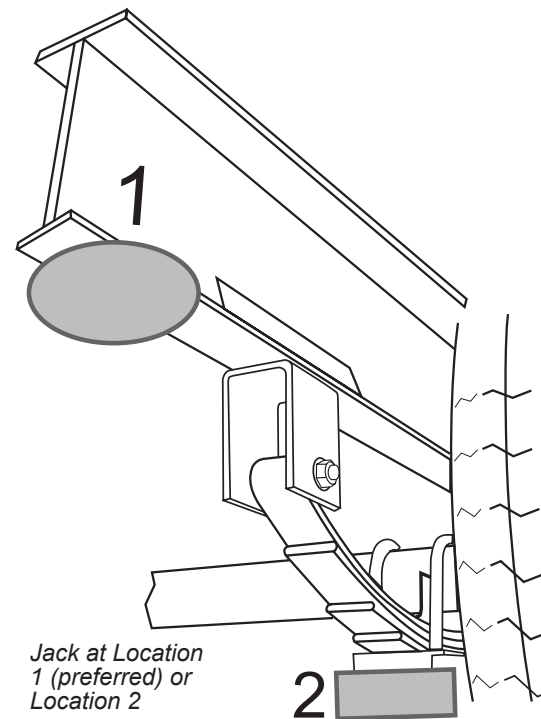
Chock all remaining tires to prevent accidental movement of the recreational vehicle.

#### **WARNING:**

Do not use rear stabilizer jacks to change tires or to elevate any wheel off the ground. Do not use the tongue jack to elevate any wheel off the ground. Damage to the tongue jack, stabilizer jack(s) and recreational vehicle may occur.

### To Change Flat Tire:

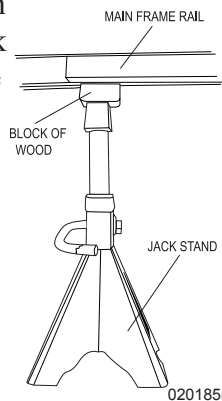
- Chock the remaining tires to prevent accidental vehicle movement.
- Place the 3' plywood on the ground. This will help stabilize the hydraulic jack and prevent it from sinking into the surface.
- Place the hydraulic jack on the 3' plywood and raise the jack to snugly contact frame (Location 1 preferred) or the axle (Location 2).



Jack at Location 1 (preferred) or Location 2

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- Loosen the lug nuts  $\frac{3}{4}$  turn while wheel is on the ground, but do not remove.
- Raise the hydraulic jack until the tire clears the ground.
- Place  $\frac{3}{4}$ " plywood block on jack stand and position jack stand under the main frame rail.
- This provides additional safety. **DO NOT** crawl under the recreational vehicle for any reason.
- Remove lug nuts.
- Remove tire from axle.
- Follow the procedures under "Wheel Mounting" in this section to mount the replacement tire.
- Torque lug nuts according to specifications.
- Remove jack stand and  $\frac{3}{4}$ " plywood block.
- Lower hydraulic jack and stow the jack, 3' plywood, jack stand,  $\frac{3}{4}$ " plywood block, wrenches, flares or triangular reflectors.
- Re-check torque after removing jack.



Check the tire warranty for emergency procedures. Save the old tire for any warranty coverage. If the changed tire appears defective, refer to the applicable warranty. Take the tire directly to the nearest dealer for inspection.

## TIRES

Tires designed for recreational vehicles are a technically engineered product and not for use on motor vehicles. Since the tire is the only contact the recreational vehicle has with road surface it is critical that proper inflation pressure be maintained. Improper pressure will lead to abnormal wear or sudden tire failure. The recreational vehicle must be weighed fully loaded before proper tire inflation pressures can be determined.

The following information concerning tires and weighing the recreational vehicle are set in the order in which the process is performed.

The tire performs additional functions of traction for moving, stopping and maintaining lateral stability, as well as providing a cushion for the recreational vehicle. To obtain the maximum wear and best service of the tires it is helpful to understand the components and function of the tires.

### **WARNING:**

**Do Not exceed the tire manufacturer's maximum speed rating. Excess speed can cause sudden tire failure resulting in serious damage, injury or death.**

### **Tire Components:**

**Tread:** Provides traction and lateral stability.

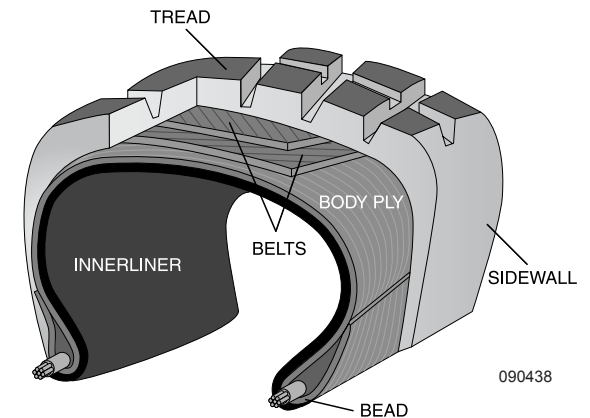
**Belts:** Stabilize and strengthen the tread.

**Sidewall:** Protects the side of the tire from road and curb damage.

**Body Ply:** Gives the tire strength and flexibility.

**Bead:** Assures an air-tight fit with the wheel.

**Inner Liner:** Keeps air inside the tire.



## **NOTICE!** **CHECK WHEEL LUGS**

On first trip, tighten wheel lugs at start and at 10, 25, and 50 miles. Tighten to manufacturer's specifications.

Thereafter, check wheel lugs before each trip, after excessive braking and following winter storage.

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## Importance of Air Pressure

The most important factor in maximizing the life of the tires is maintaining proper inflation pressure. Driving on any tire that does not have the correct inflation pressure for the load of the recreational vehicle is dangerous and may cause premature wear, tire damage, sudden tire failure and/or loss of control of the recreational vehicle.

An under-inflated tire will create excessive heat that may go beyond the design limits of the rubber and radial cords and could result in sudden failure. An under-inflated tire will also cause poor recreational vehicle handling, rapid and/or irregular tire wear and increase rolling resistance that results in decreased fuel economy. An over-inflated tire will reduce the tire's footprint/contact patch with the road, thus reducing traction, braking capacity and handling of the recreational vehicle.

Over-inflation of a tire for the load will result in a harsh ride, uneven tire wear and susceptibility to impact damage. Maintaining correct tire inflation pressure for each loaded wheel position on the recreational vehicle is of the utmost importance and must be a part of regular recreational vehicle maintenance.

### **WARNING:**

**Driving on an under-inflated tire can exceed the design limits of the tire and may damage the sidewall. A damaged sidewall can burst upon inflation resulting in serious damage, injury or death. Aged tires are also susceptible to sidewall damage.**

## Load Inflation Table

Federal law requires specifications for the tire maximum load rating be molded on the sidewall of the tire. Air pressure amounts depend on the weight of the recreational vehicle when fully loaded. The "Load Inflation Table" in this section shows weights supported by various air pressures. Using less air pressure means a lesser load can be carried.

Always comply with the tire manufacturer's recommended pressure inflation guide. Actual weight of the recreational vehicle can vary significantly depending on how it is loaded. Always comply with the manufacturer's guideline for optimum tire wear, ride and handling. The tires of the recreational vehicle are inflated at the factory to pressure(s) appropriate for the actual weight on each axle in the unloaded, "as shipped" condition.

When the recreational vehicle is loaded for travel, check and adjust inflation pressure according to the heaviest wheel position then inflate all tires with the same pressure. The amount of inflation pressure is indicated in the load inflation table for the weight carried by the tire. **Do not** over-inflate or under-inflate the tires.

The Gross Axle Weight Rating (GAWR) is listed on the federal certification label attached to the recreational vehicle is the maximum allowable loaded weight on an axle.

When the actual loaded weight of the recreational vehicle and the weight on each axle is unknown, follow the recommended tire inflation pressure(s) listed on the federal certification label. When loading a recreational vehicle, never exceed the Gross Vehicle Weight Rating (GVWR) or the GAWR for each axle. Contact the tire manufacturer for further information concerning proper inflation pressure and other tire issues.

- The tire size and load range is listed in the left margin of the table.
- After weighing (see *Weighing the Recreational Vehicle* in this section), determine the tire size and load range equipped on the recreational vehicle.
- Inflate all tires to recommended pressure based on the heaviest wheel position.

**WARNING:**

Every load range has a maximum weight rating as well as minimum and maximum inflation pressure. Do not exceed these ratings.

**NOTE:**

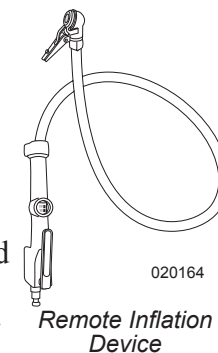
Depending upon length and options, the tires listed in the tables were available at the time of printing. The recreational vehicle manufacturer will not be responsible for substitution of an incorrect tire size or load range. Verify actual tire brand, size and load range before obtaining replacement tires.

**NOTE:**

Tires are warranted by the tire manufacturer. The recreational vehicle manufacturer is not responsible for tire wear.

**Inspecting & Pressure**

Check the tire pressure regularly. If a tire is punctured by an object and a slow leak occurs, without an air pressure check it may be overlooked until travel time. The air pressure should be checked at least once a month and before any major trip. Check tire air pressure every “drive” morning on both long and short trips (driving a day or less) or before leaving on a trip and again before starting the trip home.



Tire Size	Max Speed (MPH)	Inflation PSI								
		PSI	15	20	25	30	35	40	45	50
ST205/75R14 Load Range C	65	LBS	860	1030	1170	1300	1430	1530	1640	1760(C)

Tire Size	Max Speed (MPH)	Inflation PSI											
		PSI	15	20	25	30	35	40	45	50	55	60	65
ST225/75R15 Load Range D	65	LBS	1060	1260	1430	1600	1760	1880	2020	2150	2270	2380	2540(D)

Tire Size	Max Speed Rating (MPH)	Inflation PSI										
		PSI	35	40	45	50	55	60	65	70	75	80
LT235/85R16 Load Range E	65	LBS	1500	1650	1790	1940	2060	2190	2335	2440	2560	2680(E)

The recreational vehicle manufacturer is not the author of these charts and makes no representation or warranty concerning the accuracy of the information disclosed by the charts. Monaco is not responsible for the accuracy of the information disclosed or for any errors within the load inflation table.

**WARNING: DO NOT EXCEED THE TIRE MANUFACTURER’S MAXIMUM SPEED RATING.**

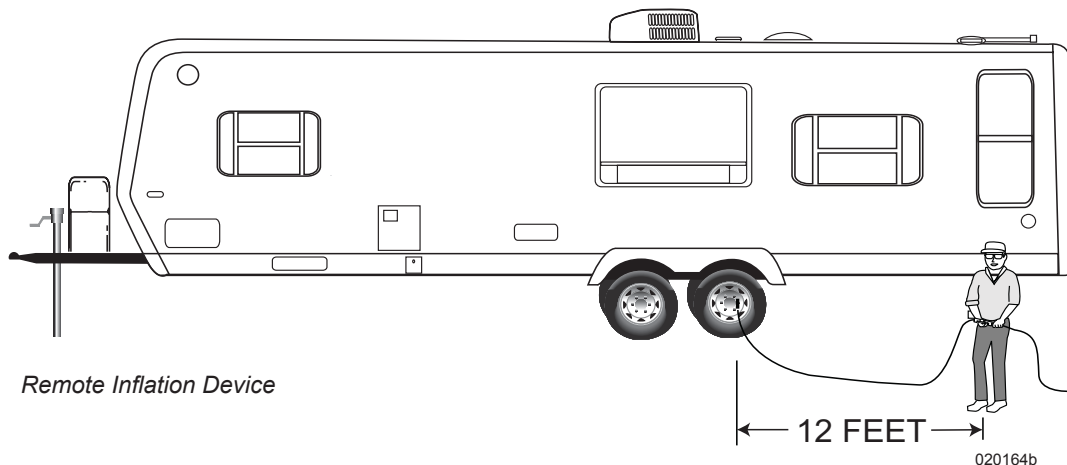
If the recreational vehicle is stored for any length of time, the air pressure should be checked prior to storage. More importantly, check the tire pressure when it is removed from storage. Check the tire pressure when the tires are “cold” and have not been driven for more than one mile.

The stated load capacity for a given cold inflation pressure is based on ambient outside temperature. If the tires must be checked when they are warm or hot, allow for a slight increase in air pressure and make sure they are within a couple of pounds of each other on the same axle.

**CAUTION:**  
Never let air out of a hot tire.

When checking the inflation pressure in the tires, use a quality truck tire air gauge which has an angle dual head. Nothing should restrict the ability to check tire air pressure daily when traveling with the recreational vehicle. Pressure sealing valve caps should always be used to prevent air from escaping from the valve stem. If there are valve stem extension hoses, make sure they are good quality stainless steel braid reinforced and are securely anchored to the wheel.

Optimum tire performance is achieved with proper inflation pressures for the loads being carried. Check and correct tire air pressure prior to travel or daily if in full-time use. Never mix different sized or constructed tires.



**WARNING:**  
Improperly inflated tires can effect handling or cause sudden tire failure possibly resulting in loss of control. Always use an accurate tire pressure gauge when checking tire pressure.

**WARNING:**  
For safety purposes, clear the area of people and pets during tire inflation. Inflate tires using a remote inflation device.

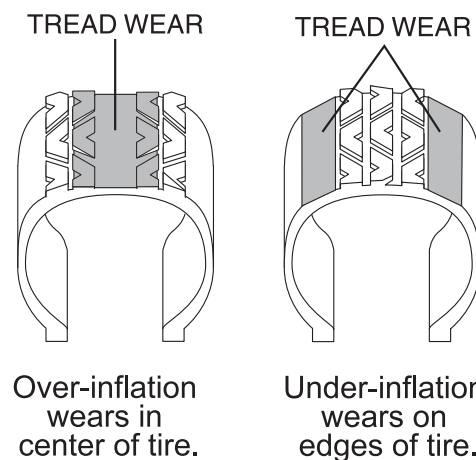
- Circumferential breaks.
- Tire cord breakage.
- Higher risk of road hazard.
- High tire temperatures.
- Loss of casing durability.
- Unequal tire pressures on same axle.
- Uneven braking, swerve on acceleration.
- Steering lead, torque steer.
- Reduced handling.

**Over-Inflation Can Cause:**

- Hard ride.
- Tire bruising or carcass damage.
- Rapid tread wear at center of tire.

**Under-Inflation Can Cause:**

- Tire squeal on turns.
- Reduced handling.
- Rapid, uneven wear on the edges of the tread.
- Separations.
- Tire rim bruises and rupture.



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## Air Pressure Checklist

1. Check air pressure when the tires are completely cool.

### **NOTE:**

**If the recreational vehicle must be driven a distance to get air, check and record the tire pressure first and add the recorded calculation when reaching the pump. It is normal for tires to heat up and the air pressure inside to go up as driven. Never reduce air pressure when tires are hot.**

2. Remove the cap from the valve.
3. Firmly press a tire gauge onto the valve and record reading.
4. Add air to achieve recommended air pressure.
5. If the tire is over-filled, release air by pushing on the metal stem in the center of the valve. Recheck the pressure with the tire gauge.
6. Replace the valve cap.
7. Repeat with each tire.
8. **Inspect** all the tires for nails or other objects that could be embedded or puncture the tire and cause air leaks.
9. Check the sidewalls for gouges, cuts, bulges, or other irregularities.

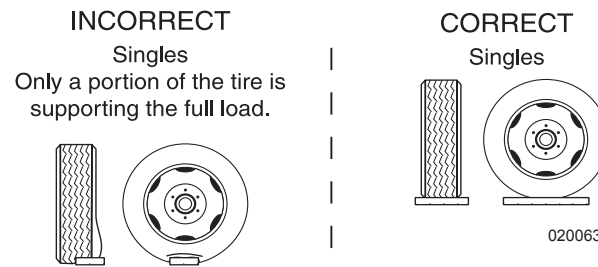
### **NOTE:**

**Air pressure in a tire goes up (in warm weather) or down (in cold weather) 1 to 2 psi for every 10° F of temperature change.**

## Supporting Tires When Leveling

Extreme caution must be taken to ensure that the tires are fully supported when placing blocks under the tires. The load on the tire should be evenly distributed on the support block. If not properly supported, the steel cables in the sidewall of the tires may be damaged and could lead to premature fatigue of the sidewall.

### Tire "Support" Methods



### **CAUTION:**

**Supporting tires prevents damage to the sidewall of the tires but does not prevent tire roll.**

## Tire Vibration

Sudden tire failure is often preceded by tire vibration. Symptoms that can cause tire failure are a bulge in the sidewall or swelling in the tire carcass. Striking an object or large hole in the road surface can damage a tire. **Inspect** the tires periodically thereafter as rotational forces can continue to stress damaged areas and later manifest in tire failure. If an unusual vibration begins or a bulge is noticed in the sidewall, have the tires evaluated by a qualified professional as soon as possible.

## Tire Rotation

Tire rotation can increase the life of the tires by achieving uniform wear. Have the tire manufacturer determine rotation pattern. Unusual or unique wear patterns should be evaluated before rotation. Misalignment, imbalance or other mechanical problems may exist and will need correction prior to rotation.

The tire rotation should be performed every 5,000 miles or at any sign of uneven wear. After a tire rotation, the inflation pressures should be checked and adjusted accordingly for the actual loads of the wheel position.

### **NOTE:**

**It is recommended that the tires be rotated every 5,000 miles.**

## Tread

To prevent skidding and hydroplaning, replace tires when the tread is worn down to 4/32". Questions regarding tread wear should be directed to the tire manufacturer.

Built in tread wear indicators look like narrow strips of smooth rubber across the tread. These indicators will appear on the tire when the tread is worn down to 4/32". The tire should be replaced when wear indicators are noticed.

Visually check the tires for signs of uneven wear. Signs of irregular tread wear are usually exhibited by low or unusually smooth areas on the tire surface. Consult the tire manufacturer as soon as possible.



## Tire Replacement

As represented within the tire manufacturer's published tire data guide, the size and rated load carrying capacity of the original equipment tires on your recreational vehicle meet or exceed the recreational vehicle's maximum axle weight/load ratings. Criteria used to determine when tire replacement is necessary are road hazard damage, wear, and age. Tire replacement based on wear is determined by either measuring the tire's groove depth or a visual inspection of wear bars. Replace tires when the groove depth is 2/32" or less on rear tires and 4/32" or less on front tires. Wear bars are raised areas cast into the groove of the tire. Replace the tire when the wear bar in the groove is even (preferably before) with the road surface contact patch. A worn out tire cannot adequately channel water through the groove, which will result in hydroplaning.

The tire manufacturer determines tire replacement based on age. While ozone inhibitors in the rubber help extend the life expectancy of a tire, exposure to the elements slowly breaks down the rubber, which can then suddenly fail when put to use.

Tires that are five to seven years old (depending upon environment) are considered age worn and need to be replaced for safety even though the tire may not outwardly show age weathering and still has considerable tread.

Replacement tires on any axle, must be of the same manufacturer brand, model, size, and load range and must have a load rated carrying capacity equal to or greater than the original equipment tires. Mixing tires on any axle of a different brand, model, size, load rating and load range can cause unusual handling and uneven braking due to different traction coefficient and could result in sudden tire failure or loss of control due to non-symmetrical handling.

### **WARNING:**

**Any and all replacement tires must have a rated load carrying capacity equal to or greater than the gross axle weight/load ratings as identified by the federal certification label located adjacent to the Pilot's seat.**

### **WARNING:**

**In many instances tire life is not determined by mileage or wear but by age. Tires are subject to weathering. Weathering cracks can appear in the sidewall and also run along the edge of the tire. Though the sidewall of the tire may look structurally sound, weathering can occur inside the groove of the tread. If any tire exhibits age weathering, replace all tires.**

### **CAUTION:**

**Signs of irregular tread wear, exhibited by scalloping or unusually smooth areas on the tire surface, are cause for concern. Immediately have the tire manufacturer inspect the tires.**

Built in tread wear indicators, or wear indicators that look like narrow strips of smooth rubber across the tread, appear on the tire when the tread is worn down to 2/32". The tire should be replaced when wear indicators appear.

Visually check tires for signs of uneven wear. Irregular tread wear is usually exhibited by low or unusually smooth areas on the tire surface. Consult the tire manufacturer as soon as possible.

## ***Axle Alignment***

Axles are aligned at the factory. The alignment can be affected by road conditions. If unusual tire wear occurs, have the alignment inspected. Only a cold bend method should be used to re-align the axles. Consult a dealer for service.

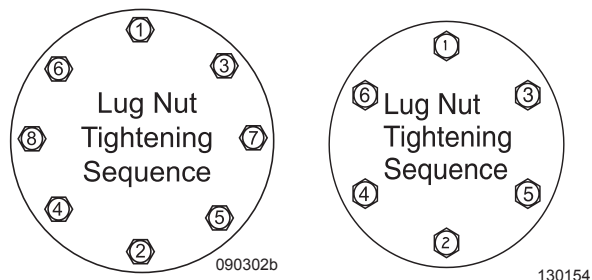
## WHEEL MOUNTING

The recreational vehicle is equipped with heavy-duty wheels. If obtaining additional wheels, such as a spare, get the same type as those installed on the recreational vehicle. Check the wheel lug torque before every trip. Tighten lug nuts between 90-120 ft. lbs.

1. After dismantling old wheel, remove all debris from stud threads. Do not lubricate threads.
2. Position wheel on recreational vehicle. **Inspect** to ensure full contact between the mounting surface (seat pads) of wheel and mounting surface of hub and brake drum.
3. Start wheel nuts on stud.
4. Finger tighten top nut. Rotate wheel so that the number two nut is at top. Finger tighten remaining nuts in numerical (crisscross) order. Always tighten nuts in top position.
5. Repeat Step 4, rotating wheel and finger tightening nuts until all nuts are snug.
6. Use a torque wrench to tighten nuts as described under “**Wheel Torque Requirement.**”
7. After wheels (with tires) have been mounted, visually inspect to ensure there is no interference with body or other component parts. Be sure to inspect wheels in all possible positions (extreme turn, etc.).
8. Only specially trained technicians using proper equipment should mount or dismount pneumatic tires. Serious or fatal injuries can result from improper tire mounting.

### NOTE

**Correct fitment of the lug wrench is important. An over-sized socket can ruin the lug nuts.**



### WARNING:

**Maintain proper torque on lug nuts or wheel bolts. Failure to do so may result in serious injury or property damage.**

### WARNING:

**Never allow anyone under the axle of a recreational vehicle being supported by the jack. Severe injury or death can occur.**

### **Wheel Torque Requirements:**

It is extremely important to apply and maintain proper torque values on the lug nuts. Torque wrenches assure the proper amount of torque is being applied to a fastener. Use no other method to torque fasteners.

### WARNING:

**Proper and accurate torque must be maintained to prevent wheels from loosening, studs from cracking and/or breaking or other possible hazardous breakage resulting in serious injury or death.**

Be sure to use only the fastener matched to the cone angle of the wheel (usually 60° or 90°). The proper procedure for attaching the wheels is as follows:

- Start all bolts or nuts by hand to prevent cross threading.
- Tighten bolts or nuts in the following stages.
- Tightening of the fastener should be done in stages.
- Following the recommended sequence, tighten fastener per wheel torque chart.
- Torque wheel nuts/bolts before first road use and after each wheel removal. Check torque after the first 10, 25 and 50 miles. Continue to check periodically.

STEEL OR CHROME WHEELS ONLY			
Torque Sequence			
Wheel Size	1st Stage	2nd Stage	3rd Stage
14"	20-25 ft. lbs.	50-60 ft. lbs.	90-120 ft. lbs.
15"	20-25 ft. lbs.	50-60 ft. lbs.	90-120 ft. lbs.
16"	20-25 ft. lbs.	50-60 ft. lbs.	90-120 ft. lbs.

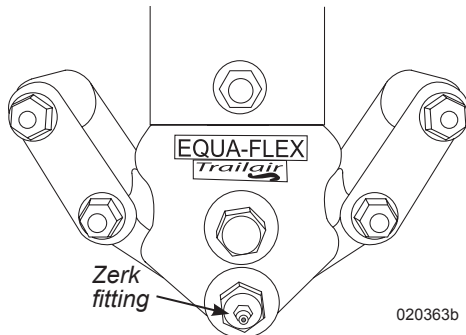
ALUMINUM WHEELS ONLY			
Torque Sequence			
Wheel Size	1st Stage	2nd Stage	3rd Stage
14"	20-25 ft. lbs.	80-90 ft. lbs.	120 ft. lbs.
15"	20-25 ft. lbs.	80-90 ft. lbs.	120 ft. lbs.
16"	20-25 ft. lbs.	80-90 ft. lbs.	120 ft. lbs.

**- ATTENTION DRIVER -**  
CHECK WHEEL LUGS  
BEFORE MOVING THIS  
VEHICLE

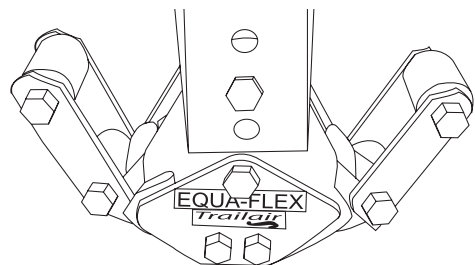
## EQUA-FLEX SUSPENSION (OPTIONAL)

The Trailair® Equa-Flex Suspension system is a rubber cushioned equalizer. The Equa-Flex rubber cushions and absorbs road shock providing a smoother ride.

While the Equa-Flex system requires no adjustments, the pivot point may require lubrication if a Zerk fitting is present. Lube the fitting once a year or when performing wheel bearing maintenance



*Equa-flex suspension. Lube fitting once a year.*

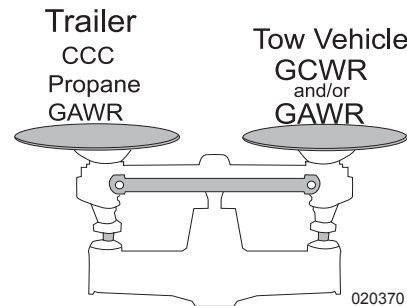


*Equa-flex suspension without Zerk fitting. No lubrication maintenance necessary*

## WEIGHING THE RECREATIONAL VEHICLE

Proper weight distribution, load management and operating within established limitations will aid in safe and enjoyable travel. The information in this section outlines guidelines and provides information on the proper techniques for weighing to accurately determine total weight, axle weights, balance and tire inflation pressure. According to the National Highway Traffic Safety Administration, most tire failures are a result of under-inflated tires. Load management, weight distribution and properly inflated tires are the responsibility of the operator.

The recreational vehicle and tow vehicle must be weighed in a loaded, ready to travel condition to correctly determine how much the recreational vehicle and tow vehicle weighs, then added to determine the Gross Combined Weight. This may require one or more adjustments and subsequently weighed again to verify proper and adequate adjustments. The first thing to determine is the maximum allowable weight of the recreational vehicle. This information is found on the federal certification label located on the exterior roadside front corner and at the entry door. This is the maximum allowable Gross Vehicle Weight Rating (GVWR) and must not be exceeded.



2012 Holiday Rambler

## Federal Certification Label:

Manufactured By –

This certification label lists the company and designate name, date of completion, and location of construction. The gross vehicle weight rating and gross axle weight ratings and vehicle type. Confirms the completed vehicle conforms to all applicable U.S. Federal Motor Vehicle Safety Standards in effect as of the date of completion of manufacture. The vehicle identification number and unit serial number are located at the bottom of the label.


MFD BY/ FABRIQUE PAR:	MONACO RV,LLC COBURG, OREGON	R-Vision	XX/XX/XXXX
GVWR/PNBV:	XXXX KG (XXXX) LB		
GAWR/PNBE	TIRES/PNEU	RIM/JAMTE	COLD INFL.PRESS/DE GONFL. A FROID
FRONT/ DEVANT	XXXX KG (XXXX) LB	225/75R 15D	15X6J
REAR/ ARRIERE	XXXX KG (XXXX) LB	225/75R 15D	15X6J
			XXX KPA (XX) PSILPC SINGLE XXX KPA (XX) PSILPC SINGLE
THIS VEHICLE CONFORMS TO ALL APPLICABLE US 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 VERTUE DU REGLEMENT SUR LA SECURITE DES VEHICULES AUTOMOBILES DU CANADA EN VIGUEUR A LA DATE DE SA FABRICATION			
VIN/NIV	XXXXXXXXXXXXXX	TYPE/TYPE	Travel Trailer SERIAL: XXXXXXXXXXXXXXXX XXXXXXXX

*Federal Certification Label*

100230da

**Tire and Loading Information:**

This certification label lists the maximum amount of weight in cargo. The chart lists tire size and load range of the tire. Cold maximum inflation pressure determined by the tire manufacturer based on the maximum weight for which the tire is designed in accordance with the tire manufacturer’s load inflation table.



**TIRE AND LOADING INFORMATION**

The weight of cargo should never exceed  
xxxx Kg or xxxx Lbs

TIRE	SIZE	COLD TIRE PRESSURE	SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION
FRONT	205/75 14 C	xxxxKpa xxxxPSI	
REAR	205/75 14 C	xxxxKpa xxxxPSI	
SPARE	NONE	NONE	

*Tire and Loading Information certificate required for vehicles under 10,000 Lbs GVWR*

100231

**Dealer Installed Federal Weight Label –**

If this certification label is attached next to the factory installed weight label on the screen door, the dealer has installed equipment and/or accessories after the recreational vehicle left the factory and prior to retail sale. This dealer installed label will list the amount of weight in equipment and/or accessories installed by the dealer. The amount of weight listed on the dealer installed label will reduce the Cargo Carrying Capacity as stated on the factory installed label by the amount stated on the dealer installed weight label.

**NOTE:**

**DO NOT remove these Federal Certification labels. These certificates confirm the vehicle conforms to guidelines and build practices as specified by the respective governmental agencies. The information on these certificates is used by the vehicle owner and the Department of Motor Vehicles (DMV) to register ownership and license the vehicle for travel.**

**NOTE:**

**Additional cargo carrying capacity labeling is added to comply with Canadian DOT (Transport Canada) regulations.**

RECREATION VEHICLE TRAILER CARGO CARRYING CAPACITY

UVW XXXXkg or xxxx lbs      VIN XXXXXXXXXXXXX

THE WEIGHT OF CARGO SHOULD NEVER EXCEED XXX Kg or xxxx lbs

CAUTION: A full load of water equals xxx kg or xxx lbs of cargo @ 1kg/L (8.3 lbs/gal)

*Factory Installed Federal Weight Label*

100179k

**CAUTION: LOAD CARRYING CAPACITY REDUCED**

Modifications to this vehicle have reduced the original load carrying capacity by

\_\_\_\_\_ kg or \_\_\_\_\_ lbs

*Dealer Installed Federal Weight Label*

100179j

## Weight Terms

The following are definitions of terms used when weighing. It is important each weight term is understood.

- **Gross Vehicle Weight Rating (GVWR):** GVWR means maximum permissible weight of the recreational vehicle. GVWR is equal to or greater than the sum of UVW plus CCC.
- **Unloaded Vehicle Weight (UVW):** UVW means weight of the recreational vehicle as built at factory with full propane tank(s). UVW does not include cargo, fresh water, or dealer installed accessories.
- **Gross Axle Weight Rating (GAWR):** GAWR means load-carrying capacity specified by manufacturer of a single axle system as measured at tire ground interfaces.
- **Cargo Carrying Capacity (CCC):** CCC is equal to GVWR minus UVW.
- **Curb Weight:** Total weight of the tow vehicle including accessories, oil, coolant and a full tank of fuel. Occupants and cargo are not included in curb weight.
- **Gross Combination Weight Rating (GCWR):** Maximum allowable combined weight of the tow vehicle and any towed load(s) as specified by the tow vehicle manufacturer. GCWR is vehicle curb weight including cargo and passengers and weight of any towed load(s).

## Weight Limits

Numerous Federal, State and local governments mandate weight limits. Understanding the terminology and performing proper weighing procedures will help eliminate confusion. It is important to weigh the recreational vehicle and tow vehicle in a loaded, ready to travel condition to ensure the Cargo Carrying Capacity, GAWR, GVWR, GCWR are not exceeded.



The GVWR is the maximum total weight for which the tow vehicle is rated including occupants, fluids and cargo. The GAWR is the maximum weight for which a single axle is rated. The GCWR is the combined total of the GVWR and any towed load. The tires, wheels, chassis frame and/or drive train component(s) may limit the GVWR, GAWR or GCWR or any combination thereof.

Every recreational vehicle, even of the same make and model, will vary in actual loaded axle weight due to different options, floor plans, occupants and cargo.

While each wheel position should be weighed to determine no wheel position is overloaded, the equalizer pivot on the recreational vehicle axles allows a small amount of weight transfer to occur between the axles on a given side. It is still possible to be within the GVWR yet overloaded on one side.

For this reason it is necessary to weigh each side of the recreational vehicle to determine the actual gross vehicle weight in a loaded, ready to travel condition and how that weight is distributed between the curbside and roadside. If weight differential is excessive, it can induce or exacerbate sway.

There are two important factors to consider when loading the recreational vehicle; total weight and balance. When loading for travel, place heavy objects as low as possible, preferably on the floor or below in storage compartments. Load weight must be distributed as evenly as possible. Instructions and diagrams to properly weigh the recreational vehicle and tow vehicle are presented on the following pages. The heaviest side of the recreational vehicle will determine the tire inflation pressure for all tires on the recreational vehicle. Refer to the tire manufacturer's load inflation table to determine the correct cold inflation pressure.

### **CAUTION:**

**State and Local authorities may impose weight restrictions to surface streets, bridges and parkways. These reductions can include maximum single axle weights or an overall maximum weight limitation based on the number of axles per vehicle.**

## Tire Pressure

The recreational vehicle may weigh slightly heavier on one side. The heaviest wheel position (if applicable) on a single axle will determine the inflation pressure for all tires on the recreational vehicle due to weight transfer that occurs when cornering.

Improperly inflated tires can result in sudden tire failure (blowout). Cargo not properly balanced on the suspension, can result in poor handling, trailer sway, over-stressed chassis components, overloaded wheel positions, and/or tires. How the recreational vehicle is loaded will influence tire inflation pressure and load carried by the axles. When the actual loaded weight of the recreational vehicle and the weight on the axles are unknown, follow the recommended tire inflation pressure(s) listed on the Tire and Loading Information label.

### **NOTE:**

**When adjusting tire inflation pressure, each tire on the recreational vehicle must be inflated to the same pressure. The wheel position carrying the most weight will determine the tire inflation pressure for all tires.**

### **WARNING:**

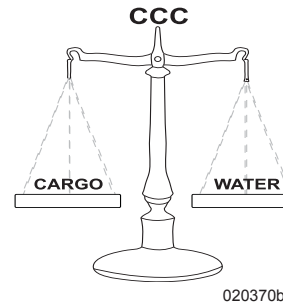
**Improperly inflated or overloaded tires can cause a blowout. An overloaded axle can cause a component failure of the suspension system. Tire blowouts or broken suspension components can lead to loss of control resulting in property damage, personal injury or death.**

### **NOTE:**

**Contact the tire manufacturer for further information concerning tire inflation pressure and other tire concerns.**

## Cargo Carrying Capacity

Each recreational vehicle, even of the same model year, floor plan and length, will weigh different due to options and accessories. The GVWR limits the weight of the entire load combination, regardless of the amount of weight of cargo, water and propane. Weighing will determine the GVWR is not exceeded as this is maximum allowable weight. While the CCC is a guide to the maximum allowable weight in combinations of cargo and water, the amount of weight in cargo and water can be adjusted so one can offset another or reduced entirely to gain advantage in CCC and/or GCWR. While maximum allowable weights are not to be exceeded, if one chooses to carry less water or no water, that can allow an increase in payload of cargo offsetting one for another and still under maximum allowable weight of GVWR, GAWR, GCWR or CCC.



## Scales

Certified public scales are located in moving and storage lots, farm supplies with grain elevators, gravel pits, recycling companies and large commercial truck stops. To locate a nearby public scale, check the yellow pages under Scales-Public or Weighers. Expect to pay a small fee.

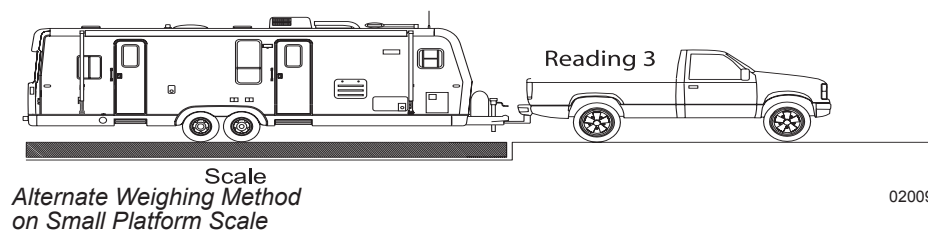
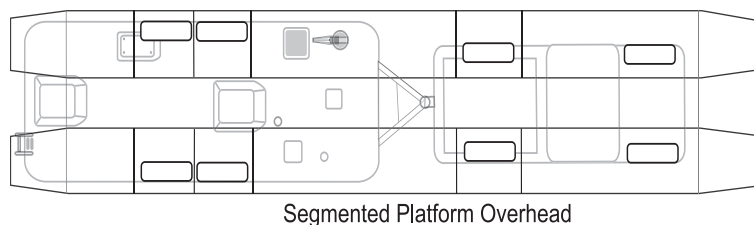
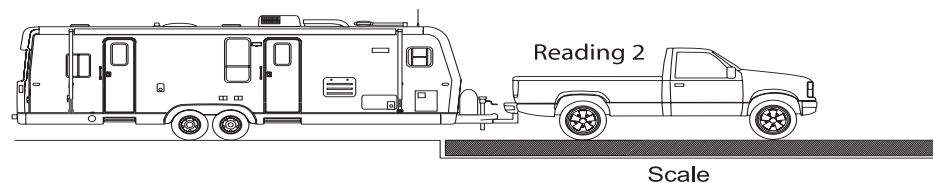
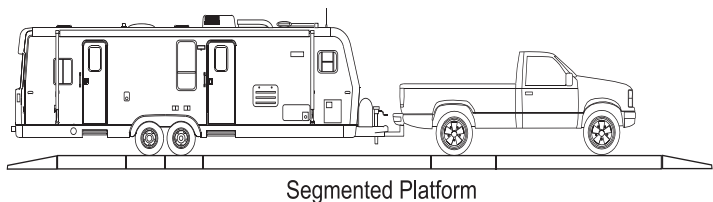
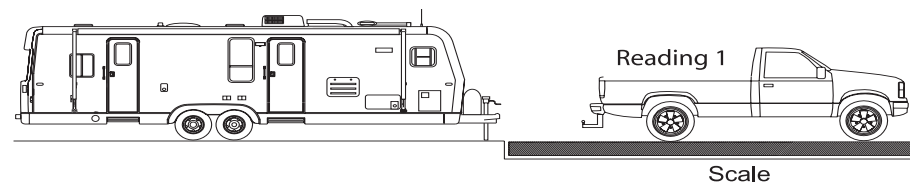
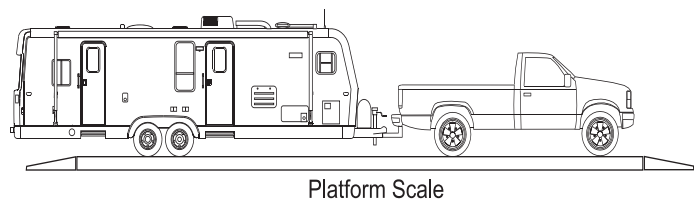
There are three basic types of scales:

- A large platform scale will allow the recreational vehicle and tow vehicle to fit on the scale to read the gross combined vehicle weight in one scale recording.
- A segmented platform scale is designed to weigh one axle at a time.
- A segmented platform scale per wheel position reads each wheel position at a time.

### **INFORMATION:**

**The most accurate weighing method is to weigh each wheel position independently. Weighing the entire recreational vehicle or a single axle will not accurately reflect the actual weight carried by all axles on one side. A platform scale that reads a single axle may be used if a platform scale that can weigh all axle(s) on one side is unavailable. In this case, weigh each axle to determine which axle supports the most weight.**

Each side of the recreational vehicle requires weighing to accurately determine the correct tire inflation pressure. When weighing, the recreational vehicle must be level to obtain accurate scale readings. A definite lean in the recreational vehicle will produce inaccurate scale readings.



Types of Scales

020049b

020094

## Weighing

### Curb Weight

For ease of weighing process and determining tongue weight, it is recommended to initially weigh the tow vehicle in an unloaded condition to obtain how much the tow vehicle weighs (curb weight) prior to loading the tow vehicle with occupants and cargo for travel. Record front and rear axle weights. Weight of occupants, tow vehicle cargo and tongue weight will be in addition to curb weight. The recreational vehicle and tow vehicle must be weighed to ensure the GCWR is within the tow vehicle manufacturer's recommendation. The following weigh method can be used if only a small platform scale is available. The recreational vehicle will need to be un-hitched.

**READING 1 - Tow Vehicle Curb Weight:** Level, unloaded without cargo or passengers.

**READING 2 - Tow Vehicle and Hitch Weight:** Level and hitched.

**READING 3 - Gross Axle Weight:** Recreational vehicle on scale level and loaded. This is weight of recreational vehicle without tongue weight.

**Hitch Weight Only - Subtract Reading 1 (tow vehicle curb weight) from Reading 2 (tow vehicle & hitch weight). Tow vehicle occupants and cargo are additional weight.**

**GCW (Gross Combined Weight) - Add Reading 2 (tow vehicle & hitch weight) and Reading 3 (GAW of recreational vehicle).**

### NOTE:

Compare actual weights and ratings to ensure the recreational vehicle is below the maximum ratings.

### WARNING:

**DO NOT** add items like generators, tools or motorcycle racks to the rear of the recreational vehicle. Weight behind the axle tends to magnify sway that may occur when passing trucks or in gusty winds. Tongue weight should be 10 to 15% of the recreational vehicle weight for proper towing characteristics.

**WARNING:**

**Improperly inflated or overloaded tires can cause a blowout. An overloaded axle can cause a component failure of the suspension system. Tire blowout or broken suspension components can lead to loss of vehicle control, property damage, personal injury or death.**

The following charts are used to determine tire inflation pressure and ensure that gross axle weight, gross vehicle weight and gross combined weight ratings are not exceeded. The recreational vehicle and tow vehicle must be weighed in a loaded, ready to travel condition including passengers, water, propane and cargo. All slideout rooms must be retracted.

**NOTE:**

**Example scale readings and weight ratings are fictitious. Actual scale readings and gross axle weight ratings will vary with model and options.**

**Tow Vehicle:**

- Record front GAWR. Example: GAWR of tow vehicle front axle is 5,500 lbs. Weigh the tow vehicle front axle and record under Actual Weight.
- Record rear GAWR. Example: GAWR of tow vehicle rear axle is 8,500 lbs. Weigh the tow vehicle rear axle and record under Actual Weight.
- Record manufacturer's GCWR. Example 15,000.
- Add Totals then compare to tow vehicle curb weight and tow vehicle manufacturer's ratings.

**Recreational Vehicle:**

- Record GAWR. Example: GAWR of recreational vehicle axles are 2,600 lbs. Weigh the recreational vehicle and record under Actual Weight.
- Record GVWR. Example 6,100.
- If necessary adjust cargo weight or cargo loading as necessary.

**NOTE:**

**It may be necessary to unhitch the recreational vehicle depending on the type of scale. Tongue weight should be 10-15% of total recreational vehicle weight.**

**Tow Vehicle**

		Actual Weight			
	GAWR	Roadside	Curbside	TOTAL	GCWR
Front	5,500	1750	1720	3470	
Rear	8,500	3,900	4,000	7,900	
Total	14,000	5,650	5,720	11,370	15,000

*Numbers in exemplar chart are fictitious.*

**Recreational Vehicle**

		Actual Weight				
	GAWR	Roadside	Curbside	TOTAL	Tongue	GVWR
Front	2,600	995	915	1,910		
Rear	2,600	875	845	1,720		
TOTAL	5,600	1870	1760	3,630	390	6,100

*Numbers in exemplar chart are fictitious. Tongue weight should be at least 10% of gross trailer weight*

**Tow Vehicle**

		Actual Weight			
	GAWR	Roadside	Curbside	TOTAL	GCWR
Front					
Rear					
Total					

*Actual worksheet*

**Recreational Vehicle**

		Actual Weight				
	GAWR	Roadside	Curbside	TOTAL	Tongue	GVWR
Front						
Rear						
Total						

*Actual worksheet*



DATE: \_\_\_\_\_

PLACE: \_\_\_\_\_

FRONT: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

REAR: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

= \_\_\_\_\_  
TOTAL GROSS VEHICLE WEIGHT

DATE: \_\_\_\_\_

PLACE: \_\_\_\_\_

FRONT: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

REAR: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

= \_\_\_\_\_  
TOTAL GROSS VEHICLE WEIGHT

DATE: \_\_\_\_\_

PLACE: \_\_\_\_\_

FRONT: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

REAR: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

= \_\_\_\_\_  
TOTAL GROSS VEHICLE WEIGHT

DATE: \_\_\_\_\_

PLACE: \_\_\_\_\_

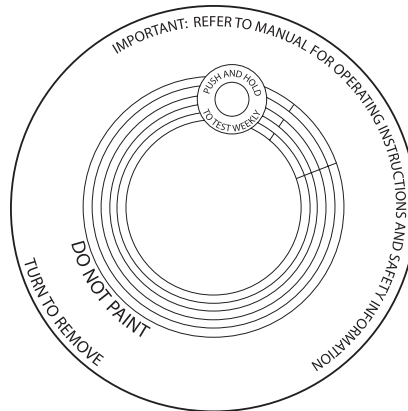
FRONT: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

REAR: \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_  
LEFT                      RIGHT                      TOTAL

= \_\_\_\_\_  
TOTAL GROSS VEHICLE WEIGHT

## SMOKE DETECTOR

Statistics show that most fire casualties are not caused by direct flame, but by less visible smoke (products of combustion). A smoke detector may not protect against fires caused by carelessness or safety hazards such as smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, natural causes such as lightning, children playing with matches and arson. Fire prevention is the best safeguard.



Test Smoke Detector Weekly 030766b

### **WARNING:**

**There is no way to ensure against injury or loss of life in a fire, however, the smoke detector is intended to help reduce the risk of tragedy. Additional smoke detectors may help to reduce the risk. Proper use and care of the smoke detector could save lives.**

### **INFORMATION:**

**Refer to the smoke detector OEM manual for detailed information and maintenance instructions.**

## Operation

When a 9 Volt DC battery is correctly connected, the indicator light blinks about once per minute showing the battery is supplying power. A loud alarm sounds when a production of combustion is sensed.

Using a smoke detector in a smoky area like a kitchen or in a high humidity area near a shower can cause false alarms. **Do not** remove the battery to disable the alarm. **Do not** remove the detector. If a false alarm occurs, try waving a towel near the detector to clear the sensing chamber. A smoke detector will not help protect against a fire if it is not powered or the detector is removed. The smoke detector should be replaced at least every 10 years.

## Testing

Firmly press the test button on the smoke detector cover for a few seconds. The smoke detector will sound by making a continuous loud beeping noise and the push to test button will blink once per second while the button is being pushed. The smoke detector will stop sounding when the button is released. The smoke detector should be tested at least once a week when the recreational vehicle is in use, prior to each trip and when the recreational vehicle has been in storage.

**⚠ WARNING**

TEST THIS ALARM'S OPERATION AFTER EACH STORAGE PERIOD, BEFORE EACH TRIP AND AT LEAST ONCE PER WEEK DURING USE.

020155e

**CAUTION:**

Never use an open flame to test the smoke detector as this may ignite the detector, surrounding area or potentially set fire to the recreational vehicle.

**Replacing the Battery**

- Remove the smoke detector from the mounting bracket by twisting counterclockwise.
- Replace with a fresh battery. Use only Eveready 522 or 1222; Mallory MN1604; Duracell MN1604; Ultralife U9VL-J.
- Ensure battery connection is tight and the battery is secure in compartment.
- Test the smoke detector for proper operation.

**CAUTION:**

A smoke detector will not work without a good battery correctly installed. The smoke detector must be tested when a new battery is installed. The smoke detector is designed with a safety mechanism that prevents mounting unless a battery is installed. Use only batteries specified above or on the label of the smoke detector. Do not use any type of rechargeable batteries.

**Maintenance**

- Test the smoke detector once a week.
- Keep a fresh supply of 9 Volt DC batteries.
- Vacuum the slots in the cover and sides with a soft brush attachment at least once a month. Test the smoke detector after the unit has been vacuumed.

- The smoke detector will beep once a minute for 30 days when the battery is low. Immediately replace with a fresh battery.

**WARNING:**

Water or cleaning solution may damage the detector. Never spray the detector with cleaning solution of any kind. Ventilate the area where the detector is installed when household cleaning supplies or similar contaminants are being used.

**WARNING:**

DO NOT try to repair the detector; this will void the warranty. Refer to the OEM manual for directions on returning the smoke detector.

**INFORMATION:**

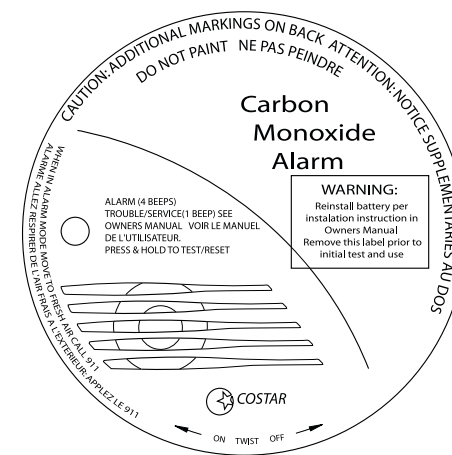
If the recreational vehicle is equipped with a different model, see the smoke detector OEM manual for detailed information on operation and safety.

**CARBON MONOXIDE DETECTOR**

American National Standards Institute (ANSI) 1192 - Fire & Life Safety 6.4.6 Carbon Monoxide Detectors states “CO detectors used must be listed as suitable for use in RV’s and installed in accordance within the terms of their listing. No specific mounting location is mandated for CO detectors; only that they be installed in accordance with their listing. The installation of the CO detector mounting bracket alone will be considered acceptable as long as the CO detector is provided.

*A CO detector is required to be installed in any RV that either contains an internal combustion engine or is designed to have one installed. This would include all motorized RV’s, regardless of whether the fuel source is gasoline, diesel, propane, or other alternate fuel. This would also include an RV equipped with a generator or designed to accommodate future installation of a generator (commonly called “generator prep” setups). This would not include RV’s equipped to store or transport internal combustion engine vehicles.*

*Also, all truck campers must have a CO detector installed, since an internal combustion engine is ultimately present once the truck camper is mounted on a pickup truck.”*



Test Carbon Monoxide Detector Weekly

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Carbon monoxide (CO) is a colorless, odorless and tasteless gas that binds with hemoglobin reducing the body's ability to absorb and carry oxygen to vital organs. Even low levels of CO have been known to cause brain and other vital organ damage in unborn infants, with no effect on the mother.

When removed from exposure, the symptoms dissipate as Carbon Monoxide is expelled through the lungs. Level of contamination in the body reduces at half-life increments at approximately four-hour intervals. Treatment with Oxygen will quicken recovery time.

In cases of mild exposure, the symptoms may include: a slight headache, nausea, vomiting and fatigue. Symptoms for medium exposure may include a severe throbbing headache, drowsiness, confusion and fast heart rate. Extreme exposure can result in unconsciousness, convulsions, cardio-respiratory failure and death. Young children and household pets may be the first affected. Other highly sensitive people include the elderly and those with lung or heart disease.

**WARNING:**

**The detector is designed to protect individuals from the acute effects of carbon monoxide exposure. It will not fully safeguard individuals with medical conditions. Individuals with medical problems may consider using warning devices which provide audible and visual signals for carbon monoxide concentrations under 30 ppm. If in doubt, consult a medical practitioner.**

**INFORMATION:**

**Refer to the carbon monoxide detector OEM manual for detailed operating and maintenance instructions.**

The CO detector is designed to detect the toxic CO Gas entering its sensing chamber. It does not sense combustible gas (such as natural gas, propane, or butane), heat, smoke or flames.

**WARNING:**

**Actuation of CO detector indicates the presence of carbon monoxide (CO), which can be deadly. If the alarm sounds (flashing red LED and pulsating horn) take appropriate action.**

**CAUTION:**

**The detector will only indicate the presence of carbon monoxide gas at the sensor. Carbon monoxide gas may be present in other areas.**

***Power Requirements***

The CO detector will not work without power. Use only a 9 volt battery for CO detector replacement, Alkaline type Duracell MN1604.

**WARNING:**

**Use of a different battery may have a detrimental effect on CO detector. Constant exposure to high or low humidity may reduce battery life. Check the battery manufacturer specifications for proper operating conditions.**

Fresh batteries should last approximately one year. The battery is installed reversed for shipping. Remove and reinstall the battery in the correct orientation as noted on the inside of the battery door. The detector will beep once to indicate proper battery installation.

**WARNING:**

**Battery is required for detector operation and detection of carbon monoxide. If no battery is installed, the battery door will not close easily and the detector will not attach to the mounting bracket.**

***Operation***

The detector is not fitted with an on/off switch. It is automatically switched on when the battery is inserted. This is to ensure that the detector cannot be inadvertently switched off and therefore fail to detect a build-up of carbon monoxide. The red LED flashes every 30 seconds when the power is on.

***Indicator Lights and Sound Patterns:***

**Normal Operation:** When no carbon monoxide is present, the red LED will flash approximately once every 30 seconds.

**Alarm Conditions:** Red LED turns on for 2 seconds and off for 4 seconds with 4 short beeps for 1 second and 5 seconds of silence. Pushing and holding the test/reset button for 3 seconds will silence the alarm for about 4 minutes. After 4 minutes, the alarm will sound again until the unsafe CO concentration is reduced.

**Trouble/Service Condition:**

The detector self-tests every 10 minutes. The detector will beep and the indicator/test button will flash once every 30 seconds if a fault is detected. This is an indication of a malfunction and that the detector requires immediate servicing.

**Low Battery:** Red LED flashes and horn chirps once every 30 seconds for a minimum of (7) days. Replace battery when signal occurs.

**WARNING:**

**Failure to replace CO detector by the “Replace By Date” printed on the detector cover may result in death by carbon monoxide poisoning. Replace by date is six (6) years from the date of manufacture.**

**When Alarm Sounds use the following steps:**

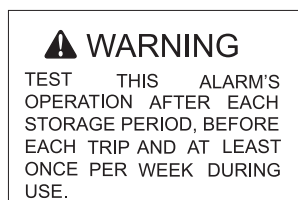
- Operate reset/silence button.
- Call emergency services.
- Evacuate recreational vehicle.
- **Do not** re-enter the recreational vehicle until it has been aired out and the problem corrected. If the alarm reactivates within a 24 hour period, repeat previous steps and call a qualified technician to investigate the sources of CO from fuel burning equipment and appliances, and inspect for proper operation of equipment.

**Potential Sources of CO when operating the recreational vehicle:**

- Engine Exhaust
- Portable Space Heaters
- Defective Engine Exhaust System
- Portable Grills
- Gas Stoves and Ovens
- Portable Generators
- Generator Exhaust
- Camp Fires
- Nearby Recreational Vehicles

**Alarm Testing**

Test the detector weekly for proper operation by pushing the test button until a short beep is heard (approximately 3 seconds). Release the button. The detector will then test itself for proper operation and the red LED will flash 4-6 times. At completion of self-test, the alarm will sound 2 patterns. The detector then resumes normal operation.



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**Maintenance****WARNING:**

**Do not use any household cleaning agents, paints, varnishes or any other chemical on the detector as these substances can damage the detector.**

To clean the detector, remove it from mounting and vacuum through the openings and around perimeter of detector. Wipe the outside with a clean towel. After cleaning, reinstall detector and test by using test button.

**Service and Warranty**

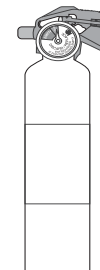
Do not attempt to repair detector. If detector is defective, contact detector manufacturer.

**INFORMATION:**

**The CO detector is accurate at the time the manual was printed. If the recreational vehicle is equipped with a different model see the CO detector OEM manual for detailed information on operation and safety instructions.**

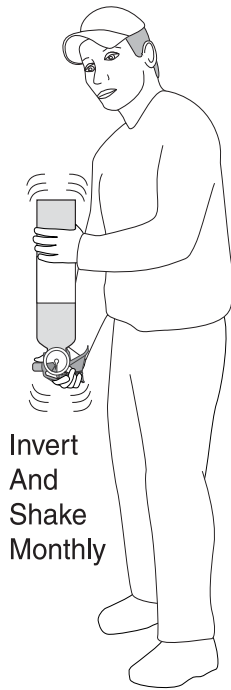
**FIRE EXTINGUISHER**

The fire extinguisher in the recreational vehicle is located near the entrance door. Read the operating instructions that are printed on the fire extinguisher. If there is any doubt on how to operate the fire extinguisher, practice using it. Be sure to replace the extinguisher immediately after use.



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**Inspect** the fire extinguisher at least once a month, or more frequently if the extinguisher is exposed to weather or possible tampering. **DO NOT** test the extinguisher by partially discharging. Internal pressure will escape and the fire extinguisher will need to be replaced.



**WARNING:** Road vibration will cause extinguisher powder to compact and may cause extinguisher malfunction. **Invert and shake extinguisher monthly.**

**Use the PASS word!**

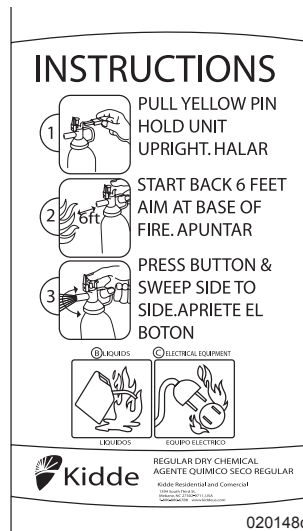
**P**ull the pin to unlock the extinguisher.

**A**im at the base (bottom) of the fire and stand 6 to 10 ft. away.

**S**queeze the lever to discharge the agent.

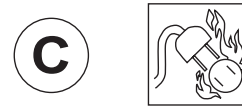
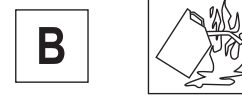
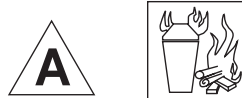
**S**weep the spray from left to right until totally extinguished.

There are three classes of fire to be concerned with in a recreational vehicle. Any fire can fall into more than one class; a fire that involves both burning paper and kitchen grease would be a Class AB fire.



**Classes of Fire:**

**A** - Fires that are fueled by materials that leave a residue when they burn: paper, wood, cloth, rubber, and certain plastics.



**B** - Fires that involve flammable liquids and gases: gasoline, paint thinner, kitchen grease, propane and acetylene.

**C** - Fires that involve energized electrical wiring or equipment. If electricity to the equipment is turned off, a class C fire becomes one of the other two class fires.

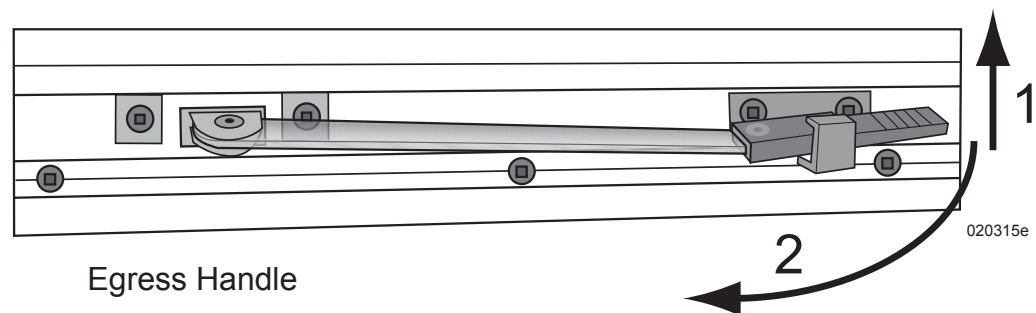
**EGRESS EXIT WINDOW**

An egress window is designated for use as an exit in the case of an emergency. Inside the recreational vehicle, the egress window is easily identified by the red locking handle. It is also marked as an "EXIT." On the outside of the recreational vehicle the egress window is identified by hinges, visible along the top of the window.

**To open the egress window:**

1. Unhook handle from latch
2. Swing handle open then push window outward guiding handle through handle access hole.

The egress window should be opened twice a year to ensure proper operation. The rubber seal tends to stick to the egress window.





# Interior and Exterior Care

## Section 3



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**INFORMATION:**

This section is on general cleaning and maintenance. Some of the articles within “Exterior & Interior Care - Section 3” may not apply to all models. Improper or inadequate maintenance may affect your warranty coverage. Please review this section carefully. For more information, see the terms and conditions of the Limited Warranty in the front of this Manual.

## **EXTERIOR CARE**

### ***Corrosion***

The most common cause of corrosion to the recreational vehicle exterior is accumulation of road salt, grime and dirt. These elements, combined with moisture, may possibly cause early component failure. The undercarriage and wheel openings require periodic cleaning to prevent component failure caused from corrosive materials collected on roadways. If the recreational vehicle is transported or stored in areas where road salts are used or near the ocean, it should be washed at least once a week, including the undercarriage. Otherwise, it is recommended to hose off the undercarriage area at least once a month to help minimize the corrosion process. High-pressure washers or steam cleaners are the most effective way of cleaning off the undercarriage and inside wheel openings. However, these devices can cause damage. Avoid directly spraying the painted surface with a high-pressure washer of any type. Also avoid directly spraying electrical wiring, connectors or electro-mechanical components with high pressure.

**CAUTION:**

It is up to the recreational vehicle owner to properly wash and protect the recreational vehicle and its components from corrosion. Sources of corrosion can come from road surfaces treated with de-icing agents or atmospheric conditions such as coastal regions.

**CAUTION:**

Exercise caution when using a high-pressure washer. The nozzle discharge pressure of these devices can exceed 1800 psi. Avoid using high pressure/high temperature steam cleaners on the exterior paint surfaces. Remove all spattered washing debris from the exterior paint surfaces as soon as possible.

### ***Winter Drive Protection***

Various substances and chemicals are applied to roadways to reduce hazardous winter driving conditions. These substances can include rock salt, sand, gravel or chemical applications such as LMC (Liquid Magnesium Chloride).

Road salts are known for their corrosive properties to steel and other metals. Road salt can also damage other recreational vehicle components and materials. Recreational vehicles located in or transported through areas where road salt is used are subject to rapid corrosion. LMC is a moisture activated chemical applied directly to the road surface for the purpose of lowering the freeze point of water. According to published information, LMC is a suitable replacement for road salt or sanding.

The draw back is LMC is highly corrosive to all metals, plastics and can even destroy rebar embedded inside concrete. After application, road traffic will cause LMC to become airborne vapor traveling as much as 2000 feet from the point of origin. Recreational vehicles located within that distance, even when stored outside, are exposed to the same corrosive affects as those traveling over a road treated with LMC. LMC lowers the freeze point allowing moisture to further penetrate surfaces, and remains active down to 27% humidity. Foot traffic will also track road salt and LMC into living spaces.

While most sand, road salt and LMC accumulation can be washed away through use of a high-pressure washer, road salt and LMC is still bonded to all exposed surfaces including paint. Only chemical washing can neutralize road salts or LMC. However, chemical washing can only neutralize open surfaces. LMC and road salt remains trapped between mating surfaces and will corrode wiring as well.

Local or state governments determine which substance is applied during winter months and can change by location. It is possible to encounter one or all of these substances while traveling. Only regular weekly washing of the exterior and undercarriage can slow corrosion during the winter months. No single treatment can be used to eliminate and neutralize the affects of these corrosive substances.

Diligent washing and awareness of what substances are applied to the road surface will dictate if a neutralizing agent must be applied to help slow the process of corrosion to exterior surfaces including the paint finish.



Therefore, it is up to the recreational vehicle owner to perform regular washing maintenance and neutralize any corrosive agent applied to the roadway by local or state governments.

### **Washing**

Care should be used when washing the recreational vehicle. Use only mild detergents or preferred specifically designed automotive detergents. Avoid using abrasive cleaners or laundry detergents which will scratch and leave a soap film. The use of specially designed automotive washing utensils, such as soft bristle brushes, are acceptable as long as the utensils do not trap abrasive material and scratch the surface while being used. Before washing the recreational vehicle, remove most of the accumulated dirt and “road wash” behind wheel openings, and on the rear of the recreational vehicle. If the build up is excessive, run water over a soft brush while gently scrubbing the surface in one direction. This will help float away the “build-up.” Avoid back and forth or circular motions. After removing the heavy build-up, use the mixed detergent solution to wash the recreational vehicle. Start washing at the top of the recreational vehicle working towards the bottom. If possible, wash the recreational vehicle in a shaded area when the exterior is not hot to the touch. If necessary, turn the recreational vehicle around to keep the area being washed in the shade. Try not to allow the detergent to dry onto the clear coat surface. Use plenty of water when rinsing the surface to remove any detergent residue.

### **Drying**

Chamois cloths come in natural and synthetic materials. Either type is acceptable as long as the surface is clean. Soak the chamois in clean water, then wring it dry. Remove the water from the surface, starting at the top and working towards the bottom, using a downward “S” pattern. Wring out the chamois as needed. Using a chamois cloth to remove the rinse water is not necessary, but the effort can be worthwhile.

### **Waxing**

Wax the recreational vehicle twice a year: spring and fall. Many types of protective barriers are available: glazes, waxes, polishes, rubbing compounds or combinations of these products.

#### **INFORMATION:**

**When selecting a product, follow the product manufacturer’s application instructions.**

#### **Types of Products:**

**Glazes:** Glazes are generally used to fill very fine scratches, being applied either by hand or by using a polisher with a special pad.

**Waxes:** Waxes come in many types of chemical make-up. Most contain cleaning agents, lubricants and wax. Cleaning agents remove oxidation and leave a high gloss. Wax leaves a clear film that protects the finish.

**Polishes:** Polishes combine wax based substances with abrasives to clean and polish at the same time. These products can be too abrasive for clear coats and are not recommended for use.

**Rubbing Compounds:** These types of products are generally applied by using a buffer. The use of rubbing compounds should be left to professionals as undesired results can quickly occur. These types of products are generally used to correct or flatten a surface by removing high spots or small amounts of material.

Follow all manufacturer application instructions when using a product. Upon first use of a product, try it on a “small test spot” - in an inconspicuous area in case an undesired reaction occurs. Observe the test area from different angles checking for hazing or swirl marks. If an abnormal reaction to the finish occurs, discontinue product use and consult the product’s manufacturer.

### **Graphics**

The recreational vehicle color scheme is comprised of vinyl graphics of different shapes and colors. Each vinyl graphic stripe is assigned a part number. “Touch-up” paint may be used to repair a small scratch or imperfection in the graphic stripe. To repair a larger area, it will be necessary to obtain a replacement vinyl graphic to maintain the original appearance.

## Paint Codes

The recreational vehicle color scheme is comprised of specific paint colors, each assigned a code used to achieve a desired color of paint. “Touch-up” paint may be used to repair a small scratch or imperfection in the paint surface. To paint a larger area, it is necessary to obtain the paint code to get the correct color match.

### To obtain replacement graphics or paint codes:

1. Contact Parts at 1-877-466-6226.
2. Specify the year, model, serial number and exterior color scheme name (if known).

## Bright Metal

All chrome, stainless steel and aluminum should be washed and cleaned each time the recreational vehicle is washed. Use only automotive approved non-abrasive cleaners and polishes on exterior bright work. Do not use rubbing compounds. Do not use any abrasive cleaners or compounds to clean the mirrors.

### **CAUTION:**

**When using chemicals to remove road tars, use only automotive products recommended for use on painted surfaces and fiberglass. Observe warning recommendations and directions printed on the container of agents used.**

## Cleaning the Tires

Road oil and dirt buildup can cause deterioration of the tire rubber. Proper cleaning methods and care of the tires must be used to obtain the maximum service years from the tires. Use a soft brush and a mild detergent to clean the tires. If a dressing product is applied to “protect” the tires from aging, use extra care and caution. Tire dressings that contain petroleum products or alcohol may cause deterioration or cracking. In many cases it is not the dressing that causes a problem, but the chemical reaction that occurs. When the same tire products are used on a passenger vehicle tire that is replaced every three to four years, it is rare to see a major problem. However, in some cases recreational vehicle tires may last longer due to limited annual mileage and exposure.

## Storage of Tires - Long Term

Rubber tires age faster when not being used. A cool, dry and sealed garage is the preferred storage location. Many recreational vehicles are stored outside. Some storage surfaces may cause tires to prematurely age. Placing a barrier (cardboard, plastic or plywood) between the tire and storage floor/ground helps to protect the tires. When the tire may be out of service 30 days or more, the recreational vehicle should be in long-term storage condition.

### **NOTE:**

**If the recreational vehicle is stored, inflate tires to maximum inflation pressure as indicated on the Federal Identification Tag.**

- Thoroughly clean the tires.
- Unload the recreational vehicle so there is minimum weight on the tires.
- Ensure the surface is reasonably level, firm, clean and has good drainage. Move the recreational vehicle every three months to prevent cracking in bulge areas as well as flat spotting from prolonged sidewall strain and tread deflection.
- Cover the tires to block direct sunlight and ultraviolet rays.
- The parking surface will affect moisture accumulation on the chassis and flooring.
- Gravel covered parking areas allow moisture to evaporate into the underside of the recreational vehicle.
- Sealed concrete pads allow better ventilation under the recreational vehicle.
- Storage buildings with sealed concrete floors or heated facilities greatly reduce the amount of moisture accumulation and protect the recreational vehicle from moisture damage.
- Avoid wet or greasy surfaces. Avoid highly reflective surfaces like asphalt, sand or snow.

Before removing recreational vehicle from long-term storage, thoroughly inspect each tire tread area and air pressure. If pressure check indicates tires have lost air, inflate to correct pressure for current load before use.

## Aluminum Wheels

### Inside:

If the tires are removed, **inspect** and clean the entire rim. Air used to fill the tire may contain moisture and can cause the areas of the wheel under the tire to severely corrode. Use a soft brush to remove any foreign materials from the tire side of the rim. Lubricate the rim and tire bead with a non-water-based lubricant before mounting the tire and ensure the inside of tire is dry before installing.

### **WARNING:**

**Do not use a flammable solution to coat the inside of the rim. This can lead to an explosion during tire inflation or in subsequent operation of the recreational vehicle.**

### Outside:

Road soils, grime and brake dust trap moisture which can cause corrosion over a period of time.

- Frequently clean using high-pressure water.
- Wash with a 100% cotton cloth and a mild soap solution (dish soap or carwash soap is recommended).
- Rinse all remaining soap residue with high-pressure water and wipe the surface dry using a 100% cotton cloth to avoid water spots.
- A secondary hand washing may be required to remove some stubborn road films.
- Carnauba wax can be applied to help protect the finish.

### **NOTE:**

**Allow heated wheels that are extremely hot to cool before spraying with cold water.**

### **CAUTION:**

**Rinse aluminum wheels using high-pressure water to remove debris from the surface before washing. Do not scrub. Rubbing debris against the surface of the wheel can result in scratches. Do not allow soap solution to dry on the finish of the wheel as spotting will occur.**

## Roof Care

Inspect the roof twice a year and wash at least 3-4 times a year. Use a non abrasive detergent and a medium bristle brush. It is recommended to wash the roof every other time the recreational vehicle exterior is washed. Do not use any petroleum distillates, harsh abrasives or citric ingredients which can cause irreparable damage to the roof. Do not use any type of cleaner which has a fruit smell. The fruit smell may attract birds or bugs.

### **CAUTION:**

**Use caution when on a wet roof; it may be slippery.**

Even though the roof is extremely puncture resistant, sharp objects such as a tree limb or branch could cause a puncture. Repairs can be made depending on the size of the puncture. Consult an authorized service center for puncture repairs.

### **WARNING:**

**Inspecting sealant will require use of a ladder or scaffold assembly. Roof access is also required. Follow proper safety measures accordingly. Exercise extreme care whenever using a ladder/scaffold assembly. Avoid getting on the roof if it is icy or moisture laden as the surface can be very slick. Use judgment if inspection is considered dangerous. Have the recreational vehicle inspected or sealed (if necessary) by a qualified service technician.**

## Fiberglass

**Inspect** the fiberglass exterior. Periodic **inspection** may reveal that flexing of the fiberglass exterior has created imperfections in the surface commonly known as “spider” or “hairline” cracks. A crack that has opened up to reveal the cloth weave threatens the integrity of the fiberglass. If the exterior exhibits signs of damage, prevent moisture penetration, particularly in freezing climates. Cover the area using plastic sheeting and/or tape, and have the damaged fiberglass repaired as soon as possible.

## Seal Inspection

Periodic resealing of the joints, seams, and exterior attachments is necessary to prevent the entrance of moisture into the recreational vehicle. Extreme damage from a water leak can rapidly occur. Inspect all joints, seams, seals and exterior attachments at least twice a year and reseal if necessary. Fully inspect all moldings/trims (including slide out trim), windows, doors, exterior attachments, lights, and all roof attachments.

Replace sealant if it has gaps, cracks or shows signs of deterioration. Roof air conditioners use a closed cell foam base gasket. No sealants are required. Check roof air conditioners for tightness at the four mounting bolts located in each interior corner of the air conditioner opening.

Torque specification is 40 to 50 in./lbs. Compress base gasket to about 1/2 an inch.

If the recreational vehicle is stored outside during winter months, fully inspect the interior every two weeks for water leaks. Never leave the recreational vehicle unattended with the slide room extended.

Specific sealants are used during construction of the recreational vehicle and are available at most RV supply outlets. Use a silicone sealant for all sidewall moldings/trim, windows, doors, and exterior attachments and lights. Use a black silicone sealant in areas where the sidewall meets the underbelly of the recreational unit. Use a self-leveling sealant for all roof attachments.

**WARNING:**

Some sealants may be labeled hazardous or require use of petroleum distillates for cleanup. Use proper precautions as suggested by the sealant or chemical manufacturer. Use of protective eye wear, gloves, respirator or open ventilation may be required. Use judgment when working with chemicals. If health limits exposure to chemicals or inhibits skills or abilities, employ a qualified service technician to perform the tasks.

The following diagram depicts general areas of the recreational unit that may require sealants.

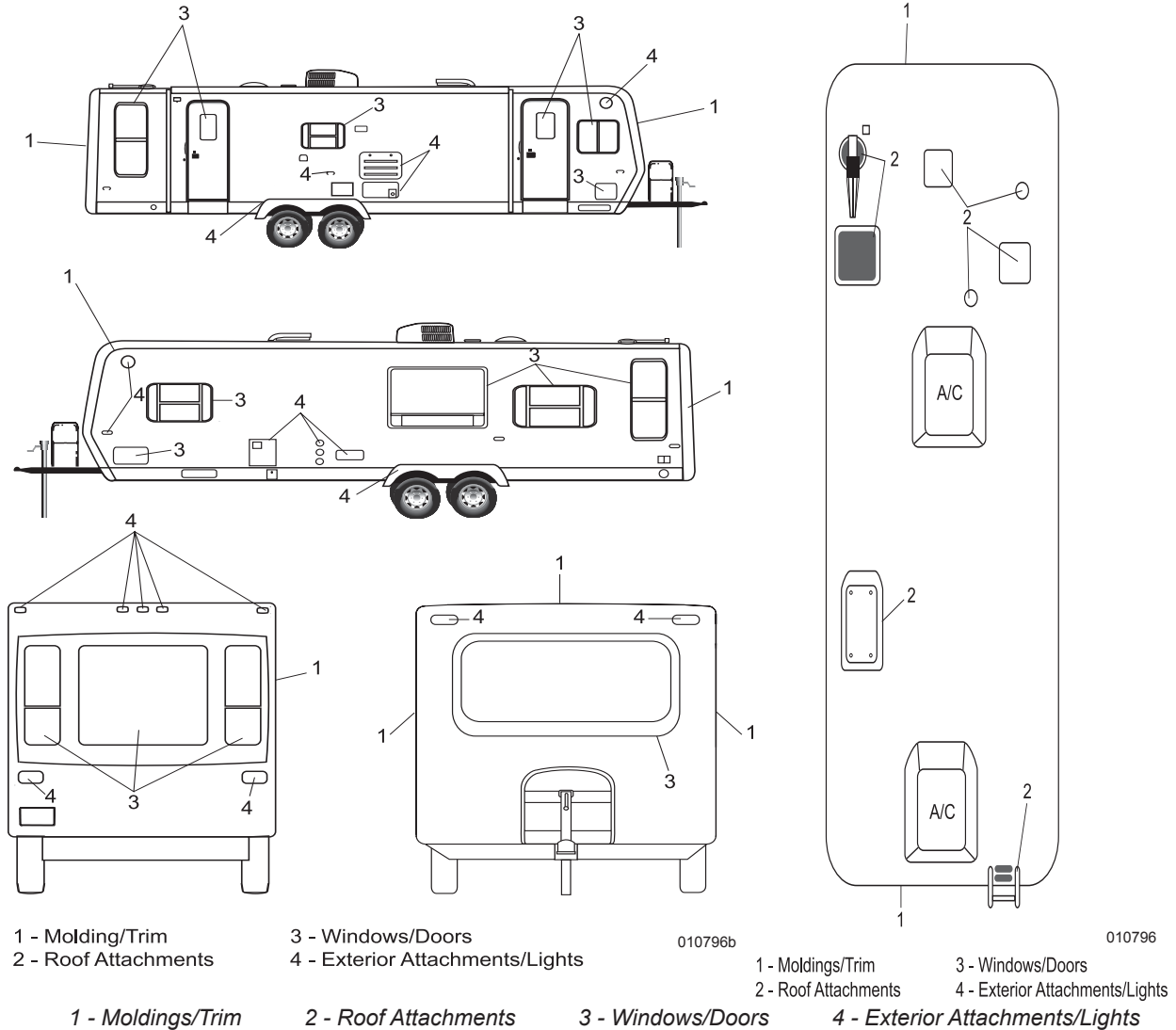
Consult authorized dealer or service center for instruction on applying approved sealants.

**CAUTION:**

Inspect exterior seals, seams and joints for sealant integrity at least twice a year. Make a full interior inspection for water leaks every two weeks while the recreational vehicle is in storage.

**INSPECTION:**

Surface must be clean and dry. Inspect seal for voids, cracks, bubbling, peeling or pulling away. Sealant that looks fine without imperfections is acceptable for continued service. Sealant that is old, cracking, flaking or bubbling will allow moisture intrusion and must be repaired.



**NOTE:**

**Diagrams are of typical recreational vehicles. Not all items apply due to options and floorplans.**

**INTERIOR CARE*****Fabrics*****General Care & Cleaning:**

The interior has been manufactured using quality materials; however, fabric that is abused can be damaged. Special care is needed when the recreational vehicle is exposed to humid climates for an extended period of time. Cover all upholstery and install window coverings to protect against sun damage. Protect the fabric from unnecessary exposure to moisture.

Frequently used items will wear accordingly and may require more attention than those items not regularly used.

If a spill occurs, blot the moisture as quickly as possible. Do not use soap and hot water as this may set a stain. Clean the spot as soon as possible.

**Cleaning Upholstery Fabrics:**

- Water-based cleaners are not recommended.
- If a spill does occur, blot the soiled area. Do not rub it.
- Some solvents may have an adverse reaction on a specific backing of the upholstery fabric and are not recommended.
- To prevent overall soiling, frequently vacuum or lightly brush to remove dust and grime.
- Use a professional furniture cleaning service for overall cleaning.

- Clean spots using a mild water-free solvent or dry cleaning product. Clean only in a well ventilated area and avoid any product containing carbon tetrachloride or other toxic materials.

***Vinyl***

Several areas of the recreational vehicle, such as the ceiling and items of furniture, may be covered in vinyl. The care and cleaning of these areas are as follows:

**Normal Cleaning:**

Most common stains can be cleaned using warm soapy water and a clear water rinse. Moderate scrubbing with a medium bristle brush will help to loosen soil from the depression of embossed surfaces. For stubborn stains use the following commercially available mild detergents in accordance with the manufacturer's instructions: *Mr. Clean®* or *Fantastik®*.

Full strength rubbing alcohol or mineral spirits may be tried cautiously as a last resort on very stubborn stains if the above suggestions do not work. Indiscriminate use of any solvent, or solvent containing cleaner, can severely damage or discolor the vinyl. Stains may become permanent if they are not immediately removed.

**NOTE:**

**Detergents should never be used on a regular or repeated basis for normal cleaning.**

**CAUTION:**

**Powdered cleaners containing abrasives, steel wool and industrial strength cleaners are not recommended for vinyl.**

**Bird Excreta & Vomit Stains:**

Sponge the area with soapy water containing a diluted bleach until the stain is removed. Rinse thoroughly with clean water.

**Urine Stains:**

Sponge with soapy water containing a small amount of household ammonia. Rinse thoroughly with clean water.

**Surface Mildew:**

Wash with diluted bleach and use a soft brush for stubborn growth. Rinse repeatedly with clear, cold water.

**Ballpoint Ink:**

Wipe the stain immediately with rubbing alcohol in a well ventilated area.

**WARNING:**

**If flammable solvents such as alcohol, turpentine or varsol are used for cleaning, use only small quantities while in a well-ventilated area.**

**Exercise proper caution by notifying any persons in the area. Keep away from any ignition source. Always wear protective gloves.**

**Oil-Base Paint:**

Use turpentine in a well ventilated area to remove any fresh paint. Dried paint must be moistened using a semi-solid, gel-type stripper. The softened paint can be gently scraped away. Rinse with soap and water.

**CAUTION:**

Lacquer solvent will cause immediate irreparable damage to the vinyl. Do not use wax on vinyl upholstery as it will cause premature embrittlement and cracking. Dilute chlorine bleach before using. Never use full strength bleach. Paint strippers will remove the print pattern and damage the vinyl if it comes in direct contact.

**Latex Paint:**

Wipe off fresh paint with a damp cloth. Hot soapy water will normally remove dried latex.

**Tar or Asphalt:**

Remove immediately. Prolonged contact will result in a permanent stain. Use a cloth lightly dampened with mineral spirits and rub the stain gently, working from the outer edge of the stain toward the center to prevent spreading. Rinse with soap and water.

**Crayon, Mustard or Ketchup:**

Sponge with mild soap and water. For stubborn stains use a cloth soaked in diluted mild detergent with gentle rubbing. Any remaining stain should be washed with diluted bleach. Rinse repeatedly with cold water.

**Chewing Gum:**

Scrape off as much gum as possible using a dull knife. Rub the gum with an ice cube to harden for easier removal. In a well ventilated area, use a cloth saturated with mineral spirits and gently rub the remaining gum. Rinse thoroughly with clean water.

**Blood or Plant Residue:**

Rub out spots using a clean cloth soaked in cool water. For stubborn spots, use household ammonia and rinse repeatedly with a clean, wet cloth. Do not use hot water or soap suds as this will set the stain.

**Lipstick, Grease, Oil, Make-Up or Shoe Polish:**

Apply a small amount of mineral spirits with a cloth. Rub gently. Be careful not to spread the stain by smearing beyond the original source. Remove shoe polish immediately as it contains a dye which will cause permanent staining. Rinse thoroughly with clean water.

**Candy, Ice Cream, Coffee, Tea, Fruit Stains, Liquor, Wine, Tanning Lotion or Soft Drinks:**

Loose material should be gently scraped with a dull knife. Use lukewarm water and sponge repeatedly. Any soiled area that remains after drying should be gently rubbed with a cloth or dampened with a mild detergent solution. Rinse thoroughly with clean water.

**Vinyl**

Vinyl requires periodic cleaning to maintain its appearance and to prevent the buildup of dirt and contaminants that may permanently stain or reduce the life of the vinyl if left untreated. Frequency of cleaning and procedures used depend upon the amount of use and the environmental conditions in which the vinyl is subjected. Tears or holes in the vinyl can be temporarily covered with clear tape to prevent further damage. Repairs should be made by a professional upholstery shop.

Commercial repair products may contain lacquers and cause the vinyl to become brittle and more difficult to repair.

**“O” Vinyl****Cleaning Suggestions:**

The following steps are to be performed in sequence. Each subsequent step is to be used if the previous step was not successful. Clean area with warm water after each process.

**For General Cleaning:**

Wipe the soiled area with warm water, a mild detergent soap and a soft cotton cloth.

**For Oil-based Stains:**

Spray soiled area with household cleaner, such as 409® or Fantastik®, and wipe with warm water using a soft cotton cloth.

**For Marker-type Stains:**

Dab stained area with solution of 50% Isopropyl Alcohol and 50% warm water using a soft cotton cloth.

**WARNING:**

**Avoid open flames or hot lighting when using an alcohol solution.**

**CAUTION:**

**Do not use any abrasive cleaner with this material.**

**NOTE:**

**A five parts water to one part bleach solution is recommended for disinfecting.**

## Ultra-Leather

### Care Instructions:

- Spot clean with mild soap and water.
- Air dry or dry quickly with warm setting of a hair dryer.
- For stubborn stains, use mild solvent.
- For tougher stains, try *Fantastik*® brand spray cleaner. Disinfect with a 5:1 Non-Chlorinated (only) bleach solution.
- Dry clean using commercial dry cleaning solvents only.
- Use a mild detergent for:
  - Red Wine, Liquor, Coffee, Tea, Cola, Milk
  - Ketchup, Mustard, Mayonnaise, Steak Sauce, Soy Sauce
  - Butter, Salad Oil, Chocolate, Lipstick, Make-up, Face Cream
  - Suntan Oil, Machine Oil, Urine, Blood

### Removing ballpoint pen stains:

Wipe the stain off with ethanol (ethyl alcohol). Follow all manufacturer safety instructions when using chemicals.

### If the stain remains, use the following procedure:

1. Dilute household bleach (sodium hypochloride) with the same amount of water. (One part to one part solution.)
2. Apply the bleach/water solution to a piece of tissue (do not apply too much). Place the tissue on the stained surface and cover it with polyethylene film to prevent the solution from drying.

3. Periodically remove the tissues to check on the condition of the stain. When the stain is almost gone, remove the tissues completely. Do not leave on for more than one hour.
4. Wash the stain with sufficient amount of clean water.

### **CAUTION:**

**If bleach residue remains on the fabric, the polyurethane resin and back cloth will yellow and deteriorate.**

### Neutralize bleach by the following method:

- Place a piece of tissue, as in Step 2, and apply hydrogen peroxide solution (15%).
- Leave the solution on for approximately 30 minutes, then remove the tissue.
- Completely remove the residue of hydrogen peroxide on the Ultra-leather with water.

## Carpet Cleaning

### Spot Removal Procedures:

- Act quickly when anything is dropped or spilled. Remove spots before they dry.
- Blot liquids with a clean, white absorbent cloth or paper towel.
- For semi-solids, scoop up with a rounded spoon.
- For solids, break up and vacuum out as much as possible.
- Pretest the spot removal agent in an inconspicuous area to make certain it will not damage the carpet dyes.

- Apply a small amount of the cleaning solution recommended for the particular spot. Do not scrub. Work from the edges of the spot to the center. Blot thoroughly. Repeat until spot is removed.
- Follow steps on the Carpet Spot Removal Guide.
- After each application, absorb as much as possible before proceeding to the next step.
- Absorb remaining moisture with layers of white paper towels, weighted down with a non-staining glass or ceramic object.
- When completely dry, vacuum or brush the pile to restore texture.
- If the spot is not completely removed, contact a professional carpet cleaner.

**Cleaning Solutions:**

- A. Dry Cleaning Fluid:** A nonflammable spot removal liquid, available in grocery and hardware stores.
- B. Nail Polish Remover:** Any acetate, which often has a banana fragrance. Do not use if it contains acetone.
- C. Detergent Solution:** Mix two cups of cold water and 1/8 teaspoon mild liquid detergent (no lanolin, non-bleach).
- D. Warm Water:** Lukewarm tap water.
- E. Vinegar Solution:** One cup white vinegar to one cup water.
- F. Ammonia Solution:** One tablespoon household ammonia to one cup water.
- G. Stain Removal Kit:** Available from retail carpet stores or professional cleaners.
- H. Call Professional:** Additional suggestions, special cleaning chemicals or patching the area may be available.
- I. Permanent Change:** Due to the nature of the stain, there may be color loss. The carpet has been permanently dyed or the carpet yarns have been permanently damaged.

**NOTE:**

**While the recommended cleaning agents have proven to be effective, some stains may become permanent.**

	A	B	C	D	E	F	G	H	I
<b>Use the solution specified in order from 1-8 until stain is removed.</b>	DRY CLEANING FLUID	NAIL POLISH REMOVER	DETERGENT SOLUTION	WARM WATER	VINEGAR SOLUTION	AMMONIA SOLUTION	STAIN REMOVAL KIT	CALL PROFESSIONAL	PERMANENT CHANGE
<b>SPOTS</b>									
Acid				2		1		3	*
Acne Medication		1		2	5	4	3	6	*
Alcoholic Beverage			1	4	3	2			*
Ammonia				2	1				*
Bleach		1	2					3	*
Blood		1	3		2	4			
Candle Wax	1					2			
Cement & Glue	2	1	3		5	4	6		*
Chalk		1	2						
Charcoal		1	2						
Chewing Gum	1								
Coffee			1	3	2		4	5	*
Cosmetics		2	1	3	6	5	4	7	*
Crayon	1		2	3					
Drain/Toilet Cleaner			2	1	3			4	*
Dye	1		2		4	3	5	6	*
Food			1	4	3	2	5	6	*
Fungicides, Insecticides, Pesticides	1		2	5	4	3	6	*	
Furniture Polish (Water Based)			1	4	3	2	5	6	*
Furniture Polish (Solvent Based)	2	1	3	6	5	4	7	8	*
Furniture Stain	2	1	3	6	5	4	7	8	*
Graphite		1	2						
Grease	1	2	3				4	5	*
Ink	2	1	3	6	5	4	7	8	*
Iodine	1		2	5	4	3	6	7	*
Lipstick	2	1	3	6	5	4	7	8	*
Medicine	2	1	3	6	5	4	7	8	*
Merthiolate			1	4	3	2	5	6	*
Nail Polish	2	1	3				4	5	*
Oil	1		2	4		3		5	*
Paint	2	1	3				4	5	*
Plant Food			1	4	3	2	5	6	*
Rust			2	3	1		4	5	*
Shoe Polish	2	1	3	5		4	6	7	*
Soft Drinks			1	4	3	2	5	6	*
Soot	1		2	3				4	*
Tar	1						2	3	*
Toothpaste			1						
Urine			1		2		3	4	*
Vomit			1	4	3	2	5	6	*

\* While recommended cleaning agents are effective, some stains may become permanent.

**Laminate Floor**

The wood plank flooring used in the recreational vehicle provides durability and ease of maintenance. This high pressure laminate flooring is designed to be incorporated as a floating floor.

The floor is easy to care for, just sweep and vacuum periodically. Do not use any floor polishes, detergents, oil-soaps, waxes, or other soaps. The residue left from these types of cleaners and polishes may damage and discolor the surface.

**INFORMATION:**

**For further information contact Hardwoods Inc at 541-465-9501 or [www.hardwoods-inc.com](http://www.hardwoods-inc.com)**

**Cleaning and Maintenance:**

- Use protector pads under heavy furniture and chair legs.
- Place mats by door entrances to pick up dirt, abrasive materials and moisture from shoes.
- Avoid scratching from pet claws by keeping them trimmed.
- Use area rugs to protect floor from heavy traffic areas. Be aware such rugs, if in sunny rooms, may cause difference in fading from non-protected areas.
- Do not wax floors; they are pre-finished.
- Do not wet mop floors or clean with products containing lemon oils, ammonia etc. Use non-wax floor cleaners.
- Water can permanently damage the floor, wipe up any spills immediately.



- Avoid walking on floors with high heeled stiletto-type shoes or dropping objects on floor that can give rise to over 1,000 psi of pressure.
- Sweep and or vacuum (using brush attachments) the floor regularly. New cleaning systems such as Swiffer® can also be used.
- Do not use any abrasive cleaners or scouring pads.
- Magic marker, shoe polish and blood can all be removed with acetone (use fingernail polish remover). Mineral Spirits will remove most stains such as tar, old adhesive, crayon and paint. Always pour these cleaners onto a cleaning cloth then wipe the affected area.

### **Vinyl Floor**

When a spill occurs, wipe it up with a damp sponge or paper towel. Avoid using cleaners containing abrasives or scouring pads as these may damage the finish of the flooring. Keep the floor clean. Dirt, grit and soil can act as abrasives. A 100% latex backed floor mat may help to keep floor clean. Do not use rubber backed mats or rubber casters as they may stain the flooring. Use large protection pads with felt spots on bases of heavy stationary items to help disperse the weight. Felt spots are non-abrasive. High, stiletto type heels may permanently damage the flooring. When moving heavy objects, lay a piece of plywood down to prevent accidental galling of vinyl.

#### **NOTE:**

**Some dishwashing liquids, oil-based cleaners and one step “polishes” can leave an oily residue which attracts soil and reduces gloss.**

#### **CAUTION:**

**Flooring may become extremely slippery when wet. Avoid personal injury by wiping up spills and keep flooring dry.**

#### **Cleaning and Maintenance:**

For everyday cleaning, vacuum the floor to remove dirt and debris. It is recommended to occasionally mop the floor using a cotton string mop and a minimal amount of water. Use a mixture of soap-free household cleaner (either vinegar or ammonia work well) and water for a more thorough cleaning.

- Wipe away stains with a damp cloth.
- Stains caused by ink or paint may require a cloth moistened with acetone (nail polish remover).
- Stains caused by gum or tar should be allowed to harden completely, then gently scraped away.
- Felt protectors on the bottom of furniture and floor mats can preserve the beauty and appearance of the flooring.

#### **CAUTION:**

**Abrasive cleaners and scouring pads can scratch and damage the flooring.**

### **Linoleum Floor**

Armstrong linoleum flooring requires regular maintenance that includes cleaning and polishing. New Armstrong linoleum flooring requires at least 3 coats of polish for adequate protection. This article will discuss basic cleaning and maintenance. For detailed information on maintenance, polishing, stripping, and removing stains, contact the Armstrong Customer Response Center at (800) 233-3823 or visit the website at [www.armstrong.com](http://www.armstrong.com)

Armstrong recommends the use of a neutral cleaning agent, preferably Armstrong Genuine Linoleum Floor Cleaner, which is specifically designed for use on Armstrong Linoleum floors. Use the following procedures for general cleaning or to clean spills

#### **NOTE:**

**Frequently change the cleaning solution during regular and heavy cleaning.**

#### **Regular Cleaning:**

- Thoroughly sweep or vacuum the floor.
- Mix ¼ cup of Armstrong Genuine Linoleum Floor Cleaner per gallon of cool water.
- Dampen a mop with the cleaning solution and lightly wash the floor.
- Allow the floor to dry.

#### **Heavier Cleaning:**

- Thoroughly sweep or vacuum the floor.
- Mix ¼ cup of Armstrong Genuine Linoleum Floor Cleaner per gallon of cool water.

- Wet a mop with the cleaning solution and scrub floor.
- Use a lightly dampened mop to scrub the floor a second time.
- Allow the floor to dry.

**Care and Maintenance:**

- Frequently sweep or vacuum the floor to eliminate abrasive, gritty dirt that can damage the floor.
- Never use highly alkaline cleaners on a linoleum floor.

**Wall Coverings**

Time is very important when removing substances that are solvent based or contain color from wall coverings. Do not use abrasive cleaners containing chlorine bleach or solvent (*Fidelity* and *Jolie* brands are recommended). Always begin with a mild detergent or soap and warm water. To remove normal dirt, clean with a soft sponge. Rinse and wipe it dry.

**Wood Care**

The care and cleaning of the solid wood surfaces and the wood products used in the recreational vehicle depends on individual choices and preferences. Numerous waxes, polishes and finishing products are available for use. Always follow the manufacture label and instructions. The solid wood surfaces should be cleaned weekly. Dust regularly with a soft, lint-free cloth. Dampen the cloth slightly with water. Wipe one small area at a time and dry immediately.

For stubborn stains, use a clean cloth dampened with a solution of mild, non-alkaline soap (like dishwashing liquid) and water. Dry thoroughly using a soft cloth. Buff lightly, following the direction of the grain. Never use abrasive cleaners, scouring pads or powdered cleaners.

Excessive dampness, dryness, heat, or cold can damage solid wood finishes. Sunlight can change the color or age the wood. **Never** allow moisture or spills to stand, always blot dry immediately. Solvents, alcohol, nail polish, polish removers, and harsh cleaners should not be used on finished wood surfaces.

Minor damage to solid wood surfaces can be repaired quickly and effectively with a bit of hard work, some careful attention to details, and most importantly, the right materials. However, any wood repair or finishing job is best left for a professionally trained individual.

**NOTE:**

**It is important to inform the service technician of any products used for the care and cleaning in the event of wood repairs.**

**Sanding and Sandpaper:**

The following table is a general guide and this may vary with wood type. The key to sanding is using the right sandpaper for the repair that is needed. Always sand with the grain.

GRIT	GRADE	USE
80-120	Medium	Smoothing the surface, removing small marks.
150-180	Fine	Final sanding prior to finishing.
220-240	Very Fine	Sanding between coats of sealing.
280-320	Extra Fine	Removing dust spots or mark between finish coats.
360-600	Super Fine	Removing luster or surface blemishes.

**Steel Wool:**

Abrasive material composed of long steel fibers of varying degrees of fineness that are matted together. Coarser grades are used to remove paint and other finishes; the finer grades for polishing or smoothing a finished surface.

**Nail Holes and Small Cracks:**

Fill nail holes and small cracks with wood putty or dough for unstained woods prior to any sanding. Stained finishes require filling holes and cracks after the stain has been applied. Putty should match the stain closely in color.

**TIP:**

**A little sawdust and wood glue can be used to make putty for end grains.**

**Scratches and Nicks:**

“Quick and simple” rarely describes repairs to stained wood finishes; however, a few tricks used by professional woodworkers can be tried to repair nicks and scratches.

**Fixing scratches in stained woodwork:**

Light scratches will often disappear when carefully rubbed with furniture polish or paste wax. When scratches appear lighter than the surrounding dark-stained woodwork, it usually means either that the scratch is deeper than the stain and into the wood or that the varnish is flaking off. Deeper scratches can be hidden by carefully rubbing with a piece of oily nut meat such as Brazil nut, black walnut or pecan. Be careful to rub the nut meat directly into the scratch to avoid darkening the surrounding wood. Color the scratch with brown coloring crayon or liquid shoe dye (especially good on walnut). Always test a procedure on an inconspicuous area on the wood to ensure no damage to the finish occurs.

**Staining the scratch with iodine:**

**Mahogany** - Use new iodine.

**Brown or Cherry Mahogany** - Use iodine that has turned dark brown.

**Maple** - Dilute one part iodine with one part denatured alcohol.

Commercial scratch removers, or stick wax to match the wood finish, can also be used. After the scratch has been hidden, polish or wax the entire area. Deep scratches should be repaired and finished by a professional.

**Dents:**

Small dents may be repaired by using steam. To raise a small dent, place a damp cloth over the area and hold a medium-hot iron on it. The steam causes the wood fibers to swell back into place. It may be necessary to repeat this process until the dented area is level with the surface. Allow the area to dry.

**Restoring the clear finish:**

The finished surface on the wood is a clear lacquer coating. The lacquer finish can be repaired should the finish become dulled or scratched. Scratches extending into the wood will require wood repair by filling the damaged area. If there is light damage, the wood can be steamed to bring the wood surface level.

Lacquer finish sheen can be restored by carefully using 0000 steel wool or equivalent. Sand damaged lacquer with fine sandpaper. Once the scratched surface is smooth, apply a clear lacquer coating using an aerosol. Lacquer can be applied by cloth or brush, but best results are obtained from an aerosol. If necessary, use 0000 steel wool or equivalent to bring out the luster and smooth overspray.

**POISON:**

**Use top coats and finishes in accordance with the manufacturer's safety instructions. Use only in well ventilated areas with proper respiratory filters and masks.**

**Re-staining the wood:**

If bare wood is visible at the bottom of the scratch, the wood will need to be re-stained. To remove damaged varnish, lightly roughen a small area around the scratch with sandpaper, steel wool or synthetic steel wool. Find a stain that is a shade lighter than the wood finish. Stain the bare wood with a very small amount of stain on a rag, brush or cotton swab. If the color is too light, apply additional coats. Rub away excess stain with a dry rag. If the wood becomes too dark, use a rag moistened in mineral spirits to lighten the wood. Select a lighter color stain and continue.

Several companies have simplified this repair process by designing oil-based wood stain into marker-like containers to rub on the scratch. Torn and scratched wood fibers will absorb stain and darken quickly. Start with a stain color that is lighter than the original finish. A second coat can always be applied if the color of the first coat is too light. Once the color is blended, patch the clear finish as described above and apply a wipe-on finish.

**COUNTERTOPS**  
***Solid Surface*****Routine Care:**

The recreational vehicle solid surface countertops and sinks have a matte/satin finish. Soapy water or ammonia-based cleaners will remove most dirt and stains from all tops and bowls. Individual techniques may be used to remove different stains. Follow the recommendations below.

**Cleaning the Countertops:**

- **Most dirt and stains:** Use soapy water or ammonia-based cleaner.
- **Water marks:** Wipe with damp cloth and towel dry.
- **Difficult stains:** Use *Soft Scrub* and a gray *Scotchbrite* pad.
- **Disinfecting:** Occasionally wipe surface with diluted household bleach (one part water and one part bleach).

**Cleaning the Solid Surfaces Sink:**

Occasionally clean by using *Soft Scrub* Liquid Cleanser and a *Scotchbrite* pad. Scrub the sink, rinse and towel dry.

**Removing Cuts and Scratches:**

Solid Surface countertops are completely renewable. Use the following instructions to remove minor cuts and scratches.

- Sand area starting with 180 grit sandpaper, working your way up to 2000 grit or until blemish is gone and renewed finish is achieved.
- Never sand in one small area. Feather out lightly at each increase in sandpaper grit to blend restoration.

**Preventing Heat Damage:**

Hot pans and heat-generating appliances, such as frying pans or crockpots, can damage the surface. To prevent heat damage, always use a hot pad or a trivet with rubber feet to protect the surface.

**Other Important Tips:**

Avoid exposing the solid surface to chemicals such as paint removers or oven cleaners. If these chemicals come in contact with the Solid Surface, quickly wash with water. Avoid contact with nail polish or nail polish remover. If contact is made, quickly wash with water.

**CAUTION:**

**Do not cut directly on the solid surface. When pouring boiling water into the solid surface sink, run the cold water faucet to dilute the excess heat.**

**Laminate**

Clean laminate countertops with a damp cloth or sponge. Use a spray cleaner to remove stubborn stains. Avoid using harsh abrasive, scouring powders, peroxides or bleaches as these products may dull or damage the surface. Avoid contact with dyes, bleaches and indelible inks used on food packages. Do not use laminated countertops as a cutting board. Laminated countertops are resistant to minor heat; however, hot pans, irons and lit cigarettes will damage the surface. Use hot pads under pans taken directly from the stovetop.

**CAUTION:**

**Do not cut directly on the laminate surface.**

**STAINLESS STEEL SURFACES**

Stainless steel can be easily damaged by improper cleaners. For example: many liquid cleansers designed to be gentle on smooth surfaces will damage stainless steel. Only use the methods outlined below and always follow the directions that come with the cleaner (usually located on the bottle).

**General Cleaning:**

- Use warm, soapy water and dry with a soft, clean cloth.

**For Heavy Soiling:**

- Only use a stainless steel cleaner designed specifically for appliances.
- Follow all directions from the manufacturer of the cleaner.

**Do Not Use:**

- Abrasive powders or cleaners
- Citrus-based cleaners
- Ammonia
- Steel wool pads
- Abrasive cloths
- Oven cleansers
- Acidic or vinegar based cleaners

**CAUTION:**

**Citric acid permanently discolors stainless steel. Immediately remove the following items from stainless steel surfaces: mustard, tomato juice, marinara sauce and citrus-based sauces or products.**

**CAUTION:**

**Do not cut directly on the stainless steel surface.**

**SHOWER**

Showers are susceptible to soap build-up. To control mildew growth, spray the shower with household chlorine bleach. Allow it to stand for five minutes, then rinse with clear water. Clean the glass shower doors with window cleaner on a weekly basis to maintain shine. If water spots cannot be removed from glass, rub lightly with the flat edge of a razor blade to remove deposits.

To prevent excessive moisture and a continual growth of mildew, use the shower only with adequate ventilation. The sealant in a regularly used shower should be replaced once a year. To replace sealant, remove the old sealant using a sharp non-metallic instrument. Apply a new sealant, which can be found at most recreational vehicle supply stores.

## CONDENSATION

The amount of condensation will vary with climate conditions, particularly in relative humidity. Condensation occurs from water vapor present in the air. Water vapor collects wherever there is available air space. When the temperature reaches the dew point, the water vapor in the air condenses and changes to liquid form.

### Controlling Moisture Condensation:

Reduce or eliminate interior moisture condensation during cold weather by using the following steps.

- Partially open the roof vents and windows so that outside air can circulate into the interior. Increase the ventilation when large numbers of people are in the recreational vehicle. Even in raining or snowing conditions the air outside will be far drier than the interior air.
- Install a dehumidifier. Continuous use of a dehumidifier is effective in removing excess moisture from the interior air. Using a dehumidifier is not a cure-all, however, it will reduce the amount of outside air needed for ventilation.
- Run the range vent fan when cooking and the bath vent fan (or open the bath vent) when bathing to reduce water vapor. Avoid excessive boiling or use of hot water as it produces steam.

- **Do not** heat the recreational vehicle interior with the range or oven. Heating with the range or oven increases the risk of toxic fumes and allows oxygen depletion. Also, open flames add moisture to the interior air increasing condensation.
- In very cold weather, leave the cabinet and closet doors partially open. The air flow will warm and ventilate the interior of the storage compartments and the exterior wall surface, reducing or eliminating condensation and preventing the possibility of ice formations.

## WINDOWS

**Water Spots:** Any glass will develop water spots if not properly cleaned. A spotting effect is magnified when the glass has a reflective finish. Use a squeegee immediately after washing to reduce water spotting. To remove stubborn water stains from reflective glass we recommend Cerium Oxide Polishing Compound, made by *C.R. Lawrence*, available at most glass shops.

## WINDOW TREATMENTS

### Mini-Blinds

#### Dusting:

Regular dusting will maintain the appearance of the mini-blinds. Keep aluminum blinds looking their best by periodically wiping with a soft cloth or a dusting mitt. By tilting the slats down, not quite closed, most of the top surface of each slat can be cleaned. Blinds may be cleaned while hanging in place using this method.

### Vacuuming:

For deeper cleaning, vacuum gently with the soft brush attachment of a vacuum cleaner.

### Compressed Air or Hair Dryer (non-heat setting):

Blow dust off each slat. Dust will be air-borne using this method so ventilate the recreational vehicle.

### Spot-Cleaning:

Spot-clean shades and blinds using a soft cloth or a moistened sponge with lukewarm water. Add mild detergent, if needed. Blot gently to avoid creasing. In a dusty environment, the blinds may need to be cleaned regularly using a sponge or dampened soft cloth. Use warm (not hot) water and a mild detergent. The mild detergent cannot contain abrasives. Rinse the blinds using a clean cloth and water to prevent water spots. Place a towel directly under the blinds to absorb water that might drip down.

### Ultrasonic cleaning:

Professional ultrasonic cleaning may be preferred.

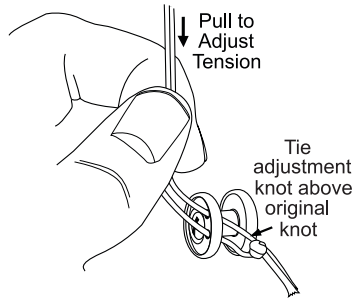
### Day/Night Shades

Leave Day/Night shades in the up position when not in use to help the shades hold their shape.

**Tension Adjustment:**

Tension should be adjusted if the shades are loose or there is excessive vibration. A button is located on the bottom of the shade at each end. Two lines on each side of the shade are threaded through the button and tied off.

- Pull the tied-off lines through the button to increase tension. Leave some slack so the shades are not too tight.
- Tie the lines off at the new position. Adjust each side equally.
- Operate the shades to ensure tension is set correctly and equally on both sides.
- Trim excess line from both sides if desired.



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**Dusting:**

Vacuum with a brush attachment or use a dusting tool on a regular basis.

**Cleaning:**

A dry foam cleaner may be used for soil and dirt removal. Follow all directions on the container or use a cleaning solution of ¼ oz. clear liquid soap to 8 oz. water.

**NOTE:**

**Do not use colored liquid soap as a stain may appear when fabric dries.**

**MOLD & MILDEW****What is Mold?**

Mold is a type of fungus that occurs naturally in the environment and can leave a musty odor, discolor fabrics, stain surfaces and cause considerable damage to the recreational vehicle.

**What Does Mold Need to Grow?**

Mold requires a food source to grow, such as grease or soil. Synthetic fabrics, such as acetate, polyester, acrylic and nylon, are mildew resistant, but soil on the surface of these fabrics are susceptible to mold. Temperate climate and moisture also help to cultivate mold growth. Moisture in the recreational vehicle can result from unattended spills, leaks, overflows, and condensation. Moisture allowed to remain on a growth medium can develop mold within 24 to 48 hours. Minimizing moisture inside of the recreational vehicle can reduce or eliminate favorable mold growth conditions. Good housekeeping and regular maintenance are essential in the effort to prevent or eliminate mold growth.

**Consequences of Mold:**

All mold is not necessarily harmful, but certain strains of mold have been shown to cause, in susceptible persons, allergic reactions, including skin irritation, watery eyes, runny nose, coughing, sneezing, congestion, sore throat and headache. Individuals with suppressed immune systems may risk infections. Some experts contend that mold causes serious symptoms and disease which may even be life threatening.

However, experts disagree about the level of mold exposure that may cause health problems and about the exact nature and extent of the health problems that may be caused by mold. Moreover, the Center for Disease Control states that a casual link between the presence of toxic mold and serious health conditions has not been proven.

Standards or threshold limit values for concentration of mold or mold spores have not been set. Currently, there are no EPA regulations or standards for airborne mold contaminants. There is simply no practical way to eliminate all mold and mold spores in the indoor environment.

For example, studies have shown that ozone cleaners are not effective at killing airborne mold or surface mold contamination.

**Controlling Mold Growth:**

The recreational vehicle owner should eliminate mold growth in the recreational vehicle. Take the following steps to eliminate mold growth in the recreational vehicle.

- Carefully examine items for signs of mold before loading them in the recreational vehicle. Potted plants (roots and soil), furnishings, clothing and linens, as well as many other household items, may contain mold.
- Regular vacuuming and cleaning will help reduce mold levels. Mild bleach solutions and most tile cleaners are effective in eliminating or preventing mold growth.

- Indoor humidity can be reduced by 30 to 60% when venting clothes dryers to the outdoors. Ventilate the kitchen and bathroom by opening windows, using exhaust fans or a combination of both. Operating the air conditioning will remove excess moisture in the air and help facilitate evaporation of water from wet surfaces.
- Promptly clean up spills, condensation and other sources of moisture. Thoroughly dry any wet surfaces or material. Do not let water pool or stand in the recreational vehicle. Promptly replace materials that cannot be thoroughly dried.
- **Inspect** for leaks on a regular basis. Look for discolorations or wet spots. Repair leaks promptly. **Inspect** condensation pans (refrigerators and air conditioners) for mold growth. Take notice of musty odors and any visible signs of mold.
- Should mold develop, thoroughly clean the affected area with a mild solution of bleach. First, test to see if the affected material or surface is color safe. If mold growth is severe, call on the services of a qualified professional cleaner.
- If mold cannot be removed from an item, throw the item away.

Whether or not a recreational vehicle owner experiences mold growth depends largely on how the recreational vehicle is managed and maintained. As a manufacturer, our responsibility is limited to things that we can control. As explained in the written warranty, we will repair or replace defects in the construction (defects defined as a failure to comply with reasonable standards of recreational vehicle construction) for the Limited Warranty coverage period provided.

**THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR DAMAGE CAUSED BY MOLD THAT MAY BE THE CONSEQUENCE OF OR ASSOCIATED WITH DEFECTS IN THE CONSTRUCTION.**

**PEST CONTROL**

Regardless of the area one lives in or travels to, it is safe to say there will be pests waiting. These pests are not only annoying but can pose a health risk and create serious damage to the recreational vehicle.

- Common pests include insects such as ants, cockroaches, termites, flies, pantry pests and wasps and wildlife including rodents, raccoons, bats, birds and snakes. It is important to remember that pests are searching for food, water and a place to live. Eliminating any one of those elements will help control the pest infestation. Take immediate steps to remove pests as soon as their presence is detected.

**Steps to help control pests:**

- Reduce clutter inside the recreational vehicle and storage compartments. All storage items, particularly food (including pet food), should be kept in tightly sealed containers. Seal all cracks and holes and insure that window, door and vent screens are securely in place.
- Routinely clean the recreational vehicle, including storage compartments. Wipe down the water bay. Promptly remove all crumbs from areas where food is regularly prepared and eaten. Garbage should be placed in a sealed container and removed to an outside receptacle daily. Only put out pet food that will be immediately eaten.
- Keep foods such as flour, cereal, spaghetti and pet food in re-sealable containers with tight lids.
- Sweep and vacuum often (especially in eating areas) to help eliminate a food source for pests.
- Seal cracks, crevices, and gaps around doors and windows.
- Pests need moisture to live and reproduce. Limit their access to water or moisture sources by sealing any cracks and leaks in pipes and faucets. Reduce moisture in the recreational vehicle by controlling condensation, immediately wiping up spills and promptly repairing leaks. Be extra alert around areas that attract rodents and insects, including the sewer hose, fresh water hose, compartment doors and items that may be leaning against the outside of the recreational vehicle such as fishing poles and golf clubs.

- When the recreational vehicle is stored outdoors, clear the surrounding area of all rodent friendly hiding places: shrubs, trees and clutter. Completely seal the underside of the recreational vehicle. Wire mesh will work well to prevent points of entry, but beware of blocking necessary air vents. Prior to operating the recreational vehicle after storage, remove all insect and animal nests that may have developed around vents and in the wheel wells.

### **Rodents:**

Rodents may chew through wires or build nests in components of the recreational vehicle. Signs of rodent infestation include droppings, shredded material or chewed furniture fabrics and vinyl. Rodents like to build nests with wire insulation, and are commonly attracted to the outside coating of wiring.

If there are signs of rodent infestation around the recreational vehicle, place traps or poisons in suspected areas. Keep the traps and poisons safely away from pets and children. Cheese is not the best bait for a rodent trap. Use peanut butter or chocolate in small amounts. Place the bait on the trigger of the trap to induce the rodent to climb onto the trigger to reach the bait. Rodents do not limit invasion to unused vehicles.

### **Insects:**

Eliminate insects when signs of infestation appear. If unable to identify the type of insect, purchase sticky traps from the hardware store and place the tape where the insects have been seen. Once a sample is caught, seek assistance in identifying the insect to determine what will be required to remove the infestation.

Regularly **inspect** the exterior of the recreational vehicle for signs of a budding wasp nest, and promptly destroy small nests before they become too large.

Spiders can be in any structure. Immediately remove spider webs. Dispense of spiders using a vacuum. Use care to capture the spider and egg sacs. Throw the vacuum bag away in a sealed bag.

Fruit flies invade the recreational vehicle by attaching to fresh fruits and vegetables. Determine what food items are generating the flies and discard that item in an outdoor trash receptacle. Fruit flies can be eliminated with a homemade trap. Pour a few ounces of vinegar into a cup and cover the cup with plastic wrap. Secure the wrap with tape or a rubber band and poke a ¼" hole in the plastic. Place the trap in the area where fruit flies are present.

Ants live in colonies. Only a fraction of the ant colony will leave to seek food. Spraying pesticides will only kill the ants that are away from the colony. The colony must be destroyed to eliminate all ants. Keep ants away from the sewer hose by spraying the hose ends with a soap and water solution.

Fleas can be removed by properly treating pets with a veterinarian approved treatment and by thoroughly cleaning the recreational vehicle. Vacuum vinyl areas and tile floors to remove dust, flea larva and flea eggs.

Follow by thoroughly washing those areas with soap and water. Carpets must be vacuumed and treated with a residual flea control product labeled safe for indoor carpet and furniture use. Perform the cleaning treatment daily for three days to ensure that all fleas have encountered the treatment.

Flying outdoor insects are attracted to bright light. Yellow porch light covers on the recreational vehicle work to discourage insect invasion. During nighttime hours insects will be attracted to docking lights, or other bright exterior lighting.

If the presence of moths is detected inside of the recreational vehicle, usually by holes appearing in material, clean the affected clothing and all other items stored in the same area. Follow by completely cleaning the closet, dresser or storage area. If cracks are detected, seal the cracks and treat the area with a properly labeled indoor pest control product.

### **Birds:**

Even birds can be considered pests, particularly when the recreational vehicle is parked in the flight path of a flock. Bird droppings are hard to remove and will leave stains. Prevent permanent staining to the roof by regularly cleaning the surface to remove all bird droppings.

### **Damage from Pests:**

Lizards can be captured using glue traps. To remove the lizard from the trap, dissolve the glue with vegetable oil and release it outside and away from the recreational vehicle. A scorpion will glow blue-green in UV light.



### Best sources of information about common household pests:

The Internet is a great place to find information about common pests. The National Pest Management Association web site can be a useful resource for common pests. Another good source for information are colleges and universities with entomology (study of insects) departments.

Electronic pest control devices can be costly and most likely not work on all types of rodents and insects. When calling on the services of a professional to combat pest infestation, call a reputable business that is licensed in handling pesticides. Check references. Explain services are needed for a recreational vehicle, as treatments may differ from standard household jobs.

### If a pest problem is suspected in the recreational vehicle, consider professional pest control help. The following guidelines can be used for selecting a pest control service:

- Seek referrals from those who have used pest control services. Inquire about the type of pest problem encountered and if service was satisfactory.
- Membership in the national, state or local pest control association is a good indicator that the company has access to modern technical information and is committed to further education.

- Reach a complete understanding with the company before work starts; what the pest is, how the problem will be treated, how long the period of treatment will be, and what results can be expected.
- Be sure to understand what is guaranteed and what is not.

### STORAGE Short Term

Short term storage is defined as storing the recreational vehicle for a period of thirty days or less. Properly preparing the recreational vehicle during periods of short term storage will make bringing the recreational vehicle out of storage a much easier process. Winterize the plumbing system if the recreational vehicle is stored in winter months or if stored when temperatures are below 32° F.

#### Checklist - Short Term Storage:

- Retract the slide rooms. **DO NOT** store the recreational vehicle with slide rooms extended.
- Shut off all appliances. Close the primary propane valve.
- Remove all articles from refrigerator/freezer and clean thoroughly. Use storage position to lock doors partially open to reduce odor, mold and bacteria.
- Drain holding tanks. Winterize the fresh water system using FDA RV antifreeze or air pressure to evacuate the plumbing system.
- Retract and secure all awnings.
- If possible, store the recreational vehicle inside a storage building.

- If stored outside, **inspect** all seams and seals twice a month for possible leakage.
- Vents and windows should be closed to prevent wind driven rain entrance.
- Tires should be stored at maximum inflation pressure.
- A full interior **inspection** for water leaks should be made twice a month. Be sure to check behind all cabinet doors and drawers.

### Long Term

Long term storage of the recreational vehicle can be defined as leaving a recreational vehicle unattended for a period of 30 days or more. When stored out in the environment without proper maintenance, the recreational vehicle is vulnerable to the moisture and oxidation processes inherent in the environment.

There are preventative measures which should be taken and preferable situations to use when storing a recreational vehicle. Such measures will aid in protecting and preventing a recreational vehicle from the damaging effects caused by an accumulation of moisture.

#### **NOTE:**

**The natural process of moisture accumulation in the air will occur with temperature changes of 30° F or more in one day. Humidity readings of 60% or greater will allow the accumulated moisture to remain for extended periods of time.**

### Recreational Vehicle Storage - AC Power Is Not Available:

- Turn off all appliances.
- If possible, situate the recreational vehicle so the batteries remain accessible. This allows a battery to be charged or replaced without moving the recreational vehicle.
- Charge the batteries to a full state of charge.
- When stored outside, use a DC Volt Meter to make a quick reference check of the batteries while the recreational vehicle is in storage. If the recreational vehicle is stored outside, solar panels (if equipped) may offset the parasitic loads.
- Preventative measures should be used if the voltage readings are low. When using preventative measures, taking the recreational vehicle out of storage or moving the recreational vehicle in case of an emergency is much easier.

#### **NOTE:**

**Batteries in a low state of charge will readily freeze. Freezing will damage the battery.**

#### **AC power is available:**

The converter will charge the battery bank. A 20 amp shore power service will be more than adequate.

#### **CAUTION:**

**A 20 Amp service using light duty extension cords and the required adapters creates serious voltage loss. Line voltage loss and the resistance at each electrical connection is a hazardous combination and should be avoided. Damage to sensitive electronic equipment may result!**

### Surface Types To Park and Store the Recreational Vehicle On:

The type of surface the recreational vehicle is parked on will have an affect on how much moisture accumulation occurs on the chassis and flooring. Moisture can eventually seep into the interior. The type of surface can affect the tires as well.

#### **Grass surface with block supports -**

Moisture can accumulate on the chassis or flooring.

**Gravel covered parking area -** Allows moisture to evaporate from the ground, through the gravel and to the underside of the recreational vehicle.

**Concrete pads -** Seals the surface, allowing for better ventilation under the recreational vehicle.

**Storage buildings with concrete floors or heated storage facilities -** Greatly reduce the amount of moisture accumulation and protect the recreational vehicle from moisture damage.

#### **NOTE:**

**Wet, oily, or greasy areas should be avoided. Highly reflective surfaces, such as sand or snow, should also be avoided. Heat absorbent surfaces, such as black asphalt, will also present problems.**

### Outdoor Storage Area

- The interior should be heated to help prevent mold and mildew growth. Moisture removing desiccate filter systems are available from hardware and RV supply stores. Place the filter system inside the recreational vehicle to reduce inside moisture condensation or humidity. These systems help control mold and mildew growth.
- Proper winterization of the fresh water system will prevent potential damage in extreme cold.
- Ultraviolet radiation affects soft goods and rubber products such as privacy curtains, window shades and tires. These items should be protected. Cardboard templates can be made for the windows to protect these items from exposure to direct sunlight.
- Tire covers are available to protect the sidewall of the tires from cracking. Make sure the tires contain the correct air pressure. Underinflated tires can be damaged.
- Washing the exterior regularly will help control moss accumulation. The clear coat has UV protective substances. Waxing the recreational vehicle twice a year will augment these substances.

### Inspect the Recreational Vehicle:

- Perform a full interior inspection for water leaks every two weeks that the recreational vehicle is in storage. Open cabinet doors looking for signs of dampness or leaks. Inspect the ceiling around roof vents or roof openings.

- Inspect roof at least twice a year. Inspect for exterior sealant gaps of roof seams, vents, skylights, sidewall seams, roof air conditioners and windows. If necessary, use proper sealants and application procedures.

### **Brakes:**

Brakes suffer during periods of storage. The bare metal machined surfaces of brake drums or rotors have only a light coating of dust from the brake lining friction material. The brake dust is the only thing protecting the metal surfaces from rusting. Only regular brake applications dry the moisture, preventing rust on brake drums. During periods of non-use, oxygen and moisture oxidize the machined surfaces. Occasional use keeps these surfaces from oxidizing. Rusty brake drum surfaces permeate the brake lining upon the first few applications, reducing friction action of the lining.

### **Electric Motors:**

Electric motors in the recreational vehicle should be operated occasionally to help lubricate and keep surfaces rotating freely. These items include the roof air conditioners, furnace and powered roof vent.

### **Winter Storage - Checklist**

- **Plumbing Lines** - Drain and protect by filling with approved RV antifreeze.
  - **Fresh Water Tank** - Drain.
  - **Body** - Clean and wax. Oil locks and hinges. Repair roof seams as needed.
  - **Countertop and Cabinets** - Wash with mild soap and water.
  - **Curtains** - Remove and clean according to care specifications.
  - **Windows** - To protect interior fabric from fading, cover windows by pulling blinds. Day/night shades should be covered with a separate cover, such as a sheet or a cut out template. Day/night shades maintain shape better if stored in the up position.
  - **Holding Tank** - Drain and rinse. Close valves.
- LUBE:**  
**Add a small amount of antifreeze to waste holding tanks to keep valves and gaskets lubricated.**
- **Drain Traps** - Pour RV antifreeze down all drains.
  - **Refrigerator** - Remove items from refrigerator/freezer and clean. Use storage position to lock doors partially open to reduce odor, mold and bacteria. If equipped with an icemaker, drain icemaker and icemaker tray. See refrigerator OEM manual for more detail.
  - **Batteries** - Check, add distilled water and recharge if needed. Disconnect cables. Remove battery and store in a cool dry place. Never park recreational vehicle where battery cannot be accessed.
  - **Air Conditioner** - Remove the air filters. Clean or replace.
  - **Roof** - Keep clear of snow accumulation or damage may occur.
  - **Interior/Exterior** - Storing under cover or indoors helps extend interior and exterior life.

### **Storage - Removal**

The following checklist pertains to items or areas which should be checked before operating or moving the recreational vehicle. If the recreational vehicle was not properly winterized, extensive freeze damage or other serious deterioration may have occurred. Consult a dealer or an authorized service center for advice.

- Thoroughly inspect the outside of recreational vehicle. Look for animal nests in the wheel wells or in other out of the way places.
- Remove all appliance flue vent covers, ceiling vent covers and air conditioning covers. Be sure the refrigerator openings are free of debris, insect nests, webs, etc.
- Open all doors and compartments. Check for animal or insect intrusion, water damage or other types of damage.
- Check the state of charge of the batteries. If necessary, fill LLA (Liquid Lead Acid) cells with distilled water only. Charge as necessary. Inspect the cable ends and terminals. They should be secure and free of corrosion.
- Check the operation of tail light, turn signals, back-up lights, license plate light and emergency flashers.
- Drain, sanitize and flush the fresh water system as outlined in the Water Section. Inspect the sewer drain hose and connections for leaks. Replace if necessary.

- Operate all faucets and fixtures in the fresh water system. Run a sufficient amount of fresh water through all the water lines and faucets to thoroughly purge any potable antifreeze from the fresh water system.

**POISON:**

**If equipped with an icemaker discard at least the first two ice trays of ice from the icemaker to ensure the ice does not contain traces of antifreeze or other contaminants.**

- Open cabinet doors and drawers inspecting for water leaks at joints or fittings. Repair as necessary.
- Operate all 12 Volt lights and accessories. If something does not work, there may be a bad 12 Volt circuit breaker or blown fuse.
- Install new batteries in safety detectors. Test the carbon monoxide, propane and smoke detectors for proper operation.
- Check that the monitor panel is properly functioning.
- Inspect the 120 Volt electrical system which includes the power cord, converter, all outlets, and exposed wiring.
- Ensure the battery is being charged. Operate the 120 Volt appliances and air conditioners. If an electrical item or appliance is not properly functioning, contact the dealer or an authorized service center to have it evaluated.

- Have a qualified technician inspect the propane system and perform a gas leak test. The leak test should also include a regulator adjustment (if needed). The test can also verify if the regulator is faulty and should be replaced. Have the propane tank inspected.
- Operate each propane appliance. Observe all burner/pilot flames for proper color and size.
- Inspect and clean the interior.
- Check the sealant around all roof and body seams and windows. Reseal if necessary.
- Lubricate all the exterior locks, hinges and latches with a graphite lubricant.
- Wash and wax the exterior. Inspect the body for scratches or other damage; touch up or repair as necessary. Flush the underside thoroughly.
- Run through the operational checks for brakes.
- If desired, have the dealer or repair center double check any preparation and correct any defects or make any necessary adjustments.

## LUBRICATION & MAINTENANCE

**Every Hook-Up:**

- Check the operation of windows, latches and hinges.
- Check, clean and tighten the battery cables.
- Lubricate all movable parts on the entrance step.

**Every Three Months:**

- Flush and disinfect the fresh water system.

**Every Six Months:**

- Lubricate the exterior doors and locks with graphite.
- Rotate the tires. Check with tire manufacturer on correct rotation pattern.
- Clean the window and door seals with a mild soap. Spray with a silicone lubricant.
- Reseal around the bath tub if needed.
- Check propane appliances for proper operation.
- Inspect and reseal the entrance door jamb corners.
- Check the tightness of lug nuts. Check the wheels and nuts for cracks.
- Have the propane pressure regulator checked and leak down test performed by an authorized service center.
- Check the roof seams for cracks or peeling. Reseal if needed.
- Check the seal around outside windows and attachments. Reseal if needed.

**NOTE:**

**Normal use of the recreational vehicle may cause certain fittings and fasteners to loosen due to road vibrations and excessive use. Periodic inspection and maintenance should be performed on these items. If the recreational vehicle is placed in storage, check it periodically. The battery must be charged even when not used.**

# Appliances

## Section 4



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## APPLIANCES - INTRODUCTION

This section covers operation and care of various appliances found in the recreational vehicle. The recreational vehicle is equipped with a refrigerator, cooktop range, microwave, furnace, water heater, roof air conditioner and several optional appliances. Many of these appliances operate on AC or DC current, propane or a combination of all three.

### **INFORMATION:**

Detailed information with **CAUTION** or **WARNING** instructions for the appliances, other than in this section, can be found in the OEM manuals.

### **WARNING:**

Before entering a refueling station, make sure propane operated appliances are off. Most propane appliances used in recreational vehicles are vented to the outside. When parked near a gasoline pump fuel vapors can enter this type of appliance and ignite an explosion or fire. Carbon monoxide gas may cause nausea, fainting or death. Operating propane appliances with inadequate ventilation or partial blockage of the flue can result in carbon monoxide poisoning. Do not store flammable liquids such as lighter fluid or gasoline in the outside refrigerator.

## REFRIGERATOR

Follow the specific guidelines in the refrigerator OEM manual to ensure longevity and proper operation of the refrigerator. With proper care and maintenance, the refrigerator should provide years of trouble-free service.

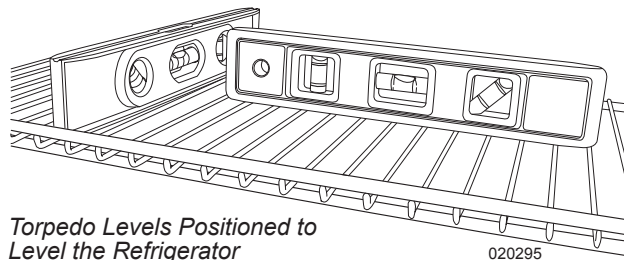
### **INFORMATION:**

Consult the refrigerator OEM Manual for detailed operating and maintenance instructions.

### ***Operation Specifics***

- The refrigerator operates from propane or 120 Volts AC electric.
- DC Voltage must be no higher than 15.4 Volts DC or lower than 10.5 Volts DC.
- AC voltage must be no higher than 132 Volts AC or lower than 108 Volts AC.

**Important:** Operate the refrigerator only when level. Level the refrigerator using a torpedo or bulls eye level. Place the level inside the refrigerator on the bottom shelf. The level bubble should be at least half-way inside the circle.



### **CAUTION:**

Operating the refrigerator “off level” separates the chemicals that crystallize and block the circulation action of the cooling unit. Damage is cumulative and irreversible.

### **WARNING:**

Do not use the refrigerator if an ammonia smell is present inside or outside of the refrigerator or if a yellowish substance appears inside or outside the access compartment. This can be an indication of refrigerant leak. Contact an authorized repair facility.

### **NOTE:**

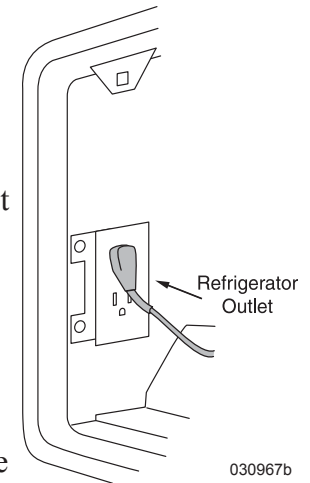
Keep interior box temperature at or below 40° F to reduce food spoilage. The refrigerator will consume more energy to maintain temperature, especially in hot climates. Lower temperature may lead to quicker frost build-up.

### **Tips:**

- Cool items, if possible, before putting them in the refrigerator.
- Keep the doors shut. Think about desired contents before opening the doors.
- Allow the refrigerator 24 hours of operation before actual use to kickstart the refrigeration process.

### **For Refrigerator Operation:**

- House batteries must be fully charged.
- Propane valve must be on.
- Refrigerator AC cord (located in outside refrigerator access door) must be plugged in.

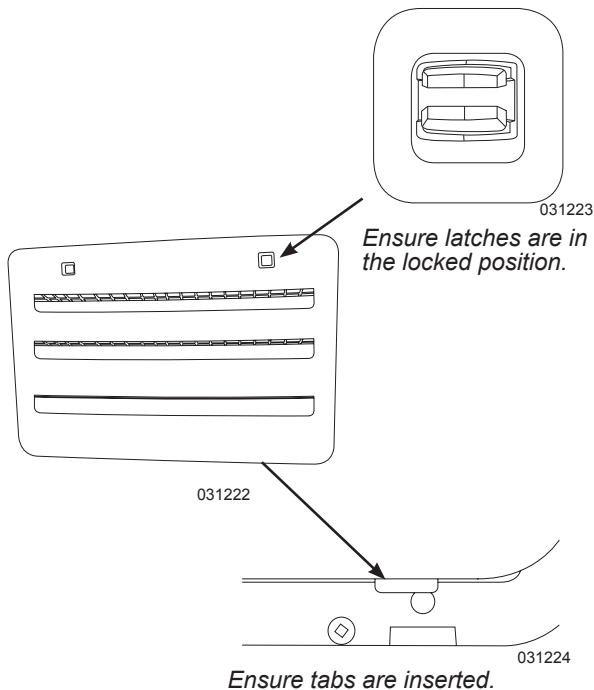


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- If the controls do not light up, check the house batteries charge status or see if the 12 Volt wires are plugged into the refrigerator circuit board (outside in refrigerator access door).

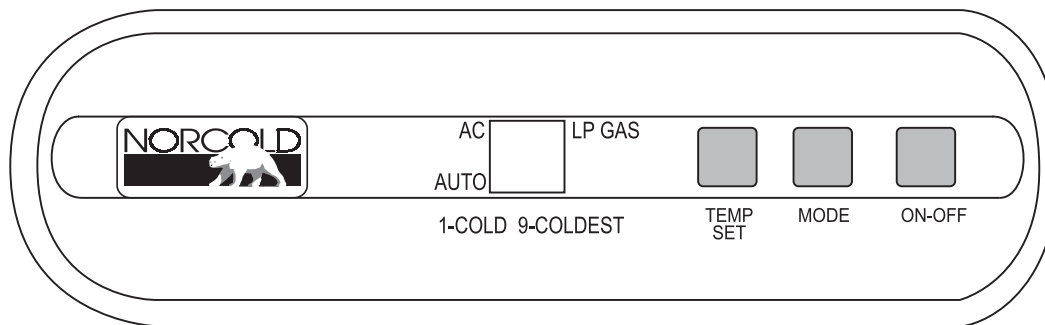
**NOTE:**

**Ensure the exterior refrigerator access panel is properly replaced after removal.**



**REFRIGERATOR CONTROLS**

**Control Panel-Single Door**



Control panel for single door refrigerator

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**On/Off Button:**

Turns power to the refrigerator on or off.

**Mode Button:**

Selects between Auto, AC or LP Gas (propane) mode. Indicator will illuminate next to the mode function selected. Press repeatedly to select desired mode.

**Temp Set Button:**

Sets the temperature of the refrigerator. Press and hold the Temp Set button to select temperature range of 1-9. 9 being the coldest setting.

**Mode Functions:**

Auto - Selects AC operation as the primary cooling mode. If AC is not available, mode of operation will automatically switch to LP Gas (propane) mode. If the refrigerator does not light, a fault indicator will illuminate in the display panel. A beeping sound may also occur to alert the operator. Ensure that AC or propane is available.

LP Gas – Selects LP Gas (propane) as the cooling mode. If the flame should not ignite, an indicator will illuminate in the display. A beeping sound may also occur to alert the operator. Ensure that propane is available or switch to AC mode.

AC – Selects AC power as the cooling mode. If AC is not available, an indicator will illuminate in the display. A beeping sound may also occur to alert the operator. Ensure that AC is available or switch mode to LP Gas (propane).

## Control Panel-Two Door

**Selector Switch:** Turns the refrigerator on and off.

- Push the selector switch to the Auto position to start the refrigerator in auto mode. Push the selector switch to the Gas position to start the refrigerator on propane.

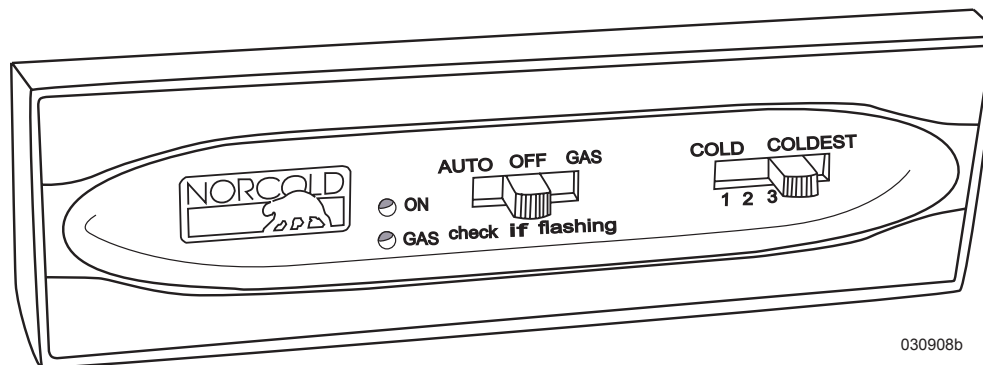
**Temperature Switch:** Controls the temperature adjustment of the freezer and the fresh food compartment. The temperature adjustment selected does not change if the mode of operation of the refrigerator changes.

- Push the temperature switch to the desired temperature setting.
- Number “5” is the coldest temperature setting.

**Automatic Mode:** The refrigerator automatically uses the most efficient energy source available for operation in Auto mode. If a more efficient energy source becomes available, the refrigerator controls change from the current energy source to the more efficient energy source. First choice of operation is AC operation.

- On light is illuminated if 120 Volts AC is available.
- On light and GAS light are both illuminated if 120 Volts AC is not available.

**Manual Mode:** When the On light and Gas light are both illuminated, the refrigerator is operating on propane.



Control panel two door

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If the propane does not ignite within 30 seconds, the control changes to a different energy source or the propane safety valve closes and F displays. Turn the refrigerator off then back on. If the propane does not ignite after several attempts, consult your dealer or authorized Norcold service center.

**Automatic Mode:** The refrigerator selects AC power over propane in Auto mode. The controls select the energy source in this sequence.

- When 120 Volts AC is available “AU AC” flashes in the display. This indicates the refrigerator is operating on AC electric. After ten seconds the “AU AC” goes off and only a power indicator remains.
- If 120 Volts AC is not available, “AU LP” flashes in the display. This means the refrigerator is operating on propane.
- After the refrigerator is operating, press the **Temp Set** button and set the desired temperature.

## Doors

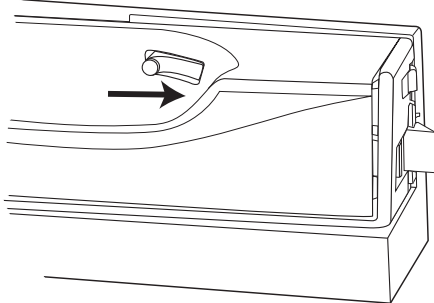
The refrigerator doors use a positive latch that secures with a “click” to prevent opening while traveling. A heating element located in the flapper on the door activates when operating the refrigerator in any mode to help prevent moisture accumulation in high humidity conditions.

### Storage Lock:

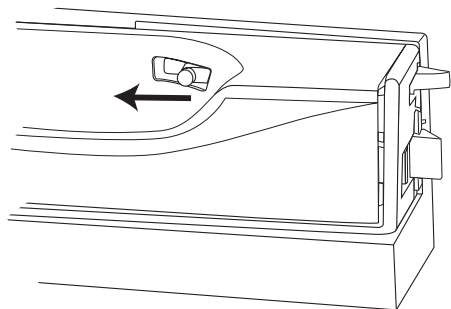
A completely sealed refrigerator can be a perfect environment for mold and bacteria to grow when the recreational vehicle is in storage. The refrigerator has a storage position that locks the doors partially open to reduce odor, mold and bacteria. To use the storage feature, partially open doors and slide tab into the cut-out of the strike plate.



Refrigerator Lock shown in Unlocked Position. Slide Lock Button in Direction of Arrow to Lock.



Refrigerator Lock shown in Locked Position. Slide Lock Button in Direction of Arrow to Unlock.



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### Interior Light

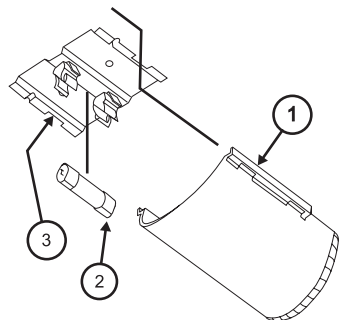
The interior light is located at the top of the fresh food compartment. When the door is open the light will illuminate.

#### Bulb Replacement:

1. Remove the light cover by pulling it toward the front of the refrigerator.
2. Remove the light bulb from the holder.
3. Install a GE#214-2 replacement bulb and replace the cover.

#### **NOTE:**

**Bulb number is accurate at time of printing. Confirm part number before ordering or obtaining a replacement.**



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### Service

The propane function of the refrigerator and propane pressure will require annual service, depending on use. Over time, the BTU rating of the flame can change, affecting the refrigerator performance. Ambient temperature and humidity can also affect performance and function. The BTU rating lowers when operating on propane at an altitude higher than 5,500 feet and affects refrigerator performance. If possible, switch mode operation to AC while at a higher altitude.

### Storage

- Disconnect power to the refrigerator and remove all items. Leave the drip tray under the cooling fins.
- Shorten defrost time by using trays of warm water. Do not use a heating gun, hair dryer or sharp objects to remove frost as these can damage the interior or cooling unit.

- Wash the interior using mild spray cleaners or a solution of liquid dish detergent and warm water. Do not use scouring pads or abrasive cleaners as these can damage the interior finish.
- Rinse with a solution of baking soda and water. Dry with a clean cloth.
- Lock the doors open using storage position.

#### **CAUTION:**

**Do not use a hot air blower to defrost. Plastic parts could be permanently damaged. Do not use sharp instruments to remove ice from the freezer. They can puncture the system.**

### Air In Propane Supply Lines

For safety reasons, the refrigerator will attempt to ignite on propane (gas) within a specified amount of time. When starting the refrigerator for the first time after storage, or after servicing the propane supply system, supply lines may contain air. Due to air in the supply lines, the refrigerator may not ignite on propane within the specified amount of time. Follow the procedure on how to remove air from the propane supply lines.

#### To remove air from propane supply lines:

- Ensure the primary propane valve and any other necessary valves are open.
- Try lighting the cooktop burners first to quickly purge air from the main distribution line.
- Push the On/Off button to turn the refrigerator on.

- Press the Mode button until the refrigerator indicates propane. The refrigerator will start a 30 second trial for ignition during which the propane safety valve opens and the igniter sparks.
- If the refrigerator fails to light, indicated by **F** or **NO FL** (No Flame), turn the refrigerator Off then back On and set to **LP Mode** (propane). If after the third attempt the refrigerator fails to light, stop and consult your local dealer or an authorized Norcold Service Center.

## MICROWAVE (OPTIONAL)

The oven is operated from 120 Volt AC supplied by shore power..

### **INFORMATION:**

**For more detailed information and operating instructions, refer to the OEM manual. Be sure to register the microwave/convection oven with the manufacturer.**

### **Operation Tips:**

- Turn the oven off before cleaning.
- To prevent damage to the operating parts inside the oven do not allow water to seep into the ventilation openings.
- If steam accumulates inside or around the outside of the oven door, wipe it away with a soft cloth. This may occur when the oven is operated under high humidity conditions and in no way indicates a malfunction of the unit.

- The glass tray and roller guide must always be in place during cooking.
- Ensure the door is firmly closed before use.
- Check the type of cookware being used to see if it is oven safe depending on the type of cooking being done.
- Gold paint or glaze may contain a trace amount of gold which is electrically conductive and not compatible for oven. Hand painted china commonly contains traces of metal.
- To test utensil for oven compatibility place it in the oven with an 8 oz. plastic cup of water. Set the oven at full power for one minute. Carefully feel the utensil and be sure it is cool to touch.
- Cover food with a microwave and/or convection oven-safe paper towel or upside-down plate to keep food spattering to a minimum. Put a paper towel on the turn table to keep clean-up to a minimum.



- Clean up all spills or spatters before dry.
- Some food wrappers may be foil lined. Check the wrapping carefully before cooling or heating. A small amount of foil is acceptable if it is not wrinkled or near the sides of the oven.

- If the oven screen is not lit, plug another electrical appliance into the same outlet as the oven to verify AC power is preset. If test item works, contact an appliance repairman to check the oven.

### **Microwave Cooking Safety:**

- Always use pot holder to prevent burns when handling utensils that are in contact with hot food. Enough heat can transfer from food through utensils to cause skin burns.
- Stay near oven when cooking and check frequently to prevent over cooking.
- Never use the oven as a storage area for cookbooks or other items.
- Avoid steam burns by directing steam away from face and hands.

The oven has safety interlocks to prevent use with the door open and screens to prevent oven leakage. These safety features should be kept in good condition. Never attempt to bypass the safety interlocks or allow residue to accumulate on the door or oven face. If the oven is damaged, do not attempt to use it. The oven should be repaired by an appliance repairman.

### **CAUTION:**

**The oven is for food preparation only. Do not use the oven to dry clothes, paper or other items.**

**WARNING:**

**If a fire flares up when using the cooktop, turn off the ventilation fan. The fan may spread the flame. If the ventilation fan has started automatically from a heated cooktop it cannot be manually turned off. Turn off the microwave and/or convection oven AC circuit breaker to prevent the flame from getting up into the oven and spreading the fire.**

***Cleaning the Microwave***

The exterior of the oven is plastic and metal. The interior is metal. Do not clean with scouring pads, harsh or abrasive cleaners, chemical cleaners or petroleum based thinners that can damage the finish. Use mild soap and water with a damp cloth or paper towel to remove stains or spills. When cleaning the touch pad, open the door to prevent accidental operation. Use mild soap and water with a soft cloth. Avoid using excess amounts of water on the touch pad. The turntable plate and oven racks are dishwasher safe.

- It is occasionally necessary to remove the glass tray for cleaning. Wash the tray in warm sudsy water or in a dishwasher.
- If the control panel becomes wet, clean with a soft, dry cloth. Do not use harsh detergents.
- The roller guide and oven cavity floor should be regularly cleaned to avoid excessive noise. Wipe the bottom surface of the oven with mild detergent water or window cleaner and then dry. The roller guide may be washed in mild sudsy water.

- Food odors may linger inside oven. To help eliminate odors, combine the juice and the peel from one lemon, several whole cloves and 8 oz. of water into a two cup bowl. Place in oven on high power, bring to a boil for several minutes. Let cool in the oven for several minutes.

**COOKTOP RANGE/OVEN**

The cooktop uses propane as a fuel source. The burners use a piezo igniter. The cooktop is for cooking purposes only and not to be used as a heating source.

The flame should have a blue appearance with a lighter blue defined flame at the burner head. A yellow flame or yellow tips indicates a rich fuel mixture, which can leave a black color or carbon on the bottom of a pot or pan.

**INFORMATION**

**For more detailed information and operating instructions, refer to cooktop range OEM manual.**

***Operation***

The cooktop will operate when the valve on the propane tank is open.

**⚠ WARNING**

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 EXPLOSION RESULTING IN DEATH OR SERIOUS INJURY.

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2012 Holiday Rambler

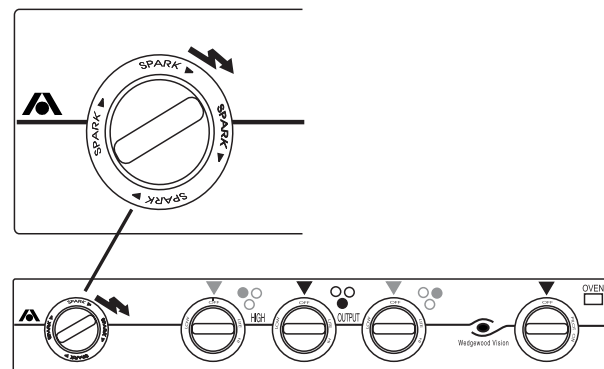
**POISON:**

**Do not heat the recreational vehicle interior with the range or oven. Gas combustion consumes oxygen inside the recreational vehicle. Carbon Monoxide is an odorless, colorless and highly poisonous gas.**

***Lighting Top Burners***

**To Light the Burner:**

- Turn the desired burner knob counterclockwise to Lite. Only light burners individually.
- Turn the spark knob clockwise until the burner lights. The burner should light within one full rotation of the knob.
- After the burner is lit, adjust the burner to the desired flame size.
- Turn the burner knob clockwise to Off.
- To extinguish the top burner flame, turn the appropriate burner knob clockwise to Off.



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## Lighting Oven Pilot

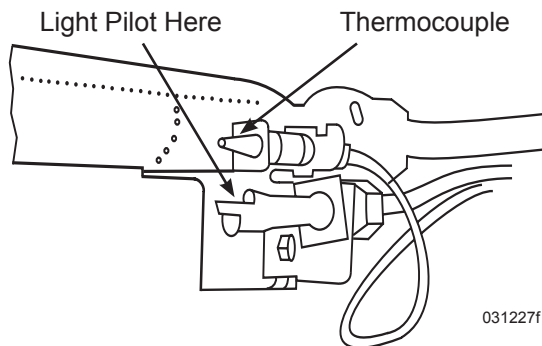
- Push in the oven control knob and rotate counterclockwise to Pilot On.
- Push in and hold oven control knob in Pilot On position to allow propane to flow to oven pilot.
- Light oven pilot located near the back of the oven, under the broiler shelf and to the right of the oven burner.
- Once pilot is lit, continue to hold oven control knob in for a few seconds to heat thermocouple.
- Once heated, the thermocouple will allow pilot to remain lit.
- Release oven control knob to Pilot On to maintain pilot flame. The oven and broiler are now ready for operation.

### To use oven:

- Rotate oven control knob to desired temperature.
- To extinguish the oven pilot, push in oven control knob and rotate clockwise to Off.

### **WARNING:**

**Extinguish all pilots when refueling or traveling. Do not block vents in oven with cookware or other objects.**



Lighting the Oven Pilot

### Operation Tips:

- A yellow flame is an indication of incorrect fuel/air ratio. Lowered BTU output and carbon build up can occur.
- Flame appearance may change and BTU output will lower when operating the cooktop at an altitude above 5,000'. Allow extra cooking time.
- Do not allow the tips of the flame to extend beyond pan or pot edge. When this occurs heat is wasted and possibility of injury increases.
- Preheat the oven for 10 minutes prior to use.

### Burner Grate

The burner grate can be removed from the cooktop for cleaning purposes. Place a towel next to the cooktop. Lift the burner grate straight up to remove and place on towel to clean. To reinstall, line up the grommets on each corner and push down on the burner grate.

### **WARNING:**

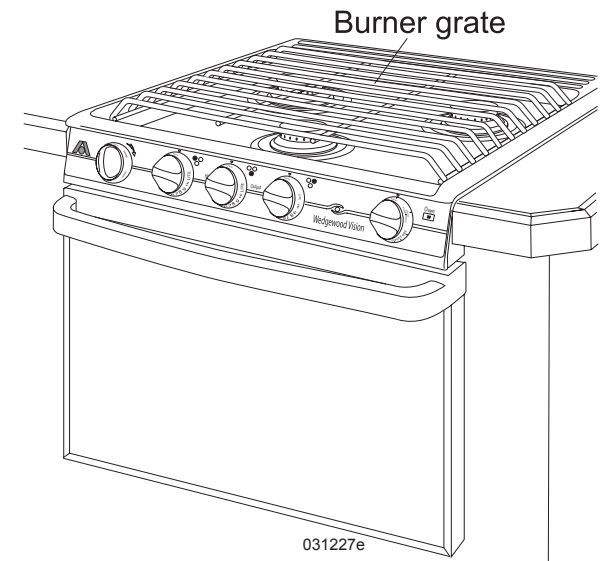
**If a propane smell exists, extinguish all open flames and turn off the main gas supply. Liquid propane is highly volatile, highly explosive and extremely dangerous. Explosion, fire, property damage, injury or death can result. Propane is a "heavy" gas and will lay on the floor and "hide" in corners. Open all windows and doors. Do not touch any electrical switches. They may cause a spark which can ignite. Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.**

## Cooktop/oven Cleaning & Maintenance

Regular cleaning with a soft cloth and a warm detergent solution is generally enough to keep the cook top clean. Wash, rinse and dry with a soft cloth. Thoroughly clean the cook top when it is cool. Use a dry cloth or paper towel while the surface is warm to the touch to clean splatters or spills. Cleaning will be more difficult if spills bake onto the surface.

Use glass cleaner sprayed on a paper towel for the cook top surface. Do not spray glass cleaner directly on the surface. Do not use abrasive cleaners, steel wool or harsh cleaners such as bleach, ammonia or oven cleaner. The surface burner grate and caps should be cleaned using the same guidelines as the cook top surface.

- Clean all surfaces as soon as possible after a boil over or spill. Allow porcelain to cool before cleaning. Burns may occur or cooktop porcelain can crack with sudden temperature change.



- Use warm, soapy water to clean the burner grates, cook tops, painted surfaces, porcelain surfaces, stainless steel surfaces and plastic items on range or cook top. Grit or acid-type cleaners may ruin the surface.
- Use only non-abrasive plastic scrubbing pads.
- Do not allow foods containing acids (such as lemon, tomato juice or vinegar) to remain on porcelain or painted surfaces. Acids may remove the glossy finish. Wipe up egg spills when cook top is cool.
- Remove the cooktop cover to clean the underside of the cooktop. The cooktop cover is retained to the cooktop with four clips. Pull on cover to remove.
- To keep the cooktop floor pan clean, carefully place strips of aluminum foil on the floor pan and under burners. Do not restrict air flow of the mixture tubes.

**Porcelain Enamel:**

Porcelain enamel is not extremely delicate but must be treated as glass. Sharp blows, sudden surface temperature changes, etc., will cause enamel to chip or crack. Some foods, such as vinegar, lemon juice, tomatoes and milk, contain acids which can dull the finish of the enamel. To avoid dulling the finish, wipe up the spill before it is baked on. The surface is glass and must be given consideration when cleaning. Steel wool and coarse, gritty cleanser will scratch or mar the surface. Any gentle kitchen cleanser powder or grease cleaner will be suitable.

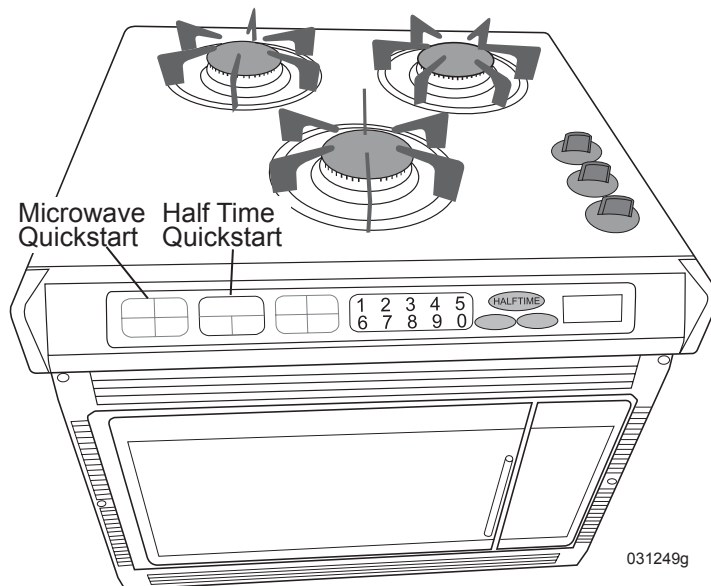
For further information on care of the porcelain, call "Hopes Cultured Marble Polish" at 1-800-325-4026.

**COOKTOP HALF TIME OVEN (OPTIONAL)**

The cooktop uses propane as a fuel source. Cooktop burners use 12 Volt DC for ignition. The cooktop and convection oven is for cooking purposes only. Do not use for comfort heating. The oven features a combination microwave convection oven. The oven can be operated as a microwave (default mode), convection oven or both (Half Time mode). Half Time mode combines microwave energy and convection heat to reduce cooking time.

**NOTE:**  
Refer to the OEM manual for in-depth operation and cooking tips.

**NOTE:**  
Half Time cook mode should only be used when hooked to 30 Amp shore power.



2012 Holiday Rambler

**Cooktop Burner Operation**

- Open primary propane valve on propane tank.
- Place utensil on desired burner for cooking.
- Press down to unlock burner knob. Rotate knob to Lite. Hold knob down to activate igniter.
- When burner ignites, let up on knob to deactivate igniter and rotate knob to desired flame setting.
- Rotate knob to Off when finished.

**WARNING:**

**Do Not heat the recreational vehicle with the cooktop or convection oven. Propane combustion consumes oxygen. Carbon Monoxide is an odorless, colorless and highly poisonous gas.**

⚠ WARNING

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 EXPLOSION RESULTING IN DEATH OR SERIOUS INJURY.**

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**WARNING:**

**Do not leave burners unattended during cooking. Do not leave burner valve(s) open while burner(s) are not lit. If a propane smell exists, extinguish all open flames and turn off the primary gas supply. Propane is highly volatile, highly explosive and extremely dangerous. Explosion, fire, property damage, injury or death can result. Propane is a “heavy” gas and will lie on the floor and “hide” in corners. Open all windows and doors. Do not touch any electrical switches. They may cause a spark that can ignite. Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.**

***Microwave Convection Operation***

The oven comes with a glass tray and metal tray. The metal tray is used in convection and Half Time modes only. Do not use the metal tray in microwave mode. Use only utensils safe for microwave and/or convection cooking. The oven default mode is microwave operation. Press either the Convection pad or Half Time pad to change cooking modes. The oven will default to Microwave mode when cook time is finished or the Reset pad is pressed. The oven can also be set for multi-mode timed operation. The clock will need to be set each time the recreational vehicle is hooked to shore power.

**Setting the Clock:**

- Press the Clock pad. The display will read Enter Clock Time.
- Enter time using number pads. Enter 0 if necessary when setting minutes.
- Press Start/Stop to set.

**Microwave Operation:**

- Place food or beverage in oven on glass tray. Do not use metal tray in microwave only mode.
- Select a preprogrammed timed event from the Popcorn or Beverage pads (microwave mode only) then select quantity or use number pads to enter cook time then press Start/Stop. The microwave will begin cooking on high power level.
- To change power level, enter cook time using number pads then press Power Level. Select 1 for low power or up to 9 for 90% power level. Then press Start/Stop to begin cooking.

**Convection Operation:**

- Place metal tray on glass tray.
- Place food on metal tray or place food in oven safe cooking utensil then place on metal tray.
- Press the Convection pad. The oven is now set to Convection mode.
- Using number pads, enter cooking temperature between 150-450° F.
- Using number pads, enter cooking time then press Start/Stop.

**Half Time Operation:**

- Place metal tray on glass tray.
- Place food on metal tray or place food in oven safe cooking utensil then place on metal tray.
- Press the Half Time pad. The oven is now set to Microwave and Convection modes. This will reduce cooking time. Refer to cooking tips in the OEM manual for approximate cooking time.
- Using number pads, enter cooking temperature between 150-450° F.
- Using number pads, enter cooking time then press Start/Stop.

**RANGE HOOD**

The range hood includes a fan and light (some models). The fan and light both operate from toggle switches located on the range hood. Use the following procedure to remove the grease filter and hood light.

**Hood Light:**

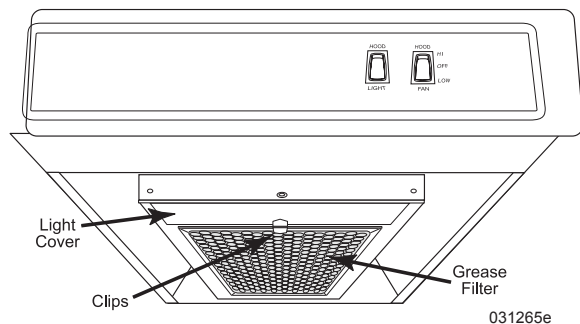
1. Disconnect power to the microwave.
2. Open the clip that holds the light cover in place.
3. Remove the light bulb and replace only with an equivalent watt bulb. Do not exceed 30 watts.
4. Carefully insert light cover and secure with clip.

**CAUTION**

**Light cover may be hot. Do not touch glass with lamp on. Never use the light for prolonged periods, such as a night light.**

**Grease Filter:**

Do not operate the range without the grease filter in place. Clean filter at least once a month.



**Cleaning the filter:**

1. Open the clip that holds filter in place and remove filter.
2. Soak the filter in hot water and mild dish soap.
3. Place the filter back into the opening, tilt upward and slide in. Do not kink or warp the filter upon installation.
4. Lock in place by securing with the clip from step 1.

**Tips:**

- Do not use ammonia or other alkali-based products that may darken the filter material.
- Use a brush to remove caked on grease.
- Rinse the filter thoroughly and shake dry.

**AIR CONDITIONER NON-DUCTED**

The roof air conditioner operates from 120 Volts AC shore power. Operating controls are on the air conditioner.

**INFORMATION:**

**Refer to air conditioner OEM manual for detailed information and operating instructions.**

**Operation**

**Mode Control Switch:**

**Low Fan** – The fan operates continuously at low speed. The thermostat does not control fan speed or cause the fan to cycle with temperature setting.

**High Fan** – The fan operates continuously at high speed. The thermostat does not control fan speed or cause the fan to cycle with temperature setting.

**Low Cool** – The fan operates continuously at low speed. The thermostat regulates compressor cycle according to thermostat setting.

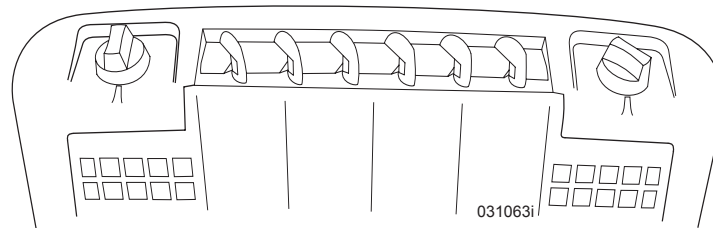
**High Cool** – The fan operates continuously at high speed. The thermostat regulates compressor cycle according to thermostat setting.

**Thermostat:**

The thermostat regulates cycling of the compressor in Low Cool and High Cool modes only. Fan speed is unaffected by the thermostat. The fan runs continuously in Low Cool and High Cool modes.

Mode control switch

Thermostat



**NOTE:**

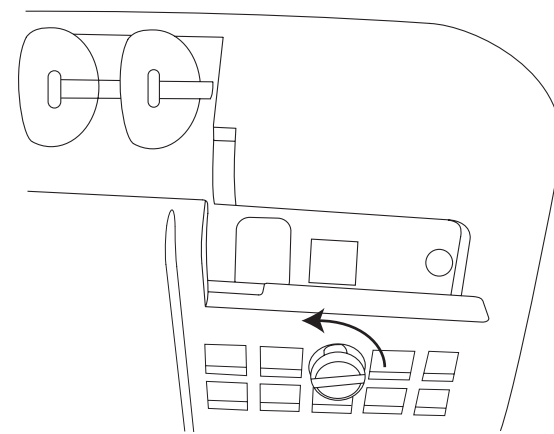
**The blower runs continuously in low cool and high cool modes to circulate air and maintain an even temperature. The thermostat regulates cycling of the compressor to maintain the set temperature level.**

**CAUTION:**

**Wait 2 minutes after the compressor cycles off before setting the thermostat to a cooler setting. This allows refrigerant pressure to equalize and compressor to easily restart.**

**Maintenance**

- Periodically remove and clean return air filters. The filters are located above the removable panel. Avoid use without filters in place.



Air filter removal

- Remove and clean filters and housing with mild soap and water. Do not use harsh cleaners, scouring powders or petroleum based cleaners as this can damage the filters and housing finish.

### Energy Saving Tips:

1. Select a temperature setting that suits comfort needs.
2. Regularly clean return air filters.
3. Park in a shaded area during extreme outdoor temperatures. Keep windows and doors closed. Keep blinds or shades closed. Avoid use of heat producing appliances.

## AIR CONDITIONER - FREE BLOW

The roof air conditioner operates from 120 Volts AC from shore power. Operating controls are on the air conditioner.

### INFORMATION:

For detailed information and operating instructions refer to air conditioner OEM manual.

### Operation

- **Thermostat:** Controls temperature setting. Set thermostat to desired temperature level.
- **On/Off:** Switch turns on sweep motion of louvers. Turn switch off to manually set louvers to desired position
- **Off Position:** Turns unit off.
- **Fan Operation:** This will circulate the air in the trailer without cooling or heating. Select a comfortable fan speed.

- **Cool Operation:** Turns fan and compressor on. Select fan speed low or high.
- Open vent (B) for direct discharge

### NOTE:

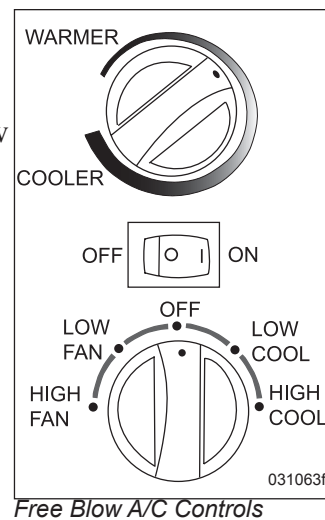
The blower runs continuously to circulate air and maintain an even temperature. The compressor will come on as soon as cooling is required to maintain the selected temperature level.

### CAUTION:

Wait 2 minutes when shutting down and restarting the air conditioner with either the selector switch or thermostat. This allows refrigerant pressure to equalize and compressor to easily restart.

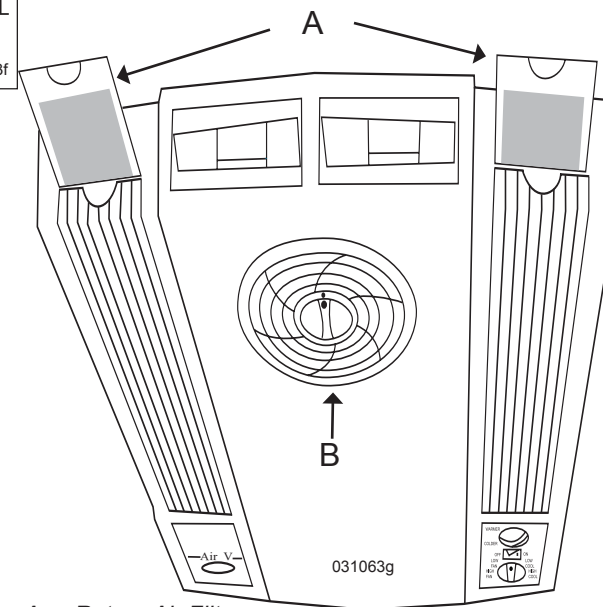
### Maintenance

- Periodically remove and clean return air filter. Filter is located above removable panel in air box. Wash filters with soap and warm water and to air dry. Do not operate without filter.
- Remove and clean air box housing with mild detergent. Do not use furniture polish or scouring powders.



### Energy Saving Tips:

1. Select the temperature setting that suits comfort needs and leave it at that setting.
2. Keep return air filter clean.
3. During extreme outdoor temperatures, park the trailer in a shaded area, keep the windows and doors closed. Avoid the use of heat producing appliances and use window shades, blinds or curtains.



A -- Return Air Filters  
B = Direct Discharge

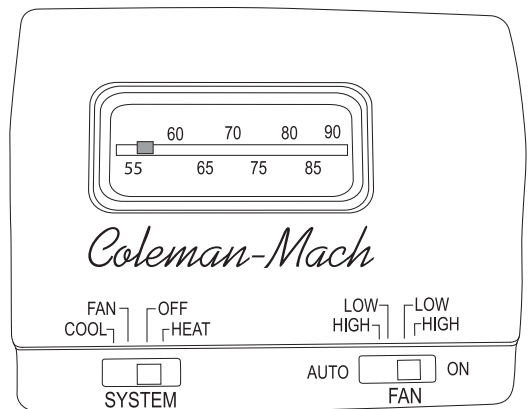


## AIR CONDITIONER - DUCTED (OPTION)

The roof air conditioner operates from 120 Volts AC shore power. The thermostat controls roof A/C functions and the furnace.

### **INFORMATION:**

**Refer to air conditioner OEM manual for detailed information and operating instructions.**



Thermostat used with optional ducted roof A/C 031063k

### **Operation**

#### **System Switch**

**Off** – Turns the thermostat off.

**Fan** - Operates the roof A/C fan only. The compressor will not engage in Fan mode.

**Cool** - The fan operates continuously for even cooling. The thermostat regulates compressor cycle according to temperature setting.

**Heat** – Sets the thermostat to operate the furnace. Fan speed of the furnace is not adjustable.

#### **Fan Switch**

Auto Mode:

**Low Fan** – The roof A/C fan operates continuously at low speed. Thermostat temperature setting will cause the fan to cycle on and off.

**High Fan** – The roof A/C fan operates continuously at low speed. Thermostat temperature setting will cause the fan to cycle on and off.

On Mode:

**Low Fan** – The fan operates continuously at low speed.

**High Fan** – The fan operates continuously at high speed.

### **NOTE:**

**The temperature setting regulates the cycle of the compressor in Cool mode. The blower runs continuously in Cool mode to circulate air and maintain an even temperature.**

### **CAUTION:**

**Wait 2 minutes after the compressor cycles off before setting the thermostat to a cooler setting. This allows refrigerant pressure to equalize and compressor to easily restart.**

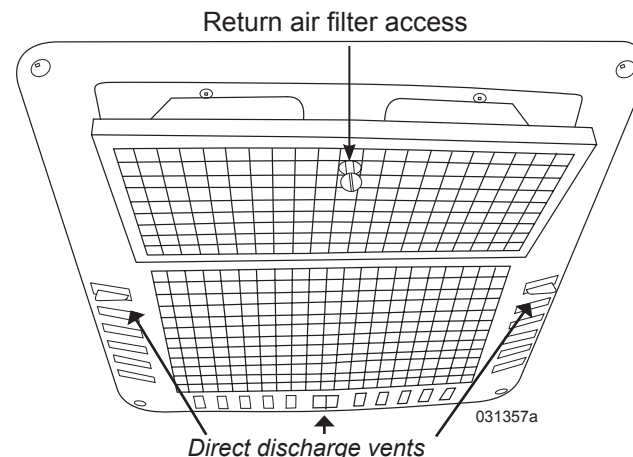
### **Maintenance**

Periodically remove and clean return air filter. The filter is located above the removable panel. Avoid use without the filter in place.

Remove and clean filter and housing with mild soap and water. Do not use harsh cleaners, scouring powders or petroleum based cleaners as this can damage the filter and housing finish.

### **Energy Saving Tips:**

1. Select a temperature setting that suits comfort needs.
2. Regularly clean return air filters.
3. Park in a shaded area during extreme outdoor temperatures. Keep windows and doors closed. Keep blinds or shades closed. Avoid use of heat producing appliances.



## AIR CONDITIONER COVER MAINTENANCE

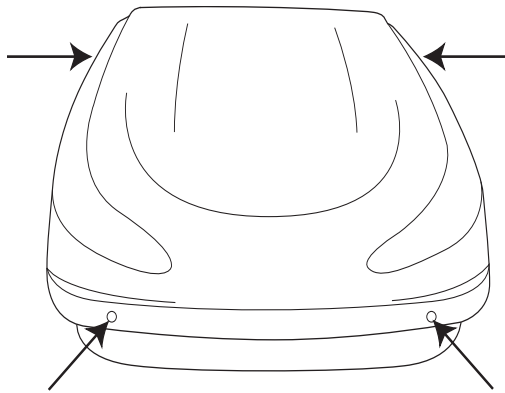
- Ensure that the screws on the air conditioner cover are tight and the air conditioner cover is secure. Check the cover whenever the roof is accessed.

### **WARNING:**

Use extreme caution and safety when accessing the roof. Serious injury or possible death could occur from a fall. Do not access roof during rain or snow when roof may be slippery.

### **NOTE:**

Screw locations will vary with model.



Ensure the cover screws are tight when roof is accessed.

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## FURNACE

The furnace is 12 Volt DC operated and uses propane as the fuel source. Electronic circuitry (automatic ignition) ignites the burner. The furnace uses outside air for burner combustion. Exhaust is expelled through the outside vent. Inside air is drawn into the furnace and blown across the internal heat exchanger. Heated air is then discharged through ducted hoses that run throughout the recreational vehicle. Warm air is also directed to heat the holding tanks in the recreational vehicle.

### ***Operation***

The furnace is directly controlled by either a wall thermostat (free blow A/C) or indirectly through the remote control (ducted A/C) that sends a signal to the roof air conditioner. The air conditioner then sends an electrical signal to the furnace to begin ignition cycle. There is a small time delay before the blower motor begins.

Once the blower motor attains a predetermined speed, the air prover switch (sail switch) will close. The air prover switch sends the electrical signal through a high temperature limit switch then to the automatic ignition circuit board. After the thermostat is satisfied the propane valve closes and extinguishes the burner. The blower motor stops after a two or three minute cool down period.

### **INFORMATION:**

See the furnace OEM manual for complete operation information.

### **To Operate the Furnace:**

1. Open the primary valve on the propane tank.
2. The house battery is charged.

### **WARNING:**

If a propane smell exists, extinguish all open flames and turn off the main propane supply. Propane is an extremely dangerous gas that can ignite and explode, resulting in property damage, injury or death. Propane is heavy and can float on the floor or hide in corners. Open all windows and doors. Do not touch electrical switches as they may spark. Keep open flame, spark producing devices and smoking material out of the area. Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.

### **CAUTION:**

Do not store any items or materials in the furnace area. Restricted air flow may hamper furnace operation leading to failure and/or fire hazard.

### **NOTE:**

The automatic ignition circuit board will attempt to light the burner three times before the ignition board will go into "lock-out." If the burner does not light the furnace blower motor will continue to run and the hand held remote will have to be cycled off.

### **NOTE:**

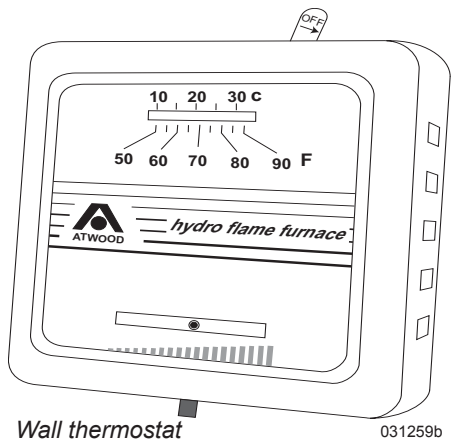
When washing the recreational vehicle exterior, avoid a direct stream of water into the outside furnace vents. This can damage the furnace.

**Tips:**

- Operation of the furnace may produce a musty smell during the first couple of cycles after the recreational vehicle has been removed from storage.
- Operating the furnace at altitudes above 5,000 feet reduces the BTU output due to air/fuel ratio.
- Have the furnace periodically serviced by a qualified technician, especially if the system exhibits unusual symptoms such a noise or a foreign odor.

**Wall Thermostat**

On/Off Switch

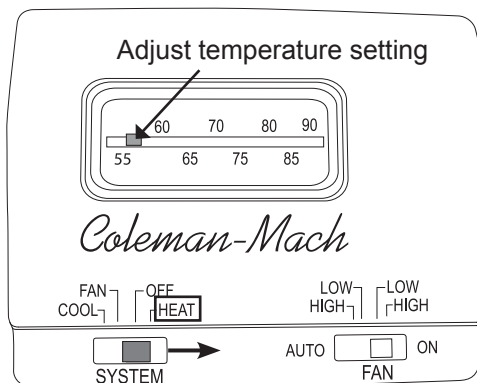


Wall thermostat

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- Switch thermostat to On.
- Set thermostat to desired temperature.

- Set thermostat to heat mode.
- Adjust temperature to desired setting.



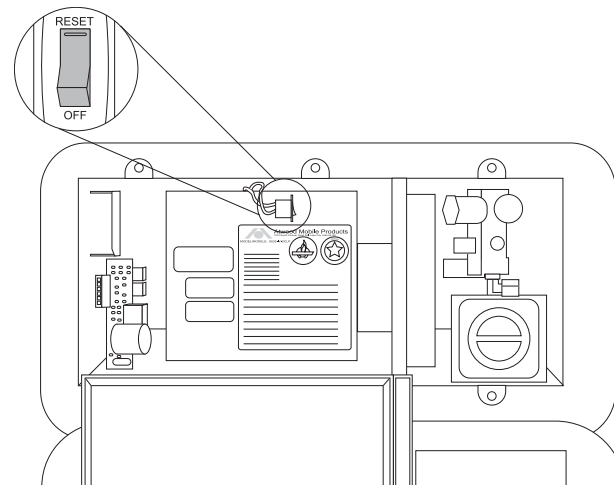
Thermostate used with ducted A/C. 031063k  
Set thermostat to heat mode

**Troubleshooting**

- Make sure the primary valve on the propane tank is open.
- The furnace will not light if the blower motor is not spinning to specified speed. This may be due to a low house battery charge condition. Hook-up to shore power to charge the batteries.
- If the blower motor does not spin and the necessary power requirements have been met, use a screwdriver or coin to open the furnace access panel. Turn the reset switch to Off and then back to Reset.

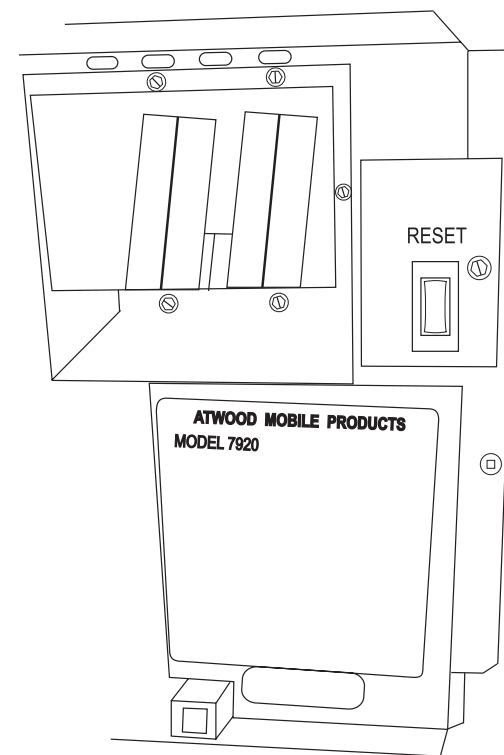
**WARNING**

**If a propane smell exists and the blower motor is spinning, Do Not attempt furnace operation. This may result in an explosion, fire or personal injury. Contact a qualified technician.**



Reset switch 30K BTU located through exterior access

030943d



Reset switch 20K BTU located through interior access

030943h

## WATER HEATER

The water heater is designed to operate with minimum maintenance. To avoid damage, fill the water heater tank before operating. The water heater is equipped with bypass valves for easy winterization and a Temperature Pressure Relief Valve for safety. The water heater has an aluminum-clad tank; therefore, an anode is not necessary.

### **INFORMATION:**

**Consult the OEM water heater manual for complete detailed operation and maintenance information.**

### **CAUTION:**

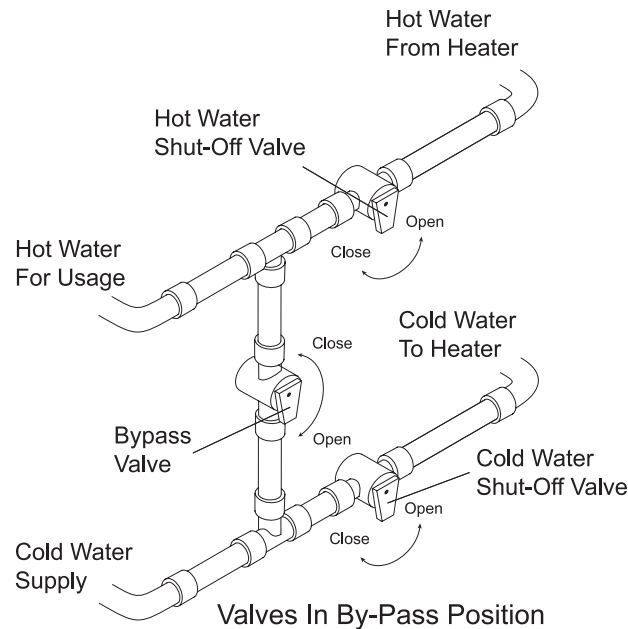
**Do not operate the water heater without water in the water heater tank. This can damage the thermostat(s).**

### **CAUTION:**

**Do not to operate the water heater on propane while the recreational vehicle is in transit. Be sure the water heater is off before refueling.**

### ***Before Using the Water Heater***

Fill the fresh water tank or hook to city water. Purge all trapped air prior to operating the water heater. Check around the tank and under the recreational vehicle for any signs of a water leak. Locate the water heater bypass (winterization) valves behind the water heater. Set the valves to the Normal Use positions.



Valves Located Behind the Water Heater

040593

Systematically open hot and cold water valves to purge the plumbing system of air and filling the water heater tank. Once the tank is filled, continue to purge the system until air pockets are eliminated and a steady stream of water appears at each faucet.

### ***Pilot Light***

The water heater uses a pilot light for the main burner ignition source. The gas valve has an adjustable thermostat.

To Light the Pilot:

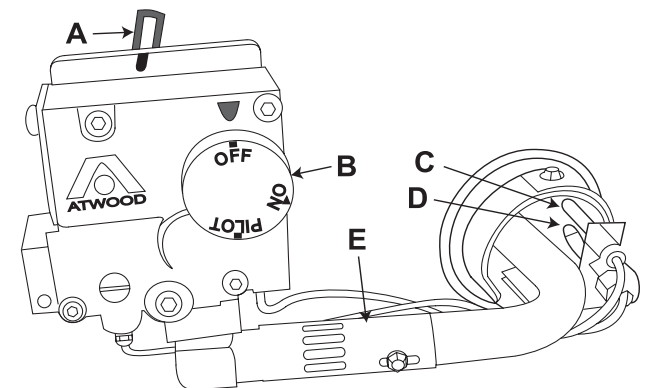
- Open primary propane tank valves.
- Light burners on cooktop to help purge air from the propane system.
- Rotate and hold lighting control knob to Pilot position.

- Use match or other safe lighting device to ignite the pilot.
- After pilot is lit, continue holding lighting control knob in pilot position for 30 seconds allowing time for the thermocouple to heat.
- Release lighting control knob and rotate to On.
- Adjust thermostat to desired level.
- Rotate lighting control knob to Off to extinguish the pilot light.

### **CAUTION:**

**Hot water can quickly burn. Keep water temperature below 125° F. Trapped water pockets may cause spattering when a hot water valve is first opened.**

- A. Thermostat.
- B. Lighting Control Knob.
- C. Thermocouple.
- D. Pilot Light.
- E. Mixture Tube.



Pilot Ignition Water Heater Valve

040424n

### Automatic Ignition Propane Only

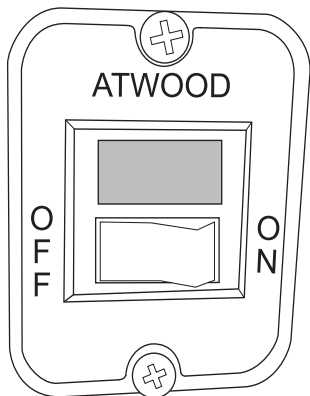
The water heater uses propane and an automatic ignition system to light the main burner. The thermostat is non-adjustable. The water heater operates from propane only.

#### Propane operation:

- Open primary propane tank valves.
- Light burners on cooktop to help purge air from the propane system.
- Ensure battery is charged.
- Turn water heater switch On.

#### NOTE:

The water heater will attempt 3 ignition cycles after which ignition lockout will occur indicated by the red light. Turn switch off then back on.



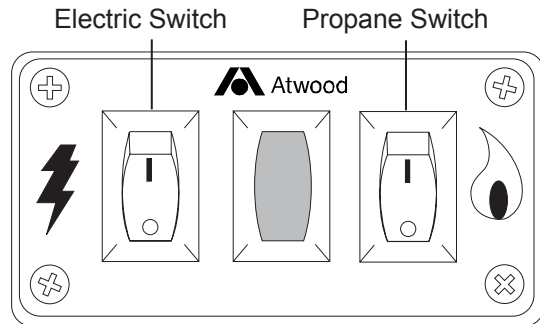
Propane Only Water Heater Switch 040511a

### Propane and Electric Water Heater

The water heater uses propane and an automatic ignition system to light the main burner and/or 120 Volt AC to heat water. The thermostats are non-adjustable. Both propane and electric functions can be on for large volume use.

#### Propane operation:

- Open primary propane tank valves.
- Light burners on cooktop to help purge air from the propane system.
- Ensure battery is charged.
- Turn the Propane Switch on.



Electric and propane water heater 060228

#### Electric operation:

- Hook to shore power. Ensure water heater circuit breaker is on.
- Turn Electric Switch on.

#### NOTE:

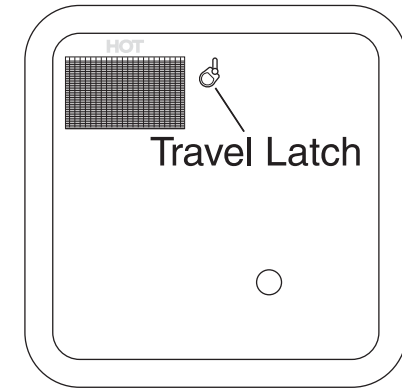
The electric element is rated 1500 Watts.

#### NOTE:

Both propane and electric operation can be on simultaneously for large volume use

### Water Heater Compartment

Periodically check the service compartment and the screen in the door located outside of the recreational vehicle to ensure no foreign material has accumulated which will prevent the flow of combustion and ventilating air. Located inside the water heater compartment is the drain plug and temperature relief valve for the water heater.



010720f

## Pressure - Temperature Relief Valve

The water heater is equipped with a Pressure-Temperature Relief Valve that may discharge during the heating cycle due to thermal expansion of water. The Pressure-Temperature Relief Valve is designed to open when the water temperature within the heater reaches 210° F (98.8° C), or when pressure reaches 150 psi. Because the unit utilizes a closed system, discharge is a normal occurrence and not necessarily a faulty valve. The water heater has an internal air pocket to reduce the possibility of dripping or weeping. Eventually, the expansion of the water will absorb the air pocket. When this occurs, utilize the following procedure to replace the air.

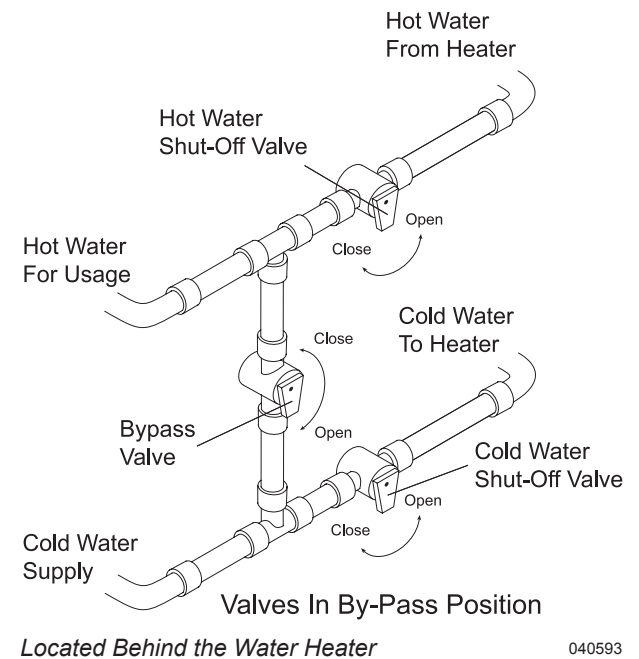
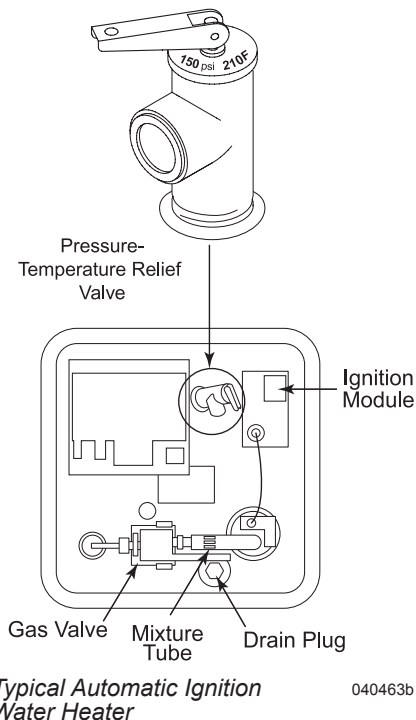
### **CAUTION:**

**Ensure the water heater tank is cool prior to checking the valve**

#### **Re-establishing the Air Pocket:**

1. Turn off the water heater.
2. Shut off the incoming water supply.
3. Open the hot water faucet closest to the water heater.
4. Pull the handle of the relief valve until the flow of water stops.
5. Close relief valve allowing it to snap shut. Close hot water faucet. Turn water supply on.
6. Turn on the water heater.

The air pocket is re-established; the process need not be repeated until the next discharge of water. If the discharge does not stop, contact a qualified service center to evaluate the valve and make any required repairs.



## Water Heater Bypass System

A winterization bypass system is installed on the water heater. The bypass valves are located behind the water heater.

Winterize the water heater for storage by removing the drain plug allowing the water heater to drain. Turn the valves to the Bypass positions to prevent winterization antifreeze from entering the tank. When it is time to resume operation, flush the lines of antifreeze then turn the valves to Normal Use position to refill the water heater tank.

### **Tips**

- Turn off water heater when not in use to conserve propane.
- When running the shower, conserve the heated water by shutting the shower water off when not in immediate use.
- The water heater element is approximately 1500 Watts. When plugged into 30 Amp shore power appliances may need to be operated in sequence to avoid tripping a breaker.
- The pressure & temperature relief valve on the outside of the water heater is set to open at 210° F or 150 psi. When water temperature and pressure reaches these settings the valve may drip until pressure has dropped. Do not open the pressure valve manually. Replacement valves are available at most hardware stores.

**WARNING:**

**Before beginning any service or work on the water heater turn off the propane connection and disconnect the 120 Volt AC and 12 Volt DC sources. Failure to do so can result in explosion, fire or injury.**

**Troubleshooting**

- If water heater fails to light, check the outside burner tube for obstructions. Spiders or insects may make nests in the burner tube.
- If the water heater indicator light does not illuminate, and the water heater does not light, verify the battery is charged or check for a blown fuse in the house distribution panel.
- If the 120 Volt A/C piloted switch does not light, check the AC source, circuit breaker or shore cord connection.
- The direct spark ignition water heater must have correct gas pressure and a DC voltage range between 10.5 Volts DC and 13.5 DC Volts. This voltage is supplied directly from the battery or from the converter.
- Due to a possible problem (air or obstruction) in the propane lines, the water heater burner will attempt three ignition cycles. If the burner does not light after the third attempt, the propane function will lock-out. Reasons for lockout may be air in the propane system or burner tube obstructions caused by an insect or spider web. Cycle the water heater Propane Switch off then back on to reset the ignition board. If problem persists consult a qualified technician.

**WARNING:**

**If a propane smell exists, extinguish all open flames and turn off the main propane supply. Propane is highly volatile, highly explosive and extremely dangerous. Explosion, fire, property damage, injury or death can result. Propane is a “heavy” gas and will lay on the floor and “hide” in corners. Open all windows and doors. Do not touch any electrical switches. They may cause a spark that can ignite. Evacuate the recreational vehicle and shut off the propane valve. Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.**

**BARBEQUE (OPTION)**

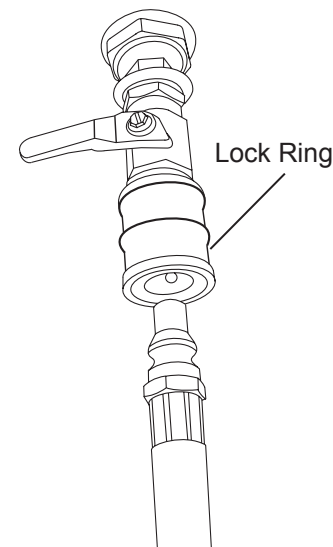
The RVQ portable barbeque comes with a 4’ propane hose and stand. The barbeque uses propane as fuel supplied by the propane quick disconnect provided on the front curbside trailer frame. The barbeque comes with a cover.

**To Use the Barbeque:**

- Locate barbeque stand within reach of the supplied service hose.
- Turn off the primary propane valves on the propane tanks.
- Ensure the quick disconnect valve is turned off.
- Remove dust cap on quick disconnect fitting.

- Push back on Lock Ring of quick disconnect fitting then firmly insert supply hose. Once fitting is firmly seated, release lock ring. Repeat for fitting on barbeque. Ensure fittings have properly engaged.
- Turn on primary propane tank valves.
- Open valve on quick disconnect fitting.
- Test all fittings with propane leak detector solution.
- Open burner valve on barbeque. Use supplied match holder to ignite burner or use a safe ignition source such as a butane lighter with extended reach tip.
- Adjust burner to desired height.

**CAUTION**  
SHUT OFF GAS SUPPLY BEFORE  
DISCONNECTING APPLIANCE.  
**ATTENTION**  
COUPER LE GAS AVANT DE  
DECONNECTER L'AAPAREIL



*Barbeque quick disconnect*

050285

**WARNING:**

Never use matches or open flame to test fittings for leaks. Explosion, fire, serious burn injury or death can occur. Use only approved propane leak detector solution when testing fittings for leaks.

**WARNING:**

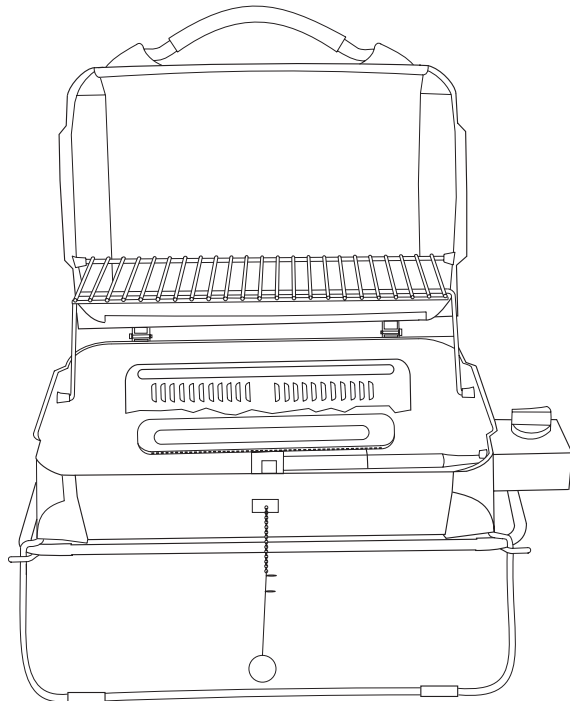
Never attempt to use the barbeque under an awning, confined spaces, indoors or in environmental conditions where safe dispersion of combustion gases cannot be maintained.

**To Stow the Barbeque:**

- Allow the barbeque to completely cool.
- Turn off the primary propane valves on the propane tanks.
- Close the valve on the quick disconnect fitting.
- With firm grip on supply hose, push back on lock ring of quick disconnect fitting to release supply hose from fitting.
- Replace dust cap on quick disconnect fitting.
- Remove supply hose from barbeque.
- Allow several minutes for propane gas to fully dissipate from fittings, barbeque and supply hose.
- Stow barbeque for travel.

**CAUTION:**

Always replace dust cap when fitting is not in use. Dirt and grit can damage fitting seals or cause fitting not to seal properly when inserted resulting in a propane leak.



RVQ Barbeque

031363



# Equipment

## Section 5



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## EQUIPMENT - INTRODUCTION

This section covers the basic operation and care of various types of equipment found in the recreational vehicle, most of which are provided for comfort and entertainment. More detailed information about specific equipment may be found in each product OEM manual. Optional equipment will also be discussed in this section which may not apply to all recreational vehicles.

### **INFORMATION:**

**Detailed information with CAUTION or WARNING instructions for the various electronics, other than what is provided in this section, can be found in the OEM manuals.**

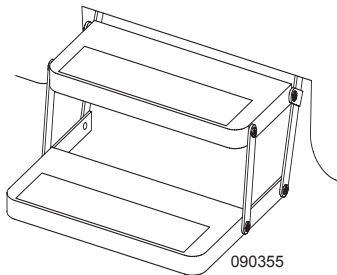
## ENTRY STEP *Operation*

Entry steps are stored under the recreational vehicle during travel. Extend the steps by pulling the assembly out from under the vehicle. Roll the bottom step out and down. To store the step assembly fold the steps and push the assembly under the recreational vehicle.

### **Lubricating the Mechanism:**

Lubricate the mechanism every 30 to 60 days.

- Carefully clean the area around the pivot points (the rivets involved in the motion of the mechanism).



## ENTRY DOOR

The door uses two separate locks for personal safety and security. The door handle incorporates a primary and secondary latching system.

- After cleaning, lubricate the pivot points between the parts (to pinpoint this area locate the washer between the parts). An automotive grade, non-staining lubricant is recommended.

### **Covering Nicks & Scratches:**

- Seal a nick or scratch with automotive grade primer to prevent rust.
- Once the nick or scratch has been sealed, cover the damaged area with an automotive grade or high-gloss paint.

### **CAUTION:**

**To prevent the possibility of slipping on the entry step avoid excess lubricant on the surface of the entry step itself. Carefully clean the entire entry step after lubricating the mechanism.**

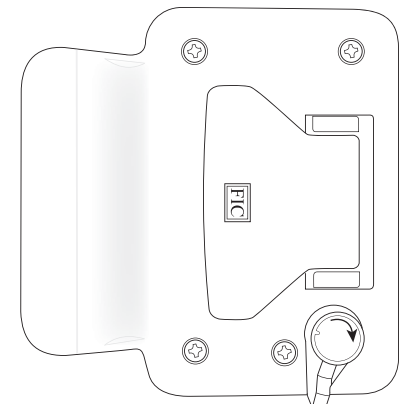
### **NOTE:**

**Silicone lubricants and WD-40 are not recommended as they have a tendency to evaporate and dry the matting surfaces which leaves them vulnerable to the elements.**

### **WARNING:**

**If the recreational vehicle is transported with the step in the extended position there is the possibility of causing major damage to both the step and the recreational vehicle.**

One locking system is the door handle and the other is a dead bolt. However, keeping the entry door in good operating condition requires some routine maintenance on a regular basis.



Interior door handle

020129K

## ***Adjustments***

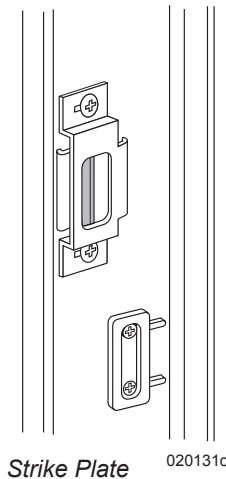
The following adjustments can help maintain entry door performance.

**Strike Plate Adjustment:** The door in the recreational vehicle was installed and adjusted to a factory setting. The position of the striker plate may change over the course of time and settlement of the recreational vehicle. The setting may need to be adjusted to insure that the door operates smoothly and efficiently. To adjust the strike plate, loosen the two Phillips head screws holding the plate to the jamb system. Move the plate in or out as needed to obtain a proper seal closing force. Retighten the screws.

### **CAUTION:**

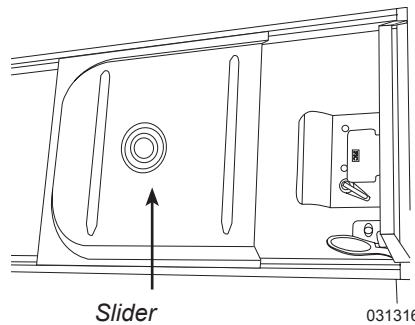
**If strike plate screws are loosened too far, the backer plate will drop down into the door jamb. Should this happen, replace the short screws with a screw that is long enough to go through the jamb system and into the frame work of the sidewall.**

**Locks:** The locking cylinder requires slight lubrication on an annual basis, or as needed. Use powdered graphite, not a petroleum product. Petroleum products gum the cylinder and inhibits smooth operation. The upper lock is the privacy lock, the lower lock is the dead bolt lock. Applying a light coating of white lithium grease to the face of the lock bolt helps in retaining a smooth close.



### Screen Door - Changing the Slider:

Place the slider in the center. Pull from the center of the slider, it will bow enough to allow easy removal. To re-install, reverse this procedure. Install the upper left corner first and pay attention to the location of the stop tabs.

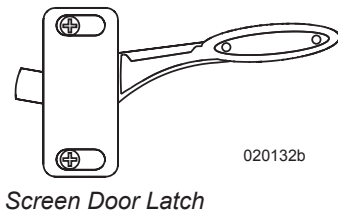


### CAUTION:

Confirm there is five or more feet of clear space outside of the recreational vehicle before moving the slideout room to the out position. Be sure there is sufficient clearance on the inside of the recreational vehicle before retracting the slideout room. Check that all cabinet doors are securely closed before extending or retracting the rooms. Clean the floor before retracting the slideout room. Dirt or grit that is trapped under slideout room will damage the surface.

**Hinges:** The hinges for the door require slight lubrication annually, or as needed, with any high-quality, dry spray lubricant.

**Screen Door - Adjusting:** The screen door can be adjusted to sit flush in the door jam. This requires two separate



adjustments. The first adjustment made is at the screen door latch/catch itself. Loosen the two Phillips screws holding the latch to the door to permit vertical adjustment. Move the latch far enough to catch on the striker mounted at the door frame. Tighten both screws. The striker mount on the door frame permits horizontal adjustment. Again, loosen the two Phillips screws holding the striker assembly. Move the striker to center the latch and tighten the Phillips screws in place.

### SLIDEOUT

The slideout is operated by a 12 Volt DC electric motor. There are two different styles of mechanical operation depending upon floor plan. One system is a below floor mechanism. The other system is an above floor mechanism. The slideout systems are adjusted at the factory for proper operation.

### Before Operating the Slideout System:

- Confirm there is enough clearance inside/outside the recreational vehicle for the room to extend/retract.
- The battery must be fully charged and connected to the electrical system.
- Open a window or vent to dissapate pressure during slideout operation.
- Ensure people, pets and objects are clear of the slide room path.
- Firmly latch all cabinet doors and close drawers. Damage to the doors, drawers and fascia can occur.

### CAUTION:

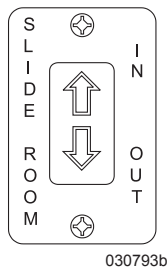
Do not operate the slideout room when the battery has been removed from the recreational vehicle. Operating the slideout by using only the converter may damage the slideout electrical components. Continuous operation of the slideout room can drain the battery and damage the slideout motor from overheating. Do not move the recreational vehicle with the slideout room extended.

### CAUTION:

Do not leave the slideout in the extended position during severe weather. Conditions such as high winds or heavy rain may cause damage to an extended slideout. It is not recommended to extend the slideout in snow, sleet, ice or freezing rain. There may be extensive damage resulting from the awning freezing. In the event the slideout room is extended in snow, sleet, ice or freezing rain conditions, it is recommended to clear the awning and ensure free movement prior to retracting the slideout.

## Extending - Slideout

1. Press and hold the slideout room switch in the Out position. The slideout room will move slowly to the out position. The drive motor will not stop automatically. To stop the slideout room before reaching the out position, release the switch. To continue room movement, press and hold the switch.
2. Release switch when slideout is fully extended. The room will lock in position.



### **CAUTION:**

**Continuous operation of the slideout room can drain the battery and overheat the motor.**

## Retracting - Slideout

1. Check for sufficient clearance inside the recreational vehicle for the slideout room to retract.
2. Clean the floor to prevent surface damage.
3. Remove debris from the exterior roof of the slideout room.
4. Ensure people, pets and objects are clear of the slide room path.
5. Press and hold switch to In. Release switch at any time to stop room movement
6. When the room is fully retracted, release the switch. The room will lock into position.

## Room Does Not Move When Switch is Pressed:

- Ensure the battery is fully charged.
- Check the auto-reset circuit breaker located underneath the frame behind the forward cross member. Depending on model, the breaker is located in a J-box or inside the “bellypan”.

## Manual Override

### - Below Floor:

The slideout system is equipped with an emergency retract feature that allows the slideout to be retracted in the event of a power loss.

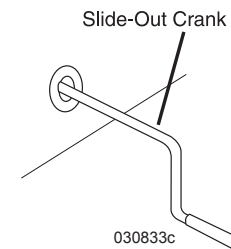
### **WARNING:**

**Do not work on the slideout system until the battery is disconnected.**

## Manual Override Procedure:

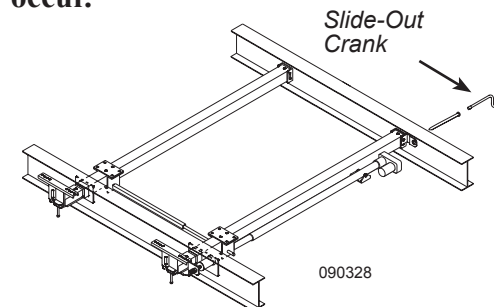
1. Disconnect the battery cables before manually overriding the slideout system.
2. Locate the slideout crank with a slotted end.
3. Locate the crank access hole on the outside of the recreational vehicle. Access will be on the opposite side from the slideout. A label affixed to the recreational vehicle reads “Manual Slideout Crank,” indicating location.
4. Insert the crank to engage the motor shaft.
5. Turn the crank to move the slideout room fully in (or out).

6. Take the recreational vehicle to an authorized repair center.



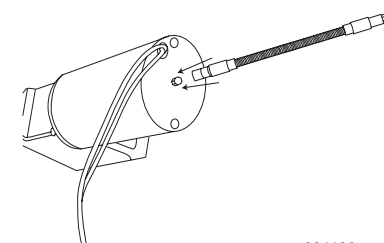
### **CAUTION:**

**Do not continue to turn the motor after the room is fully extended/retracted. Damage to the slide mechanism can occur.**



## Above Floor: (Cable System)

1. Locate the slideout motor near the ceiling of the slideout. Remove the fascia, valance or both. The fascia and valance may be attached by Velcro® or screws.
2. Disconnect the slide room motor electrical plug. Locate by following the wires that run from the motor to the plug.
3. Attach the flexible shaft to the fitting on the end of the slideout motor.



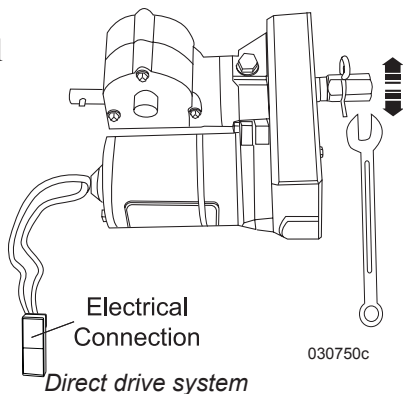
Cable system

4. Attach a ¼" socket and ratchet or cordless drill to the other end of the flexible shaft.
5. Turn slideout motor in proper direction to move the slideout. Reverse direction if cables tighten and the motor is difficult to turn.
6. Take the recreational vehicle to an authorized repair center

**CAUTION:**  
Over-torquing can result in severe damage.

**Direct Drive System:**

1. The bedroom slideout is located under the bed. Lift the bed and remove the access panel.
2. Remove 12 Volt DC from the motor by disconnecting the plug from the slide-out motor to the power supply.
3. Use a wrench to turn driveshaft and retract room.
4. Once the slide room has been manually retracted, reconnect power supply. This is necessary to stop the slide room from moving once retracted.
5. Take the recreational vehicle to an authorized repair center.



**Maintenance**

The slideout system has been designed to require very little maintenance. To ensure the long life of the slideout system, read and follow these procedures.

- When the room is out visually inspect the inner slide rail assemblies. Check for excess build-up of dirt or other foreign material; remove any debris that may be present.
- If the system squeaks or makes any noise it is permissible to apply a coat of light weight oil to the drive shaft and roller areas. Remove any excess oil to prevent dirt and debris build-up. **Do not** use grease.

**CAUTION:**  
Do not use petroleum based products on the slide seal. Petroleum based products can damage the paint and will cause premature aging of the rubber seal.

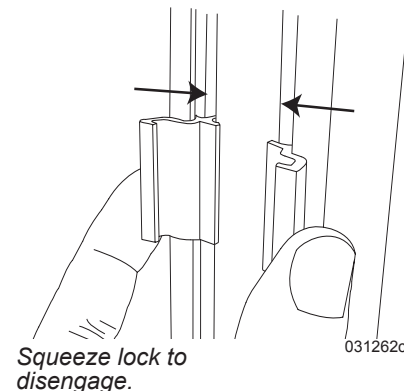
**PATIO AWNING Manual**

**CAUTION:**  
Always use the pull strap to extend or retract the awning. Do not extend or retract the awning by using rafter arms. Serious injury could occur if hands or fingers become pinched in awning hardware.

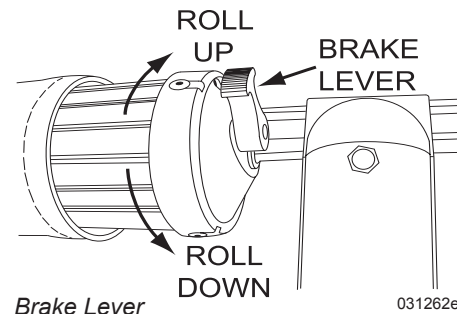
**INFORMATION:**  
Refer to the awning OEM manual for more detailed information and operating instructions.

**Extending the Awning:**

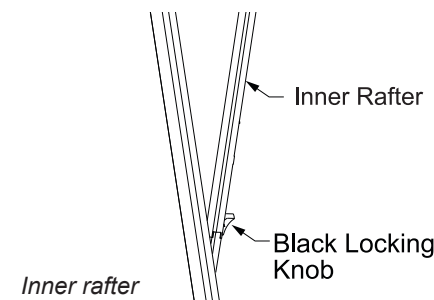
1. Squeeze travel lock to disengage lock securing inner and outer rafter arms together. Repeat for other side.

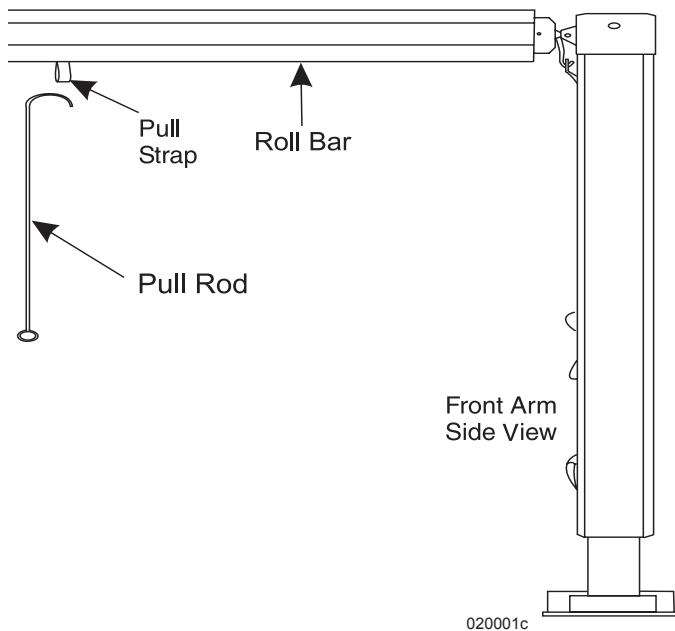


2. Place awning brake lever to Roll Down position using awning pull rod.

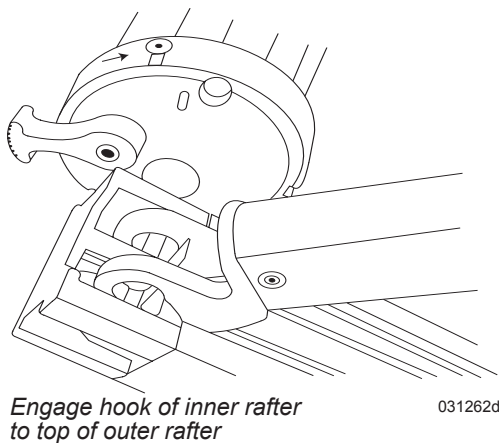


3. Loosen lock knob on inner rafter. Repeat for other side.

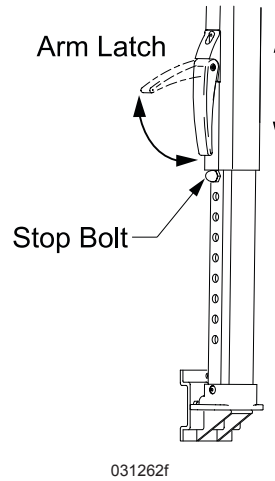




4. Hook pull strap with pull rod then extend awning full distance.
5. Hook inside rafter to top of outer rafter. Repeat for the other side.



6. Unlock arm latch then raise outside rafter to desired height. Allow arm latch lock pin to engage with hole in rafter. Repeat for other side.
7. Pull down on awning to remove slack from fabric then tighten inner rafter lock knob.



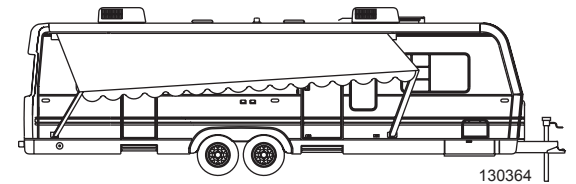
**CAUTION:**  
Use inner rafter to brace the awning in the extended position. Do not extend outer rafter beyond maximum point indicated by warning label.

**Adjusting Pitch:**

1. Open the arm latch.
2. Adjust outer arm to desired pitch of awning.
3. Close the arm lever. It may be necessary to move outer rafter up and down slightly for the lock pin to engage with hole.
4. Repeat for the other side.

**CAUTION:**  
Retract awning in inclement weather. Severe damage to the awning and/or recreational vehicle may result. If wind or extended periods of rain are expected, retract the awning and secure for travel. Storm related damage is not covered under warranty.

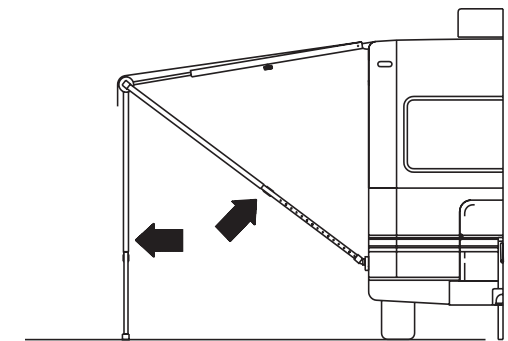
**Rain Release Setting:** If awning is extended during mist or light rain, position rear of awning lower than the front. This will provide a slope to allow water run off and prevent pooling.



Rain Release setting

**Carport Position:**

1. Open the awning.
2. While supporting the outer arm and roll bar, release foot of outer arm from the bottom support bracket.
3. Place outer arm perpendicular to the ground.
4. Repeat steps 2 and 3 for the other arm.
5. Use stakes to secure each foot to the ground.



Carport Position

## Retracting the Awning:

### **WARNING:**

Once the awning brake is placed in the roll up position, the awning is under full spring tension. If not firmly held, the awning will abruptly roll up to the stored position possibly causing personal injury or damage to both the awning and recreational vehicle.

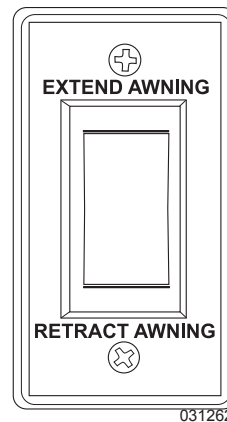
1. Disconnect, remove and/or store any optional equipment that is used.
2. If applicable, return awning from carport position.
3. Return inner rafters to travel position. Tighten locking knob.
4. Lower both outer rafters to stop bolts. Adjust arm latch pin to engage with nearest hole then close arm latch.
5. Slide pull strap forward. With one hand firmly grasping pull strap, place awning brake lever to the Roll Up position. Awning will be under tension when brake is set to roll up position.
5. Slide pull strap back to center of awning. Allow awning to partially roll up then hook pull strap with pull rod.
6. Gently allow awning to retract to the travel position.
7. Squeeze inner and outer rafters together until rafter travel lock engages for travel.

### **Electric (Optional)**

The awning operates from 12 Volt DC supplied by the battery. Ensure the battery is charged or hook to shore power.

## To Extend the Awning:

- Press and hold the awning switch to Extend.
- Allow awning to extend fully then retract slightly until fabric fascia hangs vertical.



## To Retract the Awning:

- Press and hold the awning switch to Retract.
- Allow awning to fully retract.

### **NOTE:**

**Awning motor does not stop automatically at end of travel. The switch must be released.**

### **CAUTION:**

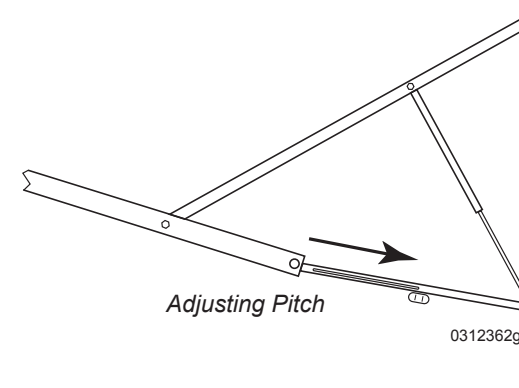
**Retract awning in inclement weather. Severe damage to the awning and/or recreational vehicle may result. If wind or extended periods of rain are expected, retract the awning and secure for travel. Storm related damage is not covered under warranty.**

### **NOTE:**

**The awning does not have a carport feature.**

## To Adjust Pitch:



- Extend awning full distance.
- Loosen lock knob on inner rafter.
- Pull down on awning roll tube to compress strut then tighten knob.



## Troubleshooting

If the awning does not retract when the switch is pressed:

- Ensure battery is charged or hook to shore power. If shore power is unavailable, connect the tow plug to the tow vehicle. Start the tow vehicle to supply battery power.
- Check the domestic fuse panel for a blown fuse.
- Check electrical connection at awning.

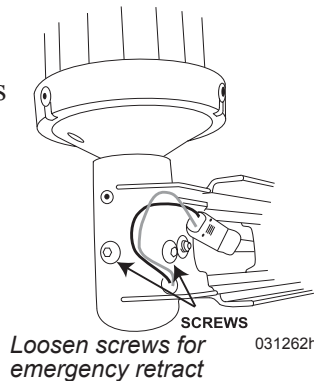
 <b>WARNING</b>	
<b>Pinch Hazard!</b> When closing awning, bottom will fold down and against back channel. This area must be kept clear of people and objects. Failure to heed this warning could cause severe personal injury and/or property damage.	

031262i

## Emergency Retract:

The awning can be retracted in case of emergency. This requires two people.

- Insert supplied awning pull strap into slot of awning roll tube.
- Have assistant loosen screws at points indicated. This will disengage motor drive allowing strut to retract the awning to the stowed position.
- Tighten top screw to prevent awning from extending during transit.
- Take the recreational vehicle to qualified repair center.



## **NOTE:**

**Allow awning to thoroughly dry before retracting the awning. Clean metal surfaces with soapy water and thoroughly rinse.**

## **Water Leaks:**

If leakage occurs after washing the awning, it is a result of insufficient rinsing. If water drips through needle holes in the stitching use a commercial seam sealer, available in most canvas and recreational vehicle supply stores. Paraffin wax may be applied to the top of the seams. As the awning ages these holes will normally seal themselves.

It is normal for slight leakage to occur through the fabric where water is allowed to accumulate or pocket on the fabric. See “Rain Release Settings” for information on proper water drainage.

Sometimes soap or chemical residue, such as from active agents in insect fog or sprays, can “wet” the fabric so that it appears unable to repel water. Rinse the fabric thoroughly and test to see if it is water repellent after it dries.

## **INFORMATION:**

**For further information on care and maintenance of the awning, consult awning OEM manual.**

## **LADDER (OPTIONAL)**

The rear ladder allows access to the roof of the recreational vehicle. Use care when ascending or descending the ladder. Limit access to the roof to cleaning and sealing purposes only.

## **NOTE:**

**Maximum weight rating is 300 lbs.**

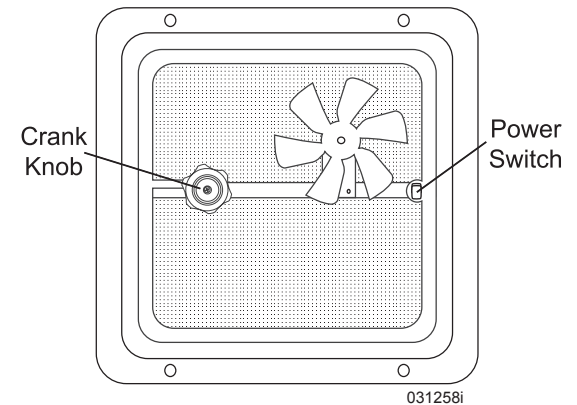
## **ROOF VENTS/FANS**

### **Manual**

The recreational vehicle is equipped with manually operated roof vents. The vent is opened or closed by turning the crank knob in the desired direction. The vent is for ventilation only, it is not designed to cool the recreational vehicle.

### **Power**

The power roof vent is operated by pushing the power switch. The vent must be opened before using the power roof vent. To close the power roof vent, push in the power switch to stop the fan and close the vent.



## **NOTE:**

**Do not leave any vent cover open while the recreational vehicle is in motion, stored or unattended for extended periods of time. High winds or other unusual conditions or obstructions may damage and prevent closing. Leakage could result, causing serious damage.**

## **Care & Maintenance**

### **Washing:**

On a monthly basis, loosen hardened dirt and remove dust from the awning with a dry, medium bristle brush. Thoroughly rinse both the top and bottom with a hose. Wash both sides of the awning using a quality vinyl cleaner solution and a soft brush. (Washing the awning can be made easier with use of awning maintenance products.) Saturate the fabric with the cleaning solution and leave it on for 15 to 20 minutes. If necessary, reapply the solution to keep the fabric saturated. Rinse the awning thoroughly. Repeat if necessary until most of the stains disappear.



**Tips:**

- A slightly open window on the shaded side of coach allows the most comfortable airflow, especially on hot sunny days.
- The best position for maximum comfort is between a slightly open window and the vent.
- To keep condensation from accumulating, open the vent lid slightly to help the air circulate. Condensation occurs naturally from fluctuations in interior and exterior temperatures, humidity and dew point changes, steam from cooking, or boiling large amounts of water on the cooktop. Shower usage also produces condensation.
- If the vent fan fails to operate, check for a blown fuse in the fuse panel.
- To clean the screen, remove the screws holding it in place. Wash the screen using a non-abrasive soap and water. Re-install the screen and tighten the screws.

**SOFA**  
**Sleeper Sofa Conversion**

The sofa will convert easily into a bed. Before converting the sofa to a bed clear the area of obstruction.

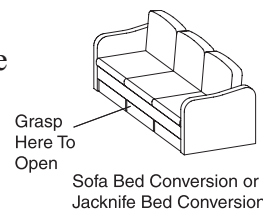
**Sofa to Sleeper:**

- Raise the sofa seat base until seat base and backrest form a V shape by lifting up from the center of sofa just below the seat cushions.

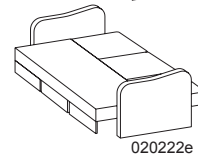
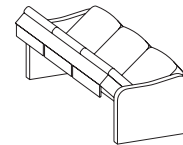
- Push down on seat base until the seat base and backrest are flat.

**Sleeper to Sofa:**

- Lift the seat base up until seat and back rest are in a V shape.
- Push down on seat base.



Sofa Bed Conversion or Jackknife Bed Conversion



Sleeper Sofa

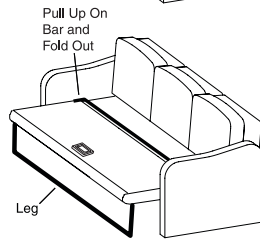
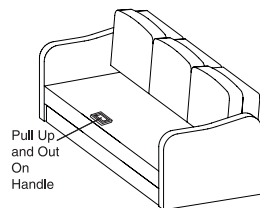
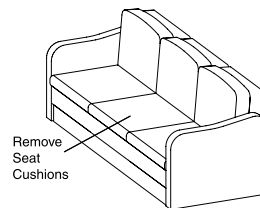
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**Hide-A-Bed Conversion**

The hide-a-bed will convert easily into a bed. Clear the area of any obstructions.

**Sofa to Sleeper:**

- Remove the seat cushions to access the hide-a-bed. The seat cushions should be stored safely until the bed is converted back to a sofa.
- Grasp the front metal bar and lift up, pulling out on the bar slightly until the leg of the bed is firmly resting on the floor.
- When the legs of the bed are firmly on the floor there will be another lifting bar exposed to complete the conversion process.



Hide-A-Bed

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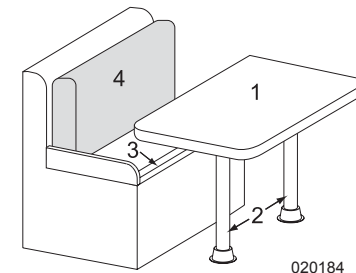
- Grasp and open the lifting bar to fully open the bed.
- **Sleeper to Sofa:**
- Remove all bedding.
- Grasp the foot of the hide-a-bed in the center using the metal lifting bar.
- Fold over the bottom portion of the bed that will form the seat.
- Lift the front portion of the lifting bar to raise and lower the hide-a-bed back into the sofa base.
- Replace the seat cushions.

**DINETTE**  
**Dinette Booth Conversion**

The booth dinette converts quickly into a bed.

**Booth to Sleeper:**

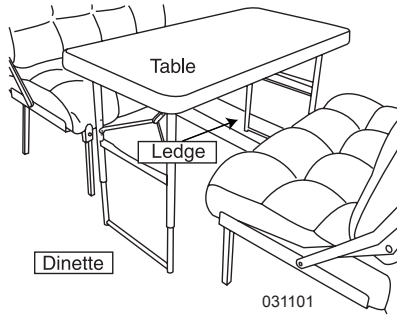
1. Remove the tabletop from the leg supports and set aside.
2. Remove the leg supports from the base and store.
3. Slide the tabletop between the booth benches allowing it to rest on the guide rail.
4. Lay both seat cushions and back cushions together to form a mattress.



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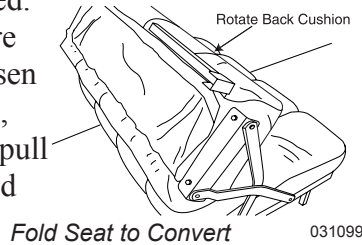
## Dinette Table Conversion

The dinette can be used as a bed or a dinette. A fold up portable table is used and should be properly stored when in transit.



### To Use The Bed:

- Remove straps from each section and fold all legs out.
- Lower bed sections and fold cushions out to form the bed.
- Reverse procedure to store bed. Loosen strap adjustments, fasten straps and pull straps tight to hold bed secure.



### To Use The Dinette:

- Remove retaining straps from each section and fold out bottom cushion legs of each section only.
- Lower each section bottom cushion to rest on the legs.
- Rotate inner cushions to form the back rests.
- Locate the table, fold the legs out and adjust the leg extensions at a desired height. Inside leg should be in a shorter adjustment to rest on the side ledge of the floor.

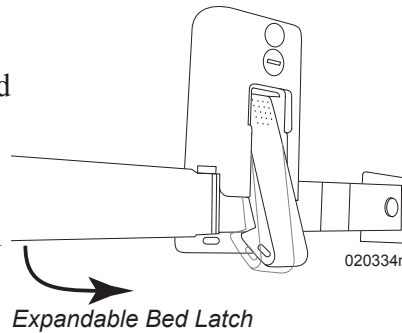
- Reverse procedure to store dinette sections. Loosen strap adjustments, fasten straps and pull straps tight to hold dinette sections secure.
- Fold over the bottom portion of the bed that will form the seat.
- Lift the front portion of the lifting bar to raise and lower the hide-a-bed back into the sofa base.
- Replace the seat cushions.

## EXPANDABLE BED

The expandable bed sets up quickly. The material is secured to the recreational vehicle for easy stowing.

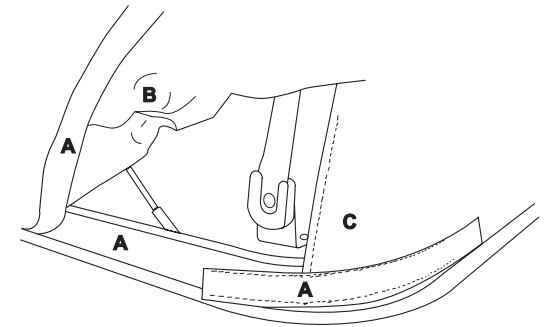
### To Open the Bed:

- Unlock and open latches.
- Lower the bed platform.
- Work tent material over bar hoop then place hoop in upright position.
- Secure end flap to hook and loop material (Velcro®).
- Fold side flaps down to cover end flap. Use hook and loop material to secure.
- Carefully stretch side flap securing ties across bottom of bed platform hooking into eyelets of other side flap.
- Unfold mattress.



### CAUTION:

**Weight limit 750 lbs.**



A = Hook and Loop  
B = Side Flap  
C = End Flap

### CAUTION:

**Retract the expandable bed in inclement weather. Severe damage to the bed, mattress, and/or recreational vehicle may result. If wind or extended periods of rain are expected, retract the bed and secure for travel. Storm related damage is not covered under warranty.**

### To Close the Bed:

- Remove and stow bedding.
- Fold mattress.
- Carefully remove securing ties from side flap and let hang.
- Work tent material over bar hoop towards interior.
- Stow end flap securing ties under mattress.
- Lower bar hoop with mattress placed towards top of bed platform.
- Raise bed platform. Ensure material, ties and mattress is clear of plating mating surfaces.
- Close and lock latches.

### NOTE:

**Refer to awning Care and Maintenance for washing instructions.**

## COUNTERTOP DROP LEAF EXTENSION

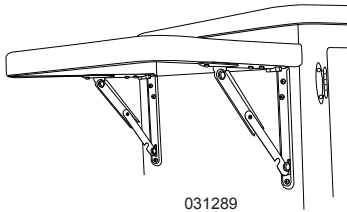
### To Extend Drop Leaf:

- Grasp extension and lift up until it locks into place.

### To Close Drop Leaf:

- Grasp extension and lift up.
- Place fingers on both arms, then push in arms to disengage lock.
- Lower extension to the closed position.

**WARNING**  
DROP LEAF EXTENSION  
MUST BE LOWERED WHEN  
NOT IN USE OR WHENEVER  
VEHICLE IS IN MOTION.  
#03005310

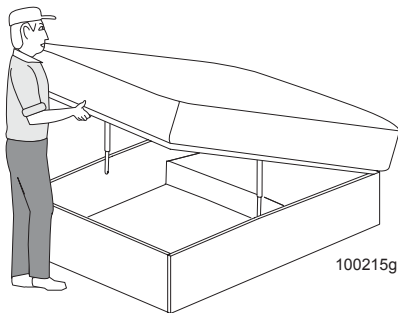


## STORAGE - UNDER BED

To use the storage compartment located under the bed, lift up the bed by the front edge of the platform. Use prop rod to hold platform open.

### **WARNING:**

Ensure prop rod is securely supporting platform. Do not use to store petroleum or propane products.



Storage Compartment Under Bed

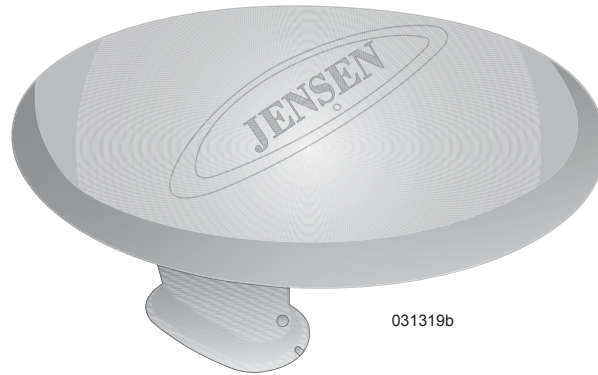
## ENTERTAINMENT COMPONENTS

### Television Antenna

#### TV Antenna

The television (TV) antenna with built-in electronics use 12 Volts DC to “boost” signal strength. A weak or fuzzy signal can be amplified by turning on the antenna select switch located in the bedroom. The antenna and booster work together to provide the best possible picture for most situations.

Certain conditions may occur that require no amplification which may actually worsen the reception. In this case, the picture quality may improve by lowering the antenna and providing no amplification.



Located on roof

### Antenna Select

The antenna select switch (also called boost) will select between the off-air roof antenna or exterior cable connection.

#### To Watch TV Using Roof Antenna:

- Set switch to Air to view over-the-air broadcasts. The red indicator LED light will illuminate. This will boost the antenna signal to the TV and the input to the TV will be set to off-air antenna.

#### To Watch TV Using Shore Cable:

- Set switch to Cable when hooked to shore cable. The red indicator LED light will go off. This will set the input to the TV to the exterior cable connection.



Antenna select switch

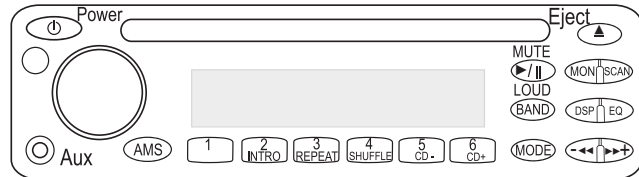
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### Radio/CD Player

The AM/FM radio also plays CDs. The system includes external speakers and auxiliary RCA stereo input jacks.

**INFORMATION:**

**For more detailed information and operating instructions, refer to the OEM manual.**



Radio/CD player

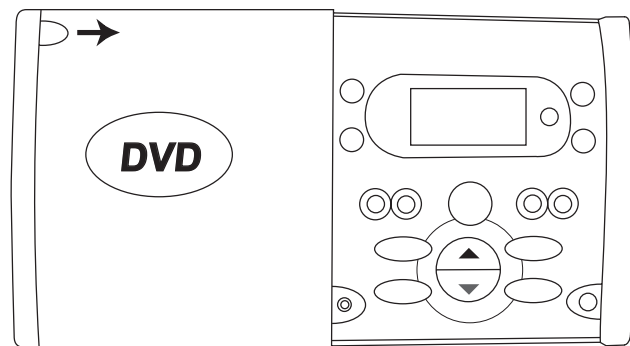
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### DVD Player

The entertainment center system consists of AM/FM, CD/DVD player, interior speakers and exterior waterproof speakers (optional). The system operates from 12 Volt DC and is powered from the battery.

**INFORMATION:**

**For more detailed information and operating instructions, refer to the OEM manual.**



Radio DVD/CD player

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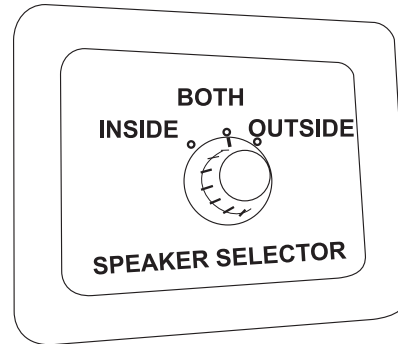
### Exterior Speaker Operation:

Radio/CD Player -

- Repeatedly press the Mode button until Function displays. Use the Fade function (rear) to enable the exterior speakers.

Radio/DVD/CD Player -

- Use the speaker select switch to change from interior speakers, exterior speakers or both.



Speaker Select Switch Used with DVD Player

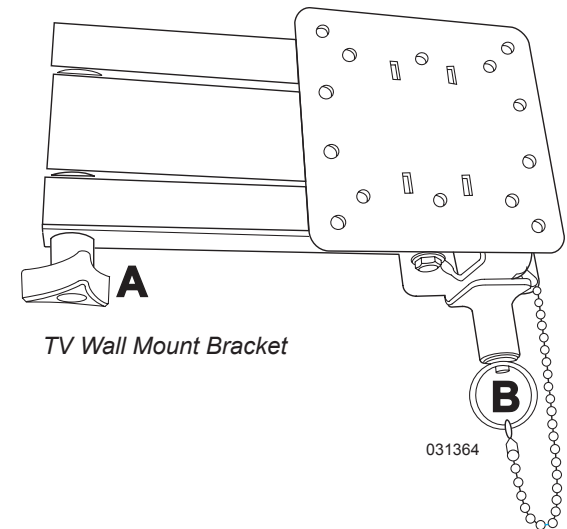
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### TV Wall Mount Bracket

The wall mount bracket is intended for a 15" flat panel TV. Bracket mount holes comply with VESA (Video Electronics Standards Association) requirements.

**NOTE:**

**The TV bracket does not swivel.**



TV Wall Mount Bracket

031364

### To Use the Wall Mount:

- Mount TV to bracket.
- Pull down on lock pin B to release from travel position.
- Swing TV to best viewing angle.
- Tighten knob A to set position.

### To Stow the Wall Mount:

- Loosen knob A.
- Fold hardware to stow position.
- Pull down on lock pin B to place mount in travel position.
- Release lock pin.
- Ensure lock pin has engaged before travel.

## Home Entertainment System

The home entertainment system consists of an AM/FM, CD/DVD, MP3 player, interior speakers and exterior waterproof speakers. The system operates from 12 Volt DC and is powered from the battery.

### **INFORMATION:**

For more detailed information and operating instructions, refer to the OEM manual.

### **INFORMATION:**

For detailed information and specific operating instructions on a particular component, refer to the OEM manual located in the Owner Information file. Also terms (such as air, mono, cable, setup, etc.) will vary with different manufacturers and models. The operation of various components and systems listed is accurate at the time of printing. Due to possible changes in the manufacturer models or system changes, actual operation may vary.

### **INFORMATION:**

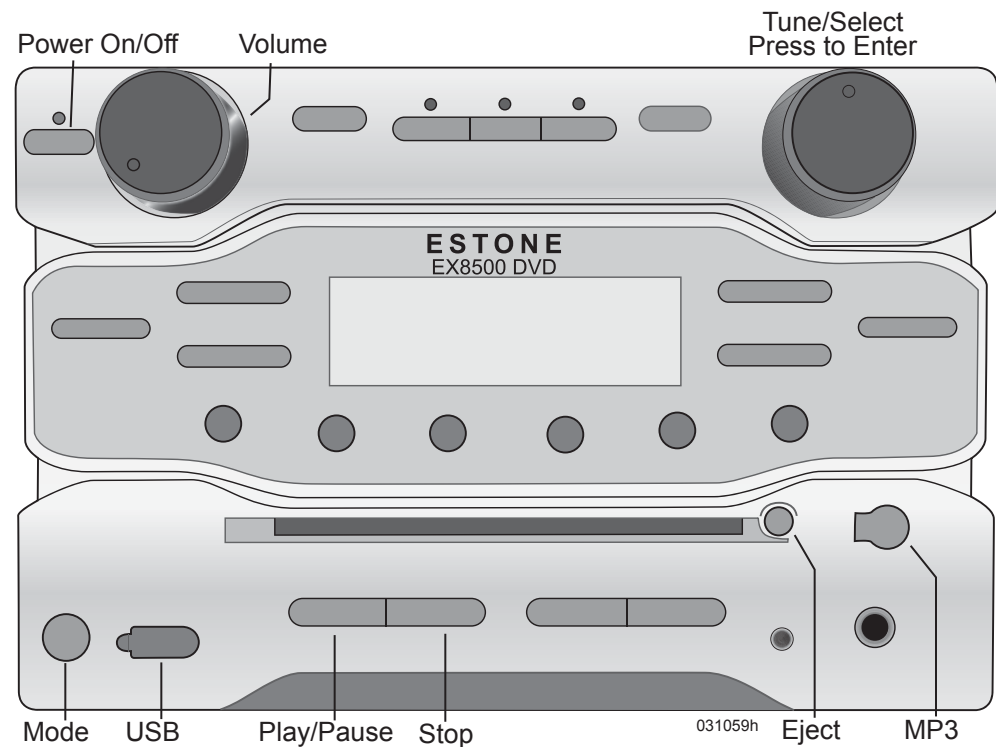
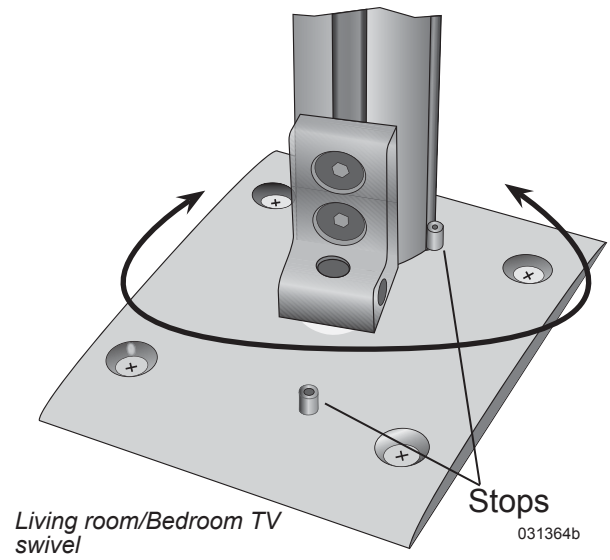
To view local channels, it is necessary to select local channels found in the television menu. Terms may vary (such as air, mono, etc.) depending on television manufacturer, but local channels (air, mono) must be selected. It may also be necessary to scan available channels. Terms may vary (such as channel search, auto program, etc.) but available channels should be scanned. Refer to television OEM manual on how to receive all available channels in the area.

### **NOTE:**

Picture quality from the TV antenna varies depending on the location of the TV station in relation to the location of the TV antenna. If picture quality is unsatisfactory, try turning on Antenna Select button to boost signal strength.

### ***TV Swivel***

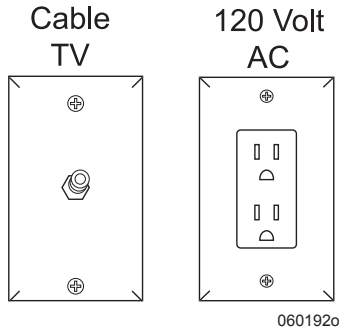
The TV swivel allows the TV to rotate between the living room and bedroom. The cabinet is pre-wired with RCA video and audio cables that connect the TV (optional) to the home theater system.



## Connections – TV Cable, Outlets & Phone

### Interior:

The recreational vehicle is equipped with cable TV and 120 Volt AC electrical outlets.



### Exterior:

Provided for convenience are exterior entertainment hook-ups. These include cable TV and 120 Volt AC electrical outlets. The hook-ups are provided for connection to hook up exterior equipment and services that may be available at a campground.

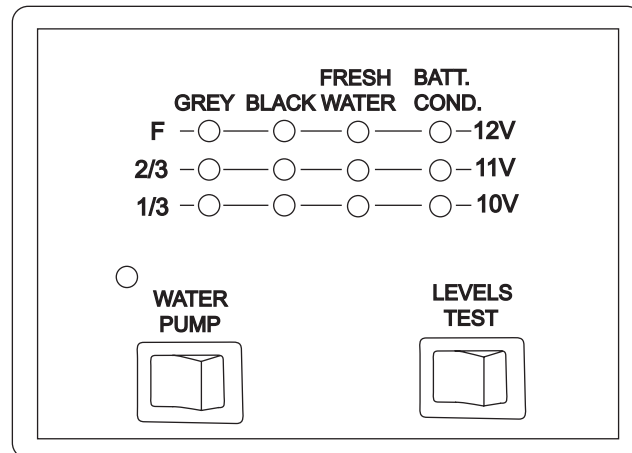
### NOTE:

The cable connection located roadside rear is a Cable Input that connects for example, to a campground cable hook-up. A second cable connection is located in the alcove storage compartment and on the curbside exterior under the awning. This is an Output that can be used to connect to an independent television monitor, for example, or a monitor sitting on a picnic table.

## MONITOR PANEL

The monitor panel is used to gauge battery voltage and tank capacities. The water pump switch is located on the monitor panel.

- **Water Pump Switch-** Applies 12 Volt DC power to operate the Water Pump.
- **Water Pump Light-** Light is lit when the water pump is on.
- **Levels Test Switch-** Displays the status of the holding tanks and battery voltage
- **Green** lamps indicate good or normal ranges.
- **Yellow** lamps indicate fair ranges.
- **Amber** lamps indicate partial ranges.
- **Red** lamps indicate full or empty ranges.



Monitor Panel

0308561

# Water Systems

## Section 6



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## WATER SYSTEM - INTRODUCTION

This section contains information about the operation and care of various water system equipment found in the recreational vehicle. Optional water equipment may also be discussed, so not all information may be applicable. More detailed information with **CAUTION** or **WARNING** instructions for various equipment, other than what is found in this section, can be found in the OEM manuals in the owner information box.

Newcomers to a self-contained recreational vehicle soon discover water does not last long unless consumption is drastically reduced. For example, less water can be used for showering if the shower is turned off while soaping down, and turned back on to rinse. Plenty of water will be available to meet personal needs once habits are adjusted.

**NOTE:**  
**Illustration is a general depiction of water system Layout.**

The plumbing system is fully self contained (FSC); the entire fresh water system and waste water system can operate independently of shore services. The plumbing system includes holding tanks for fresh water (potable), grey water (sinks and shower) and black water (toilet). An onboard water pump will supply all faucets and toilets with water from the fresh tank. A monitor panel will indicate holding tank levels.

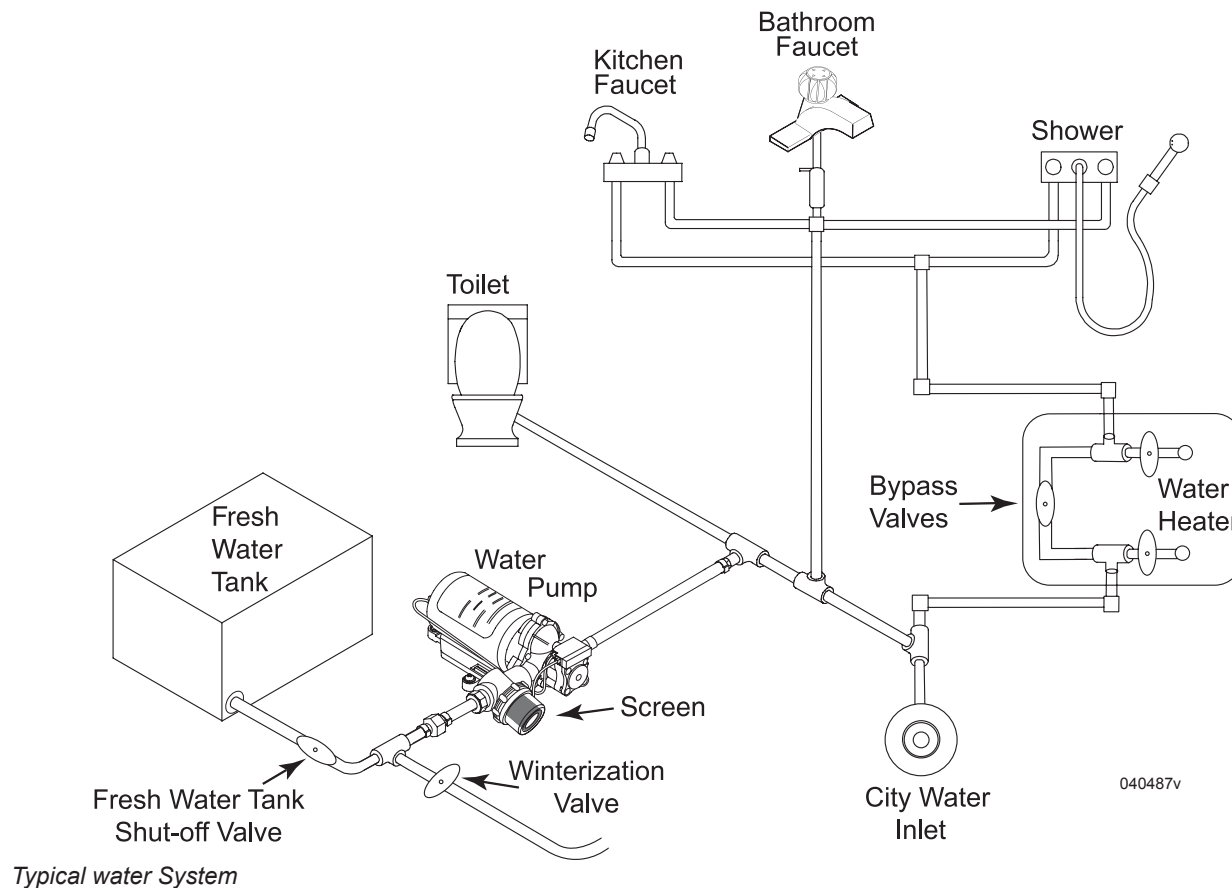
If shore services are available, city water is used to pressurize the water system so the onboard water pump can be left off. The grey and black holding tanks share a termination outlet. A sewer hose attaches between the termination outlet and shore sewer connection. Leave the black tank drain valve closed to prevent solids from clogging the hose. Leave the drain valve to the grey tank open. Drain and flush the grey and black tanks prior to departure.

### Fresh Water System:

The fresh water system consists of a fresh water tank, water pump and gravity fill inlet. Obtain a supply hose made for potable water use only. Proper care of the hose is necessary. After each use, drain the water hose and screw the ends together for sanitary purposes.

The onboard water pump uses water from the fresh water tank when a faucet is opened or the toilet is flushed. Use water sparingly when not hooked to shore service.

Improper winterizing, poor maintenance, road vibration and campsite water pressure variations are common culprits of water system problems or failure. Check all plumbing connections for leaks at least once a year.





### Waste Water System:

The sinks and shower drain into the grey water holding tank. The black water tank is dedicated for the toilet. Normally these tanks are proportionate in size to the fresh water tank. If a camping trip is started with a full fresh water tank, the waste holding tanks will be full or nearly full when all the water is used from the fresh water tank.

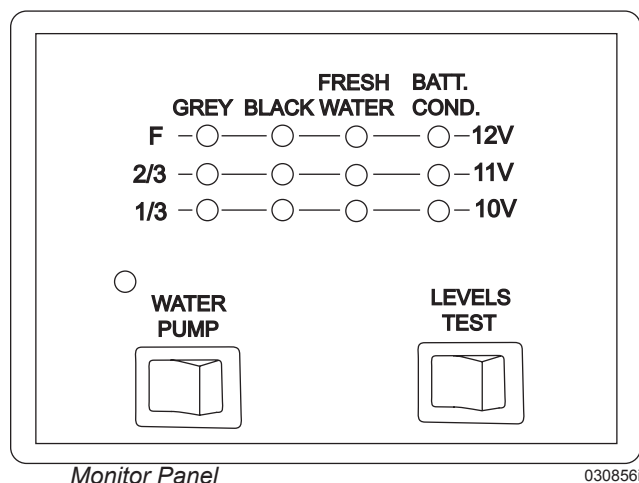
Prior to using the toilet, add several gallons of water to the black tank to help prevent accumulation of solids. Holding tank odor control chemicals are available at most RV supply outlets.

### TANK MONITOR

The recreational vehicle is equipped with a tank monitor to gauge the level of the holding tanks.

#### Tank Monitor:

- Press the Levels Test button to obtain a readout.



### WATER-POTABLE

The recreational vehicle is equipped with a fresh water holding tank and an on-demand water pump. The water pump pressurizes the fresh water system. When city water is available, city water will pressurize the fresh water system and the water pump can be left off. A water pressure regulator must be installed to limit incoming city water pressure to the fresh water system to no more than 45 psi.

#### There are two methods of supplying fresh water to the recreational vehicle:

- Use a potable water hose connected to a water source.
- Water is added directly to the fresh water tank via the gravity fill.

#### **WARNING:**

**Water is electrically conductive. DO NOT use any electrically powered item or electrical outlet that may be exposed to a water source. Electrical shock can cause serious injury or death.**

#### **CAUTION:**

**External water sources can deliver water pressure, particularly in mountainous regions. High water pressure is anything over 55 psi (pounds per square inch). Excessive water pressure can cause leaks in water lines, damage appliances and cause the potable water hose to swell and burst. Attach a pressure regulator at the city water faucet to limit water pressure to 45 psi.**

### City Water Hook-Up

Use a hose specifically manufactured and labeled “for potable water” to supply the recreational vehicle with fresh water. It is required to install a water pressure regulator to limit pressure to no more than 45 PSI to prevent over-pressurization and possible damage to the fresh water plumbing system. Attaching the pressure regulator at the water source will also protect the potable hose from expanding and bursting due to excess pressure.

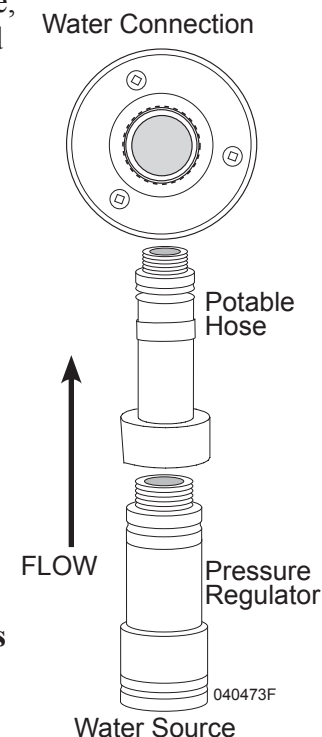
- Install a pressure regulator on potable water hose.
- Connect the potable water hose to the “City Water” connection.
- Turn on the city water supply.
- It may be necessary to open each faucet, one at a time, to get rid of trapped air inside the pipes.

#### **CAUTION:**

**A water pressure regulator must be used.**

#### **WARNING:**

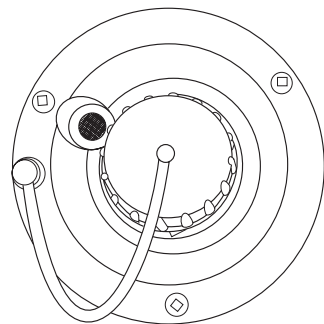
**Hose and hose fittings not manufactured for potable water can contain unsafe levels of lead. It is highly recommended to use only fresh water supply hoses manufactured for potable water use.**



## Gravity Fill

The gravity fill inlet allows fluids to be added directly into the fresh water tank. Use only potable water sources, solutions and delivery systems when using the gravity fill inlet. Water can also be poured directly from a container into the fresh water tank. The gravity fill inlet can be used to pour disinfecting solution into the fresh water tank.

- Connect a potable water hose from a city water source.
- Leave the water pump off.
- Turn on the city water supply.
- Monitor the tank filling process at all times using the monitor panel.
- When the fresh water tank is  $\frac{3}{4}$  full, prepare to shut the water supply off when water begins to overflow from the gravity fill port.



Gravity Fill Inlet

040483h

**CAUTION:**  
Do not leave the hose unattended when filling the fresh water tank. Damage to the plumbing system, fresh water tank or flooding may occur.

**WARNING**  
POTABLE WATER ONLY, SANITIZE FLUSH AND DRAIN BEFORE USING (SEE OWNERS MANUAL)  
FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY

040433i

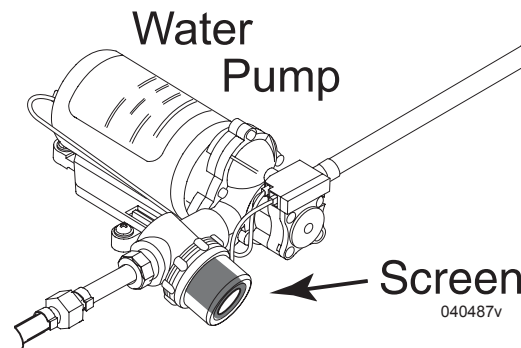
## Water pump

The water pump pressurizes the fresh water system when the recreational vehicle is not connected to city water. The water pump is totally automatic and self-priming, operating on demand as water is used. Inlet screen should be serviced once every two months or when water output becomes restricted.

### **WARNING**

**Before leaving the recreational vehicle for an extended period of time (i.e. overnight or longer), be sure that the city water and water pump have been turned off. Damage from neglect will be the responsibility of the owner, not the manufacturer.**

The water pump is operated by the water pump switch located on the monitor panel. **Do not** allow the pump to run with an empty fresh water supply tank. Operation of the pump without may damage the water pump or electrical system.



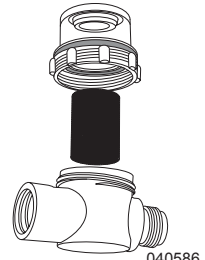
040487v

### **CAUTION:**

**Do not continue water pump operation when fresh water holding tank is empty. Damage to the water pump or electrical supply system may result.**

## To operate the pump:

- Fill the fresh water tank.
- Turn on the water pump from the monitor panel.
- Open faucets valves to purge system of air.
- Close each faucet when it delivers a steady stream of water.
- It will take several gallons to fill the water heater tank.



040586

*Water pump inlet screen: Located on water pump. Clean every two months.*

## Water Pump Troubleshooting

Vibration induced by road conditions can cause the plumbing or pump hardware to loosen. Check the water pump system for components that are loose. Many symptoms can be resolved by tightening the hardware. Check the following items:

### **Water pump will not start or blows the fuse:**

- Check the electrical connections, fuse or breaker, main switch and ground connection.
- Is voltage present at the pressure switch on the pump? If voltage is present, the pressure switch may be faulty. As a test, temporarily bypass the pressure switch.
- Check the charging system for correct voltage and good ground.
- Check for an open or grounded circuit or motor.
- Check for a seized or locked diaphragm assembly (water frozen).

**Water pump will not prime or sputters (No discharge/motor runs):**

- Is the pump inlet strainer clogged with debris?
- Is there water in the tank or has air collected in the water heater?
- Is the inlet tubing and plumbing sucking in air at plumbing connections (vacuum leak)?
- Check for proper voltage with the pump operating.
- Check the pump housing for cracks or loose drive assembly screws.

**Water pump will not shut-off or continues to run when the faucet is closed:**

- Check to see if the fresh water/tank fill valve is completely closed.
- Check the output (pressure) side plumbing for leaks and inspect for a leaky toilet or valves.
- Look for a loose drive assembly or pump head screws.

**Water pump is noisy or rough in operation:**

- Check for plumbing that may have vibrated loose.
- Does the mounting surface multiply noise (flexible)?
- Check for mounting feet that are loose or compressed too tight.
- Look for loose pump head to motor screws.

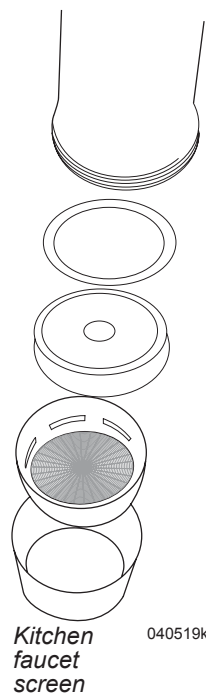
**Water pump is rapid cycling:**

- Look for restrictive water flow in the faucets or shower heads.

**Faucet Screens**

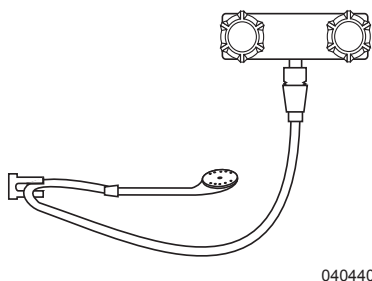
Quality of fresh water will vary by location. A build up of lime deposit or debris on the faucet screens may restrict or plug the flow of water coming from the faucets or shower heads. All faucet screens should be checked and once a month or as necessary when flow is reduced.

- Faucet screens are normally located on the outlet side of the faucet and held in place with a threaded collar.
- Remove screen from faucet.
- Clean screen using a small, soft brush and de-liming solution.
- Reinstall screen and check water flow.



**Shower - Exterior**

The exterior shower is handy for washing hands after hooking up shore service utilities or hosing off items outside. The shower is equipped with both hot and cold water.



The shower will work from either the fresh water tank or when hooked to city water. If the shower is not going to be used for a time, drain the water out of the hose, especially in cold weather conditions.

**Disinfecting Fresh Water**

Disinfecting the water system with chlorine bleach (superchlorination) protects the drinking water from bacterial or viral contamination that may come from any common water source.

**When to Disinfect the Water System:**

- The recreational vehicle is new.
- The recreational vehicle has been in storage.
- Every three months during use.

**To Disinfect the Water System:**

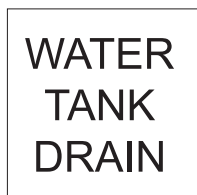
Prepare a disinfecting solution using one of the following methods:

- Combine one gallon of water and ¼ cup of household bleach. Use one gallon of solution for every 15 gallons of tank capacity or multiply tank capacity (in gallons) by 0.13. The result is the amount (in ounces) of household bleach to add to the fresh water tank.

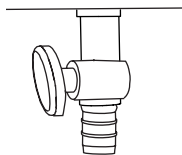
These methods yield a 50 PPM (parts per million) disinfecting solution in the water system that acts as a quick-kill dosage for harmful bacteria, viruses and slime-forming organisms. Concentrations higher than 50 PPM may damage the water lines and/or tanks.

Once the solution is prepared, the next step is to drain the water tank and water system of fresh water.

1. Locate the fresh water tank drain. Open the valve and allow the tank to drain then close the valve. The water tank drain valve is located generally in one of three places depending on floor plan:



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Fresh Water  
Tank Drain  
040433m

- On the front curbside of the frame.
- Below the floor behind the rear axle.
- The removable panel at the booth dinette.

2. Place the water heater bypass valves in the winterize position (See Water Heater Sec 4). This ensures the disinfecting solution does not enter the water heater. Refer to the water heater OEM manual for instructions on flushing the water heater tank.
3. Located the hot and cold low point drains. These are generally located towards the rear of the recreational vehicle. Red is hot and blue is cold. Remove both caps then open the kitchen faucet to release any vacuum. Close the kitchen faucet and replace caps when finished draining.

Cold Water/Hot Water  
Low Point Drains

040433l

3. Carefully pour the solution into the fresh water tank using the gravity fill inlet. It will be necessary to use a funnel.
4. Turn on the water pump. Open each faucet in turn until a distinct bleach odor is present. **Do not** forget the hot water, tub and shower faucets.
8. Allow the system to stand for four hours.
9. Drain the system and flush with fresh water repeatedly until no chlorine bleach smell or taste is left in the water system.

## WASTE WATER SYSTEM

### *Proper Waste Disposal*

Dumping raw sewage from toilet holding tanks, except at authorized dumping stations, is universally prohibited. Most National, State and private parks have either a central dump facility or campsite hook-up for sewage. Many modern rest areas along the interstate now have dump stations available. Woodall's Campground Directory, Trailer Life's RV Campgrounds and Services Directory, Rand McNally's Campground and Trailer Park Guide, Good Sam Park Director (Good Sam Club) and other similar publications list dumping stations. Some major oil companies offer dump facilities at selected stations also.

### *What Not To Put In Holding Tanks*

- Do not use strong or full strength detergents to deodorize and disinfect. Use odor control chemicals made especially for holding tanks.
- Do not put automotive antifreeze, ammonia, alcohol or acetone in holding tanks. Some chemicals will dissolve plastic.

- Do not dispose of table scraps into the tanks. They can clog pipes or damage the valve seals.
- **Do not** flush facial tissues, sanitary supplies or other non-dissolving items into the system. Chemically treated for strength, the tissue will not dissolve like toilet paper. Special holding tank tissue is available at most RV supply stores. White toilet paper dissolves faster than colored paper.

To test tissue dissolving ability, immerse one tissue square into a jar of water. Shake the jar five times to determine how the tissue disintegrates. **Do not** use any type of tissue that remains in one piece. Toilet tissue designed specifically for holding tanks is available at most RV supply stores.

### NOTE:

**Never dispose of sanitary supplies or other non-dissolving items into the system. Facial tissue, wet strength tissue, paper towels or an excessive amount of toilet tissue can create clogging in the termination valves or holding tank system.**

### CAUTION:

**Do not use any products that contain petroleum distillate or ammonia in place of RV odor controlling chemicals. Petroleum distillate or ammonia will damage the ABS plastic holding tanks and seals.**

## What To Put In Holding Tanks

### Black Water Tank (Waste):

Before using the toilet, treat the waste holding tank with a pre-charge of water and an odor-control chemical (available at most RV supply stores). First, add approximately three gallons of water to the holding tank. Next, mix/add the chemicals in accordance with the manufacturer instructions. Pour mixture through toilet into the holding tank. Be careful not to spill the chemical on hands, clothing, toilet bowl or carpet as it will stain. Hot weather conditions may require adjusting the amount of chemical used to control odor. Repeat the chemical pre-charge to the waste tank each time the tank is emptied.

### **POISON:**

**Most chemical mixtures for holding tank odor control are poisonous. Follow product manufacturer's directions and warnings when using any tank additive.**

### Grey Water Tanks (Liquid)

The grey water tank holds sink and shower drain water. A reduced mixture of chemicals can help to control odor in the grey tank, but no chemicals are required. Ensure the grey water tank is at least 1/3 full prior to emptying to provide a sufficient flow of liquid through the termination valve and sewer drain hose.

### **NOTE:**

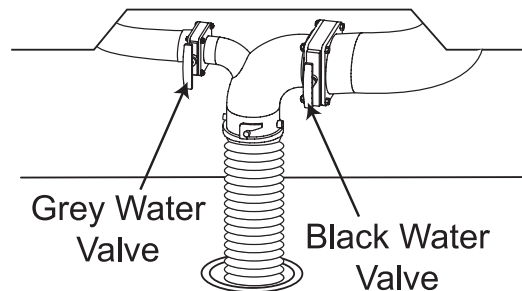
**Close the grey water valve 24 hours before departure to allow the tank to fill with a sufficient amount of liquid. Use the tank monitor to gauge level.**

### **NOTE:**

**Hot weather conditions may require adjusting the amount of chemical used to control odor. Repeat the chemical pre-charge to the holding tank each time the tank is cycled. Ensure there is a sufficient amount of liquid in the holding tanks prior to emptying the tanks. Empty the holding tanks weekly to reduce stagnation and prevent overfilling.**

### Holdng Tank Termination Valves

Drain valves dispose waste through a common termination drain. Each holding tank has a separate drain valve. The tank drain valves are located on the roadside frame of the recreational vehicle. Use the water monitor panel to observe tank levels. When ready to drain the tanks, drain the sewage tank first then drain the grey water tank. Using this sequence helps flush solids from the sewer hose. When traveling, it is recommend that the holding tanks be empty or less than half full.



Typical termination valves

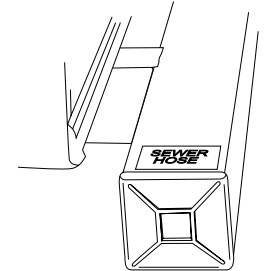
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## Sewer Hose

A flexible sewer hose is attached from the common termination drain to the shore sewer facility. It is important the sewer hose is restrained securely in place when emptying the tanks. Always tighten clamps and check restraining devices before use. Termination adapters of various configurations and sizes are available at most camping supply outlets. Wear protective and/or disposable gloves when handling the sewer hose.

### Sewer Hose Storage

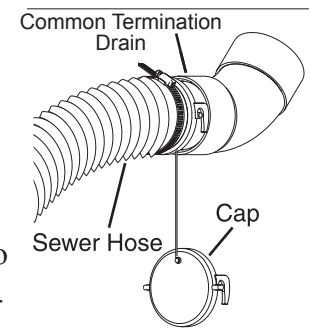
The recreational vehicle comes equipped with a sewer hose storage compartment in the rear bumper.



Hose stored in bumper 040622

### To Attach the Hose:

1. Remove termination cap. Align coupler tangs with termination tabs. Twist coupler clockwise 90°, locking coupler to termination drain.
2. Attach the other end of the hose to the drain shore service. Restrain hose to prevent movement during use.



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- Open the grey water valves during camping with drain hose attached to the shore sewer facility.

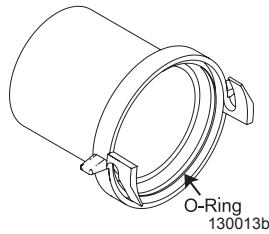
**NOTE:**

**Close the grey water valve(s) 24 hours prior to departing to allow the tank(s) to fill with liquid to help in the dumping process.**

The black water valve remains closed until the tank is full or until time of departure. This will help prevent accumulation of solids. Use the outside faucet or shower attachment for washing or rinsing.

**LUBE:**

**Lubricate the O-ring on the sewer hose adapter periodically with silicone spray. Use care when connecting the sewer hose adapter to the termination drain in cold weather.**

**Emptying the Holding Tanks**

- When preparing to empty the black tank, first close the grey water valve 24 hours before dumping tanks.
- Fill the grey tank to at least 1/3 by running water in the shower or sinks.
- Open the black water valve. Allow the tank to drain.
- Close the black water valve.
- Open the grey water valve. The water in the grey tank will flush any remaining solids from the hose. With the grey water valve open, run two gallons of water down sink drains.

- If preparing for travel, close the grey water valve or if staying, leave the grey water valve open. Undo restraining devices from the hose. Disconnect hose from the termination drain by rotating the fitting counterclockwise 90°.
- Raise hose and drain using hand over hand method working hose towards shore fitting. Rinse the hose with outside facility and repeat the hose drain process.
- Remove the hose from shore drain service and store. Secure the termination cap (required by law in some states).
- If desired, add chemicals to the tanks to control odor. Follow the chemical manufacturer's directions.

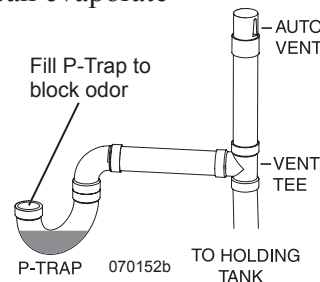
**NOTE:**

**Always empty the tanks before traveling.**

**Drain Traps & Auto Vents**

A "P-trap" and auto vent are located at each sink and shower drain to prevent holding tank odor from entering the recreational vehicle. These P-traps are usually within 54" of a vent tee. These traps must have water in them to block odors.

During storage, water can evaporate and allow odor into recreational vehicle. If odor is detected, run water into sinks, shower drain and washer (if equipped) traps.



The auto vent is to assist in the flow of water in the drain lines by enabling a smooth flow of water in the drain without creating a vacuum. If the auto vent is stuck in the open position, grey tank odors may enter the recreational vehicle. Auto vents double as clean outs in case the line has to be "snaked" out.

**NOTE:**

**During cold weather antifreeze must be added to the drain traps.**

**TOILET**

The toilet operates from either the fresh water tank or city water supply. The water pump must be turned on or the city water connected. The toilet flushes directly into a sewage holding tank (black water).

**NOTE:**

**To prevent accumulation of solids below toilet, add several gallons of water to the holding tank before use.**

**NOTE:**

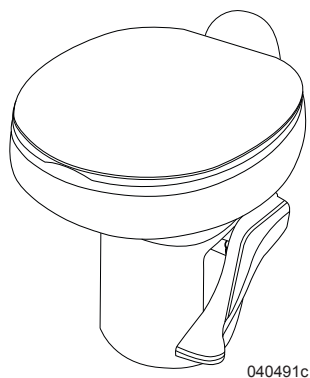
**Holding flush lever down longer than necessary results in excessive water usage.**

**NOTE:**

**Do not dispose of sanitary supplies or other non-dissolving items into the toilet.**

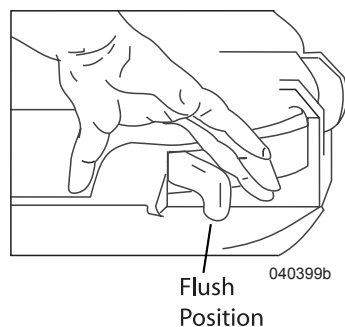
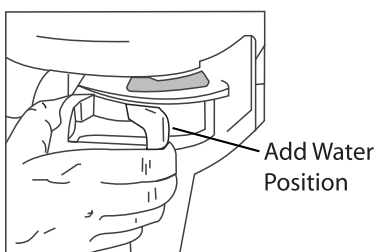
**Pedal Flush**

- To add water to the toilet before using, press and hold the pedal halfway until the desired water level is reached. Generally, more water is required only when flushing solids.
- To flush the toilet, push the lever all the way down until the sewage leaves the toilet.



### Lever Flush

- To add water to the toilet move the flush lever mid way to flush position until desired water level is reached. Generally, more water is required only when flushing solids.
- To flush the toilet, push the lever all the way to flush position until the sewage leaves the toilet. Water flow pressures vary at different locations; therefore, holding the flush lever down for five to eight seconds may be required.



### Troubleshooting - Leaks:

- Bowl will not hold water: Check for foreign material in valve blade groove in the flush drain.
- Leaks between closet flange and toilet: Check screws for tightness. If leak continues, remove toilet and check flange height. Adjust, if necessary, to 7/16" above floor. Replace the flange seal if damaged.
- Difficult hand lever operations require a light film of silicone spray on the blade.
- Poor flush: A good flush is obtained within two or three seconds. If problems persist, remove the water supply line and check flow rate. The flow rate should be at least 10 quarts (9.5 liters) per minute.
- To find leaks, check behind or under toilet. Take four or five sheets of toilet tissue and wipe all the seams and water line connections. Start at the top of the unit and work downward. When the tissue comes in contact with leaking water, it will immediately change texture.

### LUBE:

If the recreational vehicle is in storage for six months, spray silicone on the toilet valve and work it back and forth. Perform this maintenance monthly (silicone will evaporate in about 30 days). Spray must be silicone. A hydrocarbon based spray will damage the seal and other surfaces in the toilet. Petroleum Based lubricants must also be avoided as they cause the seals to swell and deteriorate faster.

### Cleaning

The toilet should be cleaned regularly for maximum sanitation and operational efficiency. Clean the toilet bowl with a mild bathroom cleaner. Do not use chlorine or caustic chemicals, such as drain opening types, as they will damage the seals.

Clean out the system by flushing several gallons of fresh water through with one cup of dry laundry detergent. Add odor control deodorant, in the amount specified for the holding tank capacity, after cleaning and every few days during use.

### COLD WEATHER USE

A recreational vehicle is not designed for extended use in below freezing (32° F./0° C.) weather. Interior water lines, fixtures, water storage tanks and pumps are normally protected from moderate freezing temperatures as long as the furnace is operating. Exposed drains may freeze quickly. If in doubt about what temperatures the recreational vehicle will tolerate, winterize the recreational vehicle.

### CAUTION:

The plumbing system and related appliances can be severely damaged if subjected to freezing. Freeze damage is not covered under warranty.

## WINTERIZATION

There are two acceptable methods of winterizing the recreational vehicle.

1. The plumbing system can be blown out with compressed air to remove water.
2. The plumbing system can be filled with FDA approved RV antifreeze to protect the plumbing system from freezing.

Which method is used to winterize the plumbing and holding tank systems is up to the owner. The preferred method is to use compressed air. Regardless which method is used, the plumbing and holding tank systems must be winterized to prevent freeze damage.

### **CAUTION:**

**Freeze damage is not covered under warranty.**

It is recommended to winterize whenever the recreational vehicle is placed in storage or below freezing weather is expected. When the plumbing system is purged with compressed air, antifreeze is not necessary except a small amount to protect P traps and termination valves from freezing. If using FDA approved antifreeze to winterize the plumbing system, several gallons may be required to fill the water lines.

### **POISON:**

**ONLY non-toxic FDA approved RV antifreeze can be used to winterize the fresh water system in the recreational vehicle. Automotive antifreeze, if ingested, can cause blindness, deafness or death.**

### **INFORMATION:**

**Some items require special winterizing procedures which can be found in their respective OEM manuals.**

### **WARNING:**

**It is recommended that a qualified RV service technician familiar with recreational vehicles, such as an authorized dealer, perform the winterizing procedure. Freeze damage is not covered under warranty.**

### ***Using Air Pressure***

Access to an air compressor and an adapter is needed to connect the air line to city water connection. Adapters can be purchased from most RV supply stores. Air pressure must not exceed 40 psi. Higher pressure can damage the plumbing system.

### **WARNING:**

**Turn off power to the water heater and allow it to cool. Hot water can result in burn injuries.**

1. Empty and flush holding tanks.
2. Drain the fresh water tank.
3. Remove low point drain caps.

### **WARNING:**

**When draining the low point hot water drain line and the water heater, be sure the water is cool. Hot water from the lines can result in burn injuries.**

4. Turn on the water pump and allow it to run for 30 seconds to one minute to clear all water out of the water pump.
5. When cool, remove the water heater drain plug and open the pressure-temperature relief valve. Both are located behind the outside water heater compartment door.
6. After draining the water heater, close the pressure-temperature relief valve. Do not install drain plug.
7. Hook an air hose to the city water connection. **Do not exceed 40 psi.** Turn on compressed until all water has finished being purged from water heater and low point drains then turn off the compressed air.
8. Place water heater bypass valves in the By-pass position. Install the water heater drain plug.
9. Install low point drain caps.
10. Turn on compressed air. Open all the faucets, including the inside and outside shower, one at time.
11. Flush the toilet until the water stops running.
12. After all water has been purged from the faucets etc, turn off compressed air and disconnect air hose.



- Pour 1 pint FDA approved antifreeze into kitchen and shower drain. Pour 2 pints into bath sink drain with some of the antifreeze going into the grey tank to protect the drain valve. While holding toilet flush handle open, pour 3½ pints into the toilet, letting the antifreeze run into the black tank to protect the valve. Pour 1 pint of antifreeze into the toilet after the toilet bowl valve has been closed. Use a soft cloth to wipe out sinks and showers after pouring in antifreeze to protect surfaces from stains.

**Using Nontoxic Antifreeze**

Approximately five gallons of FDA approved RV antifreeze is needed to fill water lines with antifreeze. Do not add antifreeze to the fresh water tank.

**WARNING:**

**Turn off power to the water heater and allow it to cool. Hot water can result in burn injuries.**

- Empty and flush holding tanks.
- Drain the fresh water tank.
- Remove low point drain caps.

**WARNING:**

**When draining the low point hot water drain lines, and the water heater, be sure the water is cool. Hot water from the lines can result in burn injuries.**

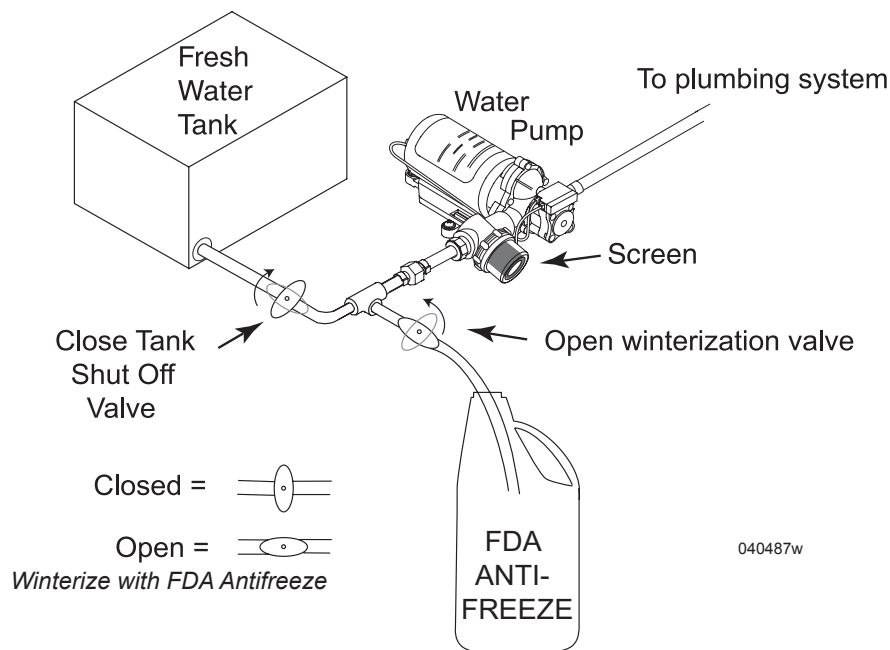
- Turn on the water pump and allow it to run for 30 seconds to one minute so that all water is cleared out of the pump.

- When cool, remove the water heater drain plug and open the pressure-temperature release valve. After draining, close the pressure-temperature relief valve. Do not install drain plug.
- Place water heater bypass valves in the By-pass position.
- Close all faucets, drain valves and low point drains.
- Place one end of the winterization hose into antifreeze container.
- Turn on the water pump.
- Open each faucet, one at a time, until a small amount of antifreeze is present then turn off the faucet. Allow a small amount of antifreeze to run into drains to protect P-traps and holding tank termination valves.

- Turn water pump OFF. Disconnect power supply line to the water pump.
- Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
- Close the winterization valve.

**De-winterization:**

- Fill the fresh tank.
- Install the water heater drain plug.
- Turn the water pump on and operate all faucets, one at a time, until clear water is present.



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# Propane Systems

## Section 7



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## PROPANE SYSTEM

This section contains safety and operating information on the various liquefied petroleum propane system equipment found in the recreational vehicle. The recreational vehicle is equipped with several appliances and various equipment that operate on propane. Some items discussed may not be applicable to all models. More detailed information with CAUTION or WARNING instructions for the various equipment, other than what is found in this section, can be found in the OEM manuals in the owner's information file.



### NOTE:

Some appliance displays and appliance manuals may refer to LP-Gas as a fuel source; however, the actual fuel source used and required for these appliances is propane. The phrase "LP-Gas" is synonymous with not only propane, but butane and propane/butane mixtures. Since propane is the actual fuel required, the term "Propane" will be used throughout this manual except for references to third party appliances (such as the refrigerator) that include the term "LP-Gas" on their displays or other literature.

All components for the recreational vehicle propane systems are approved for use in recreational vehicles. When properly handled, propane is a clean-burning dependable fuel for heat producing components. The tanks mounted in the recreational vehicle contain liquid propane under high pressure. As the fuel is used, the liquid vaporizes to a gas and passes through the primary shut-off valve.

A regulator reduces high-pressure to a low-pressure gas then distributed to components through a pipe manifold system.

Component lighting problems are commonly caused by air in the lines or an improperly adjusted gas regulator. **Do not** attempt to adjust the regulator. Adjustments need to be made by a dealer or an authorized service technician using specialized measuring devices.

In higher elevations or extreme cold weather (10° F/-21° C or lower), a shortage of propane may be experienced. Usage can be modified by running only one component at a time. For example, turn off the furnace while using the range. If propane is used in higher elevations or cold climates for a long period of time, have an authorized service technician adjust the propane regulator for these conditions.

Have the propane system checked by an authorized dealer at least once a year and before every extended trip. Although the manufacturer and the dealer test the system carefully for leakage, travel vibrations can loosen fittings.

### WARNING:

**When storing portable propane tanks that are not connected to a propane system, install an approved plug in the tank outlet hole to prevent leaks. Do not store or transport propane tanks, portable tanks, gasoline or other flammable liquids in the interior of the recreational vehicle. Keep open flame and spark producing materials away from the propane area. Shut off all appliances and the primary propane tank valve when the recreational vehicle is in storage. If this warning is ignored, a fire or explosion could result.**

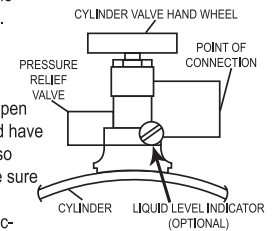
**DANGER - FLAMMABLE GAS UNDER PRESSURE • LEAKING LP-GAS MAY CAUSE FIRE OR EXPLOSION IF IGNITED**  
**• CONTACT LP-GAS SUPPLIER FOR REPAIRS OR DISPOSAL OF THIS CYLINDER OR UNUSED LP-GAS**  
**• FOR OUTDOOR USE ONLY\* DO NOT USE OR STORE CYLINDER IN A BUILDING, GARAGE OR ENCLOSED AREA**

#### CUSTOMER WARNING:

- Know the odor of LP-Gas. If you hear, see or smell leaking LP-Gas, immediately get everyone away from the cylinder and call the Fire Department. Do not attempt repairs.
- Caution your LP-Gas supplier to:
  - Be certain cylinder is purged of trapped air prior to first filling.
  - Be certain not to overfill the cylinder.
  - Be certain cylinder requalification date is checked.
- LP-Gas is heavier than air and may settle in low places while dissipating.
- Contact with the liquid contents of cylinder will cause freeze burns to the skin.
- Do not allow children to tamper or play with cylinder.
- When not connected for use, keep cylinder valve turned off. Self contained outdoor cooking appliances shall be limited to a cylinder of 20lb. capacity or less.
- Do not use, store or transport cylinder where it would be exposed to high temperatures. Relief valve may open allowing a large amount of flammable gas to escape.
- When transporting, keep cylinder secured in an upright position with cylinder valve turned off.

#### WHEN CONNECTING FOR USE:

- Use only in compliance with applicable codes.
- Read and follow manufacturers' instructions.
- Consult manufacturers' instructions concerning the cylinder connection provided with your appliance.
- Be sure regulator vent is not pointing up.
- Turn off all valves on the appliance.
- Do not check for gas leaks with a match or open flame. Apply soapy water at areas marked "X". Open cylinder valve. If bubble appears, close valve and have LP-Gas service person make needed repairs. Also check appliance valves and connections to make sure they do not leak before lighting appliance.
- Light appliance(s) following manufacturers' instructions.
- When appliance is not in use, keep the cylinder valve closed.



**DO NOT REMOVE, DEFACE OR OBLITERATE THIS LABEL EXCEPT AS AUTHORIZED BY ANSI/NFOA58 OR CAN/CGA-B149.2**  
**NEVER** store a spare LP cylinder under or near a barbecue grill. **NEVER** fill an LP cylinder beyond 80% full: a fire causing death or serious injury may occur.

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Leaks can be easily found by applying a leak detector solution on all connections. Leaks can usually be repaired by tightening the fittings. If not, close the primary shut-off valve at the tank. Immediately see an authorized dealer for repairs. Hand-tighten the primary shut-off valves only. Do not use a wrench or pliers as over-tightening may damage valve seats and cause leaks. If a leak is suspected (which can be easily identified by the odor of rotten eggs or sulfur), never light a match, have an open flame or use any spark producing equipment or appliance.

**WARNING:**

**Propane is highly volatile and extremely explosive. Do not use matches or a flame to test for leaks. Use only approved propane leak testing solutions for leak detection. Unapproved solutions can damage copper tubing and brass fittings. A liquid dish detergent solution of 10 parts water may be used. Shake the solution until bubbles form and then apply the mixed solution to fittings and accessory control valves. Do not use products that contain ammonia or chlorine. Thoroughly rinse and dry all fittings tested. Never attempt to adjust propane regulators. Only qualified technicians should perform maintenance or repair to the propane system.**

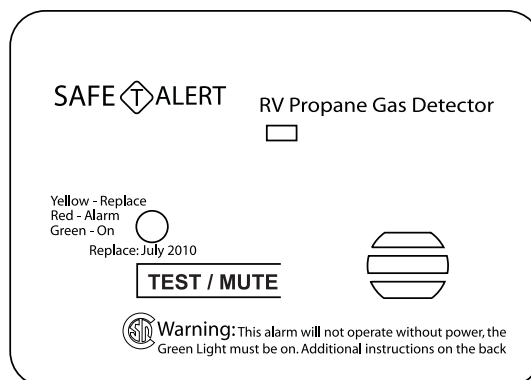
**NOTE:**

**It may be illegal to travel in some States and Canadian provinces with the primary propane valve open. Failure to comply with these State and Canadian province requirements may result in fines and/or pose a safety hazard.**

**PROPANE DETECTOR**

The propane detector is required safety equipment in RVs. American National Standards Institute (ANSI) 1192 - Fire & Life Safety, 6.4.8, Propane Detectors states

*“All recreational vehicles equipped with a propane appliance and electrical system shall be equipped with a propane detector listed as suitable for use in recreational vehicles under the requirements of UL 1484 and installed according to the terms of its listing.”*



Propane Detector

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**CAUTION:**

**The propane detector indicates the presence of propane only at its sensor. Combustible levels of propane may be present in other areas. The detector is intended for detection of propane only.**

The propane detector is provided for safety and will detect the presence of propane. Propane is heavier than air and will settle to the lowest point (generally the floor) of the recreational vehicle. The detector operates from 12 Volt DC. The battery must be connected and charged for the detector to function.

**Operation**

**Power On:**

When powered the LED color will be green (operational).

**WARNING:**

**The detector will not detect propane or sound the alarm for two minutes after it has been turned on.**

**WARNING:**

**The detector operates from 12 Volt DC. The battery must be connected and charged for the detector to function. Do not rely on the power converter as the sole power source as a power outage may occur.**

**LED & Alarm Signals**

**Testing:**

Press the Test/Mute switch when the detector is powered. The LED will turn red and the alarm will sound. This test feature checks full operation of the detector.

**NOTE**

**If the detector does not test properly, return it immediately for repair or replacement.**

**⚠ WARNING**

TEST THIS ALARM'S OPERATION AFTER EACH STORAGE PERIOD, BEFORE EACH TRIP AND AT LEAST ONCE PER WEEK DURING USE.

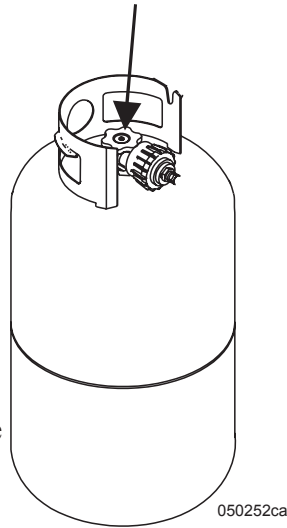
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**Alarm:**

The green LED will turn red and the alarm will sound whenever a dangerous level of propane is detected. The alarm will continue to sound until the propane clears or the Test/Mute switch is pressed.

**Procedures to Take During an Alarm:**

1. Turn off all propane appliances (range, heaters, furnace). Extinguish all flames and smoking material. Evacuate the recreational vehicle, leaving all doors and windows open.
2. Turn off the Primary Shut-Off Valve propane primary shut-off valve on both tanks.
3. Determine and repair the source of the leak. Contact a qualified service professional if the source of the leak cannot be determined or additional repairs are necessary.

**WARNING:**

If the alarm sounds and no danger is evident, open all doors and windows to air out the recreational vehicle. Exit the recreational vehicle and turn off the propane at the tanks. Do not enter the recreational vehicle until the alarm stops. If the alarm sounds again after the propane is turned back on, turn the propane off and contact a qualified service technician to repair the leak. Do not re-enter the recreational vehicle until the problem is corrected.

**Alarm Signal Mute:**

Press the Test/Mute button when the detector is in alarm.

1. The alarm will stop.
2. The red LED will remain on until the propane concentration has dispersed to a safe level.
3. The LED will turn green.
4. If dangerous propane levels return before the end of the Mute cycle (about 90 seconds), the alarm will sound.

**Malfunction Alarm:**

Should the microprocessor sense a fault in the propane detector, a fault alarm will sound and the LED will turn yellow.

**WARNING**

**In the event of a malfunction, remove the detector immediately and return it for repair or replacement.**

**Low Power Operation:**

The detector will operate normally down to 8 Volts DC. Do not operate the detector below 8 Volt DC or solely from the power converter.

**Care of the Detector**

1. Test the alarm each week.
2. Regularly monitor the indicator light on the front of the detector.
3. Vacuum the dust off the detector cover using a soft brush.
4. Remove dirt from the cover with a damp cloth. Dry with a soft cloth.
5. Do not spray cleaning agents or waxes directly onto the front panel. This action may damage the sensor, cause an alarm to sound or cause the detector to malfunction.

**INFORMATION**

If the recreational vehicle is equipped with a different propane detector model, see the OEM manual for detailed information on operation and safety.

**PROPANE EMERGENCY PROCEDURES**

If a propane smell exists (a rotten egg or sulfur smell), perform the following steps immediately:

- Shut off propane appliances.
- Manually turn off the primary shut-off propane supply at the tanks.
- Do not attempt to operate any electric switch as this can produce a spark and ignite the propane.
- Open windows and doors.
- Evacuate the recreational vehicle. Stay clear of the surrounding area.
- Keep open flames, spark producing devices and smoking material out of the area.
- Contact a qualified service technician to find the source and repair the propane leak.

**WARNING**

**A fire or explosion from ignited propane or propane fumes can cause serious injury or death.**

## PROPANE TANK Capacity

The recreational vehicle propane system is designed to accommodate two 20 pound storage tanks or two 30 pound storage tanks. These are the only approved tank sizes.

Propane Tank Capacity
20 lbs. (2)
30 lbs. (2)
<i>*Actual filled propane capacity is 80% of listing due to safety shut-off required on tank.</i>


### Tank Filling

Woodall's Campground and Trailer Guide and other publications list refueling stations. Many travel parks sell propane. Shut off the pilot lights, appliances and igniters before filling the propane tank to prevent a fire or explosion. Have a trained service technician fill the propane tank. The propane tank fill is located on the top of the propane tank.


#### **NOTE:**

**Purge air from the tanks before filling if the tanks are new and being filled for the first time.**


When the tank is filled to the proper level, there is space available for the conversion of liquid into gas. If a tank is over-filled, it may vent pressure. When this happens, a strong rotten egg odor near the tank and/or a hissing noise may exist. Propane exists in both the liquid and vapor state in the propane tank. A full tank is about 80% liquid. The pressure inside the tank varies with the temperature of the liquid.

 **DANGER**

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

 **WARNING**

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

 **CAUTION**

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

Securely cap inlet when not connected for use. After turning on propane, except after normal cylinder replacement, test propane piping and connections to appliances for leakage with soapy water or bubble solution. Do not use products that contain ammonia or chlorine.

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All tanks are required to be equipped with a pressure relief device. The purpose of the relief valve is to release gas or liquid caused by over-pressurization. Never transport the recreational vehicle without the straps securing both tanks. Close the propane primary shut-off valve, hand tight. Shut off pilot lights, appliances and igniters before filling the propane tanks to prevent a fire or explosion. Disconnect the hose from the propane tank (left hand thread). Loosen the strap to release the tank.

Remove the tank and have a trained service technician fill the propane tank. Caution the technician not to overfill the tank. Place the full tank into the carrier and secure. Re-connect the hose to the tank. Open the primary shut-off valve and check for leaks.

#### **CAUTION:**

**Pressure inside propane tanks can reach over 300 psi when exposed to direct sunlight. A high-pressure safety relief valve will purge excess high pressure if necessary. Propane will stop vaporizing as the propane tank temperature approaches -40° F. Appliances which consume large amounts of propane, such as the water heater or furnace, will need to be operated in sequence in extremely cold environments.**

#### **WARNING:**

**When storing portable propane tanks that are not connected to a propane system, install an approved plug in the tank outlet hole to prevent leaks. Do not store or transport empty propane tanks, portable tanks, gasoline or other flammable liquids in the interior area of the recreational vehicle. Keep open flame and spark producing materials away from the propane area. Shut off all appliances and the primary propane tank valve when the recreational vehicle is in storage. If this warning is ignored, a fire or explosion could result.**

#### **WARNING:**

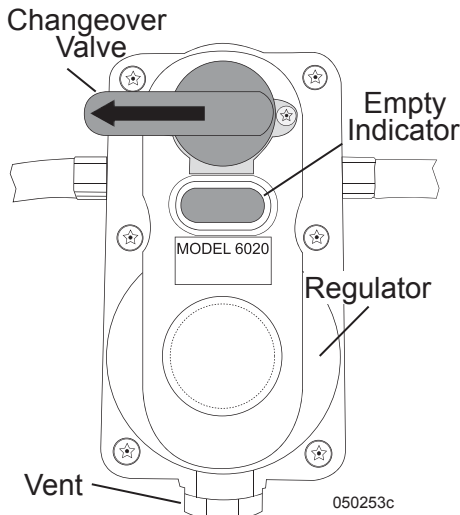
**It may be illegal to travel in some states and Canadian provinces with the primary valve open.**

## CHANGEOVER VALVE

Open both primary shut-off valves. The “lever” on the changeover valve will point to the tank in service. As long as pressure in the service tank is above 10 psig, the empty indicator will show clear. The changeover valve will automatically switch to the other tank when pressure in the service tank drops below 10 psig and the empty indicator will change from clear to red. Shut off the primary valve on the empty tank. The other tank becomes the service tank and the empty indicator will show clear. The empty tank may now be disconnected for refilling. After the tank has been refilled and installed, it becomes the second tank.

**NOTE:**

**Hand tighten the primary shut-off valve. Do not use a wrench or pliers to close the primary valve. Over-tightening may permanently damage the valve seat.**



Typical regulator w/changeover valve

## PROPANE FUNDAMENTALS

**NOTE**

**Propane fundamental information is not a complete guide for the use of propane tanks or appliances. In cold climates, keep propane level above 50% to keep vaporization of propane at the highest level.**

#Capacity	Gallon Capacity	BTU Capacity
5	1.18	107,909
10	2.36	215,807
11	2.59	237,387
20	4.72	431,613
30	7.08	647,420
40	9.43	863,226

*The above capacities allow for 20% vapor space on each cylinder. Data taken from the National Fire Prevention Association (NFPA) Pamphlet #58-1998.*

Propane Statistics	
Pounds Per Gallon	4.24
Specific Gravity of Gas	1.50
Specific Gravity of Liquid	.504
Cubic Feet Gas Per Gallon of Liquid	36.38
Cubic Feet Gas Per Pound	8.66
BTUs Per Gallon	91,502
BTUs Per Pound	21,548
Dew Point in Degrees Fahrenheit	- 44° F
Vapor Pressure at 0° F	31
Vapor Pressure at 70° F	127
Vapor Pressure at 100° F	196
Vapor Pressure at 110° F	230
Flash Point	842° F

### Basic Facts About Propane

- Propane detectors are a federal requirement on all propane equipped recreational vehicles.
- Propane is a by-product produced by refining oil.
- Odor is added to the propane after the refining process.
- Each liquid gallon of propane produces 91,502 BTUs (British Thermal Units).
- Temperature affects pressure of propane. Internal tank pressure can exceed 200 psi.
- Tank or valves contain pressure relief valves. The relief valve opens at 125% above tank rating.
- Propane stops vaporizing at -44° F.
- Standard propane operating pressure is 11” of water column or approximately 6 ¼ ounce per square inch.
- An inch of water column is a measurement of applied pressure to one side of a U-Tube ½ filled with water at sea level. The amount of pressure required to raise the water level 11”, represents 11” of water column.

### CONVERSIONS

- Gallons to Liters (1 Gallon = 3.785 Liters)
- Fahrenheit to Celsius (F° - 32 ÷ 1.8 = C°)
- 11 in Water Column = 6 1/4 ozs. per sq. in. pressure.
- 27.7 in. Water Column = 1 lb. per sq. in. pressure.



## PROPANE REGULATOR

The propane in the tank is under high pressure. The regulator reduces gas pressure to a safe operating pressure for use with the appliances.

The regulator reduces pressure to an outlet pressure of 0.4 psig (11 inches of water column). The regulator is equipped with a vent that allows it to compensate for variations in altitude. Keep the vent clear of corrosion or obstruction. If the vent becomes clogged, the regulator may over-pressurize the system which can cause component erratic appliance operation or failure. If corrosion exists, contact a qualified propane service technician. The regulator is mounted with the vent facing downward. If the vent becomes clogged, clean it with a toothbrush.

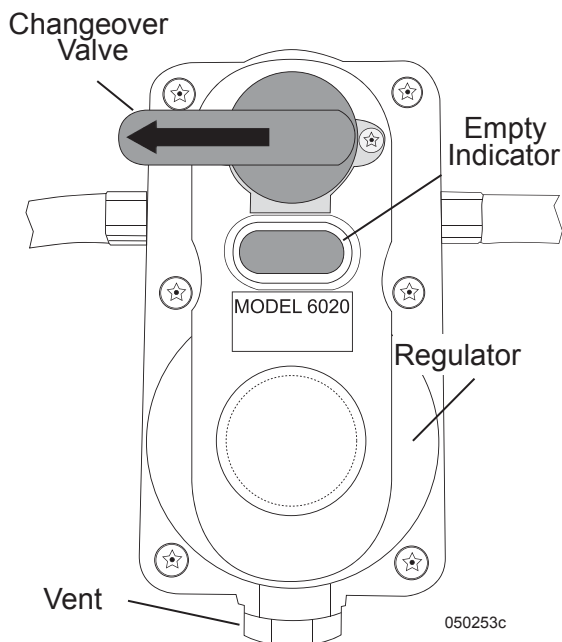
Under normal atmospheric conditions, the propane regulator and propane will not freeze. However, gas passing through the regulator can create moisture which can cause the regulator to freeze.

### To Prevent Freeze Up:

1. Ensure the propane tank is totally free of moisture prior to filling.
2. Ensure the tank is not over-filled.
3. Keep the valve closed when the tank is empty.
4. If a freeze up occurs, have a propane distributor purge the tank.
5. Have the propane distributor inject methyl alcohol in the tank.

### WARNING:

**The regulator is preset at the factory. Adjustments require special equipment. Failure to follow these instructions may result in a fire or explosion, causing severe personal injury or death. Do not attempt to enter the recreational vehicle until the problem is corrected.**



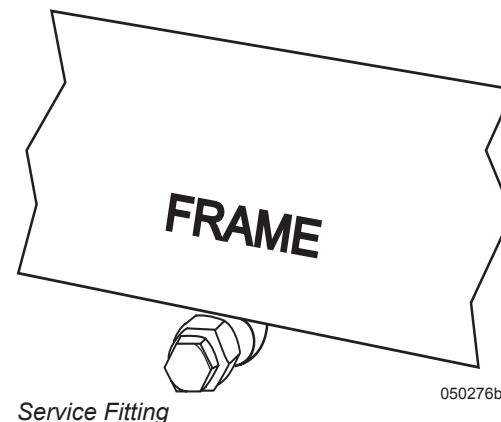
Typical regulator w/changeover valve

### Service Fitting

For ease of system testing, a propane service fitting is located on the front curbside frame near the propane tanks. This fitting can be used by service technicians to check propane pressure and perform a system leak down test without the necessity of loosening interior fittings to hook up test equipment.

### NOTE:

**Use the service fitting to perform propane testing to avoid loosening fittings in the interior.**



## Accessory Hookup

### Exterior Gas Line Hookup Prep:

A propane quick disconnect is provided for use of the propane barbeque and is to be used for external components only. For safety, only approved propane quick disconnect fittings and flexible hose should be used to connect external accessories to the remote hookup. Adding a propane quick disconnect fitting should be installed by a qualified agency as defined in the National Fire Protection Association NFPA (Fire) 54-02 code.

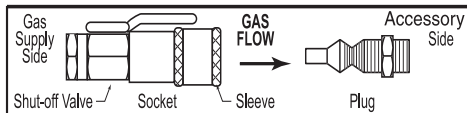
### **WARNING:**

**Check for leaks on all connections each time the remote hook-up is used. If a leak is detected, turn off the primary valve on the propane tanks. Contact a qualified service center for the repairs.**

**CAUTION**  
SHUT OFF GAS SUPPLY BEFORE  
DISCONNECTING APPLIANCE.  
**ATTENTION**  
COUPER LE GAS AVANT DE  
DECONNECTER L'AAPAREIL

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### QUICK DISCONNECT FITTING



**NOTE:**

**COUPLING TO BE INSTALLED BY A QUALIFIED AGENCY AS DEFINED IN THE NATIONAL FUEL GAS CODE (NFPA 54)**

**INSTALLATION INSTRUCTIONS**

- 1) INSTALL SOCKET WITH SHUT-OFF V VALVE ON THE GAS SUPPLY SIDE
- 2) INSTALL PLUG ON THE ACCESSORY SIDE
- 3) LEAK TEST USING SOAPY WATER SOLUTION

**OPERATING INSTRUCTIONS**

**TO CONNECT:**

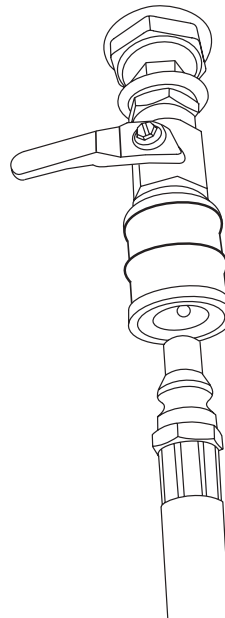
- 1) CLOSE SHUT-OFF VALVE
- 2) PULL SOCKET SLEEVE BACK
- 3) INSERT PLUG; RELEASE SLEEVE
- 4) PUSH PLUG INTO SOCKET UNTIL SLEEVE SNAPS FORWARD
- 5) OPEN SHUT-OFF
- 6) LEAK TEST USING SOAPY WATER SOLUTION

**TO DISCONNECT:**

- 1) CLOSE SHUT-OFF VALVE
- 2) TO RELEASE PLUG, PULL SLEEVE BACK AWAY FROM PLUG; PULL OUT PLUG
- 3) INSERT PLUG; RELEASE SLEEVE
- 4) LEAK TEST USING SOAPY WATER SOLUTION

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**CAUTION**  
SHUT OFF GAS SUPPLY BEFORE  
DISCONNECTING APPLIANCE.  
**ATTENTION**  
COUPER LE GAS AVANT DE  
DECONNECTER L'AAPAREIL



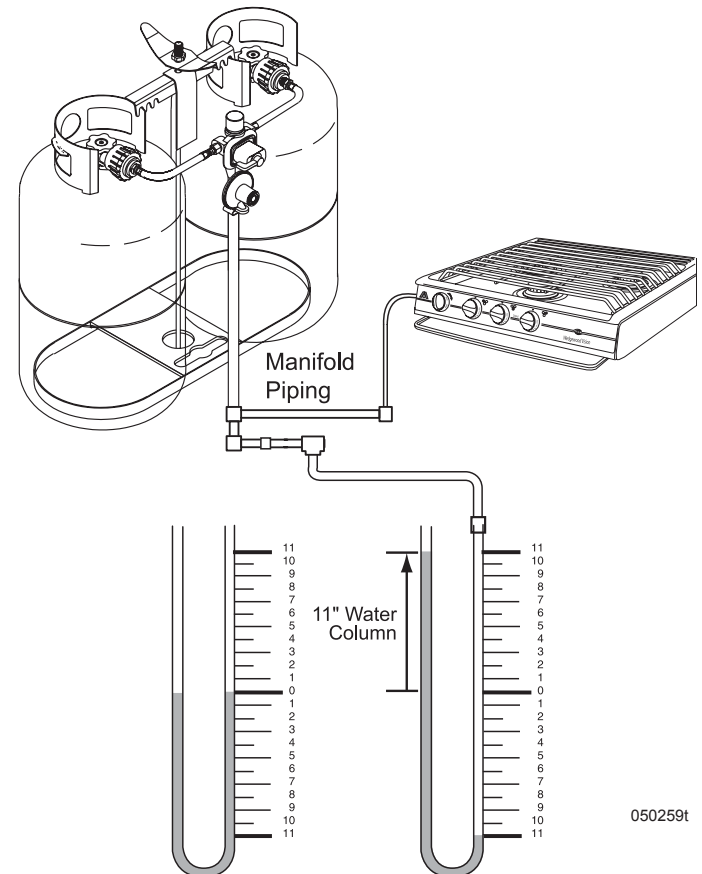
Barbeque Quick Disconnect

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### Manometer

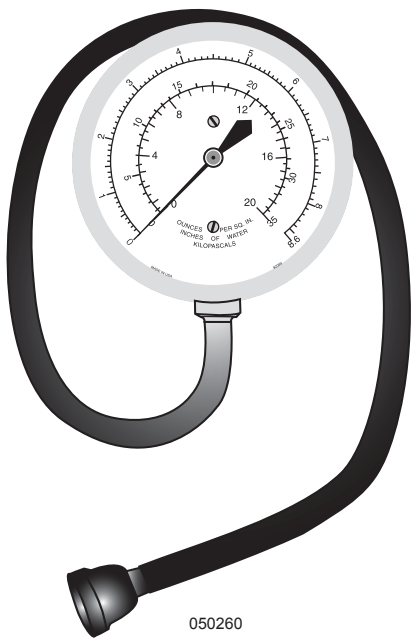
The manometer is the best way to accurately determine propane pressure. Two different styles of manometers are Gauge and U-tube.

Gas pressure is measured in Inches of Water Column. This is the amount of pressure applied to one side of a U-shaped tube half filled with water. The amount of pressure needed to raise the column of water 11" represents 11 Inches of Water Column.



U-Tube Testing Layout

050259t



Manometer Gauge

## PROPANE HOSE INSPECTION

The hose manufacturer suggests that a flexible propane supply hose undergo regular inspection. As a guideline, we suggest that all flexible propane lines connecting the slide-out, appliances and tanks be inspected in the spring and fall of each year by a qualified RV technician.

### Inspection tips:

Hose strength is controlled by the plies of reinforcement. Damage in this area cannot be tolerated. It is important that if a damaged propane hose is found, the source of the damage be determined and corrected prior to the replacement. Small cuts, nicks, or gouges that do not go completely through the cover are not cause for replacement of the hose.

Inspection should be performed when the hose is not under pressure.

### NOTE:

**Pricking of the cover in the manufacture of this type of hose is common and necessary for satisfactory hose performance. Consequently, the uniformly pricked cover should not be viewed with alarm.**

### Cause for hose replacement:

- Damage to the textile reinforcement or wire braid
- Wire braid reinforced hose that has kinked or been flattened so as to permanently deform the wire braid in the unpressurized state.
- Blistering or loose outer cover.
- Slippage evident by the misalignment of the hose and coupling and/or the scored or exposed area where slippage has occurred.

### NOTE:

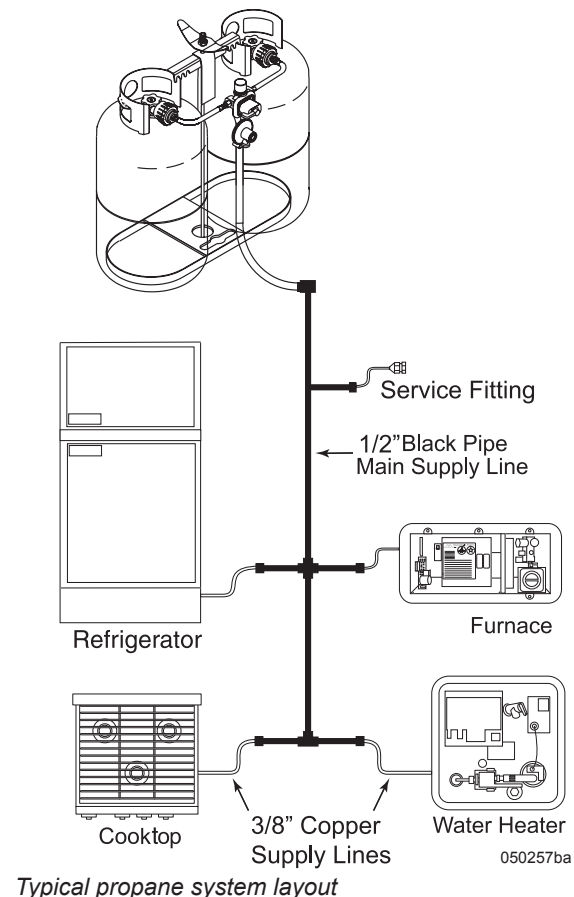
**Only a qualified RV service technician should complete replacement of propane components.**

### Additional suggested maintenance:

After performing extensive testing the manufacturer of the flexible propane supply hoses has determined that the hoses be replaced every ten (10) years as the failure rate may increase after this period of time. The recreational vehicle manufacturer recommends following this guideline to assure continued safety and dependable use.

## PROPANE DISTRIBUTION LINES

A primary manifold black steel pipe running throughout the recreational vehicle distributes propane to secondary lines. All secondary lines leading to propane appliances are made of copper tubing with flared fittings. If any line becomes damaged, do not attempt to splice it. Always run a new line. Propane distribution work should be performed by an authorized dealer or an authorized service technician.



When removing or servicing any propane appliance, manually close the primary shut-off valves located on the propane tanks. This will prevent dangerous propane leakage that could result in an explosion and possible serious injury. If a propane leak is suspected, get the system inspected and repaired by a qualified service technician as soon as possible.

## PROPANE CONSUMPTION

Each gallon of propane produces 91,502 BTU's of heat. Total consumption depends on the rate of usage by each appliance and the operating time. The stove and heating systems typically use the most propane. In sub-freezing temperatures and high winds, propane consumption by the furnace can be very high. Check the tank level often in cold weather.

### Determine Fuel Consumption:

To determine about how many hours a propane appliance will operate on one gallon of propane, use the following formula:

- Propane appliances are rated in Input BTU (British Thermal Units). The rating is usually stamped or printed on tag affixed to the appliance.
- One gallon of propane produces 91,502 BTU's.
- Divide the amount of BTU's of one gallon of propane (91,502) by the rating on the appliance.

This formula can be useful when trying to determine the approximate length of time a tank of propane will last. Generally, propane appliances do not operate continuously. An example would be the typical cycling of the furnace or water heater.

### Determining How Long a Tank of Propane Will Last:

- Combine the BTU input totals of all appliances and the approximate length of time these appliances operate per day.
- Multiply the number of liquid gallons in the propane tank by 91,502.
- Divide the total BTU's of the propane tank by the total number of BTU's the appliances consume. This equals the approximate number in hours of operation before refueling.

### WARNING:

**Propane is highly volatile and extremely explosive. Never use matches or open flame to test for leaks. Use only approved propane leak testing solution to test for leaks. Unapproved solutions can damage copper tubing and brass fittings. Never attempt to adjust propane regulators without the use of proper equipment. Improper propane regulator adjustment will affect the performance of propane operated appliances. Incorrect flame or explosion can occur. Only qualified technicians should perform any maintenance or repair to the propane system.**

## PROPANE SAFETY TIPS

Propane is one of the safest and most reliable fuels available on the market if handled properly. Propane has a great explosive potential if handled improperly. Danger is minimized by becoming familiar with and following a few safety precautions and by learning how to properly operate propane appliances.

Use of propane requires the responsibility to enforce extra safety measures. The recreational vehicle is equipped with many propane operated appliances because it is a convenient and efficient source of fuel. Propane appliances must be operated and maintained in accordance with the product manufacturer's instructions.

The National Propane Gas Association (NPGA) has a special service program offered called GAS® (Gas Appliance System) Check. The GAS® Check program is aimed at educating users in the association about the convenience of propane use with safety and peace of mind. For information on the NPGA Gas® Check program, call (202) 466-7200 or visit [www.npga.org](http://www.npga.org).

**Propane Tanks and Cylinders:** An alloy steel two-piece welded and brazed tank is used on all towable products. The marking on the collar, DOT 4BA240, identifies the DOT specifications and service pressure. Other pertinent information included on the collar is the water capacity (WC) and the tare weight (TW), both of which are measured in pounds, and the Manufacture date (one of the most important items). There is a required 10 year re-qualification. The final piece of information is for the Dip Tube (DT) length. This is part of the overfill protection and maximum liquid allowance in the cylinder.

#### **Maintenance and Safety Tips for the Propane Refrigerator and the Propane Furnace:**

- Have the refrigerator, furnace and venting annually inspected by an authorized service center.
- Before firing up the refrigerator, or using the furnace for the first time each season, have the venting system checked for blockage. Insects may have built nests that will obstruct flow. At the first indication of incomplete combustion (yellow flame instead of a blue flame or soot is present), contact a service technician immediately. Improper combustion can cause carbon monoxide buildup, which is potentially fatal!

#### **Maintenance and Safety Tips for the Propane Range and Oven:**

- Burner flame should be a blue color, indicating complete combustion. If not, have the range serviced by a qualified technician.
- Do not cover the oven bottom with foil. Air circulation will be restricted.
- Never use propane range or oven for heating purposes.
- Always have pot handles turned inward.
- Ensure children understand never to turn or play with the knobs on the front of the range.

#### **Maintenance and Safety Tips for the Propane Water Heater:**

- Keep flammable substances away from the water heater. **Do not** store items close to heater as this may block the airflow the water heater needs to operate properly.
- At the first indication of incomplete combustion (yellow flame instead of a blue flame or soot is present), call a service technician immediately. Improper combustion can cause carbon monoxide buildup, which is potentially fatal!



# House Electrical

## Section 8



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## ELECTRICAL INTRODUCTION

This section contains guidelines, procedures and information that will assist in understanding the domestic electrical system and the operation of various components. Refer to the OEM manuals included in the Owner's Information File for their respective, in-depth component operating instructions.

### **WARNING:**

**The electrical system is engineered and tested for complete safety. Circuit breakers and fuses protect electrical circuits from overloading. If modifications or additions to the electrical system are planned, it is recommended to consult an authorized RV technician for assistance to ensure continued integrity and safety of the electrical system. Any modifications may void the warranty.**

### **WARNING:**

**Disconnect the 120 Volt AC electrical shore cord and negative terminal from the 12 Volt DC battery before working on the electrical system. Remove rings, watch bands or other metal jewelry before working on electrical circuits or around batteries. Use caution when using metal tools. If a tool contacts a battery terminal, or metal connected to the battery terminal, a short circuit could occur and cause personal injury, explosion, or fire.**

### **CAUTION:**

**Before hooking up shore power, verify that proper voltage and ground protection are present. After hooking up to shore power, verify that voltage and ground protection are present in the recreational vehicle.**

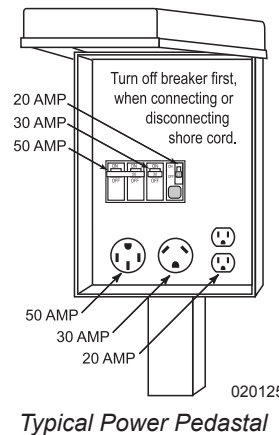
### **WARNING:**

**Water is electrically conductive. DO NOT use any electrically powered item or outlet that may be exposed to a water source. Such use can result in a serious shock causing injury or death.**

### **Shore Power**

The recreational vehicle is equipped with a shore power cord. The shore power cord connects the recreational vehicle to outside electrical services. Shore power service is the most efficient source of electrical power.

The shore power cord is rated at 30 Amp 120 Volt. Many facilities are equipped with 50 Amp 240 Volt AC power. Electrical adapters will be required to allow a proper and safe connection to the electrical service supply if connecting to anything other than 30 amp 120 Volt AC.



### **AC System - 120 Volt AC**

The recreational vehicle is designed with a 30 Amp 120 Volt AC electrical system with a UL listed power cord, a UL listed circuit breaker panel and a UL listed power converter. If 30 amp service is available, all that is necessary is to connect the recreational vehicle to the shore power source using the supplied shore power cord. The other end of the shore power cord plugs into an outlet on the recreational vehicle.

### **NOTE:**

**If other than 30 amp service is available, electrical adapters are required and power consumption must be reduced if connected to less than 30 amp service.**

### **DC Systems - 12 Volt**

A majority of lighting and appliances are designed to operate from 12 Volt DC (direct current) power, which is why the battery plays an important role in the function of the recreational vehicle. Keep the 12 Volt DC system in working order. These systems, with incorporated electronics, are voltage sensitive. Some items can be damaged if voltage is not maintained within the designed specifications.

### **SHORE POWER HOOK-UP**

The power requirement for the recreational vehicle is 30 Amp 120 Volt AC single phase. However, the recreational can be operated from 20 Amp 120 Volt AC, but with limited capacity.

### **CAUTION:**

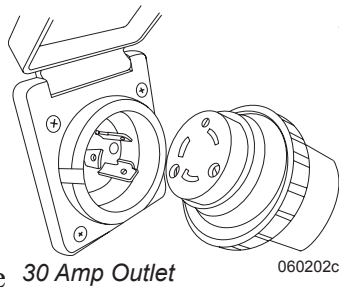
**Avoid flash damage to the electrical system contacts. Before hooking up to shore power, make sure all the appliances are off.**

### **Plugging in the Shore Cord**

- Locate the shore power cord.
- If connecting to other than 30 amp service, install the proper electrical adapters to the shore cord.

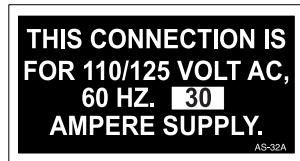


- To prevent accidental shock and flashing of electrical contacts, always turn off the shore power breaker at power supply outlet before connecting or disconnecting the shore cord.
- Make the connection to the outlet on the recreational vehicle. Screw on lock ring to support the connection.
- Plug in shore power cord to the shore power outlet then turn the breaker on.

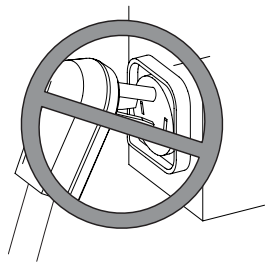


30 Amp Outlet

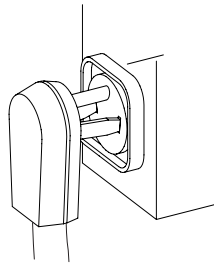
060202c



060203b



Incorrect Method  
30 Amp Shore Plug



Correct Method  
060212b

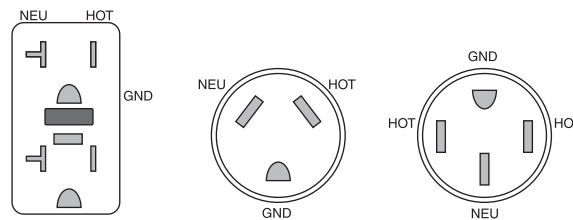
**WARNING:**

Keep fingers away from metal contacts of the shore plug end. Avoid standing in water when making electrical connections. Serious electrical shock and personal injury can occur. To avoid the risk of an electrical shock, turn the circuit breaker off for the power supply outlet before making the shore power connection.

**Power Supply**

Different amperage outlets vary greatly in the amount of available current.

- The continuous amount of current through a breaker or fuse is only 80% of its rated capacity.
- 30 amp shore power service is limited to 24 continuous amps. 20 amp shore service is limited to 16 continuous amps.
- 50 Amp 240 Volt AC shore power service consists of two power supply conductors (120 volts AC each), a neutral and a safety ground. The 50 amp breaker limits each power supply conductor to no more than a short-term maximum of 50 amps for each conductor. The 50 Amp 240 Volt service actually provides 80 continuous amps.
- Shore power service less than 50 amps consists of one power supply conductor, a neutral and a safety ground.



15-20 AMP  
120 VOLT

30 AMP  
120 VOLT

50 AMP  
220 VOLT

060121

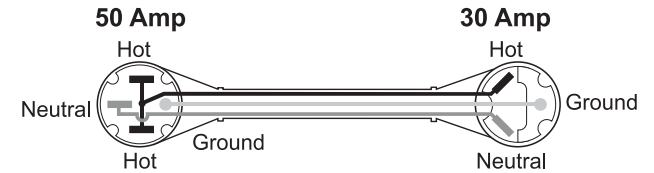
The three most common types of outlets

**CAUTION:**

Avoid the risk of electrical shock or component damage by disconnecting from shore power during electrical storm activity.

**Electrical Adapters**

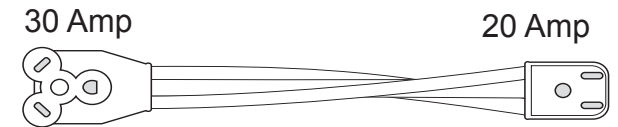
There are many different electrical adapters available to suit a variety of needs. Only UL approved adapters should be used.



50 amp to 30 amp adapter

060164

The most common adapter is a 50-30 amp adapter. This type of connector adapts the 50 amp shore cord to a 30 amp shore power outlet. Always install the adapter to the cord prior to making the connection to the outlet.



30 amp to 20 amp Adapter

060174

Another common adapter is a 30-20 amp adapter. This type of connector adapts the 30 amp shore cord to a 20 amp shore power outlet.

**CAUTION:**

If shore power service is limited to 15 or 20 amps, use of light duty extension cords and electrical adapters creates voltage loss through the cord and at each electrical connection. Line voltage loss and resistance at each electrical connection can be a hazardous combination. Damage to sensitive electronic equipment may result!

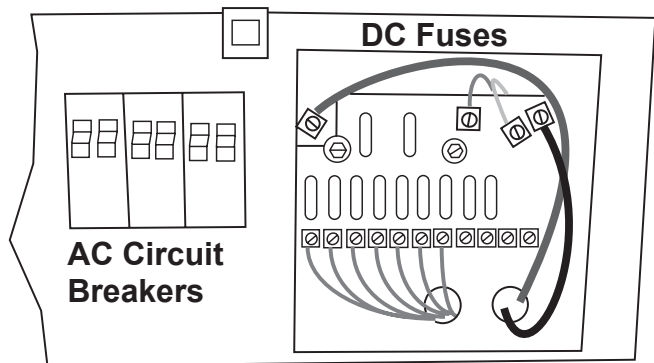
### Disconnecting the Shore Cord:

- Turn off all AC appliances.
- Turn off the shore power breaker. This will prevent accidental shock and flashing of electrical contact when disconnecting.
- Grasp housing of electrical cord without touching electrical contacts, and work plug out and away from socket.
- Straighten and clean cord then store in compartment.

### LOAD CENTER

The recreational vehicle is equipped with a 30 Amp 120 Volt AC load center. The load center contains both AC circuit breakers and DC fuses as well as a power converter.

Shore power goes to the Main breaker. The main breaker provides power to all individual branch circuit breakers. DC fuses supply power to individual circuits for interior lighting or the furnace for example. Refer to the panel labels for specific circuit assignments.



Typical Load Center

060182ba

### WARNING:

**This panel contains high voltage that can cause serious injury or death. Before beginning any work or testing procedures involving the electric panels or any of the branch circuits, be sure to unplug the recreational vehicle from shore power. Certain testing procedures can require the AC power to be on. Only qualified technicians with electrical backgrounds should attempt any testing or repair procedures.**

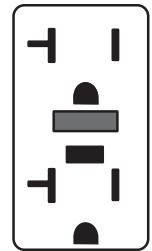
Branch circuits supply AC power to the different items or “loads.” An electrical load is any item or device that uses current when supplied with an electromotive force. Should a breaker “trip” from an over-current condition, or from a shorted circuit, the load to which the breaker is supplying the electromotive force should be reviewed or disconnected to determine the cause of the trip. If no cause is found, or not readily apparent, reset the breaker by toggling the breaker to the Off position, then back to On. Should the breaker trip again after the load is reapplied, it may indicate a fault with that particular load. **Do not** continue to reset breaker until the problem is diagnosed and corrected.

### WARNING:

**If a fuse blows, replace the fuse with same amperage rating and type. Installing a higher amperage fuse can damage the wiring or the item the fuse is protecting or may cause a fire. If the fuse repeatedly blows after replacing, do not continue to replace it. Have the problem diagnosed and corrected by a qualified technician.**

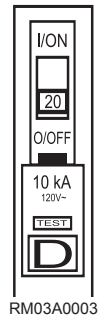
### GFCI Breakers & Outlets

A Ground Fault Circuit Interrupter (GFCI) can be found in two different types of applications. One type is incorporated in a breaker used in 120 Volt AC breaker panels; the other is incorporated in an outlet.



060072

The GFCI, whether it is a breaker or an outlet, offers two types of protection. One type of protection is from over-current or shorts to guard against hazardous ground fault currents that can result in injury or death. Ground fault currents are currents that flow from the “hot” or power terminal through a person to the ground. **For example:** touching a faulty appliance while making contact with an electrical ground such as a water fixture or the earth.



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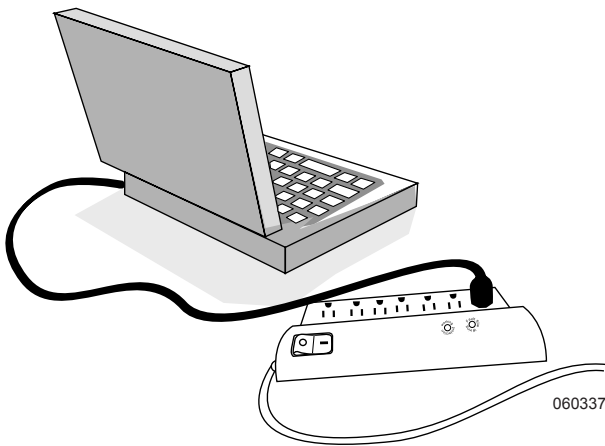
GFCI Breaker

The GFCI offers protection against the type of shock that can result from faulty insulation, wet wiring from inside an appliance, or any device or equipment plugged in or wired to that circuit. The ground fault portion of the outlet or breaker uses sensitive electronics inside the outlet or breaker to detect a ground fault problem. The electronics monitor the normal current of power flowing to the hot (black) wire through the load (eg. a light bulb or appliance) and coming back on the neutral (white) wire. If a small amount of current comes back on the safety ground wire, the electronics will trip the breaker or outlet, stopping the flow of electricity.

The amount of current it takes to trip the device from a ground fault varies slightly from the different outlet or breaker manufacturer (approximately 4 to 6 milliamps or less).

**NOTE:**  
One milliamp is 1/1000 of one Amp.

Electrical shocks resulting from ground faults can be felt, but such a shock is considerably less than one without ground fault protection. People with medical conditions that make them susceptible to shock can still be seriously injured. A GFCI outlet or breaker will not protect against shock from a normal current flow. **For example:** a shock from touching both metal prongs of an electrical cord or appliance while plugging it in.



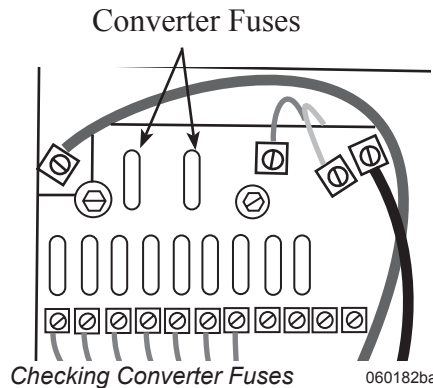
**CAUTION:**  
GFCI outlets do not protect sensitive electronic equipment such as laptops from voltage surge. Plug sensitive electronic equipment into a separate surge protection device.

**NOTE:**  
Test the ground fault outlet or breaker once a month to ensure it is operating. Use the TEST button on the outlet or breaker. It should trip with an audible “click.” The breaker or outlet will not trip if AC power is not present at the device. If power is present and the device will not trip, replace it before using that circuit.

**WARNING:**  
If a breaker or outlet continually trips, do not continue to reset breaker or outlet until the problem has been identified and corrected.

### CONVERTER - 55 AMP

The power converter provides filtered 12 Volt DC power to the lighting and appliance circuits. The converter charges and maintains the battery. The power converter is built into the load center. There are some tests that can be performed to ensure the power converter is functioning properly.



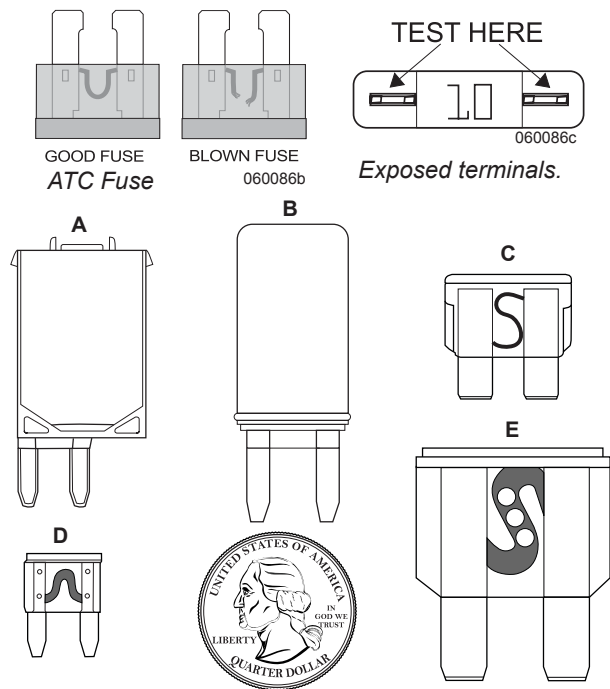
- Output on the fuse terminals should read 13.6 Volts DC +/- .3 Volts.
- Inspect the fuses to ensure they are not blown.
- Power requirements for the converter is 120 Volts AC.

If the converter output is correct, but the battery is not charging, check the connections on the battery for corrosion or an “open” wire between the converter and battery.

If there is no interior power, the converter fuses may be blown. If the converter fuses are blown, the battery may have been connected in reverse polarity. Correct as necessary. If the converter has AC power and the fuses are good but there is no output from the converter, the converter may be bad. Have a qualified technician diagnose and repair the problem.

### Fuses

The 12 Volt DC fuses are the standard automotive type. When a fuse is “blown”, the wire in middle of the plastic case will be burnt. A broken, bad or “blown” fuse must be replaced with a fuse of the same rating and type. Using a fuse with a different rating or type will defeat the circuit protection provided by that fuse and could result in damage to the electrical system.



Quarter is used for size comparison of fuses. 080528e  
 A. Manual Reset Circuit Breaker D. Mini Fuse  
 B. Auto Reset Circuit Breaker E. Maxi Fuse  
 C. Standard Fuse  
 Representation of various fuses and a circuit breaker.

BLADE FUSE GUIDE			
	Mini	Standard	Maxi
Black	1		
Gray	2	2	25
Violet	3	3	
Pink	4	4	
Tan	5	5	70
Brown	7 1/2	7 1/2	35
Red	10	10	50
Blue	15	15	60
Yellow	20	20	20
Clear	25	25	80
Green	30	30	30
Blue-Green	35		
Orange	40		40

Mini, Standard and Maxi fuse colors and amperage ratings

The 12 Volt DC fuses service the interior house lighting, ventilation fans, furnace and monitor panel. Fuses are color coded to indicate the rated amperage. Fuse current set points follow much of the same electrical principle as the 120 Volt AC breakers. Using 12 Volt DC as the electromotive force can make it more susceptible to outside influences, such as corrosion from weathering or oxidation.

The danger from shocks with this voltage is minimized but can still occur. A good example is when a magnetic field is generated then collapses when the power supply is cut. The result is a discharge that can reach tens of thousands of volts for a short time period. Care should be used when working with this voltage as current values can be quite high, as in the case of battery cables. Shorting a battery cable to ground with a battery at a reasonable state of charge can result in a fire or serious personal injury from a burn.

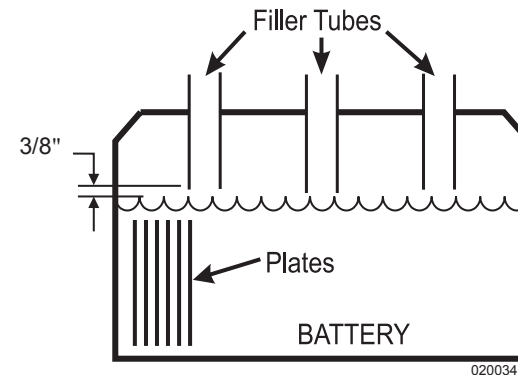
### BATTERY Deep Cycle Battery

Deep cycle batteries are designed to operate appliances and lighting then be recharged. These batteries are available in many sizes and types. The most common is a non-sealed, liquid electrolyte battery. The non-sealed type have battery caps that are removed periodically to check the level of electrolyte and acidity. Deep cycle batteries consume water. When the level in a cell is low, use only distilled water to refill the cell to the proper level.

Water consumption will vary depending on factors such as: how far the batteries are depleted before recharge, how much voltage is used when being recharged and how long the voltage is applied to charge the battery and how often this occurs.

**CAUTION:**  
**Non-sealed Liquid Lead Acid (LLA) batteries require regular maintenance. Lack of maintenance will result in a shortened battery life.**

**NOTE:**  
**Use only distilled water to refill battery cells. Tap water contains minerals that can alter battery chemistry and ruin the battery.**



Battery State of Charge	Spec. Gravity	Voltage
100%	1.265	12.7
75%	1.225	12.4
50%	1.190	12.2
25%	1.155	12.0
Discharged	1.120	11.9 or Less

NOTE: The distilled water level in battery should be 3/8" below the filler tube.

## Battery Maintenance

Check the battery electrolyte level at least once a month. Check the level sooner if the battery is frequently used. The level should be above the top of the plates, but not overfull. Most batteries have a plastic cup or well.

The proper electrolyte is about 3/8" below the well to allow room for expansion while the battery is being charged. Over-filling the battery will allow the electrolyte solution to boil or gas out of the battery cap. Charging a battery with a low electrolyte level where the internal plates are not covered with electrolyte will cause rapid water loss. This process may take only a matter of hours. If this has happened, the battery is more than likely damaged. Adding distilled water at this point will not undo the damage.

Keep the top of the battery clean. The accumulation of electrolyte and dirt may permit small amounts of current to flow between the terminals which can drain the battery.

Check the battery connections for tightness and corrosion. If any corrosion is found, disconnect the cables (make a diagram of the battery cable locations) and carefully clean connections with a mild solution of baking soda and water.

Aerosol products are also available that will help neutralize corrosion. **Do not** allow the any solution to enter the battery as this will damage the electrolyte balance. Flush with tap water to rinse the top of the battery area when done. Hook the cables back to the battery. Coat the terminals with petroleum jelly or an anti-corrosive grease. Replace plugs that are cracked or missing.

### **WARNING:**

**Liquid lead acid batteries produce hydrogen gas while charging. Hydrogen gas is highly flammable. Do not smoke around batteries. Extinguish all flames in the area. Hydrogen gas can explode resulting in fire, personal injury, property damage or death.**

### **CAUTION:**

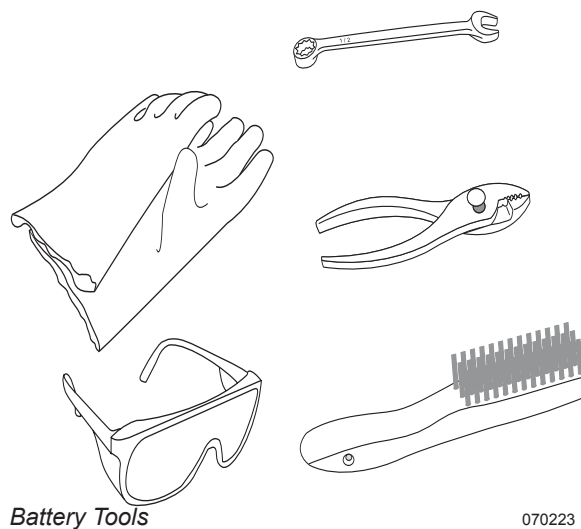
**Many types of petroleum based products or battery by-products can damage the paint finish. If the chemicals come in contact with painted surfaces, immediately wash with a mild automotive detergent and clear water.**

### **CAUTION:**

**Always wear safety glasses when servicing the battery.**

### **Battery Tools:**

A few simple hand tools are required to work on the batteries and should be kept aside for working on batteries only.



Battery Tools

070223

- Wear old clothes. Clothing is easily damaged when in contact with batteries.
- Wear thick rubber gloves that are solvent and thinner proof.
- Keep a 1/2" box-end wrench, wire brush and pair of adjustable pliers separate from other tools.

### **WARNING:**

**Sulfuric acid in the batteries can cause severe injury or death. Sulfuric acid can cause permanent damage to eyes, burn skin and eat holes in clothing. Always wear splash-proof safety goggles when working around the battery. If the battery electrolyte is splashed in the eyes, or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous splattering of electrolyte.**

### **Safety Precautions:**

Working on batteries requires a few safety procedures:

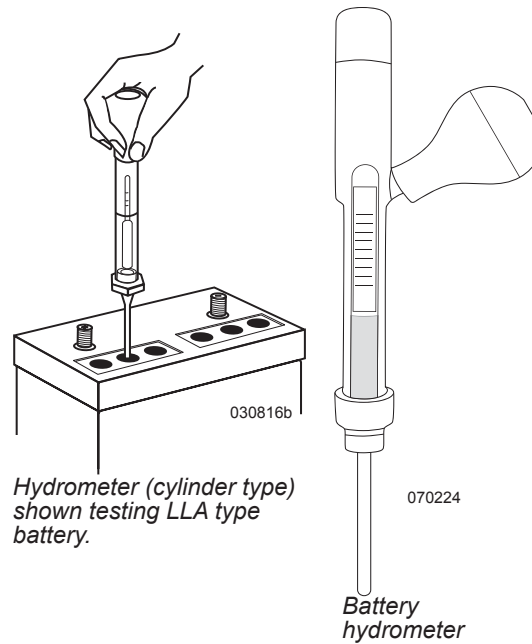
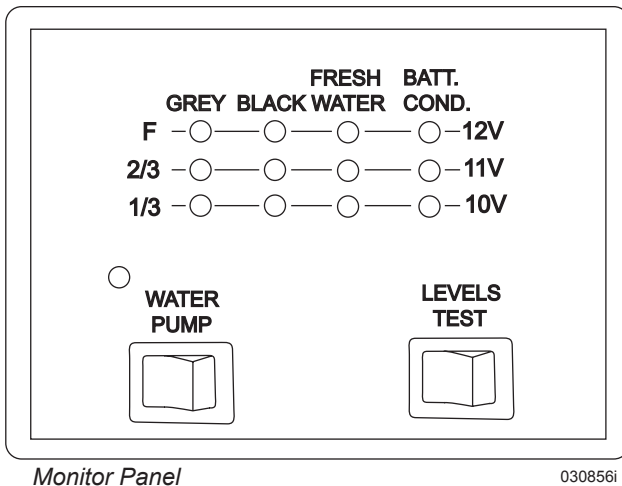
- Never short battery terminals or cables with anything metallic to "test" batteries for power.
- Wear safety glasses. Even a small amount of corrosion or acid can be very painful and harmful to the eyes.

- When wire brushing terminals, work the brush in one direction away from you. Avoid contacting opposite polarity terminals. Avoid breathing the powder. A particle mask can be helpful.

Before performing major maintenance procedures, draw a diagram of how the batteries fit in the tray and the relative location of the positive and negative terminals. Draw a diagram of cable routing, polarity and how the cables attach to the batteries. Mark all cables positive and negative respectively. One misplaced cable can have disastrous results. Before removing any cables, stop all charging or discharging current.

### Testing the Battery

A battery can be tested and/or monitored several ways. The monitor panel will indicate battery voltage providing an approximate indication of the state of charge of the battery.



The most accurate method is to test the electrolyte solution with a battery hydrometer. Two main styles of battery hydrometers are available; one type is a cylinder with graduation marks (preferred), the other uses a cylinder with floating balls. Hydrometers can be purchased from most auto parts stores.

The hydrometer tests the battery's electrolyte solution measured in specific gravity. The electrolyte solution is a mixture of distilled water and sulfuric acid. Distilled water has a specific gravity reading of 1,000. The hydrometer is calibrated to this mark at 80° F. Pure sulfuric acid has a specific gravity of 1,840. The acid is 1.84 times heavier than water. The electrolyte solution is about 64% water to 36% acid (fully charged battery). A fully charged battery at 80° F., has a specific gravity reading of 1265 per cell.

Hydrometers with cylinder graduation are graphed and the exact state of specific gravity can be determined.

Draw the electrolyte solution from a battery cell into the hydrometer. Note the reading for that cell. Complete the same test for the rest of the cells on that battery bank. Temperature affects the hydrometer readings, the higher the electrolyte temperature, the higher the specific gravity reading.

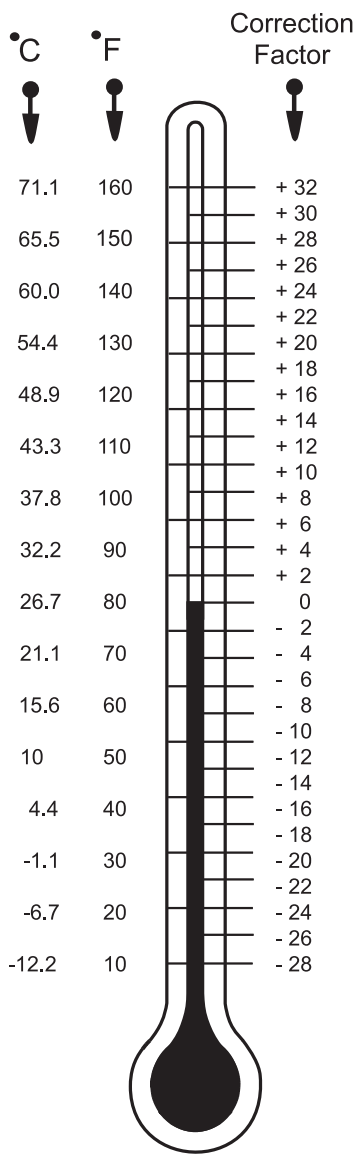
A lower ambient temperature will have a lower the specific gravity reading. Add or subtract four points for each 10° variance from the 80° F. chart. Readings between cells should not vary more than 50 points.

Temperature and recent battery activity (charging or discharging) affect hydrometer readings. It is best to check the battery when it has been at rest for three hours, although readings taken at other times will be approximate. If one cell in a particular battery bank is at a 50% state of charge and the other cells indicate nearly fully charged, charge that battery only to see if the low cell will rise in specific gravity but at the same time do not over-charge the healthy cells.

If the specific gravity reading of the bad cell does not rise after charging, the low cell can drain the rest of the battery bank and that battery should be replaced. An accurate digital Volt meter + - .5% will also give an indicator of the battery's state of charge.

**NOTE:**

**See the chart for temperature compensation. Liquid levels should be even between the cells of the battery being tested as it will affect the accuracy of the test.**



**Temperature Compensation Chart**  
030815

**Placing a load on the Battery:**

Another test that can be performed is to place a specific load on the battery for a predetermined length of time equal to that particular battery’s rating. This machine is usually an adjustable carbon pile that can vary the load being applied to the batteries while monitoring voltage to see if they will perform to their specific rated capacities.

**Battery Amp Hours**

Deep cycle batteries are rated in amp hours (Ahrs) with the discharge occurring over an extended period of time before the battery is charged. The working range of a deep cycle battery is between 50 and 100% state of charge (SOC). Deep cycle batteries should not be cycled below 50% state of charge. Discharging a deep cycle battery below 50% state of charge shortens the life of the battery.

Deep cycle batteries use an amp hour rating that is usually calculated over a 20 hour discharge interval. For example: A deep cycle battery with a rated capacity of 100 Ahrs. is designed to release current at the rate of 5 amps per hour. Multiply a 5 amp load over a 20 hour discharge period equals the rated 100 Ahr. capacity.

These discharge figures are calculated with the battery starting at 100% state of charge with the battery at 80° F when the discharge cycle begins. However, increasing the discharge load applied to the battery from 5 amps to 10 amps on a 100 Ahr battery does not yield ten hours of discharge time. This is due to the internal reactions which occur when a battery is discharging.

Actual discharge time for a 10 amp load may be closer to eight hours of discharge time. Increasing the load applied to the battery to 20 amps will not yield five hours discharge time but may be less than three hours.

**How long will the batteries last?**

Conduct this eight-hour test to determine how long your particular battery will operate before dropping below 50% state of charge.

1. Before beginning the test, be sure the battery is at 100% charge by verifying with a hydrometer or an accurate voltmeter.
2. Turn on three lights. Switch refrigerator operation to propane.
3. After the eight-hour period, turn off the lights and refrigerator. Allow the battery electrolyte to stabilize for at least one to three hours.
4. Test the battery again with a hydrometer or voltmeter.

## MAINTENANCE RECORD

After scheduled services are performed, record the date and where service was performed. In addition, retain all maintenance receipts. The owner information file is a convenient place to store receipts.

BATTERY RECORD						
MAKE	TYPE	DATE INSTALLED	REPAIRS	DATE REPLACED	SERVICE	
					MONTHS	MILES

TIRE RECORD							
MAKE	TYPE	PLY	DATE INSTALLED	REPAIRS	DATE REPLACED	SERVICE	
						MONTHS	MILES



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