

WARRANTY - LIMITED: CAMELOT 2006. 1
WARRANTY - LIMITED: 2006 ROADMASTER CHASSIS. . . . 5
WARRANTY INFORMATION FILE.10

WARRANTY - LIMITED: CAMELOT 2006

WHAT THE PERIOD OF COVERAGE IS:

If you use your Monaco® motorhome only for recreational travel and family camping purposes, the Limited Warranty provided by Monaco (“Warrantor”) covers your new motorhome when sold by an authorized dealer, for twelve (12) months from the original retail purchase date or the first 24,000 miles of use, whichever occurs first. However, the Limited Warranty provided by Warrantor covers the steel or aluminum frame structure of the sidewalls (excluding slide outs), roof, and rear and front walls for sixty (60) months from the original retail purchase date or the first 50,000 miles of use, whichever occurs first.

If you use your motorhome for any rental, commercial or business purposes whatsoever, the Limited Warranty provided by Warrantor covers your new motorhome when sold by an authorized dealer for ninety (90) days from the original retail purchase date or the first 24,000 miles of use, whichever occurs first. In addition, the Limited Warranty provided by Warrantor covers the steel or aluminum frame structure of the sidewalls (excluding slide outs), roof, and rear and front walls for twelve (12) months from the original retail purchase date or the first 24,000 miles of use, whichever occurs first. A conclusive presumption that your motorhome has been used for commercial and/or business purposes arises if you have filed a federal or state tax form claiming any business tax benefit related to your ownership of the motorhome.

The above Limited Warranty coverage applies to all owners, including subsequent owners, of the motorhome. However, a subsequent owner must submit a warranty transfer form by filing the form through an authorized Monaco dealer. A subsequent owner’s warranty coverage period is the remaining balance of the warranty coverage period the prior owner was entitled to under this Limited Warranty. Warranty transfer forms can be obtained by contacting the Customer Relations Department. There is no charge for the transfer.

Limitations 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 MOTORHOME 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 defects in the manufacture of your motorhome and defects in materials used to manufacture your motorhome. "Defect" means the failure of the motorhome and/or the materials used to assemble the motorhome to conform to Warrantor's design and manufacturing specification and tolerances. Also see the section "What the Warranty Does Not Cover" set out below.

What We Will Do to Correct Problems

Warrantor will 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 Motorhome 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 excluded from coverage shall be considered "good will" repairs, which shall not alter the express terms of this limited warranty.

Warrantor may use new and/or remanufactured parts and/or components of substantially equal quality to complete any repair.

Defects 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 motorhome to the selling dealer or on the selling dealer's lot. Normally, any such defect or damage is 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 defect or damage when you take delivery of the motorhome, you must notify your dealer or Warrantor within five days of the date of purchase to have repairs performed to the defect at no cost to you as provided by this Limited Warranty.

If either three or more unsuccessful repair attempts have been made to correct any covered defect that you believe substantially impairs the value, use or safety of your motorhome or repairs to any covered defect(s), which you believe substantially impairs the value, use or safety of your motorhome, have taken 30 or more days to complete, 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 exercising a final repair attempt for the purpose of performing a successful repair to the identified defect(s).

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 and repair of your motorhome. 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 motorhome (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
91320 Coburg Industrial Way
Coburg, Oregon
97408**

In the event the motorhome is inoperative due to malfunction of a warranted part, Warrantor will pay the cost of having the motorhome towed to the nearest authorized repair facility provided you notify Warrantor prior to incurring the towing charges to receive directions to the nearest repair facility.

Because Warrantor does not control the scheduling of service work by its 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 motorhome sold or registered outside of the United States or Canada; items which are added or changed after the motorhome 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 condensation inside the motorhome; defacing, scratching, dents and chips on any surface or fabric of the motorhome, not caused by Warrantor; routine maintenance, including by way of example wheel alignments; the automotive chassis and power train, including, by way of example the engine, drivetrain, steering and handling, braking, wheel balance, muffler, tires, tubes, batteries and gauges; appliances and components covered by their own manufacturer's warranty including, by way of example the microwave, refrigerator, ice maker, stove, oven, generator, roof air conditioners, hydraulic jacks, VCR, television(s), water heater, furnace, stereo, radio, compact disc player, washer, dryer, inverter and cellular phone; or flaking, peeling and chips or other defects or damage in or to the exterior or finish caused by rocks or other road hazards, the environment including airborne pollutants, salt, tree sap and hail. Component part and appliance manufacturers issue limited warranties covering those portions of the motorhome 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 Motorhome.

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, overloading in excess of rated capacities, and odometer tampering shall discharge Warrantor from any express or implied warranty obligation to repair any resulting defect.

Disclaimer of Consequential & Incidental Damages

THE ORIGINAL PURCHASER OF THE MOTORHOME AND ANY PERSON TO WHOM THE MOTORHOME IS TRANSFERRED, AND ANY PERSON WHO IS AN INTENDED OR UNINTENDED USER OR BENEFICIARY OF THE MOTORHOME, SHALL NOT BE ENTITLED TO RECOVER FROM WARRANTOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE MOTORHOME. 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.

THESE WARRANTIES ARE NOT INTENDED TO “EXTEND TO FUTURE PERFORMANCE.” ANY ACTION TO ENFORCE THESE EXPRESS OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN NINETY (90) DAYS AFTER THE EXPIRATION OF THE ONE YEAR WARRANTY COVERAGE PERIOD DESIGNATED ABOVE. IF YOU USE YOUR MOTOR HOME FOR COMMERCIAL OR BUSINESS PURPOSES, ANY ACTION TO ENFORCE THESE EXPRESS OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN ONE YEAR AFTER THE EXPIRATION OF THE NINETY (90) DAY WARRANTY COVERAGE PERIOD DESIGNATED ABOVE. THE PERFORMANCE OF REPAIRS SHALL NOT SUSPEND THIS LIMITATIONS PERIOD FROM EXPIRING. 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.

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WARRANTY - LIMITED: 2006 ROADMASTER CHASSIS**WHAT THE PERIOD OF COVERAGE IS:**

If you use the Roadmaster Chassis that your motorhome is mounted upon for only recreational travel and family camping purposes, the Limited Warranty provided by Roadmaster (“Warrantor”) covers your Roadmaster Chassis for thirty-six (36) months from the original retail purchase date or the first 36,000 miles of use, whichever occurs first.

If you use the Roadmaster Chassis that your motorhome is mounted upon for any rental, commercial or business purposes whatsoever, the Limited Warranty provided by Warrantor covers your new Roadmaster Chassis for Ninety (90) days from the original retail purchase date of the motorhome or the first 24,000 miles of use, whichever occurs first. A conclusive presumption that the Roadmaster Chassis has been used for commercial and/or business purposes arises if you have filed a federal or state tax form claiming any business tax benefit related to your ownership of the motorhome.

Limitations 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 ROADMASTER CHASSIS 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. Any dealer selling a motorhome assembled upon a Roadmaster Chassis 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 defects in the manufacture of the Roadmaster Chassis and defects in materials used to manufacture the Roadmaster Chassis. "Defect" means the failure of the Roadmaster Chassis and/or the materials used to assemble the Roadmaster Chassis to conform to Warrantor's design and manufacturing specification and tolerances.

What We Will Do to Correct Problems

Warrantor will 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 any such defect; and (2) you deliver the Roadmaster Chassis 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 excluded from coverage shall be considered "good will" repairs, which shall not alter the express terms of this limited warranty.

Warrantor may use new and/or remanufactured parts and/or components of substantially equal quality to complete any repairs.

Defect and/or damage to the Roadmaster Chassis may occur during manufacture at the factory, during delivery of the motorhome to the selling dealer or on the selling dealer's lot. Normally, any factory defect or damage is 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 defect or damage when you take delivery of the Roadmaster Chassis, you must notify your dealer or Warrantor within five days of the date of purchase to have repairs performed to any such defect at no cost to you as provided by this Limited Warranty.

If either three or more unsuccessful repair attempts have been made to correct any covered defect that you believe substantially impairs the value, use or safety of your motorhome or repairs to any covered defect(s), which you believe substantially impairs the value, use or safety of your motorhome, have taken 30 or more days to complete, 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 exercising a final repair attempt for the purpose of performing a successful repair to the identified defect(s).

How to Get Service

For warranty service simply contact one of Warrantor's authorized service centers for an appointment, then deliver your Roadmaster Chassis (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
91320 Coburg Industrial Way
Coburg, Oregon
97408**

In the event the Roadmaster Chassis is inoperative due to malfunction of a warranted part, Warrantor shall pay the cost of having the Roadmaster Chassis that the motorhome is mounted upon towed to the nearest authorized repair facility provided you notify Warrantor prior to incurring the towing charges to receive directions to the nearest repair facility.

Because Warrantor does not control the scheduling of service work by its 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: modifications and alterations to the Roadmaster Chassis by others; the motorhome that is mounted upon the Roadmaster Chassis, including by way of example the motorhome manufacturer's design, manufacture, assembly and/or installation of the side walls, roof, windows, flooring, electrical system, plumbing system, LP gas system, appliances and slide outs; items that are working as designed but which you are unhappy with because of the design; normal wear and usage; routine maintenance including by way of example wheel alignments; component parts covered by their own manufacturer's warranty, including by way of example the engine, transmission, tires, tubes, batteries, exhaust system and the emission control systems; and, flaking, peeling rusting and chips or other defects or damage in or to the frame and frame cross members caused by rocks or other road hazards and the environment including airborne pollutants and salt. Component part manufacturers issue limited warranties covering those portions of the Roadmaster Chassis not covered by the Limited Warranty issued by Warrantor. To learn more on what specific component parts are excluded from the Limited Warranty issued by Warrantor please contact your selling dealership or Warrantor directly or review the warranty packet inside the motorhome.

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, overloading in excess of rated capacities, and odometer tampering shall discharge Warrantor from any express or implied warranty obligation to repair any resulting defect.

Disclaimer of Consequential & Incidental Damages

THE ORIGINAL RETAIL PURCHASER OF THE ROADMASTER CHASSIS AND ANY PERSON TO WHOM THE ROADMASTER CHASSIS IS TRANSFERRED, AND ANY PERSON WHO IS AN INTENDED OR UNINTENDED USER OR BENEFICIARY OF THE ROADMASTER CHASSIS, SHALL NOT BE ENTITLED TO RECOVER FROM WARRANTOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE MOTORHOME. 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.

THESE WARRANTIES ARE NOT INTENDED TO “EXTEND TO FUTURE PERFORMANCE.” ANY ACTION TO ENFORCE THESE EXPRESS OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN NINETY (90) DAYS AFTER THE EXPIRATION OF THE ONE YEAR WARRANTY COVERAGE PERIOD DESIGNATED ABOVE. IF YOU USE YOUR ROADMASTER CHASSIS FOR COMMERCIAL OR BUSINESS PURPOSES, ANY ACTION TO ENFORCE THESE EXPRESS OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN ONE YEAR AFTER THE EXPIRATION OF THE NINETY (90) DAY WARRANTY COVERAGE PERIOD DESIGNATED ABOVE. 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.

**Roadmaster Chassis Division
Monaco Coach Corporation
91320 Coburg Industrial Way
Coburg, Oregon
97408**

WARRANTY INFORMATION FILE

In addition to this owner's manual, you will find a Warranty Information File in your unit. This file contains valuable documents about your motorhome systems and equipment. Many of the component manufacturer warranty registration cards can be found in the box. They will need to be filled out and mailed. Be sure you read and understand all the information in this file to help you 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. 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 your particular model but information contained therein can be useful.

MANUAL ADDENDUMS & TECH TIPS

www.monaco-online.com

Click on the **Monaco** logo, Place curser on **SERVICE** link and choose either **MANUAL ADDENDUMS** or **TECH TIPS** from the drop down menu.

Wood Finish

Because no two trees look alike, authentic woods vary in color and character markings such as streaks, knots and grain patterns. Since the stains may attach differently to these grain patterns, some natural light and dark areas may result. The beauty lies in these natural variations of color and grain that give each cabinet its own individual charm.

The beauty of these products is protected with a furniture-quality exterior finish. After a period of time, there may be minimal changes in the finish color as it ages in its surrounding conditions. This is an inherent characteristic of this particular finish, and the natural aging process adds to the unique appearance of the cabinetry. Due to the minor differences in tone, it may not be possible to match the finish color of existing cabinets exactly when replacing doors or adding additional cabinets at a later date.

The foregoing is not a warning. See the Limited Warranty or call (877) 466-6226 for warranty information and limitations.

CAMELOT

BY MONACO

SECTIONS

GENERAL INFORMATION ~ 1

DRIVING & SAFETY ~ 2

EXTERIOR & INTERIOR CARE ~ 3

APPLIANCES ~ 4

EQUIPMENT ~ 5

WATER SYSTEMS ~ 6

LP-GAS SYSTEMS ~ 7

ELECTRICAL SYSTEMS - HOUSE ~ 8

ELECTRICAL SYSTEMS - CHASSIS ~ 9

CHASSIS INFORMATION ~ 10

INDEX ~ PP 319

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 this 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 motorhome manufacturer reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligation.

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CAMELOT 2006

GENERAL INFORMATION — SECTION 1

SAFETY TERMS.....	15
GLOSSARY OF TERMS.....	16
REPORTING SAFETY DEFECTS.....	19
SURVEY.....	21
LIMITED WARRANTY APPLICATION/ CHANGE OF OWNER INFORMATION.....	23

SAFETY TERMS

WARNING - Information pertaining to personal safety and/or potential extensive or permanent damage to the motorhome.

CAUTION - Information pertaining to potential damage to the motorhome and/or its components.

DANGER - Information pertaining to danger or caution of potential electrical shock to person(s) or component(s), and/or risk of electrical fire to motorhome.

FLAMMABLE or **EXPLOSIVE** - Information concerning fire or explosive material pertaining to personal safety and/or protection of the motorhome and its components.

POISON - Information pertaining to safety and/or use of a poisonous substance or harmful chemical.

NOTE - Information and reminders concerning operation of motorhome and/or components.

INSPECT - Inspection of the motorhome and/or its components is required. Additional instruction may follow.

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

ASSEMBLE/REPAIR - Assembly, disassembly or installation of a component or part, and/or repair to the motorhome may be required. Assistance of Technical Support or Technician may be necessary.

INFORMATION - References to additional information regarding operation of the motorhome and/or its components found in additional sources other than the Owner's Manual. Also refers to the WARRANTY INFORMATION FILE, found within the Warranty Information Box inside the motorhome.

TIP - Information regarding helpful hints and/or suggestion for ease of operation of the motorhome and/or its components.

GLOSSARY OF TERMS

AC Electricity - Alternating current also known as household power.

Air Compressor - Pumps air to and builds air pressure in an air system.

Air Dryer - Cools, filters and dries the air delivered by an air compressor.

Air Governor - Controls the operation of the air compressor by constantly monitoring air pressure in the supply tank of the air system. The air governor initiates the unload cycle when the cut-out pressure is reached. The air governor also controls the air dryer by sending an air signal (at the beginning of the compressor unload cycle) to the control port of the air dryer, initiating the purge cycle. When this air signal is removed by the governor (at the beginning of the compressor load cycle) the purge valve closes and the drying cycle begins.

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, inverter 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 the current in amperes by the time in hours of discharge. (Example: A battery which delivers 5 amperes for 20 hours, delivers 5 amperes 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.

CCA - Cold Cranking Amperage is the amount of current a battery can deliver for 30 seconds at zero degrees F without dropping below a specified voltage, usually 10.5 volts DC.

Chassis Battery - Powers chassis 12 Volt accessories and starts engine.

Circuit - An electric circuit in the path of an electric current. A closed circuit has a complete path. An open circuit has a broken or disconnected path.

City Water - A term associated with the water supply that you hook-up to 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.

Compressor Load Cycle - The time during which the air compressor is building air pressure in an air system.

Compressor Unload Cycle - The time during which the air compressor is idling and is not building air pressure in an air system.

Curbside - This refers to the side of the motorhome which faces the curb when it is parked. Often called the door side or the passenger's 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.

Cut-In Pressure - The pressure level in the air system supply tank which triggers the compressor load cycle.

Cut-Out Pressure - The pressure level in the air system supply tank which triggers the compressor unload cycle.

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

Desiccant - A granular substance that has a high affinity for water and is used to retain moisture from the air stream flowing through the air dryer cartridge.

Direct Current (DC) - Power that is stored in a battery bank or supplied by photovoltaics, alternator, chargers and DC generators.

Drain Trap - This is a curve that is in all drains. Water is trapped in the curve and this creates a barrier so tank odors cannot escape through the drain.

Dry Camping - Camping in the motorhome when there is no city water hook-up or shore power. In other words, using only the water and power that is in the motorhome and not from another source.

Drying Cycle - The time during which the air dryer cools, filters and removes moisture from the air delivered by the air compressor. The drying cycle begins and ends the same as the compressor load cycle.

Dump Station - A site where the waste (grey) and sewage (black) tanks can be drained. In most states it is illegal to drain waste tanks anywhere other than at a dump station.

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 located in the motorhome. 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 the sink drains, the shower and the washer/dryer (if equipped) go into this tank.

House Battery - Powers 12 Volt lights and accessories inside motorhome.

LED - (Light Emitting Diode) Indicator light.

Low Point Drain - The lowest point in the plumbing. Drains are placed here so that water will drain out of the lower end of the motorhome. These drains must be closed when you fill the water tank.

OHM - A unit for measuring electrical resistances.

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

Potentiometer - A device for measuring an unknown potential difference or electromotive force.

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.

Purge - The initial blast of air (decompression) from the air dryer purge valve at the beginning of the air compressor.

Purge Cycle - The time during which the air dryer is undergoing purge and regeneration. This cycle starts at the beginning of the compressor unload cycle and normally ends well before the beginning of the compressor load cycle.

Regeneration - The mild backflow of air through the air dryer and out the purge valve that begins immediately after the purge and lasts normally 10 to 15 seconds. This backflow of air, from the air system and through the air dryer, removes moisture from the desiccant cartridge and prepares the air dryer for the next compressor load cycle.

Roadside - This refers to the side of the motorhome which faces the road when it is parked. Often called the off-door side or the driver's side.

SCA - Term for Supplemental Coolant Additive. Chemical added to coolant for diesel engines to help prevent cylinder liner pitting and internal corrosion.

Shore Line - This is the electrical cord which runs from the motorhome to the campground 120 Volt electrical supply.

Shore Line Plug - The 120 Volt outlet allows the motorhome to be hooked up to a campground facility.

Stinger - An arm attachment on a tow truck that is used to lift motorhome slightly so that it can be towed.

VIM - Vehicle Interface Module.

Volt - The unit of measure for electric potential.

Watt - The unit for measuring electrical power, i.e. the rate of doing work, in moving electrons by or against an electric potential.

Wet Cell Battery - A type of battery that uses liquid as an electrolyte. This type of battery requires periodic maintenance such as cleaning the connections and checking the electrolyte level.

REPORTING SAFETY DEFECTS

If you believe that your motorhome 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 Coach. If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of motorhomes, it may order a recall or remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer or Monaco Coach. To contact NHTSA you may call the Auto Safety Hot line toll-free at 1-888-327-4236 (TTY: 1-800-424-9135), visit their website at <http://www.safercar.gov> or write to:

NHTSA
U.S. Department of Transportation
400 Seventh Street S.W.
Washington, DC 20590

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Owner's Manual Survey

Monaco Coach 2006

Your suggestions are very important to us and we are continually striving to improve the quality of our manuals. After becoming familiar with your new recreational vehicle and the accompanying manual, please take the time to answer the following questions. When you are finished please return the survey via mail to our Technical Publications Department, or you may fax the survey to: **(541) 681-8031 Attention: Technical Publications Department**. Feel free to attach an additional page if you desire.

1. Is this your first recreational vehicle? YES / NO (circle one)
2. If no, what was your previous recreational vehicle brand/model? _____

3. Was the overall appearance and lay-out of this manual what you expected to see in your new recreational vehicle?

4. Was the information within this manual helpful in acquainting you with your new recreational vehicle? If not please address any area(s) we need to expand or improve on.

5. Were the operating instructions clearly written, and were you able to follow the steps without any difficulty?

6. Is there any additional information you would like to see incorporated within the owner's manual?

Cut Along
the Dotted
Line to Mail



NAME: _____ PHONE: (____) _____
ADDRESS: _____

SERIAL # _____

FOLD

Place
Postage
Here

**TECHNICAL PUBLICATIONS PLT. 17
MONACO COACH CORPORATION
91320 COBURG INDUSTRIAL WAY
COBURG, OR 97408**

FOLD



Cut Along
Dotted Line
to Mail

**LIMITED WARRANTY TRANSFER
APPLICATION/CHANGE OF OWNER INFORMATION**

Mail to:

**Monaco Coach Corporation
P.O. Box 465
Wakarusa, IN 46573
ATTN: Warranty Registration**

Please read terms and representations below before signing.

Submitted By:

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: (____) _____

☐

Limited Warranty Transfer

☐

Address Change

A. Current Owner Information:

Name Initial Last Name First

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

B. New Owner Information, Transfer Coverage To:

First Name Initial Last Name

(____)
Phone Number Street Address City State Zip

Date of Transfer (If Applicable) Odometer Reading at Transfer (If Applicable)

C. Signatures:

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

Terms & Representations

By your signature(s) on face side of this form, and in order to induce Monaco Coach Corporation to transfer its Limited Warranty, you represent the following:

1. That you have received and read a copy of the Limited Warranty.
2. You understand that the unit is to be used only for family camping and cross country travel on improved roads.
3. All information provided by you on face side of this form is true and correct.
4. You understand that you are purchasing a pre-owned recreational vehicle and Monaco Coach Corporation does not make any representation as to its present condition.



CAMELOT 2006

DRIVING & SAFETY — SECTION 2

DRIVING & SAFETY	27	WHEEL MOUNTING	55
Inspections.....	27	WEIGHING THE MOTORHOME	56
Familiarize Yourself.....	27	Weight Terms.....	56
Ramco Mirrors.....	27	Weight Label.....	59
Safety Seat Belts.....	28	Four Point Weighing Example.....	60
DRIVING TIPS	30	Cargo Carrying Capacity Flowchart.....	63
TRIP PREPARATION	34	Weighing Procedure Worksheet.....	64
HITCH	35	Weight Record Sheet.....	66
Using the Rear Receiver.....	35	SMOKE DETECTOR	67
Brake Control.....	36	Operation.....	67
Tow Plug Connection.....	37	Testing.....	67
REAR VIEW SYSTEM	37	Maintenance.....	67
BACKING UP THE MOTORHOME	38	Troubleshooting.....	68
SET-UP PROCEDURES	39	CARBON MONOXIDE DETECTOR	68
DRY CAMPING	40	Operation.....	69
BREAKING CAMP	41	Alarm.....	69
EMERGENCY PROCEDURES - ROADSIDE	42	Testing.....	69
OnStar® (Optional).....	43	Cleaning & Maintenance.....	70
In Case of Flat Tire.....	44	FIRE EXTINGUISHER	70
Light - Retractable.....	44	EGRESS WINDOW	71
Running Out of Fuel.....	45		
Dead Chassis Battery.....	45		
TOWING PROCEDURES	47		
Disabling the Parking Brake.....	48		
TIRES	49		
Importance of Air Pressure.....	49		
Tire Pressure Inflation Guideline.....	50		
TIRE CHART - GOODYEAR	50		
Inspecting & Pressure.....	52		
Air Pressure Checklist.....	53		
Supporting When Leveling.....	53		
Tire Vibration.....	54		
Tire Rotation.....	54		
Tread.....	54		
Storage of Tires - Long Term.....	54		

DRIVING & SAFETY

This section contains information on driving tips, emergency situations, towing, safety devices, weighing the motorhome and tires.

NOTE:

The motorhome has an electronic data recording device that may record information about direction, road speed, engine speed, brake application, steering attitude or other vehicle operating data. Data recording devices can be present in engines, transmissions, ABS (Antilock Brake Systems), or other systems affiliated with operation of the vehicle. Information from data recording devices can be examined in case of an accident. Contact the component manufacturer to learn more about these devices.

Inspections

There are significant differences between a passenger automobile and a motorhome. Always be aware of these differences when traveling. The key to safely operating a motorhome is inspection. Any defect found could result in problems on the road that may cause lost time and money. Several states require that the motorhome be inspected prior to registration. Know and observe state laws when traveling. Laws may vary from state to state. A systematic inspection conducted prior to moving the motorhome ensures nothing is overlooked and assists in familiarizing the owner with the motorhome. Prior to moving the motorhome perform a general **inspection** which includes examining the condition of the motorhome and the surrounding area for hazards. Look high and low when walking around the motorhome.

Familiarize Yourself

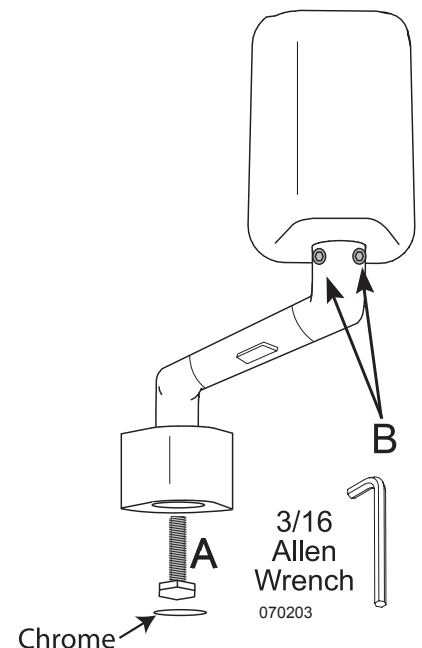
The location of the driver's seat in the motorhome is higher and farther to the left than most vehicles. This creates a different perspective of the roadway. Rely on the outside mirrors to line up with the center of the road and to check the conditions behind the motorhome. The dashboard may contain more gauges and controls than are normally found in passenger automobiles. Become familiar with the gauges and their indications before starting.

Ramco Mirrors

The mirrors requires adjusting before starting out. It is recommended to have someone assist with these procedures to prevent damage to the mirror or the coach.

Mirror Adjusting

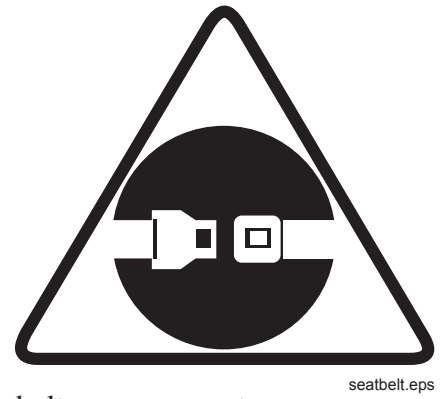
- Adjust the driver's seat to the travel position.
- Using a socket wrench, have the assistant loosen the bolt located at the base of the mirror. (See point A on the drawing.)
- Adjust the mirror so that there is a clear side view of the coach.
- Tighten the bolt once the proper adjustments are made.
- To adjust the "head" of the mirror loosen the bolt, using a socket wrench, located at the top of the arm shown on point "B." Adjust the head of the mirror to the left or right for the desired view.
- Tighten set screws once the proper adjustment is made.
- Repeat procedure for passenger side mirror.



Safety Seat Belts

All occupants must be furnished with and use seat belts while the motorhome is moving. The driver's seat, and all other seats designed to carry passengers while the motorhome is in motion, are equipped with safety seat belts. Do not occupy beds or any seats that are not equipped with a safety belt while the motorhome is in motion. Safety belts are supplied at affixed seating positions. The driver's seat must be locked in the forward facing position while motorhome is in motion. Do not use a seat belt on more than one person.

To fasten the seat belt, pull the belt out of the retractors and insert the tab into the buckle; a click will be heard when the tab locks into the buckle. Seat belt lengths automatically adjust to desired size and sitting position. Do not route belts over armrest.



WARNING:

Safety belts are supplied at affixed seating positions. Do not occupy seats not equipped with safety belts while the motorhome is in motion. Do not use a single seat belt on more than one person. Pilot and Co-pilot seats must be locked in a forward facing position with seat belts fastened while the motorhome is in motion. Avoid seat rotation while in transit.

Child Safety Seat:

Children that fit into Example 1 and Example 2 require the use of a child safety seat

In the motorhome, the child safety seat can be positioned either on the front passenger (co-pilot) seat or on the forward facing permanently mounted booth dinette seat.

WARNING:

Children must not be transported unrestrained. Infants must be placed in approved safety seats. Small children must be restrained in child safety seats. Failure to comply with these rules can lead to injury or death.

NOTE:

Individual states and Canadian provinces may have laws that can exceed the requirements described above. It is the obligation of the recreational vehicle owner to know and comply with the laws in the state or province at hand.

NOTE:

Only forward facing booth dinette seats equipped with seat belts are designed for occupancy while the motorhome is in motion.

A child safety seat is required for any child:

- **Infants:** From birth to one year, or up to 21 pounds, the child is considered an infant. A (convertible) safety seat for an infant must be secured facing rearward. The top of the head must be below the top of the safety seat. Secure safety seat harness straps at or below the shoulders. **(See Example 1.)**
- **Toddlers:** Children over one year old and 20 to 40 pounds are considered toddlers. A (convertible) safety seat for a child must be secured facing forward. The top of the head must be below the top of the safety seat. Secure safety seat harness straps at or above the shoulders. **(See Example 2.)** Most seats require top slot for forward
- **Young children:** Children ages 4 to 8 and over 40 lbs., unless over 4' 9" require a booster seat. The booster seat places the child's waist and shoulders at the proper height for the supplied safety belt to be effective. The top of the head must be below the top of the safety seat. **(See Example 2.)**



Example 1: Convertible Seat Facing to the Rear.



Example 2: High back booster seat facing forward.

CAUTION:

Installation illustrations are for reference only, and are not to be used as a guide. Refer to the safety seat manufacturer's guide. Because there are many styles of safety and booster seats, refer to the manufacturer's manual for proper installation and how to properly secure the safety or booster seat.

WARNING:

Only forward facing booth dinette seats equipped with seatbelts, and NOT located in the slide-out are designed for occupancy while the vehicle is in motion.

NOTE:

Individual states and Canadian provinces may prohibit use of a safety or booster seat in the front seat.

Seat Belt Care:

Keep the belt clean and dry. To clean, use a mild soap and lukewarm water. Never use bleach, dye or abrasive cleaners as they may weaken the belt. Inspect the belts periodically. Check for cuts, frays or loose parts. Replace any damaged parts. Do not disassemble or modify the system. Replace the belt assembly if it has been in a severe impact, even if damage is not obvious.

DRIVING TIPS

The motorhome is a complex vehicle that requires increased driving awareness because of its size and various components. Due to the motorhome length the turning radius will be much wider than that of a standard automobile. Always pay close attention to all perimeters of the motorhome: front, sides, rear, roof and undercarriage. Ensure the surrounding area is clear of obstacles. Utilize the driving mirrors to observe traffic conditions as well as the motorhome exterior: tires, bay doors, blind spots, etc. Use a push-pull method of steering, with both hands parallel on the steering wheel.

The motorhome is also heavier than an automobile with a higher center of gravity. These factors affect the reaction time of the motorhome. Swerves and sharp turns, especially performed at high speeds, could result in loss of control of the motorhome. Keep the size of the motorhome in mind and 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 of the motorhome position.

The motorhome will travel safely and comfortably at highway speed limits. However, it takes more time to reach highway speed. When passing another vehicle, allow extra time and space to complete the pass due to the added length of the motorhome. When descending a long hill, use the engine brake. The transmission and engine will help control downhill speed and can extend the service life of the brake lining. The distance required to stop the motorhome is greater than an automobile. The brakes are designed for the (GVWR) Gross Vehicle Weight Rating. Practice stopping away from traffic to get the “feel” of distance required to stop the motorhome.

When backing up, have the co-pilot stand at the roadside rear corner so the co-pilot remains visible in the roadside mirror. The co-pilot can watch for obstacles and give hand signals during the backing up process.

When traveling, make sure bridges being crossed can support the weight of the motorhome. Check the tonnage limit of the bridges before crossing. Signs should be posted at bridge entrances. Check the posted height of all overpasses or situations where overhead clearance is limited. Keep in mind that road surfaces may be repaved or packed with snow; therefore, the actual posted clearance height would not apply in such conditions.

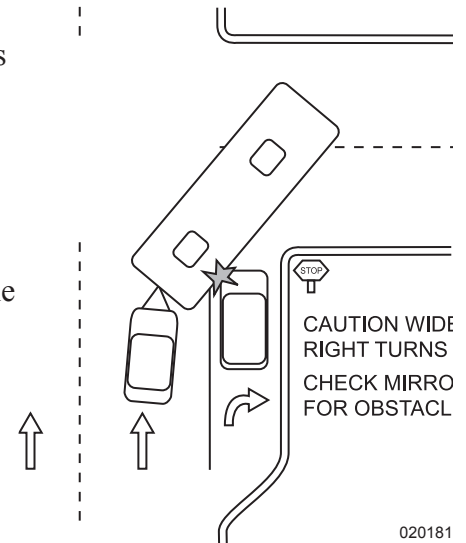
Driving Cautions:

- Avoid getting too close to the edge of the road. A soft shoulder may not support the weight of the motorhome.
- Side spacing is best maintained by keeping the motorhome centered in the driving lane.
- Driving lanes in work zones can be uneven, congested and narrower than usual.
- Be cautious of road debris which can damage the undercarriage of the motorhome or become lodged in the dual tires causing damage to the tires, wheel rims or tow car.
- Keep in consideration that posted speed signs are passenger automobile rated. Therefore, an extra awareness of the driving conditions and appropriate speed for a motorhome are necessary, 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 3 seconds of a brake application.
- Use a 4 second rule when following other vehicles at speeds under 40 mph. Use a 5 second rule when following at speeds over 40 mph.

Right Turns:

Negotiating a right hand turn in a motorhome can be difficult. Many drivers fear they cannot make the turn without entering into the other lane or jumping the curb. Here are a few tips to make a right hand turn easier:

- As the turn approaches, look into the mirror to ensure the lane to the left is clear, then move wide over to the left.
- When about to make the turn; the left rear wheel should touch the center line of the road and hips should be parallel to the roadside curb of the corner being turned. This will aid in avoiding a premature turn.
- Make the turn slowly.
- Check mirrors frequently, being aware of necessary clearance and space management of the motorhome, while negotiating the turn.



Left Turns:

- Do not start the turn until the center of the intersection is reached with hips. If there are two lanes available, take the right hand lane. A car or driver on the left hand side is easier seen.

Ascending a Grade:

When approaching an uphill grade, try to assess how steep and long it is before beginning to climb. Prepare early for long climbs.

Unlike gasoline engines, diesels do not necessarily produce more power by pressing further on the accelerator! A gasoline engine will happily work at full throttle (at least for a short period of time), but a diesel usually just wastes fuel at full throttle. The power output from a diesel engine is dependent upon the following:

- **RPM** - Every engine has a range of RPM where it produces power most efficiently.
- **Fuel/Air mixture** - At a given RPM, an engine, even with the help of a turbocharger, can only pump a given volume of air into the combustion chamber. This volume of air can combine with only so much fuel efficiently; so it follows logically that feeding more fuel to the fire will simply waste fuel.

Determine the range where the motorhome works best by driving long grades in a way that temperatures will remain stable for the duration of the climb.

IMPORTANT SAFETY TIP:

If the road speed degrades to the point where the motorhome is moving significantly below the posted speed, turn on the four-way flashers. Take advantage of pullouts if traffic is building. Once in the pullout, if there is sufficient clearance for safety, idle the engine for a while to allow the exhaust and the turbo to cool. While these are cooling, the transmission also cools. Monitor the gauges while waiting.

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 (combined weight of the motorhome and a trailer/tow car). At the crest of the hill, manually shift the transmission into a lower gear. Do not allow the motorhome to gain momentum before slowing down.

Use the exhaust brake to help maintain a slow, safe downhill speed. Located on the driver side console is an exhaust brake switch. When the exhaust brake switch is on, the exhaust brake activates when the throttle is released.

With the exhaust brake applied, road speed may increase until the transmission automatically shifts to the next higher gear. apply the brakes using moderately heavy pressure on the brake pedal to reduce speed and manually downshift to maintain a safe, slow speed. Do not “pump” the brakes as this can result in a loss of air pressure. Avoid “riding” the brakes as this can cause the brakes to overheat. Either method can result in loss of brake effectiveness or brake failure.



downhill.eps

Night Driving:

- As always, 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 while driving. They can create a glare on the windshield, decreasing visibility.
- Dim the dash lights to a comfortable level to reduce the level of glare.

Extreme Heat and Hot Weather Conditions:

- Observe all gauges frequently. Any variations from the normal conditions should be evaluated promptly.
- Check tire pressure before traveling in hot conditions. Tire air pressure increases with heat. It is not advisable to let air out of a hot tire. When the tires cool down they will return to the correct/previous tire pressure.
- Pay extra attention to hoses and belts which are more susceptible to fatigue in extreme heat.

Winter and Cold Climate Conditions:

- The motorhome should be prepared for Cold Weather Use.
- Keep speeds slow and steady. Move gradually and increase visual distance for increased reaction time.
- If road or weather conditions are treacherous find a safe stopping place and wait for conditions to improve.
- Avoid using an engine retarding device on wet or slippery surfaces. They can cause the drive wheels to skid.
- Wipers should be in good condition and the washer reservoir should have sufficient window wash fluid that has antifreeze included within it.
- Use the mirror heat to keep the mirrors clear.
- Remove any ice build-up from the entry step to avoid accidental slipping.

Wet Conditions:

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

Fuel Economy:

Driving styles, wind resistance, terrain, vehicle weight, and engine-driven accessories are some of the many factors that contribute to the fuel economy.

Guidelines to Help Increase Fuel Efficiency:

- When starting out, apply the throttle lightly and accelerate gradually, avoid using excessive throttle and accelerating quickly.
- Check the tire pressure. A low tire is not only a safety hazard, it also increases rolling resistance which increases fuel consumption.
- While operating the motorhome, keep the engine at a low to mid operating range of 1100 to 1500 RPM. This will use less fuel than operating at higher RPM.
- Avoid using full throttle when ascending a long hill. This wastes fuel and increases engine operating temperature from incomplete combustion. Manually shift to a lower gear and use less throttle. Fuel will burn more efficiently.
- Avoid extended idling to warm-up the engine. Start the engine and wait long enough for normal oil pressure to register. Engage the high idle feature until the engine coolant temperature gauge raises. The engine is now ready for travel. Whenever coolant temperature is below 160° F (as in an idling engine) incomplete combustion occurs. This causes carbon buildup and raw fuel will wash the lubricating oil from the cylinder walls diluting the crankcase oil.
- Excessive idling (more than 15 or 20 minutes) can clog fuel injectors and may eventually cause piston rings and valves to stick.
- Operate the transmission with the **MODE** function set to **Economy** whenever possible; this allows for earlier shifts and enhanced fuel economy. **PERF** mode changes shift points to increase power, but it reduces fuel economy.
- Follow the maintenance schedule for the engine, transmission and chassis. Proper maintenance will lead to enhanced fuel economy, motorhome performance, and overall longevity.



Refueling:

- Truck stops are good refueling points for motorhomes.
- Check overhead clearance heights 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 hung up on the motorhome, causing body damage.
- Use of gloves is recommended for refueling. Store the gloves in the outside compartment.
- To prevent grease and fuel deposits from being tracked into the motorhome when refueling, change shoes before entering the motorhome. Store the extra pair near the entry door.

WARNING:

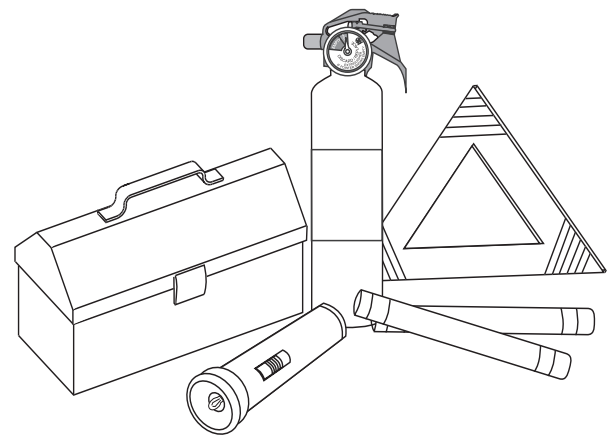
Ensure all flames are extinguished, all LP-Gas appliances are off and the primary LP-Gas valve is off before refueling to avoid the risk of fire or explosion. LP-Gas and gasoline are highly flammable and can ignite, resulting in an explosion, fire or death.

TRIP PREPARATION

The suggestions below are a general guideline when preparing for a trip.

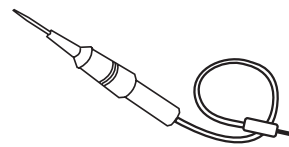
Items to Carry:

- Local, State and National Maps. A “Motor Carrier” road atlas can be useful for showing maps, refueling stations and truck repair facilities.
- Emergency road kit containing a flashlight, road flares, warning signs and a fire extinguisher.
- Potable/non-potable water hoses and a water pressure regulator.
- Assortment of termination connectors for sewage.
- Hand tools.
- 12 Volt DC test light and a 120 AC Polarity Tester. (These may be helpful when on the phone with a technician.)
- Battery hydrometer.
- Spare 12 Volt DC continuous duty solenoid (if applicable).
- An assortment of spare fuses.
- One link kit for ride height control assembly (for air suspension only).
- Spare alternator belt.
- Charge air cooler T-bolt clamp.



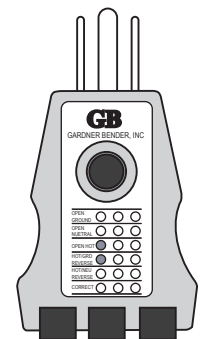
Tool Box & Emergency Road Supplies

020064b



Test Light

090333f



110 Tester

020062

Inspection:

- Inside the motorhome store and secure the heavier objects in the lower cabinets. Close and secure all cabinet doors and drawers, shower and pocket doors.
- Close roof vents and windows.
- Turn interior lighting off.
- Check operation of all exterior lights, headlamps, taillights, brake and clearance lights.
- Ensure all exterior items are stowed or secured, i.e. TV antenna, ceiling vents, awnings.
- Adjust mirrors.
- Check belts, hoses, engine and battery fluid levels, as well as dash gauges for proper operation.
- Inspect the engine, transmission per OEM manuals.
- Check all fluid levels on the chassis and generator. (See Chassis Information section and the OEM generator manual for details.)
- Check all tires for accurate pressure or damage. Look around, above and under the motorhome for obstruction or leaks. Check all exterior lighting.

INFORMATION:

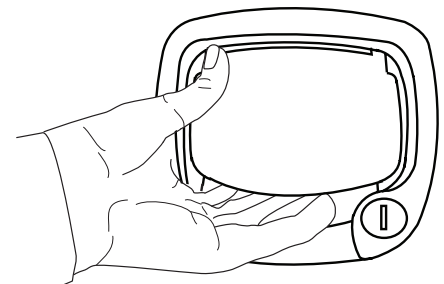
For chassis maintenance details refer to the chassis section.

CAUTION:

Open the cargo door slowly as cargo may shift forward during travel.

WARNING:

To avoid injury, never place hands near the edges of the bay door when opening or closing. Always use the latch handle. Apply pressure with the other hand just above the latch handle.



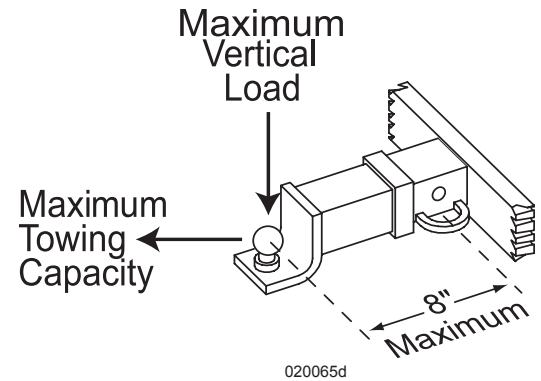
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HITCH

Using the Rear Receiver

When using the rear hitch remember that the motorhome is intended for towing light loads. The motorhome is designed to be used primarily as a recreational vehicle. Safety and durability of the hitch receiver requires proper receiver use. Avoid excessive towing loads or other misuse of the receiver. Towing affects fuel economy. Weight pushing down on the rear hitch must not exceed 10% of the hitch capacity.

It is recommended to weigh the motorhome when fully loaded to ensure proper weight distribution of the GCVW (Gross Combined Vehicle Weight). When weighing the motorhome, add all passenger weight to the GCVW total. The motorhome fully loaded, including fresh water, LP-Gas and any vehicle or trailer towed, must not exceed the GCVR.

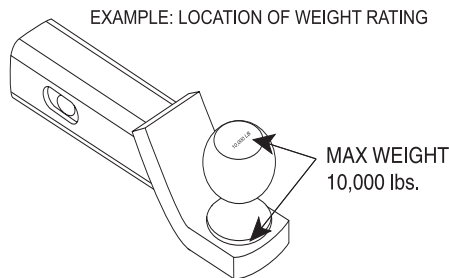


WARNING:

Most states and Canadian provinces require trailers or towed vehicles have adequate auxiliary brakes. Failure to comply with state and Canadian province requirements may result in fines and/or pose a safety hazard or accident.

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. If there are any questions, call a factory technician.



 MONACO COACH CORPORATION Coburg, Oregon Springfield, Oregon Wakarusa, Indiana Elkhart, Indiana	Do Not Cut, Weld or Modify
	Do Not Exceed Vehicle Ratings
	Maximum Towing Capacity 10,000 lbs. (4,536 Kg.)
	Maximum vertical Load 1,000 Lbs. (454 Kg.)
Any Towed Vehicle or Trailer Over 1000 lbs. (450 kg) Should Have Separate Functioning Brake System	

Tow Car or Trailer:

1. Connect a tow car or trailer to the motorhome with safety chains rated for the weight of load.
2. Make the electrical connection and perform a light check before starting a trip and at each rest stop.
3. Check the tires frequently. Flat tires on a towed vehicle cannot be detected from the motorhome while driving. A flat tire is a safety hazard and may cause extensive damage.

WARNING:

Be sure the weight ratings of the ball mount, tow ball and safety chains are equal 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, chassis or both.

Brake Control

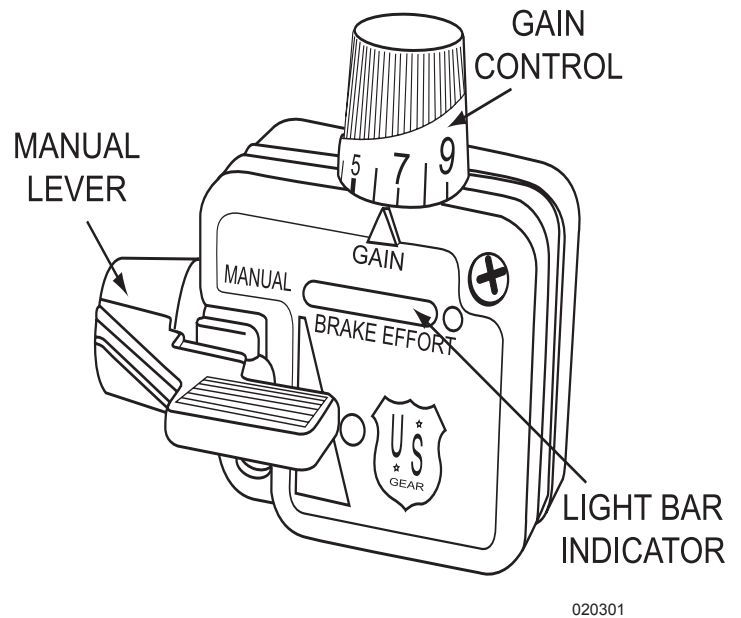
The motorhome is pre-wired and equipped with a US Gear D-Celerator brake control that has adjustable gain settings with manual brake activation. When properly configured, the system provides safe, smooth braking on the towed vehicle. A safety warning beeper sounds, should the tow harness become unplugged.

NOTE:

See the OEM US Gear D-Celerator manual for complete operating and safety instructions.

WARNING:

Most states and Canadian provinces require trailers and/or towed vehicles to have adequate auxiliary brakes. Failure to comply with these requirements may result in fines and/or pose a safety hazard, which may result in an accident.



Gain Control:

The gain control adjusts the amount of braking force applied. Adjust gain settings 1 to 9 so the towed vehicle applies sufficient braking force. Gain set too high causes towed vehicle wheels to skid. Once set, the braking force applied to the towed vehicle mirrors the amount of braking force of the motorhome. The result is progressive proportional braking. The braking action to the towed vehicle is reflected in the light bar display on the controller.

Manual Brake Activation:

The brake control is equipped with a manual lever to activate the towed vehicles brakes. Moving the lever applies increasing force to the tow vehicles brakes. This manual lever can be used at slow speed (below 10 MPH) to ensure the system is working.

CAUTION:

Due to the weight of the motorhome and power of the engine, skidding wheels on a towed car is not perceived from the cockpit of the motorhome.

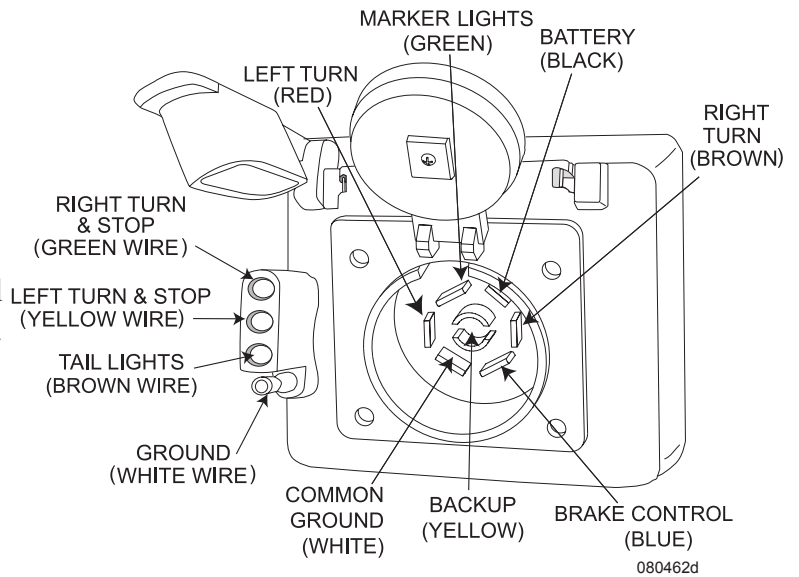
INFORMATION:

The tow brake control is only part of the U.S. Gear D-Celerator Unified Tow Brake System. Components not supplied by the motorhome manufacturer must be installed on the towed vehicle to complete system installation. These components can be obtained from National Parts at 1-877-466-6226.

Tow Plug Connection

The motorhome is pre-wired from the factory with an electrical connection for towing, located on or near the hitch receiver. Convoluted tubing protects the tow harness wires. Current draw should not exceed ten amps for each designated light circuit. Within the electrical connection is a positive terminal for use when towing a trailer equipped with a battery. The positive terminal maintains the charge of the trailer battery.

When preparing a tow plug connection, strip the wires 3/8". Twist the wire strands and place under the clip and secure the screw. Make sure there are no loose strands of wire that could short against the case or other terminals. Do not mirror image the trailer connection.

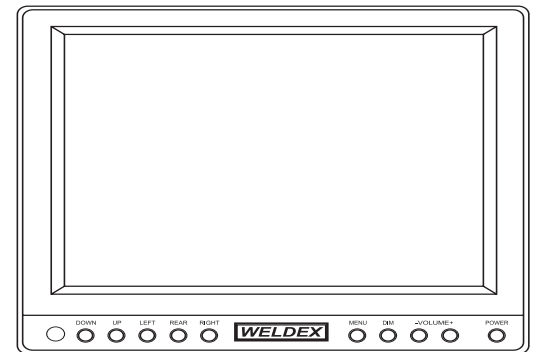


CAUTION:

Positive terminal connections of the tow plug remains live at all times. When towing a trailer equipped with a battery, unplug the electrical tow connection when parked. Failure to unplug the tow connection may result in discharged chassis batteries.

REAR VIEW SYSTEM

The motorhome is equipped with a rear vision and voice system. The rear vision system consists of an adjustable camera with a microphone and a dash mounted monitor that allows the driver to see what is behind the motorhome as well as listen to verbal guidance. The system remote control can perform all the operations available on the monitor panel.

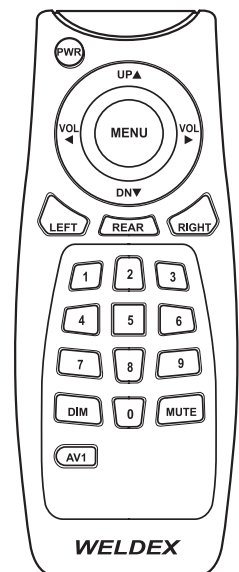


Monitor Features:

- **Power button:** Turning the main power switch **ON** allows continuous operation of the rear vision system while the ignition key is **ON**.
- **Volume buttons:** Control volume of camera system microphone.
- **Down and Up buttons:** Adjust the rear camera view up or down.
- **Left and Right buttons:** For optional 3 camera system. Manually selects the left or right camera. Blinker activation automatically selects the corresponding camera.
- **Rear button:** Manually selects the rear camera.
- **Dim button:** Adjusts monitor brightness.

INFORMATION:

For more detailed instructions see the manufacturer's manual.



BACKING UP THE MOTORHOME

When backing up, the driver (pilot) should be comfortable using the mirrors, the back-up camera and co-pilot's directions (ground guide) for assistance. Practice in a large unobstructed parking lot. The backing up process should begin while the motorhome is in forward motion. Maneuver the motorhome to allow straight alignment with the site. Aligning the motorhome with the site after the backing process begins requires considerably more room than an automobile, and may require more than one attempt. When the motorhome is properly aligned with the site, the parking area is visible in both mirrors. Use straight lines, such as road markings, as reference points when possible.

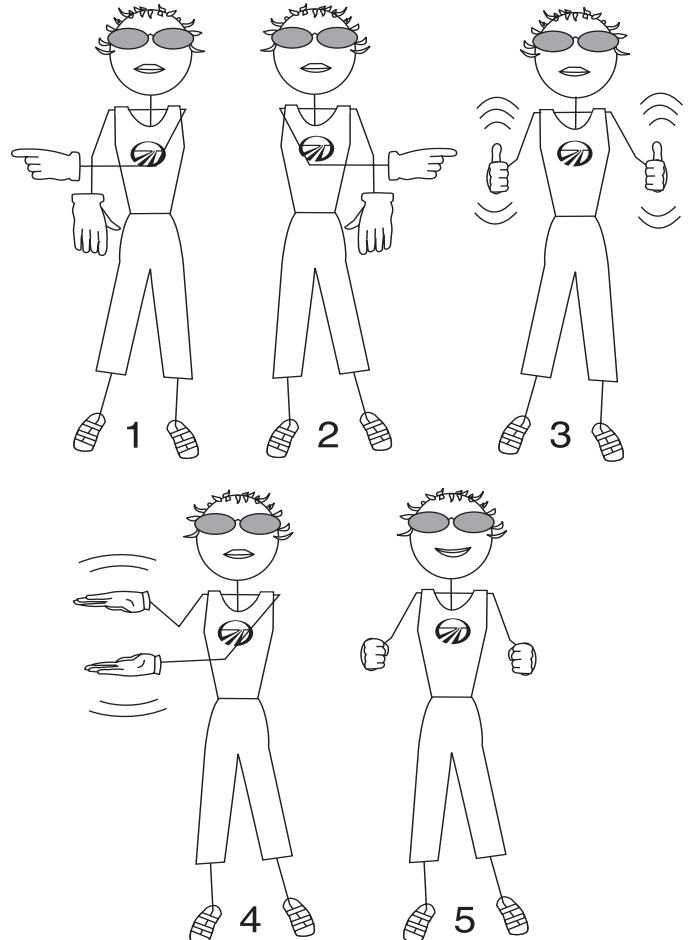
If the destination does not have "pull-through" sites, try to pick a solid, level site. If possible, pick a site located on the left side. The driver has a better field of vision by using the roadside mirror. If the site is on the right side, the driver has to use the curbside mirror for backing up, which leaves a blind spot. When a potential site is spotted, stop the motorhome before the site. Get out and observe the area for soft ground, posts, large rocks, low hanging limbs or other obstacles. If the site meets the particular criteria, prepare to back in carefully. Have the co-pilot provide guidance using the five hand signals.

When guiding the driver, the co-pilot should be located safely at the left rear corner of the motorhome, facing forward, while remaining visible in the roadside mirror at all times. The co-pilot should make a conscious effort to maintain sight of the driver through the roadside mirror as the front of the motorhome maneuvers. If the driver loses sight of the co-pilot, stop the backing up process until the co-pilot returns to view. To avoid mishaps, the co-pilot should be focused only on what the driver is doing, with brief observation moments. The driver should receive directions only from the co-pilot. If necessary, stop the backing up process to have co-pilot inspect other areas or angles of concern. Walkie-talkies aid in guidance.

When the co-pilot is guiding the driver, five clearly defined signals should be used, with one signal given at a time. Signals should be given with purpose and confidence. Directional signals are directing travel of the rear of the motorhome. The co-pilot uses steady until desired movement is completed.

The five directional signals are as follows:

1. Co-pilot holds left hand and arm horizontal; forefinger pointing right, to direct rear of motorhome to the right.
2. Co-pilot holds right hand and arm horizontal; forefinger pointing left, to direct rear of motorhome to the left.
3. Co-pilot holds 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 horizontally, hands open with palms facing one another. Start with widely separated hands gradually closing distance, in an appropriate rate to vehicle speed, to indicate amount of distance to the stopping point.
5. Closed fists and crossed arms indicates STOP.



020082

Towed Vehicles:

Towed vehicles using a tow bar or tow dolly have more than one pivoting point which makes this type of equipment not suitable for backing. If using this type of towing equipment, plan ahead. Park safely along the road and walk a distance, if necessary, to avoid a possible back up situation. Avoid putting the motorhome and tow vehicle in a backing situation. To back up this combination, completely disconnect the tow vehicle from motorhome. Trying to back up the motorhome with a tow vehicle connected will result in damage to the motorhome, tow vehicle and towing device.

CAUTION:

Tow bars or car dollies generally are made to travel in a forward direction only. Most towing equipment of this type is not designed for backing. Never attempt short back up distances with a tow bar or tow dolly. Damage to the motorhome, vehicle or towing device will result.

Backing Up Trailers:

The same rules for backing a motorhome may be applied when backing a trailer. When preparing to back a trailer into a space, maneuver the motorhome sweeping wide, then turn back to the opposite direction. This sets the motorhome and trailer in a position to maneuver the trailer into the space. When backing up a trailer, the driver may become disoriented with the direction of the steering wheel in relation to the direction of the trailer. The bottom of the steering wheel must be moved in the desired direction of the trailer. For example: If the desired direction of the trailer is left, rotate the bottom of the steering wheel left. If the trailer moves in an undesirable direction, use a short pull-up method, pulling forward just far enough to align the trailer with the space. The co-pilot should stand safely at the left rear corner of the trailer within view of the driver in the roadside mirror, using the five hand signals for guiding.

SET-UP PROCEDURES

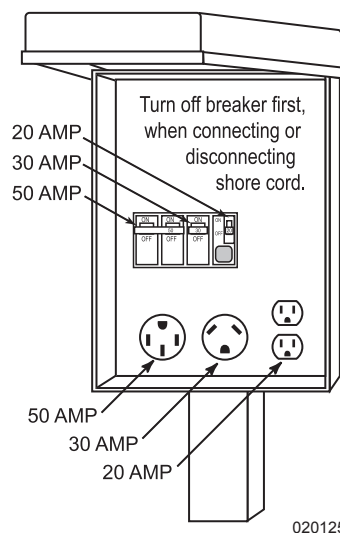
If the site for the motorhome has full hook-ups, use this reference as a guide. This checklist has information on hooking up utilities and preparing appliances for use.

1. Level the motorhome:

- Follow the procedures and guidelines for “*Leveling the Motorhome*” in **Section 10**. If the motorhome is equipped with hydraulic jacks, confirm that the parking surface will accommodate the weight placed on the jacks.

2. Hook up utilities and prepare appliances for use:

- Open the LP-Gas tank primary valve.
- Prepare the shore cord for connection. Uncoil and inspect the cord, and perform necessary cord maintenance. Install proper electrical adapters if anything other than 50 Amp service is provided. Operate electrical appliances in sequence when hooked to limited shore power service. Turn shore power circuit breaker **OFF** prior to plugging in the shore cord.
- Begin appliance operation on LP-Gas, if hooked to less than 50 Amp service, for the first 60 minutes. Switch the refrigerator operation to gas and start the Hydro-Hot (if needed). This allows time for the inverter to stabilize battery charging.



CAUTION:

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

CAUTION:

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

NOTE:

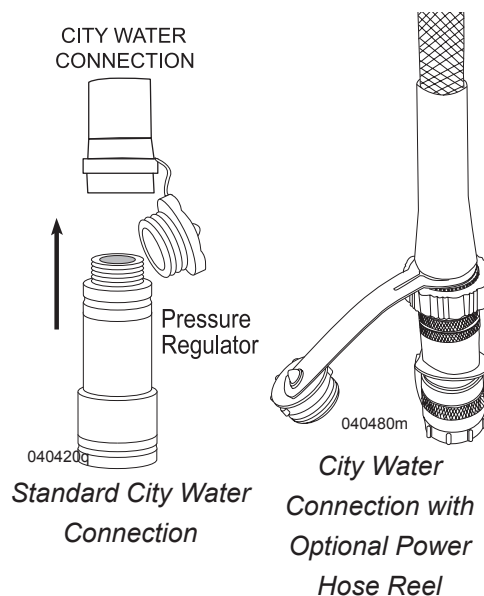
To avoid shore power overload when hooked to 30 Amp service, determine appliances current load prior to turning on appliances or using interior outlets.

- If cable service is provided, hook-up a 75 Ohm RG59 or RG6 cable to cable connection in service center.
- A phone connection port is provided in the service center. Phone utility outlets are placed throughout the motorhome, including a phone line attached to the satellite receiver for Pay-Per-View movies and events.
- Hook the potable water hose to the city water connection in the service center. Install a water pressure regulator to protect water hose from excess pressure. Turn hand valve so the pointer indicates "city water."

NOTE:

A water pressure regulator attached between the city water faucet and the potable fresh water hose will protect the hose from swelling or bursting under high city water pressure. Securing the pressure regulator to the hose with pliers will prevent the regulator from being misplaced.

- Hook-up the sewer hose. Sewer drain pipe diameters are generally either three or four inches. Proper sewer hose adapters will ensure against leaks or spillage. With the sewer hose properly connected open the grey water valve (small valve). The black water valve (large valve) remains closed until the tank is full or until time of departure.



DRY CAMPING

When choosing a location that does not have electrical, water or sewage hook ups, plan ahead and conserve resources for a successful dry camping trip. Below are some suggestions. Before arriving at the site ensure batteries are fully charged and properly maintained (see **Section 8 in Batteries - House** under "**Battery Maintenance**"), the fresh water tank and water heater are full and waste holding tanks are empty.

To conserve water and fuel:

- At the site operate the refrigerator on LP-Gas. Plan what is needed from the refrigerator prior to opening. Conserve LP-Gas by cooking over a campfire.
- If the motorhome has Hydro-Hot, operate it on diesel for hot water. Turn the system on about 20 minutes prior to use. Once heated, water remains hot for several hours. Turn the system off when not in use.
- When interior heat is needed set the thermostat temperature slightly lower than desired to prevent frequent cycling of the heating system.
- Know the tank capacities and routinely check fuel levels, especially during cold weather.
- Open windows during the day to reduce use of the roof air conditioner.
- Frequently monitor water consumption. Limit shower usage; turn water off when soaping down, and back on to rinse. When water conservation is critical, take a sponge bath or use campground shower facilities, if available. Do not fill the sink with water to wash only a few dishes. Use disposable dishes when possible.
- Evacuate waste holding tanks prior to filling fresh water tank.

To conserve battery power:

- Do not allow batteries to fully discharge before operating the generator. If possible run the generator twice a day, morning and afternoon, to charge the batteries.
- When not using the inverter for 120 Volts AC, turn it off.
- Turn off interior 12 Volt DC power whenever possible. Refrigerator, battery charging and inverter operation will not be affected. Turn off small battery operated items i.e., porch, bay exterior step, generator and engine compartment lights, etc. Turn off the antenna boost when not watching TV. One light left on can quickly reduce battery reserves.
- Keep a working flashlight handy for night trips through the campsite and inside motorhome. When interior lighting is desired, use one light in a central location such as the vanity. Unscrew all but one or two bulbs.
- If equipped with a solar panel(s), keep panel(s) clean for optimum performance.
- Turn on the water pump only when using water.
- If weather does not permit or no outdoor table is available, eat at the dinette table by candlelight.
- Operate the generator when using microwave/convection oven.

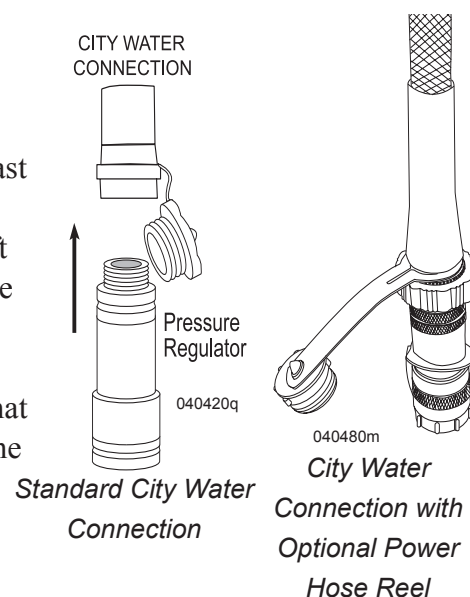
BREAKING CAMP

Preparing the motorhome for travel will require several small tasks. Properly securing and storing items helps prevent them from getting lost or damaged. Below is a checklist guide to reference when preparing to break camp.

Outside Checklist:

- Disconnect the cable TV and lower the TV antenna.
- Disconnect and stow the telephone line.
- Retract awnings and secure them for travel.
- Close the primary LP-Gas tank valve.
- Connect the sewer hose.
- Drain and flush holding tanks. Start by closing the grey water valve. Run enough cold water down sink and shower drains to fill the grey tank at least 50%. Use caution to avoid overfilling or flooding the grey tank. Connect a non-potable water hose to the “Water Inlet Only” fitting in the lower left corner of the service center, open the black tank valve, and allow adequate time for black tank to drain. Close black tank valve and open grey water valve. Water from the grey tank will help to flush the drain hose. Once evacuated, close grey water valve. Disconnect the sewer hose and flush that hose with clean water from a non-potable hose. Store the hose. Replace the sewer cap.
- Fill fresh water tank, then disconnect fresh water hose from the source. Store hose with end cap in place. If applicable, remove the hose protection water pressure regulator from the city water faucet.
- Turn shore power breaker off and disconnect shore line. Wind up and store shore cord. Secure door.
- Inspect fluid level in oil bath hubs (if applicable) and check all tire pressures.
- Secure all compartment doors.
- Inspect tires and wheels.
- Check for fluid leaks under and around the motorhome.

Typical Current Draw	
Battery Cut-off	1.5 Amps
13" TV	1.7 Amps
Rope Light (10 ft.)	1.3 Amps
Porch Light	2.0 Amps
Fluorescent Bulb (1)	2.1 Amps
Halogen Ceiling Light (1)	.09 Amps



Engine Checklist:

- **Inspect** the engine, transmission and the engine compartment for fluid leaks.
- **Inspect** the area under the motorhome for fluid leaks or puddles.
- Check all fluid levels: oil, antifreeze, transmission, hydraulic fluid and washer fluid.
- **Inspect** belts and hoses for wear.
- **Inspect** wiring for loose, frayed or corroded connections.
- Start engine and listen for unusual noises.
- **Inspect** gauges and controls for proper operation.

Interior Checklist:

- If applicable, retract leveling jacks allowing the air suspension to obtain proper ride height.
- Clear the slide room path, clean the floor and move the driver seat forward. After confirming bay doors are closed, retract the slide room. When the slide room is fully retracted, secure all slide room awning locks.

NOTE:

To operate the slide-out room, the ignition must be OFF and the park brake set.

- Secure and fasten the bi-fold and pocket doors. Lock the shower door.
- Close roof vents and windows.
- Secure all loose, heavy or sharp objects in case of a sudden stop.
- Close all cabinet doors and drawers.
- Turn off interior lights.
- Turn off the water pump.
- Check the fuel level gauge and all other dash gauges for operation and correct level indications.

Departure Checklist:

- Check items in storage bays to ensure shifting or damage of items will not occur.
- Look around, above and under the motorhome for obstructions. Check for debris stuck between the rear dual tires.
- Walk around the motorhome and camp area checking for forgotten items.
- Outside compartment doors should be closed and locked.
- Check operation of all exterior lights, headlamp, taillamp, brake and clearance lights.
- Secure all awning travel locks.
- Ensure jack pad is clear of debris when retracting hydraulic jacks. Loose rocks, gravel and debris can be thrown from the jack pad and can possibly damage the tow car.
- Secure and lock the entry door for travel.
- Pull forward out of the campsite. Ensure the site is clean and no items are forgotten.

EMERGENCY PROCEDURES - ROADSIDE

If an emergency situation occurs, use the appropriate braking technique 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. In the event of an emergency stop due to a mechanical breakdown or other motorhome related problems, contact the manufacturer's **Customer Support** at **1-877-466-6226** or an emergency service provider.

EMERGENCY SERVICE PROVIDER		
Equipment	Provider	Emergency Number
Motorhome: Monaco Coach	Monaco Customer Support	1-877-466-6226
Chassis: Roadmaster	Roadmaster	1-877-466-6226
Engine: Cummins Detroit	Cummins Customer Assistance Center	1-800-343-7357
	Detroit Diesel Customer Assistance	1-800-445-1980
Transmission	Allison Transmission	1-800-524-2303
Towing	Owner's Advantage Program	1-877-882-0614
Tires: Goodyear	Goodyear	877-484-7376
Assistance (Optional)	OnStar	1-888-466-7827

Road flares or reflective warning signs should be displayed if the motorhome is alongside of 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 feet, 100 feet and 200 feet from the rear of the motorhome when on a divided highway or one-way road. On a two-way road, with traffic traveling both directions, the same placement would also be required at the front of the motorhome. Roads with curves and hills may require the placement of the last/furthest triangle to be 500 feet behind the motorhome in order to safely warn approaching traffic.

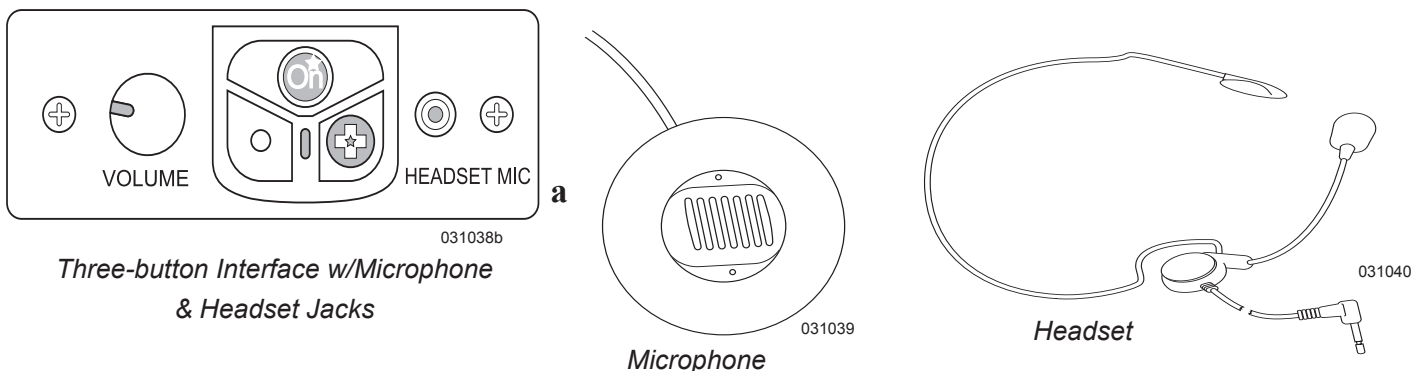
OnStar® (Optional)

OnStar® combines existing technology with a sophisticated Global Positioning System (GPS) to track motorhome location. OnStar® services provide travel aids that range from helping to find a destination to arranging for motorhome roadside assistance. In an emergency situation, OnStar® can utilize vast resources to summon state or local emergency assistance.

In the event of motorhome breakdown, subscribers can contact an advisor at the call center. Concerns involving interior operations that do not impede travel should be made directly to the Monaco Coach Corporation Customer Service Department.

Prior to contacting OnStar®, the motorhome must be registered with Monaco Coach Corporation. A service contract to activate the service can be acquired by either pushing the blue OnStar® button located in the motorhome cockpit, or by calling **800-ONSTAR7**.

Motorhome components comprising the OnStar® system include a microphone, three-button interface with volume control, and a jack for use of hands-free headset communication.

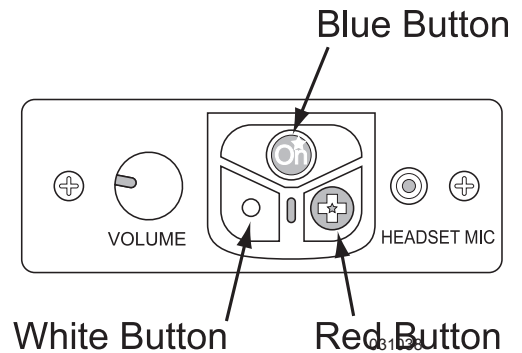


Operation:

OnStar® operates using the motorhome electrical system powered by the house batteries. If the house battery cut-off switch is turned off, or the batteries are dead, damaged or disconnected, the OnStar® system will not function.

Three Button Keypad:

- The **blue** On button connects directly to the OnStar® center.
- The primary function of the **red** emergency button is to summon emergency assistance by alerting OnStar® of a priority call. The operator will inquire of the nature of the emergency. If there is no response, the OnStar® operator will GPS the vehicle location and summon immediate emergency assistance. **OnStar® will not determine if medical help is necessary, regardless of the subscriber description of symptoms.**
- The **white** button is used to answer and disconnect calls to the OnStar® call center, and to operate the optional Personal Calling and Virtual Advisor features. For more information on Personal Calling and Virtual Advisor, contact the OnStar® call center.



In Case of Flat Tire

In the event of a flat tire, it is recommended to call for roadside assistance. The size and weight of the motorhome and its tires require proper equipment to change the tire. 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. Hold the steering wheel firmly and gradually decrease speed. Slowly move to a safe off-road place, which should be a firm level spot. Turn the ignition off and turn the hazard flasher system **ON**. Save the old tire for possible warranty coverage.

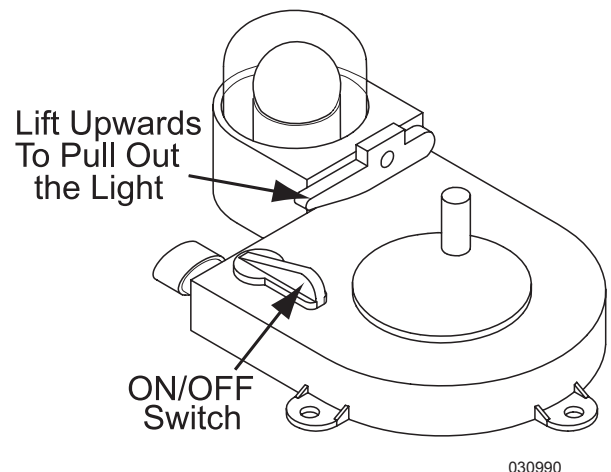


Light - Retractable

The retractable light is located in places of limited lighting for emergency purposes. Light is located in an outside compartment.

To use:

1. Activate light by moving **ON/OFF** switch to the **ON** position.
2. The light is on an 18' retractable reel cord. To operate, lift the lever and pull the light out.
3. The light has a magnetic base attached. Locate a place to attach the light so you can work hands free.
4. To replace bulb push down on clear plastic cover and twist.
5. To rewind, crank the handle in the retract direction. When fully retracted, push down on the leverhandle to keep the light locked into place.



Running Out of Fuel

When the motorhome runs out of fuel, air enters the fuel lines and fuel system components of the engine. Diesel engines are sensitive to air in the fuel system. If the engine has stalled due to low fuel, it will be necessary to prime the fuel system to restart the engine. Several gallons of fuel will be necessary in the tank before attempting to prime the fuel system.

CAUTION: The engine will sputter for a short period before it stops running due to a low fuel condition. Pull off the road on a firm level surface a safe distance away from traffic. Steering may become stiff if the engine stops running.

To Prime the Fuel System:

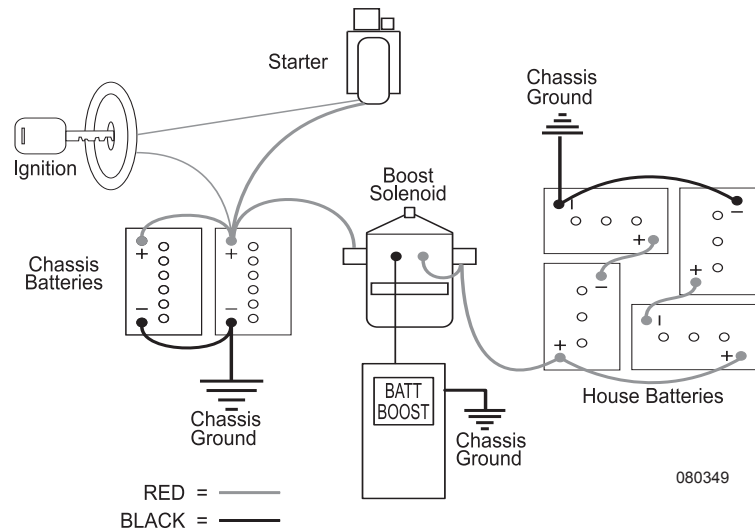
1. Add 30 gallons of fuel to the empty tank, possibly more if the motorhome is parked on an angle.
2. Follow the instructions ***“To Prime the Fuel System”*** located in **Fuel System/Fuel Filters** in **Section 10**.

Dead Chassis Battery

A weak or discharged battery will not supply the amount of CCA (Cold Cranking Amps) necessary to initiate the required voltage to start the engine. If the engine fails to crank, or cranks slowly due to a weak chassis battery, there are electrical back-up systems in place that may increase chassis battery voltage.

Battery Boost Switch:

The Battery Boost switch, located on the dash, engages a heavy-duty solenoid to electrically connect the house batteries to the engine battery in the event the engine will not crank or cranks slowly. The solenoid is designed for short-term high current intermittent use. Engaging the boost solenoid for an extended period damages the solenoid.



Jump Starting Using the Battery Boost Switch:

- With the ignition key off, press and hold the Battery Boost switch for 10 seconds. After 10 seconds, continue to hold the switch down and turn on the ignition. Observe the battery volt gauge on the dash, it should read at least 12 Volts. If voltage is sufficient, try to start the engine.
- If the engine fails to crank, or does not crank fast enough, discontinue the attempt. Continued attempts will only diminish any remaining surface charge in the chassis battery and end future alternative attempts.
- Next, start the generator. This may require using the Battery Boost switch for the generator to start from the engine battery. Once the generator is operating, the electrical combination of the generator and the inverter will charge the batteries.
- Allow the generator to run about ½ hour before attempting to start the engine.
- After ½ hour of generator operation, leave the generator on and hold down the Battery Boost switch for one minute. Release the switch for one minute, then press the switch again for one minute. Alternate this cycle 3 to 5 times to avoid overheating the Boost solenoid.

- Next, hold the switch down and turn the ignition on. The battery voltage gauge on the dash should indicate at least 12 Volts. If voltage is sufficient with the Boost switch held down, try to start the engine.
- If the engine fails to crank, or fails to crank quickly, the chassis battery may be depleted and the motorhome will require jump-starting or an external charger hooked to the chassis battery.

Jump Starting Using an External Source:

When using jumper cables to start the engine, the cables must connect in a parallel configuration. That is, positive (+) to positive and negative battery (-) to negative chassis (-). Always connect the positive (+) before connecting the negative (-). To prevent arcing when disconnecting the cables; disconnect the negative (-) before disconnecting the positive (+).

WARNING:

Always ventilate the battery compartment prior to work or services. Gas emitted by the batteries can explode when exposed to smoking material, flames, sparks or other sources of ignition, resulting in injury or vehicle damage. Batteries contain sulfuric acid that can burn skin, eyes and clothing. Do not connect the end of the second cable to the negative (-) terminal of the battery to be jumped. Connect only to the chassis, away from the battery.

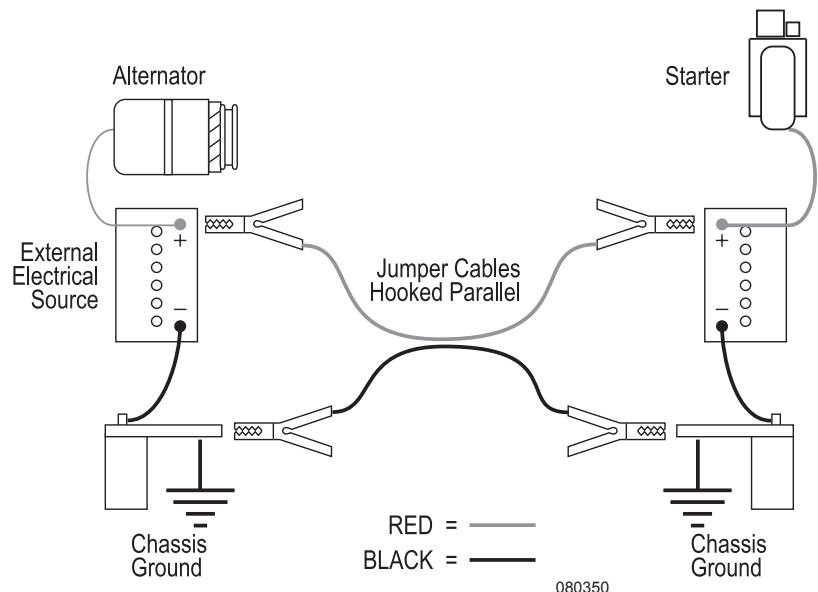
CAUTION:

A large amount of electrical current is required to jump-start an engine. The sizes of the battery, alternator and jumper cables supplying the “jump” are current limiting factors. Wait a sufficient amount of time for a surface charge to build before attempting to start the engine. Voltage fluctuations that occur during a jump-start procedure can damage sensitive electronic equipment and charging systems. If a jump-start is necessary, call Roadside Assistance. They will have the equipment necessary to jump-start the motorhome.

CAUTION:

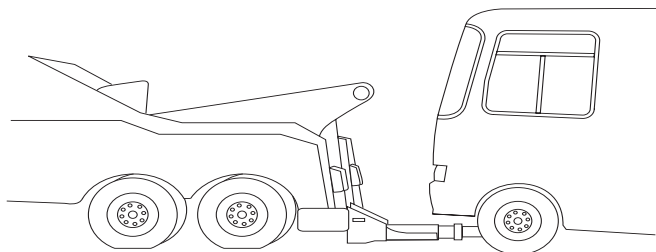
Do not use the towed vehicle for jump-starting. The charging system of the towed vehicle does not supply the amperage necessary to jump-start the motorhome. Voltage sensitive equipment on the towed vehicle can be damaged, leaving the towed vehicle disabled.

1. When using an external electrical source to connect to the chassis battery, turn the main battery disconnect switches **OFF** prior to hooking up the jumper cables.
2. Hook up the cables then wait several minutes to allow a surface charge to build in the chassis battery before attempting to start the engine.
3. Turn **ON** the battery disconnect switches and attempt to start the engine. **DO NOT** crank the engine more than a few seconds.
4. After the engine has started, disconnect the cables. Disconnect the negative (-) cables before disconnecting the positive (+) cables to prevent arcing.
5. If the engine does not crank, or cranks slowly, **DO NOT CONTINUE**. Extensive damage, fire or injury can occur. Get help from a qualified technician.

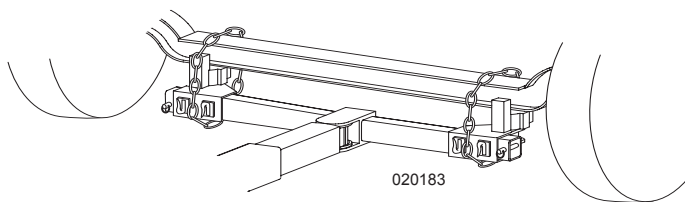


TOWING PROCEDURES

If calling a towing company for service, it is recommended to use a lowboy/landall type of trailer. If a tow truck is used it needs to have a support arm that goes under the motorhome and secures to the front axle. Inform the tow company of the axle weights and total weight of the motorhome. Other important information is the length of the motorhome, number of passengers and milepost location. Two tow trucks may be necessary. One to tow the motorhome and the other to tow a trailer or the tow vehicle if it is not operational.

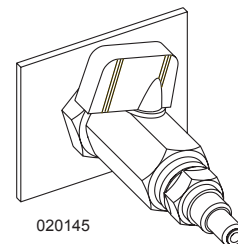


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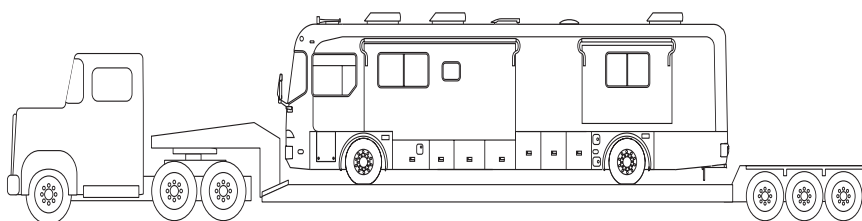
The towing company may need to locate the air nipple to release the air brakes. The air nipple is located in the rear curbside compartment and should be used by towing personnel only. Generally, if the motorhome ever needs to be towed, use the following instructions:



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Air Nipple: Located on the Curbside in the Generator Compartment.

- Secure loose or protruding parts if the motorhome is damaged.
- Inspect the points of attachment on a disabled motorhome. If attachment points are damaged, select other attachment points at a substantial frame structural member.
- Never allow anyone to go under a motorhome while it is being lifted by towing equipment unless the disabled motorhome is adequately supported by safety stands.
- Do not tow the motorhome from the rear. Towing from the rear will severely overload the front tires and suspension possibly resulting in tire and/or front suspension failure. Rear frame extensions are not designed to support weight loads imposed by lifting the motorhome from the rear.
- If the rear wheels are disabled, place the motorhome on a flat bed trailer or use a heavy duty dolly under the rear wheels and tow the motorhome from the front.
- The drive shaft must be removed to prevent damage to the transmission. Secure the end caps to prevent losing or contaminating the needle bearings.
- The optional mud flap may need to be removed to prevent damage due to limited ground clearance.
- When towing a motorhome equipped with the Air-Leveling System, the ignition **MUST** be left in the **ON** position and the Travel indicator lamp on the panel must be lit for the air suspension to operate. If the ignition system is not functioning, or if chassis voltage is below specification, the motorhome must be placed on a lowboy/landall trailer to prevent suspension damage.



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WARNING:

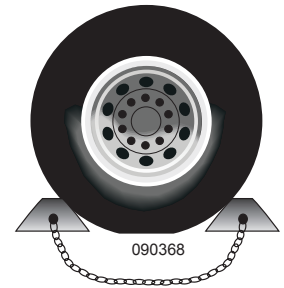
In case the motorhome requires towing, ensure all precautions are followed. The drive shaft must be disconnected and the mud flap may need to be removed. The manufacturer WILL NOT cover damage to the motorhome caused by a towing company.

Disabling the Parking Brake

The park/emergency brakes apply to the drive axle only. The brakes can be manually released if the air system will not build sufficient air pressure to release them. This emergency procedure is to be used by trained technicians or towing personnel to move the motorhome to a safe location or repair facility.

WARNING:

Only trained personnel should perform this procedure.



Example of a properly chocked wheel.

Disabling Brakes:

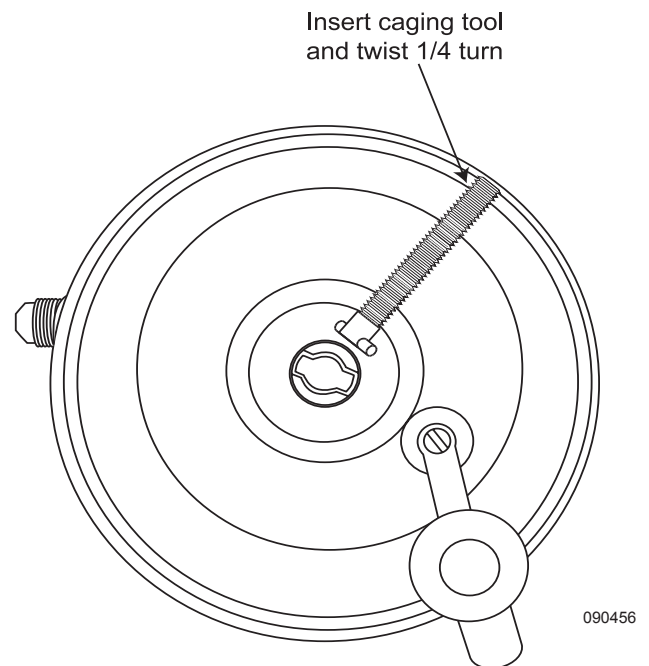
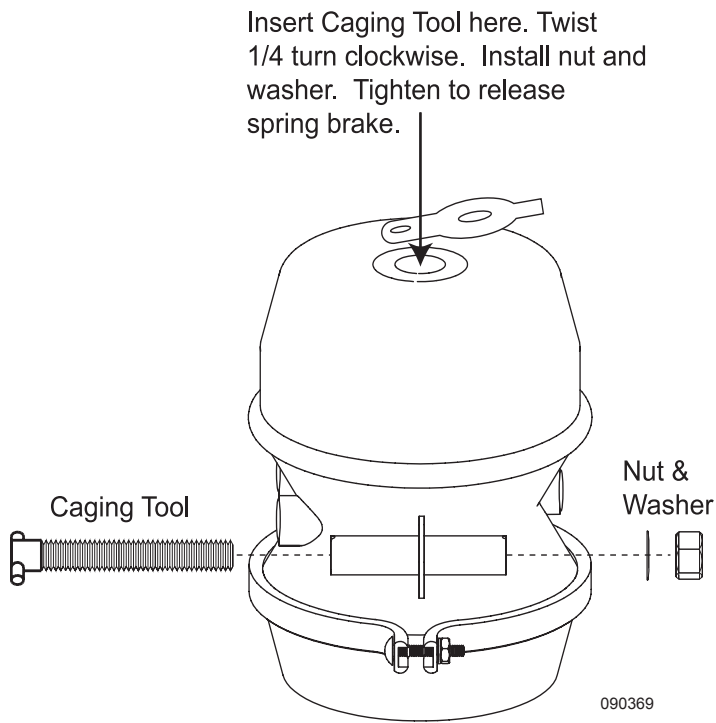
- Place wheel chocks firmly against the wheel before performing this procedure.
- Remove the plug from the center of rear brake chamber on the drive axle.
- Remove the caging tool from its holder on the brake chamber and insert the tool into hole. Turn clockwise to engage.
- Screw nut and washer onto caging tool. Use a wrench to tighten the nut, compressing the internal spring to release the brake.
- Repeat procedure for the other side.

Enabling Brakes:

- After towing, or when air pressure is again available, loosen the nut and remove the tool. Return the caging tool to its original location and replace the plug.
- Repeat for the other side.

WARNING:

Failure to securely chock the wheels can result in the motorhome rolling when the spring brakes are released. Severe injury or death can occur.



TIRES

Tires designed for the motorhome are a very technical and engineered product. Since the tire is the only contact the motorhome has with road surface it is critical that proper air pressure be maintained. Improper pressure will lead to abnormal wear or sudden tire failure. The motorhome must be weighed fully loaded before proper tire inflation pressures can be determined. The following information concerning tires and weighing the motorhome are set in the order in which the process is performed.

The tire performs additional functions of traction for moving stopping and steering, as well as providing a cushion for the motorhome. Modern tire technology blends a unique mix of chemistry, physics and engineering to provide a high degree of comfort, performance, efficiency, reliability and safety. To obtain the maximum wear and best service from tires, it is helpful to understand the components and functions of the tire.

Tire Components:

Tread: Provides traction and cornering grip.

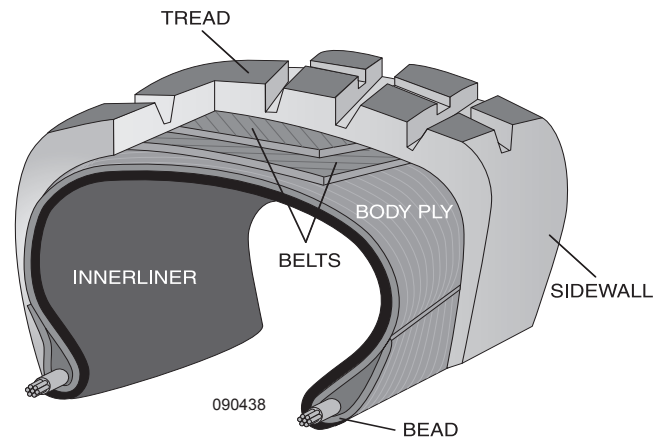
Belts: Stabilize and strengthen the tread.

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.



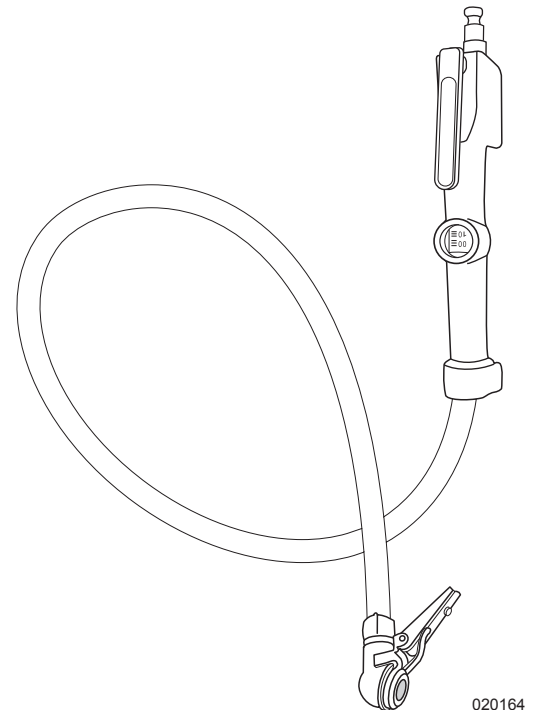
Importance of Air Pressure

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

An under-inflated tire builds up excessive heat that may go beyond the design limits of the rubber and radial cords, which could result in sudden failure. An under-inflated tire also causes poor motorhome handling, rapid and/or irregular tire wear and an increase in rolling resistance that results in a decreased fuel economy.

An over-inflated tire reduces the tire's footprint/contact patch with the road, thus reducing traction, braking capacity and handling of the motorhome. Over-inflation of a tire for the load results in a harsh ride, uneven tire wear and is susceptible to impact damage.

Maintaining correct tire inflation pressure for each loaded wheel position on the motorhome is of the utmost importance and must be a part of regular motorhome maintenance.



WARNING:

Driving on a tire that is under-inflated 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.

Tire Pressure Inflation Guideline

Federal law requires that the specifications for the tire's maximum load rating be molded into the sidewall of the tire. The amount of air pressure to use is dependent on the weight of the motorhome when fully loaded. The tire chart indicates the weights that can be properly supported by varying air pressures. Decreasing air pressure decreases load carrying capacity.

Always comply with the tire manufacturer's recommended pressure inflation guideline. The actual weight of the motorhome can vary significantly depending on how it is loaded. For optimum tire wear, ride and handling always comply with the manufacturer guideline. A tire inflation chart listing proper inflation pressure for different loads can be found in this section.

The tires of the motorhome are inflated to pressure(s) appropriate for the actual weight on each axle in the unloaded, shipped condition. When the motorhome is loaded, check and adjust the inflation pressure on each tire as needed.

Always inflate tires to the pressure indicated in the tire chart for the load carried by the tire. **DO NOT OVERINFLATE OR UNDERINFLATE THE TIRES.**

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

When the actual loaded weight of the motorhome and the weight on each axle is unknown, follow the recommended tire inflation pressure(s) listed on the federal certification label. When loading a motorhome never exceed the motorhome Gross Vehicle Weight Rating (**GVWR**) or the GAWR for each axle.

Contact the tire manufacturer for further information concerning proper tire pressure inflation and other tire issues.

TIRE CHART - GOODYEAR

Understanding the Inflation Table:

The tire size is on the left margin of the table. Determine the Single inflation reading or Dual inflation reading, denoted with a D or S on the table. Single is for the front axle and tag axle (if equipped). Dual is for the drive axle. On the following chart, find the corresponding psi at the top columns to see the corresponding maximum weight capacity for that psi.

NOTE:

Every load range has a maximum rating as well as a minimum rating. Do not exceed those ratings.

Rated load capacities are listed for individual tires in a Dual or Single position.

NOTE:

Do not exceed tire manufacturers maximum speed rating.

LOAD & INFLATION TABLE

Tire Size	Max Speed Rating (MPH)	Single (S) Dual (D)	INFLATION PRESSURE PSI												
			65	70	75	80	85	90	95	100	105	110	115	120	125
8R19.5	75	S D	2410 2350	2540 2460	2680 2610	2835 2755	2955 2865	3075 2975	3195 3085	3305 3195	3415 3305	3525(F) 3415(F)			
225/70R19.5	75	S D		2895 2720	3040 2860	3195 3000	3315 3115	3450 3245	3640(F) 3415(F)	3715 3490	3845 3615	3970(G) 3750(G)			
245/70R19.5	75	S D		3640 3415	3740 3515	3890 3655	4080(F) 3970(F)	4190 4115	4335 4265	4540(G) 4410(G)					
265/70R19.5	75	S D				3970 3750	4180 3930	4355 4095	4540 4300	4685 4405	4850 4560	5070 4805	5170 4860	5355(G) 5070(G)	
9R22.5	75	S D		3370 3270	3560 3410	3730 3550	3890 3690	4080 3860	4235 4005	4390 4150	4540(F) 4300(F)				
10R22.5	65	S D		4080 3860	4280 4045	4480 4230	4675 4410	4850 4585	5025 4760	5205(F) 4940(F)	5360 5075	5515 5210	5675(G) 5355(G)		
11R22.5	75	S D		4530 4380	4770 4580	4990 4760	5220 4950	5510 5205	5730 5415	5950 5625	6175(G) 5840(G)	6320 5895	6465 5950	6610(H) 6005(H)	
12R22.5	75	S D		4940 4780	5200 4990	5450 5190	5690 5390	6005 5675	6205 5785	6405 5895	6610 6005	6870 6265	7130 6525	7390(H) 6780(H)	
245/75R22.5	75	S D		3470 3260	3645 3425	3860 3640	3980 3740	4140 3890	4300 4080	4455 4190	4610 4335	4675(G) 4410(G)			
255/70R22.5	75	S D				4190 3970	4370 4110	4550 4275	4675 4410	4895 4455	5065 4610	5205 4675	5400 4915	5510(H) 5070(H)	
265/75R22.5	75	S D		3875 3870	4070 4040	4255 4205	4440 4370	4620 4525	4800 4685	4975 4805(G)	5150	5205(G)			
275/70R22.5	75	S D					5170 4770	5400 4980	5630 5180	5850 5390	6070 5590	6290 5800	6510 6000	6730 6200	6940(H) 6395(H)
275/80R22.5	75	S D						5500 5080	5745 5305	5985 5530	6225 5750	6460 5965	6700 6185	6930 6400	7160(H) 6610(H)
295/75R22.5	75	S D			4725 4690	4940 4885	5155 5070	5370 5260	5510 5440	5780 5675(G)	5980 5800	6175(G) 6005(H)	6370	6610(H)	
295/80R22.5	75	S D				5480 4855	5750 5100	6020 5335	6285 5570	6550 5805	6810 6035	7070 6265	7320 6490	7580 6720	7830(H) 6490(H)
315/80R22.5	75	S D					6415 5840	6670 6070	6940 6395	7190 6540	7440 6770	7610 6940	7920 7210	8270(J) 7610(J)	
11R24.5	75	S D				5310 5070	5550 5260	5840 5510	6095 5675	6350 5840	6610(G) 6005(G)	6790 6205	6970 6405	7160(H) 6610(H)	

The motorhome manufacturer is not the author of this chart and makes no representation or warranty concerning the accuracy of the information disclosed by the chart. Monaco is not responsible for the accuracy of the information disclosed or for any errors within the Tire Inflation chart.

The Load and Inflation Table helps determine correct tire inflation pressure after properly weighing the motorhome. All pressures are rated at a cold psi. Cold psi is defined as early in the morning before the day's ambient temperature, sun's radiant heat or the heat generated while driving have caused the tire pressure to temporarily increase. This means the tire inflation pressure should be checked early and when the motorhome has not been driven more than one mile. Check tire inflation pressure regularly. The check interval should be in the morning, before the "drive" trip and every morning on extended trips. A quality truck tire gauge with an angle airhead is needed to access the dual wheel positions of the drive axle. Ensure the valve cap is replaced on the stem after the inflation pressure is checked. Use valve stem caps with a positive seal to prevent air escaping from the valve stem. If there are extension hoses on the valve stem, make sure they are good quality reinforced stainless steel braid. Attach hoses securely to the outer wheel.

The valve stem cap guarantees the valve core remains free of dirt and foreign material. Material lodged between the valve core and internal stem can cause slow leaks resulting in tire failure. Optimum tire performance is achieved at proper inflation pressure for the load carried. Do not mix tires of different tread patterns, size or construction on the same axle. The difference in traction could cause rear end gear fight and mechanical damage to the drive train.

CAUTION:

Never let air out of a hot tire.

Over-inflation can cause:

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

Under-inflation can cause:

- Tire squeal on turns.
- Circumferential breaks.
- Tire cord breakage.
- Loss of casing durability.
- High fuel consumption.
- Rapid and uneven wear on the edges of the tread.
- Separations.
- Higher risk of road hazard.
- Tire container may bruise or rupture.
- Excessive tire temperature.
- Reduced handling quality.

WARNING:

A slow leak may go unnoticed on one of the dual tires. This can cause the good tire to fail by exceeding the load limit. Tires with damaged sidewalls can burst upon inflation. A flat or nearly flat tire can also generate enough heat from friction to ignite.

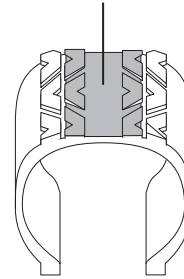
Unequal tire pressures on same axle can cause:

- Uneven braking, swerve upon acceleration
- Steering lead, torque steer
- Reduced handling quality

WARNING:

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

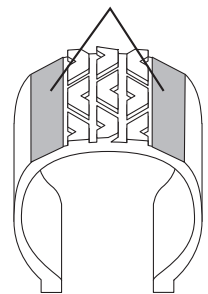
TREAD WEAR



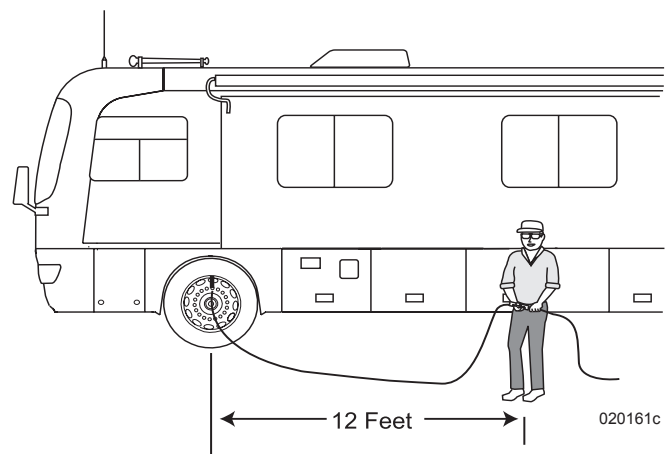
Over-inflation wears in center of tire.

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TREAD WEAR



Under-inflation wears on edges of tire.



Air Pressure Checklist

1. When checking air pressure in the tires, make sure the tires are cool before increasing or reducing air pressure. Even driving a short distance can heat up tires.

NOTE:

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

2. Remove the cap from the valve on one tire.
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. Then recheck the pressure with the tire gauge.
6. Replace the valve cap.
7. Repeat with each tire.
8. Inspect the tires to ensure there is nothing that could poke a hole in the tire and cause an air leak.
9. Check the sidewalls to make sure there are no 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 pounds for every 10 degrees of temperature change.

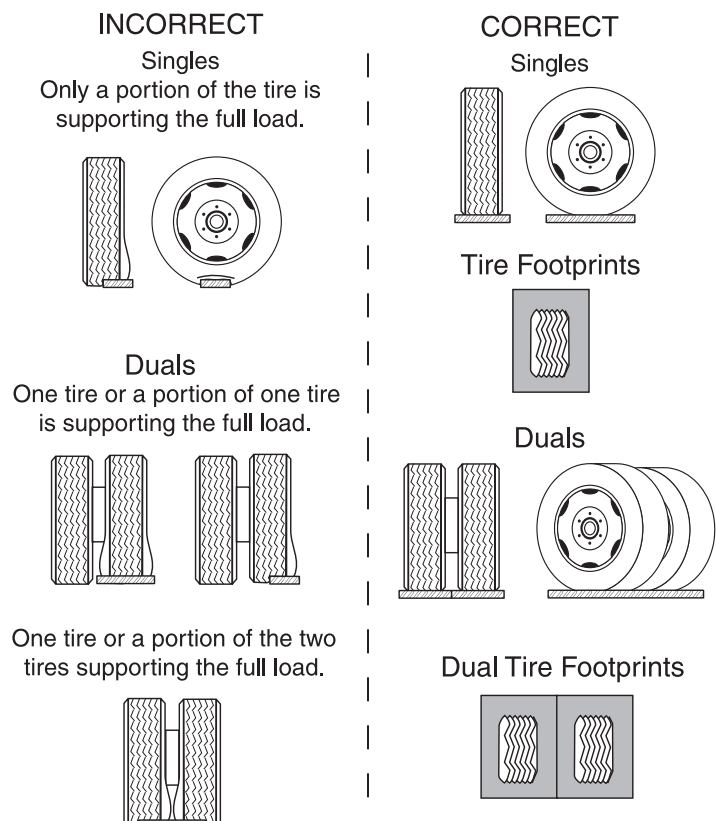
Supporting When Leveling

Extreme caution must be taken to ensure the tires are fully supported when placing blocks under the tires. The load on the tire should be evenly distributed on the support block. In the case of dual tires, distribute the load evenly on blocks for both tires. 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.

CAUTION:

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

Tire "Support" Methods



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Tire Vibration

Sudden tire failure or blowout is often preceded by tire vibration. Some other 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 immediately after such an occurrence. Continue to inspect the tires periodically thereafter in case minor damage occurred. Rotation forces can continue to stress damaged areas that can manifest later in a sudden tire failure. If an unusual vibration begins, or a bulge is noticed in a 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 on all of the tires. The tire manufacturer determines rotation pattern. The first tire rotation is the most important in determining which rotation pattern to use. Any unusual or unique wear patterns, or indications of uneven wear that may have developed, should be evaluated for possible tire rotation. Misalignment, imbalance or other mechanical problems may exist and will need corrected prior to rotation.

Tread

To prevent skidding and hydroplaning, replace tires when the tread is worn down to 4/32 of an inch on the front, and 2/32 of an inch on the rear. Questions regarding tread wear should be directed to the tire manufacturer.

Built in tread wear indicators, or wear bars, which look like narrow strips of smooth rubber across the tread will appear on the tire when the tread is worn down to one-sixteenth of an inch. When these wear bars are noticed, the tire is worn out and should be replaced. Check the tires for signs of uneven wear. Signs of irregular tread wear are usually exhibited by low areas or unusually smooth areas. Consult the tire manufacturer as soon as possible.

WARNING:

In many instances the life of the tires on the motorhome is not determined by mileage but by age. Tires are subject to weathering. Weathering cracks run in circumference with the tire. Though the sidewall of the tire may look fine and be structurally sound, weathering can occur inside the well of the tread, therefore replacement may be determined not by mileage but age. Have the tire manufacturer inspect the tires for age weathering.

Storage of Tires - Long Term

A cool, dry, garage with a sealed cement floor is ideal for storage. Tires stored outside may prematurely age.

Prior to Storage:

- Thoroughly clean the tires.
- Unload the motorhome to reduce weight on the tires.
- Ensure the surface is reasonably level, firm, clean and has good drainage.
- Inflate the tires to the maximum inflation pressure as indicated on the Federal Identification Tag.

During Storage:

- Cover the tires to block direct sunlight.
- Periodically ensure tires are at proper pressure.
- Move the motorhome every three months to prevent cracking in bulge areas, as well as flat spotting from prolonged sidewall strain and tread deflection.

Removal from Storage:

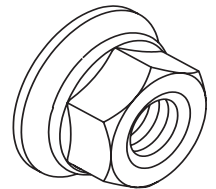
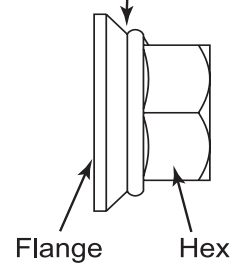
Before removing the motorhome from long-term storage thoroughly inspect each tire's tread area and air pressure. If the tires have lost air during storage, inflate them to the correct pressure.

WHEEL MOUNTING

Hub Piloted Mounting:

- Before using flange nuts that have already been used in service, apply two drops of oil at one point between the flange and hex. This will allow parts to rotate freely and provide the proper clamping force when tightened. Use any common lubricant typically used for fasteners. Examples are motor oil and general purpose lubricating oils. Excessive lubricant is not desirable, this will not improve the nut torquing performance. Excessive lubricant makes the nuts hard to handle, attracts dirt to the nuts and may cause unsightly appearance to the wheel. Only used nuts need to be lubricated.
- Flange nuts generate higher clamping force always use grade eight studs with hub mount wheels.
- Before installing the wheels, lubricate the hub pilot pads with a drop of oil to prevent galling. Do not lubricate any other wheel or hub surface.
- For a hub with intermittent pilot pads, position a pad at the twelve o'clock position to center the wheel and reduce runout.

For Used Nuts
Add 2 drops of Oil
Between Flange
and Hex



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NOTE:

Loosen and tighten lug nuts in a star pattern sequence. Sequence tighten to 50 ft. lbs. first, then sequence tighten to 500 lbs. Over-tightening can cause distortion.

WARNING:

Never use wheels or lug nuts different than the original equipment as this could damage the wheel or the mounting system. Damage to the wheel or mounting system could cause a wheel to come off while the recreational vehicle is in motion.

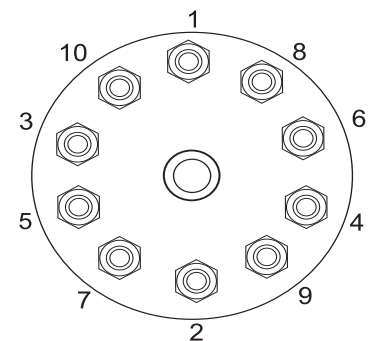
Front Wheels:

Slide the front wheel over the studs. Use caution to avoid damaging stud threads. Snug the nuts in sequence. When all nuts have been seated, tighten to 500 ft. lbs. in sequence (as shown in the illustration).

Dual Rear Wheels:

Slide the inner dual wheel over the studs. Use caution to avoid damaging stud threads. Align the handholds for valve access and slide the outer dual wheel over the studs, using caution to avoid damaging the stud threads. When all nuts are seated, tighten the nuts to 500 ft. lbs. in sequence (as shown in the illustration).

The hub mount wheels use two-piece flange cap nuts for both front and rear applications. No inner cap nuts are required.



Nut Tightening Sequence

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Torque the Nuts Properly:

- Tighten the wheel nuts to the recommended lug nut torque. Do not over tighten.
- Maintain the nut torque at the recommended level through planned periodic checks or at 10,000 mile intervals, whichever comes first.
- If air wrenches are used they must be periodically calibrated for the proper torque output. Use a torque wrench to check the air wrench output and adjust the line pressure for the correct torque.

WEIGHING THE MOTORHOME

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 worksheets for weighing procedures.

Proper weight distribution and load management is an individual responsibility. In order to correctly manage load and weight distribution, more than one weight measurement will be required. Each wheel position must be weighed to accurately determine the weight placed on each wheel position for proper weight computations. The entire process of weigh management begins with the Gross Vehicle Weight Rating as listed on the Federal Certification Label. **This weight cannot be exceeded.**

CAUTION:

Most states limit the amount of weight carried by any single axle position. It is the responsibility of the operator to know the legal weight limit of the state traveled.

Weight Terms

Numerous Federal, state and local governments mandate weight limits. Understanding the terminology and performing proper weighing procedure will help eliminate confusion. It is important to understand there are two reasons to weigh the motorhome. One to find out the **Cargo Carrying Capacity (CCC)** and the other to ensure no axle is overloaded.

The Gross Axle Weight Rating (GAWR) of the axles is listed on the federal certification label attached to the motorhome. This is the maximum allowable loaded weight on a particular axle. This label is generally located to the rear of the driver's seat, on the wall.

When the actual loaded weight of the motorhome, and the weight on each axle is unknown, follow the recommended tire inflation pressure(s) listed on the federal certification label. When loading a motorhome never exceed the motorhome **Gross Vehicle Weight Rating (GVWR)** or the **GAWR** for each axle.

NOTE:

Contact the tire manufacturer for further information concerning proper tire pressure inflation and other tire issues.

The **Gross Vehicle Weight Rating (GVWR)** and **Gross Axle Weight Rating (GAWR)** listed on the Federal certification label attached to the motorhome will detail the chassis manufacturer's and/or the RV manufacturer's total vehicle maximum weight rating and per axle weight rating.

The **GVWR** is the maximum total weight for which the motorhome is rated - including passengers, fluids and cargo. The **GAWR** is the maximum weight for which a single axle is designed. The tires, wheels, axle, the motorhome frame and/or other components of the motorhome could limit these per axle and total maximum weight ratings.

The Federal certification label is a guide in knowing the maximum loaded axle weight rating **GAWR**, and subsequently the correct tire inflation pressure for that weight. Every recreational vehicle, even of the same make and model, will vary in actual loaded axle weights because of different options and personal loads.

While the actual loaded axle weight should be below the **GAWR**, the motorhome must be weighed in a loaded condition to know its actual weight. Weigh the front axle, the total unit and the rear axle. This includes the tag axle. It is possible for a motorhome to be within the **GVWR** yet overloaded on an axle. It is even possible for one wheel position to be overloaded, even though the **GAWR** has not been exceeded. For this reason it will be necessary to weigh each wheel position of the motorhome to give a clear indication of exactly how the weight of the motorhome is distributed. Instructions and diagrams are presented on the following pages. When the total weight and the weight on each axle is known, the tire load data chart in this manual will show the correct cold inflation pressure per tire for each axle.

There are two important factors to consider when loading the motorhome: **total weight** and **balance**. When loading heavy objects keep them as low as possible, preferably on the floor or below in storage compartments. Load weight must be distributed as evenly as possible. The following is an explanation of commonly used weight abbreviations.

- **Gross Vehicle Weight Rating (GVWR):** Maximum permissible weight of this motorhome. **GVWR** is equal to or greater than the sum of **UVW** plus **CCC**.
- **Unloaded Vehicle Weight (UVW):** Weight of this motorhome as built at factory with full fuel, engine oil and coolants. **UVW** does not include cargo, fresh water, occupants or dealer installed accessories.
- **Cargo Carrying Capacity (CCC):** Equal to **GVWR** minus each of the following: **UVW**, full fresh potable water weight (including water heater) and **SCWR**. Tongue weight of towed vehicle and dealer installed equipment will reduce **CCC**.
- **Gross Combination Weight Rating (GCWR):** The maximum allowable loaded weight of this motorhome and any towed trailer or towed vehicle.
- **Gross Axle Weight Rating (GAWR):** Load-carrying capacity specified by manufacturer of a single axle system, as measured at tire ground interfaces.
- **Sleeping Capacity Weight Rating (SCWR):** The manufacturer's designated number of sleeping positions multiplied by 154 pounds.

Tire Pressure:

A motorhome may weigh slightly heavier on one side than on the other. Tire inflation pressure of the heavier side tires determines the inflation pressure for all tire(s) on that axle due to the weight transfer that occurs when cornering.

Improperly inflated tires, or suspension that is incorrectly loaded, can result in poor fuel economy, poor handling and over-stressed chassis components. Vehicle loading will influence tire inflation pressure and the load carried by each axle. This is why each wheel position must be weighed. Motorhome axle configuration and floor plan styles will require different weighing procedures.

NOTE:

When weighing a motorhome, each tire on any axle must be inflated to the same pressure. The wheel position carrying the most weight will determine the tire inflation pressure for each tire of that particular axle.

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 local area telephone book yellow pages under Scales-Public or Weighers. A nominal fee may be charged, but this is money wisely spent.

Weight scale types and weighing methods determine the procedure used to calculate proper tire inflation pressure and axle loading. Several types of scales are in use today. A platform scale will allow the entire motorhome to fit on the scale to read the **GVW** in one scale recording. A segmented platform scale is designed to weigh one axle at a time. A single axle scale weighs one axle at a time. Some scales read only one wheel position at a time due to physical size. Several scale readings may be required to determine the **GAW** or **GVW** total. Each wheel position requires weighing, referred to as a four-point weigh, to accurately determine the correct tire inflation pressure.

NOTE:

The most accurate method to determine proper tire pressure is four-point weighing. Each wheel position must be weighed independently. Weighing the entire axle will not accurately determine the total weight carried by that wheel position. When calculating the drive axle dual tire pressure using a independent corner weigh method, divide the total weight by two to determine the weight carried by each tire. Each wheel position must be weighed and recorded.

When weighing, the scales and the motorhome must be level to obtain an accurate scale reading. Even when an axle is not physically on the scale, a definite lean in the motorhome will produce inaccurate scale readings.

Weight Label

MODEL YEAR: _____ MAKE: _____ MODEL: _____

UNIT NO. _____ CHASSIS VIN: _____

		<u>LBS.</u>	<u>KGS.</u>
<u>GVWR</u>	(Gross Vehicle Weight Rating) is the maximum permissible weight of this fully loaded motorhome	_____	_____
<u>UVW</u>	(Unloaded Vehicle Weight) is the weight of this motorhome as manufactured at the factory with full fuel, engine oil and coolants.....	_____	_____
<u>SCWR</u>	(Sleeping Capacity Weight Rating) is the manufacturer's designated number of sleeping positions multiplied by 154 pounds (70 kilograms)	_____	_____
<u>CCC</u>	(Cargo Carrying Capacity) is the GVWR minus each of the following: UVW, full fresh (potable) water weight (including water heater), full LP-Gas weight and SCWR (*1).....	_____	_____
<u>GCWR</u>	(Gross Combination Weight Rating) is the maximum allowable combined weight of this motorhome and the towable product. (*1).....	_____	_____
	FACTORY INSTALLED OPTIONS are options installed at the factory but do not include dealer installed after market equipment...	_____	_____

CARGO CARRYING CAPACITY (CCC) COMPUTATION

GVWR	_____	_____
minus UVW	_____	_____
minus fresh water (*2) weight of _____ gallons @ 8.3 lbs./gal	_____	_____
minus LP-Gas weight of _____ gallons @ 4.2 lbs./gal	_____	_____
minus SCWR of _____ persons @ 154 lbs./person.....	_____	_____
CCC for this motorhome (*3)	_____	_____

WARNING: CONSULT OWNER MANUAL(S) FOR SPECIFIC WEIGHING INSTRUCTIONS AND TOWING GUIDELINES INCLUDING AUXILIARY BRAKE REQUIREMENTS FOR ANY TOWED TRAILER OR TOWED VEHICLE.

Factory installed options do not include dealer installed after market equipment.

WARNING: DO NOT EXCEED THE GVWR, GCWR AND/OR GAWR AFTER LOADING YOUR MOTORHOME WITH WATER, FUEL, PASSENGERS AND CARGO. GAWR (Gross Axle Weight Rating) means the maximum permissible load weight a specific axle is designed to carry. See Federal Certification Label for disclosure of The GAWR for each axle.

(*1) Towing capacity is limited by GCWR; your vehicle's towing capacity is the difference between the GCWR and the actual vehicle weight; including all water, fuel, passengers, and cargo. Consult your Owner's Manual for further information.

(*2) Your motorhome's fresh water tank and water heater taken together determine the gross fresh water capacity. Your usable fresh water capacity, however, may be less.

(*3) Dealer installed equipment and towed vehicle tongue weight will reduce CCC.

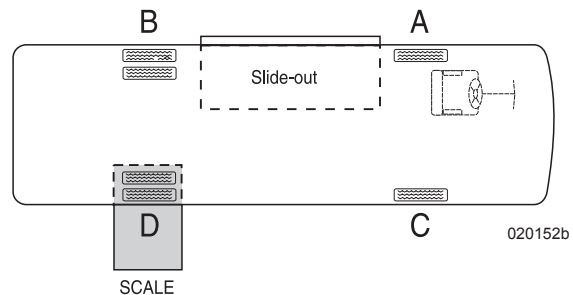
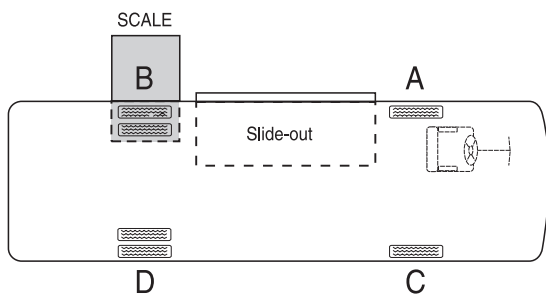
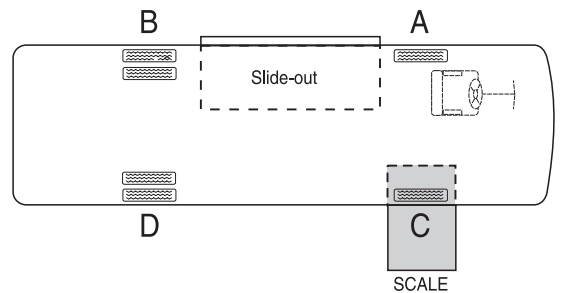
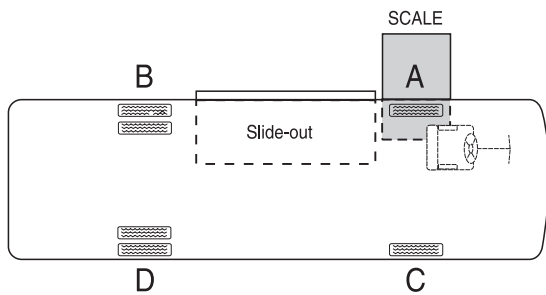
Four Point Weighing (Example)

NOTE:

Following scale readings and Gross Axle Weight Ratings are fictitious. Actual scale readings and Gross Axle Weight Ratings will vary with model and options.

The motorhome must be weighed fully loaded to obtain accurate scale readings and to determine the proper tire pressure. All slide rooms must be in retracted position.

- Take the rear axle **Gross Axle Weight Rating (GAWR)** and divide it by two. Example: Rear axle **GAWR** taken from the motorhome Vehicle Certification Label is 20,000 lbs. Divide the figure by 2, using chart below, record 10,000 lbs. on Scale B and D, line 1.
- Weigh the driver side rear corner (Scale B) and record weight on chart Scale B, line 2. Example: 5,500 lbs.
- Weigh the passenger side rear corner (Scale D) and record weight on chart Scale D, line 2. Example: 5,000 lbs.
- Add chart Scale B and D, lines 1, for **Gross Axle Weight Rating (GAWR)** and record on chart under Totals. Example: 20,000 lbs.
- Add chart Scale B and D, lines 2, for actual **Gross Axle Weight (GAW)** and record on chart under Totals. Example: 10,000 lbs.
- Actual Gross Axle Weight (GAW). Example: 12,500 lbs., is not to exceed **Gross Axle Weight Rating (GAWR)**. Example: 20,000 lbs.



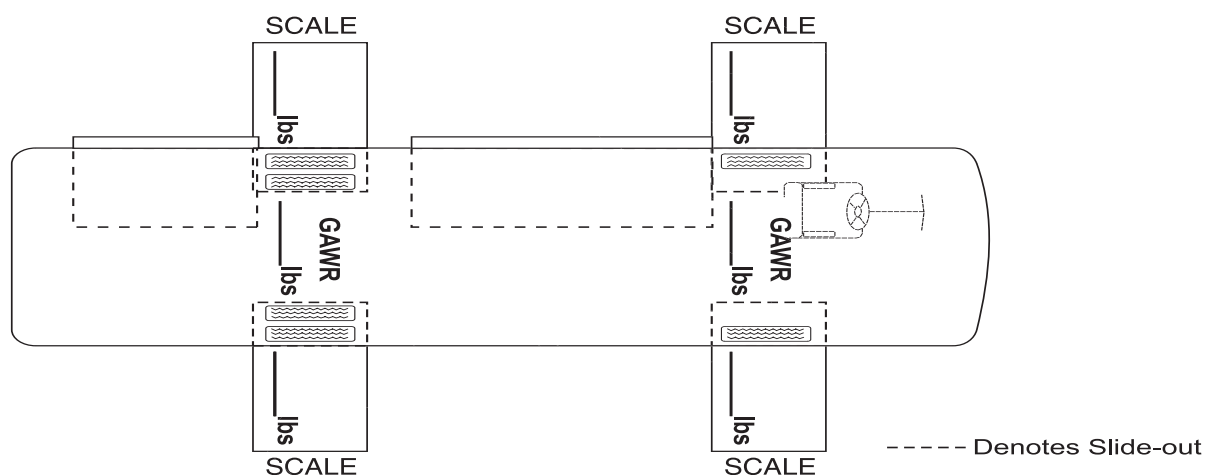
- Refer to the Tire Chart (Tire size 275/80R22.5). Use the highest actual weight, Scale B or D, line 2. Example 5,500 lbs. Determine the proper tire pressure for each tire using the Load Inflation chart. Example: 105 psi or stamp on the sidewall of the tire.
- Repeat above procedures to determine front axle Scale A and C, tire pressures.

	ROADSIDE		CURBSIDE		TOTAL AXLE WEIGHT		GROSS AXLE WEIGHT RATING GAWR		GAWR Minus Total Axle Weight
FRONT	1. 6,500		6,500		13,000				
AXLE	2.(A) 5,500	+	(C) 5,000	=	10,500		13,000		2,500
DRIVE	1. 10,000		10,000		20,000				
AXLE	2.(B) 6,500	+	(D) 6,000	=	12,500		20,000		7,500
			Total Axle Weight	=	23000 UVW	=	33000 GVWR	=	10,000 CCC

020255r

NOTE:

These measurements are with a full fuel tank and nobody in the motorhome.



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 resulting in property damage, personal injury or death.

CAUTION:

If actual weight carried by any tire is below the tire chart weight specification minimum tire pressure, the minimum inflation pressure must be maintained. Tire pressure below the minimum inflation pressure can overheat and damage the tire casing leading to premature tire failure or blowout.

Cargo Carrying Capacity:

When weighing the motorhome it is important to understand that each motorhome, even of the same model year, floorplan and length will weigh different due to options and accessories. The **Gross Vehicle Weight Rating (GVWR)**, **Gross Combination Weight Rating (GCWR)** and/or **Gross Axle Weight Rating (GAWR)** must not be exceeded.

GVWR of the vehicle limits the weight of the entire load combination, regardless of the mix of water, LP-Gas, passengers, or cargo.

It is important to understand the weighing process is performed in two phases. The first phase is determining the **Cargo Carrying Capacity (CCC)** and the second to ensure the **GVWR** is not exceeded when adjusting tire pressures. The weighing process should start by recording the **GVWR** from the Federal Weight Label, then weighing the motorhome unloaded, without passengers and with a full fuel tank. Engine and transmission fluid levels must be full. This is known as the **Unloaded Vehicle Weight (UVW)**. Once this weight has been recorded it can be subtracted from the **GVWR**.

$$\text{GVWR } \underline{33,000} - \text{UVW } \underline{21,000} = \text{A } \underline{12,000}$$

Next, begin to calculate the **Cargo Carrying Capacity (CCC)**.

Fresh water weight and LP-Gas weight can now be subtracted from the remaining total line A.

- Water weight is the number of gallons multiplied by 8.3.
- LP-Gas weight is the number of gallons multiplied by 4.2.

A 12-gallon water heater with a 95-gallon fresh tank would total 107 gallons times 8.3, or 888 pounds.

A 55-gallon LP-Gas tank will have 44 gallons of LP-Gas due to the 80% liquid capacity. This would mean 44 gallons multiplied by 4.2, or 185 pounds.

$$\text{A } \underline{12,000} - 888 = \text{B } \underline{11,112}$$

$$\text{B } \underline{11,112} - 185 = \text{C } \underline{10,927}$$

Next, calculate the **Sleep Capacity Weight Rating (SCWR)**. The manufacturer designated number of sleeping positions for the motorhome multiplied by 154 lbs.

The 154 lbs. (70kg) is the average weight established by the US Federal Government and Transport Canada, and is used to arrive at **Cargo Carrying Capacity (CCC)**. However, actual sleep capacity weight may be greater. The **SCWR** is not intended to limit the sleeping capacity to a specified weight.

Example: If the manufacturer has designated the motorhome sleeping position at 5 (770 lbs.) and there are five people who weigh 200, 150, 150, 140 and 130 lbs., totaling 770 lbs., that doesn't mean the sleeping capacity is reduced to three individuals, but rather the **CCC** is reduced to the actual passenger weight.

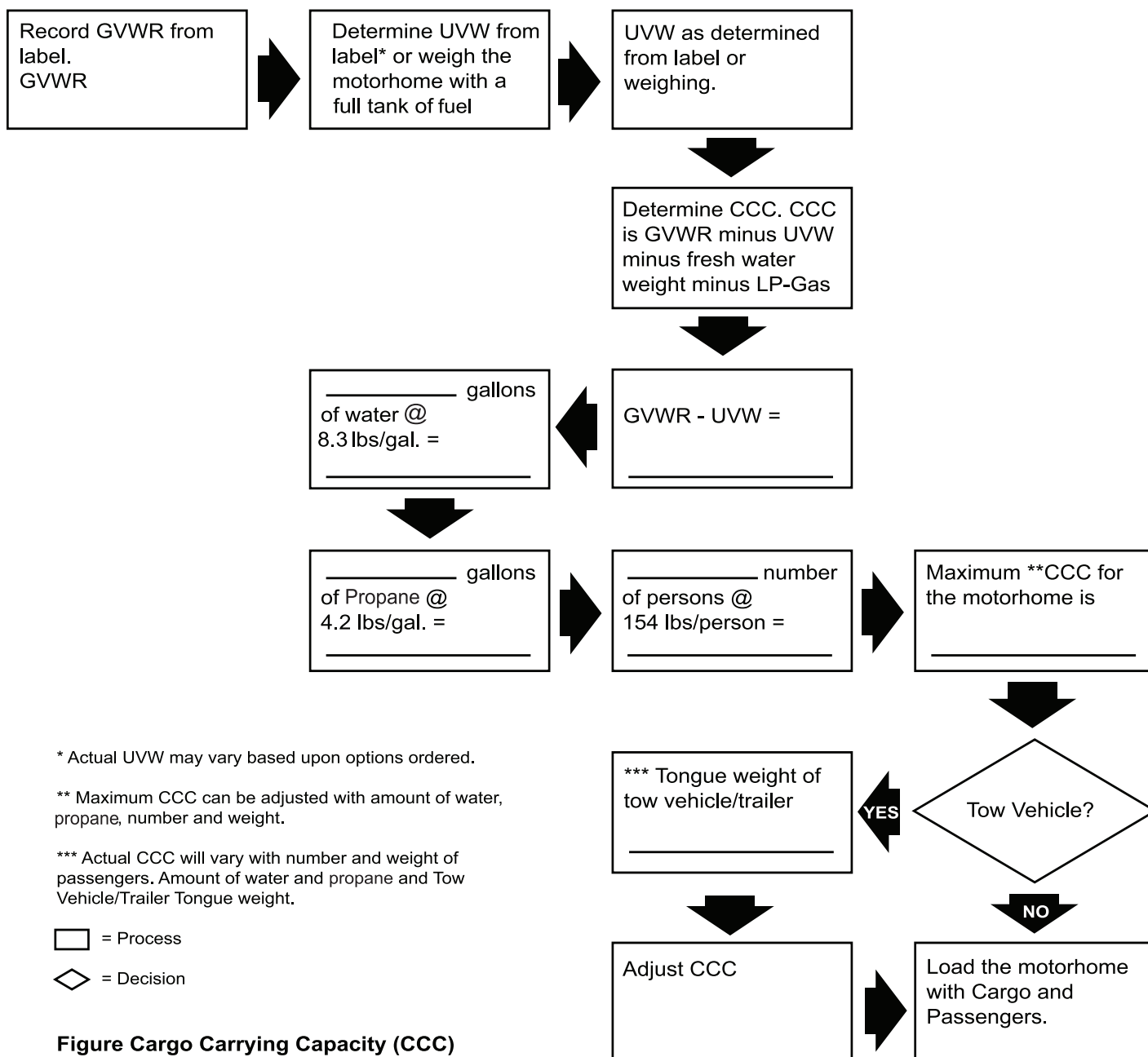
$$\text{C } \underline{10,927} - \text{SCWR } 770 = \text{CCC } \underline{10,157}$$

Cargo Carrying Capacity (CCC) is how much cargo the motorhome can carry. However, tongue weight of a towed vehicle will further reduce this amount.

Now the motorhome can be fully loaded and weighed to ensure **GVWR** is not exceeded. When weighing the motorhome, all slide rooms must be in the retracted position. The motorhome must remain as level as possible on the scale, even though an axle or side is not physically on the scale. Once the motorhome is fully loaded and weighed to obtain an accurate scale reading, determine the proper tire pressure.

- Each wheel position must be weighed to accurately determine the weight carried at each wheel position.
- Refer to the previous examples on how to weigh each wheel position. Each wheel position weight must be weighed and recorded to determine proper tire inflation.
- Wheel position weights are not to exceed any **Gross Axle Weight Rating (GAWR)** and **Gross Vehicle Weight Rating (GVWR)** as printed on the Motorhome Vehicle Certification Label.
- Compare wheel position weights with weight ratings on the label. Do not operate if wheel position weights exceed maximum specifications. Items will need to be removed until rating weight is within specification.

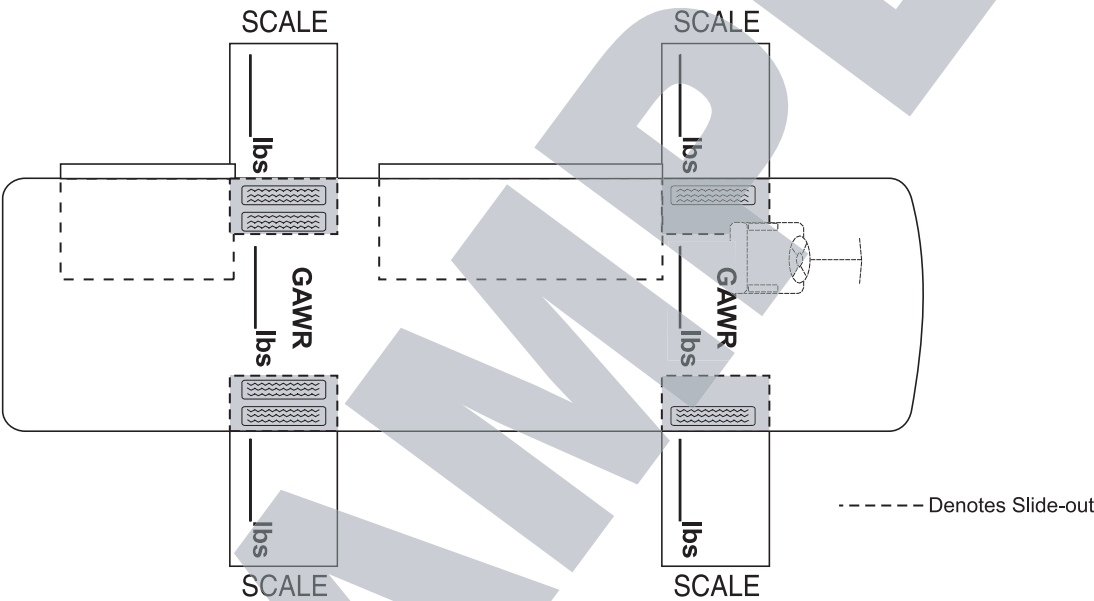
Cargo Carrying Capacity Flowchart



Weighing Procedure Worksheet

	ROADSIDE		CURBSIDE		TOTAL AXLE WEIGHT	GROSS AXLE WEIGHT RATING GAWR	GAWR Minus Total Axle Weight
FRONT AXLE	1. 6,500	+	6,500	=	13,000	13,000	2,500
	2.(A) 5,500		(C) 5,000		10,500		
DRIVE AXLE	1. 10,000	+	10,000	=	20,000	+ 20,000	9,500
	2.(B) 5,500		(D) 5,000		+ 10,500		
		Total Axle Weight			= 21,000 UVW	= 33,000 GVWR	= 12,000 CCC

NOTE: These measurements are with a full fuel tank and nobody in the motorhome.

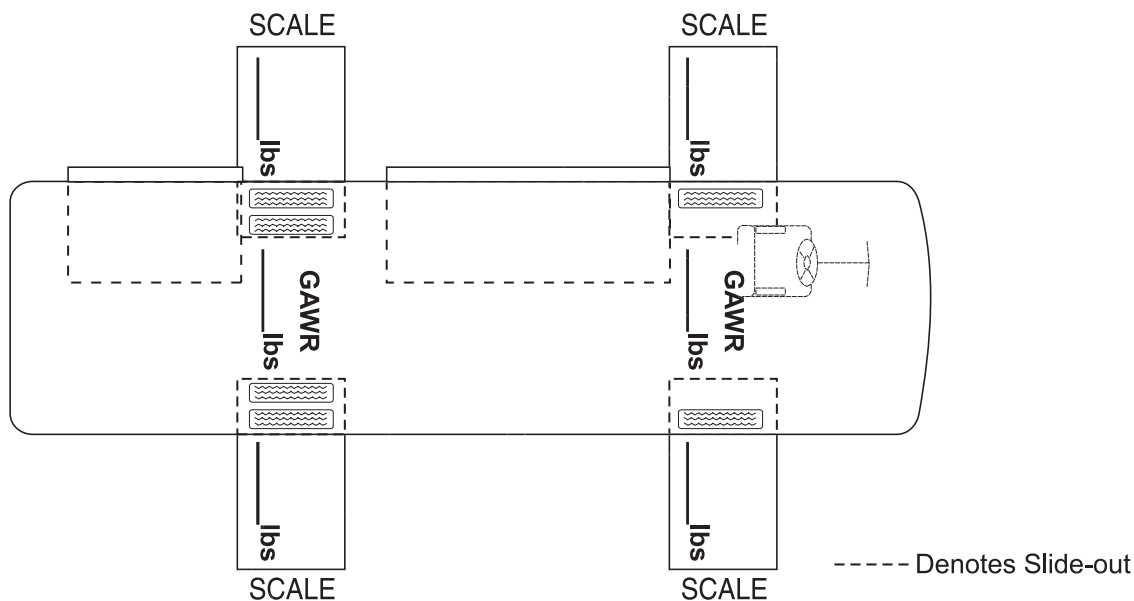


	FORMULA	UVW 23,000 CAPACITY		CCC 12,000
FRESH WATER	Subtract Gallon @ 8.3 lbs/gal	95 x 8.3 = 789	-	11,211
WATER HEATER	Subtract Gallon @ 8.3 lbs/gal	12 x 8.3 = 100	-	11,111
LP-GAS	Subtract Gallon @ 4.2 lbs/gal	44 x 4.2 = 185	-	10,926
SLEEP CARRYING WEIGHT RATING	Subtract Persons @ 154 lbs/person	5 x 154 = 770	-	10,156
Maximum Cargo Carrying Capacity will change by varying any of the capacities. Tongue Weight of a towed vehicle will reduce the Cargo Carrying Capacity (CCC).		Maximum Cargo Carrying Capacity CCC		10,156

ACTUAL WORKSHEET

	ROADSIDE		CURBSIDE		TOTAL AXLE WEIGHT	GROSS AXLE WEIGHT RATING GAWR	GAWR Minus Total Axle Weight
FRONT AXLE	1.	+		=			
	2.(A)		(C)				
DRIVE AXLE	1.	+		=			
	2.(B)		(D)		+		
			Total Axle Weight		= UVW	= GVWR	= CCC

NOTE: These measurements are with a full tank and nobody in the motorhome.



		UVW	CCC
	FORMULA	CAPACITY	
FRESH WATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
WATER HEATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
PROPANE	Subtract Gallon @ 4.2 lbs/gal	X 4.2 =	-
SLEEP CAPACITY WEIGHT RATING	Subtract Persons @ 154 lbs/person	X 154 =	-
Maximum Cargo Carrying Capacity will change by varying any of the capacities. Tongue Weight of a towed vehicle will reduce the Cargo Carrying Capacity (CCC).		Maximum Cargo Carrying Capacity CCC	

Weight Record Sheet

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

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

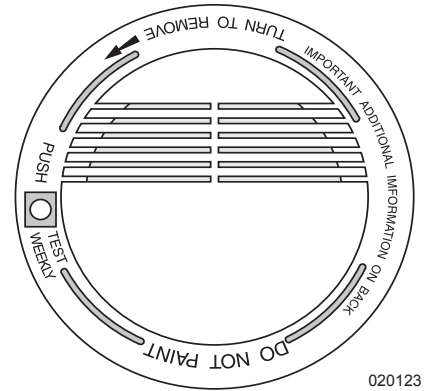
REAR: _____ + _____ = _____
LEFT RIGHT TOTAL

= _____
TOTAL GROSS
VEHICLE WEIGHT

020262

SMOKE DETECTOR

Statistics show that most fire casualties are not caused by direct flame, but by less visible smoke (products of combustion). The smoke detector responds to both visible and invisible products of combustion. The smoke detector will automatically return from alarm to normal state when the reason for activation, the presence of smoke, is completely removed. Fires are commonly caused by smoking in bed, leaving children unattended, or using flammable cleaning fluids. Please be safety conscious and avoid unnecessary risk.



WARNING:

Injury or loss of life in a fire is possible. 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.

Operation

When a 9 Volt DC battery is correctly connected, the smoke alarm operates. The Red LED flashes every 30 to 40 seconds showing the battery is supplying power. A load alarm sounds when a combustion production is sensed.

NOTE:

The unit will not operate without a battery. A battery flag will pop up preventing the unit from being installed to the mounting bracket without a battery. Carbon zinc batteries average a service life of one year. Alkaline batteries average a service life of one to two years.

Testing

Press the test button on the smoke alarm cover for about 3 seconds. The alarm sounds if all electronic circuitry, horn and battery are working properly. The smoke alarm should be tested at least once a week when the motorhome is in use, prior to each trip and when the motorhome has been in storage. When testing the smoke alarm it is advised to stand at arm's length.

CAUTION:

Never use an open flame to test the smoke alarm, as a fire may ignite and set fire to the alarm and to the motorhome.

Maintenance

Smoke Detector Maintenance:

- Test the smoke alarm once a week.
- Keep a supply of 9 Volt DC batteries on hand.
- Vacuum the slots in the cover and sides with a soft brush attachment every month. Test the smoke alarm once the unit has been vacuumed.
- The smoke alarm should be cleaned every six months to help keep the unit working efficiently.
- The smoke alarm “chirps” about every 30 to 40 seconds when battery is low. Replace battery immediately.

Troubleshooting

If the alarm does not sound when the test button is pushed, or with a smoke test, try the following:

- Inspect for obvious damage.
- Check for the recommended battery type.
- Check the battery for proper connection or replace the battery if needed.
- Gently vacuum as recommended.

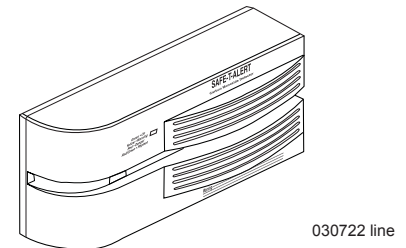
If these procedures do not correct the problem, do not attempt repairs. If the smoke alarm is within the warranty period and the terms indicate the nature of the problem, return the unit to the dealer. Smoke detectors beyond the warranty period cannot be economically repaired.

CARBON MONOXIDE DETECTOR

American National Standards Institute (ANSI) A119.2 - Fire & Life Safety 3-4.6 Carbon Monoxide Detectors states *“All RVs equipped with an internal combustion engine or designed with features to accommodate future installation of an internal combustion engine and truck campers shall be equipped with a listed CO detector installed in accordance with its listing.”*

The motorhome is equipped with such a carbon monoxide detector. Everyone is at risk with carbon monoxide poisoning. 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 about 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. Some consider this a “Flu-like Symptom.” 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 would include the elderly and people with lung or heart disease or anemia. The CO detector is designed to detect the toxic CO Gas resulting from incomplete combustion of any fuel. This can be gasoline, propane, natural gas, oil, charcoal or wood. Anything that burns fuel such as engines, generators, furnaces, gas stoves or water heaters, produces CO gas. Consequently, it is uncommon for household smoke from cigarettes or normal cooking to cause the alarm to sound.



Located in bedroom area

CAUTION:

Activation of this device indicates the presence of carbon monoxide (CO), which can be fatal. A concentration of above 100 PPM causes a warning condition. Individuals with medical problems may consider using detection devices with lower carbon monoxide alarming capabilities. Prolonged exposure to the horn at a close distances may be harmful to hearing.

WARNING:

Constant beeping and a flashing red light means CO gas has been detected. Shut off appliances, motorhome engine, and water heater. Evacuate the motorhome and call the fire department. Have any problems corrected before restarting appliances or the coach.

The CO detector is wired to both the house and chassis batteries to allow reliable and continuous protection by alerting the build up of potentially dangerous levels of CO. Once the unit is powered, it runs through a brief warm-up and self check prior to monitoring for CO gas. There are no switches that can accidentally turn the system off.

Operation

The detector is equipped with a self-cleaning CO sensor and requires a 10 minute initial warm-up period to clean the sensor element and achieve stabilization. During the warm-up period, the **green** power light flashes **ON** and **OFF**. The **green** power light should be lit when the power is on. If the light is not lit, turn power **OFF** and check wire connections. If the power is on and the connections are correct, but the indicator still is not lit, the detector should be returned for service. **Do not attempt to fix the detector.** The indicator light displays a specific color to monitor along with a matching sound pattern:

Indicator Lights and Sound Patterns:

- **ON** or normal condition is indicated by green. The CO detector has power and is sensing air for the presence of CO gas. The alarm horn will not sound.
- Flashing **red** indicates low CO Alarm condition, with 4 beeps then **OFF** for 5 seconds. The alarm horn sounds and can be reset by the **TEST/RESET** button. The CO detector detected the presence of 70 ppm.
- Steady Red indicates a **CO ALARM** condition. The detector has sensed the presence of levels over 100 ppm of carbon monoxide. The alarm horn sounds continuously until the RESET switch is reset.
- Alternating red and green indicates a malfunction alarm.

Alarm

When the alarm sounds have the detector and the motorhome checked by an authorized service technician as soon as possible. Never disconnect a CO detector to silence an annoying alarm. Evacuate the motorhome immediately when the **red** light is lit and the alarm sounds. Call the nearest fire department and ask them to determine the carbon monoxide source. Do not enter the motorhome until it has been aired out and corrected.

Potential Sources of CO when operating the motorhome:

- | | | |
|--------------------------|-----------------------|-----------------------------------|
| • Engine Exhaust | • Portable Grills | • Other Motorhomes |
| • Portable Space Heaters | • Camp Fires | • Generator Exhaust |
| • Gas Stoves and Ovens | • Portable Generators | • Defective Engine Exhaust System |

Testing

Test Procedures:

Test the carbon monoxide detector operation after the motorhome has been in storage, before each trip and at least once a week during use. Test the alarm by holding the **TEST/RESET** button in until the alarm sounds. The alarm sounds 4 beeps and the indicator lamp goes steady **red**. Six seconds later the alarm again beeps 4 times and the indicator light goes steady **green**.

Peak Level Memory:

The CO detector has the capability to remember the level of carbon monoxide that activated the alarm. Press the **TEST/RESET** button for less than one second and observe the visual and audible signals.

- **One beep** and a **green** flash indicate memory is clear.
- **Two beeps** and **two red** flashes indicate less than 100 ppm.
- **Three beeps** and **three red** flashes indicate less than 200 ppm.
- **Four beeps** and **four red** flashes indicate greater than 200 ppm.

NOTE:

Memory is erased when power is disconnected for 15 seconds.

Cleaning & Maintenance

Use a vacuum cleaner to remove dust or any other buildup on the detector. Do not wash. Wipe the detector with a damp cloth and dry with a towel. Do not open the detector for cleaning. Do not paint the detector. It is recommended that the carbon monoxide detector be replaced every 10 years.

The CO detector has **NO** user service parts. If there is a problem with the detector refer to an authorized service center. **DO NOT REMOVE POWER.**

NOTE:

Check the CO detector weekly and at the beginning and end of each trip.

FIRE EXTINGUISHER

The fire extinguishers in the motorhome are located next to the co-pilot seat and in the electrical bay. Please read the operating instructions that are printed on the fire extinguishers. Be sure to replace or recharge the extinguisher immediately after use.

Inspect the fire extinguishers at least once a month. Do so more frequently if an extinguisher is exposed to weather or possible tampering. Do not test the extinguisher by partially discharging. Internal pressure escapes and the fire extinguisher needs to be replaced.

Use the **PASS** word!

Pull the pin to unlock the extinguisher.

Aim at the base (bottom) of the fire and stand 6 to 10 feet away.

Squeeze the lever to discharge the agent.

Sweep the spray from left to right until totally extinguished.

WARNING:

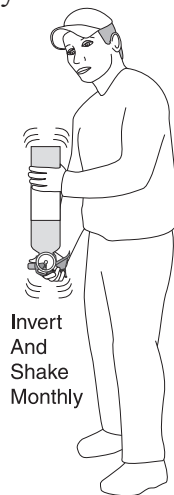
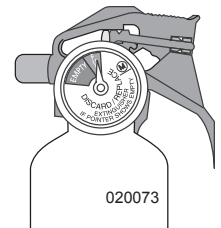
Road vibrations cause extinguisher powder to compact and may cause extinguisher malfunction. Invert and shake extinguisher monthly.

Classes of Fire:

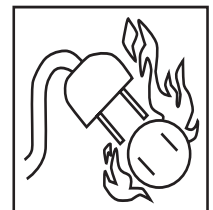
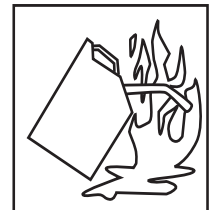
A - Fire that is fueled by materials that leave a residue when they burn: paper, wood, cloth, rubber, and certain plastics.

B - Fire that involves flammable liquids and gases: gasoline, paint thinner, kitchen grease, propane and acetylene.

C - Fire that involves 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.



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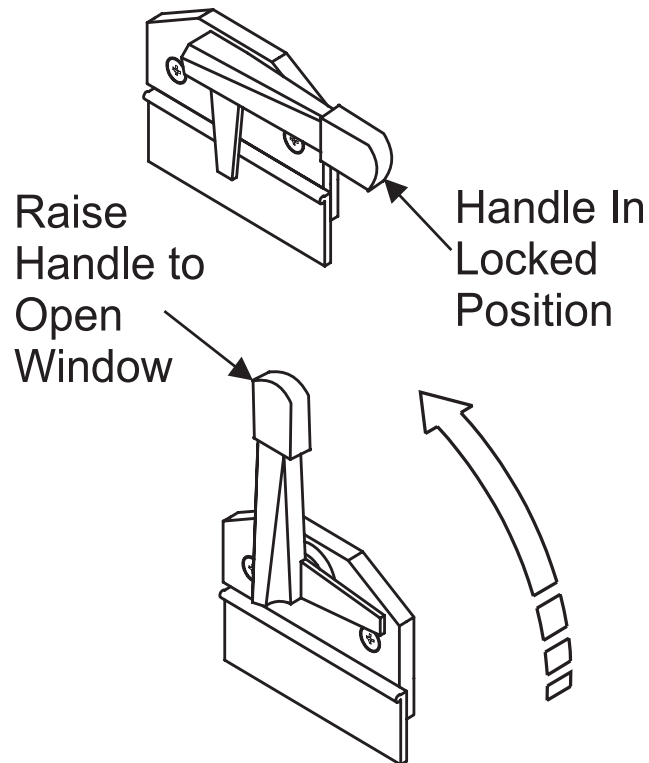
EGRESS WINDOW

An egress window is designated for use as an exit in the case of an emergency. Inside the motorhome the egress window is easily identified by the red locking handle. It is also marked as an “EXIT.” The glass slider in the egress window operates the same as all other windows.

- To open the egress window, lift the red handle and push outward on the window.
- To close the egress window, pull the window closed and lower the handles to lock window in place.

CAUTION:

The egress window should be opened twice a year to ensure proper operation. Over time, the rubber seal will tend to stick to the egress window. Occasional operation will help prevent the rubber seal from sticking.



020029

Egress Window Handle

[illegible]

CAMELOT 2006

EXTERIOR & INTERIOR CARE — SECTION 3

EXTERIOR CARE	75
Corrosion	75
Washing	75
Drying	75
Waxing	76
Paint Codes	77
Tire Care	77
Aluminum Wheels (Accuride)	77
Bright Metal	78
EXTERIOR MAINTENANCE	79
Roof Care & Seal Inspections	79
Sealant Types	79
INTERIOR CARE	80
Cockpit	80
FABRICS	80
General Care & Cleaning	80
Vinyl	81
Leather	83
Ultra-Leather	83
Fabric Cleaning Codes	84
FLOORS	85
Carpet Cleaning	85
Tile Floor	87
Laminate Floor (Optional)	88
SHOWER	88
CEILING	88
WALL COVERINGS	89
WOOD CARE	90
COUNTERTOPS	92
Solid Surface	92
Stainless Steel Surfaces	92
WINDOWS	93
Condensation	93
WINDOW TREATMENTS	93
Mini-Blinds	93
Day/Night Shades	94
MOLD & MILDEW	94
PEST CONTROL	96
STORAGE	98
Short Term	98
Long Term	99
Winter Storage - Checklist	100
Removal From Storage	101

EXTERIOR CARE

Corrosion

The most common cause of corrosion to the motorhome is the accumulation of road salts, grime and dirt. These elements, combined with moisture, may possibly cause early component failure. Salt air and fog from coastal trips can greatly accelerate the corrosion process. Corrosive materials collected from roadways accumulate on the undercarriage, around wheel openings and on the radiator charge air cooler package. These areas need to be cleaned periodically to help prevent component failure due to corrosion. If the motorhome is driven in areas where road salts are used it should be washed at least once a week. 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 underside and inside wheel openings. **Avoid directly spraying the painted surface with a high pressure washer.** Remove road debris and mud that has accumulated. Material left behind can intensify the corrosion problem.

CAUTION:

Exercise caution when cleaning the radiator charge air cooler package. Damage to the fins can result when using a high pressure washer or steam cleaner. Nozzle discharge pressure can exceed 1,800 psi. Avoid using high pressure steam cleaners on the exterior paint surfaces. Remove all spattered washing debris from the exterior paint surfaces as soon as possible.

Washing

Periodic cleaning will help preserve the paint finish. The motorhome is painted with a “base coat, clear coat system.” The clear coat is a polyurethane based material which brings out the shine or luster to the base coat paint. Care should be used when washing the motorhome. Use only mild detergents or preferred specifically designed automotive detergents. Avoid using abrasive cleansers or laundry detergents as they will scratch the clear coat and leave a soap film. The use of specially designed automotive washing utensils, such as soft bristle brushes, are acceptable as long as they do not trap abrasive material and scratch the surface while being used. Before washing the motorhome remove most of the accumulated dirt and “road wash” behind wheel openings, below the windshield and on the rear of the motorhome. If the build up is excessive, run water over a soft brush while gently scrubbing the surface in one direction. This helps float away the “build-up” from the clear coat. Avoid back and forth or circular motions as this may act like sandpaper, scratching the clear coat and leaving a haze or “swirl marks.” After removing the heavy build-up, use the mixed detergent solution to wash the motorhome. Start washing at the top of the motorhome working towards the bottom. If possible, wash the motorhome in a shaded area when the exterior is not hot to the touch. If necessary, turn the motorhome 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

Drying chamois cloths come in natural and synthetic materials. Use only a natural chamois, because some synthetic materials may leave swirl marks on the finish. Soak the chamois in clean water until all chamois material has absorbed water. Wring excess water from chamois. Start at the top and work towards the bottom. Use a downward “S” pattern to remove water from the surface. Wring out the chamois as needed. Using a chamois cloth to remove the rinse water is not necessary, but the effort can be worthwhile.

There are many schools of thought on waxing. The two most common thoughts are:

- The clear coat needs to “breathe.” A layer of wax will seal the clear coat not allowing it to breathe, possibly leading to failure of the clear coat.
- If the surface is not waxed, what is protecting the surface from the environment (road salts, acid rain, road tar, ultraviolet light)?

It is recommended to wax the motorhome twice a year; once in the spring and once in the fall. Many types of protective barriers are available today that may be applied to the clear coat: glazes, waxes, polishes, rubbing compounds or combinations of these products.

NOTE:

Use a grease and wax remover before applying another coat of wax. Chemicals can become trapped between layers of wax, possibly damaging the paint finish.

INFORMATION:

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

Types of Products:

Glazes - Glazes are generally used to fill very fine scratches in the clear coat. They are applied either by hand or by using a polisher with a special pad.

Waxes - Waxes come in many types of chemical make-up. The popular Carnauba wax is a natural wax from the leaves or fronds of the Carnauba palm tree. Mineral waxes have a paraffin base. There are also waxes which contain silicone.

Polishes - Polishes usually contain a combination of wax based substances with an abrasive, getting the two for one idea. 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.

When selecting a product the container should be marked, “safe for clear coats” or “clear coat safe.” Carefully follow the 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 to check for hazing or swirl marks. If an abnormal reaction to the finish occurs, discontinue product use and consult the product manufacturer. If the product is a paste, do not allow dried paste to be baked on by the sun. Remove paste shortly after drying. Clean, dry, 100% cotton cloths are best suited for the removal of dried paste. Turn the cloth often. Use a separate clean cloth to buff. The surface should feel slick when rubbing the cloth lightly over it. Avoid repeated wax applications which can cause wax to build up. Some very fine scratches or swirl marks may be removed by an application of a glaze. These types of glazes fill the scratches or swirl marks.

The motorhome has a large surface area. Washing and waxing may not be completed in one afternoon. Select sections to wax until the motorhome is complete. If the task seems overwhelming, have an automotive detailer perform the task.

Paint Codes

The motorhome has a color scheme comprised of different colors. Each of these colors in the color scheme has been assigned a paint code. The paint code is a formula used to mix different colors to achieve a desired color of paint. It may be necessary to obtain “Touch-up” paint to repair a small imperfection in the paint surface. However if it becomes necessary to paint a larger area, it will be necessary to obtain the paint code to get the correct color.

To Obtain the Paint Code:

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

Tire Care

Road oil will cause deterioration of the rubber. Dirt buildup will help hold chemicals in the air next to the tire and will also cause deterioration.

When cleaning any rubber product, proper care and methods in cleaning must be used to obtain the maximum service years out of the tires. Use a soft brush and a mild detergent to clean the tires. If a dressing product is used 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 subsequently occurs. When these same dressing products are used on a passenger car tire that is replaced every three to four years, it is rare to see a major problem. However, in most cases recreational vehicle tires may last longer due to limited annual mileage and exposure.

Aluminum Wheels (Accuride)

Aluminum wheels or polished aluminum wheels should be cared for the same as the painted finish of the motorhome. Regularly cleaning the polished aluminum wheels is recommended to keep the wheel finish bright and shiny. The use of an aluminum wheel polish or carnauba wax will protect the polished wheel surfaces. It will also help prevent corrosion and pitting of the aluminum wheel surfaces caused from natural environmental contamination and will make future cleaning and polishing easier.

Outside: Follow these simple steps to keep the polished aluminum wheels looking their best:

1. High-pressure water is recommended to rinse the wheel to remove any debris, grit or dirt particles.
2. A 100% cotton cloth dipped in a mild soap solution is used to help remove built up dirt and grease.
3. The remaining soap residue is rinsed from the wheel using high-pressure water.
4. Dry the wheel thoroughly with a 100% cotton cloth.
5. Use an aluminum wheel polish to remove spots and stains from the surfaces of the wheel as necessary.
6. Apply carnauba wax to the visible wheel surfaces. Carnauba wax should be reapplied on a regular basis to maintain wheel luster.

NOTE:

Allow wheels to cool before spraying with cold water.

CAUTION:

Begin washing wheels by rinsing off loose particles using high-pressure water. Synthetic cleaning pads can result in streaking of the polished aluminum surface. Using wire brushes to remove dirt or grime can scratch the wheel surface. Strong detergents, alkaline or acidic cleaners can etch the surface of the aluminum and leave dull areas. Soap solution allowed to dry on the surface can dull the wheel finish. Do not apply abrasive polishes to the aluminum wheels.

Wheels - Coated (ACCU-SHIELD)

Outside: The coated surface of the wheels should be treated the same as the paint finish on the motorhome. Road soils, grime and break dust trap moisture which can cause corrosion over a period of time.

1. Clean frequently with high-pressure water.
2. Using a 100% cotton cloth and a mild soap solution (dish soap or car wash soap is recommended) to speed up the cleaning process.
3. Rinse remaining soap residue with high-pressure water. Wipe dry using a 100% cotton cloth to avoid water spots.
4. A secondary hand washing may be required to remove some stubborn road films.
5. Carnauba wax can be applied to help protect the finish.

NOTE: Allow wheels to cool before spraying with cold water.

CAUTION: Use only polishes marked “Safe for Clear Coat” or Alcoa Aluminum Care. Strong detergents made from alkaline or acidic cleaners used to clean the ACCU-SHIELD aluminum wheel can attack the surface of the wheel and leave dull areas. Do not clean the polished surface of the wheel with abrasive cleaners or cleaning tools, synthetic cleaning pads or strong chemicals such as acids or lye-based products. Use of strong solvents to remove grime from the surface of the wheel can cause damage to the wheel surface finish.

Minor imperfections in the coating can usually be repaired. Contact Accuride for “Accuride Technical Bulletin 2.0038” at **1-800-823-8332**.

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

NOTE:

For further information contact Accuride at 1-800-823-8332.

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 motorhome.

Bright Metal

Wash and clean all chrome, stainless steel and aluminum each time the motorhome is washed. Use only automotive approved non-abrasive cleansers and polishes on exterior bright work. Do not use abrasive cleaners or rubbing compounds to clean the mirrors.

NOTE: When using chemicals to remove road tars, use only automotive type products recommended for use on painted surfaces and fiberglass. Observe warning recommendations and directions, printed on the container, of any cleaning agent.

EXTERIOR MAINTENANCE

The motorhome is exposed to extreme temperatures, humidity, ultraviolet rays, acid rain and other environmental conditions. While in operation the motorhome is subject to twisting and flexing caused by (for example) going in and out of driveways, bouncing through potholes and driving through winding mountain roads. Maintenance is necessary not only to keep the exterior looking nice, but also to keep it in proper working order.

Roof Care & Seal Inspections

Periodic resealing of the joints and seams is necessary to prevent the entrance of moisture into the motorhome. Enough emphasis cannot be placed on this issue. Extreme damage from a water leak can rapidly occur. Never leave the vehicle unattended with a slide room extended. If the motorhome is stored outdoors during winter, perform a full interior inspection for water leaks every two weeks. Extensive sealing has been done at the factory, but the normal twisting and flexing that occurs while traveling may compromise a seal or a seam. Inspect all joints and seams at least twice a year. Replace caulking as necessary. Pay special attention to the roof air conditioner seals, ceiling and plumbing vents, skylights, roof mounted antennas, windows, door molding, clearance lights and beltline molding. Specific sealant products, available at most RV supply outlets, should be used in most areas for which they are designed. Listed below are some common sealants and the areas for which they are designed.

INSPECT:

Inspect all joints and seams at least twice a year and recaulked as necessary.

WARNING:

Some products may contain hazardous materials which require special handling. Read labels carefully. Follow all product manufacturer safety requirements.

Sealant Types

Acryl-R:

Used on all roof openings such as vents, skylights, roof-mounted antennas and ladder roof mounts. Sealant should be applied only where equipment bases meet the roof. Acryl-R is generally available in a caulking tube. Two colors are available - white and silver. Silver is used on items mounted on the forward painted area of the roof. White is used at all other points. Remove old sealant that is not adhered. Sealant that is secured need not be removed. Dirty or damp surface areas compromise sealant effectiveness. Thoroughly clean and dry the surface area before applying new sealant. Lay masking tape around the area to be sealed to stop sealant from spreading beyond the desired area. Using a caulking gun, apply new sealant as needed, working the caulking gun in a manner that cause the sealant to fully adhere to the applied area. Allow adequate cure time. Roof air conditioners use a closed cell foam base gasket and do not require sealant. The roof air conditioners should be regularly inspected for tightness at the four mounting bolts, one located in each interior corner of the air conditioner roof opening. Torque specification is 40 to 50 in/lbs. The base gasket should be compressed to about ½ inch.

Acrylic Sealants (Geocel 2300):

Used where items are sealed under a painted surface such as the metal corners of slide out rooms. The material is specially formulated to allow paint adhesion.

Black Urethane:

Used for sealing windshields, not designed to fill holes or other imperfections. Black Urethane is available in a tube that applies similar to silicone. Clean up using solvents such as paint thinner. Gloves are required when using this hazardous material.

Silicone:

Primarily used on the sidewalls around windows, doors, handles, beltline molding, latches and bases of surface mounted items such as clearance lights. Old peeling sealant should be removed with nylon sticks or equivalent. Metal utensils can scratch the painted surface. Avoid lacquer thinners or ketone based solvents as these chemicals can damage painted surfaces. Confirm that surface is clean and dry before a new application. Cut the tube at an angle with the smallest usable opening. Avoid a heavy bead. A little goes a long way. Use finger at a 45° angle on beaded surface to smooth out product. Do not moisten finger, use a disposable latex glove. Keep rags or paper towels handy for clean up. Use care when applying silicone. Plan ahead before starting a bead, look for obstacles that may impede application.

Spray Foam:

This product is used as a sealant where a hole has been made for items such as water lines or wires that are coming through a floor opening.

INTERIOR CARE***Cockpit***

The cockpit area dashboard is a molded fiberglass vinyl wrapped pod. The instrument panel is comprised of various gauges and switches. The dashboard and instrument panel each have different cleaning requirements. Clean the vinyl wrapped dash pod following the instructions under “Vinyl Care” in this section. In the event a blemish or small cut occurs in the vinyl, contact a professional upholstery repair service.

Clean the plastic or Plexiglas® instrument panels using a cloth dampened in a mild soap and water solution. Dry using a separate cotton cloth. Plastic polish products that will help to brighten the appearance of plastic or Plexiglas instrument panels are *Novus Plastic Care*®, a three-part system; *Meguires*®; and *Johnson Paste Wax*®, which will require extensive buffing and rubbing.

Glass lens gauges can be cleaned using glass cleaner. Spray cleaner on the cloth, not directly onto the lens, to prevent over spray or runoff.

CAUTION:

Most glass cleaning products are volatile to plastics; extreme care must be used to prevent the glass cleaners from contacting the plastic, making the plastic brittle and dulling the finish.

TIP:

To determine if the lens is glass or plastic, simply tap the lens with a fingernail. Plastic lenses have a dull hollow sound whereas glass has a clear ping.

FABRICS - General Care & Cleaning

Special care needs to be taken when the motorhome is exposed to a very humid climate for an extended period of time. Protect the fabric from any unnecessary exposure to moisture. Cover all upholstery and make sure window coverings are down to protect fabrics from sun damage. Frequently used items 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.
- Solvents that may have an adverse reaction on a specific backing of the upholstery fabric are not recommended.
- To prevent overall soiling, frequently vacuum or lightly brush to remove dust and grime.
- Clean spots using a mild water-free solvent or dry cleaning product.
- Clean in a well ventilated area and avoid products containing carbon tetrachloride or other toxic materials.
- Use a professional furniture cleaning service for overall cleaning.

Vinyl

Several areas of the motorhome, such as the dash, 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 in a well-ventilated area. Exercise proper caution. Keep away from 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:

Fresh paint can be wiped off with a damp cloth. Hot soapy water will normally remove dried latex.

Tar or Asphalt:

Remove immediately. Prolonged contact results 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 that have set, 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 and 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.

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, dampened with a mild detergent solution. 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.

TIP:

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.

Leather

Spots and Spills:

Absorb excess liquid immediately with a clean cloth or sponge. Use water only if necessary. Do not use a cleaning product. If water is used, clean the entire area where the spot occurred. An example would be the entire seat cushion or the entire arm. Allow to air dry. Do not dry the wet areas with hair dryers, etc.

Stubborn Spots and Stains:

Use lukewarm water and a mild soap to work up a thin layer of suds on a piece of cheesecloth. Scrub the surface. Rinse with a piece of clean, damp cheesecloth. Allow to air dry. Do not use saddle soap, cleaning solvents, furniture polish, oils, varnish, abrasive cleaners, soaps or ammonia water.

NOTE:

These are recommended or suggested methods of cleaning. The manufacturer is not responsible for damage incurred while cleaning. Always test the cleaning method in an inconspicuous area first before applying to the entire area.

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 with ethanol (ethyl alcohol). Follow 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 there is residue of bleach, the polyurethane resin and back cloth deteriorates.

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.

Sodium hypochloride is the only chemical that removes ballpoint pen stains. This chemical may yellow polyurethane or cause the back cloth to deteriorate. Remove ballpoint pen stains as soon as possible with ethanol.

**For more information, please call: Ultrafabrics, LLC
Customer Service: 1-877-309-6648**

Fabric Cleaning Codes

The following fabric cleaning codes list detailed cleaning instructions recommended by the fabric manufacturing industry. Refer to the fabric charts, located on the following pages, for particular fabrics and follow the recommended cleaning code.

“W” - Clean this fabric with the foam only of a water-based cleaning agent to remove the overall soil. Many household cleaning solvents are harmful to the color and life of a fabric. Cleaning only by a professional furniture cleaning service is recommended. To prevent overall soil, frequent vacuuming or light brushing to remove dust and grime is recommended.

“S” - Clean this fabric with pure solvents (petroleum distillate-based products such as Energine, Carbona, Renuzit, or similar products may be used) in a well ventilated room. Cleaning only by a professional furniture cleaning service is recommended.

CAUTION:

Use of water-based or detergent-based solvent cleaners may cause excessive shrinking. Water stains may become permanent and unable to be removed with solvent cleaning agents. Avoid products containing Carbon Tetrachloride as it is highly toxic. To help prevent soiling, frequent vacuuming or light brushing to remove dust and grime is recommended.

“S/W” - Clean this fabric with the foam only of a water-based cleaning agent or with a pure solvent in a well ventilated room (petroleum distillate-based products such as Energine, Carbona, Renuzit, or similar products may be used). Cleaning only by a professional furniture cleaning service is recommended. To help prevent overall soiling, frequent vacuuming or light brushing to remove dust and grime is suggested.

“P” - The article is resistant against perchlorethene, cleaning benzine (spirit), white spirit, R-11 and R-13.

“Dry Clean Only” - Cleaning only by a professional dry cleaner or furniture cleaning service is recommended for this fabric.

“X” - Vacuum only. A non-metallic brush may be used.

***Machine Washing for 100% Polyester:**

“Wash Cycle” - Use synthetic setting and high water level with mild agitation. A mild soap or detergent in water not to exceed 160° F. No bleach or fabric softener.

“Drying” - Use low temperatures, a synthetic setting of 85° F to 90° F maximum should be used. Do not exceed three to five minutes time on the synthetic cycle. If washed at 160° F, the maximum temperature which can be used to dry is 140° F. Hang or fold immediately after drying.

“Finishing” - If necessary, press as following:

- Iron on low setting (275° F) with damp cloth or steam iron using a dry press cloth.
- Grid Head press for short intervals with minimum steam. Do not lock the head.
- Flat bed press dampened drapery using cloth covering.
- Avoid prolonged contact with heat.

FLOORS

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: 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. Call Professional: Additional suggestions, special cleaning chemicals or the ability to patch the area might be available.

H. 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.

I. Spot Removal Kit: Available from retail carpet stores or professional cleaners.

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
Use the solution specified in order from 1-8 until stain is removed.	DRY CLEANING FLUID	NAIL POLISH REMOVER	DETERGENT SOLUTION	WARM WATER	VINEGAR SOLUTION	AMMONIA SOLUTION	STAIN REMOVAL KIT	CALL PROFESSIONAL	PERMANENT CHANGE
SPOTS									
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.

Tile Floor

Tile floors vary in porosity and surface irregularities. Regular maintenance is important to keep the tile in the motorhome looking showroom new. Once the slide-out has been extended, keep the tile floor clean to prevent dirt from scratching the tiles prior to retracting the slide-out.

NOTE:

Tile is ceramic and chips or breaks easily. Avoid dropping heavy or sharp objects on the tile.

Cleaning Tile:

Use a damp sponge mop or a cloth to clean tile. If moderate staining occurs, clean with a window cleaner such as Windex. A mild solution of hot water and all-purpose cleaner for tile floors, walls and countertops can also be used. Rinse well with clear water and dry with a soft cloth to prevent streaking. Avoid cleaning tile with soap. Soap forms a film to dull the luster. Soap also promotes the growth of mildew and bacteria. Do not use powdered cleaners on unglazed tile floors. Undissolved powder dulls the surface. Grout sealers protect the porous surfaces. If a sealer is used, follow sealant manufacturer guidelines for application. Never use sealers on unglazed tile. With the exception of terra cotta, which may be oiled or waxed, tile does not need to be polished to maintain its finish.

NOTE:

Before using any solution to clean the tile, check the manufacturer's warning label to ensure the safety of the product. If there is any doubt, apply several test patches of the solution in an inconspicuous place to determine product suitability.

Grout:

The grout used is a two part concrete mix. It is normal for this type of grout to develop surface cracks over time. In motorhome application, due to constant flexing of the flooring, this process may accelerate. If grout requires cleaning, scrub with a plastic brush. Do not use steel wool. Small particles may remain and produce stains.

Sealing the Tile:

Apply sealant to the tile floor and grout to prevent discoloring from spills. One pint of 511 Impregnator sealer, provided with the motorhome, is sufficient to seal the floor. Follow application instructions carefully.



070182

CAUTION:

Product contains petroleum distillate. Open windows, vents and doors to provide adequate airflow during application.

NOTE:

It is recommended to test a small amount of sealant on an inconspicuous area before applying to the entire floor. Avoid getting sealant onto surfaces other than the flooring.

To Apply:

1. Extend slide room(s) and clean floor. Allow floor and grout to thoroughly dry.
2. Working from rear towards doorway, apply sealant direct from container onto a cloth towel or broom handle applicator. Grout sealant applicators are available at large hardware stores.
3. Apply only enough sealant to wet surface. Do not allow sealant to puddle in grout lines. Extra care should be used to make sure all grout has been sealed. Only one application is necessary.
4. Allow five hours to dry. Sealant will fully cure in 72 hours.

NOTE:

If a spill occurs before sealant has cured, it may be necessary to clean and additionally treat area with sealant as needed.

Laminate Floor (Optional)

Laminate flooring used in the motorhome provides style, durability and ease of maintenance. This high-pressure laminated flooring is designed to be incorporated as a floating floor.

Laminate flooring is constructed of three main material components. The surface, similar to many countertops, contains aluminum oxide particles to form an extremely hard, durable outer layer. The carrier, or core layer, is constructed from high density fiberboard. A tongue and groove design provides a tighter bond. The backer or bottom layer is also made of laminate for strength.

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.

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.

CEILING

The ceiling of the motorhome can be a variety of materials or fabrics:

Hardwood Vinyl and Decorated Paneling:

Certain cleaning agents will affect the surface on both printed and unprinted vinyl. Use only a mild, non-abrasive detergent and warm water with a soft cloth or sponge to clean. Do not use bleach, alcohol, oil-based spray cleaners or cleaning agents that contain solvents, citrus oil or harsh chemicals.

Decorative Ceiling Mirror:

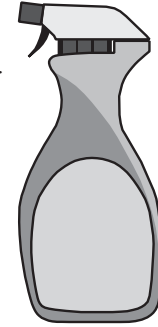
Household cleaners, ammoniated detergents or glass cleaners may be used on A-Look Decorative Metals. Use a glass cleaner applied to a soft cloth to clean.

Suede Fabric:

Restore suede surfaces using a soft brush. Remove dust from the suede fabric using the soft brush attachment of a vacuum.

WALL COVERINGS

Time is very important when removing substance from wall coverings that are solvent based or contain color. Do not use abrasive cleaners containing chlorine bleach or solvents. 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 dry.



cleaner.eps

Care for the Tower Wall Covering:

Remove ordinary stains with mild soap and warm water. Sponge on. Rinse well and dry with a soft cloth. For special cleaning problems: To remove ball point pen, blood, lipstick, etc., use a sponge or soft bristle brush and *Formula 409*, *Fantastik* or a similar product. Rinse well and dry. Finish cleaning by applying full strength isopropyl alcohol with a sponge or soft brush. Rinse well and dry.

Care for the Satinesque Wall Covering:

Remove stain quickly to minimize the reaction on the wall covering, especially if the stain is solvent-based or pigmented. Examples: nail polish, oil, shampoo, lacquer, enamel, paint, ink and lipstick.

Begin cleaning the stain with a mild soap-based detergent; and if necessary, move to a stronger cleaner such as household bleach, liquid household cleaners or rubbing alcohol. Before applying a stronger cleaner, test the cleaning agent on a small inconspicuous portion of the wall covering to ensure the cleaner does not affect the color or gloss of the wall covering.

Stain Removal Procedures for Specific Stain Types:

Normal Dirt - Remove normal dirt using a mild soap or detergent and warm water. Allow it to soak for a few minutes then rub briskly with a cloth or sponge.

Nail Polish, Shellac or Lacquer - Remove liquid using a dry cloth. Use care not to spread the stain. Quickly clean the remaining stain with rubbing alcohol. Rinse with clean water.

Ink - Remove immediately by wiping with a cloth dampened in rubbing alcohol. Rinse with clean water.

Chewing Gum - Rub with an ice cube to cool and harden. Gently pull off the bulk of the gum. Remove remaining gum with rubbing alcohol.

Pencil - Erase as much of pencil mark as possible. Wipe remaining marks with rubbing alcohol.

Blood, Feces or Urine - Remove these staining substances as quickly as possible. Wash the stained area with a strong soap. If the stain does not disappear, rinse the soapy area thoroughly with clean water. Mix a solution of 50% water and 50% household bleach. Clean the stained area with the bleach solution. Rinse with clean water.

WOOD CARE

Wood should be treated the same as a piece of fine furniture. Care and cleaning of the wood surface is essential in maintaining the natural beauty of wood. Keep in mind that wood finishes can vary widely. Test a new cleaning solution in an inconspicuous area to check for possible damage.

The care and cleaning of the solid wood surfaces and the wood products used in the motorhome depends on individual choices and preferences. Numerous waxes, polishes and finishing products are available for use. Always follow the manufacture’s label and instructions. 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 cleansers.

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 and polish removers, as well as 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 to the proper uses, although this may vary from wood type to type. The key to sanding is using the right sandpaper for the repair that is needed. Always sand with the grain.

GRIT	Common Name	Uses
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	Sanding finish to remove luster or surface blemishes.

Steel Wool:

Abrasive material composed of long steel fibers of varying degrees of fineness that are matted together. The 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.

NOTE:
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 goes through the stain 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 of 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 damages 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:

Check the scratches carefully. If flaking varnish is visible with dark-stained wood underneath, only the clear finish may need to be restored. Rub the loose varnish with fine steel wool or fine synthetic steel wool until you have removed the flaking varnish and slightly roughened a small area of the finish surrounding the scratch. With the tip of a rag, a small brush, or even a cotton swab, apply a thin coat of wipe-on finish. Apply finish to the damaged area only. Several coats may be needed to hide the scratch.

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 several 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 onto the scratch. Start with a stain color that is lighter than the original finish, because torn and scratched wood fibers will absorb stain and darken quickly. 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 motorhome 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 Grey 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 Grey 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 with 180 grit sandpaper, followed by 320 grit, until the scratch is gone.
- Restore the finish using a grey Scotchbrite pad. Never sand hard in one small area. Feather out lightly 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 using strong chemicals on the Solid Surface 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.

NOTE:

Do not cut directly on the solid surface. When pouring boiling water into the Solid Surface sink, run cold water to prevent damage.

Stainless Steel Surfaces

Clean stainless steel once a week with a damp sponge. Apply stainless steel cleaner/polish with the grain, not across, using a non-abrasive cloth or sponge. Do not use steel wool, a wire brush or abrasive sponge pad as these mar the finish. Cleaner containing chloride is not recommended; however, if used, thoroughly rinse the surface to prevent corrosion. To avoid water spots, do not allow water to evaporate on the surface.

WINDOWS

Water Spots:

Glass develops water spots if not properly cleaned. Water spots are 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.

Condensation

Condensation occurs from water vapor present in the air. More vapor is added by breathing, bathing, cooking, etc., and 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 motorhome. Even in raining or snowing conditions the air outside will be far drier than the interior air.
- Install a dehumidifier, as continuous use is effective in removing excess moisture from the interior air. Using a dehumidifier is not a cure-all, however, it reduces 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 motorhome interior with the oven. Heating with the 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 warms and ventilates the interior of the storage compartments and the exterior wall surface, reducing or eliminating condensation and preventing the possibility of ice formations.

WINDOW TREATMENTS

Mini-Blinds

Dusting:

Regular dusting maintains the appearance of most blinds. Keep the aluminum blinds looking their best by periodically wiping them with a soft cloth or a dusting mitt. By tilting the slats down, but 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 brush attachment of any 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 motorhome.

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 any water that might drip down.

Ultrasonic cleaning:

Professional ultrasonic cleaning may be preferred.

Day/Night Shades**Guidelines for care and maintenance of polyester blended the day/night shades:**

- Leave Day-Night shades in the UP position when not in use to help the shades hold their shape.
- String tension for the shades should be equal. The tension can be adjusted if the shades will not remain up.

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 a cleaning solution of ¼ ounce clear liquid soap to 8 ounces 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. Mold spreads by means of microscopic spores borne on the wind, and is found everywhere life can be supported. Motorhome construction is not, and cannot be, designed to exclude mold spores. If the conditions are right, mold can grow in the motorhome. Most people are familiar with mold growth in the form of bread mold, and mildew that may grow on bathroom tile. Mold spores, as they grow, can leave a musty odor, discolor fabrics, stain surfaces, and cause considerable damage.

What Does Mold Need to Grow?

Mold requires a food source to grow. Grease films contain nutrients to cultivate mold spores. Soil on items such as fabrics and furniture may also supply nutrients for mold growth. Synthetic fabrics, such as acetate, polyester, acrylic and nylon, are mildew resistant, but soil on the surface of these fabrics is susceptible to mold.

Temperate climate and moisture help to cultivate mold growth. Moisture in the motorhome 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 motorhome 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 motorhome owner can, and should, reduce or eliminate the occurrence of mold growth in the motorhome; thereby, minimizing any possible adverse effects. Take the following steps to help reduce or eliminate mold growth in the motorhome.

1. Check for signs of mold prior to bringing items in the motorhome. Potted plants (roots and soil), furnishings, or stored clothing and bedding material, as well as many other household goods, may already contain mold growth.
2. Regular vacuuming and cleaning will help reduce mold levels. Mild bleach solutions and most tile cleaners are effective in eliminating or preventing mold growth.
3. 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.
4. 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 motorhome. Promptly replace materials that cannot be thoroughly dried.
5. 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.
6. 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. Should mold growth be severe, call on the services of a qualified professional cleaner.
7. If mold cannot be removed from an item, properly dispose of.

Whether or not a motorhome owner experiences mold growth depends largely on how the motorhome 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 motorhome 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 location, it is safe to assume there will be pests waiting. These pests are not only annoying; they can pose health risk and create serious damage to the motorhome.

- Common pests include insects such as ants, cockroaches, termites, flies, pantry pests and wasps as well as wildlife such as 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 the clutter inside the motorhome and storage bays. 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 motorhome, including storage bays. 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. Ensure all windows and doors are screened and that the screens fit snug in the frames.
- Many pests need moisture to successfully 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 motorhome 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, bay doors and items that may be leaning against the outside of the motorhome, such as fishing poles and golf clubs.
- When the motorhome is stored outdoors, clear the surrounding area of all rodent friendly hiding places - shrubs, trees and clutter. Completely seal the underside of the motorhome. Wire mesh will work well to prevent points of entry, but beware of blocking necessary air vents. Prior to operating the motorhome after storage, remove all insect and animal nests that may have developed around vents, engine compartments, the exhaust pipe and in the wheel wells.

Rodents:

Rodents may chew through wires or build nests in components of the motorhome. 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 120 Volt AC wiring more than 12 DC Volt wiring.

NOTE:

Although the back cap of the motorhomes is well sealed, rodents are capable of chewing through the foam insulation and that area should be routinely inspected.

If there are signs of rodent infestation around the motorhome, 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 is required to remove the infestation. Regularly inspect the exterior of the motorhome 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. Some types of spiders like to nest on top of the diesel tank and around the diesel hoses. 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 motorhome 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 1/4" 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 leaves to seek food. Spraying pesticides only kills the ants that are away from the colony. To eliminate all ants, the colony must be destroyed. 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 motorhome. 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 motorhome work to discourage insect invasion. During nighttime hours insects are attracted to bright exterior lighting.

If the presence of moths is detected inside of the motorhome, 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 motorhome is parked in the flight path of a flock. Bird droppings are hard to remove and will leave stains. Prevent permanent staining to the motorhome roof by regularly cleaning the surface to remove all bird droppings.

Damage from Pests:

Lizards have been known to crawl into the inverter and short out the circuit board. 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 well away from the motorhome. A scorpion will glow blue-green in UV light. If the presence of scorpions in the motorhome is suspected, investigate with an UV black light during the nighttime hours.

Best sources of information about common household pests:

The Internet is a great place to find information about common pests, however, the information is not always correct. The National Pest Management Association website can be useful resource about 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 will 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 that you are seeking assistance for a motorhome, as treatments may differ from standard household jobs. If a pest problem is suspected in the motorhome, 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 they were satisfied with the service.
- Membership in the national, state or local pest control associations 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; find out 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 means storing the motorhome for a period of 30 days or less. Properly preparing the motorhome during periods of short term storage makes bringing the motorhome out of storage much easier. Winterize the plumbing system if the motorhome is stored when temperatures are below 32° F.

Checklist - Short Term Storage:

- Retract the slide rooms. Do not store the motorhome with slide rooms extended.
- Shut off all appliances. Close the primary LP-Gas valve.
- Remove all articles from refrigerator/freezer and clean thoroughly.
Prop doors open to prevent mildew.
- Holding tanks should be drained and fresh water system winterized with potable antifreeze or winterize the plumbing system using air pressure.
- Retract and secure all awnings.
- Turn **OFF** the interior house power.
- Cancel the Automatic Generator Start program (if the motorhome is equipped).
- Batteries should be stored fully charged. Batteries stored in a discharged state will readily freeze.
- If possible, park the motorhome so that the batteries are accessible for charging or changing without having to move the motorhome.
- If available, leave the motorhome hooked to shore power. Leave the main battery disconnect switches **ON**.
- Careful placement of a small heat source and desiccate filter systems help remove interior moisture.
- If AC power is not available, turn the chassis battery disconnect switch **OFF**.
- If possible, store the motorhome inside a storage building.
- If stored outside, inspect all seams and seals bi-monthly for possible leakage.
- Store the motorhome with a full fuel tank to minimize moisture condensing at top of fuel tank.
- 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 bi-monthly. Be sure to check behind all cabinet doors and drawers.

Long Term

Long term storage means leaving a motorhome unattended for 30 days or more. When left out in the environment without proper storage or maintenance, a motorhome is vulnerable to moisture and oxidation.

NOTE:

Moisture in the air condensing occurs with temperature changes of 30° F or more in one day. Humidity readings of 60% or greater allows the accumulated moisture to remain for extended periods of time.

If AC power is not available in storage area:

- Turn off all appliances.
- Turn off the interior battery disconnect switch.
- If possible, situate the motorhome so the batteries remain accessible, allowing a battery to be charged or replaced without moving the motorhome.
- Charge the batteries to a full state of charge.
- Cancel the Automatic Generator Start program (if the motorhome is equipped).
- Turn the main battery disconnects **OFF**.
- When stored outside, use Aladdin™ to make a chassis battery voltage check. If the motorhome is stored outside, solar panels may offset parasitic loads. Use preventative measures if voltage readings are low. Removing the motorhome from storage or moving the motorhome in an emergency is an easier process.

NOTE:

Batteries in a low state of charge readily freeze. Freezing damages the battery.

If AC power is available:

The chassis battery disconnect switch remains **ON**. The inverter charges both house and engine battery banks. A 30 Amp shore power service is more than adequate.

CAUTION:

A 20 Amp service using light duty extension cords and required adapters create 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!

Type of surface to park and store the motorhome on:

- Do not park the motorhome on grass or gravel with the tires on blocks to avoid moisture accumulation.
- Concrete pads seal the surface allowing better ventilation under the motorhome.
- Storage buildings with concrete floors or heated storage facilities greatly reduce moisture accumulation and protect the motorhome from moisture damage.

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 motorhome to reduce interior moisture condensation or humidity.
- Proper winterization of the fresh water system prevents 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. Store Day/Night Shades in the Up position.
- Cardboard templates can be made for the windows to protect the interior from exposure to direct sunlight.
- Tire covers are available to protect the sidewall of the tires from cracking. Make sure tires in storage contain the correct air pressure to prevent damaged caused by underinflation.
- Regularly washing the exterior to help control moss accumulation.

Inspect the motorhome:

- Perform a full interior inspection for water leaks every two weeks while the motorhome is in storage. Check inside all cabinets for signs of dampness or leaks. Inspect the ceiling areas around roof openings.
- The roof and sidewall seams should be inspected and cleaned at least twice a year. Inspect for exterior sealant gaps of all roof seams, vents, skylights, roof air conditioners and windows.

Fuel:

Storing the motorhome with a full tank of fuel minimizes moisture condensing at the top of the tank. Diesel fuel is an organic material which develops a microbe growth (black slime). Fuel stabilizers may be added to control microbe growth and degrading of the fuel. Consult the engine manufacturer's owner's manual or a distributor for further detailed information on fuel stabilizers and additives.

Brakes:

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

Engine:

Internal combustion engines need to be "exercised" on a regular basis to ensure an adequate supply of lubricating oil coats the cylinder walls and piston rings. Valve and valve seat surfaces also suffer from non-use. Some valves remain open depending at which part of the combustion cycle the engine has stopped. The heat and cold of the day allows moisture to accumulate through the exhaust system. Start the generator at least monthly.

Electric Motors:

Electric motors in the motorhome should be occasionally operated to keep surfaces lubricated. This includes roof air conditioners, dash fans, dash blower motor, Hydro-Hot motors, heat exchangers and powered roof vents.

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 avoid fading fabrics, cover windows with blinds, closing shades or using a separate cover.
- **Holding Tank** - Drain and rinse. Close valves. Add a small amount of antifreeze to keep valves and gaskets lubricated.
- **Drain Traps** - Pour RV antifreeze down all drains.
- **Refrigerator** - Clean and leave both doors propped open. Cover the exterior panels and roof vents.
- **Batteries** - Add distilled water and recharge if needed. Disconnect the cables. Remove batteries and store them in a cool dry place. Never park the motorhome where the battery door cannot be opened.
- **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.
- **Fuel Tank** - Diesel fuel tank should be full of fuel.

Removal From Storage

If the motorhome was properly and carefully prepared for storage, removing it from storage is not difficult. The following checklist pertains to items or areas that should be checked before operating or moving the motorhome. If the motorhome 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 motorhome. 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 which may have occurred.
- Check the state of charge of the batteries. If necessary fill the cells with distilled water only and charge as necessary. Inspect the cable ends and terminals. They should be clean and free of corrosion.
- Check all the chassis fluid levels: engine oil, engine coolant, hydraulic fluid reservoir, transmission oil and rear axle oil.
- Start the engine, allowing it to reach operating temperature. Ensure the engine instruments are indicating proper readings.
- While the engine is running check the operation of headlights, taillights, turn signals, back-up lights, license plate light and emergency flasher. Operate the dash air conditioner. If the air conditioner does not work, or the compressor makes unusual noises, have the system checked by a qualified air conditioner technician.
- Shut the engine down. Adjust or add fluids as necessary. Inspect the engine for fluid leaks. Look under the motorhome for fluid leaks.
- Drain, sanitize and flush the fresh water system as outlined in the ***Water Systems - Section 6***. 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.

NOTE:

Discard at least the first two trays of ice from the icemaker to ensure the ice does not contain traces of antifreeze or other contaminants.

- Open cabinet doors and drawers. Inspect for water leaks at joints or fittings. Repair as necessary.
- Operate all 12 Volt DC lights and accessories. If something does not work there may be a bad 12 Volt DC circuit breaker or blown fuse.
- Install new batteries in battery operated safety detectors or devices. Test the Carbon Monoxide, LP-Gas and smoke detectors for proper operation.
- Check that the monitor panel is properly functioning.
- Inspect the 120 Volt AC electrical system which includes the power cord, inverter/converter, all outlets and exposed wiring.

NOTE:

Prepare the generator for operation following the instructions in the Generator OEM manual.

- Start and run the generator.
- Confirm that the batteries are charging. Operate the 120 Volt AC 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 LP-Gas system and perform an LP-Gas leak test. The leak test should also include an LP-Gas regulator adjustment (if needed). The test can also verify if the regulator is faulty and should be replaced. Have the LP-Gas tank inspected.
- Operate each LP-Gas 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.
- Check the windshield wiper blade condition. Check the wiper/washer operation.
- Wash and wax the exterior. Check the body for scratches or other damage; touch up or repair as necessary. Flush the underside thoroughly.
- Run through the operational checks for steering, brakes, engine and transmission. Operate the motorhome slowly during these checks to allow sufficient circulation of fluids and resetting of the components.
- If desired, have the dealer or repair center double-check preparation to make necessary adjustments and/or correct defects.

CAMELOT 2006

APPLIANCES — SECTION 4

APPLIANCES - INTRODUCTION	105
REFRIGERATOR.....	105
Operation Specifics	105
Control Panel - Two Door.....	107
Control Panel - Four Door (Optional)	108
Icemaker.....	108
Refrigerator Alarm.....	109
Cooling Unit Fans (Four Door Models)	109
Doors	109
Storage Procedures.....	110
Interior Light.....	110
Service	110
Air in LP-Gas Supply Lines	110
MICROWAVE/CONVECTION OVEN.....	111
Care & Cleaning	112
COOKTOP	113
COOKTOP RANGE/OVEN (OPTIONAL).....	114
Cooktop Cover	115
Lighting the Burners	115
Burner Grate	116
WALL THERMOSTAT	117
AIR CONDITIONING - ROOF.....	117
Operations	118
Heat Pump Mode	118
Return Air Filters	119
FURNACE	119
Operating Instructions	120
Using the Furnace	120
If the Furnace Fails to Light.....	121
WATER HEATER.....	121
Before Using the Water Heater.....	121
Operation	122
Ignition Module Function	123
Water Heater Bypass.....	123
Pressure - Temperature Relief Valve.....	123
Burner Compartment.....	124
Tips	124
Draining & Storage.....	125
Troubleshooting	125
HYDRO-HOT (OPTIONAL).....	125
Troubleshooting	127
Fuel Filter/Water Separator.....	129
Garber Filter - Hydro-Hot FLX-120-000	130
Hydro-Hot Overall View	130
WASHER-DRYER PREPARED	131
WASHER - DRYER (OPTIONAL).....	132
Operation	133
Washer/Dryer Maintenance	134
Winterizing the Washer/Dryer	134

APPLIANCES - INTRODUCTION

This section covers operation and care of the various standard and optional appliances found in the motorhome.

INFORMATION:

Detailed information with CAUTION or WARNING instructions for the various appliances, other than what is found in this section, can be found in the manufacturer manuals.

WARNING:

Before entering any type of refueling station turn off all LP-Gas operated appliances. Most LP-Gas appliances used in recreational vehicles are vented to the outside. When parked close to a gasoline pump it is possible for fuel vapors to enter this type of appliance and ignite, resulting in an explosion or fire.

WARNING:

Carbon monoxide gas may cause nausea, fainting or death. Operating an LP-Gas appliance with inadequate ventilation or partial blockage of the flue can result in carbon monoxide poisoning. Do not store flammable liquids such as lighter fluid, gasoline or propane in the outside refrigerator compartment.

NOTE:

Features and options vary with floorplans.

REFRIGERATOR

The refrigerant is heated until it vaporizes. When the refrigerant cools, heat is extracted from inside the refrigerator. Gravity returns the coolant to a reservoir and the cycle is repeated. To ensure longevity and proper operation of the refrigerator, follow the specific guidelines in the refrigerator manual. With proper care and maintenance, the refrigerator should provide years of trouble-free service.

INFORMATION:

Refer to the refrigerator manual for detailed operating and maintenance instructions.

NOTE:

To reduce the possibility of food spoilage, keep the interior box temperature at or below 40°F. The refrigerator consumes more energy to maintain low temperature, especially in hot, humid climates. Lower temperature may also lead to quicker frost build-up.

Operation Specifics

- The refrigerator operates from LP-Gas or 120 Volts AC electric.
- DC Voltage for control pad operation 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.

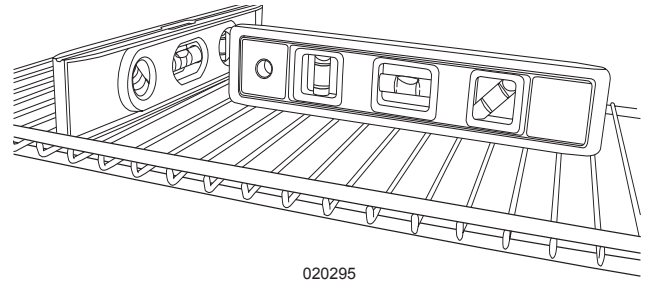
Important: Operate refrigerator only when level. Level the refrigerator, (from front view) within 3° side-to-side and 6° front-to-back, using a torpedo or bulls eye (fence post) level. Place the levels on the bottom shelf of the refrigerator. The level should be within the circle by a half of a bubble. Generally, this is within comfortable living conditions.

CAUTION:

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

WARNING:

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



For the refrigerator to operate:

- The house batteries must be charged.
- The battery cut-off switch must be on.
- The primary LP-Gas valve must be on, the electric gas valve must be on or an AC source must be available.
- **Figure A:** The refrigerator 120 Volt AC cord(s) must be plugged in (located outside behind refrigerator access door).
- **Figure B:** The water valve must be open if the refrigerator is equipped with an icemaker. (Located behind the refrigerator access door.)
- **Figure C:** If controls do not light up, check house batteries charge status or see if the 12 Volt DC wires are plugged into the refrigerator’s circuit board (located outside behind refrigerator access door).

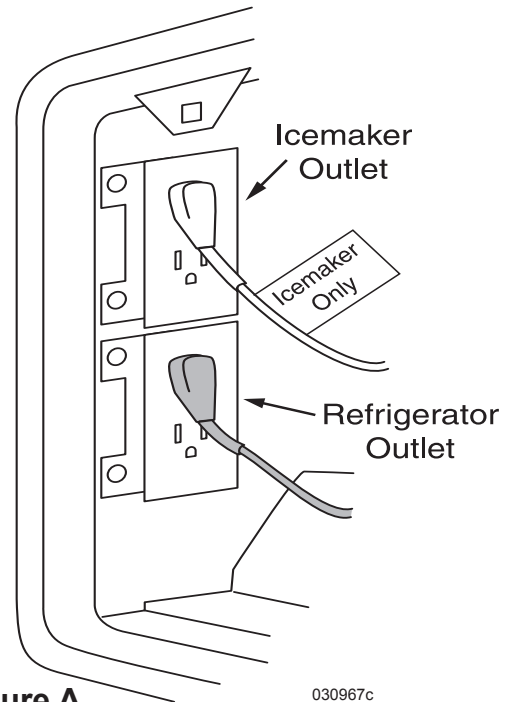


Figure A

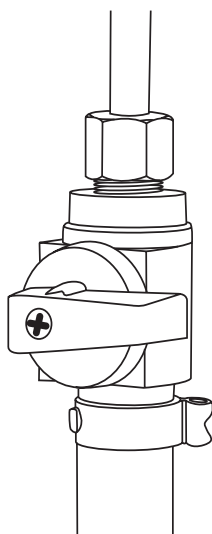
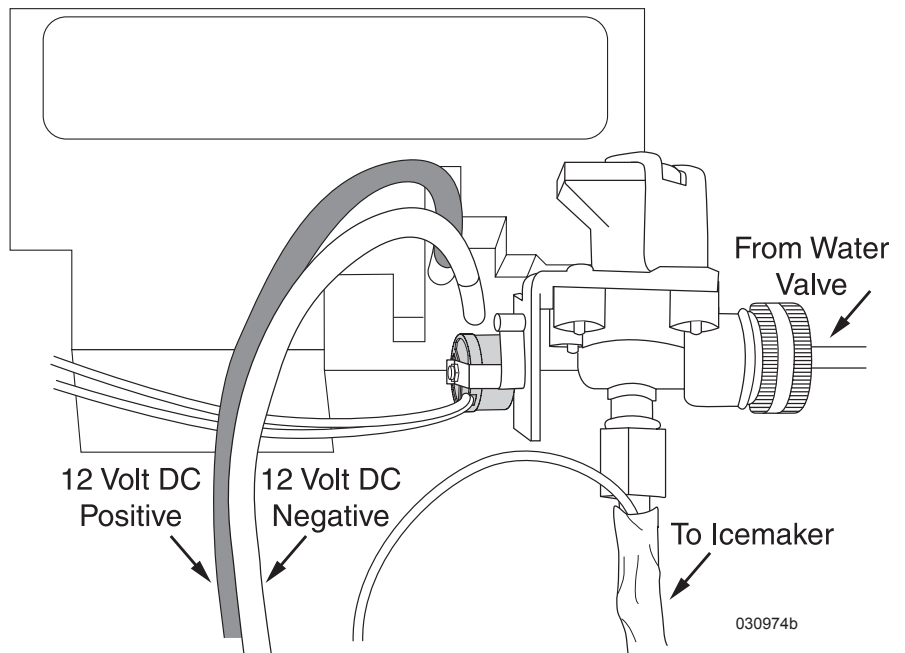
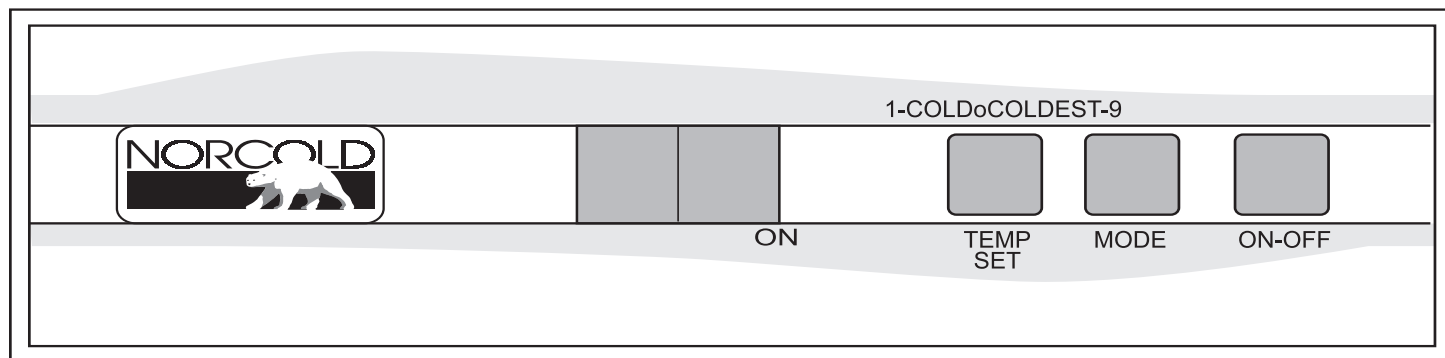


Figure B

Located in the exterior refrigerator access compartment



Control Panel - Two Door



- **ON/OFF Button** - Turns the refrigerator on or off.
 - Push the **ON/OFF** button to start the refrigerator in Auto mode.
 - Push and hold the **ON/OFF** button for two seconds to shut it off.
- **LED Display** - This screen is used for mode, temperature and fault code display.
- **TEMP SET Button** - Adjusts the temperature.
 - To adjust push and hold the **TEMP SET** button.
 - Number “9” is the coldest setting.
- **MODE Button** - Controls the operation mode of the refrigerator.
 - Press the **MODE** button to select between Automatic AU, AC or LP operation.

Manual Mode:

When one of the two manual modes is selected:

1. **AC** = The refrigerator is operating on AC electric.
2. **LP** = The refrigerator is operating on LP-Gas.

Automatic Mode (AU):

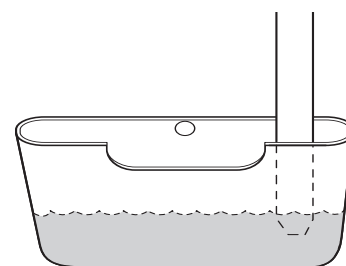
This feature selects AC over LP-Gas operation. If AC discontinues, the refrigerator switches to LP-Gas operation. If the refrigerator fails to light, the alarm sounds and a code displays.

- Press the **MODE** button until **AU** displays.
- Press and hold the **SET TEMP** button until the desired temperature displays. Release button.
- In **AUTO** mode, **AU/AC** or **AU/LP** will alternate three times when a mode has changed.

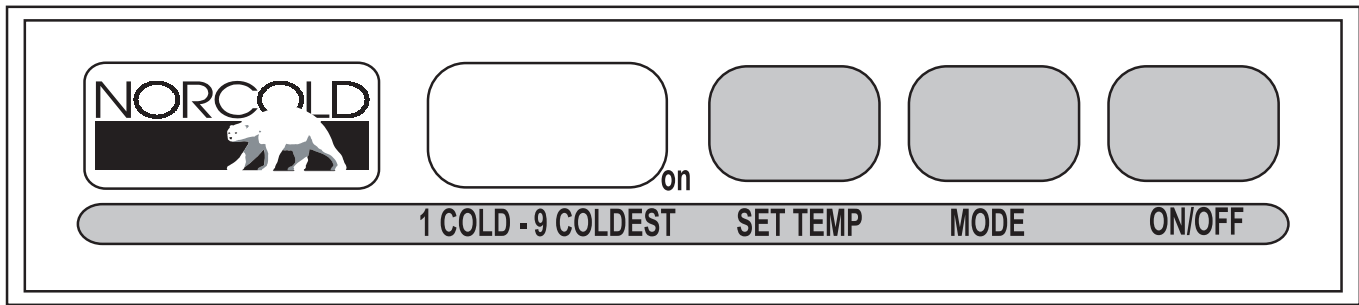
If the LP-Gas does not ignite within 30 seconds, the control changes to a different energy source or the gas safety valve closes and “NO,” then “FL” displays and an alarm sounds. Turn the refrigerator off then back on. If the gas does not ignite after several attempts consult a dealer or authorized Norcold service center.

Tips:

- Cool items first, if possible, before putting them into the refrigerator.
- Keep the doors shut. Know what you want before opening the doors.
- Allow the refrigerator 24 hours of operation before actual use to help get a “head start” with the refrigeration process.
- A box of open baking soda will help absorb food odors.
- Refrigerator icing can be slowed in high humidity if the end of the drain tube is submersed in drip pan.



Control Panel - Four Door (Optional)



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- **ON/OFF Button** - Turns the refrigerator on or off.
 - Push the **ON/OFF** button to start the refrigerator in Auto mode.
 - Push and hold the **ON/OFF** button for two seconds to shut it off.
- **LED Display** - This screen is used for mode, temperature and fault code display.
- **MODE Button** - Controls the operation mode of the refrigerator.
 - Push and hold the **MODE** button to select between Automatic AU, AC or LP operation.
- **TEMP SET Button** - Adjusts the temperature.
 - To adjust push and hold the **TEMP SET** button.
 - Number “9” is the coldest setting.

Manual Mode:

When one of the two manual modes is selected:

1. **AC** = The refrigerator is operating on AC electric.
2. **LP** = The refrigerator is operating on LP-Gas.

Automatic Mode:

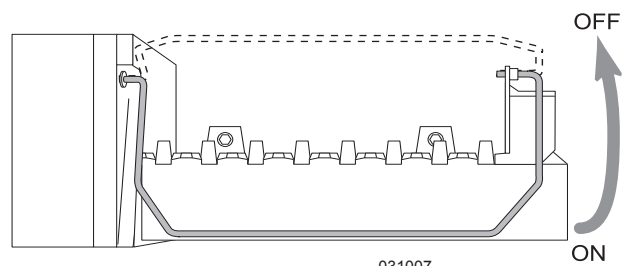
This feature selects AC over LP-Gas operation. If AC discontinues, the alarm sounds and the refrigerator switches to LP-Gas operation. If the refrigerator fails to light, the alarm sounds and a code displays.

- Press and hold the **MODE** button until AUTO displays, release the button.
- Press and hold the **TEMP SET** button until the desired temperature displays, release button.
- In AUTO mode, AC or LP will remain lit for 10 seconds or when a mode has changed.

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

Icemaker

The icemaker requires 120 Volts AC to operate. Only after the freezer reaches freezing temperature will the icemaker function. City water or the water pump must be on and the valve for the water supply line to the icemaker must be on.



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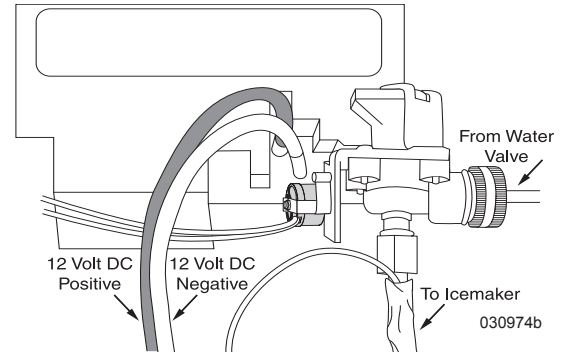
- Pull the metal arm (bail) down to turn the icemaker on.
- Push the arm up to turn the icemaker off.

NOTE:

If the icemaker is in operation while the motorhome is in motion, water may spill out of the ice tray. Raise the icemaker arm to stop ice production while in transit. Do not use the first 1 or 2 trays of ice if the refrigerator has been in storage. Ice cubes may have contaminants. Do not operate the icemaker without water pressure supplied to the refrigerator as this can damage the icemaker assembly.

Water Line Heater:

A thermal disc supplies voltage to heater tape when ambient temperature is less than 38° F (+/- 4°) and shuts off at temperatures greater than 48° F (+/- 5°). The water line heater is only for the line from the solenoid to the icemaker. The line from the icemaker shut-off valve to the water valve is protected with foam insulation.



Refrigerator Alarm

The refrigerator alarm will sound for the following reasons:

1. DC or AC voltage is higher or lower than allowed.
2. The refrigerator fails to light on LP-Gas or fails to light after a period of operation.
3. Refrigerator is set to Auto, 120 Volts AC is discontinued and LP-Gas fails to light. **NO AC** displays, followed by **NO FL**, and the alarm sounds. Consult the OEM manual.
4. Door is open longer than 2 minutes.
5. The circuit board detects a failure. The control panel will display a code.

NOTE:

If the alarm sounds, note the code in the LED display and turn refrigerator off to silence the alarm.

INFORMATION:

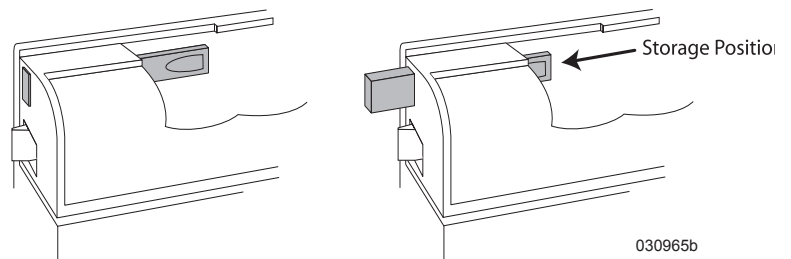
Refer to the OEM manual for the list of codes and their meanings.

Cooling Unit Fans (Four Door Models)

The cooling unit is equipped with a pair of cooling fans that pass air across the cooling unit. These fans start automatically and are audible when in operation.

Doors

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



In storage, a completely sealed refrigerator is a perfect environment for mold and bacteria to grow. When storing the motorhome, reduce odor from mold and bacteria in the refrigerator by using the door storage feature to lock the doors partially open. To use the storage feature, open doors enough to slide tab into the cut-out of the strike plate.

Storage Procedures

Storage Feature:

- Turn the refrigerator off 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 that can damage the interior finish.
- Rinse with a solution of baking soda and water. Dry with a clean cloth.
- Lock the doors open.

CAUTION:

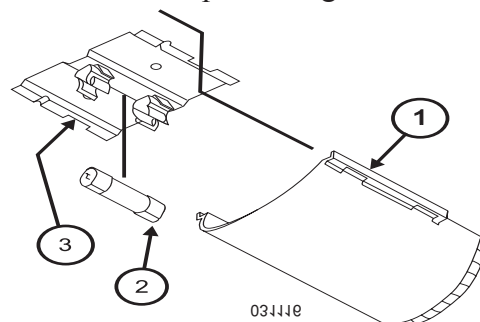
When defrosting, do not use a hot air blower. Permanent damage could result to plastic parts. Do not use a knife, ice pick or any other sharp instrument to remove ice from the freezer as they can puncture the system.

Interior Light

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

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.



Service

The LP-Gas function of the refrigerator and LP-Gas pressure will require annual service. Over time, the BTU rating of the flame can change, affecting the refrigerator's performance. Ambient temperature, high humidity and altitude above 5,500 feet can affect performance and function. If possible, switch mode operation to AC while at a higher altitude.

Air in LP-Gas 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 gas supply system, propane gas supply lines may contain air. Due to the air in the gas supply lines, the refrigerator may not ignite on propane gas within the specified amount of time. Follow the procedure on how to remove air from the LP-Gas supply lines.

To remove the air from the LP-Gas supply lines:

- Ensure the primary LP-Gas 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 LP. The refrigerator will start a 30 second trial for ignition during which the gas 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. If after the third attempt the refrigerator fails to light, stop and consult your local dealer or an authorized Norcold Service Center.

MICROWAVE/CONVECTION OVEN

The microwave/convection oven operates by 120 Volt AC supplied by shore power, the generator or inverter.

Operation Tips:

- Ensure cookware being used is microwave safe. Gold paint or glaze may contain a trace amount of gold which is electrically conductive and not compatible for microwave. Hand painted china commonly contains traces of metal.
- The glass tray and roller guide must always be in place during cooking.
- Ensure the door is firmly closed before use.
- If the control pad is not lit, plug another electrical appliance into the same outlet to verify 120 Volt AC power is present. If the test item works, contact an appliance repair facility to have the microwave/convection oven checked.
- Steam accumulating inside or around the outside of the oven door may occur when the microwave/convection oven is operated under high humidity conditions and in no way indicates a malfunction of the unit. Wipe away steam using a soft cloth.

Microwave/Convection Oven Facts:

One of the most useful documents for the microwave/convection oven is the operations manual, located in the owner's information file box. Read it carefully and keep it for reference.

A properly functioning microwave/convection oven presents no hazard with ordinary use. Safety features should be kept in good condition. Never attempt to bypass safety interlocks or allow debris or residue to accumulate on the door or oven face. If the oven is damaged, discontinue use.

Oven adjustments or repairs should be made by qualified service personnel. Check the microwave/convection oven owner's manual for maintenance tips and other information. Remember to register the microwave/convection oven with the manufacturer.

CAUTION:

If a fire flares up when using the cooktop, turn off the ventilation fan as it may spread the flame. The ventilation fan cannot be turned off manually if it has started automatically from a heated cooktop. Turn off the microwave AC breaker to prevent the flames from spreading into the microwave.

NOTE:

When dry camping, minimize using the inverter to operate the microwave/convection oven due to the high rate of battery consumption.

NOTE:

The microwave/convection oven is for food preparation only. Do not use the microwave/convection oven to dry clothes, newspapers, shoes or other items.

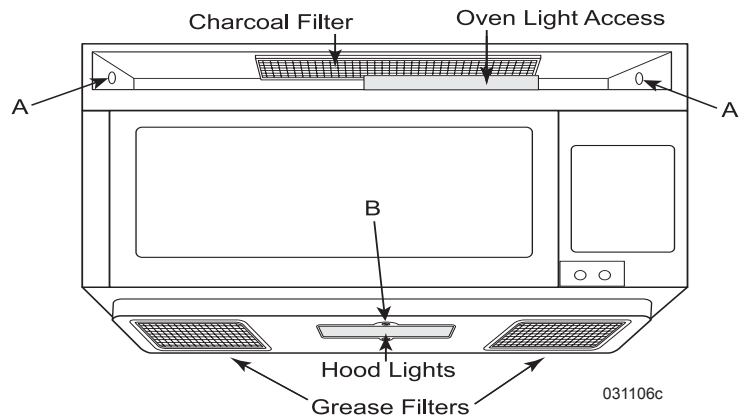
Care & Cleaning

The exterior of the microwave/convection 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.

Charcoal Filter:

Depending on use the charcoal filter should be replaced every 6 to 12 months. Use the following procedure to remove the louvers to replace the charcoal filter and oven light.

1. Remove power to the microwave/convection oven.
2. Remove the screws (A) securing the louver.
3. Insert a flat edge screwdriver over each tab pressing downward and move the louver away from the microwave.
4. Remove and replace the charcoal filter. Ensure the filter is positioned on the supporting tabs.
5. Replace louver and mounting screws.



Oven Light:

1. Remove the louver as indicated above.
2. Slide the metal light cover forward and lift upwards.
3. Remove the light bulb and replace only with an equivalent watt bulb. **DO NOT EXCEED 30 WATTS.**
4. Replace light cover, louver and mounting screws.

Hood Light:

1. Remove power to the microwave/convection oven.
2. Remove the screw (B) securing the light cover.
3. Remove the light bulb and replace only with an equivalent watt bulb. **DO NOT EXCEED 30 WATTS.**
4. Close the cover and re-secure with screw.

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 Filters:

Operating the microwave/convection oven without the grease filters in place can damage the unit. Grease filters should be cleaned at least once a month. To remove the filters, use the pull-tab to slide the filter to the end of the opening and tip down. Soak the filters in the sink or in a dishpan filled with hot water and detergent.

- Do not use ammonia or other alkali-based products that may darken the filter material.
- Agitate the filter. Use a scrub brush to remove caked on grease.
- Rinse the filter thoroughly and shake dry. Place the filter back into the opening, tip upward and slide filter to the end of the opening. Lock in place. Be careful not to kink or warp the filter upon installation.

Cleaning Tips for the Microwave:

- Turn the oven off before cleaning.
- Cover food while cooking to keep food spattering to a minimum.
- Clean up all spills or spatters before they dry. Wipe up food spatters or spilled liquids with a damp cloth. Mild detergent may be used for stubborn spills. Do not use harsh detergent or abrasive cleaner.
- It is occasionally necessary to remove the glass tray for cleaning. Wash the tray in warm, sudsy water or in a dishwasher.
- The roller guide and oven cavity floor should be cleaned regularly 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 1 lemon, several whole cloves and 8 oz. of water into a 2 cup bowl. Place in oven on high power; bring to a boil for several minutes. Let cool in the oven for several minutes.
- Clean the outside oven surface with soap and water. Wipe away any residue using a damp cloth. Dry with a soft cloth. To prevent damage to the operating parts inside the oven, do not allow water to seep into the ventilation openings.
- If the control panel becomes wet, clean with a soft, dry cloth. Do not use harsh detergents or abrasive when cleaning the control panel.

COOKTOP

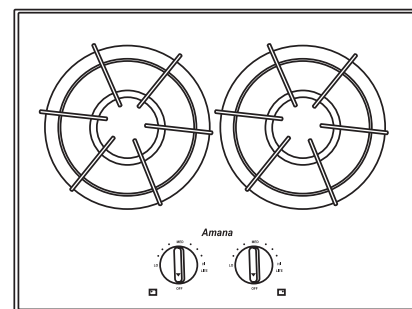
The cooktop utilizes sealed glass surface burners that spread heat evenly across the bottom of the cookware surface. The cooktop uses an electric ignition system that requires 12 Volt DC to operate. The house disconnect switch must be **ON** to supply power to ignition module. The cooktop should be used for cooking purposes only, not for heating. When the burner valve is open, the fuel source flows through the valve into the mixture tube. The fuel passes by a hole or venturi in the mixture tube, which draws air in with the fuel for a proper fuel/air ratio. The flame should have a blue appearance with a lighter blue defined flame at the burner head. A yellow flame indicates a rich fuel mixture, which can leave carbon on the bottom of the cookware. To conserve LP-Gas energy, preheat the pans only when recommended and shorten the cooking time by using the least amount of water possible. When cooking, heat the food on a higher heat setting, and then turn the heat down to finish cooking.

The cooktop operates under the following conditions:

1. The primary LP-Gas valve on the LP tank is open.
2. The battery cut-off switch is **ON**.

Surface Burners:

The surface burners have an independent heat rating. The ratings for both burners used are 9,100 BTU's. The amount of heat produced is controlled at the control panel. The flames at the surface burners should have an even appearance at the burner base. Uneven flames may indicate the need to clean the burners.



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WARNING:

Do not leave burner valve(s) open while unlit. LP-Gas is heavier than air and settles on the floor and “hides” in corners. If you smell gas, extinguish all open flames and turn off the main gas supply. Liquid propane is dangerous. Explosion, fire, property damage, injury or death can result. Open all windows and doors. Do not touch electrical switches that may cause a spark that can ignite. Evacuate the motorhome and shut off the primary LP valve. Contact a qualified service center to have the problem repaired before operation.

Using the Cooktop:

Place a pan on the burner grate over the desired surface burner first. To preserve the grate finish, do not operate the burners without a pan on the grate to absorb the heat from the burner. Push in knob and turn immediately counterclockwise to the LIGHT position. A clicking (spark) sound is heard and the burner lights. All ignitors spark when any surface burner knob is turned on. However, only the selected burner lights. After the burner lights, turn knob to desired flame size. In the unlikely event of a power outage or igniter failure, the cooktop can be lit manually.

WARNING:

Do not leave burners unattended while cooking. Do not heat the motorhome interior with the cooktop or oven. Gas combustion consumes oxygen inside the motorhome. Carbon monoxide is an odorless, colorless and highly poisonous gas.

Tips:

- A yellow flame is an indicator of incorrect fuel/air ratio. Lowered BTU output and carbon build up can occur. With LP-Gas, some yellow tips on the flames are acceptable. This is normal and adjustment is not necessary.
- When cooking at an altitude above 5,000 feet, the flame may change appearance and the flame BTU output will be lowered. 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.
- Cooking time can be reduced if the least amount of liquid is used. The choice of cookware selected can make a big difference.
- With some types of gas, a “popping” sound may be heard when the surface burner is turned off. This is normal operating sound of the burner.

Care and Cleaning:

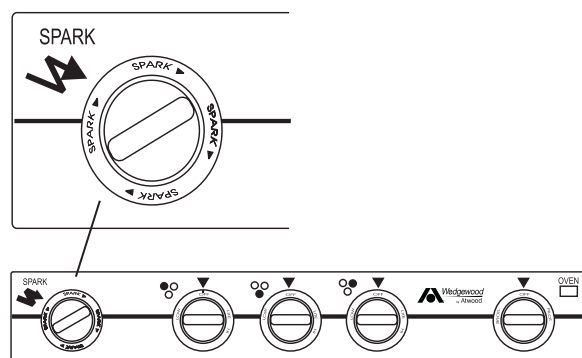
Regular cleaning with a soft cloth and a warm detergent solution is generally enough to keep the cooktop clean. Wash, rinse with clean water and dry with a soft cloth. Thoroughly clean the cooktop when it is cool. Use a dry cloth or paper towel while the surface is warm to the touch to clean splatters or spills. Cleaning is more difficult if spills bake onto the surface. Glass cleaner sprayed on a paper towel should be used for the cooktop surface. DO NOT spray glass cleaner directly on the surface. DO NOT use abrasive cleaners or steel wool. Harsh cleansers like bleach, ammonia and oven cleaner should NEVER be used. The surface burner grate and caps should be cleaned using the same guidelines as the cooktop surface.

COOKTOP RANGE/OVEN (OPTIONAL)

The cooktop range/oven uses LP-Gas only as a fuel source. The burners use a piezo type igniter. The cooktop should be used for cooking purposes only and not as a heating source. When the burner valve is opened the fuel source flows through the valve into the mixture tube. The fuel passes by a hole or venturi in the mixture tube, which draws air in with the fuel for a proper fuel/air ratio. The flame should have a blue appearance with a lighter blue defined flame at the burner head. A yellow flame or yellow tips indicate a rich fuel mixture, which can leave a black color or carbon on the bottom of a pot or pan.

The cooktop operates under the following conditions:

1. The primary LP-Gas valve on the LP tank is open.
 2. The battery cut-off switch is on.
- The oven may be used with the cooktop cover down.
 - Push in the oven control knob and rotate counterclockwise to **PILOT ON**.
 - Light the oven pilot located near the back of the oven, under the broiler shelf, to the left of the oven burner.
 - Set the oven control knob to **PILOT ON** to maintain the pilot flame. The oven and broiler are now ready for operation. The oven pilot has been factory set and requires no further adjustment.
 - To extinguish the oven pilot push in the oven control knob and rotate clockwise to **OFF**.



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WARNING:

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

To use the cooktop open the desired burner valve and rotate the igniter knob clockwise. Before cooking on the range top the cover must be in full upright and folded position. Push the cover toward the outside wall to prevent it from falling onto the range top during cooking.

- Never close the cover while the burners are in use.
- Do not use the cover as a griddle.
- The bi-fold cover must always be closed when the motorhome is in transit.

WARNING:

Do not heat the motorhome interior with the cooktop or oven. Gas combustion consumes oxygen inside the motorhome. Carbon monoxide is an odorless, colorless and highly poisonous gas.

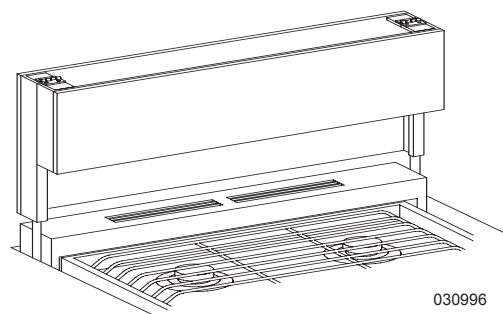
Cooktop Cover

To Lift Cover:

- Lift the cover then fold. The cover will lock into the upright position.

To Close Cover:

- Allow the cooktop to cool to room temperature before closing cover. Raise cover arms from lock position, lower and unfold cover.



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WARNING:

Top cover must be open when the cooking surface is in operation. Do not cover the oven vent openings while the oven is in operation.

Lighting the Burners

- Turn the appropriate burner knob counterclockwise to **LITE**. Do not light more than one burner at a time.
- Turn the **SPARK** knob clockwise one click. If the burner fails to light, continue turning the **SPARK** knob clockwise until the burner lights.
- Turn the burner knob clockwise to **OFF**, to turn the burner off.

The burner grate is attached to the cooktop cover by two spring clips located on the underside of the cooktop cover. To remove the cooktop cover, place a towel on the countertop next to the cooktop. Lift the cooktop cover up by pushing cover towards rear of cooktop. Lift cover at the front edge. Place the cooktop cover upsidedown on the towel. Squeeze both grate spring clips to remove the grate from cooktop cover.

WARNING:

If you smell gas, extinguish all open flames and turn off the main gas supply. Liquid propane is extremely dangerous. Explosion, fire, property damage, injury or death can result. Propane is a “heavy” gas and lays on the floor and “hides” in corners. Open all windows and doors. Do not touch electrical switches that may cause a spark which can ignite. Contact a qualified service center to have the problem correctly repaired before resuming operation.

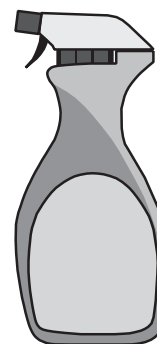
Operation Tips:

- A yellow flame indicates incorrect fuel/air ratio. Lowered BTU output and carbon build up can occur.
- Flame appearance may change and BTU output lowers when operating the cooktop at an altitude above 5,000 feet. 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.
- Remove cooktop cover to help keep the underside of the cooktop clean. Place strips of aluminum foil on the cooktop floor pan and under burners. Do not restrict air flow of mixture tubes.
- Pre-heat the oven for 10 minutes prior to use.

Cleaning Tips:

- Clean all surfaces as soon as possible after boil overs or spillovers.
- Use warm soapy water to clean the burner grates, cooktops, painted surfaces, porcelain surfaces, stainless steel surfaces and plastic items on the range or cooktop. Grit or acid-type cleaners may ruin the surface.
- Use only non-abrasive plastic scrubbing pads.
- Do not allow foods containing acids (e.g. lemon or tomato juice, vinegar) to remain on porcelain or painted surfaces. Acids may remove the glossy finish. Wipe up egg spills when cooktop is cool.
- Allow porcelain surfaces to cool before cleaning to avoid burns or porcelain cooktop cracks.

Regular cleaning with a soft cloth and a warm detergent solution is generally enough to keep the cooktop clean. Wash, rinse and dry with a soft cloth. Thoroughly clean the cooktop 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 is more difficult if spills bake onto the surface. Glass cleaner sprayed on a paper towel should be used for the cooktop surface. Do not spray glass cleaner directly on the surface. **DO NOT** use abrasive cleaners, steel wool, bleach, ammonia and oven. The surface burner grate and caps should be cleaned using the same guidelines as the cooktop surface.



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Porcelain Enamel:

Porcelain enamel, a type of glass fused on steel at a very high temperature, is not extremely delicate but must be treated as glass. Sharp blows, radical 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 800-325-4026.

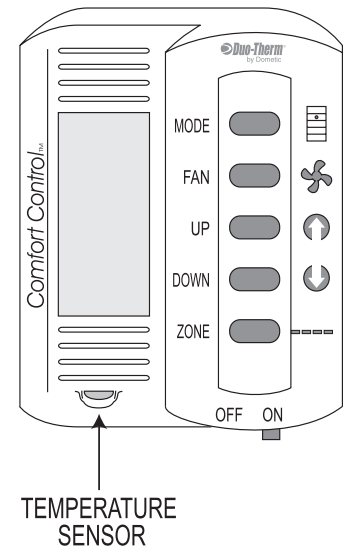
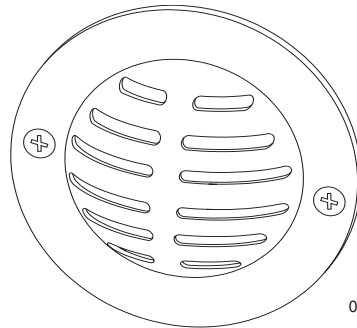
WALL THERMOSTAT

Comfort Controls to operate the **HVAC** (Heating, Ventilation and Air Conditioning systems) are located in the living room and in the bedroom.

The living room Comfort Control operates the front roof air conditioner functions and the Hydro-Hot living room heat exchangers. The bedroom Comfort Control operates the rear roof air conditioner, mid-roof air conditioner and Hydro-Hot bathroom and bedroom heat exchangers. The Comfort Controls use a liquid crystal display to show the current mode status.

The **HVAC** system provides five different functions: **Off**, **Fan**, **Cool**, **Heat Pump** and **Furnace** that are selected by pressing the **Mode** button.

Fan controls blower speed of the roof air conditioner. Two speeds are available - low and high. Selecting fan speed **Auto** adjusts the fan speed automatically, based on temperature set point and actual temperature in a selected zone.



The motorhome is divided into two operating zones: front, middle and rear. The selected Zone will flash. Control individual zone temperatures using the **UP** or **DOWN** buttons.

Living Room = Zone 1

Bedroom/Bathroom = Zone 2

NOTE:

The Comfort Control must be **ON** to operate any HVAC function. Do not select conflicting modes of operation. One zone cannot be on **Cool** while another zone is set to **Furnace**.

NOTE:

The motorhome will not heat or cool faster by selecting a very high or very low temperature setting.

NOTE:

Only one of the following can be used at a time: **Bedroom A/C**, **Washer-Dryer** or **cooktop**. This is due to the automatic appliance selector limiting the use of appliances according to priority, to prevent electrical overload.

AIR CONDITIONING - ROOF

The roof air conditioners operate from 120 Volts AC supplied by shore power or the generator. The wall thermostat requires 12 Volt DC to operate.

NOTE:

The air conditioning system freezes moisture in the air. It is recommended to set the blower fan speed to high when operating in high humidity.

NOTE:

There are ambient air temperature limitations in **Heat Pump** mode. The roof air conditioner does not operate in **Heat Pump** mode in ambient temperatures of 30° F or below.

Operations

The roof air conditioner only operates when the following needs are met:

- 120 Volts AC, from either shore power or the generator, is supplied.
- The battery cut-off switch is **ON** and the house batteries are charged.

Fan Operation:

Circulates interior air by using the roof air conditioner blower. The fan speed controls the roof air conditioner blower speed in the following modes: **Fan**, **Cool** or **Heat Pump**.

- Press the **MODE** button repeatedly until **Fan** is displayed.
- Press the **FAN** button to select the desired fan speed.

Air Conditioner Operation:

The living room comfort control operates the front roof air conditioner functions.

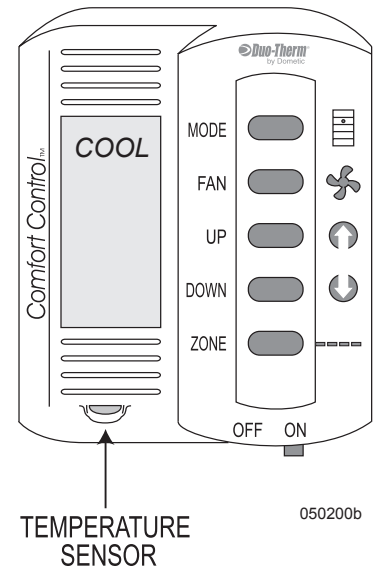
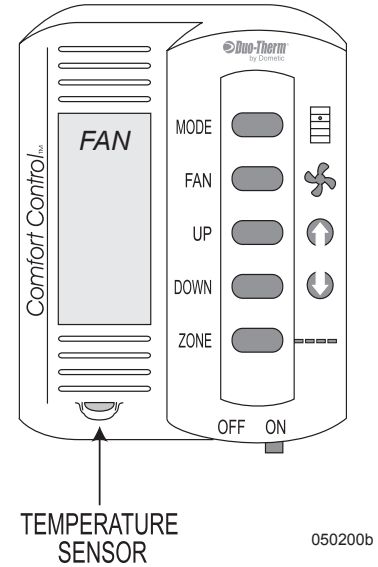
- Press the **MODE** button repeatedly until **Cool** is displayed.
- Set desired fan speed by pressing the **FAN** button.
- Set desired cooling temperature by pressing the **UP** or **DOWN** buttons.

The Bedroom comfort control operates rear roof air conditioner functions and (if equipped) the center roof air conditioner.

- Press the **MODE** button repeatedly until **Cool** is displayed.
- Press the **ZONE** button to alternate between Zone 1 and Zone 2. Zone 1 controls the front roof air conditioner and Zone 2 controls the rear roof air conditioner.
- Set desired fan speed by pressing the **FAN** button.
- Press the **UP** or **DOWN** buttons to set desired cooling temperature.

NOTE:

The compressor will engage about 2 minutes after blower motor activation to prevent accidental compressor operation against high pressure.



Heat Pump Mode

The Heat Pump mode supplies heat by using the air conditioner. The air conditioning principle is reversed, supplying heated air to the ceiling registers instead of refrigerated air. There are ambient temperature limitations of Heat Pump mode.

NOTE:

The roof air conditioner will not operate in HEAT PUMP mode with ambient temperatures at or below 30° F.

Aux Heat Mode:

If the Heat Pump mode is selected at or below 30° F, or if operating in Heat Pump mode and temperature drops to 30° F, the air conditioner will stop Heat Pump operation and AUX HEAT will be displayed. The furnace will be selected as the auxiliary heat source and will begin operation. The furnace will remain the primary heat source until ambient temperature rises above 42° F. When ambient temperature is between 30° to 42° F, a defrost cycle is initiated approximately every 40 minutes of compressor operation. The blower motor will stop for five minutes and DEFROST will be displayed. After the defrost cycle the Heat Pump operation will resume.

Heat Pump Operation:

- Battery cut-off switch must be in the **ON** position.
- Slide the **ON/OFF** switch to the **ON** position.
- Press the **MODE** button repeatedly until Heat Pump is displayed.
- Set desired fan speed by pressing the **FAN** button.
- Press the **UP** or **DOWN** buttons to set desired heating temperature.
- Select Zone 1 or Zone 2, using the **MODE** button.

Return Air Filters

The return air filters are located inside the motorhome behind the hinged intake vent covers. Pull down on the hinged vent covers to remove filters. Never run the air conditioner without the return air filters in place. Dust and other particles plug the evaporator core and substantially reduce the performance of the air conditioners.

NOTE:

To prevent scratching the mirrored surface when accessing filters, place a protective barrier, such as a cotton towel, between the mirrored surface and work area of any tools.

To Clean the Return Air Filters:

- Wash filters in warm soapy water. Do not use solvents.
- Rinse filters thoroughly with fresh water. Allow them to dry.
- Install filters and secure the intake vent covers.

FURNACE

The furnace and related components are 12 Volt DC operated, using LP-Gas as the fuel source. Electronic circuitry (automatic ignition) is used to ignite the burner. The furnace uses outside air for the burner combustion and 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 which can be run throughout the motorhome.

CAUTION:

Do not store any items/materials in furnace area. Restricted air flow may hamper furnace operation leading to failure and/or fire hazard.

WARNING:

IF YOU SMELL GAS extinguish all open flames and turn off the main gas supply. Liquid propane is an extremely dangerous gas. It can explode or ignite, which may result in property damage, injury or death. Propane is “heavy” and can “hide” in corners. Open all windows and doors. Do not touch electrical switches. They may spark, which can ignite. Keep all open flames, spark producing devices and smoking material out of the area. Contact a qualified service center to have the problem repaired before resuming operation.

Operating Instructions

The furnace operates in the following manner: The wall thermostat sends a signal to the front roof air conditioner circuit board, which closes a relay. Closing a relay sends an electrical signal to the furnace to begin the ignition cycle. There is a small time delay before the blower motor begins. Once the blower motor attains a predetermined speed it closes the sail switch. The sail switch, which is now closed, sends the electrical signal through a high temperature protection switch, then to the automatic ignition circuit board. After the thermostat is satisfied, the gas valve closes and extinguishes the burner. The blower motor stops 2 or 3 minutes after cool down.

The furnace will operate when the following conditions have been met.

1. The LP-Gas primary valve on the LP tank is open and the LP-Gas valve at furnace is on.
2. The battery cut-off switch is **ON**.
3. The house batteries in the motorhome are fully charged.

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 wall thermostat will have to be cycled off.

Using the Furnace

- Slide the **ON/OFF** switch to the **ON** position.
- Press the **ZONE** button to select Zone 1 or 2.
- Select the Furnace mode on the Comfort Control using the **MODE** button.
- Select the desired temperature using the **UP** and **DOWN** arrow buttons.

Tips:

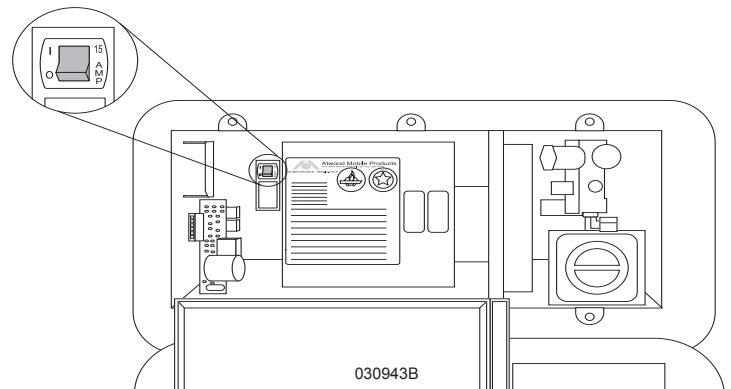
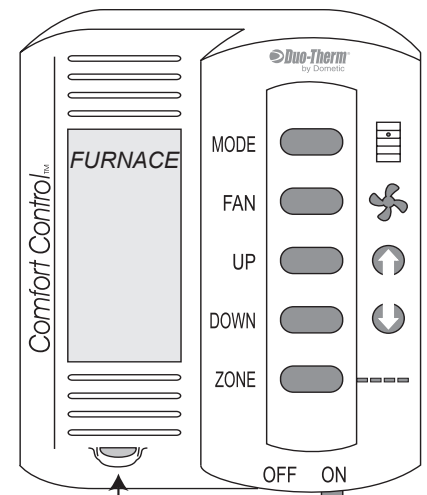
- After storage the furnace may produce a musty smell during the first couple of cycles.
- Operating the furnace at an altitude above 5,000 feet reduces the BTU output due to air/fuel ratio.
- The furnace will periodically need to be serviced by a qualified technician. If the furnace exhibits unusual symptoms or noises, or has an unusual odor when operating, have the furnace checked or serviced.
- If the blower fails to operate after verifying the batteries are charged and fuses are good, use a screwdriver to open outside access door. Make sure the power switch is on and circuit breaker is pushed in.

CAUTION:

It is not advisable to use the furnace to heat the inside of the motorhome during transit.

NOTE:

When washing the exterior of the motorhome, avoid a direct stream of water into the outside furnace vents. This can cause damage to the furnace.



If the Furnace Fails to Light

If the furnace fails to light make sure the LP-Gas primary supply valves are open. The furnace will not light if the blower motor is not spinning to its specified speed. This may be due to a low house battery charge condition.

To Charge the House Batteries:

1. Hook-up to shore power.
2. Start the generator.
3. Start the main engine to charge the batteries.

WARNING:

If you smell gas and the blower motor is spinning do not attempt additional furnace operation to avoid explosion, fire or personal injury. Contact a qualified technician.

WATER HEATER

The water heater uses two different methods to heat water: (1) 120 Volt AC, supplied either by shore power or the on board generator (2) LP-Gas. The 120 Volt AC uses a heating element similar to the type used in a house water heater. The 120 Volt AC method is efficient if shore power is available. An automatic ignition circuit board, operated by 12 Volt DC, controls the LP-Gas. Two thermostats control water temperature: one for the 120 Volt and the other for the LP-Gas. The thermostat temperatures are preset by the water heater manufacturer and are not adjustable. Water is pumped into the bottom of the water heater tank where it is heated to an extremely high temperature. A mixing valve combines cold water with the hot water to moderate the temperature, about 130° F, upon discharge out of the top. This system allows more hot water to be heated then discharged.

NOTE:

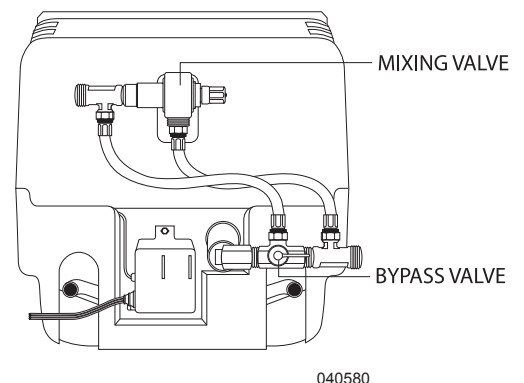
Do not operate the water heater without water in the tank to avoid damage to the thermostats and electric heating element.

Before Using the Water Heater

Before using the water heater, purge all trapped air from the water system and water heater.

To Purge the Air and Pressurize the System:

- Turn the water heater Bypass Valve (located at the back of the water heater) to Normal Flow. If necessary replace drain plug.
- Fill the fresh water tank or hook to city water.
- Turn on the water pump or city water.
- Turn on the hot and cold valves for each faucet, one at a time. Operate each faucet, inside and outside the motorhome, until a steady stream of water with no air bubbles or air pockets are present. Do not operate the water heater until the water system is purged of air.
- After the system pressurizes, inspect the water heater and water system for leaks.



CAUTION:

After purging the water lines and water heater, air may still be present. Use caution upon opening a hot water faucet after the first heat cycle of the water heater.

WARNING:

IF YOU SMELL GAS extinguish all open flames and turn off the primary LP-Gas valve. Do not touch any electrical switches to avoid a spark that can ignite. Open all windows and doors. Evacuate the motorhome. Propane is a “heavy” gas and lays on the floor and “hides” in corners. Liquid propane is highly volatile, explosive and dangerous. Explosion, fire, property damage, injury or death can result. Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.

Operation**Water Heater Operation:**

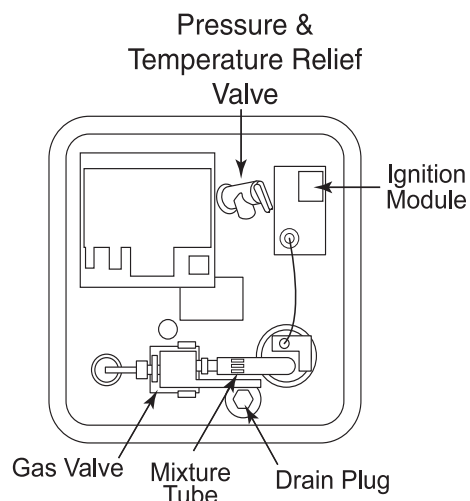
- Turn on the battery cut-off switch at the entry door.
- 120 Volt AC is supplied from shore power or the generator.
- The house batteries are charged.
- The primary LP-Gas valve on the LP tank is open.

Heating Water with 120 Volt AC:

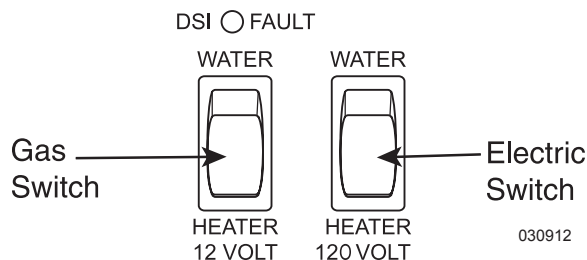
- Have either shore power (preferable) or the generator supplying AC voltage.
- Turn on the Water Heater 120 Volt switch.

Heating Water with LP-Gas:

- Make sure the primary LP-Gas valve is open.
- Turn on the water heater 12 V switch. The indicator light on the switch will illuminate briefly then go out when the burner ignites. The burner will make an audible “roar” when lit.
- The automatic ignition circuit board attempts 3 ignition cycles to light the burner. If the burner does not light after the third attempt, the circuit board “locks-out” and the indicator light on the switch glows steady.
- Check the level of LP-Gas in the tank and make sure the primary LP-Gas valve is on. Cycle the LP switch Off then back On to reset the ignition board.



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NOTE:

The LP-Gas and AC electric functions may be on at the same time. This will speed the recovery process of heating water for large volume use.

CAUTION:

It is recommended not to operate the water heater on LP-Gas while the motorhome is in transit. Be sure the water heater is off before refueling.

WARNING:

Before beginning any service or work on the water heater make sure the LP-Gas is turned off, the 120 Volt AC source has been disconnected and the 12 Volt DC source has been disconnected. Failure to do so can result in explosion, fire or injury.

Indicator Lamp:

- Illuminates briefly when the LP switch is turned on, ignition occurs and the lamp goes out.
- If the burner does not light within 6 to 9 seconds the ignition board will attempt two more ignition cycles. If the burner does not light after the third attempt, the indicator lamp glows steadily.

Ignition Module Function

The LP-Gas On/Off switch controls the ignition circuit water heater.

The indicator lamp illuminates under the following conditions:

- Upon initial start-up the lamp illuminates briefly, ignition occurs and the lamp goes out.
- If the burner does not light within 6 to 9 seconds, the ignition board locks out and the indicator lamp glows steady.

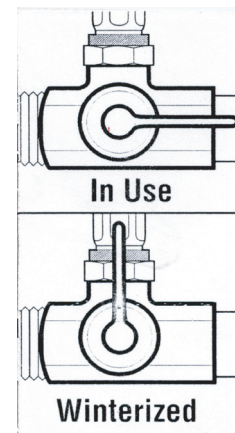
The next portion of the operation is controlled by the direct spark ignition (DSI) system, as power is applied to the DSI board. The system will do the following:

1. The board has a timing circuit, which allows 6 to 9 seconds for ignition to occur.
2. Initially the board supplies current to the gas valve. At the same time, it produces a high-voltage current supply to the electrode to produce a spark at the burner.
3. The board will also confirm the presence of a flame.

If the flame is not sensed within 6 to 9 seconds, the module board will go into lock out. Flame sensing is through the spark wire. The Thermostat-Limit controls the power to the module board. At 130° F, the thermostat will open, shutting off the burner. If the thermostat fails, the safety High Temperature limit switch opens, and requires manual resetting.

Water Heater Bypass

The bypass valve is located at the back of the water heater. Turning the valve to BYPASS (Up position) stops water from entering the cold water inlet of the water heater. Place the valve in the BYPASS position when winterizing. Bypassing the water heater prevents water or antifreeze from entering the water heater. For normal operation, turn valve so that handle points to normal flow.



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Pressure - Temperature Relief Valve

The water heater is equipped with a Pressure-Temperature relief valve. The water heater may discharge from the Pressure-Temperature relief valve during the heating cycle due to thermal expansion of water. The Pressure-Temperature relief valve is designed to open if the water temperature in the tank reaches 210° F (98.8° C), or if internal pressure reaches 150 psi. A small discharge is normal and is 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, the air pocket will have to be replaced utilizing the following procedure.

CAUTION:

Ensure the water heater tank is cool prior to making any check of the valve or scalding may result.

Re-establishing the Air Pocket:

Step 1: Turn **OFF** the water heater.

Step 2: Shut **OFF** the incoming water supply.

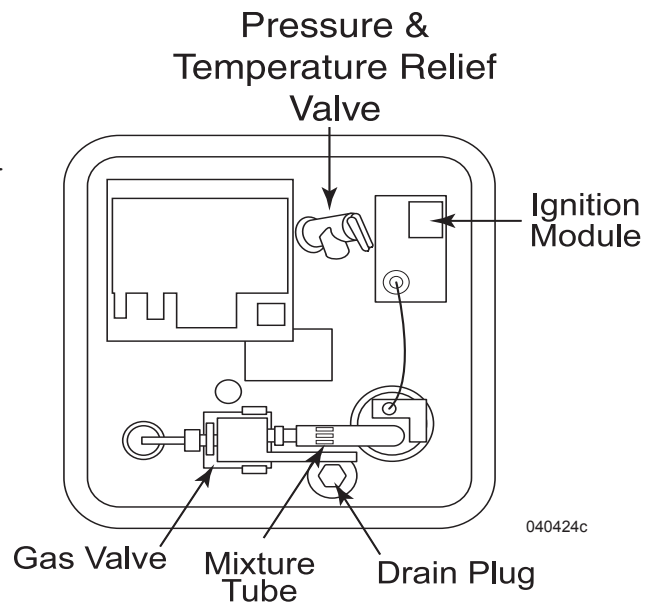
Step 3: Open the hot water faucet closest to the water heater.

Step 4: Pull the handle of the relief valve until the flow of water stops.

Step 5: Close the relief valve allowing it to snap shut. Close the hot faucet and turn **ON** the water supply.

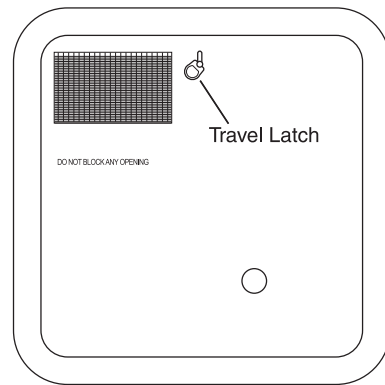
Step 6: Turn **ON** the water heater.

The air pocket is re-established and the process does not need to be repeated until the next discharge of water from the T & P valve. If the discharge does not stop, contact a qualified service center to evaluate the valve and make any required repairs.



Burner Compartment

Periodically check the outside service compartment and screen (in the door) for foreign material that can accumulate and prevent the flow of combustion and ventilating air.



Tips

- To conserve LP-Gas, turn off the water heater when not in use.
- When using the shower, conserve energy and hot water by shutting the shower water off when not in use.
- Use caution when hooked to anything less than 50 Amp shore service. When the water heater element is in operation it will use approximately 12 AC Amps. Appliances will need to be operated in sequence to avoid tripping a breaker.
- Water may drip occasionally from the Pressure - Temperature relief valve until the pressure has dropped. Avoid opening the P & T valve manually as collected minerals may cause the valve to leak continually. The valves can be purchased from most hardware stores.
- Operate the water heater using LP-Gas when hooked to 30 Amp shore power. This will reduce the likelihood of tripping the shore power breaker.

Draining & Storage

If the motorhome is to be stored during the winter months, drain the water heater to prevent freeze damage.

1. Turn off electrical power to the water heater.
2. Shut off the primary LP-Gas valve.
3. Open low point drains.
4. Open both **HOT** and **COLD** on all faucets.
5. Remove water heater drain plug.
6. Turn the Bypass lever to **BYPASS**.

NOTE:

Be sure to refill the water heater with water before resuming operation.

Troubleshooting

- If water heater fails to light check the mixture tube for obstructions. Spiders may make nests in the burner tube. It is recommended to clean the burner tube with a brush and not compressed air. Compressed air may not fully remove the obstruction.
- If the indicator light on the switch does not light, and the water heater does not light, ensure the house power switch at the entry door is on or check for a blown fuse in the house distribution panel.
- If the water heater fails to operate after checking the fuses, the High Temperature safety limit switch may be tripped. Have a qualified technician inspect the water heater.

HYDRO-HOT (OPTIONAL)

The Hydro-Hot heat system is a state-of-the-art hydronic heating system. The Hydro-Hot is a water heater and furnace in one appliance. A 50,000 BTU diesel-fired burner and a 1650 Watt AC element work to heat a 50/50 solution of Propylene Glycol antifreeze and water to approximately 200° F. The heated antifreeze solution circulates through heat exchangers located throughout the motorhome to provide interior heat. Potable water is heated by the Hydro-Hot for domestic use. The Hydro-Hot can also be used to preheat the engine if equipped with the optional engine loop. The heart of the Hydro-Hot system is the 4-gallon heat storage tank located in the Curbside bay of the motorhome.

NOTE:

It is important to read the OEM manufacturer's owner's manual included in the warranty information packet prior to operating the Hydro-Hot Heating System.

NOTE:

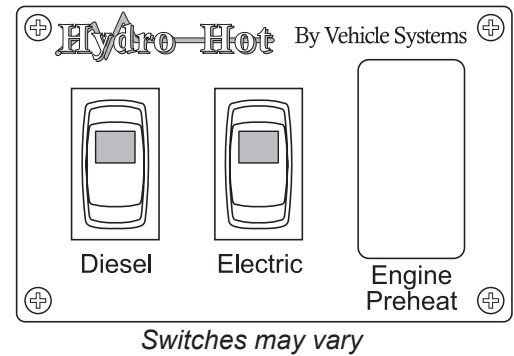
The Hydro-Hot antifreeze is propylene glycol based boiler antifreeze. Do not mix antifreeze types.

NOTE:

The Hydro-Hot must be turned ON before using any heat feature.

Diesel Burner:

The Hydro-Hot consumes about 1 to 2 gallons of diesel fuel per day during full time operation. The diesel burner is rated at 12 Volt DC/65 watts. Circulating pumps are rated at 12 Volt DC/12 Watts each. The Hydro-Hot has a fast recovery rate when operating on diesel. To heat the Hydro-Hot with the diesel burner, turn the switch **ON**. The switch illuminates when the Hydro-Hot is on. The burner has to operate for 20 to 30 minutes before maximum heat is available interior heating or hot water.



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Electric Heat Element:

The electric element works well if plugged into 50 Amp service. When plugging into less than 50 Amp service, exercise care not to overload the electric service provided. The rate of recovery of the electric element is slower than the diesel burner. Allow 2 to 3 hours for the Hydro-Hot to reach operating temperature when operating from the electric element.

NOTE:

Operating from shore power or generator power, the electric heating element may be used independently, without the diesel-fired burner, in situations where moderate temperatures exist and there is a low demand for hot water.

Interior Heat Exchangers:

The heat exchangers are small radiators with 12 Volt DC blower motors. Current consumption is approximately ½ Amp per large heat exchanger. The small heat exchanger used in the private bath and the holding tank bay is ¼ Amp.

Engine Preheat (Optional):

The Hydro-Hot system has an engine preheat feature to aid engine starting in cold weather. Inside the Hydro-Hot are an engine coolant loop and pump. The Hydro-Hot will heat the engine coolant. The internal engine pump inside the Hydro-Hot will circulate heated coolant through the engine.

To Use the System:

- The Hydro-Hot must be hot for this feature. Turn On the diesel burner, electric element or both.
- Turn the On the Hydro-Hot diesel switch.
- Turn the Hydro-Hot Engine preheat switch On to activate the engine pump inside the Hydro-Hot.

The time required to preheat the engine varies with ambient temperature. Allow 2 to 3 hours of engine pre-heat time.

Engine Heat Exchange System:

When traveling, the water pump on the engine circulates heated engine coolant through the Hydro-Hot. Through convection, heat transfers to the Hydro-Hot coolant, providing hot water and interior heating. Use the Comfort Control to operate the heat exchangers.

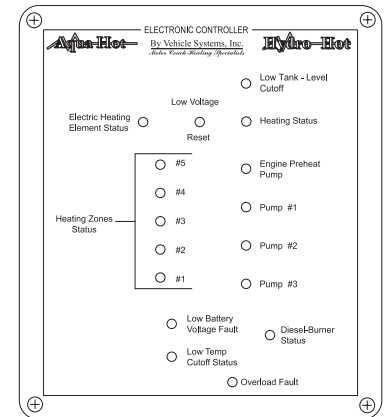
Domestic Hot Water System:

The Hydro-Hot at operating temperature heats and provides the domestic hot water automatically as it is being used. The Hydro-Hot does not store any hot water. Opening any hot water faucet produces a continuous supply of domestic hot water within a few seconds.

NOTE:

The Hydro-Hot's "Domestic Water Priority System" disables the interior Zone Heating Fans, Zone Circulation Pumps, and the Engine Preheat Pump (if applicable) whenever domestic hot water is being used on a continuous basis. The Hydro-Hot will automatically enable these systems, within a few minutes, after the demand for continuous domestic hot water ceases.

Control of the Hydro-Hot is accomplished using the switch panel with the Diesel and Electric switches. When operating the Hydro-Hot it is important to determine the heating and domestic hot water requirements. Under normal heating requirements, the Diesel burner must be used and left **ON**. When moderate ambient temperatures exist and/or when a low demand for domestic hot water exists, the electric heating element can be used. When starting the Hydro-Hot, allow 10 to 20 minutes for the diesel burner to reach operating temperature. The electric element takes 1 to 2 hours to reach operating temperature.



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Troubleshooting

The Hydro-Hot has an electronic display panel located next to the component in the curbside bay. The display panel has LED fault indicators that are used to diagnose a problem with the Hydro-Hot. If a heating source is selected (diesel or electric) and the Hydro-Hot does not appear to be working, check to see if any LED fault indicators are lit on the electronic display panel. A fault lamp may be overlooked due to viewing angle.

- **Low Tank Level Cutoff:**

Heating function has shutdown due to low level of coolant in the Hydro-Hot. Check coolant level.

- **Electric Heating Element Status:**

Green indicator means the unit is being heated by 120 Volts AC.

- **Low Voltage Reset:**

The Low Battery Voltage Fault LED illuminates. This requires a reset of the electronic panel after operating in a low battery voltage condition.

- **Heating Status:**

The Hydro-Hot is being heated by Diesel or the 120 Volt AC electric element.

- **Heating Zones Status:**

A thermostat is calling for heat in a zone. LED will be green. A red LED means a short has occurred in that zone.

- **Pump Status:**

A pump is operating. LED will be green. A red LED indicates a short in the pump.

- **Low Battery Voltage Fault:**

Red LED indicates that battery voltage is too low. Hook to shore power or start the generator. The Electric Panel will need to be reset.

Cycling the Diesel burner Off and On resets the electrical panel. A paperclip or similar tool can be used on the Electrical Panel.

Bay Thermostat:

A small heat exchanger is located in the basement to help prevent freezing of the water system during cold weather. During cold weather, a thermostat in the holding tank compartment turns on the exchanger in the storage bay to prevent freezing. A thermal disc supplies voltage to the heat exchanger when the ambient temperature is less than 38° F (=/- 4 degrees) and shuts off at temperature greater than 48° F (=/- 5 degrees).

NOTE:

The diesel burner or electric element must be activated when heating the bay.

Antifreeze:

The antifreeze is a special “boiler type” propylene glycol base. The antifreeze has low silicate content with corrosion inhibitors and heat transfer compounds. This type of antifreeze provides freeze protection and excellent heat transfer for operating efficiency. The antifreeze is mixed to a 50/50 ratio with de-ionized water. Do not mix antifreeze types as this can cause scaling and possible component failure. The antifreeze can be purchased directly from Vehicle Systems Inc.

CAUTION:

Use only a non-toxic propylene glycol based antifreeze recommended for “boiler” applications. Contact Vehicle Systems Inc. at 1-800-685-4298 to purchase the antifreeze.

Reservoir:

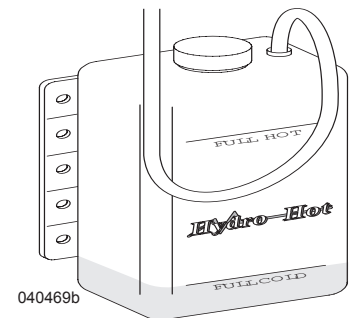
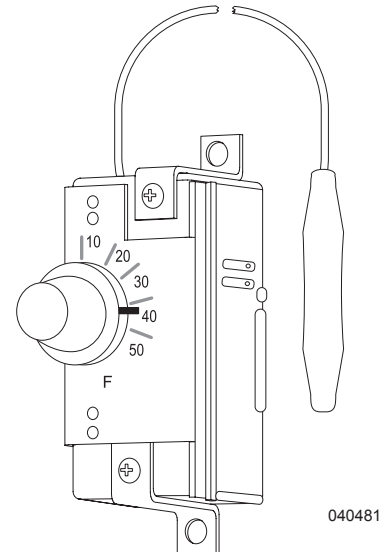
The coolant reservoir is located behind the curbside fuel door. Check the reservoir coolant level monthly. Inspect the coolant level immediately after the diesel burner finishes a burn cycle. After a burn cycle the coolant reservoir should register on the FULL HOT mark. Adding coolant to the reservoir when the Hydro-Hot is not at operating temperature may result in overflow when the Hydro-Hot attains normal operating temperature.

Disinfecting: (Domestic Water Loop)

The tubing inside the Hydro-Hot is rated for fresh water and winterizing solutions. Periodically the water system may be disinfected. Disinfecting the water system will include having the solution flushed through the Hydro-Hot. This will not affect the Hydro-Hot as long as the disinfecting solution is thoroughly rinsed. However, failure to thoroughly rinse the Hydro-Hot with fresh water will result in damage to the Hydro-Hot.

CAUTION:

A high concentration of chlorine is not advised. If not properly and thoroughly rinsed, bleach or other concentrated chlorine bearing chemicals can cause failure to the tubing inside the Hydro-Hot domestic water loop.



Winterize:

Coils of piping inside the Hydro-Hot heat potable water for domestic use. The domestic piping inside the Hydro-Hot must be winterized to prevent freeze damage. Winterize the Hydro-Hot with Non-Toxic FDA approved RV antifreeze. The RV antifreeze must be pumped through the Hydro-Hot until the solution appears at the hot water side of a faucet. The onboard water pump can be used or a separate pump hooked to the city water fitting. Refer to the Hydro-Hot owner's manual for complete winterizing instructions.

CAUTION:

Failure to winterize the Hydro-Hot with Non-Toxic FDA approved RV antifreeze during freezing temperature will result in serious damage to the Hydro-Hot. Refer to the Hydro-Hot owner's manual for detailed winterizing instructions.

Annually:

Have the Hydro-Hot tuned up yearly. A tune up consists of a fuel nozzle and fuel filter replacement, as well as a thorough cleaning of the combustion chamber. This simple tune up will keep the Hydro-Hot running smoothly throughout the year, as well as allow service personnel to inspect for additional wear of other components. Signs that the Hydro-Hot may need servicing are continuous white exhaust smoke or poor ignition start up. When in operation, the Hydro-Hot should have a smooth, high-pitched whine. Loud growls or other abnormal noise indicates service or repair is required.

CAUTION:

Disconnect all power supplies before cleaning or servicing.

Fuel Filter/Water Separator**Hydro-Hot Fuel Filter:**

The filter is located on the curbside of motorhome behind the fuel access door.

Draining the Collection Bowl:

Water is heavier than fuel. Water will settle to the bottom of a fuel bowl, making it appear different in color. In high humidity environment, check the collection bowl more often. If contaminants are present, turn off the Hydro-Hot then open the drain. Properly dispose of waste contaminant.

Element Replacement:

Contamination levels in the fuel determine the frequency of element replacement. Fuel flow to the Hydro-Hot becomes restricted as the element gradually plugs up with contaminants, resulting in noticeable heating loss and/or hard starting. If this occurs, change the element as soon as possible.

As a guideline, change the element every 500 hours, annually or at first indication of heat loss, whichever occurs first. Always carry an extra replacement element as 1 tank of contaminated fuel can plug a fuel filter. Replacement filters must have a 10-micron rating.

To Replace the Element:

- Open the drain valve to drain the filter unit.
- Spin bowl/element from head and remove element.
- Coat new seals with motor oil and install the new element.
- Spin bowl/element onto head and tighten firmly by hand.
- Start Hydro-Hot and check fuel filter for leaks.

NOTE:

It may be necessary to cycle the diesel burner switch on and off a few times to thoroughly purge the fuel system of air.

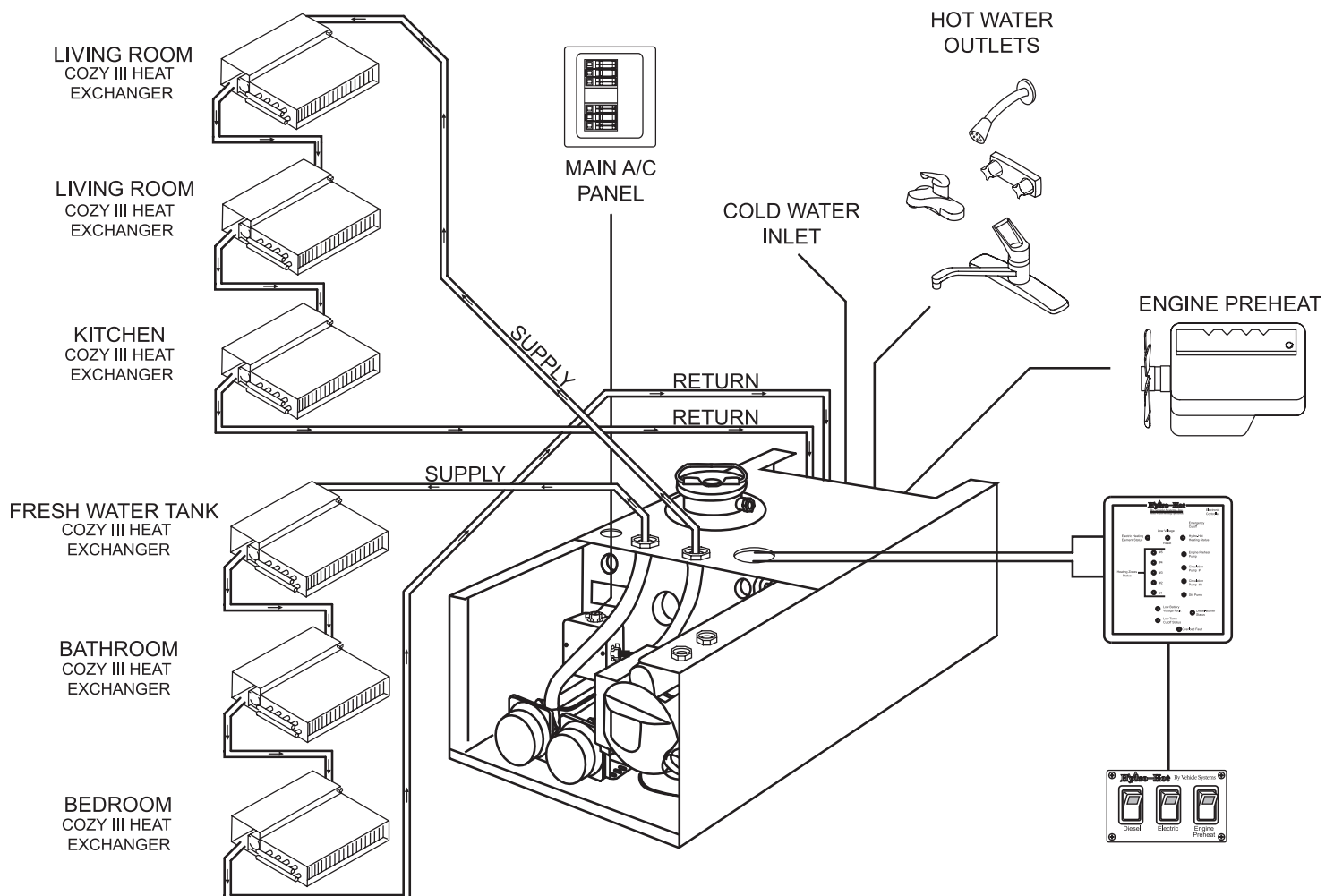


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Hydro-Hot Overall View

General Layout:

An understanding of the general layout of the Hydro-Hot system helps operate and troubleshoot the system.



WASHER-DRYER PREPARED

If the motorhome was not ordered with an optional washer-dryer, it will have a washer-dryer preparation package installed from the factory. The washer-dryer “prep” package includes the following items:

- Two color coded water supply lines. A red line for hot; a blue line for cold.
- A 1½ inch water drain line with threaded cap, P-trap and an automatic vent cap.
- A 120 Volt receptacle located in the compartment.

The washer drain line will either be connected to a grey or black holding tank. When the black (solid waste water) holding tank is used, the drain valve should be opened to drain the washer water into the drain service. The black tank drain valve must be closed when washer is not being used to prevent the tank from becoming clogged.

When the grey (waste water) holding tank is used, the drain valve should be opened to drain the washer water into the drain service. The grey tank drain valve can be left open when the washer is not being used.

Before using the washer for the first time, determine which holding tank is being used:

- Empty all the holding tanks (see “Water Systems” section).
- Close all holding tank valves and run washer for one cycle. Washer uses between 12 and 20 gallons of water.
- Use the tank level monitor to determine which holding tank is being used. Drain the holding tank.

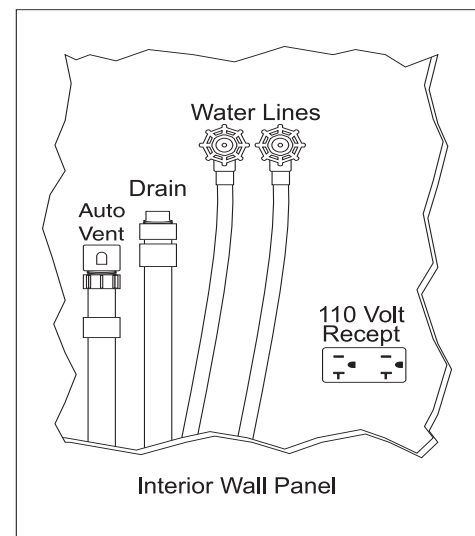
If a washer-dryer is to be installed at a later date, follow all the manufacturer’s installation instructions.

Listed here are further instructions which should be adhered to for safe and reliable operation:

- Do not connect the clothes dryer exhaust duct to any other duct, vent or chimney.
- Do not terminate the exhaust duct beneath the motorhome.
- Use proper length fastener when attaching exhaust vent to exterior sidewall. Stainless steel fasteners are best suited for this as they will not rust.
- If the cabinet or closet in which a washer-dryer is installed does not have vented louvered doors, the manufacturer’s installation instructions may require installation of vented doors or vents to be installed in the doors. This is for sufficient circulation of air.

NOTE:

Sidewall dryer vents are not part of the prep package. If a sidewall vent is to be installed, properly seal vent to sidewall.



Location of specified parts may vary within wall panel depending on floor plan and model.

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WASHER - DRYER (OPTIONAL)

The automatic washer-dryer is front loading with an extra large door opening for easier access. Several wash and dry programs are available along with variable water temperature settings.

- The washer-dryer operates on 120 Volt AC from shore power or the generator.
- The washer-dryer uses about 12 to 20 gallons of water per wash cycle. The washer drain line is connected to a grey or black holding tank.

When the black (solid waste water) holding tank is used, open the drain valve to drain the washer water into the drain service. The black tank drain valve must be closed when not in use to prevent clogging.

When the grey (waste water) holding tank is used, open the drain valve to drain the washer water into the drain service. The grey tank drain valve can be left open when the washer is not being used.

Before using the washer for the first time, determine which holding tank is being used:

- Empty all the holding tanks (see “Water Systems” section).
- Close holding tank valves and run washer for 1 cycle. Washer uses between 12 and 20 gallons of water.
- Use the tank level monitor to determine which holding tank is being used. Drain the holding tank.

INFO:

Refer to the manufacturer’s manual for detailed operating instructions.

WARNING:

Open a window or vent while operating the dryer. The washer-dryer can create negative air pressure inside the motorhome that can accumulate Carbon monoxide or LP-Gas while operating fuel-burning appliances.

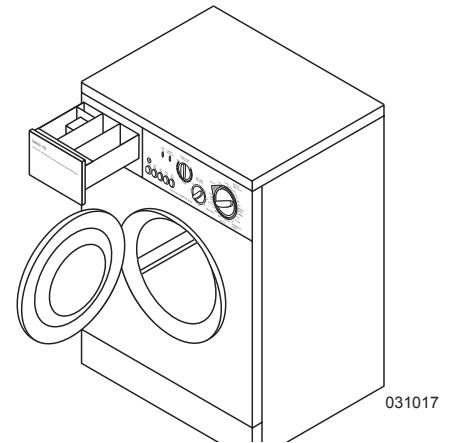
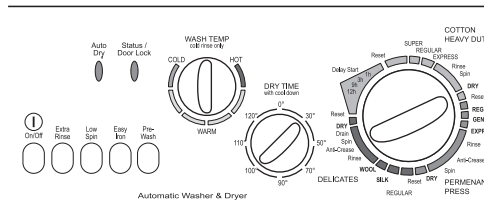
CAUTION:

Do not use the washer-dryer while traveling. Suspension movement, combined with the weight of the drum while in the wash cycle, can damage the internal components of the washer-dryer.

Before using the washer, after winter storage or a long period of non-use, it is a good idea to conduct this simple test procedure prior to loading the machine for use. This procedure will verify all the hardware and electronic components are functioning properly. Wipe the inside and outside with a damp cloth to remove any travel dust that has accumulated.

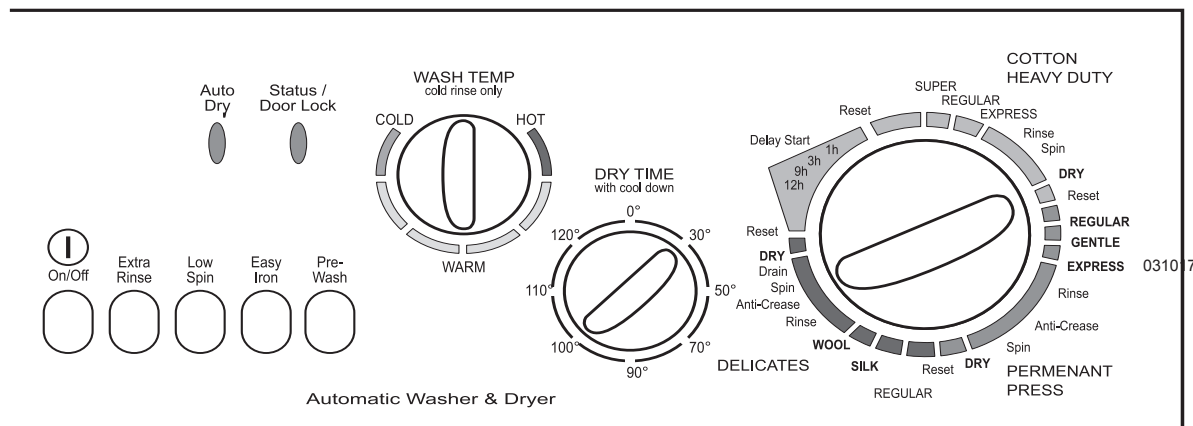
NOTE:

Perform this test before putting the washer-dryer in use or after the winter months. This will clear the water lines and drum of winterization antifreeze.



Test Procedure Requirements:

- Make sure water supply lines are secure and fresh water valves are open.
- Hook to city water or turn on the water pump.
- Hook to shore power or start the generator.



To Conduct the Test Procedure:

1. Set the selector knob to **Reset**.
2. Set the **Dry Timer** knob to 30 minutes. Push the **On/Off** button to On. Wait 5 seconds. The **Auto Dry** light should be on and the Status light flashes fast then slow.
3. Set the selector knob to a wash cycle. Set **Wash Temp** knob to Warm. Water should be flowing into washer and drum should rotate both directions.
4. Set the selector knob to **Reset**. Wait 5 seconds.
5. Set the selector knob to **Spin**. Water should drain and drum rotation should speed up.
6. Set the selector knob to **Reset**. Wait 5 seconds.
7. Set the selector knob to **Dry**. Dryer fan should begin and drum should rotate both directions.
8. Set the selector knob to Reset. Wait 5 seconds.
9. Set the **Dry Time** knob to zero. The **Auto Dry** light should go off.
10. The door will unlock in 2 minutes or less. The **Status** light flashes fast then slow. The door should now open.
11. Push the **On/Off** button to **Out** (Off) position. The **Status** light should be off.
12. If applicable, close the holding tank drain valve.

WARNING:

Do not wash or dry articles that have been cleaned, washed, soaked or spotted with gasoline, dry cleaning solvents or other flammable or explosive substances. They emit flammable vapors. Do not add flammable or explosive substances to the wash water.

CAUTION:

Do not use washer/dryer to dry articles containing rubber-like materials

To begin a wash load:

- Sort and pre-treat clothes.
- Add the measured amount of detergent suggested by the package directions (maximum 2 tablespoons).
- Load the clothes loosely into the washer. Close the washer door.
- Turn the Wash Temperature knob to the desired temperature setting.
- Choose the desired washing cycle option using the Selector knob.
- Load wash tray with detergent.
- Turn the power **ON**.
- After the cycle is complete, wait 2 minutes for the door lock to release before attempting to open the door.
- If applicable, turn the power **OFF** and close the holding tank drain valve.

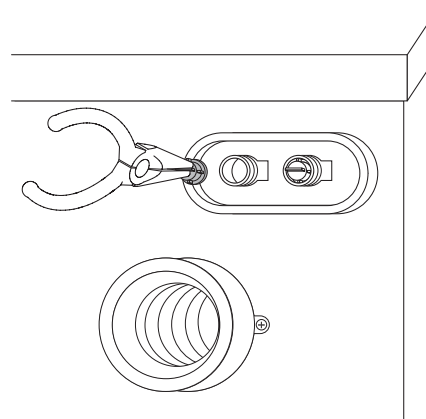
Washer/Dryer Maintenance

Occasionally wipe the exterior cabinet of the washer-dryer with a damp cloth or sponge. Wipe dry with a soft cloth. Do not use polish on plastic trim. In areas of hard water, detergent can accumulate in the drum. Obtain a packaged water softener. Add quantity as specified by the manufacturer directly to the drum. Run the washer through a complete cycle using hot water. Repeat the process if necessary. Remove hard water deposits using only cleaners labeled as washer safe. Wipe the inside of the washer-dryer door with a soft cloth to remove moisture. Periodically apply a thin coat of paste wax to the inner door, especially to the area that is immediately next to the door window. This protects the door finish from laundry spills and discoloration.

If water flow to the washer-dryer is reduced, the Hot and Cold water inlet screens may be clogged. Remove water pressure and undo water lines at the back of the washer-dryer. Use tweezers or pliers to remove screens from fittings. Clean and install screens and water lines. Hook to city water or turn on the water pump. Check for water leaks before using the washer-dryer.

NOTE:

Should the washer-dryer need removal for service, care should be taken as the washer-dryer weighs about 170 lbs. Use proper accommodations to avoid injury or damage to the cabinetry.



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Winterizing the Washer/Dryer

Winterize Using Air Pressure:

1. Hook an airline (regulated to 45 psi or less) to the water inlet of the motorhome.
2. Rotate Selector knob to a wash position with the Wash Temp setting on Warm. Press the power button to On. Air pressure clears the Hot and Cold water lines.
3. After water lines are clear, rotate Selector knob to Spin. Allow the pump to drain the drum.
4. Set Selector knob to Reset and Timer to zero. The door unlocks in 2 minutes or less. Open door and pour in ¼ gallon of RV antifreeze.
5. Set selector knob to Spin. The pump primes with antifreeze. Set selector knob to Reset and turn the power off.

Winterize Using RV Antifreeze:

Either add antifreeze directly to the water tank or use a separate container of antifreeze with water line connected to the intake side of the water pump.

1. Turn on water pump. Rotate selector knob to a wash position with the Wash Temp setting on Warm. Turn power button **ON**. Allow antifreeze to enter the drum.
2. After water lines are filled with antifreeze, rotate selector knob to **SPIN**. Allow pump to drain the drum.
3. Set selector knob to **RESET** and timer to zero. The door unlocks in 2 minutes or less. Turn power **OFF**.
4. Any remaining liquid should contain a sufficient amount of antifreeze to be protected from freezing.

NOTE:

After winter, perform a Test Procedure before washing or drying any laundry to ensure all antifreeze has purged.

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CAMELOT 2006

EQUIPMENT — SECTION 5

EQUIPMENT- INTRODUCTION	139	SOFA	155
ENTRY STEP.....	139	Easy Bed Conversion	155
Operation.....	139	Hide-A-Bed Conversion (Optional).....	155
Tips	139	Air Mattress (Optional)	156
Stepwell.....	140	Magic Bed Conversion (Optional)	156
ENTRY DOOR	140	J-Lounge (Optional)	157
Screen Door	140	TO EXTEND FIXED DINETTE	157
KEYLESS ENTRY	141	DINETTE BED CONVERSION (OPTIONAL).....	157
Operation.....	141	STORAGE - UNDER BED	158
SLIDE-OUT OPERATION	142	STORAGE BAY SLIDE-OUT TRAY (OPTIONAL).....	158
Main Room Slide-out.....	143	ENTERTAINMENT SYSTEMS.....	158
Bedroom Slide-out	144	Hook-ups - TV Cable, Computer & Telephone ..	159
Manual Override - Bedroom Slide-out	145	Cell Phone Antenna	159
AWNINGS.....	146	Television (Front) w/Lock-out Feature	159
Slide-out Cover	146	Television Antenna	160
Front Door Awning - Mirage Automatic	147	DVD/VCR/CD	161
AWNINGS	147	Television/Entertainment System - Front	162
Window Awning (Optional)	147	Video Selector Box.....	162
Patio Awning.....	147	Television/Entertainment System – Bedroom ..	163
Patio Awning - Eclipse (Optional).....	149	LCD TV Auxiliary Equipment	
Patio Awning - Mirage (Optional)	150	Hook-up (Optional).....	164
Awning Care & Cleaning.....	150	Satellite System - Prewire.....	164
Storm Precautions	151	CITIZENS BAND (CB) RADIO - PREP	165
REAR LADDER.....	151	CITIZEN BAND (CB) RADIO (OPTIONAL).....	165
FANS	151	SATELLITE SYSTEMS (OPTIONAL).....	166
Bathroom Exhaust Fan.....	151	Stationary System.....	166
Rain Sensor Exhaust Fan (Optional)	152	In-Motion Satellite System (Optional).....	168
POWER SUNVISOR	153	RADIO - DASH.....	168
SEAT CONTROLS.....	154	ALADDIN™ SYSTEM	169
Swivel Seats	154	Operations	169

EQUIPMENT- INTRODUCTION

This section covers basic operation and care of equipment found in the motorhome, most of which is provided for entertainment and comfort. Detailed information about specific equipment may be found in that particular manufacturer's manual. Optional equipment is discussed in this section, which may not apply to all motorhomes.

INFORMATION:

Detailed information with CAUTION or WARNING instructions for the various electronics, other than what is provided in this section, can be found in that specific manufacturer's manual.

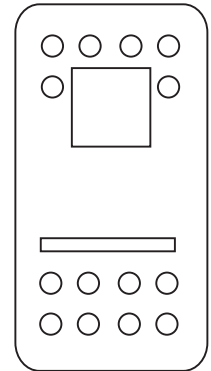
ENTRY STEP

Operation

The entry step includes the exterior electric entry step, which features retractable steps, automatic retraction with the ignition key in the **RUN** position and a last out feature. The bar light indicator on the switch, when illuminated, indicates the circuit is active.

NOTE:

When dry camping, turn the Entry Step switch off to prevent unnecessary step actuation and draining of the chassis batteries.



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Operating the Entry Step:

1. With the entrance door open, turn the step switch on.
2. Close the door. The step retracts and locks in the **IN** position.
3. Open the door. The step extends and locks **OUT**. The step retracts when the door is closed.
4. When the switch is turned off, the step should remain in the extended position with the door closed.
Close the door and turn on the ignition switch. The step retracts for travel.
5. With the power switch off, the step extended, the entrance door closed and the ignition turned on, the ignition override system engages to automatically retract the step.
6. Turn ignition off and open door. The step extends and locks **OUT**. This is the "last out" feature. When ignition is **ON** the step always activates with door movement, regardless of power switch position.

CAUTION:

High curbs can impede step operation. Use care when parked on side streets.

Tips

If the step fails to operate:

- Verify that the step switch is **ON**.
- Check main power supply for the step: a 20 Amp fuse located at the rear run box on the R4 circuit board.

WARNING:

If the motorhome is driven with the step extended, major damage to the step and motorhome could occur.

Lubrication:

Keeping the step clean is essential for smooth and reliable operation. Before applying a dry spray lubricant or graphite on the slide mechanisms, thoroughly clean the step using a pressure washer or a stiff nylon bristle-brush and automotive detergent. Allow the step to thoroughly dry.

CAUTION:

Keep fingers, clothing and other hardware away from moving components.

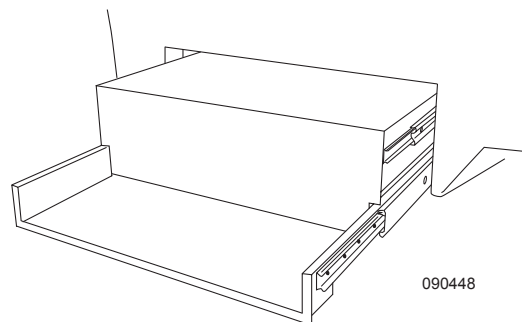
NOTE:

Clean and lubricate step more frequently in adverse weather conditions. Mud, snow, road salts and sand quickly break down lubricant and corrode painted surfaces.

NOTE:

Only use a dry spray lubricant or graphite on the slide mechanisms. Do not use Kwik Lube spray lubricant. The slide mechanisms will become clogged with road grime.

- Lubricate points with graphite or a dry spray lubricant.
- Work step several times, allowing lubricant to work into surfaces.
- Repeat as necessary.
- Remove excess lubricant.
- Periodically apply di-electric grease at electrical connections.

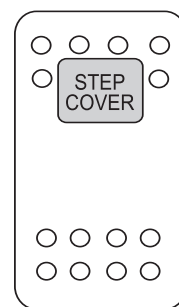


Stepwell**To Operate the Stepwell Cover:**

1. Turn **ON** battery cut-off switch.
2. Press the Step Cover switch to desired direction. Release the switch to stop movement.

WARNING:

When adjusting the stepwell cover clear the stepwell area of obstructions, pets or persons. Do not adjust the stepwell cover while stepwell area is occupied.



ENTRY DOOR

The entry door incorporates 3 separate seals to eliminate noise during travel. The door uses 2 locks for safety and security: the door handle and a dead bolt. The door handle incorporates a primary and secondary latching system used to ensure secure and safe latching. Adjustments can be made to maintain entry door performance.

Screen Door**Changing the Glass in the Screen Door:**

- The screen slider is Lexan and can be bowed for removal and replacement.
- Replace with new Lexan and reverse the procedure.

Adjusting the Screen Door for In and Out Location:

- Loosen the chrome bolts on the hinge side of the screen door: Two on each of the three hinges (six total).
- Slots in the steel hinge allow for in and out movement.
- Adjust the screen door to fit. The hinge should fit tightly to the trim of the door when the screen door is latched and the door is open.

Removing the Screen:

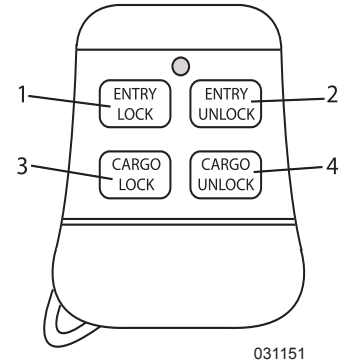
- The top half of the screen door is removable for a clear view through the entry door glass while traveling.
- Rotate the clips to remove the top half of the screen door. Store for travel.

KEYLESS ENTRY

The keyless entry system features the ability to lock and unlock bay and entry doors. Marker lights flash as system is activated. System is controlled by using a mounted control module, hand remote transmitter, and keypad.

NOTE:

All motorhomes equipped with the keyless entry system are shipped from the factory with default 5 digit access and authority code settings. To assign a new authority code refer to the instruction manual in the Owner's Information File Box.



It is recommended the access codes be personalized for security purposes before using the keypad.

Operation

Using the Key Fob:

Press the appropriate Entry button to perform the following:

1. Lock entry door and arm optional security system.
2. Unlock entry door and disarm optional security system. The inside map lights illuminate for a few seconds and then goes out. Starting the engine deactivates the lights.

Press the appropriate Cargo button to perform the following:

1. Lock all compartment doors.
2. Unlock all compartment doors.

Locking All Doors with Keypad:

Press and hold down the (1/2) button for 1 to 6 seconds. Marker lights flashes as system is activated.

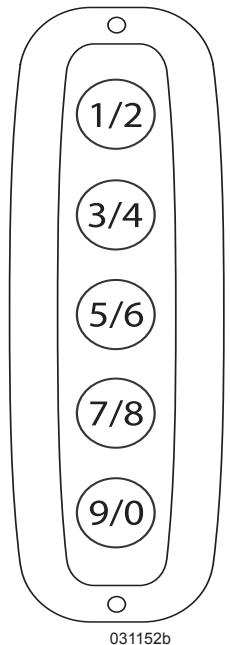
NOTE:

An access code is not needed to lock the doors.

Unlocking Doors/Security Functions:

1. First enter a valid five digit access code on the keypad. For factory default press (1/2), (3/4), (5/6), (7/8), (9/0) buttons. Confirmation beeps indicate the system is enabled.
2. Next, press the (3/4) button within 5 seconds and all doors unlock. The inside map light illuminates for a few seconds and then goes out. Starting the engine deactivates the lights.

If an unassigned button or no button is pressed while the system is enabled, the keypad reverts back to disabled state.



Assigning New Access Codes:

1. Press the **(5/6)** button for 5 seconds, then release after the keypad provides a confirmation beep. The backlighting LED of the keypad flashes indicating the learn mode.
2. Enter in the 5 digit authority code. Factory default is **77777**. Keypad provides confirmation beeps.
3. Press and release the button that corresponds to the access number. For example, press the **(1/2)** button for access #1, and press the **(3/4)** button for access #2. During this activity you are defining 1 of 5 access numbers. A subsequent code is assigned to this access number. The keypad provides a confirmation beep after this single button press.
4. Enter in your new 5 digit access code. The keypad provides confirmation.
5. Re-enter new access code. The keypad provides confirmation beeps.

Before testing the new access code make sure entry door keys are outside the coach. After performing the above sequence, the keypad automatically reverts back to default operation mode.

Additional Access Codes:

Up to 5 different access codes can be assigned at one time. As additional access codes are defined, pre-existing access codes are over-written. For example, if a new access code is assigned for access #3, the previous access #3 code is no longer valid.

SLIDE-OUT OPERATION

Slide room operation uses safety features to prevent mechanical damage or physical harm. Slide room(s) will not operate until all safety requirements are met.

Safety Requirements:

- Ensure the ignition key is **OFF**.
- The park brake must be applied.

CAUTION:

Never move the motorhome with any slide room extended. Perform the slide room operation with the air suspension system full.

CAUTION:

Do not leave the slide room extended during severe weather. Conditions such as high winds or heavy rain may cause damage. Rain water can pool on the slide room awning, adding weight and causing the awning to sag. Retract the room in small increments to allow the water to run off. Extensive damage could occur to the slide room and awning if extended in snow, sleet, ice or freezing rain. In such conditions, if the slide room is extended, clear the awning and ensure free movement prior to operating slide room.

Guidelines to ensure long life of slide system:

- **Inspect** roof of the slide for debris such as pine needles, dirt, leaves, sticks, etc. Debris left on the top may cause damage to the seals during retraction. If debris is present, wash with soap and water, then rinse.
- When the room is out, visually **inspect** the wipe seal for dirt or other foreign material and for tears.
- If the slide room leaks, fully retract the room. If necessary, tape exterior opening closed with duct tape until repairs to the motorhome can be completed.
- Open a window or vent to equalize pressure during slide operation.

CAUTION:

Firmly latch all cabinet doors adjacent to the slide before extending or retracting the rooms. Damage to doors or the fascia may occur.

NOTE:

Dirt trapped under the slide room could result in damage to the floor. If the motorhome has a ceramic tile floor, ensure the floor is clean before retracting the slide room. Dirt under the slide room can scratch the floor. Never move the motorhome with the slide room extended.

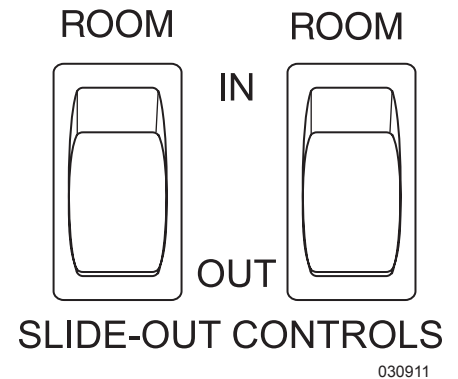
NOTE:

Do not use petroleum based products on the slide seal as they can damage the paint and cause premature aging of the rubber seal.

Main Room Slide-out

To Extend the Main Slide-out Room:

- Move the cab seat(s) forward.
- Confirm that there is at least 5' of clearance outside the motorhome for the slide-out room to extend.
- Be sure the bay doors under the slide-out room are closed.
- Ensure the ignition key is **OFF**.
- The park brake must be applied.
- The house batteries are fully charged.
- Be sure all people, pets and objects are clear of slide-out room path.
- The control switch for the slide-out room is on the system monitor panel.
- Press and hold the front slide-out room switch **OUT**. The slide-out room slowly moves **OUT**. Release the switch to stop room movement. To continue the room movement, push and hold the switch in.
- Release the slide-out switch when the room is fully extended (a change in motor sound indicates extension). The slide-out drive motor will not stop automatically; the switch must be released.
- If equipped, extend additional slide-out rooms.
- Level the motorhome with the leveling system.



NOTE: Perform the slide-out room operation with the air suspension system full. Extensive damage could occur to the slide-out room and awning when extending the slide-out room in snow, sleet, ice or freezing rain. In such conditions, if the slide-out room is extended, clear the awning and ensure free movement prior to operating the slide-out room.

CAUTION: Dirt and grit trapped under the slide-out room could result in damage to the floor. Continuous operation of the slide-out could cause a drain on the house batteries and damage to the slide-out motor from overheating.

To Retract the Main Slide-out Room(s):

- Check for sufficient clearance inside the motorhome before retracting the slide-out room.
- Clean the floor, if applicable, to ensure there is no dirt that could result in floor damage during operation.
- Move the cab seat(s) forward.
- Inspect the exterior to ensure there are no sags in the awning material.
- Remove any debris from the top of the slide-out room.
- Be sure the bay doors under the slide-out room are closed.
- Start the motorhome before retracting the slide-out room. Allow air bags to inflate to normal travel height.
- Retract the leveling jacks prior to operating the slide-out.
- Turn the ignition switch **OFF**. The slide-out room will not operate with the engine running.
- The house batteries should be fully charged.
- The park brake must be applied.
- Ensure all people, pets and objects are clear of slide-out room path.

- Press and hold the switch **IN**. The slide-out room moves slowly in. To stop the slide-out room, release the switch. To continue the room movement, push and hold the switch in.
- Release the switch.
- Rain water can pool on the slide-out awning. Added weight causes the awning to sag. Upon retracting the room, the material can catch between the top of the slide room and the opening in the motorhome. It is necessary to retract the room in small increments, allowing the water time to run off.

NOTE:

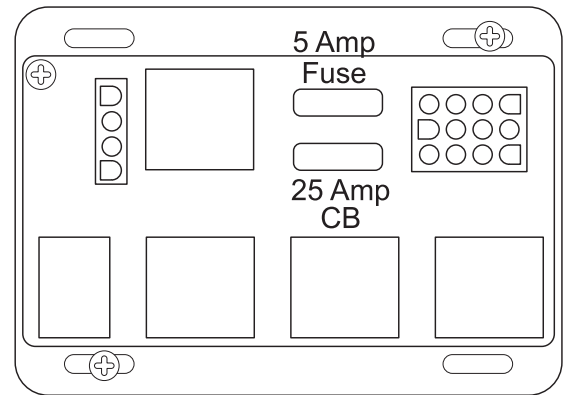
Ensure there is sufficient clearance on the inside of the motorhome (driver's seat, etc.) and the floor is clean before retracting the slide-out room. Dirt under the slide-out room can scratch the floor surface. Never move the motorhome with the slide-out room extended.

CAUTION:

Rain water can pool on the slide-out awning. The added weight causes the awning to sag. Upon retracting the room, material can become caught in between the top of slide room and the opening in the motorhome. It is necessary to retract the room in small increments, allowing the water time to run off.

If the Slide Room Fails to Operate:

Check the fuse and auto-reset circuit breaker on the slide-out relay module located in the rear curbside electrical compartment. If the fuses and circuit breakers test okay, get mechanical assistance.



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Bedroom Slide-out

To Extend the Bedroom Slide-out:

- Confirm that there is at least five feet of clearance outside the motorhome for the slide-out room to extend.
- Ensure the ignition key is **OFF**.
- The house batteries are fully charged.
- The battery cut-off switch must be **ON**. Depending on the floor plan, the switch is either on the monitor panel, or in the bedroom wall.
- Ensure all people, pets and objects are clear of the slide-out room path.
- Press and hold the rear slide-out room switch **OUT**. The slide-out room slowly moves **OUT**. Release the switch to stop room movement. To continue room movement, push and hold switch in.
- Release the slide-out switch when the room is fully extended (a change in motor sound indicates extension). The slide-out drive motor stops automatically.
- Level the motorhome with the leveling system.

WARNING:

Firmly latch all cabinet doors adjacent to the bedroom slide-out before extending or retracting the room. Damage to doors or fascia can occur.

CAUTION:

Dirt trapped under the slide could result in damage to the floor. Continuous operation of the slide-out could cause a drain on the house batteries and the motor from overheating.

NOTE:

Do not leave the slide-out in the extended position during severe weather. Conditions such as high winds or heavy rain may cause damage.

NOTE:

Perform the slide-out room operation with the air suspension system full. Extensive damage could occur to the slide-out room and awning when extending the slide-out room in snow, sleet, ice or freezing rain conditions. In such conditions, if the slide-out room is extended, clear the awning and ensure free movement prior to operating the slide-out room.

To Retract the Bedroom Slide-out:

- Check for sufficient clearance inside the motorhome before retracting the slide-out room.
- Clean the floor, if applicable, to ensure there is no dirt or grit that could result in floor damage during slide-out retraction.
- Remove any debris from the top of the slide-out room.
- Prior to retracting the slide-out room, start the motorhome. Allow the air bags to fully inflate to normal travel height.
- Retract the leveling system or prepare the air leveling system for travel prior to operating the slide-out.
- Turn the ignition switch **OFF**. **The slide-out room will not operate with the engine running.**
- The house batteries are fully charged.
- The battery cut-off switch must be **ON**.
- Locate the control switch for the slide-out, usually located on the monitor panel, or on the bedroom wall.
- Clear all people, pets and objects from the slide-out room path.
- Press and hold the switch in the **IN** position. The slide-out room moves slowly **IN**. To stop the slide-out room before the room reaches the **IN** position, release the switch. To continue the room movement, push and hold the switch in. The motor automatically stops when the slide-out room is fully retracted.
- Release the switch.
- Rain water can pool on the slide-out awning. Added weight causes the awning to sag. Upon retracting the room, the material can catch between the top of the slide room and the opening in the motorhome. It is necessary to retract the room in small increments, allowing the water time to run off.

CAUTION:

Continuous operation of the slide-out room can drain the battery and damage the slide-out motor from overheating. Never move the motorhome without having the slide-out room retracted.

Manual Override - Bedroom Slide-out

If the slide-out room does not respond from the switch, check that all the safety features are in place.

- The ignition key is **OFF**.
- The battery cut-off switch is **ON**.
- The house batteries are fully charged.

If the Slide Room Fails to Operate:

Check the fuse and auto-reset circuit breaker on the slide-out relay module located adjacent to the inverter. If the fuses and circuit breakers test okay, it is necessary to call and obtain mechanical assistance to correct the problem.

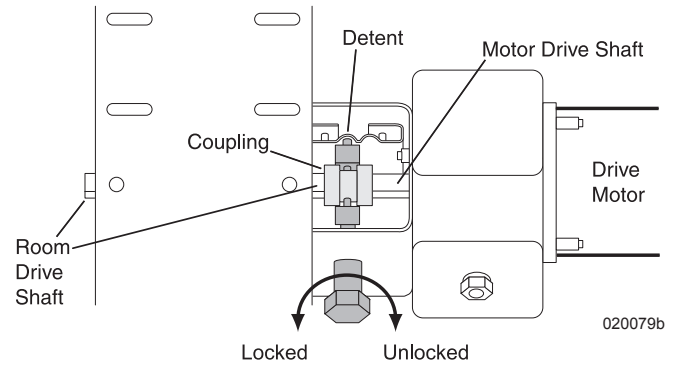
WARNING:

Do not work on the slide-out system unless the battery is disconnected. Make sure the floor is clean before retracting the slide-out room.

After the previous items have been checked and the room still does not move when the slide-out switch is pressed, follow these simple steps to manually override the slide-out room:

Manual Override for Bedroom Slide-out:

1. Lift up the mattress and unscrew baseboard to gain access to slide-out cover board and mechanism.
2. Remove 12 Volt DC from the motor by disconnecting the plug from the slide-out motor to the power supply.
3. The drive mechanism has a sliding coupling to engage and disengage the drive motor. Turn the large hex nut clockwise to unlock the drive motor.
4. The slide-out then can be pushed back.
5. Once the slide room has been manually retracted, turn the large hex nut counterclockwise to lock the room in place.
6. Take the motorhome to an authorized dealer for service.



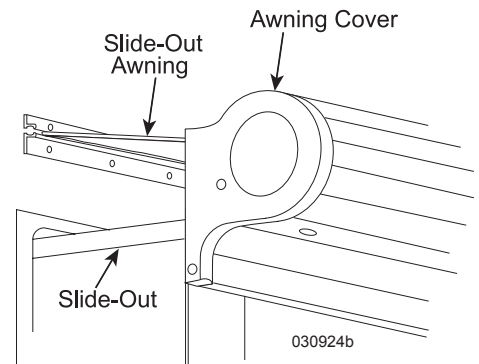
NOTE:

The slide out room is heavy and may require several persons to retract it.

AWNINGS

Slide-out Cover

The slide-out cover automatically reacts. A fixed edge of the slide-out cover is installed into an awning rail, mounted just above the slide-out. In hard rain, the cover helps prevent water from penetrating the seal of the slide-out. The slide-out cover automatically reaches full extension when the slide-out room is fully extended. The slide-out cover automatically rolls up to the travel position when completely retracted.



NOTE:

Water may pool on top of the extended cover. As the slide-out is retracted, water is removed.

NOTE:

When retracting the slide-out, stop the room about halfway. Be sure the fabric is rolling properly before fully retracting the slide-out.

CAUTION:

Retract the slide-out room and awning during heavy wind, rain or snow to prevent damage to the awning or motorhome. Wind can drive rain under the slide-out awning and into the motorhome.

CAUTION:

At least 5' of clearance is needed between the side of the motorhome and any objects, such as trees or fences, to allow the slide room and slid-out awning to fully extend.

CAUTION:

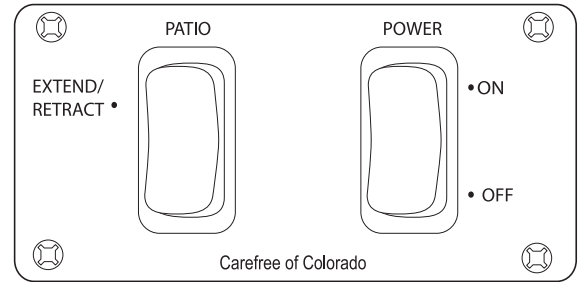
Rain water can pool on the slide-out awning. The added weight causes the awning to sag. Upon retracting the room, material can become caught between the top of slide room and the opening in the motorhome. It is necessary to retract the slide room in small increments to allow the water time to run off.

Front Door Awning - Mirage Automatic

The Mirage lateral arm is a box awning that operates on 120 Volts AC by the push of a button to extend the Mirage to its full extension. An optional remote control and a wind retraction systems are also available. The ignition must be **OFF** for the awning to operate and the awning requires 10' of lateral side clearance.

To Operate:

1. Turn power button **ON**.
2. Push the **Extend/Retract** button and hold. When desired extension is reached, release the button.
3. Place power button to **OFF**.
4. To close, push the **Extend/Retract** button and hold to retract awning to the travel position.
5. Turn power button **OFF**.



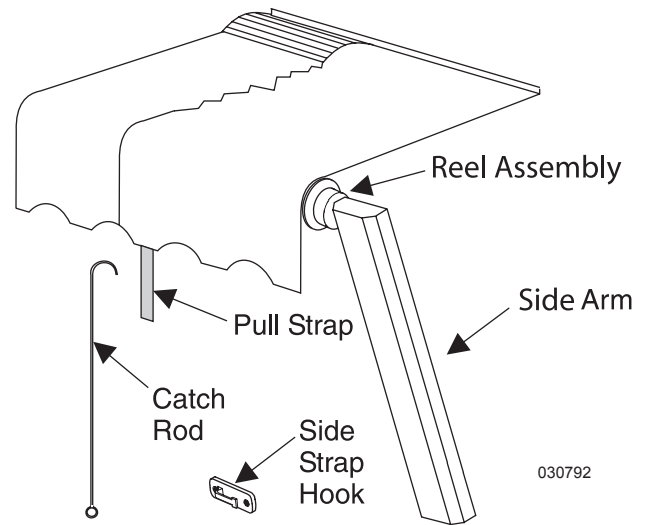
Window Awning (Optional)

To Extend the Window Awning:

- Hook loop of pull strap with catch rod and pull awning, reel assembly and side arms to extend fully away from motorhome.
- Hook pull strap on side strap hook, remove catch rod from pull strap and store.

To Retract the Window Awning:

- Hook catch rod on pull strap, remove pull strap from side strap hook and slowly allow awning to retract.
- Remove catch rod from pull strap and store.

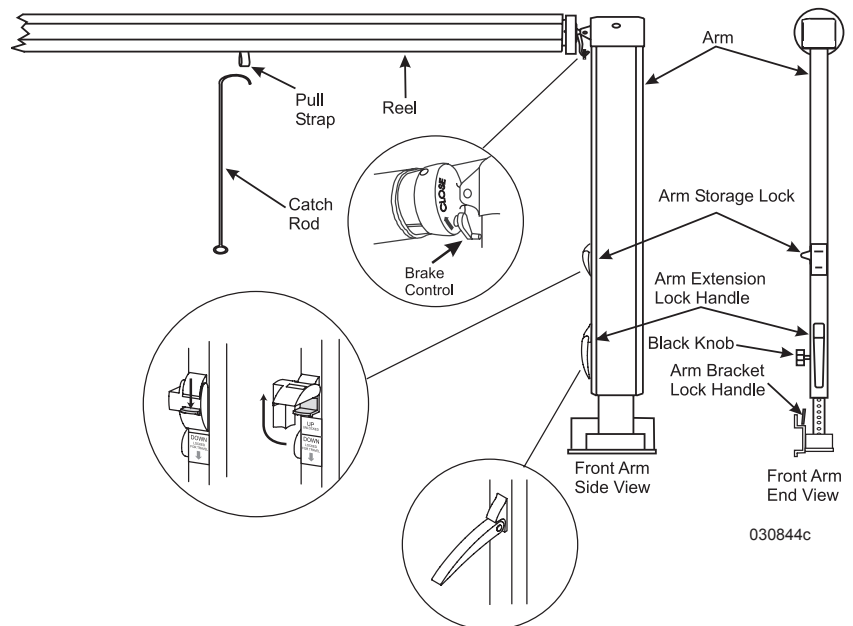


Patio Awning

To Unlock the Awning:

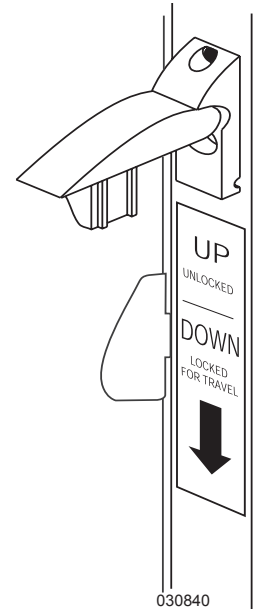
Start with either awning leg and repeat the following steps for each leg.

1. Loosen the black locking knob located on the backside of the awning leg (only about 6 turns are needed). This allows the support brace to move freely.
2. Unlock the travel lock by using one hand to squeeze inner and outer arm to remove tension from storage lock. Push up on tab and swing lock away.
3. Move the brake control (front leg only) to the up/unlock position.



To Extend the Patio Awning:

1. Locate the awning pull rod.
2. Locate the loop of the pull strap and hook it with the awning pull rod. Draw the awning away from the motorhome to the desired extension.



WARNING:

Always use the pull strap for extending and retracting awning. Never retract awning while holding onto the awning arm. Hands caught between the awning arm and brace channels during retraction may result in injury.

3. Slide the inner bracing rafters to the top of each arm ensuring the bracing is locked in place. Tighten the black locking knob.

NOTE:

Ensure the locking tab on support brace is latched through the hole in the end cap.

4. If equipped with Canopy Clamps, fasten the clamps at this time.
5. Using the arm extension lock handle, the awning can be hoisted upwards for additional clearance. Grasp upper arm with one hand and lift slightly upward. While lifting upward, push in on the release lever located on the lower portion of the upper arm. Lift front of awning to the desired height. Support the weight of the awning with one hand while relaxing release lever and allow the engaging pin to set into a hole in the lower arm. Go to the other awning arm and do the same. Ensure the awning is straight.
6. Slide the center pull strap to one end of the awning and store it by wrapping the strap around awning leg.

To Retract the Patio Awning:

1. Loosen the strap from the awning leg if it has been stored there.
2. Support the weight of the awning with one hand while opening the extension lock handle and lower the awning until the arms rest on the lower stop bolt. Loosen the two black locking knobs enough to allow the support brace to travel freely.
3. If equipped with Canopy Clamps, remove and store the clamps at this time.
4. Release the locking tab on the end cap of the awning leg and slide the inner support brace to down the awning leg to the stop bolt. Repeat for opposite side.
5. While pulling down slightly on pull strap, slide the brake control down located on the front awning leg.
6. Keeping downward pressure applied, slide the pull strap to the center of the awning while holding on to the strap.
7. Place the hook end of awning rod into pull strap loop to assist in retracting the awning. Make sure pull wand does not slip out of pull strap loop, allow the awning to roll up to the stored position.
8. Store the awning rod until it is needed again.
9. Verify that the brake control is in the locked or closed position. Snap the arm storage locks into the down position and tighten black locking knobs.

Rain Release Setting:

After the awning has been extended, choose the rain release position to prevent water build up on the awning. To position the awning in the rain release setting, lower one arm of the awning and leave the other arm in the normal position. This creates enough of a slope for adequate water run off.

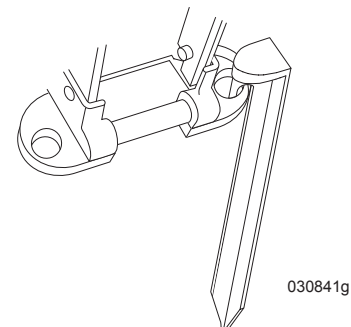
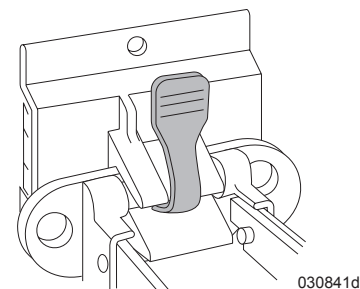
NOTE:

Water can quickly accumulate on the canvas during storm activity and damage the awning or motorhome. Storm related damage is not covered under warranty.

Using the Carport Feature:

(Not available with Carefree One Touch Awnings.)

1. Unlock and extend the awning as described under “To Unlock the Awning” and “To Extend Awning.”
2. Unlatch the bottom of the rear arm by pushing in on the lock handle on the arm bracket. Swing the arm away from the motorhome to an upright position.
3. Drive the stakes through the bottom holes in the arm.
4. Raise the rear arm extension lock handle all the way up or to the desired height and lower the lock handle to lock the arms in place.
5. Repeat instructions 2 through 4 for the front arm.



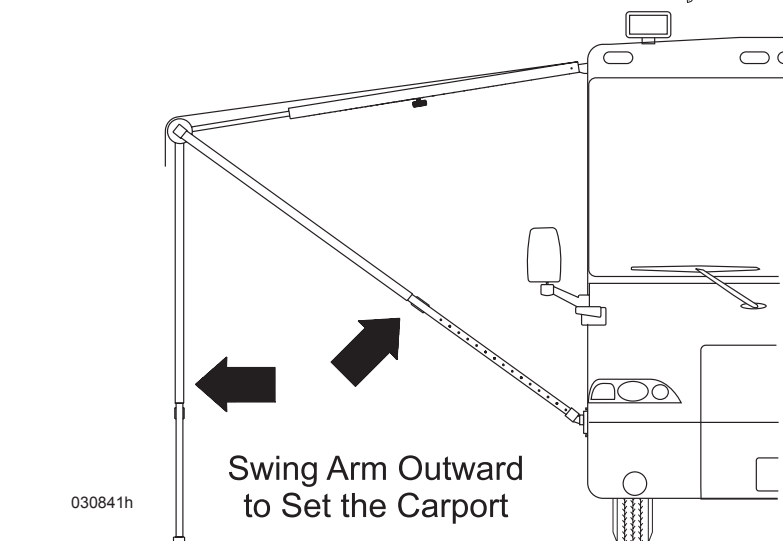
NOTE:

To move the awning out of the carport position reverse the above steps.

Securing the Awning for Travel:

Before traveling, check the following:

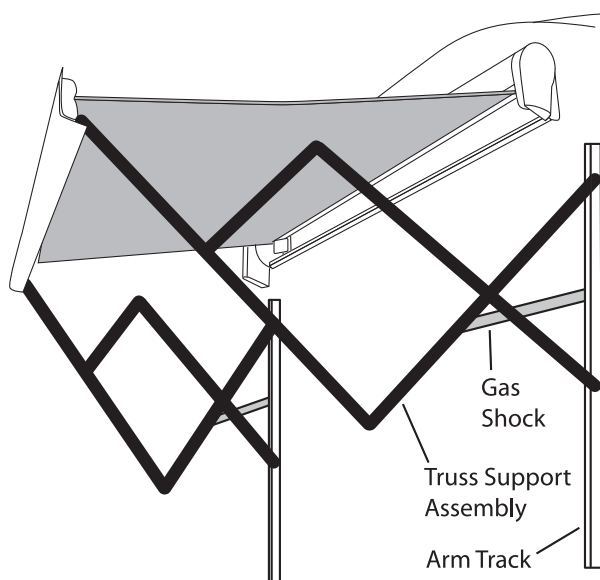
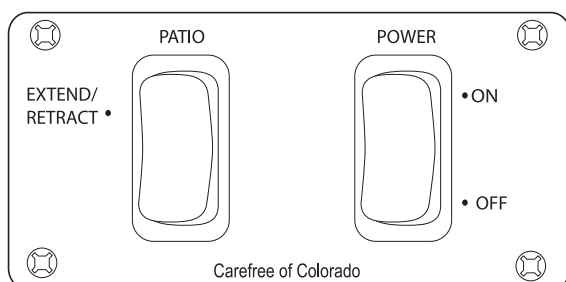
1. The awning is fully retracted against the sides of the motorhome.
2. The black locking knobs are tightened.
3. The brake control is in the full down (locked) position, and no red warning is showing.
4. The storage locks are down and in the locked position.
5. The bottom of the front and rear arms is latched properly into the bottom brackets.
6. The awning pull rod is stored away.



Patio Awning - Eclipse (Optional)

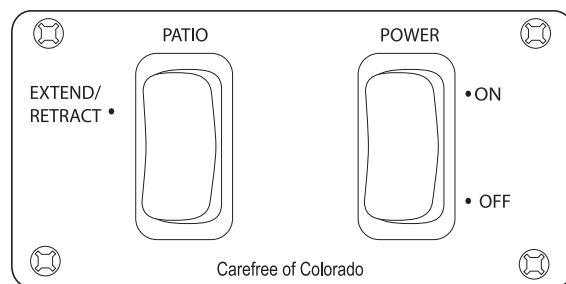
The awning requires 10' of lateral side clearance.

- Turn the power button **ON**.
- Push and hold the button to extend the awning. Release the button at any time for partial extension.
- Push the button and hold to retract awning.

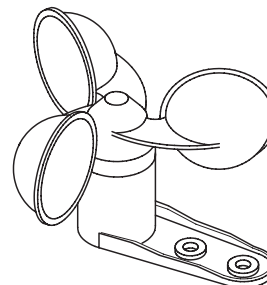
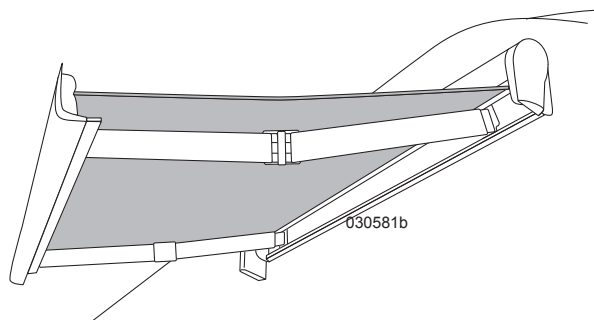


Patio Awning - Mirage (Optional)

- Turn the power button **ON**.
- Push and hold the button to extend the awning. Release the button at any time for partial extension.
- Push the button and hold to retract awning.
- Leave the switch **ON** while awning is extended to activate the Automatic Wind Sensor. If a strong wind is detected the sensor will automatically retract the awning.



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Wind Sensor Mounted
On Roof

030929b

Awning Care & Cleaning

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 garden hose. A high-quality acrylic fabric cleaner may be used to help maintain appearance. Carefully follow the instructions on any cleaning product used. Metal surfaces should be cleaned with soapy water and thoroughly rinsed. Allow the awning to thoroughly air dry while extended. Awning maintenance products can be found at RV supply stores.

Carefree Awnings:

Acrylic Awnings - Wash both sides of the awning with a mild soap (i.e., dish soap) and lukewarm water. Do not use detergents. If necessary, reapply the solution to keep fabric saturated. Rinse the awning thoroughly. Repeat, if necessary, until most of the stains disappear. Contact *Carefree of Colorado* for removal of stubborn stains.

Vinyl Awnings - Mildew will not form on the awning material itself, but it may form on the dust accumulated on the canopy. A quality vinyl cleaner, such as *Carefree Awning Magic*, will help keep the awning looking new. Be sure to follow the instructions on the container.

Leaks:

It is normal for slight leakage to occur through the fabric where water is allowed to accumulate. If water drips through the needle holes in the stitching use a commercial seam sealer that is available in canvas and trailer supply stores. Paraffin wax may also be applied to the top of the seams. As the awning “weathers” these holes will normally seal themselves. Soap or chemical residue 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. If leakage continues after washing and thoroughly rinsing, please contact *Carefree of Colorado*.

Storm Precautions

The warranty does not cover damage caused by acts of nature; therefore, steps should be taken to prevent damage from occurring due to wind, rain or storms. Retract the awning in inclement weather conditions or when leaving the motorhome unattended. Should the awning need to be retracted while the fabric is wet, extended it as soon as possible to allow it to completely dry.

NOTE:

Water weighs 8.33 pounds per gallon. The awning was not designed to withstand the 500 to 700 pounds of water that could accumulate on the canvas.

REAR LADDER

The rear ladder allows access to the roof. Be careful when climbing the ladder. Access to the roof should be limited to cleaning and sealing purposes only. Remove the bottom step section to open rear engine access door.

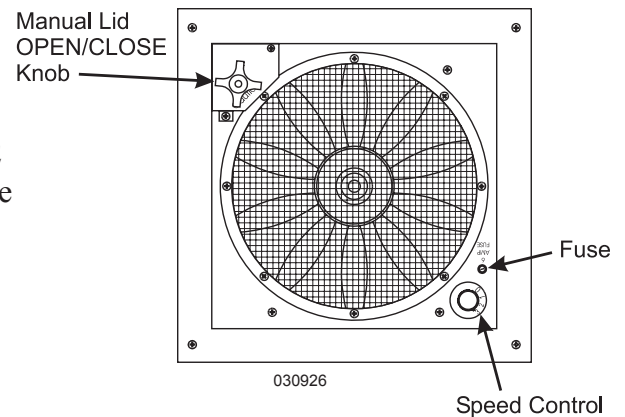
NOTE:

Maximum weight capacity for the ladder is 300 lbs.

FANS

Bathroom Exhaust Fan

The exhaust fan is a three-speed controlled fan with a zero or off position on the fan. The exhaust fan requires the presence of 12 Volt DC to operate. The fan extracts air from the motorhome. There are two ceiling vent fans. The knurled knob manually opens and closes the dome cover. The rotary knob selects the operating speed of the fan. When the dome cover opens about 2", the fan motor begins to operate.



To Operate the Fan:

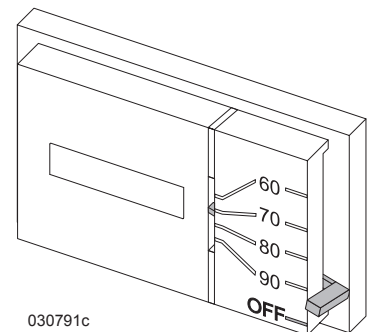
- The battery cut-off switch needs to be set **ON**.
- The fan blades activate once the dome opens past about 2".
- The dome manually opens and closes using the knurled knob.
- Set wall thermostat at desired setting.
- Select the desired fan speed on the speed control dial:

Zero = OFF

One = LOW

Two = MEDIUM

Three = HIGH



NOTE:

If the speed switch is in the "0" position the fan operates only as a vent.

- To keep condensation from accumulating open the vent fan lids 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 fan fails to operate, check for a blown fuse in the domestic fuse panel or 6-amp fuse on the fan.
- To clean the screen, remove the eight screws holding it in place. Wash the screen using a non-abrasive soap and water. Re-install the screen and tighten the screws.
- Keep all the vents closed when using the Fantastic Fan Vent. Direct the airflow by slightly opening the window(s) on the shaded side of the motorhome to obtain the maximum airflow, especially on hot, sunny days. Close all the roof vents. The area between the open window(s) and the Fantastic Vent supplies the maximum airflow and providing the most comfort.

NOTE:

Do not leave the vent cover open while the motorhome is in motion, stored or unattended for extended periods. High winds, other unusual conditions or obstructions may damage the cover and prevent it from closing. The resulting leakage could cause serious damage.

Rain Sensor Exhaust Fan (Optional)

The exhaust fan with rain sensor is a three-speed fan, which operates from 12 Volt DC power. There are three basic controls located on the exhaust fan: Adjustment Knob, Fan Speed Rotary Knob and the Fan Blade **IN/OFF/OUT** Control Switch.

During normal operations, the Adjustment Knob offers manual control of the dome cover for opening and closing. After the dome opens, pull Adjustment Knob down to Manual, then adjust the dome height and immediately push up and back to Auto. After adjusting the dome, check Knob to insure it is locked into the gearbox. When the rain sensor is wet, use the Adjustment Knob to manually open the dome override the rain sensor.

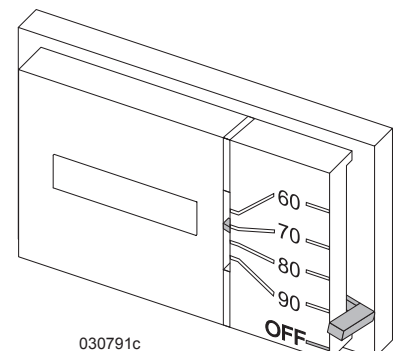
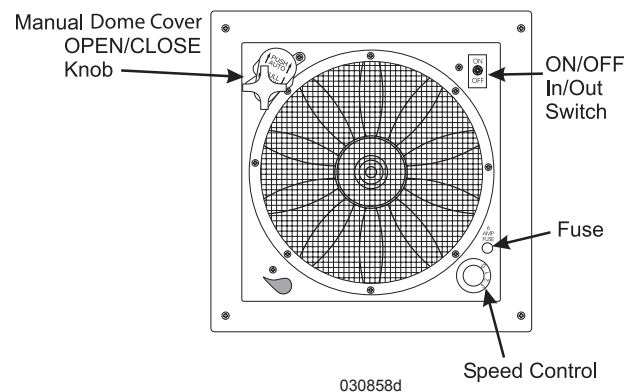
WARNING:

Keep fingers away from Adjustment Knob while dome is automatically opening or closing, unless deliberately applying opposite force to stop the dome partially open.

The Fan Speed knob controls the operation speed of the fan blade. The blade can be set between the “0” which represents **OFF**, to “3” which represents the fast blade setting.

The **IN/OFF/OUT** switch controls fan direction, which determines airflow direction through the exhaust fan. When the dome cover opens about two inches, the fan motor begins to operate. By pressing the **IN/OFF/OUT** switch to **IN**, exterior air passes through the exhaust fan into the motorhome. By pressing the **IN/OFF/OUT** switch to **OUT**, interior air passes through the exhaust fan to the exterior of the motorhome. By pressing the **IN/OFF/OUT** switch to the center, OFF position, the fan blade operation ceases. The rain sensor is always active in any mode. If the fan blade is **OFF** or **IN**, rain can infiltrate the motorhome until the dome is closed via the rain sensor.

The wall thermostat is for automatic control of the exhaust fan (kitchen fan only). Select a maximum ambient temperature between 60° F to 90° F. When the interior ambient temperature is warmer than the thermostat setting, the dome opens automatically and the fan blade turns on to the pre-selected speed and direction. When the motorhome cools below the thermostat setting, the dome closes and turns the fan blades off.



To Operate the Fan:

- The Battery cut-off switch needs to be **ON**.
- Select the desired fan direction to **IN/OUT**.
- Select the desired fan speed.
- Select the maximum ambient temperature on the wall (kitchen fan only) thermostat.

NOTE:

Let fan come to a complete stop before changing fan direction.

NOTE:

If the speed switch is in the “0” position the fan operates only as a vent.

Tips:

- To keep condensation from accumulating open the vent fan lids 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 fan fails to operate, check for a blown fuse in the domestic fuse panel or the 6-amp fuse on the fan.
- To clean the screen, remove the eight screws holding it in place. Wash the screen using a non-abrasive soap and water. Re-install the screen and tighten the screws.
- Keep all the other vents closed when using the Fantastic Fan Vent. Direct the airflow by slightly opening the window(s) on the shaded side of the motorhome to obtain the maximum airflow, especially on hot, sunny days. Close all the roof vents. The area between the open window(s) and the Fantastic Vent supplies the maximum airflow and providing the most comfort.

POWER SUNVISOR

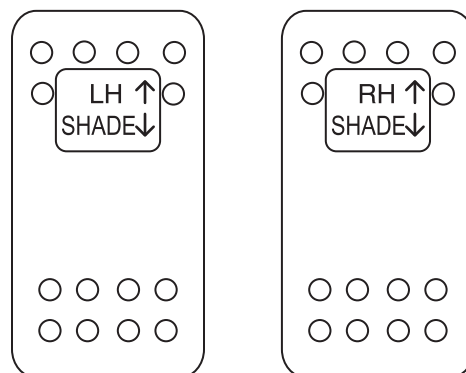
The windshield visors are 12 Volt DC operating from the house batteries. One visor assembly is used for the driver and another for the passenger.

To Operate the Visors:

- Use the house battery cut-off switch to turn on the interior house power.
- Push the switch down to lower the desired Sunvisor.
- Push the switch up to raise the Sunvisor.

NOTE:

Do not attempt to move or drive the motorhome with any window view obstructed.



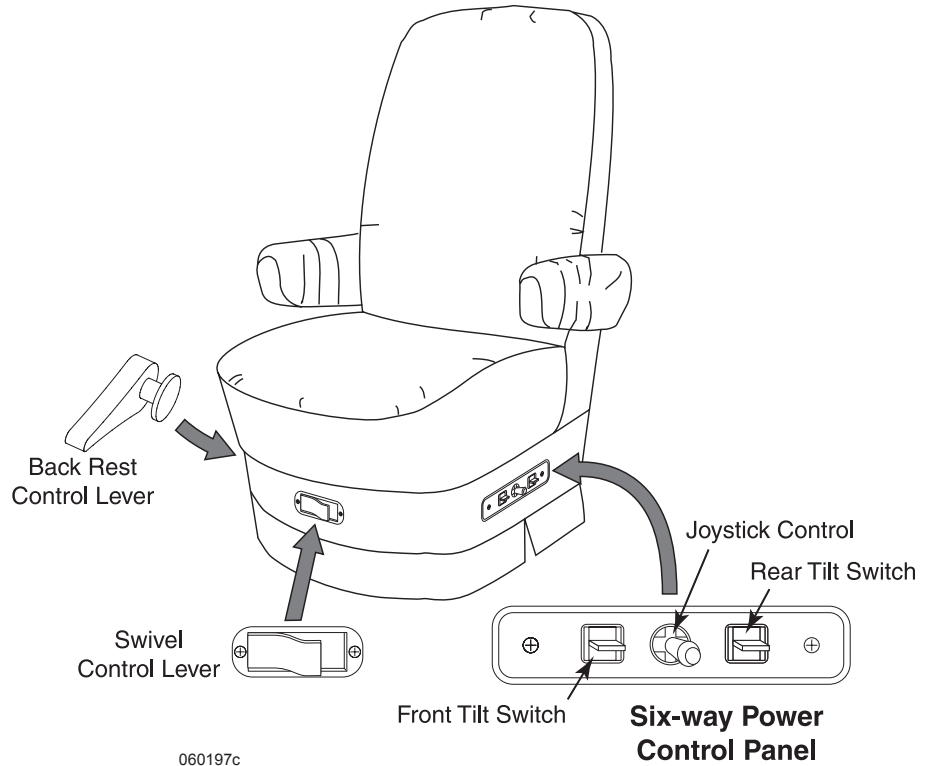
080306b

SEAT CONTROLS

The Pilot and Co-Pilot seats are adjustable to provide maximum comfort. Seats must be locked in the forward facing direction while traveling. Each seat is operated by a 20 Amp fuse, located in the front run box.

NOTE:

The seats operate from 12 Volt DC house power. The ignition must be on to operate the lumbar/seat support and heater functions.



Swivel Seats

Swivel Seat Operation:

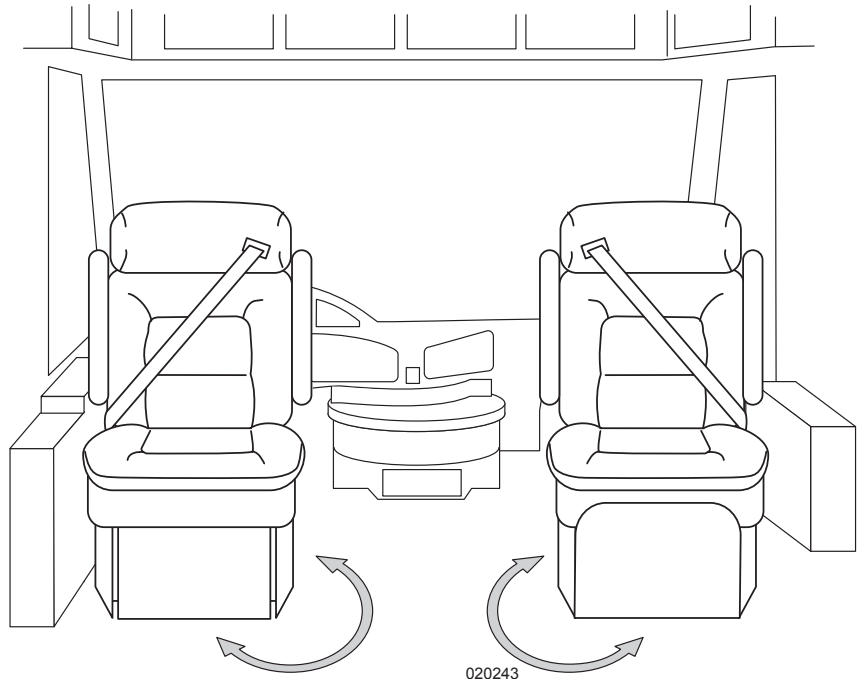
- When swiveling a seat, lift up the swivel lever and rotate to the desired position.
- The passenger seat swivels all the way around when the slide-out is extended.
- When rotating the driver seat, put the steering wheel in the upright position.
- Move the seat forward, then pull the swivel lever up and rotate to the desired position.

WARNING:

Seats must be locked in the forward facing position while the motorhome in transit.

NOTE:

After either seat is rotated 180°, it must be rotated back in the opposite direction. The 12 Volt wiring in the seat may disconnect if rotated 360°.



SOFA

Easy Bed Conversion

The sofa converts easily into a bed. The sofa comes equipped with safety belts and these should be used if occupied during travel.

Sofa to Sleeper:

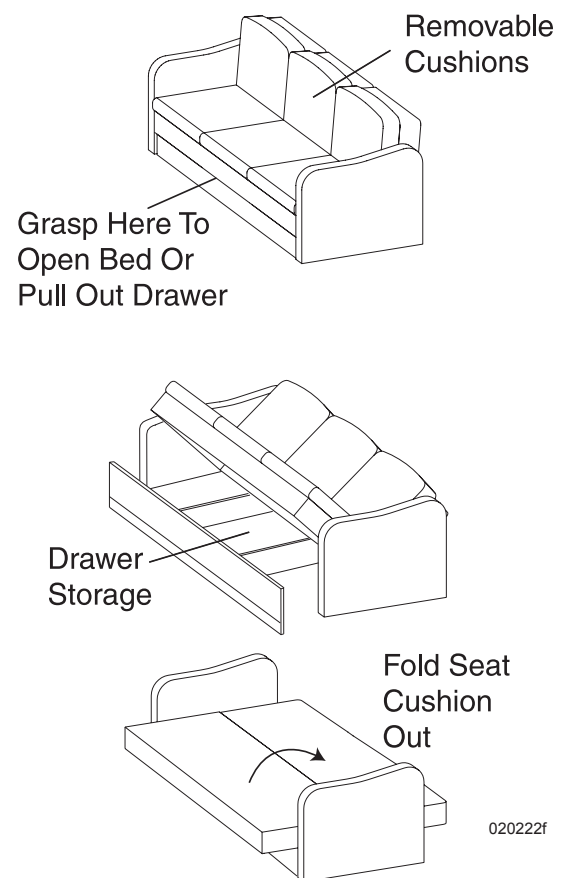
- If applicable, slide the lever forward to release the locking mechanism.
- Raise the sofa seat base until seat base and backrest form a “V” shape by lifting up from the center of sofa just below the seat cushions.
- Push down on seat base until the seat base and backrest are flat.
- Fold seat belts out of the way.

Sleeper to Sofa:

- Lift the seat base up until seat and back rest are in a “V” shape.
- Push down on seat base.

WARNING:

Do Not use the sofa for transporting infants or children that require safety seats or booster seats.



Hide-A-Bed Conversion (Optional)

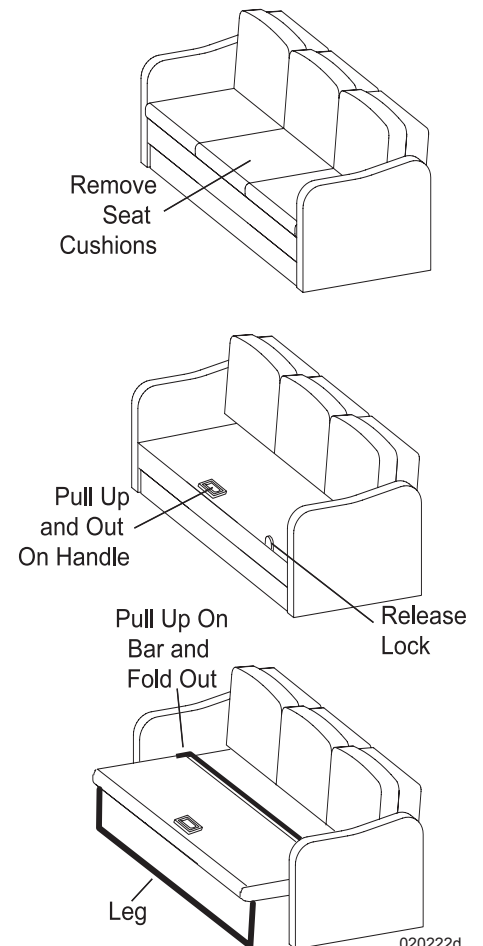
The sofa hide-a-bed converts easily into a bed. Clear the area of obstruction. The sofa comes equipped with safety belts to be worn if occupied during travel.

Sofa to Sleeper:

- Remove the three seat cushions to access the hide-a-bed. The seat cushions should be stored safely until the bed is converted back to a sofa.
- If applicable, release the lock on the right side of metal bar, grasp the front metal bar and lift up, pulling out on the bar until leg of the bed firmly rests on the floor.
- Fold seat belts out of the way.
- When the legs of the bed are firmly on the floor there will be another lifting bar exposed to complete the conversion process.
- Grasp and open the lifting bar to open the bed fully.

Sleeper to Sofa:

- Remove all bedding from the hide-a-bed.
- 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.
- Position the seat belts for use.
- Replace the seat cushions.

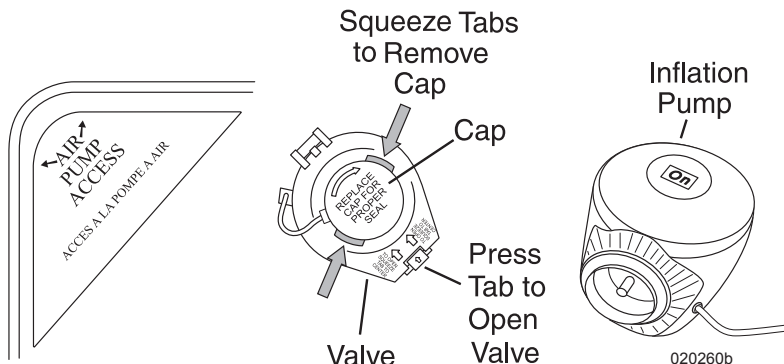


Air Mattress (Optional)

The Air Mattress inflates and deflates in a matter of a few seconds. Inflating the mattress is accomplished by using an electric pump. The pump operates from any 120 Volt AC outlet.

To Inflate the Mattress:

- Open sofa and allow the mattress to lie flat.
- Unzip the corner of the mattress labeled “Air Pump Access.”
- Ensure the valve is locked securely in place.
- Remove the cap from the valve by squeezing the tabs on each side of cap.
- Place the pump into the valve and turn pump $\frac{1}{4}$ turn clockwise to lock pump into valve.
- Plug in the pump motor to inflate to a desired firmness.
- Remove the pump, reinstall the cap on the valve and zip the “Air Pump Access” cover closed. The bed is now ready for linen.



To Deflate the Mattress:

- Remove bedding items.
- Unzip the corner cover of the mattress labeled “Air Pump Access.”
- Press tab on the side of valve and pivot valve up to release the air in mattress.
- Once mattress is deflated allow valve to rest loosely on valve seat, **DO NOT LOCK VALVE CLOSED.**
- Zip the “Air Pump Access” cover closed and close the sofa.

Magic Bed Conversion (Optional)

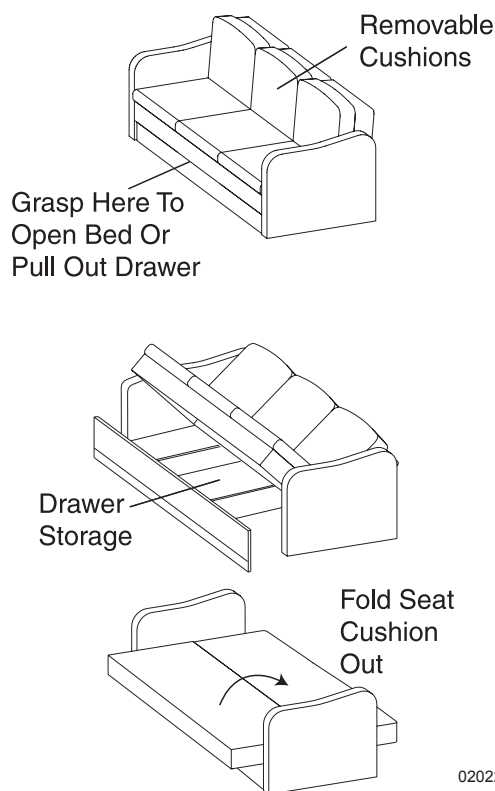
The sofa converts easily into a bed. A drawer is provided for convenience. The sofa comes equipped with safety belts and these should be used if occupied during travel.

Sofa to Sleeper:

- Remove back rest cushions.
- Raise sofa seat base until seat base and backrest form a “V” shape by lifting up from the center of the sofa just below seat cushions.
- Pull out and push down on seat base until the seat base is flat.
- Fold seat belts out of the way.
- Flip seat cushions back to form mattress.

Sleeper to Sofa:

- Fold mattress in to form the seat cushions.
- Lift the seat base up until seat and backrest are in a “V” shape.
- Push back and down on seat base.
- Replace back cushions.



J-Lounge (Optional)

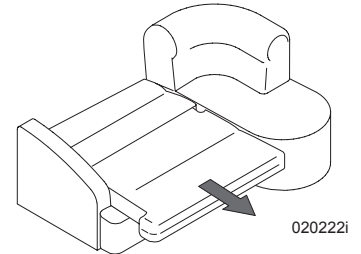
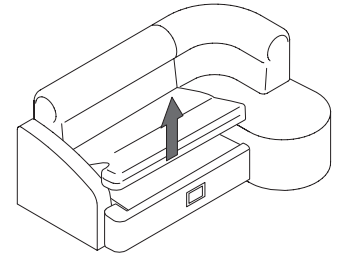
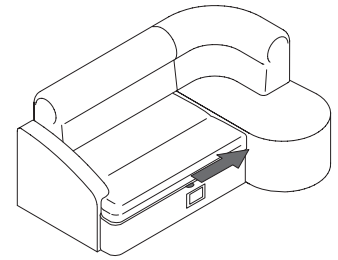
The J-Lounge provides comfortable seating and extra storage space. The J-Lounge comes equipped with safety belts that should be used if occupied during travel.

Storage Compartment Open:

Lift the handle latch up, releasing the lock mechanism and pull the storage drawer forward.

Close:

Push the storage drawer until the lock mechanism catches the latch.



J-Lounge to Sleeper:

- Slide the lever to the right to release the locking mechanism.
- While holding the lever in the unlock position, raise the J-Lounge seat base until the seat base and backrest form a “V” shape by lifting up from the center of the J-Lounge just below the seat cushions.
- Pull the seat cushion forward until the seat base and backrest are flat.
- Fold seatbelts out of the way.

Sleeper to J-Lounge:

- Slide the lever to the right to release the locking mechanism.
- While holding the lever in the unlock position, raise the seat base.
- Push the seat base towards the backrest.
- Push the seat base down to latch the locking mechanism.

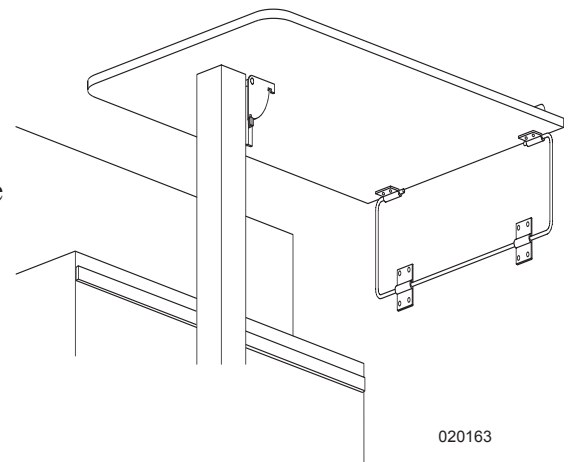
TO EXTEND FIXED DINETTE

- To extend table, pull out on table until it locks completely out.
- to retract table push in on table until it locks completely in.

DINETTE BED CONVERSION (OPTIONAL)

The booth dinette easily converts into a bed.

- Lift or remove the seat cushions to permit the table to swing down into position.
- With a firm grip, lift front edge of the table about 6” and push table leg lock to release the support leg.
- Swing the table leg up, locking into the horizontal position.
- Continue lifting table until table stays are clear of retainers. Pull outward and lower table down.
- Use both seat cushions and one back cushion for mattress. Leave one back cushion in a vertical position.



WARNING:

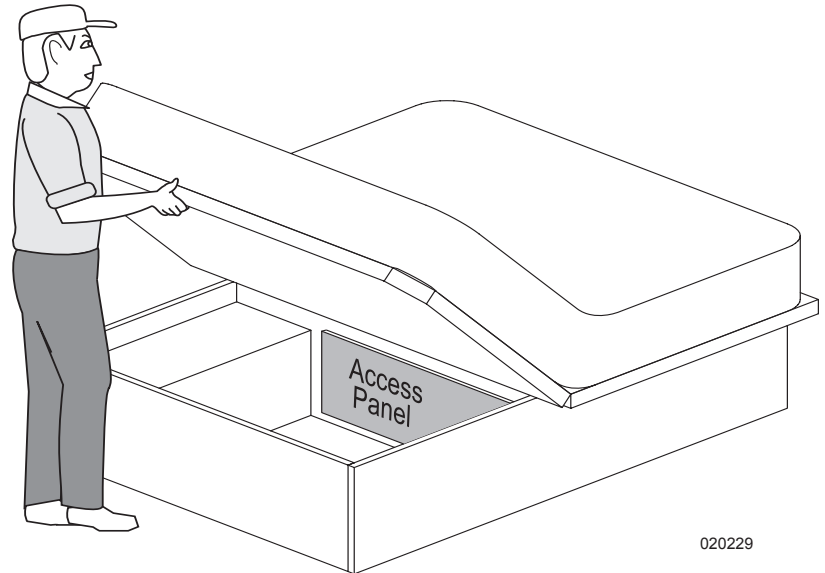
Only forward facing booth dinette seats equipped with seat belts are designed for occupancy while the motorhome is in motion. To avoid injury, chairs must be stored in an enclosed area or secured with tie straps while the motorhome is in motion.

STORAGE - UNDER BED

To use the storage compartment located under the bed, locate and unlock the bed deck latches. Lift up the bed by the front edge of the mattress platform. Gas struts hold the mattress and platform open.

NOTE:

Do not over stress gas struts by rapidly opening or closing the bed access cover, as this action can damage the struts or mounts. In extreme cold gas struts may not hold the mattress platform in the open position.



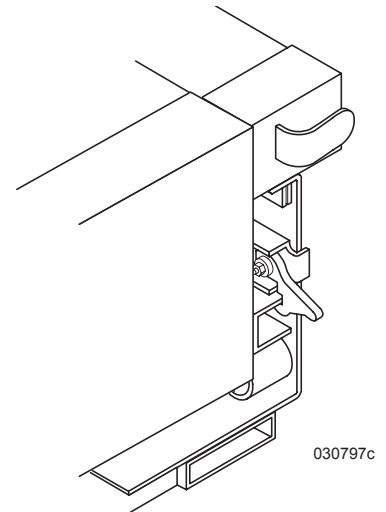
STORAGE BAY SLIDE-OUT TRAY (OPTIONAL)

The super slide is an option available for use in the storage compartment bays of the motorhome. This allows for the pay-load to slide outward for easier access.

- The motorhome must be level before opening.
- Two latches release: lift and hold up to release one, pull outward while pulling on the slide to release the other.
- Never exceed maximum weight capacity (1,000 lbs).

WARNING:

The motorhome must be level when sliding the drawer out of the bay compartment. The drawer can slide out abruptly and cause bodily harm if the motorhome is not level.



ENTERTAINMENT SYSTEMS

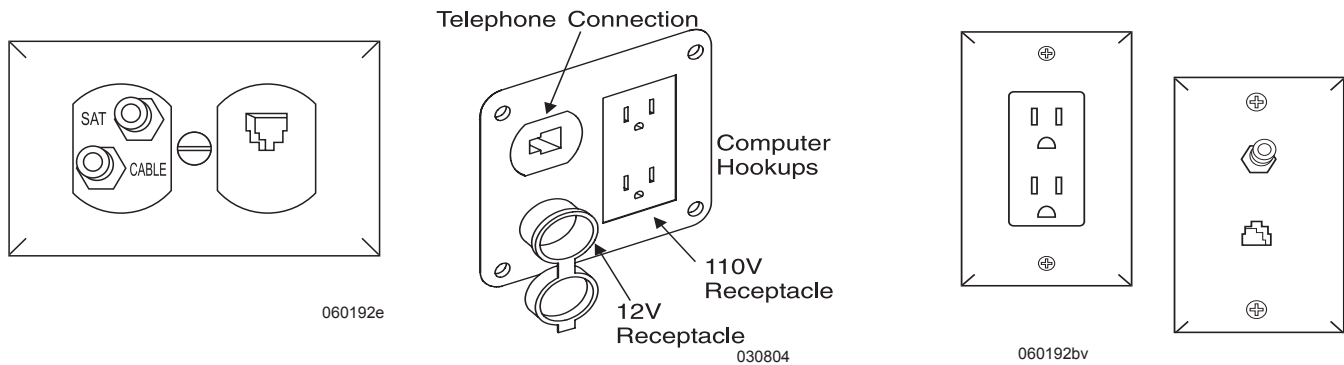
The components used to make up the entertainment center are carefully selected to provide the highest quality in audio and visual enjoyment. There are several pieces of equipment, which encompass the entertainment center. The following paragraphs will discuss the operations and various components. Use the instructions given in the Video Selector Box section to use these components.

NOTE:

It may be necessary to use the set-up menu for the television, DVD/VCR/CD components prior to using the system. Auto programming may not select Channel 3, which is required for operations.

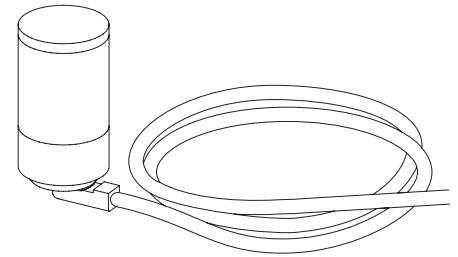
Hook-ups - TV Cable, Computer & Telephone

The motorhome is equipped with cable TV, satellite TV, 120 Volt AC electric outlet and telephone hook-ups, located in the various outside bays. For convenience, there are auxiliary outlets located at the co-pilot seat and on the optional computer desk. This connection is set up for a telephone or laptop computer.



Cell Phone Antenna

The motorhome is equipped with a cell phone antenna. The antenna lead is located behind the dash instrument cluster. To access the lead remove the inspection panel located on top of the dash pad. The antenna lead run is installed from the roof down the driver side A-pillar. This is the section between the driver side window and the windshield. The coiled antenna lead should be located toward the front firewall, directly behind the instrument cluster.



030866

Television (Front) w/Lock-out Feature

The Main TV has lockout circuitry. Simply stated, the ignition switch controls the front television power outlet. The front television only operates with the ignition **OFF**. No other television set is affected by the lockout circuitry. The television operates on 120 Volt AC power only. This power can be provided by shore power, the generator or the inverter. Viewing time of the front TV from the inverter depends on the state of charge of the house batteries and any additional 12 Volt DC circuitry which is being operated.

Television Antenna

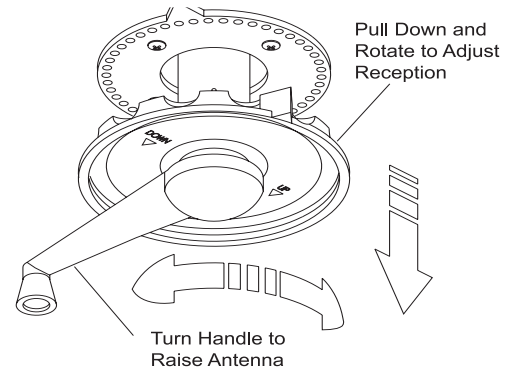
The television antenna is a manual crank up style antenna with built in electronics that use 12 Volts DC to “boost” signal strength. Signals that are weak or fuzzy can be amplified by turning on the TV Ant Power switch on the Video Selector Box. The antenna and booster work together to provide the best possible picture for most situations. Certain conditions occur when no amplification is needed, and in fact may make the picture worse. The television station sends a signal that resembles the waves or rings of water from a rock thrown into a still pond. The radiating television signal can hit an object such as a mountain and come back. The antenna receives a signal from the initial pass, and then receives an additional signal from the rebound resulting in a split or double image. In this case, the picture may be improved by no amplification or even lowering the antenna.

NOTE:

Do not move the motorhome with antenna in the raised position, it can be damaged by tree limbs or wires.

WARNING:

Before raising antenna make an outside inspection for any obstructions or overhead electrical wires. Damage to the antenna, severe shock, personal injury or death can occur from inadequate clearance.



130024

To Raise the Antenna:

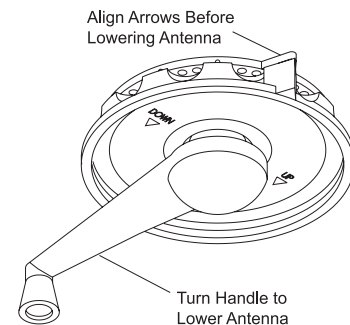
- Rotate the crank handle clockwise (about 14 ½ turns).
- Pull down on the outside directional wheel and rotate the antenna until the best picture is obtained. The directional wheel is spring loaded.

WARNING:

Do not raise a TV antenna near overhead electrical wires as contact may cause serious injury or death. The motorhome must not be driven with the antenna in a raised or partially raised position. Worm gear or worm breakage may result.

To Lower the Antenna:

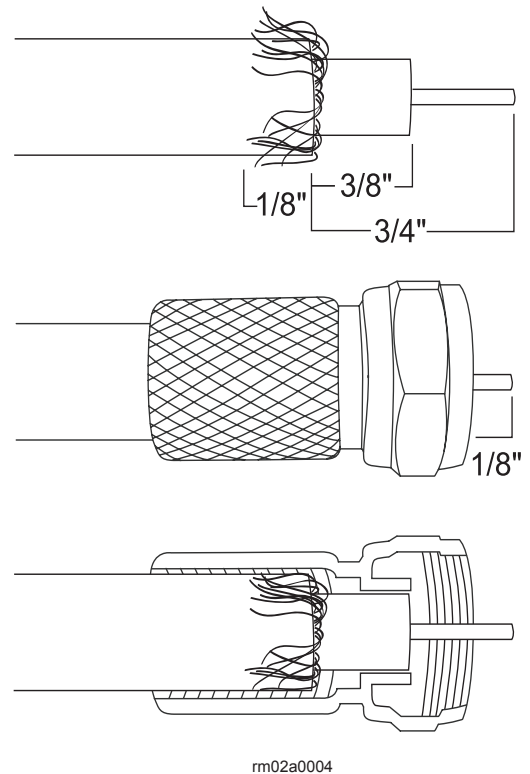
- Pull down on the directional wheel and align arrows together.
- Rotate the crank handle counterclockwise to lower the antenna fully into the cradle. Make an outside visual inspection to ensure the antenna is properly stowed.



130024

Troubleshooting the Coax Wire:

Weak or no picture can indicate a possible shorted or open coax. The coax cable is made of two conductors: A center conductor usually of copper and a ground that is woven of braided aluminum. The “die-electric” insulating material separates the two conductors. The ground and center conductors are to remain electrically separate from one another. When installing a F-connector onto a coax cable, use care so none of the woven ground strands make contact with the center conductor. A continuity tester is required to test a suspected fault in a coax wire. Unscrew both ends of the suspected bad coax run, with the continuity tester check between the center conductor and the outside threaded ring. If continuity is present, the coax is shorted. To test for an open connection of a particular coax run, use one test lead and touch the threaded end of the coax. With the other test lead, touch the threaded ring at the opposite end. Continuity should be present. Perform the same test procedure on the center conductor. Proper electrical coax operation should indicate continuity from the center conductor at one end to center conductor at other end. Continuity should be present between each coax terminal end. There should be no continuity between the terminal end and center conductor. Though damage does not usually occur from a shorted or open coax cable, picture quality is compromised.



Television Set:

Ensure the television set selects channel 3. The TV menu may need programmed. (i.e.: Input Video Signal Type, Channel Programming or Signal Output Levels.)

INFORMATION:

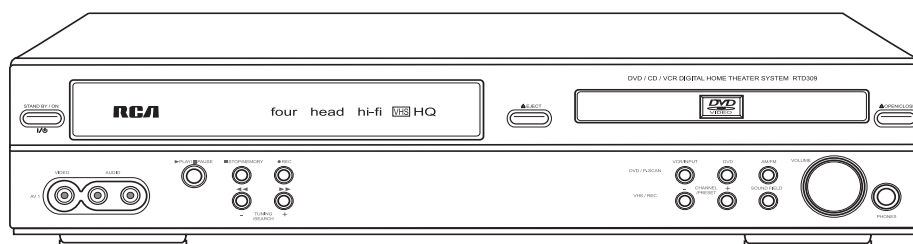
For detailed information and operating instructions on the television, refer to the manufacturer’s manual located in the Owner’s Information File.

DVD/VCR/CD

The DVD/VCR/CD player is the same one found in many homes. It features Digital Cinema and Progressive scan to produce a sharper picture.

INFORMATION:

Reading the individual component owner’s manual is recommended. Many features and combinations for operating the entertainment system are available.



031193

Television/Entertainment System - Front

The front entertainment system includes a television, a combination DVD/VCR Home Theater System and optional satellite receiver.

NOTE:

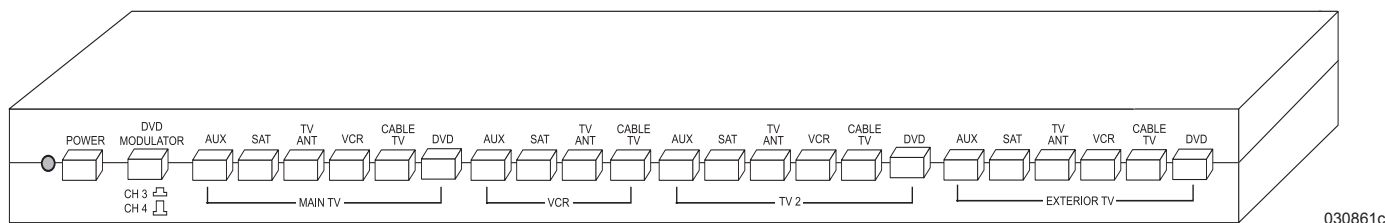
For detailed information and operating instructions, refer to the manufacturer's manual located in the Owner's Information File.

Video Selector Box

The motorhome is equipped with a video selector box which has six inputs and four outputs.

Features Include:

- Push button controls allow sending signals from one of six different inputs to three televisions and a VCR.
- Six inputs are Satellite Receiver, TV Antenna, VCR, DVD, Cable TV & Aladdin Monitoring System.
- Four Outputs: Main TV, TV2, Exterior TV and VCR.
- Built-in +12 VDC television antenna power supply eliminates need for separate wall mounted television antenna power supply.
- Self-resetting fuses used in antenna power supply prevent failure caused by shorted connections.
- Video switch allows independent viewing of signals on different televisions, with a record option from VCR.

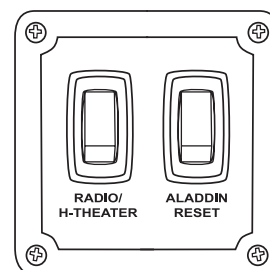


To Operate any Component:

Hook to shore power, start the generator or turn on the inverter. The battery cut-off switch must be **ON** and the house batteries charged. The Radio/Home Theater switch, located in the overhead compartment above the driver's seat, must be in the correct position for sound to be heard through the surround sound system.

NOTE:

Press the Radio/Home Theater switch UP for Radio and DOWN for television surround sound.



To Watch Television Using Antenna:

To view signals from an amplified television antenna, press the television antenna **POWER** button **ON**. This provides +12 Volt power to the television antenna amplifier located inside the antenna housing. To view the television antenna signal on the main television, press the **TV ANT** button located above the area marked "MAIN TV." Follow the same procedure for TV 2 or exterior TV. For the front RCA television, go into the menu and select Source Air. Then select Auto Search and television scans available channels. Choose desired channel.

NOTE:

The picture quality from the outdoor television antenna varies by location of the station in relationship to the antenna. If picture quality is poor and there is no external power supply, try turning the television Antenna Power button located on the control box OFF and ON.

To Watch Television Using Cable Signal:

To view Cable TV signals on the main television, press the CABLE TV button above the area marked “Main TV.” Follow the same procedure for TV 2 or exterior TV. For the front RCA television, select Source Cable from the menu. Then select Auto Search and the television scans available channels. Choose desired channel for viewing.

NOTE:

To view Cable TV signals, you must be connected to a Cable TV input on the outside of the motorhome. Cable TV inputs are available at many of today’s campgrounds.

To Watch Television using Satellite Signal:

To view Satellite signals on the main television, press the SAT button above the area marked “Main TV.” Follow the same procedure for TV 2 or exterior television. Turn television **ON** and select channel 3. Turn **ON** satellite receiver, then use satellite tracking system to acquire satellite. Use satellite remote control to select desired channel.

To Watch Television using VCR Signal:

To view VCR signals on the main television, press the **VCR** button above the area marked “Main TV.” Follow the same procedure for TV2 or exterior television. On the RTD300 player, push the **VCR/INPUT** button. Turn the television **ON** and select Channel 3. Insert video tape to view.

To Watch Television using DVD Signal:

To view DVD signals on the main television, press the DVD button above the area marked “Main TV.” Follow the same procedure for TV2 or EXTERIOR TV. On the RTD300 player, push the **DVD** button. Turn the television **ON** and select Channel 3. Insert DVD to view.

To Play a CD:

- Turn **ON** by pushing the **Standby/On** button.
- To open (or close), push **Open/Close** button.
- Insert CD, label side up and close by pushing **Open/Close** button. CD automatically plays.
- To eject, push **Open/Close** button.

Television/Entertainment System – Bedroom

The bedroom television system, separate from the front system, is comprised of a RCA television, combination DVD/VCR/CD player, and an optional satellite receiver. An optional AM/FM/CD/DVD player is available. The following is for the standard RCA television and RCA 300 receiver which is located in the compartment above the driver.

INFORMATION:

Reading the individual component owner’s manual is recommended. Many features and combinations for operating the entertainment system are available.

To Watch Television Using Antenna:

To view signals from an amplified television antenna, first press the television antenna POWER button **ON**. To view the television antenna signal on the bedroom television, press the TV ANT button located in the area marked “TV 2.” Select Signal Type Antenna from the menu. Select Start and the television scans available channels. Choose desired channels for viewing.

To Watch Television Using Cable Signal:

Press the **CABLE TV** button in the area marked “TV 2.” Turn television **ON** and go into the menu and select Signal Type Cable. Next select Start the television scans available channels. Select Channel 3 on the television. Choose desired channels for viewing.

To Watch Television Using Satellite Signal:

Press the **SAT** button above the area marked “TV 2.” Turn on television and select Channel 3. Turn on Satellite receiver. Use satellite tracking system to acquire satellite. Use satellite remote control to select desired channel.

To Watch Television Using VCR Signal:

Press the **VCR** button in the area marked “TV 2.” On the RTD 300 receiver push VCR/Input button. Turn television on and select Channel 3. Insert video tape to view.

To Watch Television Using DVD Signal:

Press the **DVD** button in the area marked “TV 2”. On the RTD 300 receiver push DVD button. Turn television on and select Channel 3. Insert DVD to view.

LCD TV Auxiliary Equipment Hook-up (Optional)

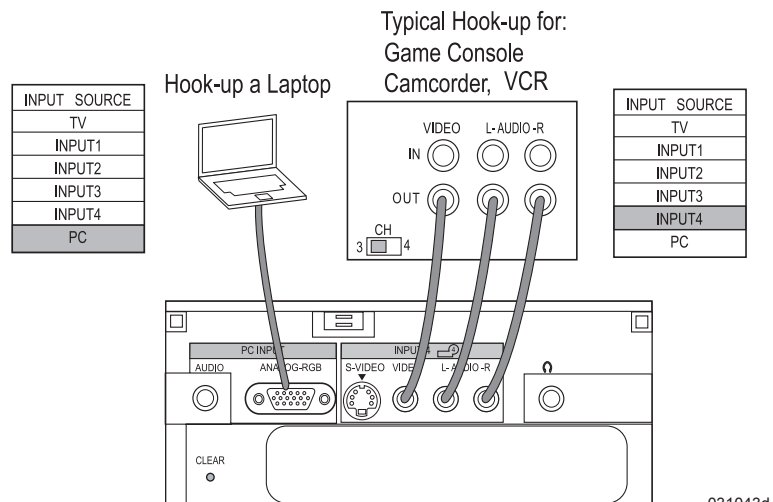
Additional equipment can be connected to the LCD tuner. Located behind the control box access door are auxiliary RCA jacks and RGB (PC) port.

INFORMATION:

Before hooking up additional equipment, refer to the equipment manufacturer manuals for cautions and instructions.

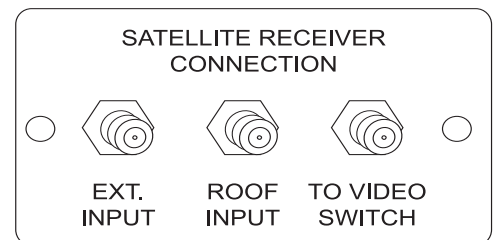
NOTE:

Refer to each component manual for in-depth operating instructions.



Satellite System - Prewire

The motorhome is prewired for a roof mount Satellite System. The prewire consists of a $\frac{3}{4}$ " flexible conduit, which runs from the front overhead connection panel to a spot marked on the roof. A telephone hook-up is provided for Pay Per View access.

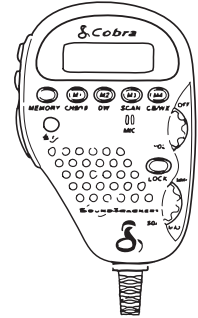


CITIZENS BAND (CB) RADIO - PREP

A two pin connector labeled Citizens Band Radio is located behind the dash panel, along with the CB Antenna coax, which is routed to the roof mounted base. The red wire is + 12 Volt DC (positive) and has a two amp fuse in the front distribution panel. The white wire is connected to the frame (ground).

CITIZEN BAND (CB) RADIO (Optional)

The CB radio is a low-powered transmitting device for two-way, short-distance communications. The CB can be a useful tool for emergency weather condition information and potential road hazards reported by other CB operators.



030783

Handset:

- Volume/On/Off control has no effect on radio transmission.
- Squelch control is first turned up to a point where static or background noise can be heard then reduced to a point where the static disappears.
- The Channel Selector is used to select channels (1 through 40) by pressing the Channel Up/Down Tuning buttons.
- When the Microphone button is pressed, the CB radio switches from a listening device to a transmitter. Anything spoken into the microphone is transmitted over the airway of the channel selected. Press the button to talk and release the button to receive a reply.

Emergency Communication:

- Set the CB radio to Channel 9.
- Request a React base (if available) to respond by saying “Break Channel 9 for a React base” and provide the CB Distress Data (called “CLIP”) repeatedly so the nearest monitor may be of assistance:

Call Sign - Identify yourself and vehicle.

Location - Be exact.

Injuries - How many? What type? Are persons trapped?

Problem - Give details and be specific about the assistance needed.

NOTE:

Channel 9 is for emergency use only.

Following rules of use:

Limit communication to five minutes at a time. Give others a chance to use the channel. Do not use illegally amplified transmitter power or illegally high antennas or promote illegal activities. Do not transmit profanity or music over the airway. Do not use the CB to sell merchandise or a professional service.

Troubleshooting:

- **Limited Range:** Weather conditions, environment, terrain, trees, other vehicles, and/or the power of the radio and its antenna, and matching of the Standing Wave Ratio (SWR) setting affect CB radio range. See OEM (Original Equipment Manufacturer) manual to adjust SWR.
- **No Power:** Check 3 Amp fuse in Front Run Box.

SATELLITE SYSTEMS (OPTIONAL)

Stationary System

The self-contained stationary, automatic satellite TV system automatically acquires and tracks DirecTV®, DISH Network™ and Bell ExpressVu satellite signals throughout the continental United States when the motorhome is stationary. Satellite service requires subscription.

NOTE:

The satellite is a self-acquiring satellite TV antenna for use when the motorhome is stationary. The system is not designed to track the TV satellite when the motorhome is in motion.

NOTE:

For specific satellite coverage areas and providers see the OEM manual.

The Internal Receiver Descrambler (IRD) receives satellite signals from the antenna for decoding, processing, and channel selection, and then sends those signals to the TV for viewing. The IRD also provides the interface for the user to activate authorization for reception.

INFORMATION:

Refer to the IRD User's Manual for complete operating instructions.

The satellite system requires a clear view of the southern sky to receive satellite signals. Ideal antenna site has an unobstructed view of 15° to 75° in the Southern horizon.

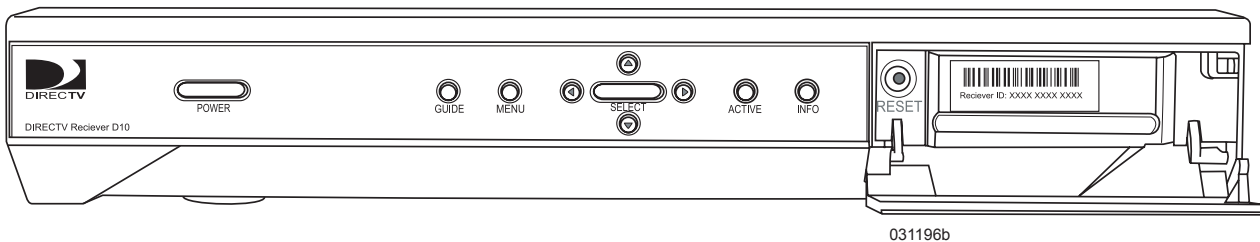
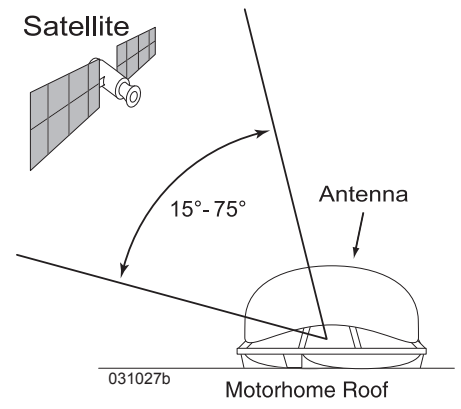
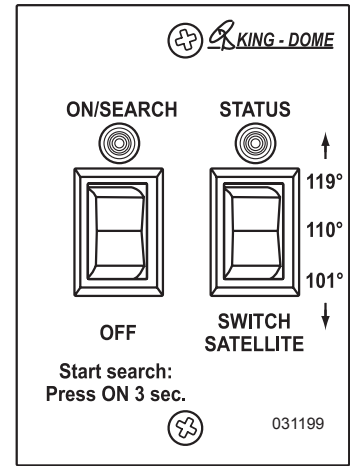
If the satellite antenna receives intermittent signals, or cannot locate the satellite, check around the motorhome for objects that could be blocking the signal, such as trees, building, etc. The satellite antenna must be located in the selected satellite's coverage area in order to receive a signal.

NOTE:

The satellite receiver must be turned on for the system to function.

NOTE:

As part of the startup process, the System will default to channel 200, a program directory. This is the system's means of verifying that it has identified and is tracking the correct satellite. Once channel 200 appears, wait at least another 30 seconds before changing the channel to ensure that the system has completed the startup routine.



For Dish 500 subscribers:

After being locked onto a satellite Dish 500 subscribers can switch between the 110 and 119 satellites.

To switch satellites:

Press and hold the 3 position switch for 1 second. Up will switch to 119 while down will switch to 110.

System Start-up:

- Upon power-up, the system performs a set of start-up routines.
- Antenna then searches for a TV satellite.
- After locating a satellite, the IRD data connection determines whether the satellite signal can be decoded. If so, the antenna locks onto and tracks the satellite.

NOTE:

Once the startup procedure is complete and the antenna is locked onto the correct satellite, the power switch may be turned off to avoid unnecessary discharge of house battery power. Because the antenna LNB receives its power from the IRD, the antenna will continue to receive the satellite TV signals and relay them to the IRD.

NOTE:

If the antenna is unable to locate the desired satellite, refer to the OEM Manual for possible causes and corrective actions.

“Instant On” Operation:

As part of operation, the satellite routinely saves its position. When turned on, the system looks at the last saved position and if the motorhome has not changed location, the antenna immediately acquires the signal. If the motorhome moves after the system is turned off, the antenna quickly carries out normal initialization routine to re-acquire the satellite. To turn the system off, press the Power button.

NOTE:

It is highly recommended that the system be turned OFF prior to moving the motorhome. The system will not track a satellite while the vehicle is in motion.

The system requires the following preventive maintenance to for optimum performance.

Monthly:

- Wash the exterior of the radome and base plate assembly with fresh water; a mild detergent may be added to remove grime. **DO NOT** spray the radome directly with high-pressure water.
- **DO NOT** apply abrasive cleaners or volatile solvents, such as acetone, to the ABS dome.

Annually:

- Have the satellite system inspected by a professional RV Technician or satellite installer.
- Apply full strength liquid dish detergent to the dome surface and allow it to dry. This treatment provides a film on the dome surface that will allow moisture to bead up and roll off.

NOTE:

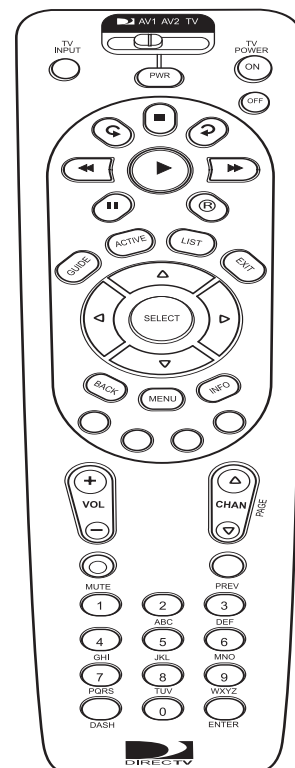
If a need arises to paint the radome, ONLY use non-metallic automotive paint to avoid degrading the RF signal strength and the reception quality.

INFORMATION:

For information on warranty, repair, and liability policies, refer to the complete warranty statement provided with the OEM Manual.

NOTE:

The satellite system is designed to be maintenance free. For optimum signal strength, keep the dome clean. Periodically washing the dome with mild soap and water is recommended. If the vehicle is stored for long periods, it is recommended to put the system through a search procedure on a quarterly basis to keep all moving parts in good working order.



031197

In-Motion Satellite System (Optional)

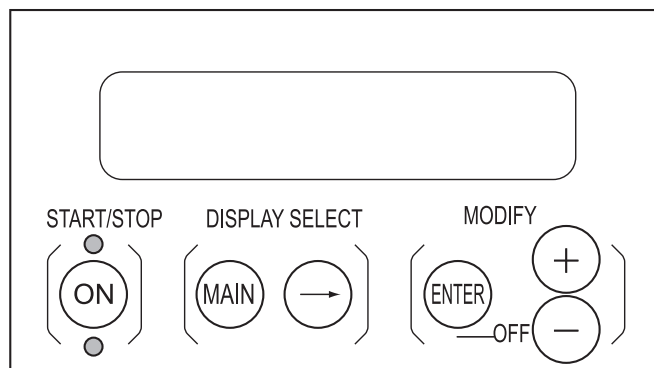
The In-Motion system automatically tracks the satellite during travel. If the motorhome is parked the control panel can be turned off to conserve battery power after the system has obtained the signal. With unlimited rotation the user never experiences a loss of picture. To turn the control panel off simultaneously press the Enter and – buttons.

To Use the In-Motion System:

- Press the **ON** button on the satellite control panel.
The dish automatically acquires the signal from the satellite.
- Ensure the access card is inserted and press the Power button on the satellite receiver. The green LED on the receiver illuminates.

NOTE:

Inclement weather conditions may adversely affect the satellite signal acquisition. Degraded audio and video signals through the receiver will result.



031033b

RADIO - DASH

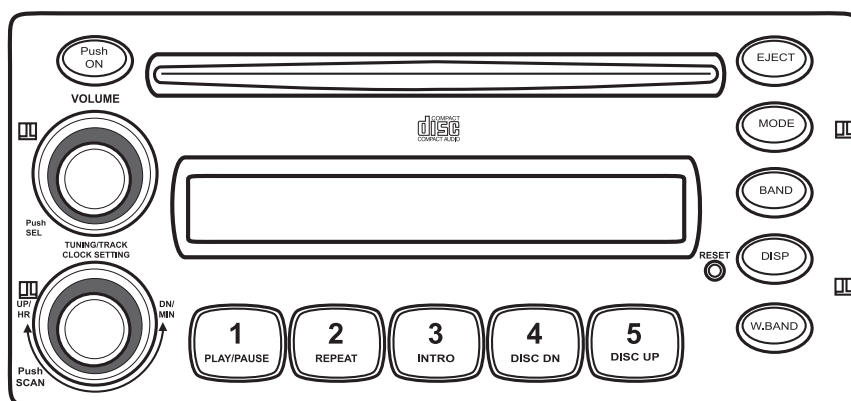
The dash radio is a tuner and a compact disc player. Holding up to 15 preset FM stations and 10 AM stations. Other features are clock display, auto seek and scan tuning and weather band operation. The compact disc player features are fast forward and reverse, random track play, repeat and pause.

Operation:

- Turn **ON** the house battery disconnect switch.
- Turn **ON** the house battery cut-off switch, located at the entry door.
- Turn **ON** the radio power switch at the dash panel.
- To turn the radio **ON**, push the **ON** button.
- To turn the radio **OFF**, push the **ON** button for about 2 seconds.

INFORMATION:

Additional information for the dash radio functions and operations can be found in the Owner's Information File Box.



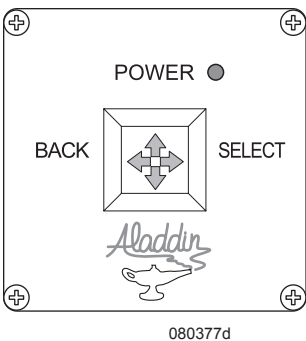
031191

ALADDIN™ SYSTEM

The Aladdin system is designed to monitor various chassis and house information. This allows the operator to make informed decisions regarding motorhome operation. Chassis information comes from the engine and transmission electronics. House information is obtained from a number of sensor modules distributed throughout the motorhome.

Joystick Module:

The Joystick Module is the operator interface to the Aladdin™ system. Options are displayed through the monitor display. Multiple joystick modules may be attached to the Aladdin™. Each joystick module allows the operator to control cursor movements. Pushing the joystick to the right typically enters a menu item; pushing the joystick to the left typically returns the operator back to the previous menu. Pushing the joystick up or down enables the operator to scroll through or change information. An LED provides system-on power indication. The LED blinks when the joystick is moved, indicating that the joystick command has been transferred to the Aladdin™ controlled module. During normal operation, the LED also blinks about every 4 seconds.

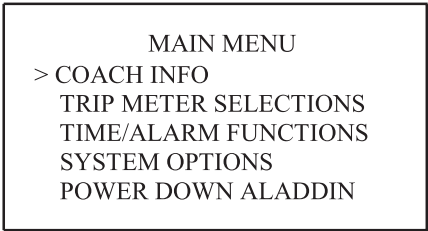


Operations

The Aladdin™ is turned on with the motorhome ignition switch or the joystick. The Aladdin™ powers down when ignition is turned off, unless the operator selects the Aladdin™ to remain on.

Main Menu:

When the Aladdin™ is powered up, the main menu appears. The operator can choose any item by pressing the joystick up or down. An arrow indicates the current menu item. Pressing the joystick right selects that menu item. Pressing the joystick left goes to the previous screen.

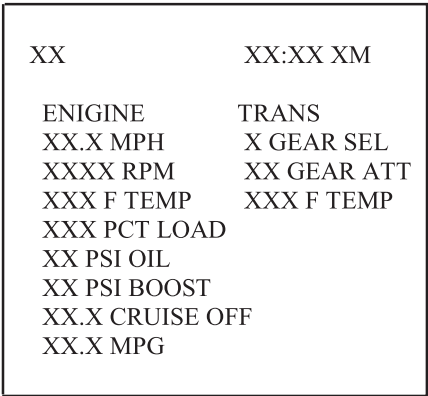


main menu.eps

Engine/Trans Status:

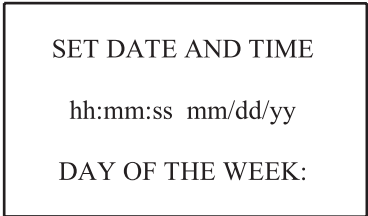
This screen provides the operator with a single screen display of current available engine and transmission data. Compass heading and time are displayed on each screen. If the operator moves the joystick right in this screen, an enlarged engine and transmission screen displays, showing only four parameters at a time.

Move the joystick left to return to the previous all-in-one screen. A left/back from this original status screen will return the operator to the main menu.



Set Date and Time Screen:

This screen allows setting the current time and date. Move the joystick left or right to select place and up or down to change the value.



View Current Time:

This screen is a large display of information entered in the Set Date and Time screen. There are no changes which can be made to this screen.

Power Down VCM:

Select POWER DOWN VCM to enter low power mode. Low Power mode is cancelled when any joystick module is touched.

Turning off the ignition causes the Aladdin™ to power down. A ten-second countdown is performed prior to power down. Joystick action aborts this countdown and the Aladdin™ remains on. The Aladdin™ can be manually powered down when desired by selecting the POWER DOWN VCM. If the joystick is not touched before the countdown, and the Aladdin™ has powered down, the joystick touch causes the Aladdin™ to power back up.

IGNITION OFF:

SHUTTING DOWN IN

10 SECONDS

020218d

System Options:

The system options screen provides the operator with a submenu for Aladdin™ functions that are less frequently used, and includes screen appearance adjust. Screen and text colors are selected by first selecting the menu item using joystick up and down, then successive joystick rights sequence through the available colors. Colors selected will be displayed immediately to allow the operator to set colors for personal preferences. Color selected is stored and remains in effect until changed even if the Aladdin™ is powered down.

SYSTEM OPTIONS

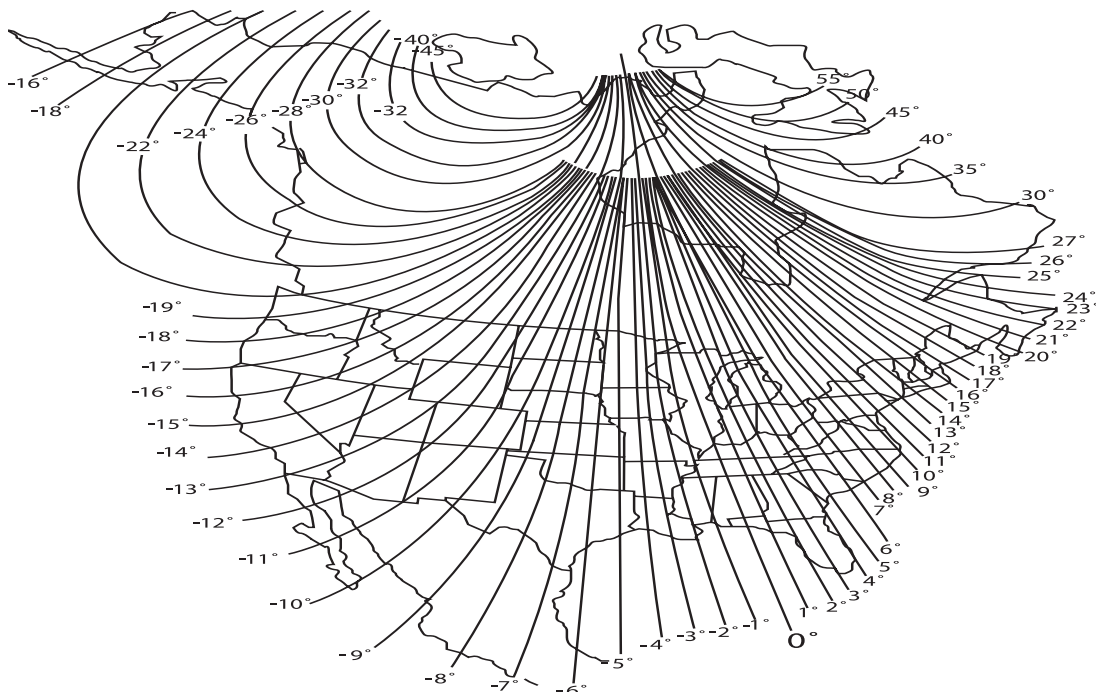
ALADDIN 211-06L v3.03
JOYSTICK FIRMWARE v

SCREEN COLOR: 0
TEXT COLOR: 1
SENSOR MODE:
SET FUEL CAPACITY
COMPASS CALIBRATION

main menu.eps

Compass Calibration:

The compass calibration system allows the owner to match the motorhome to the compass module. Calibration is accomplished by selecting START CALIBRATION, then driving the coach in a full 360-degree circle. At the end of driving this loop, select STOP CALIBRATION. At this time the Aladdin™ requests calibration status from the TCM (Temperature Compass Module). A successful calibration causes a “Calibration Successful” message to be displayed. A calibration that fails will display “Calibration Fail” and a failure code.



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CAMELOT 2006

WATER SYSTEMS — SECTION 6

WATER SYSTEMS - INTRODUCTION	173
WATER TANKS	173
Measurements & Calibration	173
SERVICE CENTER.....	174
WATER TANK - FRESH FILL.....	174
WATER TANK - FRESH GRAVITY FILL	175
PLUMBING MANIFOLD.....	175
WATER - CITY HOOK-UP	176
WATER PUMP	176
Troubleshooting	177
WATER SYSTEM FILTER.....	178
FAUCET WATER FILTER.....	179
WATER SYSTEM - TROUBLESHOOTING	179
Faucet Screens	180
Disinfecting Fresh Water	180
WASTE WATER SYSTEMS	181
Proper Waste Disposal	181
What Not to Put into the Holding Tanks	181
What to Put in Holding Tanks	181
Waste Drain & Sewage Tanks	182
Black Tank Flush	182
Gravity Waste Drain Hose.....	182
Gravity Drain Hose Dumping.....	183
Pressure Pump Dumping (Optional).....	184
TOILET	185
Operation	185
Cleaning	186
Maintenance	186
DRAIN TRAPS & AUTO VENTS	187
COLD WEATHER USE	187
STORAGE - COLD WEATHER	188
WINTERIZING	188
Using Air Pressure	188
Using Non Toxic Antifreeze	189
Using Prevent-A-Freeze System (Optional).....	190

WATER SYSTEMS - INTRODUCTION

This section contains information about the operation and care of the various water system equipment found in the motorhome. Optional water equipment will also be discussed, so not all information may be applicable to the motorhome. 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.

It is hard to imagine how much water is used by the average person. Newcomers to a self-contained motorhome 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, then turned back on to rinse. This way a good shower uses a couple gallons of water or less. There is plenty of water to meet personal needs once habits are adjusted.

Fresh Water System:

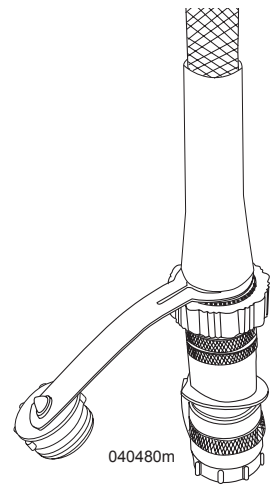
The fresh water system consists of the fresh water tank, water pump, gravity fill connection, water filter(s) and a water hose for potable water use only. Proper care of the hose is necessary. After each use, drain the water hose. Roll the hose up onto the hose reel. Attach the regulator and plug to keep out insects and debris.

Waste Water System:

The waste water system consists of a waste holding tank (grey water), a sewage holding tank (black water), flush system, toilet and drains.

WARNING:

Water is electrically conductive. Do not use any electrically powered item or electrical outlet that may be exposed to a water source. Such use can result in a serious shock causing injury or death.



*Water Pressure Regulator:
Attached to hose reel.*

WATER TANKS

Measurements & Calibration

The motorhome is equipped with a monitor panel to aid in managing the storage tanks. The monitor panel is located in a Main Status Monitor Panel in the hallway area. A second monitor can be found in the roadside service center. The switch marked TEST is a momentary switch which requires being held down while testing the level of the storage tanks. Read the scale for the desired storage tank that is be monitored. Each scale uses colored lights along with a corresponding scale reading. The lights and scale are as follows:

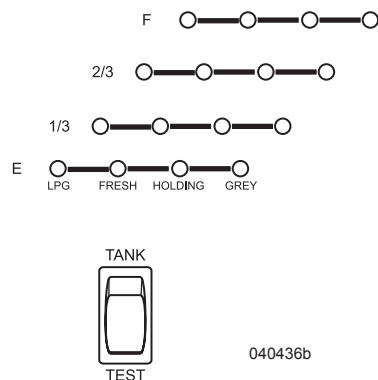
LP Tank and Fresh Tank

Red = Empty

Orange = 1/3 Full

Yellow = 2/3 Full

Green = Full



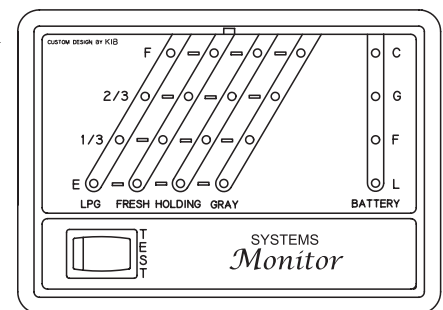
Waste Holding Tanks

Green = Empty

Yellow = 1/3 Full

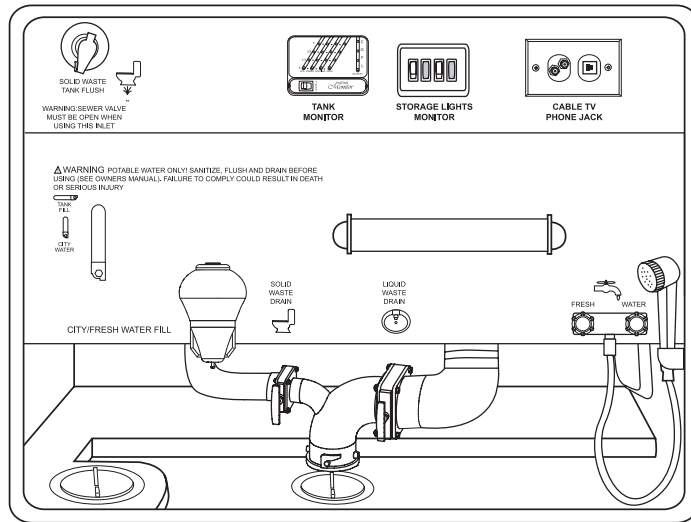
Orange = 2/3 Full

Red = Full



SERVICE CENTER

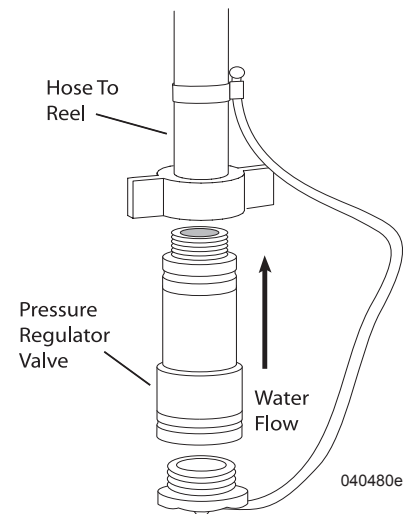
The service center water controls are used for performing all tasks pertaining to water usage in the motorhome. Service center is located in an outside compartment of the motorhome.



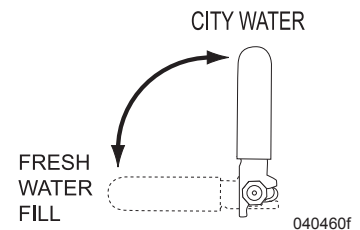
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WATER TANK - FRESH FILL

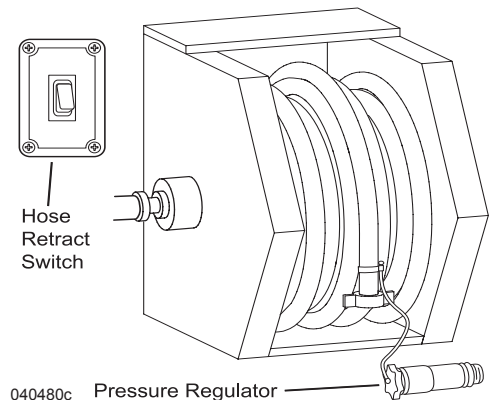
1. If the motorhome has the optional hose reel, pull hose out. Connect the pressure regulator and hose to water source and go to step 4. Arrow on pressure regulator must be pointed toward reel. If motorhome does not have the reel, proceed with step 2.
2. Connect the hose labeled for potable water to the water source. Install the provided pressure regulator on the fill valve. Arrow on regulator must be pointed toward valve.
3. Connect the water hose to the pressure regulator inlet.
4. Check to make sure the fresh water tank drain valve, located on roadside in the service center, is in the closed position.
5. The fill valve should be in the Fresh Water Tank position.
6. Turn on the water at the water source. The water should be audible as the fresh water tank fills.
7. Monitor tank percentage full using the bay tank monitor. Push **ON/OFF** button on bay tank monitor to read level of tank. When the fresh tank is full, water will come out an overflow hose underneath the motorhome.
8. Turn off water supply as quickly as possible.
9. Return fill valve handle to city water.
10. Unhook hose from water source. If applicable, remove pressure regulator from water source and activate hose reel switch to coil hose on the reel.



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040460f



040480c

WATER TANK - FRESH GRAVITY FILL

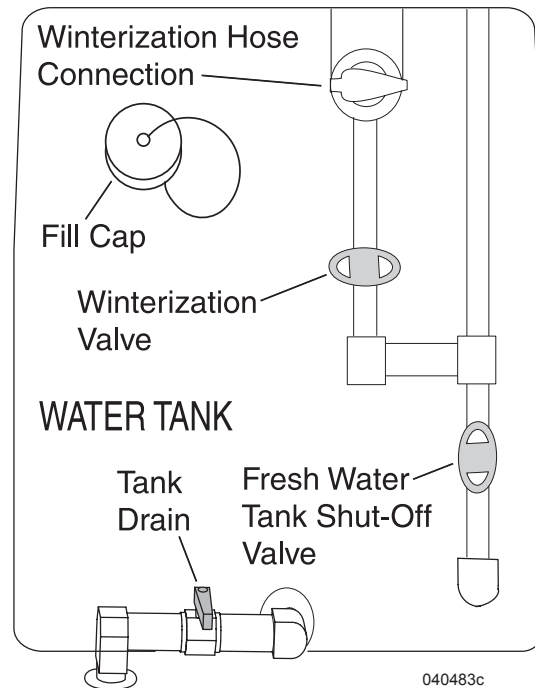
The gravity fill inlet allows fluids to be introduced directly into the fresh water tank. Water can be poured directly from a container into the fresh water tank. The gravity fill inlet can be used to pour disinfecting solution into the fresh water tank or when using potable RV antifreeze to winterize the fresh water system. Use only potable water sources, solutions and delivery systems when using the gravity fill inlet.

Filling the Tank:

1. Unscrew fill cap taking care to keep cap and inlet clean.
2. Insert potable water hose into inlet.
3. Fill tank until water overflows from inlet.

NOTE:

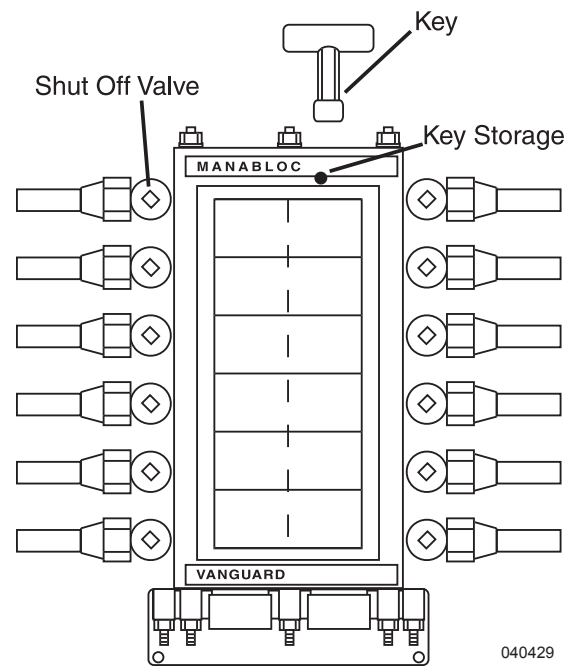
When filling tank do not leave hose unattended.



PLUMBING MANIFOLD

The Manibloc water manifold system separates the main hot and cold lines. The main hot and cold inputs are divided into the individual branch lines. Water flows unrestricted with no hidden fittings located behind the walls.

Each faucet or appliance water line may be turned off individually. The hot water valves are located on the left and the cold water valves are on the right. Use the key provided to turn on or off any water line. When key is horizontal the water line is open. Turning the key to the vertical position shuts that water line off. Each water line is labeled for easy reference. Snap the Manibloc key into the storage position after use.



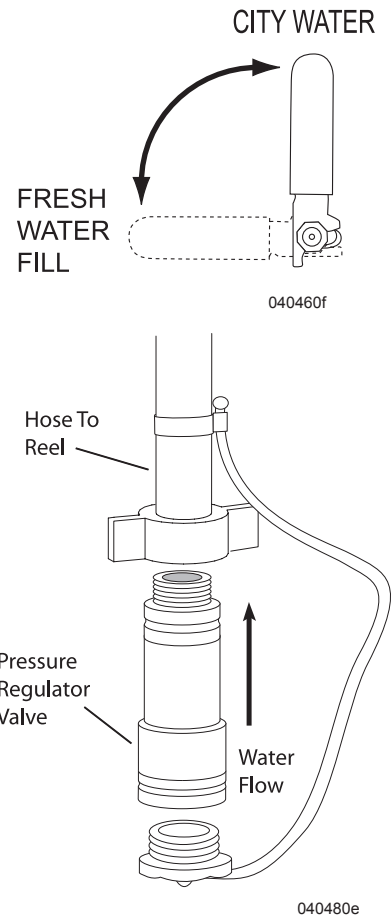
WATER - CITY HOOK-UP

When connecting the motorhome to fresh water, use a hose manufactured and labeled for potable water to ensure that the hose will not flavor the water.

1. If the motorhome has an optional hose reel, pull hose out. Connect the pressure regulator and hose to water source and go to #4. Arrow on the pressure regulator must be pointed toward reel. If motorhome does not have a reel, proceed with #2.
2. Connect the hose labeled for potable water to the water source. Install the provided pressure regulator on the fill valve. Arrow on regulator must be pointed toward valve.
3. Connect the water hose to the pressure regulator.
4. Valve handle should be in the city water position.
5. Turn on water at water source.
6. The water pump can either be **OFF** or **ON**. It will not affect the water pump to leave it on.
7. Open each faucet, one at a time, to rid any trapped air inside the pipes.

CAUTION:

Some water sources develop 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.



WATER PUMP

The water pump pressurizes the fresh water system when not connected to city water. The water pump is automatic and self-priming, operating on demand as water is used. The water pump is located in a storage compartment of the motorhome.

WARNING:

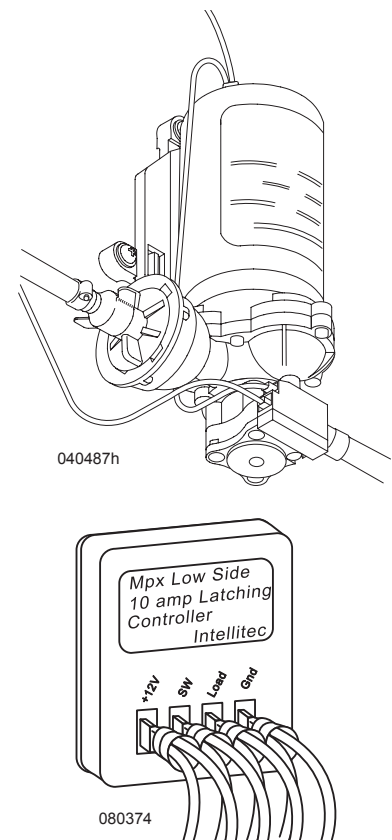
Before leaving the motorhome for extended periods of time (i.e. overnight or longer) be sure that the city water and all water pumps have been turned off. Damage from neglect will be the responsibility of the owner, not the manufacturer.

Latching Controller:

The circuitry of a latching controller allows multiple switch locations to operate the water pump. Pressing one of the water pump switches provides a momentary ground signal to the latching controller, turning the water pump on or off from any location. An indicator lamp at each water pump switch illuminates when the water pump is on.

NOTE:

The latching controller is located next to the water pump.



The water pump can be operated from the following locations:

- Monitor Panel
- Bathroom
- Service Center
- Kitchen

To turn the water pump on or off:

- Momentarily press the water pump switch. The indicator lamp illuminates when water pump is turned on.

CAUTION:

Do not continue water pump operation if the fresh water holding tank is empty. Damage to the water pump or electrical supply system may result.

Use the following procedure to operate the water pump after unhooking from city water supply or after storage:

- Close all drain valves and low point drains.
- Fill the fresh water tank.
- Open the hot and cold water valves of each faucet.
- Turn the water pump on. Wait for the water lines and the hot water tank to fill.
- Close each faucet when it delivers a steady stream of water (cold water faucets first).

Troubleshooting

Vibration induced by road conditions can cause the plumbing or pump hardware to loosen. Check for system components that are loose. Many symptoms can be resolved by simply tightening the hardware. Check the following items along with other particulars of the system.

The water pump will not start/blows the circuit:

- Check the electrical connections, fuse, breaker, main switch and ground connection.
- Is the motor hot? The thermal breaker may have triggered. It resets when cool.
- Is the voltage present at the switch? Bypass the pressure switch.
- Does the pump operate? Check the charging system for correct voltage and check the pump for the proper ground connection.
- Look for an open or grounded circuit or motor.
- Check for seized or locked diaphragm assembly (water frozen).

The water pump will not prime/sputters (No discharge/motor runs):

- Is the strainer clogged with debris?
- Is there water in the tank, or has air collected in the hot water heater?
- Is the inlet tubing/plumbing sucking in air at plumbing connections (vacuum leak)?
- Check for proper voltage with the pump operating.
- Look for debris in the pump inlet/outlet valves or dry/swollen valves.
- Check the pump housing for cracks or loose drive assembly screws.

The water pump will not shut-off/runs when the faucet is closed:

- Make sure the fresh water tank fill valve is completely closed.
- Check output side (pressure) plumbing for leaks and inspect for a leaky toilet or valves.
- Look for loose drive assembly or pump head screws.
- Are the valves or the internal check valve held open by debris or is the rubber swollen?

The water pump is noisy or rough in operation:

- Check for plumbing which 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 (three long screws).
- Is the motor noisy with the pump head removed? Is noise coming from the motor or pump head?

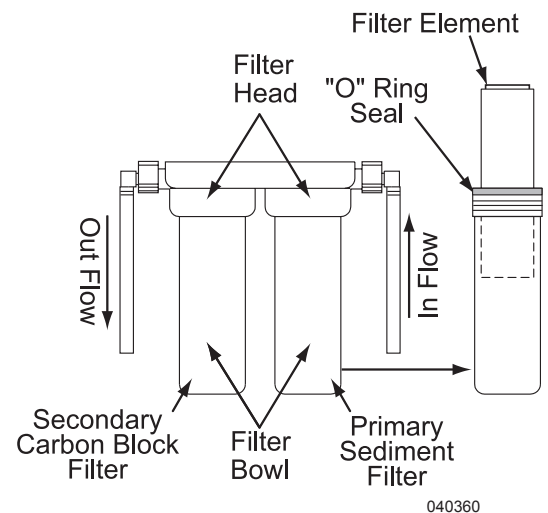
The water pump is rapid cycling:

- Look for restrictive plumbing/flow restrictors in the faucets or shower heads.

WATER SYSTEM FILTER

The 2-stage filtration system will filter up to 1,350 gallons (about 6 months of water) between filter changes. The 2-stage filtration system uses the following filters:

- **First Stage - Five Micron Sediment Filter:** For reduction of suspended solids, dirt and rust down to 5 microns in size. Life expectancy varies with incoming water condition. Recommended change interval of six months to one year depending on usage and incoming water quality.
- **Second Stage - 56 Cubic Inch Granular Activated Carbon Filter:** Improves water quality by reducing volatile organic chemicals, chlorine, tastes and odors. Recommended change interval of six months to one year depending on usage and incoming water quality.



Prior to disinfecting the water system with chlorine bleach solution, the filter elements will need to be removed and the filter bowls reassembled, without the elements. To remove or change the filter elements use the following procedure:

Removal:

- Turn off the water supply and the water pump. Open the faucet to bleed off pressure.
- Unscrew the filter bowl from the filter head.
- Remove the old element and empty any remaining water in the bowl.

Installation:

- Place the elements in the bowls, observing primary and secondary filter locations.
- Screw the bowls onto the filter heads, hand tight.
- Turn on the water pump or city water.
- Open the outside faucet and purge air from the filter assembly.
- Check for leaks.

FAUCET WATER FILTER

The motorhome is shipped with a diverter hose in place of the in-line faucet water filter. For winterization purposes the diverter hose will have to be installed in place of the filter. To initially install a water filter or to replace a water filter, use the procedure as follows:

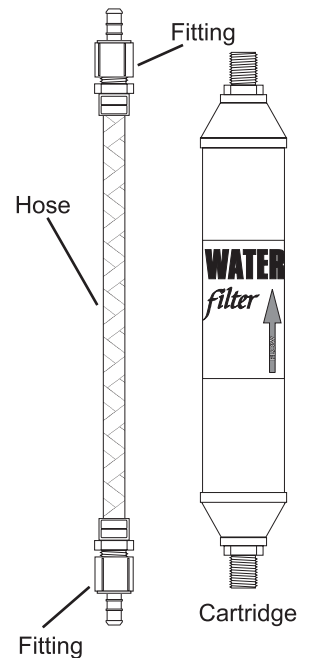
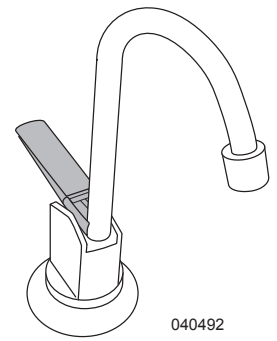
- Locate the water filter diverter hose under the galley sink area.
- Remove the top and bottom fittings from either the hose or filter.
- Connect top and bottom fittings to the filter to purify the system.
- Store diverter hose for use when winterizing the water system.

A fresh replacement cartridge is needed when the flow of water from the faucet becomes slow. The life of the filter depends upon incoming water conditions and water consumption. As water passes through the water filter, dirt particles are trapped in the tiny pores of the micro-pure coating on the filtering element inside the cartridge. As the cartridge removes the impurities from the water, its microscopic pores slowly permeate and the amount of water flowing from the cartridge gradually decreases.

When the flow of water from the water filter becomes too slow for convenience it requires servicing. If the cartridge is not changed the flow will eventually stop. Even when a decreasing water flow does not demand the cartridge be replaced, it is recommended the filter be replaced at least once a year for continued reliable performance from the purification system.

NOTE:

Change the filter at least once a year.



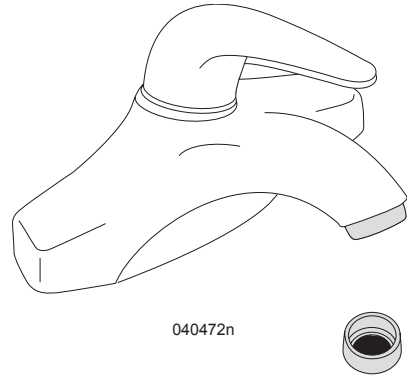
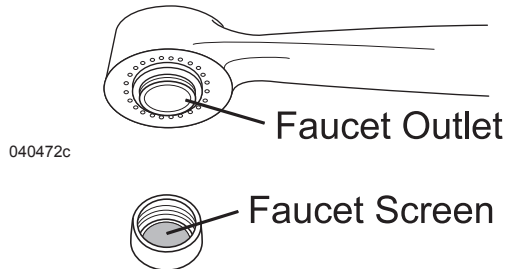
WATER SYSTEM - TROUBLESHOOTING

Water system problems and leaks usually fall into two categories: system problems and problems caused by improper use or lack of attention. These problems usually stem from improper winterizing, poor maintenance, road vibration and campsite water pressure variations. Check all plumbing connections for leaks at least once a year. If the water pump runs when a faucet is not open, check for a water leak. Be sure the tank drain valves are closed. If the system continues to leak take the motorhome to an authorized dealer for service.

Faucet Screens

Fresh water sources vary by location. Build up, lime deposits or debris on the faucet screens restricts the flow of water coming from the faucets. All faucet screens should be checked and cleaned every 2 weeks of use.

- Faucet screens are located on the outlet side of the faucet and held in place with a threaded collar.
- Clean screen using a small soft brush and a de-liming solution.
- Remove screen from faucet.



- Reinstall screen and check water flow.

Disinfecting Fresh Water

Disinfecting the water system with chlorine bleach (superchlorination) protects against bacteriological or viral contamination from any common water source.

Disinfect the Water System:

- If the motorhome is new.
- If the motorhome has not been used in a long time.
- Every three months.

NOTE:

Use the gravity fill to perform this task. Remove cap from the gravity fill. Add the solution to the fresh water tank. When finished, secure the gravity feed cap.

Use following procedure to disinfect water system:

- Remove all water filter elements.
- Prepare a household chlorine bleach solution of 1 gallon water and 1/4 cup of chlorine bleach. Use 1 gallon of solution for every 15 gallons of tank capacity. E.g.: Add 2-2/3 gallons solution to a 40 gallon tank. This mixture puts a 50 ppm (parts per million) residual in the water system, and 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.
- Turn the water pump **OFF**.
- Drain the fresh water tank. Water tank drain is located at the bottom of the tank. Close the drain and pour the solution into the fresh water tank using the gravity fill and a funnel.
- Turn the water pump **ON**. Open each faucet, in turn, and run the water until you smell a distinct chlorine bleach odor. Do not forget the hot water, tub and shower faucets.
- Allow the system to stand for 4 hours.
- Drain the system and flush with fresh water. The water tank and low point drains are located in the outside water control compartment. Flush with fresh water repeatedly, until the water system no longer smells or tastes like chlorine bleach.
- Install new water filters.

WASTE WATER SYSTEMS

Proper Waste Disposal

Most State Parks have strict regulations about discharging wastes only in authorized disposal systems. Dumping raw sewage from toilet holding tanks, except at authorized dumping stations, is universally prohibited. Most National, state and private parks have a central dump facility or campsite hook-up for sewage. Many rest areas along the interstate have dump stations available. A list of stations from coast to coast are in Woodall's Campground Directory, Rand McNally's Campground and Trailer Park Guide, Good Sam Park Director (Good Sam Club), and other similar publications. Some major oil companies offer dump facilities at selected stations.

What Not to Put into the 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 antifreeze, ammonia, alcohol or acetone in holding tanks. Some chemicals dissolve plastic.
- Do not put large table scraps in the tanks. They could stick in or damage the valve seals.
- Do not flush facial tissues, sanitary napkins or other non-dissolving items into the system. Chemically treated for strength, the tissue does not dissolve like toilet paper. Special holding tank tissue is available at most RV supply stores. White toilet paper dissolves faster than colored paper.

CAUTION:

Do not use products containing petroleum distillate or ammonia in place of RV odor controlling chemicals as they damage the ABS plastic holding tanks and seals.

NOTE:

Never dispose of sanitary supplies or other non-dissolving items in the system. Facial tissue, wet strength tissue, paper towels or excessive amounts of toilet tissue can clog the system.

What to Put in Holding Tanks

Black Tank:

Before initially operating the toilet, treat the sewage holding tank with a pre-charge of water mixed with an odor-controlling chemical (available at most RV supply stores). First, add about 3 gallons of water to the holding tank. Next, mix the chemicals, in accordance with the manufacturer instructions, with about 1 gallon of water. Pour mixture through toilet to the holding tank. Do not spill on hands, clothing, toilet bowl or carpet. Hot weather conditions may require adjusting the chemicals to control odor. Repeat the chemical pre-charge to the holding tank each time the tank is cycled.

WARNING:

Most chemical mixtures for holding tank odor control are poisonous. Follow the product manufacturer's directions and warnings when using holding tank additive. Do not use any products that contain petroleum distillate or ammonia in place of RV odor controlling chemical, as they damage the ABS plastic holding tanks and seals.

Grey Tank:

The grey water waste tank stores the sink, shower and clothes washer drain water. A reduced mixture of chemicals may help to control odor in the grey tank. Ensure enough liquid is in the holding tanks prior to dumping the waste holding tanks to provide a smooth flow through the valve, drain pipe and drain hose. Empty the waste holding tanks weekly to prevent stagnation and overfilling.

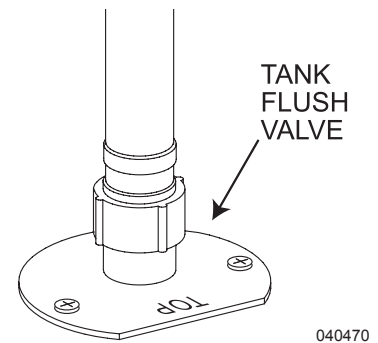
Waste Drain & Sewage Tanks

The waste drain system provides adequate and safe storage and/or discharge of waste materials. The drain system uses ABS plastic piping and fittings connected to sinks, shower, toilet and holding tanks draining to an outside termination. The motorhome should be reasonably level for optimum operation of the waste systems. The wastewater holding system consists of a grey water tank that stores the sink, shower and laundry washer drain water, and a black holding tank that stores waste from the toilet.

Drain valves and a tank flush system dispose waste through a common termination. Each holding tank has a separate drain valve dumping the waste water (grey water) and sewage (black water) through a common single discharge outlet. The tank drain valves are located in the service center on the roadside of the motorhome. Use the monitor panels to observe tank levels. When ready to drain the tanks, drain the sewage tank first. Next, flush the black tank with the flush system. Close black tank valve after flushing the tank. Drain the grey water tank. Using this sequence helps flush solids from the sewer hose. When traveling, it is recommend both holding tanks be empty or at least less than half full.

Black Tank Flush

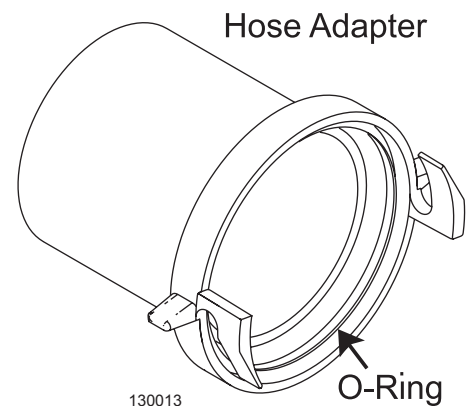
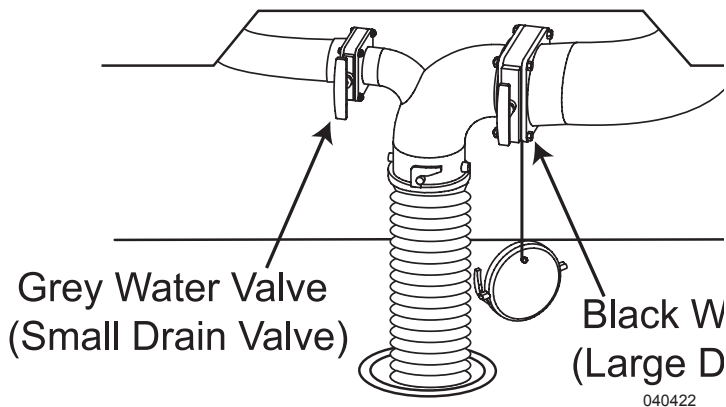
The motorhome comes equipped with a power flush system to aid in cleaning the holding tank. The power flush nozzle, located in the black tank, helps reduce solid build-up. Use the tank flush each drain cycle. Failure to thoroughly rinse the tank each drain cycle may result in solids accumulating and a clogged spray nozzle.



Gravity Waste Drain Hose

A flexible three inch sewer hose attaches between the termination drain and the shore facility. Sewer hoses usually come in 10' or 20' lengths. The shore fitting for the sewer hose may be 3" or 4" pipe, which could be male or female thread. Another possibility may be a 4" pipe, with no threads, covered by a metal plate. There are many configurations. Different style adapters are available to fit most configurations. Hose ladders may also be purchased to support the hose.

It is important that the hose remains secure. Always tighten clamps and restraining devices before use. Lay the hose inline between the termination outlet and the shore fitting. Restrain the hose to prevent movement during use. Wear protective and/or disposable gloves when handling the sewer hose.



To Attach the Hose:

1. Remove termination cap. Align coupler tangs with termination tabs. Twist coupler clockwise 90° locking coupler to termination outlet.
2. Attach the other end of the hose to the drain service. Restrain hose to prevent movement during use.
3. Open the (small) grey water valve.

NOTE:

Close the grey water valve 24 hours before departing, allowing the tank to fill with liquid to help the dumping process.

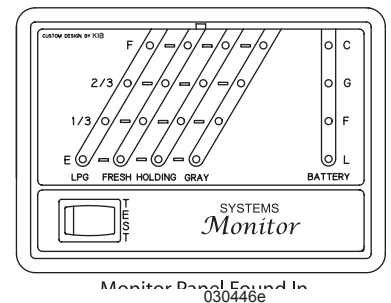
The (large) black water valve remains closed until the tank is full or until time of departure. This helps prevent accumulation of solids. Use the outside faucet or shower attachment for washing or rinsing.

NOTE:

Periodically lubricate the O-ring on the sewer hose adapter with silicone spray. Use care when connecting the sewer hose adapter to the termination outlet in cold weather.

Gravity Drain Hose Dumping

1. Attach the sewer hose to terminal drain and shore facility.
2. Close the grey water holding tank valve. Fill the grey tank to at least 50% by running water in the shower or sinks.
3. Use the Service Bay Monitor or the Main Monitor Panel to observe tank fluid levels. Push tank test button to view real levels of tanks. When the grey tank is 50% full, stop filling the tank.
4. Open the black water valve. Allow the black tank to drain.
5. Use the tank flush system.
6. Connect a non-potable water hose, with pressure regulator, to the flush system fitting located in the service center.
7. Turn on the faucet allowing water to rinse the black tank at least three minutes. Never operate the system unattended. Ensure the water flows freely through the drain hose.
8. When completed turn off the faucet and close the black water valve.
9. Open the grey water valve. The water in the grey tank flushes any remaining solids from the hose. With the grey water valve open, run 2 gallons of water down any drain to flush the grey tank. The grey valve remains open until the next drain cycle or departure.

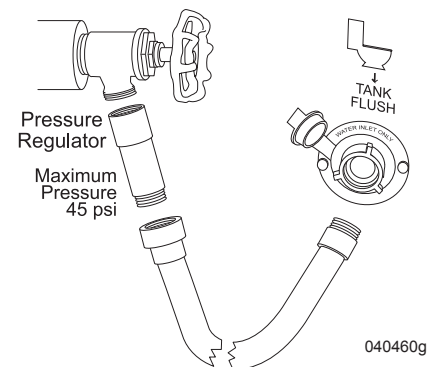


WARNING:

Never operate the flush system unattended. Flooding may occur. Use the tank flush system each time the holding tanks are cycled. Failure to routinely use the flush system results in a clogged spray nozzle. Turn off the water supply when finished.

10. If preparing for travel, close both the valves. Undo restraining devices from the hose. Disconnect the hose from the termination outlet by rotating the fitting counterclockwise 90°.
11. 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.
12. Remove the hose from shore fitting. Install hose in carrier. Lock door. Secure the termination cap (required by law in some states).
- 13. If desired, add chemicals to the tanks to control odor. Follow the chemical manufacturer's directions.

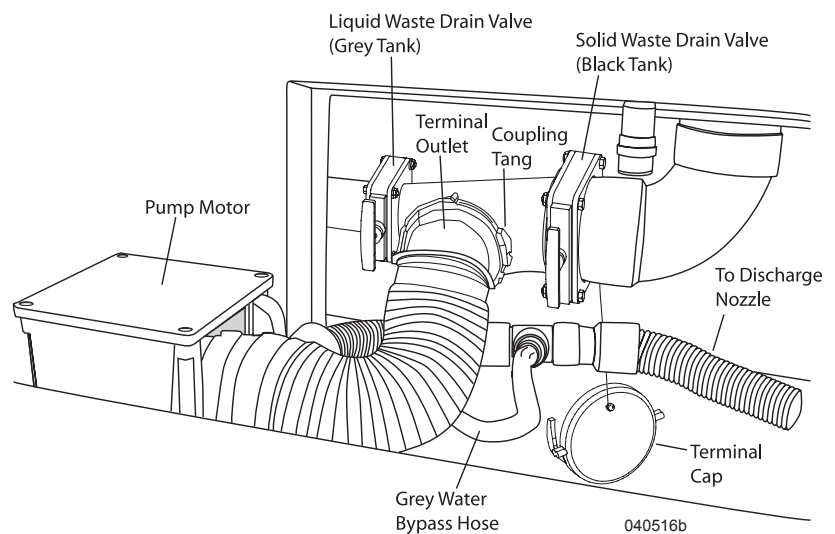
Pressure Pump Dumping (Optional)



The holding tank management system is a closed loop system using a 12 gallon per minute macerator pump. Using the pressure pump to empty the holding tanks can be accomplished in a matter of minutes. It is not necessary to empty the black tank before the grey tank unless desiring to do so. The pressure pump allows for dumping the holding tanks into a shore drain that is at any height.

Prepare the Pump for Use:

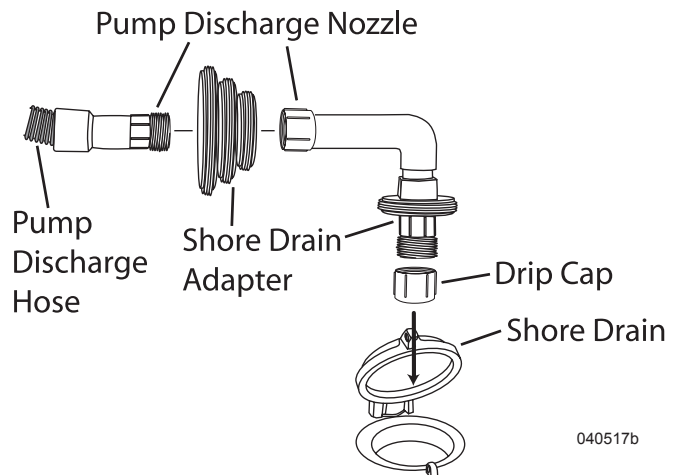
- Make sure the black tank (solid waste water) and grey tank (liquid waste water) valves are closed.
- Remove the terminal outlet drain cap. Align pump inlet hose coupler tangs with terminal tabs. Twist the coupler clockwise to lock it to the terminal outlet.
- Remove the drip cap from the outlet of the pump discharge nozzle.
- Install discharge nozzle to the shore drain. The nozzle adapters are threaded to fit most shore drain pipes.
- Turn on the chassis battery disconnect. Pump operates on 12 Volts from the chassis battery.
- If desired, the grey tank (liquid waste water) valve can be opened while the discharge nozzle is attached to the shore drain. Water used from the sinks, shower and clothes washer drains through the bypass hose into the shore drain.



Use the water service bay tank monitor to observe tank fluid levels. Push **ON/OFF** button on the bay tank monitor to read the water levels.

Prepare the Pump for Travel:

- Make sure the black and grey tank valves are closed.
- Turn the pump **ON** for a few seconds to clear water from the pump inlet hose. Turn the pump **OFF**.
- Remove pump discharge nozzle from the shore drain. Install the drip cap on the nozzle (required by law in some states).
- Store nozzle and pump discharge hose.
- If desired, add chemicals to the holding tanks to control odor. Follow the chemical manufacturer's directions.

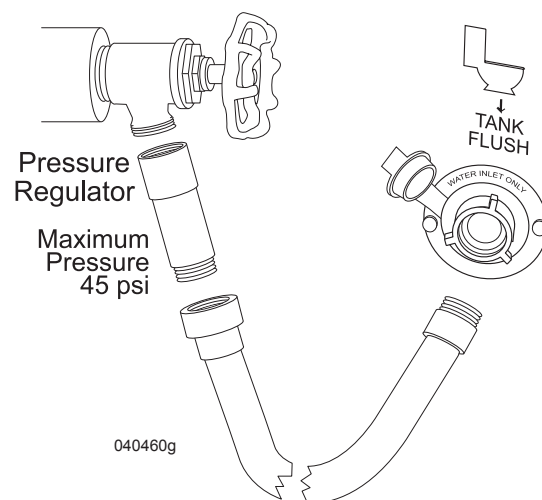


To Empty the Grey Tank (Liquid Waste Water):

- Prepare the pump for use if not already done.
- If applicable, close the black tank (solid waste water) valve.
- Open the grey tank drain valve.
- Turn the pump **ON**. Allow the grey tank to empty. The pump runs faster when the tank is empty. Turn the pump **OFF**.
- Close the grey tank drain valve.
- If applicable, the black tank (solid waste water) can be emptied at this time.
- Prepare the pump for travel as desired.

To Empty the Black Tank (Solid Waste Water):

- Prepare the pump for use if not already done.
- If applicable, close the grey tank (liquid waste water) valve.
- Open the black tank drain valve.
- Turn the pump **ON** and allow the black tank to empty. The pump runs faster when the tank is empty. Turn the pump **OFF**.
- Use the black tank flush system. Connect a non-potable water hose, with pressure regulator, to the water source. Connect the other end of the water hose to the fitting located in the service center.
- Turn on the water source and allow the water to rinse the black tank at least three minutes.
- Turn the water off, disconnect the hose and pressure regulator. Store the hose and regulator for future use.
- Turn the pump **ON** and allow the black tank to empty. Turn the pump **OFF** and close the black tank drain valve.
- If applicable, the grey tank (liquid waste water) can be emptied at this time.
- Prepare the pump for travel as desired.



TOILET

Operation

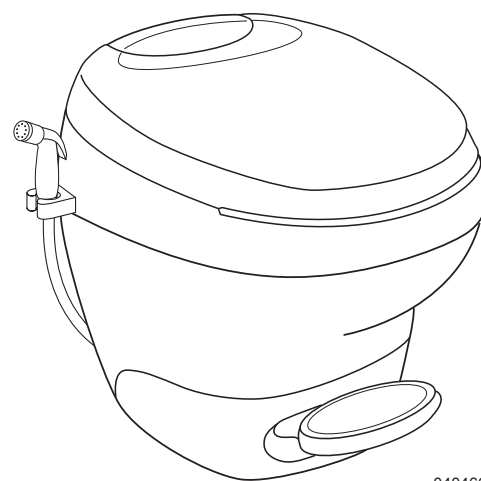
The toilet operates from either the fresh water tank or city water supply. The water pump must be turned on or the city water connected. The toilet flushes directly into a sewage holding tank (black water).

NOTE:

To prevent accumulation of solids below toilet, add several gallons of water to the holding tank before use.

CAUTION:

Most chemical mixtures for holding tank odor control are poisonous. Follow the product manufacturer's directions and warnings when using any holding tank additive.



- To add water to the toilet before using, press and hold the pedal halfway until desired water level is reached. Generally, more water is required when flushing solids.

- To flush the toilet, push the lever all the way down until the sewage leaves the toilet.

Water flow pressures vary at different locations; therefore, holding the flush lever down for several seconds may be required. Release the flush lever by allowing it to snap back, which permits positive sealing around the flush ball. A small amount of water should remain in bowl.

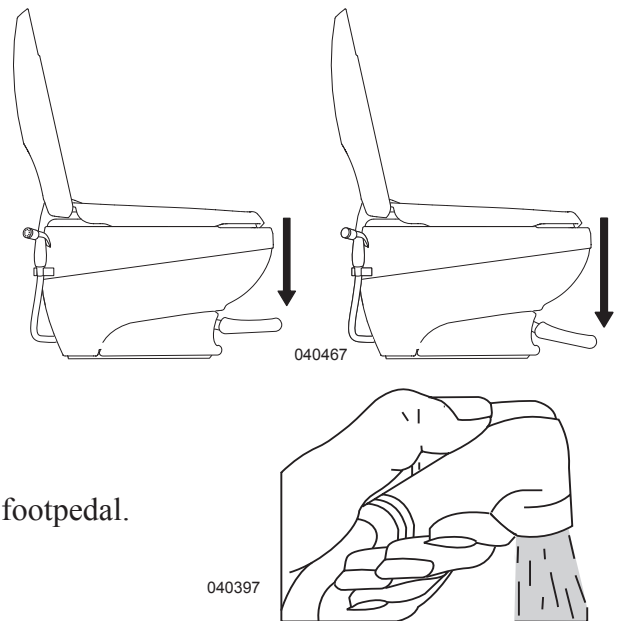
NOTE:

Holding flush lever down longer than necessary results in excessive water usage.

- To operate the hand sprayer, depress the thumb lever. Step on footpedal. Direct water into the bowl.

NOTE:

Never dispose of sanitary supplies or other non-dissolving items into the toilet. Facial tissue, wet strengths issue, paper towels or an excessive amount of toilet tissue can clog the tank or termination valve.



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 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 your holding tank capacity, after cleaning and every few days during use.

Maintenance

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.

NOTE:

If the motorhome is in storage for six months it is a good idea to spray silicone on the toilet valve and work it back and forth. Perform this maintenance monthly (silicone evaporates in about 30 days).

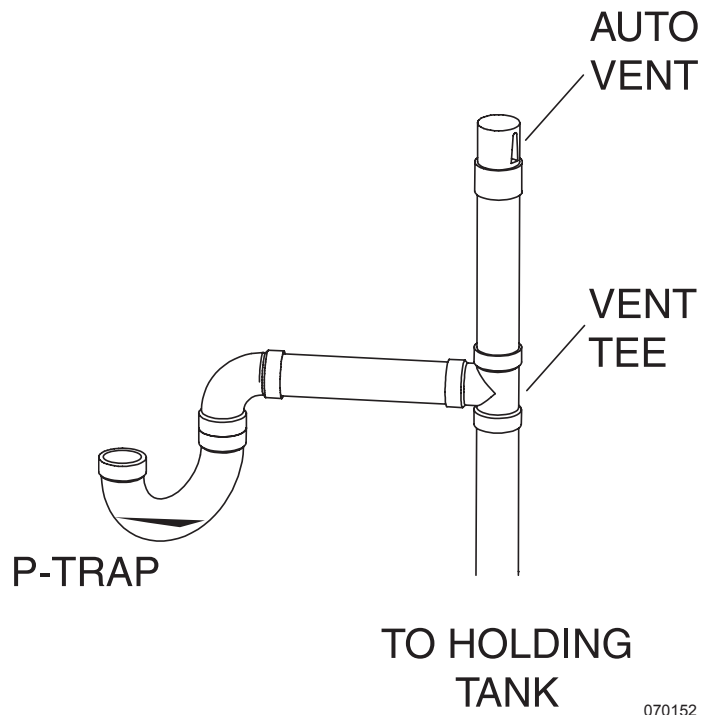
Checking for leaks:

- Back of toilet: check water supply line connection. Resecure and retighten as necessary.
- 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 flange seal if damaged.
- Poor flush: A good flush should be obtained within 2 to 3 seconds. If problem persists remove the water supply line and check flow rate. The flow rate should be at least 10 quarts (9.5 liters) per minute.
- Bowl will not hold water: Check for and remove any foreign material from blade seal track. Check blade seal compression with mechanism. If blade seal is worn, replace.

DRAIN TRAPS & AUTO VENTS

Sinks, shower and clothes washer drains incorporate a water trap or “P-trap” and auto vents to prevent waste water holding tank odor from entering the motorhome. 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 motorhome. If odor is detected run water into sinks, shower and clothes washer to fill drain traps. The auto vent by design is to assist in the flow of water in the drain lines. They enable a smooth flow of water in the drain without creating a vacuum.

If the auto vent is stuck in the open position, grey odors may enter the motorhome. Auto vents double as “clean outs” in case the line has to be “snaked” out.



NOTE:

Most chemical mixtures for holding tank odor control are poisonous. Follow the product manufacturer’s directions and warnings when using any holding tank additive.

NOTE:

During cold weather antifreeze must be added to the drain traps.

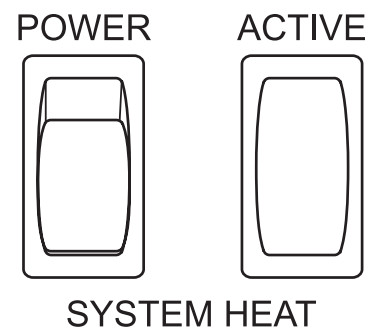
COLD WEATHER USE

The motorhome is not designed for extended use in below freezing (32°F/0°C) weather. There are precautionary measures that can be taken for extended cold weather use. Interior water lines, fixtures, and drains above the floor are normally protected from moderate freezing temperatures as long as the furnace is operating.

Cold temperature can adversely affect water systems below the floor level because the furnace heat does not provide heat to these components. The tank heater pad(s) protects the fresh water tank. A bay heater with a “Snap Disc” thermostat is used to heat the water control bay.

System Operation:

1. Systems heat switch is turned **ON** by applying power to the snap disc thermostat, bay heater and heating pad(s) relay.
2. When the bay temperature reaches 40° F +/-6° F the snap disc thermostat will close applying power to the bay heater and the systems heat active indicator light will be lit. The twelve-volt heater continues to operate until the bay temperature reaches 55° F +/-6° F. The indicator light turns **OFF**.
3. When the bay temperature reaches 44° F the heating pad thermostat(s) turns on the heating pad(s) to heat the fresh water tank. Heating pad(s) continues to heat the tank until the bay temperature reaches 64° F.
4. The system active indicator light does not indicate heating pad(s) operation, everyone does need to be aware that when the systems heat switch is **ON**, the pad(s) operates independent of the twelve volt heater.



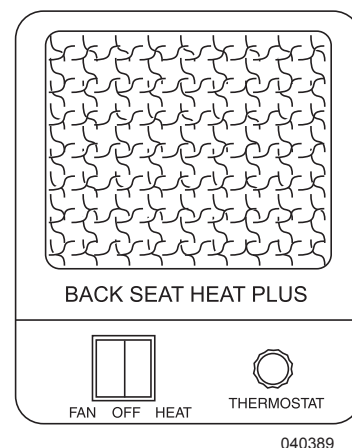
Exposed drains and water lines may freeze quickly in below freezing temperatures. If, by the way of prior experience, there is doubt as to what temperature the motorhome water system tolerates and the water system will not be used, winterize the water system using potable antifreeze. When the tanks are dumped, additional potable antifreeze needs to be added to the storage tanks.

WARNING:

The battery disconnect switches must be turned off if the motorhome is left for an extended period (2 hrs). The battery cut-off switch does not control bay heater circuitry.

NOTE:

The heat system quickly drains the motorhome batteries when not connected to shore power or operating from the generator. Only use the heat functions when hooked to shore power or operating from the generator.



STORAGE - COLD WEATHER

If the motorhome is stored where freezing temperatures may occur, drain the domestic fresh water loop completely of water. The method chosen to winterize the motorhome and water lines is up to the motorhome owner. The lines can be air blown to remove standing water or the lines can be filled with an approved FDA RV antifreeze. Either way, all interior and exterior faucets need to be opened and closed, one at a time, to be checked. All low point drains should be opened and the holding tanks emptied.

NOTE:

Icemakers (if applicable), water filters, washer/dryer (if applicable), Hydro-Hot and water heaters all use domestic water and should be drained and stored in accordance with the manufacturer's recommendation for winterization.

WINTERIZING

Using Air Pressure

To use air pressure to winterize the motorhome access is needed to an air compressor and an adapter to connect the air line to the water system. Adapters can be found at any RV supply store. When hooked to the water lines the pressure should not exceed 40 psi. Higher pressure can damage the lines.

1. Remove the water filter elements from the filters and reassemble the filters without the elements (see "Water Filter").
2. Drain the fresh water tank by opening the valve located at the bottom of the tank.
3. Open the water heater and the low-point drains. Water heater drain is at the back of water heater and low point drains are next to the Manibloc manifold. Turn knobs to open the drains. Open the low point drains to clear the water out of the hot and cold water lines. Leave the low-point valves open until the motorhome is used again.
4. Let all the water drain. Turn the pump on and allow it to run so that all the water is cleared out of the pump and lines. Turn the pump off.
5. After the water lines are drained, hook an air hose to the city water connection located on the water control panel in the outside service compartment. Blow out the water lines until no further water can be seen coming out of the drain lines. Do not exceed 40 psi in the water lines and faucets.

6. Open all faucets (including the outside spigot), one at a time while the air is on, to clear water from the faucet supply lines. Do not forget to drain the shower.
7. While the air is on, flush the toilet repeatedly until the water stops running.
8. Unhook the air hose and close the city water connection.
9. Drain the holding tanks. Close valve when tanks have drained.
10. One gallon of RV antifreeze is needed to protect various water drain lines in the motorhome. Pour 1 pint into both the kitchen and bath shower drains. Pour 2 pints into the bath sink drain, with some of the antifreeze going into grey tank to protect the drain valve. Pour another 3½ pints into the toilet. Flush the toilet and allow the antifreeze to run into the black tank to protect the valve located there. Pour the last pint of antifreeze into the toilet after you have released the flush control. Use a soft cloth to wipe out the sinks and shower (after the antifreeze is poured in) to protect the surfaces from stains.
11. Leave the low-point drains open until the motorhome is used again.

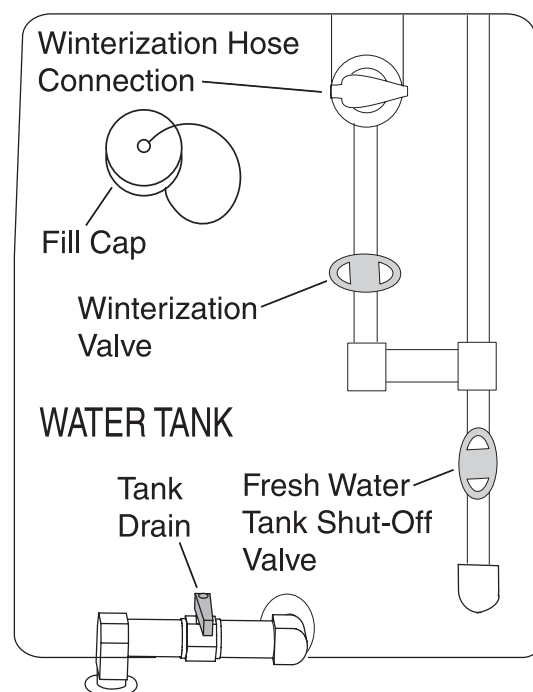
WARNING:

When draining the low water drain lines and the water heater be sure the water is not hot. Hot water from the lines can burn or injure skin.

Using Non Toxic Antifreeze

Ten gallons of FDA RV winterizing antifreeze is needed if the water lines are to be filled with antifreeze.

1. If applicable winterize the washer/dryer (see “WINTERIZE THE WASHER/DRYER”).
2. Remove the water system filter elements from the filters; reassemble filters without the elements (see “Water Filter”).
3. Replace the faucet water filter with the diverter hose (see “Faucet Water Filter”).
4. Open all low point drains and drain valves to drain the fresh water tank, water heater tank, and fresh water lines. The fresh water tank drain is located at the bottom of the tank, water heater drain is at the back of the water heater and low point drains are next to the Manibloc manifold.
5. Drain the holding tanks. Close valves when tanks have drained.
6. Close all faucets, drain valves and low point drains.
7. Close the water valve and open the winterization valve.
8. Install a hose to the winterization hose connection and drop the other end of hose into the antifreeze container.
9. Turn **ON** the system water pump and operate each faucet individually until a small amount of antifreeze is present.
10. Close off the faucets.
11. Open the shower faucets and toilet valves to allow a small amount of antifreeze to run into the holding tanks.
12. Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
13. Exterior faucet should be opened and closed using the same procedures as the interior faucets.
14. If the motorhome is equipped with an ice maker, remove the ¾ inch fitting and flush antifreeze through the water line.
15. Turn water pump off.
16. Disconnect the power supply line affecting water pump operation.



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De-winterization:

For de-winterization, drain off the fresh tank and fill the fresh tank with water. Reconnect the power supply line for the water pump. Turn water pump on and operate all faucets, one at a time, until clear water is present. If applicable, cycle icemaker several times until fresh water is present and reconnect valve outlet line. Install new water filters and fill water heater with water.

WARNING:

Use only designed non-toxic RV antifreeze for potable water systems. Automotive antifreeze, if ingested, can cause blindness, deafness or death.

CAUTION:

Discard the first two trays of ice from the icemaker. They may contain contaminants.

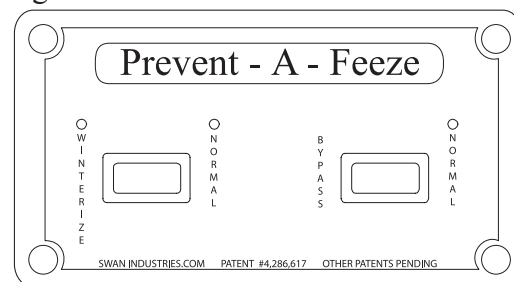
WARNING:

It is recommended that a qualified RV service technician familiar with motorhomes, such as an authorized dealer, do this procedure.

Using Prevent-A-Freeze System (Optional)

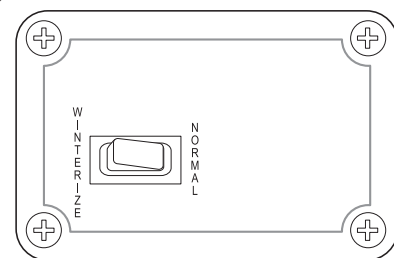
Three gallons of FDA RV winterizing antifreeze is needed to fill the storage tank. Keep the storage tank full after each use. If the motorhome is equipped with a Hydro-Hot, three more gallons of antifreeze are needed.

1. **Fill the storage tank with FDA RV winterizing antifreeze. Tank is located next to the plumbing manifold.**
2. Remove the water system filter elements from the filters and reassemble the filters without the elements (see “Water Filter”).
3. Replace the faucet water filter with the diverter hose (see “Faucet Water Filter”).
4. Open all low point drains and drain valves to drain the fresh water tank, water heater tank, and fresh water lines. The fresh water tank drain is located at the bottom of the tank, water heater drain is at the back of the water heater and low point drains are next to the plumbing manifold.
5. Drain the holding tanks. Close valves when tanks have drained.
6. Close all faucets, drain valves and low point drains.
7. Turn the Prevent-A Freeze switch to “WINTERIZE” position.
8. Turn the other Prevent-A-Freeze switch to “BYPASS”.
9. Turn **ON** the system water pump and operate each faucet individually until a small amount of antifreeze is present.
10. Close all faucets.
11. Open shower faucets and toilet valves to allow a small amount of antifreeze to run into holding tanks.
12. Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
13. Exterior faucet should be opened and closed using the same procedures as the interior faucets.
14. If applicable winterize the washer/dryer (see “Winterize the Washer/Dryer”).
15. If the motorhome is equipped with an icemaker, remove the $\frac{3}{4}$ inch fitting and flush antifreeze through the water line.
16. Turn water pump **OFF**.
17. Open a hot and cold faucet to relieve line pressures then close the faucets.
18. Leave Prevent-A-Freeze switch in “WINTERIZE” position until de-winterization.



For units without Hydro-Hot

040578



For units with Hydro-Hot

De-winterization:

1. Drain the fresh tank.
2. Fill the fresh tank with water.
3. Turn the Prevent-A-Freeze switch to “NORMAL” position.
4. Turn water pump on and operate all faucets, one at a time, until clear water is present.
5. Install new water filters and fill water heater with water.
6. If applicable, cycle icemaker several times until fresh water is present and reconnect valve outlet line.
7. If applicable, operate washer/dryer to purge antifreeze from washer.

WARNING:

Use only designed non-toxic RV antifreeze for potable water systems. Automotive antifreeze, if ingested, can cause blindness, deafness or death.

CAUTION:

Discard the first two trays of ice from the icemaker. They may contain contaminants.

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CAMELOT 2006

LP-GAS SYSTEMS — SECTION 7

LP-GAS SYSTEMS	195
LP-GAS DETECTOR	196
Testing	197
Alarm.....	197
Maintenance	198
LP-GAS EMERGENCY PROCEDURES CHECKLIST	198
LP-GAS TANK	198
Measurement.....	198
Tank Capacity	198
Tank Filling	199
Tank Operation	200
LP-GAS FUNDAMENTALS	200
LP-GAS REGULATOR	201
LP-GAS HOSE INSPECTION	202
LP-GAS DISTRIBUTION LINES	203
LP-GAS CONSUMPTION	203
LP-GAS SAFETY TIPS	204

LP-GAS SYSTEMS

This section contains safety information and operating instructions of the Liquefied Petroleum Gas (LP-Gas) system and related equipment in the motorhome. Some items discussed may not be applicable to all motorhomes. More detailed information with CAUTION or WARNING instructions for various equipment other than items within this section, can be found in the equipment manufacturer's manual in the owner's information box.

The LP-Gas tank mounted in the motorhome contains LP-Gas that is under high pressure. As fuel is used, the liquid vaporizes and passes through the primary tank valve to a regulator that reduces pressure. Low-pressure gas is then distributed to components through a pipe manifold system.

Component lighting problems are commonly caused by air in the manifold system or incorrect gas pressure. Do not attempt to adjust the regulator. Adjustments must be made by a dealer or an authorized service person with the proper equipment. In higher elevations or extreme cold weather (10° F/-12° C or lower) a shortage of LP-Gas may be experienced. If LP-Gas is going to be used in higher elevations or cold climates for a long period of time, have an authorized service person adjust the LP-Gas regulator for these conditions.

Have the LP-Gas system tested by an authorized dealer or service center at least once a year and before every extended trip. The test will include having the system checked for leaks and the regulator pressure checked and tested for functionality. Although the manufacturer and the dealer test the system carefully for leakage, travel vibrations can loosen fittings.

WARNING:

When storing portable LP-Gas tanks that are not connected to an LP-Gas system, install an approved plug in the tank outlet hole to prevent leaks. Do not store or transport empty LP-Gas tanks, portable tanks, gasoline or other flammable liquids in the interior area of the motorhome. Keep open flame and spark producing materials away from the LP-Gas area. Shut off all appliances and the primary LP-Gas tank valve when the motorhome is in storage. If this warning is ignored, a fire or explosion could result.

Leaks (identified by the odor of rotten eggs or sulfur) can be easily found by applying a leak detector solution on all connections. Never light a match, have an open flame or use any spark producing equipment or appliance to test for leaks. Leaks can usually be repaired by tightening the fittings. If not, shut off the primary gas valve at the tank. Hand-tighten the primary valve only. Do not use a wrench or pliers as over tightening may damage valve seats and cause leaks. If a leak is suspected, immediately see an authorized dealer or service center for repairs.

WARNING:

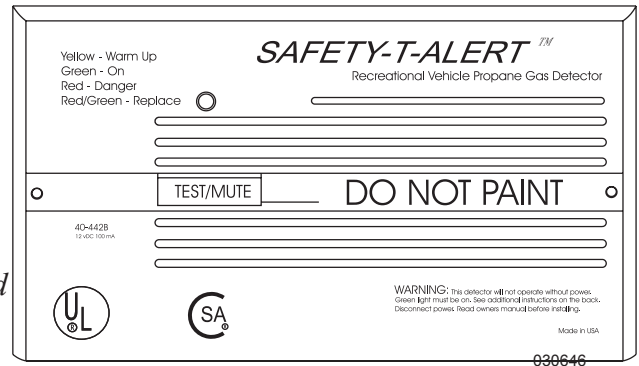
LP-Gas is highly volatile and extremely explosive. DO NOT use matches or a flame to test for leaks. Only approved LP-Gas leak testing solution for leak detection should be used. Unapproved solutions can damage copper tubing and brass fittings. A liquid dish soap solution of 10 parts water may be used. Shake the solution until bubbles form and then apply the mixed solution to fittings and accessory control valves. All fittings tested should be thoroughly rinsed and dried after testing. Never attempt to adjust LP-Gas regulators. Only qualified service personnel should perform maintenance or repairs to the LP-Gas system.

NOTE:

It may be illegal to travel in some states and Canadian provinces with the primary LP-Gas valve open. Failure to comply with these requirements may result in fines and/or pose a safety hazard.

LP-GAS DETECTOR

The LP-Gas detector is required safety equipment in RVs. **American National Standards Institute (ANSI) A119.2 - Fire & Life Safety 3-4.8 LP Gas Detectors** states “ *A LP-Gas detector must be installed in any RV that contains an LP-Gas appliance and an electrical system. The LP-Gas detector must be listed as suitable for use in recreational vehicles under the requirement of UL 1484 Residential Gas Detectors, and installed according to the terms of its listing.* ”



LP-Gas is heavier than air and will settle to the lowest point in the motorhome. The LP-Gas detector is also sensitive to other fumes such as hair spray, of which most contain butane as the propellant. Butane, like propane, is heavier than air and will settle to the floor level. Sulfated batteries (rotten egg odor) will also sound the alarm. When this occurs, reset the detector to stop the alert sound.

About the LP-Gas Detector:

Be aware of the difference between a leak versus LP-Gas escaping from an unlit, open burner. Pure LP-Gas vapors from a leaking pipe or fitting are heavier than air and will build up heaviest concentration at the leak and float down to mix with air. LP-Gas from open burners is intentionally mixed with air to induce burning and dissipate into the air. When mixed with air, LP-Gas becomes only marginally heavier and will expand outward. If a burner is left on, the area around the burner, range, and adjoining counter space will be combustible and can cause injury and damage if ignited. This condition will exist for an extended time period. Eventually, the LP-Gas will reach the detector's location and cause the alarm to sound.

NOTE:

The LP-Gas detector indicates the presence of LP-Gas only at its sensor. Combustible levels of LP-Gas may be present in other areas. The detector is intended for detection of LP-Gas only.

The LP-Gas detector is not designed to detect other types of gas. However, other volatile gases (nuisance gases), most of them flammable in various concentration, may cause the detector to alarm. Some products may cause the detector to alarm, such as alcohol, liquor, kerosene, gasoline, deodorants, colognes, propellant used in spray cans and cleaning solvents. In some cases, vapors from glue and adhesive used in the manufacturing of the motorhome may also cause the detector to alarm for several months after the date of manufacture. If it is determined that the detector has false alarmed because of the above mentioned nuisance gases, reset the detector and ventilate the motorhome with fresh outside air. Take precautions to ensure one of these nuisances has not masked an actual LP-Gas alarm condition.

The detector draws less current than one instrument panel lamp and will detect gas until the battery is drained down to 7.0 Volts. A voltage higher than 7.0 Volts is needed for the detector to operate properly. If the power source is disconnected, or if the power is otherwise interrupted, the detector will not operate.

The LP-Gas detector has a self-check circuit running at all times while the detector is powered. In the event that the circuitry fails, a failure alarm will sound and the operating indicator will cease to light.

LP-Gas Detector Operation:

Upon first application of power, the LED will flash yellow for three minutes while the detector is stabilizing. At the end of the start cycle the LED will turn Green, indicating full operation. If the detector senses unsafe levels of LP-Gas, it will immediately sound an alarm. The LP-Gas detector draws power from the chassis batteries, with a current draw of less than 1/10th of one amp.

CAUTION:

The detector does not alarm during the three minute warm up cycle.

Testing

Press the TEST switch any time during the warm up cycle or while in normal operation. The LED should flash red and the alarm should sound. Release the switch. This is the only way the detector should be tested. The test feature checks full operation of the detector.

WARNING:

Test the operation of this detector after the motorhome has been in storage, before each trip and at least once per week during use.

Alarm

The red LED flashes and the alarm sounds whenever dangerous levels of LP-Gas or natural gas are detected. The detector continues to alarm until the gas clears or the Test/Mute switch is pressed.

Alarm Procedures:

1. Turn off all LP-Gas appliances (stove, water heater, furnace, refrigerator), extinguish all flames and smoking material. Evacuate immediately. Leave doors and windows open.
2. Turn off primary valve on the LP-Gas tank.
3. Determine and repair the source of the leak. If necessary, contact a qualified professional for service.

WARNING:

Do not operate any electric switch. This can produce a spark and ignite the gas.

CAUTION:

Do not re-enter until the problem is corrected.

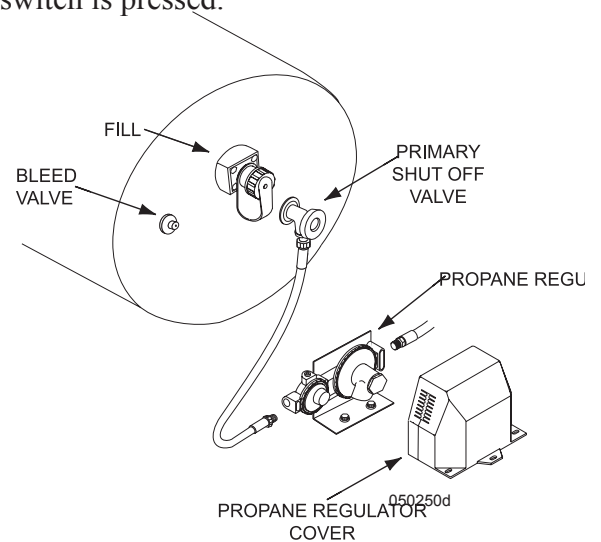
Alarm Mute:

Press the Test-Mute button when the detector is in alarm.

1. The red LED continues to flash and the alarm beeps every 30 seconds until the gas level has dropped to a safe level.
2. The LED will flash green until the end of the Mute cycle.
3. If dangerous gas levels return before the end of the Mute cycle, the alarm will beep four times and return to phase 1.
4. After two minutes the detector will return to normal operation (solid green) or resound the alarm if dangerous levels of gas remain in the area.

Fault Alarm:

Should the microprocessor sense a fault in the gas detector, a fault alarm sounds twice every 15 seconds. The LED alternately flashes red to green and the MUTE switch will not respond to any command. The gas detector must be repaired or replaced.



Potential Sources of LP Gas Leaks When Operating the Motorhome:	
• Cooktop Burners • Oven • Refrigerator • Water Heater	• Defective LP-Gas Connection • Defective Regulator • Portable Propane Powered Appliances/Accessories • Furnace

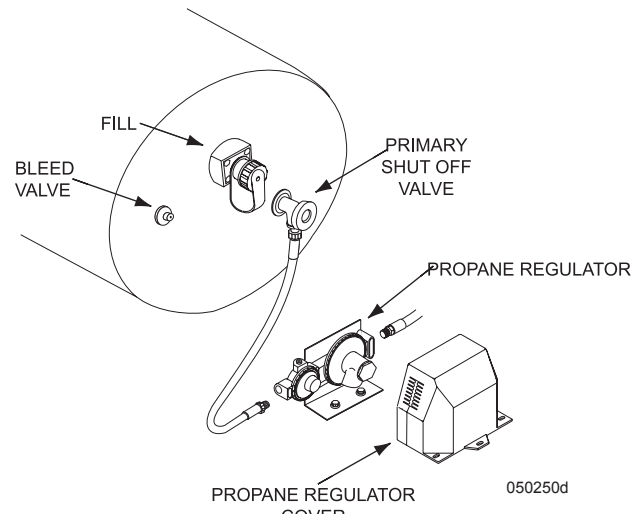
Maintenance

- 1. Vacuum the dust off the detector cover weekly (more frequently in dusty locations) using the soft brush attachment of a vacuum.
- 2. Do not spray cleaning agents or waxes directly onto the front panel. This action may damage the sensor, cause an alarm or cause a detector malfunction.

LP-GAS EMERGENCY PROCEDURES CHECKLIST

If you smell gas (a rotten egg or sulfur smell) at any time, perform the following steps immediately:

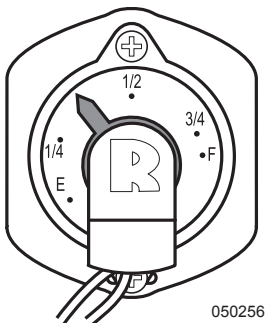
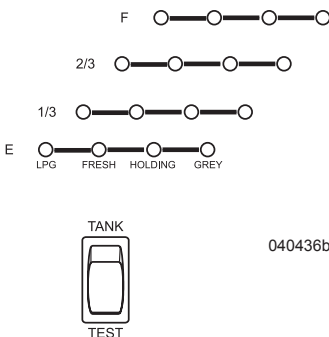
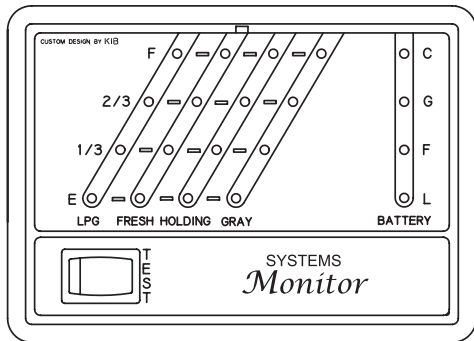
- Shut off LP-Gas appliances.
- Manually turn off primary shut-off valve at the LP-Gas tank.
- Do not operate any electric switch. This can produce a spark and ignite the gas.
- Open windows and doors.
- Evacuate the motorhome. Stay clear of the surrounding area.
- Keep all ignition sources out of the area.
- Contact a qualified service technician to find the source and repair the gas leak.



WARNING:
A fire or explosion from ignited gas or gas fumes can cause serious injury or death.

LP-GAS TANK
Measurement

Two methods can be used to monitor the amount of fuel in the LP-Gas tank: A small non-adjustable gauge located on the curbside of the LP-Gas tank provides a quick view of the LP-Gas level. Two monitor panels, the Main Status Monitor in the hallway area and the monitor in the roadside service center use colored lights with a corresponding scale reading to monitor the LP-Gas level.



Tank Capacity

LP-Gas Tank Capacity	
All Models	*55 Gallons
*Actual filled LP-Gas capacity is 80% of listing due to safety shut-off required on tank.	

NOTE:

This chart reflects product specifications available at the time of printing.

NOTE:

LP-Gas tank capacity is estimated based on calculations provided by the tank manufacturer and represents approximate capacity. The actual “usable capacity” may be greater or less than the estimated capacity. Actual full liquid capacity is 80% of full tank capacity.

Tank Filling

Woodall’s Campground and Trailer Guide, and other similar publications, list refueling stations. Many travel parks sell LP-Gas. Before filling the LP-Gas tank, shut off pilot lights, appliances and igniters to prevent a fire or explosion. Have a trained service person fill the LP-Gas tank.

WARNING:

Before entering a refueling station, turn off all pilot lights and LP-Gas operated appliances. Most LP-Gas appliances used in recreational vehicles are vented to the outside. Fuel vapors can enter an appliance vent on a motorhome that is parked close to a gasoline pump, resulting in an explosion or fire.

WARNING:

Extinguish all sources of heat, sparks, flames and smoking materials within a 50’ radius during the fueling process.

The LP-Gas tank fill is located in the roadside compartment. When the tank is filled to the proper level, space is available for the conversion of liquid into gas. If a tank is overfilled, it may cause the safety valve to release pressure. When this happens, a strong rotten egg odor near the tank and/or a hissing noise may be detected.

WARNING:

It is common for small amounts of LP-Gas to escape and evaporate during the fueling process. Protect bare skin. Instant freezing will occur if exposed to LP-Gas. a

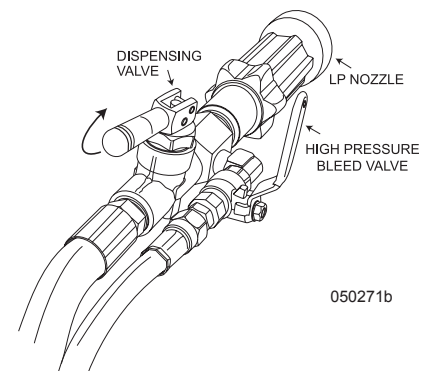
LP-Gas exists in both liquid and vapor form within the tank. A “Full” tank is about 80% liquid. The pressure inside the tank varies with the temperature of the liquid. All tanks are required to be equipped with a safety pressure relief device. The purpose of the safety valve is to release excess pressure. When the tank is full, the gauge on the tank will only read $\frac{3}{4}$ full. The Aladdin system is adjusted to indicate “full” at this point.

NOTE:

If the tank is new and being filled for the first time, inform the service technician to purge any air from the tank before filling.

Tank Filling Procedures:

1. Turn off pilot lights, all appliances and the engine. Close all vents, doors and windows to prevent vapors from entering the motorhome.
2. Remove dust cover. Screw the fill nozzle to the fill valve.
3. Turn on dispensing pump, then open the 80% bleed valve.
4. Open dispensing valve on the fill nozzle and dispense liquid into the tank.
5. Close the dispensing valve on fill nozzle as liquid just begins to expel from the 80% bleed valve. The overfill protection valve prevents filling the tank to more than 80% of the rated capacity.
6. Close the 80% valve and shut off the dispensing pump.
7. Open the high-pressure bleed valve on the fill nozzle to remove pressure between the dispensing pump and fill nozzle. Remove nozzle from the fill valve.



8. Install the dust cover.
9. LP-Gas appliances (especially the refrigerator) may have difficulty starting after a period of non-use. To speed the process of supplying fresh fuel to the appliances, light the stove first.

CAUTION:

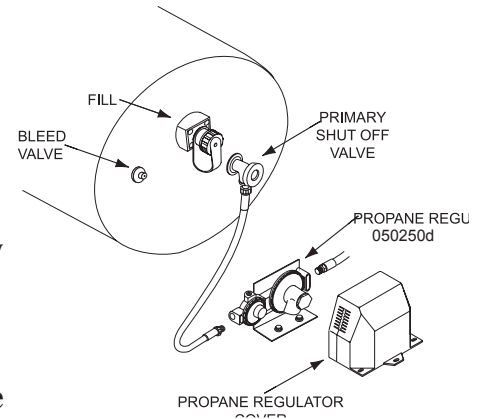
Pressure inside LP-Gas tanks can reach over 200 psi when exposed to direct sunlight. A high-pressure safety relief valve purges excess high pressure if necessary. LP-Gas stops vaporizing as the LP-Gas tank temperature approaches -44° F.

Tank Operation

- Manually open the primary shut-off valve located on the LP-Gas tank.
- Turn off the primary valve on the LP-Gas tank when the tank is being filled, when driving, in between trips and when in storage.
- Hand-tighten the primary valve only. Do not use a wrench or pliers, as this over-tightens the valve. The primary valve is designed to be closed by hand, over-tightening may permanently damage the valve seat.

NOTE:

In some states and Canadian provinces, it may be illegal to drive the motorhome while primary valve on the LP tank is open.



LP-GAS FUNDAMENTALS

# 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

CONVERSIONS

Gallons to Liters (1 Gallon = 3.785 Liters)
 Fahrenheit to Celsius ($F^{\circ} - 32 \div 1.8 = C^{\circ}$)
 11 in. Water Column = 6 1/4 ozs. per sq. in. pressure.
 27.7 in. Water Column = 1 lb. per sq. in. pressure.

The above capacities allow for 20% vapor space on each cylinder.

Data taken from the National Fire Prevention Association (NFPA), Pamphlet #58-1998.

LP-Gas 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 LP-Gas:
• LP-Gas detectors are a federal requirement on all LP-Gas equipped recreation vehicles. • LP-Gas is a by-product produced by refining oil. • Odor is added to LP-Gas after the refining process. • Each liquid gallon of LP-Gas produces 91,502 BTUs (British Thermal Units). • Temperature affects pressure of LP-Gas. Internal tank pressure can exceed 200 psi. • Tanks or valves contain pressure relief valves. The relief valve opens at 125% above tank rating. • LP-Gas stops vaporizing at -44° F. • Standard LP-Gas operating pressure is 11" of Water Column or approximately 6 1/4 ounces per square inch. • An inch of Water Column is a measurement of applied pressure to one side of a U-Tube 1/2 filled with water at sea level. The amount of pressure required to raise the water level 11", represents 11" of Water Column.

NOTE:

The above information is not a complete guide for the use of LP-Gas tanks or appliances. In cold climates keep LP-Gas level above 50% to keep vaporization of LP-Gas at the highest level.

LP-GAS REGULATOR

LP-Gas is compressed into liquid form in the tank. Only the vapor is used during combustion by an appliance. As vapor is removed from the tank, the remaining liquid will vaporize to maintain pressure that is removed during consumption. This process will continue until there is no liquid remaining in the tank.

Temperature affects the vaporizing action of the liquid. If temperature of the liquid is - 44° F, the liquid remains stable with tank pressure, about 0 psi. If liquid temperature is 100° F, the liquid quickly vaporizes with tank pressure, about 200 psi. Vapor pressure must remain relatively consistent, regardless of temperature, for the appliance heat output to remain stable. Vapor pressure regulation is performed by the regulator.

The two-stage regulator reduces vapor pressure so that it is safe for use. The first stage of the regulator reduces tank pressure to a range of 10 to 13 psig (pounds per square inch gauge). The second stage further reduces pressure to a working pressure of 0.4 psig (11 Inches of Water Column or about 6¼ ounces psi.). A vent is installed to allow the internal diaphragm to move with atmospheric pressure change. It is important to keep the vent clean and clear of obstruction or corrosion. If the vent becomes clogged, pressure from LP tank may cause erratic pressure regulation. If there is any corrosion, contact a qualified LP-Gas service technician. The regulator is mounted so that the vent faces downward. If the vent becomes clogged, clean it with a toothbrush.

Under normal atmospheric conditions an LP-Gas regulator will not freeze, nor will the LP-Gas. Vapor passing through the regulator will expand and cool, condensing moisture in the gas. The moisture freezes, builds up and blocks the vent. The possibility of freeze up is greatly reduced with the two-stage regulator.

To Prevent Freeze Up:

- Ensure the LP-Gas tank is totally free of moisture prior to filling.
- Ensure the tank is not overfilled.
- Keep the valve closed when the tank is empty.

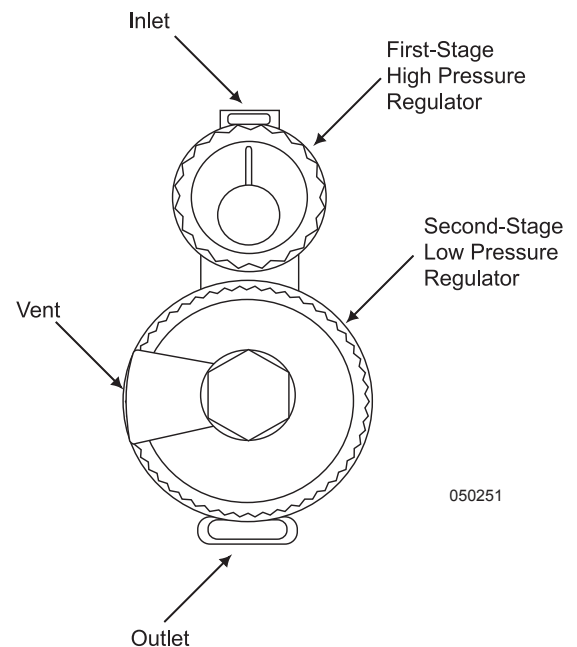
If A Freeze Up Occurs:

- Have an LP-Gas distributor purge the tank.
- Have the LP-Gas distributor inject methyl alcohol into the tank.

Damage to the regulator can occur when the tank is overfilled. The regulator is designed to work with vapor only. This is why the tank is filled to only 80% of its liquid capacity. The other 20% allows for vaporization of the liquid. The primary vapor valve is located in the vapor section of the tank. In an overfilled tank, liquefied petroleum can fill the regulator. As the liquid vaporizes, it can freeze the diaphragm. High tank pressure on a frozen diaphragm can cause a rupture and result in erratic pressure regulation. This is why it is important to have the LP-Gas pressure checked for proper pressure and accurate regulation during appliance operation. Erratic pressure regulation dramatically affects refrigerator operation on LP-Gas.

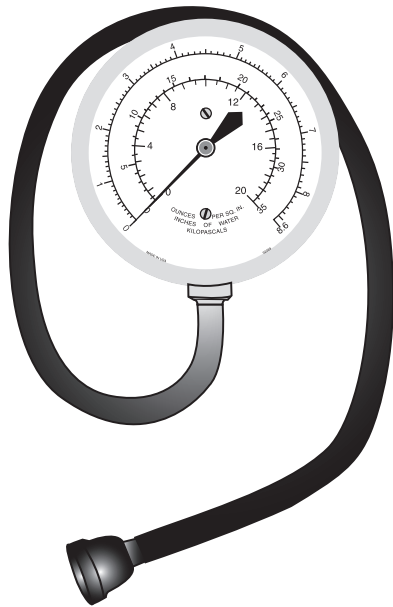
WARNING:

Do not attempt to adjust the regulator. Adjustments require special equipment. Failure to follow these instructions may result in a fire or explosion, and can cause severe personal injury or death. Do not operate LP-Gas appliances until the LP-Gas pressure is checked and a leak down test is performed!

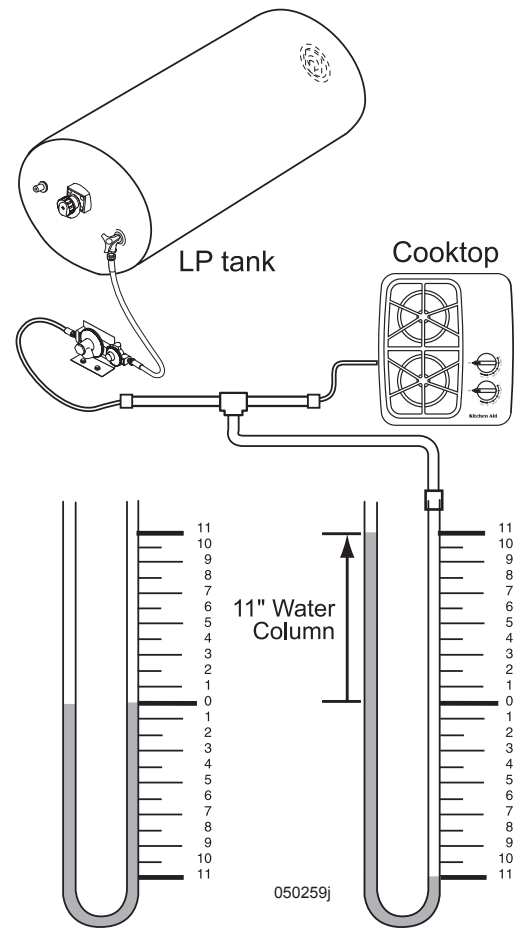


Manometers:

The manometer is the best way to accurately determine LP-Gas pressure. There are two different styles of manometers: 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" of Water Column.



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LP-GAS HOSE INSPECTION

It is suggested by the hose manufacturer that the flexible LP-Gas supply hoses undergo regular inspection. As a guideline, we suggest that all flexible LP-Gas 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 and damage in this area cannot be tolerated. It is important that if a damaged LP-Gas 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, which has been kinked or flattened so as to permanently deform the wire braid in the un-pressurized state.
- Blistering or loose outer cover.
- Slippage; evidenced by the misalignment of the hose and coupling and/or the scored or exposed area where slippage has occurred.

NOTE:

Only a qualified RV technician should complete replacement of LP-Gas components.

Additional suggested maintenance:

After performing extensive testing the manufacturer of the flexible LP-Gas supply hoses has determined that the hoses be replaced every 10 years as the failure rate may increase after this period of time. The motorhome manufacturer recommends following this guideline to assure continued safety and dependable use.

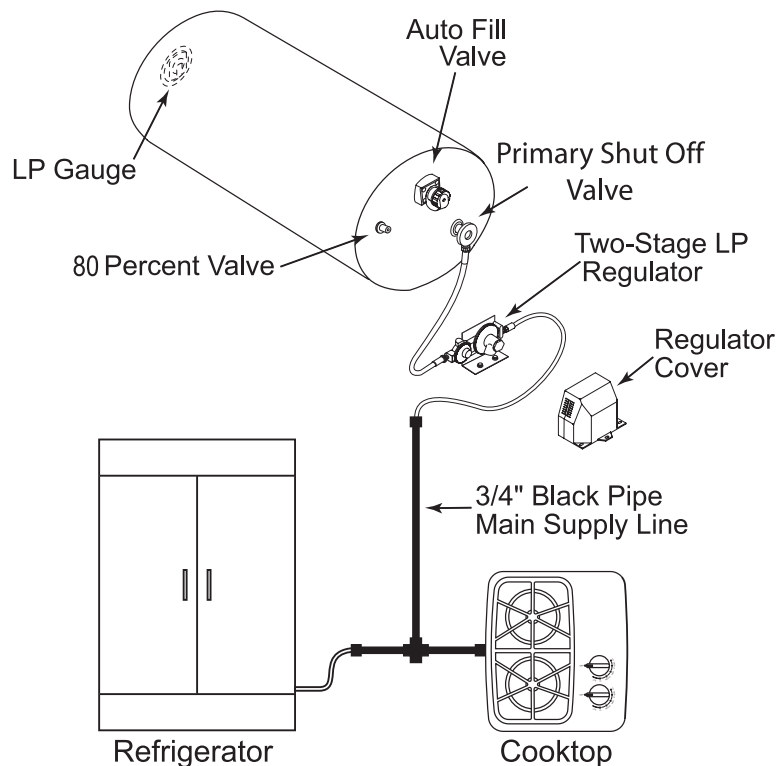
LP-GAS DISTRIBUTION LINES

A primary manifold black steel pipe running throughout the motorhome distributes LP-Gas to secondary lines. All secondary lines leading to gas appliances are made of copper tubing with flared fittings. If any lines rupture do not attempt to splice them. Always run a new line. It is recommended that gas distribution work be performed by an authorized dealer or an authorized service technician. When removing or servicing any gas appliance, manually close the primary valve located on the LP-Gas tank. This prevents dangerous gas leakage that could result in an explosion and possible serious injury.

INSPECTION:

Inspect the rubber flexible lines, twice a year, for abrasions, tears, kinks or other signs of damage.

If a gas leak is suspected, have the system inspected and repaired by a qualified service technician as soon as possible.



LP-GAS CONSUMPTION

Each gallon of LP-Gas produces 91,502 BTUs of heat. One 27 gallon tank produces two million BTU's. Total consumption depends on usage rate and operating time of each appliance. The stove usually uses the most LP-Gas.

Determine Fuel Consumption:

To determine about how many hours an LP-Gas appliance operates on one gallon of LP-Gas, use the following formula:

- LP-Gas appliances are rated in Input BTU (British Thermal Units). The rating is usually stamped or printed on a tag affixed to the appliance. For example: the Input rating of the appliance is 10,000 BTUs.
- One gallon of LP-Gas produces 91,502 BTUs.
- Divide the amount of BTUs of one gallon of LP-Gas (91,502) by the rating on the appliance in this example 10,000. Net continuous operation time for one gallon of LP-Gas for this appliance would be about 9.2 hours.

This formula can be useful when determining the approximate length of time a tank of LP-Gas will last. Generally, LP-Gas appliances do not operate continuously. For example: the typical cycling of the refrigerator.

Determining how long a tank of LP-Gas 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 LP-Gas tank by 91,502.
- Divide the total of BTUs of the LP-Gas tank by the total number of BTUs the appliances consume, equals the approximate number of hours of operation before refueling.

Typical Appliance BTU Ratings

Cooktop

Front = 5,000 BTU

Rear = 9,000 BTU

Refrigerator

2-door 1,500 BTU

4-door 2,200 BTU

WARNING:

LP-Gas is highly volatile and extremely explosive. Never use matches or open flame to test for leaks. Use only approved LP-Gas leak testing solution to test for leaks. Unapproved solutions can damage copper tubing and brass fittings. Never attempt to adjust the LP-Gas regulator without the use of proper equipment. Improper LP-Gas regulator adjustment will affect the performance of LP-Gas operated appliances. Incorrect flame or explosion can occur. Only qualified personnel should perform any maintenance or repair to the LP-Gas system.

LP-GAS SAFETY TIPS

LP-Gas is one of the safest and most reliable fuels available on the market when handled properly. LP-Gas, however, does have 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 LP-Gas appliances. Use of LP-Gas requires the responsibility to enforce extra safety measures.

The motorhome is equipped with many LP-Gas operated appliances because it is a convenient and efficient source of fuel. LP-Gas 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 about the convenience of propane with safety and peace of mind. For information on the **NPGA Gas® Check program**, call **(202) 466-7200** or visit **www.npga.org**.

LP-Gas Tanks and Cylinders:

Tanks are built to American Society of Mechanical Engineers (ASME) Code. The cylinders are built to DOT (Department of Transportation) Code. The major difference between cylinders and tanks is in required testing and inspection procedures, and in construction of the containers. Both tanks and cylinders are required to undergo pressure testing and inspection; however, the procedures for how they are tested and inspected differ.

The difference between the two codes are that the valves, fittings and brackets are located only on the ends of the DOT cylinders; however, on the ASME tanks they may be located on ends, as well as the sides. There is also a difference in how the tanks are rated. Required tank ratings are in gallons (ASME ratings) or pounds (DOT) water capacity. The Federal DOT (Department of Transportation) regulations require periodic inspections and re-qualifications of cylinders. American Society of Mechanical Engineers (ASME) tanks or bulk containers are generally used in motorhomes, and are permanently mounted on to the unit.

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 which are measured in pounds, and the manufacture date (one of the most important items). There is a required 12 year re-qualification. The final piece of information is Dip Tube (DT) length. This is part of the overfill protection and maximum liquid allowance in the cylinder.

Maintenance and Safety Tips for the LP-Gas Refrigerator:

- Have the refrigerator venting inspected annually by an authorized service center.
- Before firing up the refrigerator 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 LP-Gas Range:

- Burner flame should be a blue color, indicating complete combustion. If not, have the unit serviced by a qualified technician.
- Do not cover the oven bottom with foil. Air circulation will be restricted.
- Never use LP-Gas ranges or ovens 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 LP-Gas range.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

CAMELOT 2006

ELECTRICAL SYSTEMS - HOUSE — SECTION 8

HOUSE ELECTRICAL - INTRODUCTION	209
BATTERY DISCONNECT - HOUSE	210
BATTERY CUT-OFF SWITCH	211
SHORE POWER HOOK-UP	211
Power Cord Reel (Optional)	214
TRANSFER SWITCH	214
GENERATOR - 120 VOLT AC	215
Pre-Start Checks.....	215
Starting the Generator	215
Stopping the Generator.....	216
Powering the Equipment.....	216
Generator Fuel.....	216
Resetting the Circuit Breaker.....	217
Generator Exercise	217
INVERTER	217
Providing AC Power with Inverter.....	218
Battery Charging with the Inverter.....	218
Auto Generator Start (Optional)	219
Factory Default Settings	219
Battery Temperature Sensor	219
Pass-Through AC Power.....	219
DISTRIBUTION PANEL (50 AMP).....	220
Energy Management System	221
Fuses.....	222
GFCI BREAKERS & OUTLETS	223
Tools of the Trade.....	224
Know When to Say No	224
BATTERY	225
How It Works	225
Battery Types	225
Testing the Battery	226
Battery Maintenance	227
Battery Voltage & Current	227
Battery Charge Time & Consumption Rate	228
SOLAR PANEL (OPTIONAL).....	229
Charge Controller	230
Solar Panel Care.....	231
LIGHTS.....	231
Interior Halogen.....	231

HOUSE 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 box for their respective, in-depth, individual component operating instructions.

General Overview:

The motorhome can utilize various sources of electrical power: shore power connection, generator, inverter, solar panels, chassis batteries and domestic batteries. All of these electrical power sources, while independent of each other, can be combined in a variety of ways to provide a highly efficient electrical operating system. Two types of electrical systems are used: 120/240 Volt AC and 12 Volt DC.

The motorhome 120/240 Volt AC system can be operated from three different power sources: shore power, the on-board generator or the inverter/charger. Shore power is the most efficient and should be used whenever possible. The generator can be used when shore power is unavailable. The inverter/charger supplies silent AC power using the house batteries of the motorhome. The AC power output is limited and should be used sparingly.

Two different sources supply the main AC circuit breaker panel with power: the 50 Amp shore power cord or the on-board generator. The power source used is automatically selected by a switching device known as a transfer switch. The inverter supplies AC power to the sub-panel.

WARNING:

The electrical system is engineered and tested for complete safety. Circuit breakers and fuses protect the electrical circuits from overloading. When planning modifications or additions to the electrical system, we strongly recommend consulting the dealer for assistance to ensure continued integrity and safety of the electrical system. Please note that any modifications may void the warranty.

WARNING:

Water is electrically conductive. Do not use any electrically powered item or electrical outlet that may be exposed to a water source. Such use can result in a serious shock causing injury or death.

The motorhome has two 12 Volt DC systems: chassis and house. These two systems, for the most part, are separate from one another. The house system does not operate engine functions; the engine system does not operate house functions. However, within the two systems there are some inner connections. For example: While the motorhome is driven the alternator on the engine will charge the house batteries. Likewise, while the motorhome is plugged into shore power, or the generator is running, the engine batteries are being charged. Each system will supply 12 Volt DC power to the 12 Volt distribution panels. The 12 Volt panel that services a majority of the chassis system functions is located outside, in the front roadside bay. The other panel, located in the bedroom, services the house interior functions such as the interior lighting and appliances. Become familiar with these panels and the items they operate.

With all the technological advancements taking place in the past several years manufacturers have now incorporated electronics into these systems. It is important to keep the 12 Volt systems in good working order. These systems, with their incorporated electronics, are voltage sensitive. Some items can be damaged if the DC voltage is not maintained within the designed specifications.

The two different systems, chassis and house, have their own sets of batteries. The chassis batteries supply 12 Volt DC power to the front distribution panel located outside, in the front roadside bay. This panel contains mostly engine system fuses and wiring such as headlights, taillight, dashboard functions, gauges, etc. The house batteries supply 12 Volt DC power to the distribution panel located in the bedroom. This panel contains fuses for the house, interior lighting and appliances.

A majority of the lighting and appliances are designed to operate from 12 Volt DC (direct current) power. This is why the batteries play such an important role in the function of the motorhome. There are exceptions with appliances such as the microwave or television; however, indirectly they still operate from 12 Volt DC power, as they can be operated from the inverter. The chassis functions (engine, transmission, dash air, etc.) are also 12 Volt DC.

Shore Power:

The motorhome is equipped with a shore power cord to connect the motorhome to outside electrical services. Shore power service is the most efficient source of electrical power. The plug end of the shore power cord is 50 Amp, 240 Volt AC. When this type of power service is not available, electrical adapters will be required to allow a proper and safe connection to the electrical service supply.

NOTE:

When 50 Amp shore service is not available, care will have to be used when operating the appliances and using the outlets to avoid overloading the shore power service.

Generator:

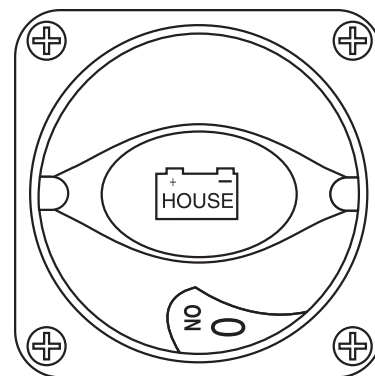
The generator can be selected for use when shore power is unavailable. The maximum amount of generator output power, measured in watts, is calculated at an elevation of 500 feet above sea level. This figure will decrease slightly at higher altitude. Ambient temperature also effects total maximum output. The amount of AC electrical load applied to the generator determines fuel consumption.

Inverter/Charger:

The Inverter/Charger is an auxiliary 120 Volt AC power source that inverts 12 Volt DC house battery power to 120 Volts AC. This device has limited AC power output, measured in watts, and operates only selected appliances and outlets. The Inverter/Charger also converts 120 Volts AC power, supplied from either shore power or the generator, to 12 Volts DC power, to recharge the batteries. When dry camping, the Inverter/Charger may be used to supply power to selected outlets.

BATTERY DISCONNECT - HOUSE

The main house battery disconnect switch turns the house battery power supply on or off by disconnecting 12 Volt DC power to the following items: inverter, domestic fuse panel in the bedroom, domestic fuse panel in the front run box and domestic power supply in the rear run box(s). Turn the house battery disconnect switch off when the motorhome is going to be stored or before performing electrical maintenance. If possible, leave the motorhome plugged into an AC source with the battery disconnect switch on to help prevent the possibility of dead batteries. Use of this battery cut-off switch will not turn off all DC electrical items or other parasitic loads present on the house battery. Some are federal mandate items such as the LP-Gas detector. If an AC power source is not available, and the motorhome is going to be stored for more than 48 hours, it is recommended to turn the house battery disconnect switch off.



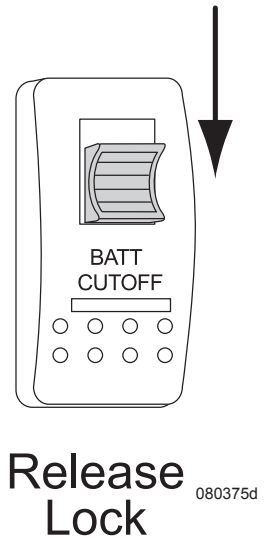
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NOTE:

The optional solar panel will charge the batteries with the disconnect switches off.

BATTERY CUT-OFF SWITCH

The battery cut-off switch is located inside next to the entry door. This switch controls the 12 Volt DC power to the domestic fuse panel. The switch locks into the center position to prevent interior DC power from being accidentally turned on or off. When the switch is activated, power is supplied to all interior DC lighting and DC operated appliances. Some appliances require both DC and AC power to operate, such as the roof air conditioner. This switch is helpful when dry camping to conserve house battery power. Refrigerator and inverter operation are unaffected by the use of this switch. When the interior house power is off there are still parasitic loads on the house batteries; therefore, is not a substitute for the main battery disconnect switch.



To Turn the Interior Power On or Off:

- Simultaneously push the spring-loaded lock down and push the switch.

CAUTION:

To avoid flash damage to electrical contacts, turn off the interior lighting before operating the battery cut-off switch.

SHORE POWER HOOK-UP

The power requirement for the motorhome is 30 Amp, 120 Volt AC or 50 Amp, 240 Volt AC single phase. The shore cord is stored in the roadside compartment. If 50 Amp shore power service is available, connect the supplied shore power cord. If less than 50 Amp service is available, electrical adapters will be required.

CAUTION:

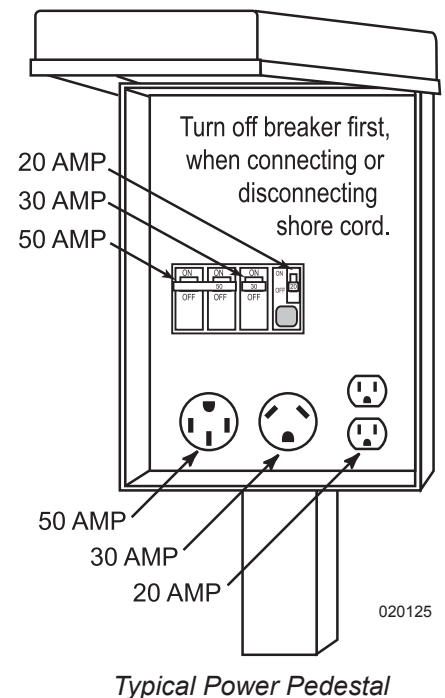
Avoid flash damage to the electrical system contacts. Before plugging the motorhome into shore power, starting the generator or using the inverter, make sure all the appliances are off.

WARNING:

Keep fingers away from metal contacts of the shore plug end. Do Not stand in water when making electrical connections. Serious electrical shock and personal injury can occur. To avoid the risk of electrical shock, turn the circuit breaker off at the power supply outlet before making the shore power connection.

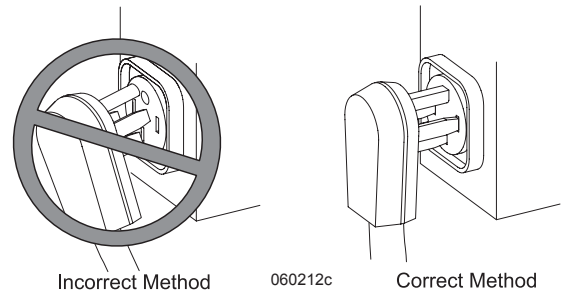
CAUTION:

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



Plugging in Shore Cord:

- Located in the roadside compartment is the shore power cord.
- Unscrew the deck plate and insert the end of the shore cable through the deck plate.
- If 50 Amp service is not available, install the proper electrical adapter(s) to the opposite end of the cord.
- Always turn off the shore power breaker to the power supply outlet before connecting or disconnecting the shore cord. This prevents an accidental shock and flashing of electrical contacts.
- Make the connection to the outlet and turn the shore power breaker on. The transfer switch should make an audible click.
- Check for AC voltage using the Aladdin screen.

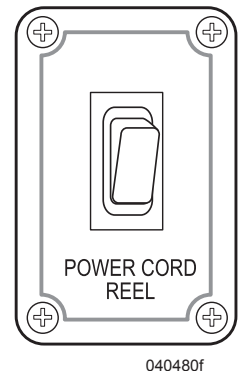


Plugging in Shore Cord with Optional Cord Reel:

- Located in the roadside compartment is the shore power cord.
- Manually, or by using the optional electric power cord, extend a sufficient amount of cable to reach the power supply.
- Always turn off the shore power breaker to the power supply, before connecting or disconnecting the shore cord to avoid an accidental shock or flashing of electrical contacts.
- After the connection is made, turn the shore power breaker on. The transfer switch should click.
- Check for AC voltage. The AC light on the inverter and the microwave display should be lit.

Disconnecting Shore Cord:

- Turn off all AC appliances. This prevents accidental shock and flashing of electrical contact when disconnecting.
- Turn off the shore power breaker.
- Grasp housing of electrical cord. Without touching electrical contacts, work cord out and away from socket.
- Straighten and clean cord. If applicable, press the power cord switch to retract cord.
- Stow in Compartment.



When Hooked to 50 Amps:

After verifying proper voltage, wait approximately one minute for the inverter/charger to “stabilize” charging of the batteries before starting air conditioners or other large AC loads.

When Hooked to 30 Amps:

If 50 Amp service is not available, wait approximately one hour before operating electric appliances. Use caution when operating appliances to avoid overloading the supplied shore service breaker. Operate appliances and outlets in sequence rather than all at the same time.

CAUTION:

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

WARNING:

Avoid the risk of electrical shock or component damage by disconnecting from shore power during electrical storm activity. Use the Inverter/Charger or start the generator, if AC power is needed.

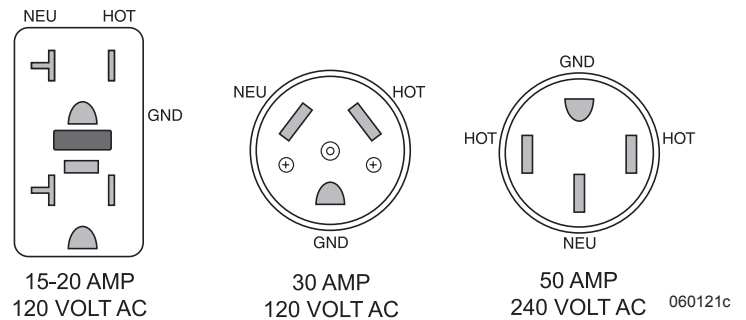
NOTE:

Three types of shore power outlets most commonly used are shown in the illustration.

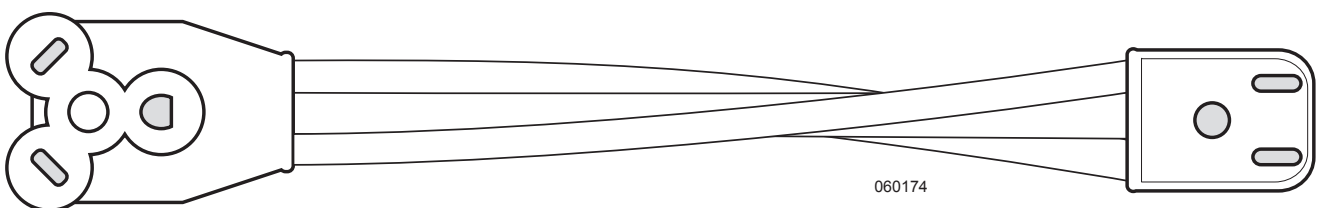
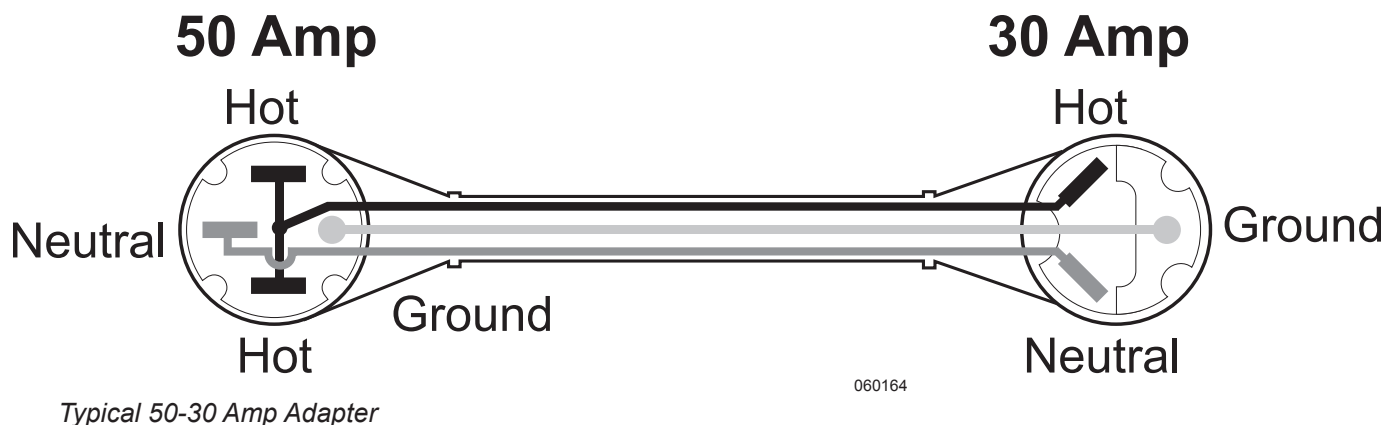
Power Supply:

Different amperage supplies 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.
- 50 Amp 240 Volt AC shore power service consists of two power supply conductors, a neutral and a safety ground. The 50 Amp breaker simultaneously 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.
- Use care when hooked to anything less than 50 Amp shore service. Shore power service less than 50 Amps consists of one power supply conductor, a neutral and a safety ground; 30 Amp shore service is limited to 24 continuous Amps; 20 Amp shore service is limited to 16 continuous Amps.

**Electrical Adapters:**

There are many different electrical adapters to suit a variety of needs. Only UL approved adapters should be used. The most common adapter is a 50-30 Amp adapter. The type of connector adapts the 50 Amp shore cord to a 30 Amp shore power outlet. Another common adapter is the 30-20 Amp adapter. Always install the adapter to the cord prior to making the connection to the outlet.

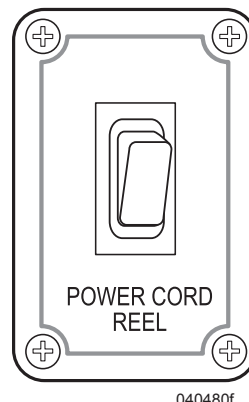


Typical 50-30 Amp Adapter 30 Amp Shore Cord to 20 Amp Shore Power Outlet

Power Cord Reel (Optional)

The Power Cord reel is a 12 Volt DC motorized assembly designed to mechanically coil and stow the shore cord. The Power Cord reel is located in the roadside compartment of the motorhome. One end of the Power Cord is wired directly to the transfer switch. The motor control switch is labeled **IN** and **OUT**. This switch operates the 12 Volt DC motor to extend or retract the cable.

When extending or retracting the power cord, turn the switch to the direction desired. Assist the cord, following the direction of travel. Extend only as much power cord as necessary to reach the shore power outlet. When the cord is connected to shore power, the cord should be slightly slack.



Maintenance:

When only a short section of the shore power cable is frequently used, the cable may coil sharper than normal and kink. To relieve kinking, routinely extend the cable full distance and straighten the power cable on the ground. It is important the cable remains clean. Accumulated dust and dirt on the cable may cause difficulty in retracting the cord. After cleaning and straightening the cable, allow the Cablemaster to retract the cable into the motorhome.

Check all AC and DC wiring at least once each year to ensure corrosion-free, tight connections. Check the neoprene cover on the Power Switch to confirm it is free of cracks or fractures.

WARNING:

Before working on the electrical system, disconnect from shore power and turn off the Inverter/Charger. Disconnect the negative 12 Volt DC battery cables at the inverter. Remove rings, metal watchbands and other metal jewelry before working around batteries and connectors. Use caution when working with metal tools. If the tool contacts a battery terminal or metal connected to it, a short circuit could cause injury, explosion or fire.

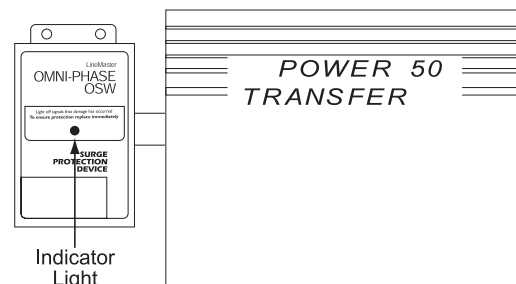
TRANSFER SWITCH

The transfer switch uses electronics to monitor voltage input for high or low voltage conditions. If the incoming voltage from the generator or shore power exceeds 138 AC Volts, or if voltage drops below 105 AC Volts, the transfer switch automatically disconnects the electrical service. This helps prevent damage to voltage sensitive equipment that can occur.

Surge Protector:

A surge protector mounts to the transfer switch to prevent the motorhome from receiving a sudden “spike” of incoming voltage.

When hooked to shore power, or operating from the generator, lights on the surge protector will activate to indicate the surge protector is operating. If one, or both, indicator lights are inactive, damage to the surge protector or electrical system may have occurred. Disconnect from shore power, stop the generator and do not use the inverter. Replace the surge protector and have the electrical system inspected by a qualified electrical service technician.



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NOTE:

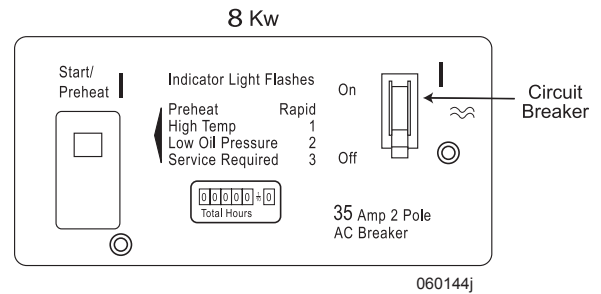
To prevent damage to the transfer switch contacts, do not operate appliances or plug AC loads into the outlets when hooking to shore power or starting the generator. If voltage from shore power is below or above acceptable levels, start the generator and disconnect from shore service until shore power supply voltage becomes stable.

GENERATOR - 120 VOLT AC

The generator is located in the front compartment of the motorhome.

The generator can be started from the following locations:

- Generator remote switch on the dash.
- Generator control panel located on the generator.
- Inverter panel.



Pre-Start Checks

Prior to the first start of the day perform a general inspection including oil and coolant levels. Keep a maintenance log on number of hours in operation since the last service. Perform any service or maintenance that may be due.

WARNING:

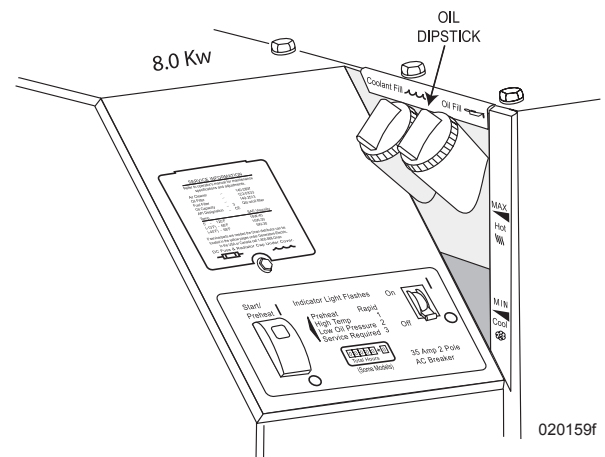
If applicable, disable the optional Auto Gen Start feature before servicing the generator.

Before Starting the Generator:

- Clear people and animals from hazards of electrical shock and moving parts.
- All appliances and other large AC electrical loads must be **OFF**.

NOTE:

The generator may require priming. To prime, hold control switch OFF. Repeat if necessary. The diesel generator fuel pick-up tube is cut to about ¼ tank so the main engine does not run out of fuel.



Starting the Generator

Push and hold the control switch in the START position until the generator starts. Release switch. The control switch may flash up to 15 seconds, indicating engine preheat.

WARNING:

Excessive cranking can overheat and damage the starter motor. Do not crank the engine for more than 30 seconds at a time, in two minute intervals. If the generator fails to start, refer to the OEM manual.

WARNING:

When the motorhome is parked, position the dash air conditioner vent control OFF to prevent exhaust gases from entering the motorhome during generator operation.

Engine exhaust contains Carbon Monoxide, an odorless and colorless gas. Carbon Monoxide is poisonous and can cause unconsciousness and/or death. Inspect the exhaust system thoroughly before starting the generator. Do not block the exhaust pipe, or situate the motorhome where exhaust may accumulate around the motorhome or nearby vehicles. Operate the generator only when safe dispersion of exhaust can be assured. Monitor outside conditions to ensure exhaust continues to safely disperse.

WARNING:

When parking near high grass, be sure that the hot exhaust gases or the exhaust pipe does not contact the grass and ignite, resulting in a fire.

CAUTION:

An exhaust extension adds weight and stresses the generator exhaust system. Damage to the exhaust piping or exhaust manifold can result, allowing Carbon Monoxide gases to accumulate under or leak into the motorhome.

Stopping the Generator

Turn off the appliances and disconnect other AC loads being used. Allow the generator to run unloaded for at least one minute before shutdown to allow the engine to cool. Momentarily push the control switch to STOP.

NOTE:

The generator requires only a momentary stop signal.

Powering the Equipment

The AC output of the generator powers the motorhome air conditioners, the AC Inverter/Charger and all appliances and items plugged into the electrical outlets of the motorhome. The number of electrical appliances that can be operated at any given time depends upon how much power is available from the generator. If the generator is “overloaded” or a short circuit causes “over current,” either the generator will shut down or the circuit breaker will trip. If power consumption, in total, exceeds the generator power output, compensation for temperature and elevation may be necessary. Operate appliances in sequence, rather than all at the same time.

NOTE:

The generator may shut down when loaded nearly to full power and an air conditioner (or other large motor load) cycles on. For a brief moment during start up an electric motor can draw up to three times the rated power. For this reason it may be necessary to operate some appliances in sequence when air conditioners or other large motor loads are on.

Air density decreases as altitude increases. Power decreases at about 3% of the rated power each 1,000 feet (305M) of increase in elevation above sea level. It may be necessary to operate fewer appliances at the same time when camping at a higher elevation. For example: 7500 watt generator at 5,000 ft. = 6375 watts net. Temperature also affects maximum output power. For example: at 120° a 7500 watt generator produces 6000 watts net.

INFORMATION:

The generator may shut down for reasons other than an overload. If a blink code appears on the control switch, refer to the manufacturer’s manual to obtain an explanation for the code.

Generator Fuel

There is always a possibility fuel may be contaminated. Diesel fuel may contain water or a microbe growth (black slime). Any contamination of fuel greatly reduces the total output of the generator, and may cause erratic AC output.

Average Fuel Consumption	Diesel 8,000 Watts (gal./hr.)
No Load	0.13
Half Load	0.49
Full Load	1.02

NOTE:

The motorhome manufacturer does not cover damage to the generator caused by fuel contamination, or to appliances due to erratic AC voltage.

Resetting the Circuit Breaker

If a circuit breaker trips in the main AC breaker panel, or on the generator control panel, there may be a short circuit or too much load.

NOTE:

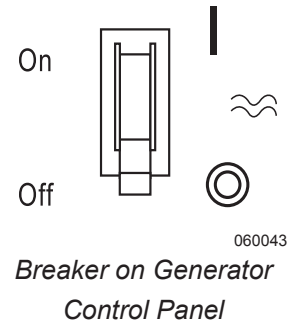
The generator continues to run after a circuit breaker trips.

If a circuit breaker trips, disconnect or turn off as many loads as possible. To reset the circuit breaker, switch the circuit breaker **OFF**, then switch back **ON** to reconnect the circuit.

If the circuit breaker immediately trips, the electrical distribution system has a short or the circuit breaker is faulty. Call a qualified electrician. If the circuit breaker does not trip, reconnect a combination of loads that will not overload the generator or cause the circuit breaker to trip again. Remember to compensate for elevation and temperature changes when re-connecting loads.

NOTE:

An appliance or load may have a short if it causes a circuit breaker to trip after re-connection. DO NOT continue to reset breaker. Have the problem corrected before resuming operation.



Generator Exercise

If use of the generator is infrequent, “exercise” the generator once a month by operating it at approximately half the maximum rated output for two hours. This “exercise” helps promote better starting, more reliable operation and longer engine life. This procedure drives off moisture, lubricates the internal engine parts, replaces the old stale fuel with a fresh supply, and also promotes removing oxides from the electrical switches and contacts.

NOTE:

Avoid short run periods of the generator. Run the generator set under a load for a minimum of one-half hour.

INVERTER

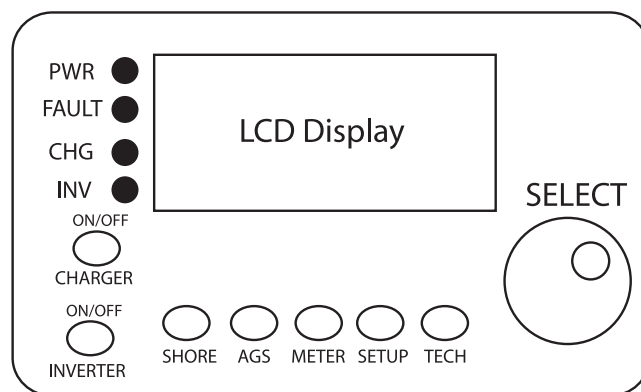
The inverter performs two functions: it changes DC battery power to AC electrical power, and it charges the batteries when hooked to shore power or operating from the generator. Use the inverter to supply AC power when shore power is not available and the generator is not going to be used as a secondary AC power source. The inverter supplies AC power to most outlets and appliances. It is important to remember that using the inverter quickly consumes house battery power. Turn off the inverter when not in use to conserve house battery power. The remote control is used to change the variable settings.

NOTE:

The all-electric option requires two control panels; one for each of the two inverters.

Providing AC Power with Inverter

Press the INVERTER ON/OFF switch to turn on the inverter. If the inverter doesn't sense AC power from the generator or shore power, it provides AC power from the motorhome batteries to most outlets and appliances. If the generator is started or the motorhome is connected to shore power, the inverter automatically begins charging.



Battery Charging with the Inverter

The inverter automatically begins charging when AC power is supplied from shore service or the generator. The inverter uses a three-stage charge cycle to charge the batteries. If desired the charger may be turned off.

To turn the charger on and off:

- Press the switch marked **CHARGER ON/OFF** on the remote panel.

Inverter three-stage charging cycle:

• Bulk Charge Cycle:

Brings the DC voltage up high, initially between 14.2 - 14.6 Volts. The length of time the inverter is in Bulk Charge depends on the state of charge of the batteries.

• Absorb Cycle:

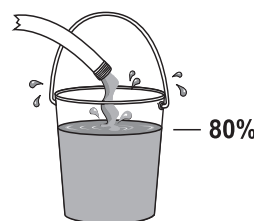
Absorb Cycle battery voltage is the same as the Bulk Charge Cycle, between 14.2 - 14.6 Volts. Length of the Absorb Cycle is a timed event determined by the inverter.

• Float Charge Cycle:

Charge voltage is generally around 13.3 - 13.7 Volts. Approximately 80% of the charging cycle has been completed by this time.

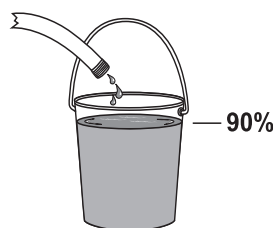
NOTE:

Refer to the OEM manual located in the Owner's Information File Box for detailed instructions.



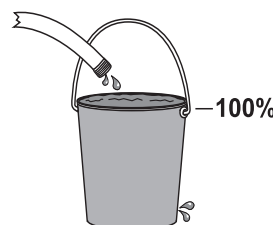
Bulk Charge:

Water on full blast - wide open. Then the water is abruptly shut off.



Absorption is called topping off:

One drop at a time until the last drop spurts out. Then the container is totally full to 90%.



Float: Maintenance keeps it full.

Trickle charge - a constant fixed rate of charging - now obsolete. In most case too much charge is not enough over a time period.

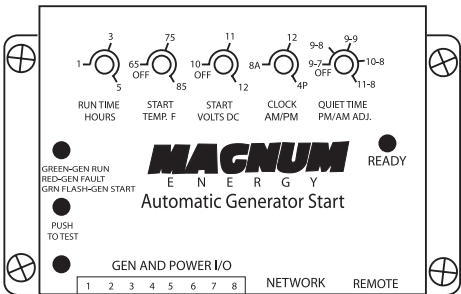
If one drop falls out, one drop falls in.

060236b

Auto Generator Start (Optional)

The Auto Gen Start (AGS) allows the inverter remote control to start the generator when battery voltage or interior motorhome temperature reaches a preset point.

NOTE:
Generator run time, battery voltage and interior temperature settings for the AGS function are selected with the AGS controller, located in a cargo bay next to the inverter. Refer to the OEM manual located in the Owner’s Information File Box for detailed instructions.



060299

To Enable AGS:

- Press the AGS button on the inverter remote control. Use the select knob to scroll through the AGS menu options until “AutoGenSt Enabl” appears. Press the select knob to activate the AGS.

To Disable AGS:

- Press the AGS button on the inverter remote control. Use the select knob to scroll through the AGS menu options until “AutoGenSt OFF” appears. Press the select knob to deactivate the AGS.

Factory Default Settings

Function	Default
Search	5 Watts
Low Battery Cutoff	11 Volts DC
Battery Bank	400 AH
Battery Type	Liquid Lead Acid
Charge Rate	80 %
Contrast	75 %

NOTE:
The Inverter/Charger charges the batteries with AC power applied regardless of remote status.

Battery Temperature Sensor

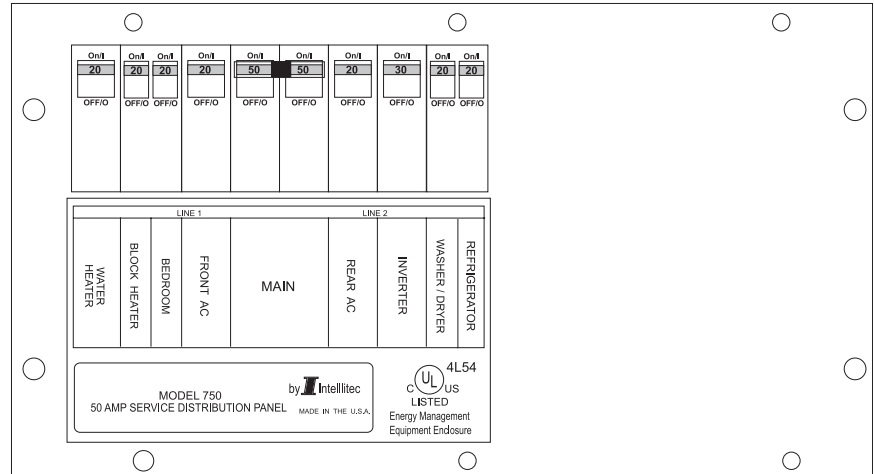
A Battery Temperature Sensor (BTS) is affixed to one of the house batteries to measure battery temperature and send that information to the inverter. When battery temperature rises, the inverter will decrease charge voltage to prevent boiling the batteries. When battery temperature cools, the inverter raises charge voltage. Voltage compensation with temperature variation is necessary to keep charge voltage at optimum values. If the BTS cord is unplugged from the inverter, the inverter uses a temperature default setting of 77° F/25° C as a reference point.

Pass-Through AC Power

A double pole “pass-through” relay trips when AC power is supplied to the input terminals to transfer AC power through the inverter to the sub breaker panel in the bedroom. The sub breaker panel supplies AC power to most outlets and appliances. When the inverter receives AC power, the internal battery charger “ramps up” battery charging voltage. After about 20 seconds, the relay engages, allowing AC power to pass through the inverter to the sub-panel.

DISTRIBUTION PANEL (50 AMP)

The AC distribution panels are located in the bedroom. The main 240 Volt AC panel receives power from the transfer switch, which is supplied by either shore power or the generator. AC power is supplied to the 50 Amp main breaker first, then the power is supplied to the individual branch circuit breakers. The panel label describes the breaker layout and the item, outlet or appliance to which they pertain.



NOTE: This panel will change with options.

060083b

WARNING:

The 240/120 Volt AC panels contain high voltage which can cause injury or death. Before beginning work or testing procedures involving the electric panels, or any of the branch circuits, be sure the motorhome is unplugged from shore power, the generator is not running and the inverter is off. Certain testing procedures may require the AC power to be on. Only qualified personnel with electrical backgrounds should attempt any testing procedures.

Branch circuit breakers supply AC power to the different items or “loads.” An electrical load is any item or device that will use current when supplied with an electromotive force. Should a breaker “trip” from over current use, or a short circuit condition, 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 **OFF**, then back **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 has been diagnosed and corrected.

Breaker current ratings are current set points in which the breaker is designed to operate. The internal configuration of the circuit breaker is designed to trip when excess continuous current is drawn through the breaker. The trip action of the circuit breaker can occur within milliseconds due to the speed at which electricity can travel. Breaker ratings are set to operate on a continuous load at 80% of the breaker’s rated capacity and handle loads in excess of their rating for short periods of time. This designed set point is when an inductive load is applied, such as when an electric motor turns on. As the motor starts to spin, current consumption may momentarily exceed the rated capacity of the breaker. As the electric motor comes up to operating speed the electric motor’s current consumption will fall. The AC current load then falls back into the breaker’s rated 80% set point. This electric principle should be kept in mind when using anything other than 50 amp shore service and using appliances with electric motors. When using outlets care should be considered when applying loads such as electric motors, heaters, coffee makers, toasters, hair dryer or other large current consuming loads. If the current rating of a load is not known it is usually stated on most electrical items. The rating is either in amps or watts.

Current ratings stated on electrical items changes slightly with voltage fluctuations. As voltage increases current consumption decreases. As voltage decreases current consumption increases. This may explain why in some instances items operated at borderline voltage to current tolerances may seem fine in one location but problematic in another.

NOTE:

To calculate watts to amps simply divide the watt figure by the voltage of which the item operates from. For example: The electrical item is rated at 1370 watts. Divide that by the operating voltage of 115 volts which equals 11.913 amps. Use this formula to calculate load to current supply ratio.

The Energy Management System is easily identified by the remote display panel located inside motorhome.

The 50 Amp Smart EMS consists of two elements: the display panel and the bedroom distribution panel. The distribution panel, located in the bedroom, is a completely self-contained 120/240 Volt power distribution and energy management system intended to be used in recreational vehicles. It is housed in a sheet metal enclosure with removable front panel. It provides circuit protection for all the 120 Volt AC loads in the motorhome and a system of energy management to minimize the over-loading and tripping of circuit breakers.

Circuit Breakers:

The distribution panel offers slots for eight single or dual, standard 120 Volt circuit breakers. Two of these breakers, located in the two center positions, must be a 50 Amp unit that act as a main input protection for each of the lines supplying the remainder of the branch breakers (up to 12).

Energy Management:

The 50 Amp Smart EMS automatically senses the available power to the motorhome, determining whether it is connected to a 120 Volt AC - 30 Amp shore power source, 50 Amp shore power source or generator source. Depending upon available power, the EMS controls the operation of 6 possible loads as indicated on the distribution panel. These may be any type load, but are typically heavier loads; those whose use can be “postponed until a time when current is available for use. If the available power source is 120 Volt AC - 30 Amp shore power, the EMS attempts to keep the total 120 Volt current draw to less than 30 Amps.

Operation:

If 120 Volt AC is not available at the distribution panel, L1 or L2 outputs, the system shuts itself off. This feature is intended to prevent the system from drawing current from the +12 Volt DC battery supply when not in operation. When 120 Volt AC power is applied, the system automatically powers up and determines the nature of the power source.

If the generator is running, 120 Volt AC will be present at the distribution panel L1 and L2 inputs. In this mode the energy management feature is disabled and all control relay contacts are closed, energizing all of the controlled loads. The control module sends a signal to the display panel causing the load meter to display actual load current, the GEN SET service indicator to light and all power status indicators to light.

If 120 Volt AC is present at the distribution panel L1 and L2 inputs the system will assume that 120 Volt AC, 30 Amp shore power is available and the energy management feature will be enabled. If only 20 Amp service is available the user must select the 20 AMP service mode by momentarily pressing the 20/30 Amp select switch on the Control Panel. Initially, all relay contacts are closed and the total current is monitored. If the total current should exceed the service limit the system will turn off the first load in the shedding table, turning the loads off and calculating the amount of current that was removed, which is the value for that load. This value is placed in memory. If the current remains above the service limit, the system will turn off the next load in shedding table, again calculating the amount of current that was removed and placing this value, which is the value of that load, in memory. The system continues to turn off loads until the total current falls below the service limit or all of the six controlled loads have been shed. Through this process the system has “learned” the amount of current that each particular load draws. This feature compensates for the differences in current draw over a range of line voltage and ambient temperature, by re-learning the load each time it is turned off or “shed.”

The 50 Amp Smart EMS now waits until the total current is lower than the service limit and enough current is available (as compared with the amount in memory for the last load shed) before turning that load back on. This assures that there is sufficient current to operate the load.

NOTE:

There is a two minute minimum delay period after a load is shed before the load will be turned on again to prevent air conditioners from turning on with a head pressure.

Three Hour Averaging:

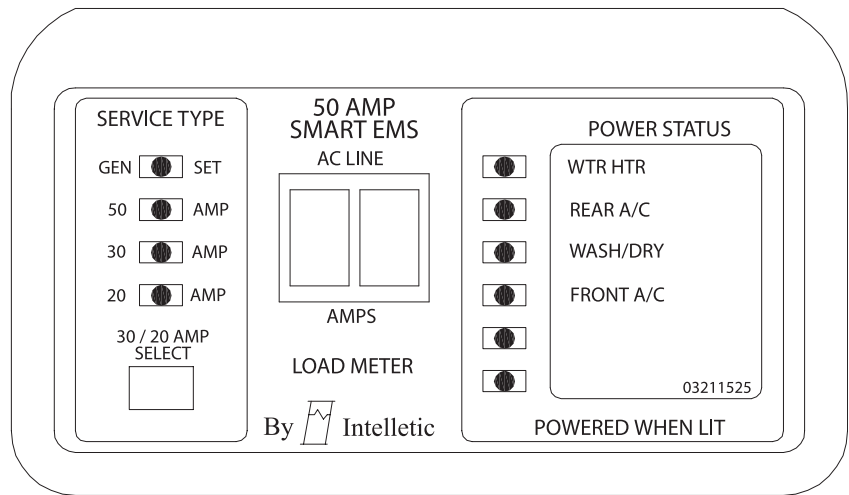
The RVIA (Recreational Vehicle Industry Association) in conjunction with the NEC (National Electrical Council) have established rules regarding the rating of electrical systems and the use of energy management systems. One of these rules requires that, if any energy management system is used, the average total load current for the system over a three hour period be limited to 80% of the service rating. For that reason the 50 Amp EMS calculates the average running current for the system and, if it exceeds 80% of the service rating, the EMS sheds loads to reduce the average current below that limit.

For example, if a system operating under 120 Volt AC, 30 Amp service has been running at the 30 Amp limit for three hours, the EMS will change its shedding threshold to 24 Amps and turn off loads until the 24 Amp limit is attained. If the user selects the 20 Amp service mode this limit translates to 16 Amps. Because the EMS calculates a running three hour average, if the average load current drops below the limit the system restores power to loads based on their impact on the limit. If the system is in the averaging mode the decimal point at the lower right corner of the load meter display on the display panel illuminates.

Display Panel: The display panel connects to the distribution panel located in the bedroom. Six power status LED's indicate power is applied to those loads. These LED's are on when the power is applied. The load meter has a two digit display to indicate the amount of current actually being drawn by all the appliances in the motorhome.

Four service type LED's indicate the source for 120/240 Volt AC power. Three of these sources are automatically detected and indicated by the EMS, namely: Gen Set Service, 50 Amp Service and 30 Amp Service.

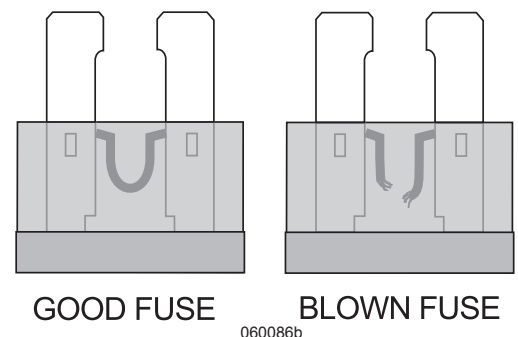
The 20 Amp service mode is not automatically detected and the operator must manually select the 20 Amp mode when 20 Amp service is available. The service select button allows the current threshold to be set to either 30 Amps or 20 Amps, to match the incoming service.



Fuses

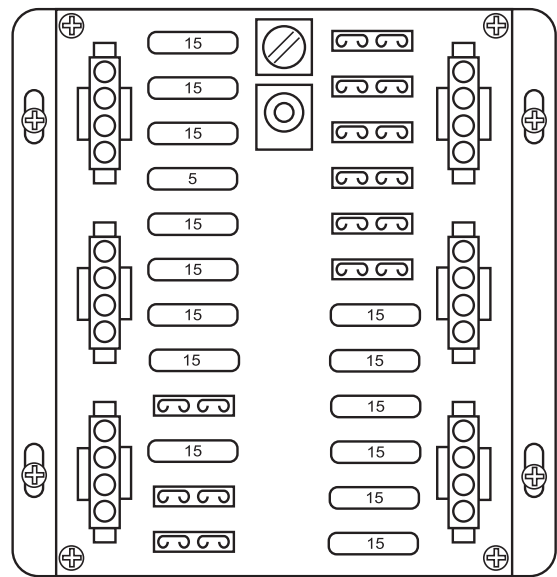
The 12 Volt DC fuses protect the low voltage electrical circuits. These fuses are a standard automotive type. When a fuse is “blown,” the wire in middle of the plastic case is burnt. A broken, bad or “blown” fuse must be replaced with a fuse of the same rating and type. Using a fuse with a different rating or type defeats the circuit protection provided by that fuse and could result in damage to the motorhome electrical system.

The 12 Volt fuses, located in this distribution panel, service the interior house lighting, ventilation fans, monitor panel, furnace and water heater. Should a fuse blow it will be evident by the broken metal strip located in the center of the fuse. Replacement fuses should be of the same amperage. If a higher rated fuse is installed it can damage the wiring. Blade style fuses are color coded to reflect their amperage rating. See chart for details. Fuse current set points follow much of the same electrical principles 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 large variety of applications this voltage can be used in makes it a diet staple for most of the recreational vehicle and automotive industries. 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, like 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.



060165

FUSE	COL	GA	AMP	CIRCUIT
F1	BLU	14	15	CSIDE BATH LTS
F2	YEL	14	15	PORCH, GRB HNDL
F3	GRN	14	15	S/O BDRM LTS
F4	VIO	14	15	VENTS (BATH, GALLEY)
F5	RED	14	15	FRONT CEILING LTS
F6	GRY	14	15	FRONT FURNACE
F7	RED	12	20	WATER PUMP
F8	ORG	14	15	RDSIDE BATH LTS
F9	GRY	16	7.5	RADIO / COURTESY LTS
F10	GRN	14	15	WINTERIZATION
F11	RED	14	5	CABLE BOX / SAT
F12	GRY	14	15	REAR FURNACE
F13	ORG	14	15	FRONT, REAR A/C'S
F14	GRN	14	15	WTR HEATER REL, MON PANL
F15	RED	18	3	RANGE / STOVE
F16	BLU	14	15	RDSIDE S/O POWER
F17	YEL	18	1	ALADDIN W/O SLR PNL
F18	ORN	14	15	CS S/O POWER
F19	BRN	14	15	KITCHEN LTS
F20	GRN	14	15	BEDROOM LTS
F21	----	----	----	-----
F22	----	----	----	-----
F23	----	----	----	-----
F24	----	----	----	-----
CAM/SCE				#03213228

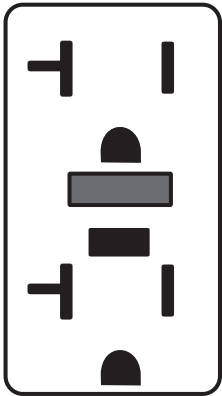
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GFCI BREAKERS & OUTLETS

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.

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 standing on or making contact with an electrical ground such as a water fixture, bath tub or the earth.

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 (e.g.. 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 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 manufacturers (about 30 milliamps or less). Electrical shocks resulting from ground faults can be felt, but such a shock is considerably less than one without ground fault protection.



060072

GFCI Outlet

People with heart conditions, or other conditions that make them susceptible to shocks, can still be seriously injured. A GFCI outlet or breaker does 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.

WARNING:

If a breaker or outlet continually trips, DO NOT continue to reset breaker or outlet until the problem has been identified and corrected.

NOTE:

The ground fault outlet or breaker should be tested once a month to ensure it is operating. Use the TEST button on the outlet or breaker. It should trip with a click. The breaker or outlet will not trip if AC power is not present. If power is present and the device will not trip, replace it before using that circuit.

NOTE:

One milliamp is 1/1000 of one amp.

Tools of the Trade

One of the most widely used tools for testing a 12 Volt problem is the test light. Test lights come in a variety of styles, such as a light bulb with a probe and ground clip, to the electronic ones that measure a wide scale of voltages and perform a variety of functions. A VOM or Volt Ohm Meter is used to perform a multitude of tests. It is generally used when exact values are needed for evaluation. These meters come in analog or digital. Either of these testing tools may be used, depending on personal preference. If a 12 Volt light is not working, the test light may be better suited for this. In the case of a charging system problem the meter may be the tool of choice. In any situation the testing tool is an invaluable piece of equipment when it comes to determining an electrical problem.

Know When to Say No

If it is necessary to use testing tools, use precautions and consider three things. First, recognize when the problem is beyond your skill level. Nothing creates more problems than being armed with tools and going in an unknown direction. Good intentions can lead to major problems. The second item to consider is if something will cause more grief by being dealt with now than if it were left alone and repaired by a professional at a more convenient time. Items that seem as if they should only take a few minutes, may end up taking an entire day. The third item to consider is whether or not the current situation may be potentially dangerous if left to be repaired at a more convenient time.

NOTE:

Check all related fuses before assuming you have encountered an electrical problem or situation. Spare fuses should be kept on hand and can be purchased from auto parts stores. A fuse description label is on the distribution panel cover.

WARNING:

If a fuse blows replace the fuse with same amperage rating and type. Installing higher amperage fuses 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.

BATTERY

How It Works

Batteries come in different sizes, types, amp hours, voltages and chemistries. There are nearly as many descriptions of battery types and how they should be used as there are people willing to offer advice on them. Although it is not possible to cover batteries in their entirety, there are guidelines that can be followed to ensure that the batteries are well maintained.

The operation of the battery is based on a chemical reaction. The battery is a container of lead plates, insulators and a solution of distilled water and sulfuric acid. The solution, when mixed together, is known as “electrolyte.”

The 12 Volt battery is actually six batteries in one case. When charged, each cell has a voltage of 2.1 Volts. When six cells are hooked together this makes a 12.6 Volt battery (fully charged).

Electrons are stored on the negative plates. When a load (e.g., a light bulb) is put between the positive and negative terminals, the electrons move from the negative plate to the positive plate through the “load” and then back to the ground terminal. At this time the sulfuric acid leaves the water and adheres onto the plates of the battery. The electrolyte solution keeps the electrons from flowing while the battery is in the “at rest” position.

Charging the battery moves the sulfuric acid back into solution with the distilled water. A battery left in a low or discharged state will cause the acid to “sulfate.” In attempting to recharge the battery, the acid has become hardened and no longer leaves the plates and enter into the liquid solution with the distilled water. The lowered acid to water ratio has a direct affect on the battery’s ability to release the stored electrons (power output) and the length of time it can perform (reserve capacity). Batteries left in a discharged condition readily freeze. This can crack the case allowing the solution to spill, it can also warp the plates. The acid acts like an “antifreeze” for the battery. This is why batteries should not be left or stored in a “discharged” condition.

Battery Types

Starting Batteries:

Starting batteries are designed for high output cranking power, but not for deep cycling like the house batteries are designed to do. Starting batteries do not last long in deep cycle application. The way they are rated should give a good indication of their intended use. “Cold Cranking Ampere” is a measurement of amperage output that can be sustained for 30 seconds. Starting batteries use thin plates to maximize the surface area of the battery. This allows a very high starting current but lets the plates warp when the battery is deep cycled (discharged).

Deep Cycle Batteries:

Deep cycle batteries are best suited for use with 12 Volt operated lights, appliances and inverter/converters. Deep cycle batteries are designed to have a majority of their capacity used before being recharged. These are available in many sizes and types. The most common is a non-sealed, liquid electrolyte battery. The non-sealed types have battery caps. The caps should be removed periodically to check the level of electrolyte. When a cell is low, only distilled water should be added. Water consumption varies depending on many factors: how far the batteries are depleted, how long the voltage is being applied to charge the batteries, how much voltage is used and how often this occurs. Generally, the batteries should be checked every two or three weeks when continuously hooked to shore power.

NOTE:

Tap water contains minerals which can alter battery chemistry and ruin the battery. Use only distilled water when refilling the battery.

NOTE:

Batteries should not be drained past 50% of capacity, life of batteries may be shortened.

Testing the Battery

There are several ways that a battery can be tested and monitored. The motorhome uses the Systems Monitor panel, found in the roadside service center, and the Main Status Monitor panel located in the hallway, to show the status of the batteries.

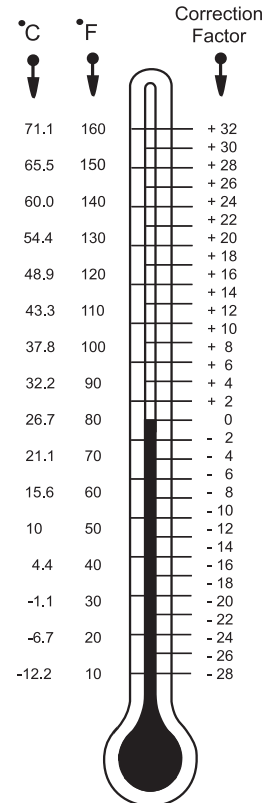
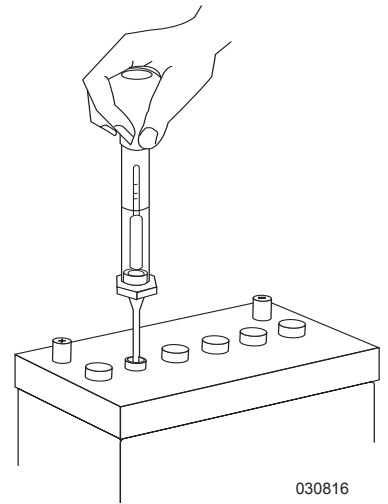
A more efficient way of testing the batteries is to check the electrolyte solution. The only way to test a battery's electrolyte solution is with a hydrometer. Hydrometers can be purchased from most auto parts stores.

Many styles are available, from types with cylinder graduation (shown here) to types with floating balls. The hydrometer tests the battery's electrolyte solution which is measured in specific gravity. Distilled water has a specific assigned gravity of 1,000. The hydrometer is calibrated to this mark. Pure sulfuric acid has a specific gravity reading 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). Hydrometers with cylinder graduation are graphed and the exact state of specific gravity can be determined.

Temperature and recent battery activity (charging or discharging) affect the hydrometer readings. It is best to check the battery when it has been "at rest" for at least three hours, although readings taken at other times give a "ballpark" figure. When using the hydrometer, draw the electrolyte solution up into the tube. Allow the hydrometer to attain the same temperature as the electrolyte solution. Note the reading for that cell. Complete the same test for the rest of the cells on that battery bank.

The hydrometer is calibrated at 80° F. Temperature affects the hydrometer readings. The higher the electrolyte temperature, the higher the specific gravity reading. The lower the temperature, the 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. If one cell in a particular battery bank being tested is at a 50% state of charge while the others are indicating a full charge, charge only that battery to see if the low cell comes up. At the same time, do not over charge the "healthy" cells. If the low cell does not come up after charging, this battery can damage the rest of the battery bank and should be replaced. An accurate digital volt meter + - .5% will also give an indicator of the battery's state of charge.

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 battery(s) while monitoring voltage to see if they will perform to their specific rated capacities.



Temperature Compensation Chart

NOTE:

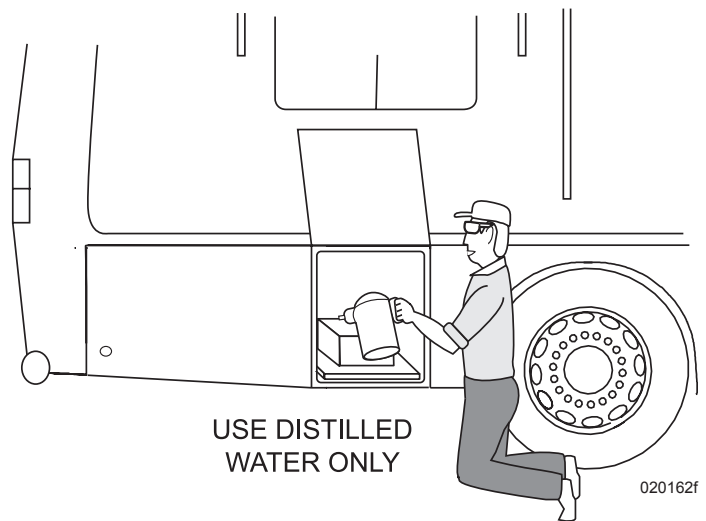
See the Temperature Compensation Chart. Liquid levels should be even between the cells of the battery being tested as it will affect the accuracy of the test.

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.

Battery Maintenance

At a minimum, the battery electrolyte level should be checked 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 electrolyte level should be about 3/8" below the well to allow room for expansion while the battery is being charged. Over-filling the battery allows the electrolyte solution to boil or gas out of the battery cap. Remember to use only distilled water to refill the battery. A battery with a low electrolyte level boils the water out rapidly once the plates have been exposed to air. This process may take only a matter of hours. If this has happened the battery is more than likely damaged.



After checking the battery's electrolyte levels it is also a good idea to check the battery connections for tightness and corrosion. If any corrosion is found disconnect the cables (make sure to mark their locations) and carefully clean them with a mild solution of baking soda and water. There are also aerosol products available that work. This neutralizes any acid that may be present. Do not allow the solution to enter the battery as this damages the electrolyte balance. Use water to rinse the top of the battery and surrounding area when done. Carefully hook the cables back to the battery. Coat the terminals with petroleum jelly or an anti-corrosion grease.

The battery cable to battery terminal connections should be metal to metal. Periodically check the batteries for corrosion. Look for cracks and check the vent plugs. Replace them if they are cracked or missing. Keep the top of the batteries clean. The accumulation of electrolyte and dirt may permit small amounts of current to flow between the terminals, which can drain the battery.

WARNING:

Liquid lead acid batteries produce highly explosive hydrogen gas when charging. Do not smoke around batteries. Extinguish all flames in the area. The hydrogen gas may explode resulting in fire, personal injury, property damage or death.

Battery Voltage & Current

Why does the voltage on a discharged battery measure the same as a fully charged battery until the loads are applied? The answer to this might go as follows: A battery creates electrical power by converting energy from a chemical reaction into electrical energy. As this reaction slows down, the battery voltage drops. In a lead acid battery the electrolyte conductivity (how well electrical current can flow through it) changes. The same current may be available but the rate of the reaction decreases, causing a voltage drop.

Another way of looking at this is to use the analogy of a water pump (a battery is an electric pump). The pressure in psi (pounds per square inch) that a pump delivers is like a battery's voltage. The volume of water in GPM (gallons per minute) is like the electrical current. Look at a 12 psi pump with no loads (the pump is running but the outflow valve is turned off). The pump runs and the internal pressure of the pump builds up to some point higher than 12 psi. When the valve is opened, and the water is free to flow into the loads, the pressure drops to the rated output pressure of 12 psi, but only if the load is not too big. If the pump is designed to maintain 12 psi at 15 GPM, and a load demanding 20 GPM is connected, the pump will not be able to keep up and the pressure will get sucked down to a lower psi. If the load is reduced or removed the pump catches up and return to its rated 12 psi pressure. If the pump has an infinite source of water, such as a lake or the water utility (this is like the grid, no battery), the pump never runs out of pressure.

If the pump never runs out of pressure, and is operated at or below its 15 GPM level, it will hold 12 psi. However, a pump that is connected to a water tank with a finite capacity starts to lose the ability to hold pressure as the level of water in the tank drops. Think of siphoning water from a bucket. As the level of the water drops, the volume of water exiting the siphon slows down.

When the tank is full it is capable of feeding more “pressure” to the pump inlet due to gravity, and the pump always has enough water available to maintain its rated pressure and volume. However, if the water tank gets low the pump will not have enough water volume coming in to maintain 12 psi at 15 GPM. If the loads are removed from the pump by closing the valve on the outflow, even with low pressure in the tank, the pump eventually pressures up to 12 psi. It just takes it longer to get there. When the valve is opened the pump sustains 12 psi for a brief period, but since the tank is no longer feeding the pump as fast as needed the pressure eventually drops. This analogy can be restated by replacing the pump with a battery, pressure with voltage, volume with amps, outflow valve with a switch, water with electricity and the water tank with the battery electrolyte.

The level of the tank could be thought of as the rate of the reaction occurring in the electrolyte. When the battery is fully charged the electrolyte has an excess of reactions taking place to feed the battery terminals. This tapers off with time as the electrolyte is spent, so maintaining voltage becomes possible. With no loads, the discharged electrolyte is capable of producing close to the rated voltage, but only after a period of time has elapsed for enough of a reaction to take place to bring the voltage back up. This explains why a battery measured at rest can indicate close to its rated voltage, but does not run a load.

Battery Charge Time & Consumption Rate

Calculating Run Times:

Calculating run time figures when operating 120 Volt AC electrical items with an inverter/converter can be exponential. This is due to battery characteristics. Flow characteristics of electrons vary with different battery types and chemical compositions. Deep cycle batteries are generally designed to slowly release a majority of their charge capacity. Deep cycle batteries are rated in amp hours (Ahrs) with the discharge occurring over an extended period of time before the battery is charged. Engine starting batteries are designed to quickly release large amounts of current for short durations, without depleting battery reserves. Commercial type batteries bridge the gap of deep cycle and engine batteries. Commercial batteries release medium amounts of current over a longer period of time but they are not designed to cycle their charge capacity.

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 which 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 10 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 8 hours of discharge time. Increasing the load applied to the battery to 20 Amps will not yield 5 hours discharge time but may be less than 3 hours. It might be understood as a point of diminishing return.

Calculating applied loads to an inverter/converter to approximate run time from the battery amp hours available is not an equal trade up when voltage is inverted and amperage is calculated. When the inverter/converter is used to operate an AC load it uses approximately ten times the DC current needed from the battery when inverting 12 Volts to operate the 120 Volt item. There is also a small efficiency loss of about 10% when inverting. For example: When using the inverter/converter to operate an AC electrical item, which has a current draw rating of 2 Amps, the inverter/converter will use over 20 Amps DC power from the batteries.

Determining Current Consumption:

First determine the amount of current used by an AC item. For example: The television is rated at 200 watts at 120 Volts. Calculate watts to amps. Divide 200 watts by the operating voltage of 120, this equals 1.6 Amps. Multiply 1.6 Amps AC current by a factor of ten the inverter/converter uses, this equals 16 Amps DC battery current. Add the revised 10% efficiency loss figure, this calculates to a total of 17.6 Amps DC. If the battery bank capacity is rated at 500 Ahrs., actual elapsed time to the suggested 50% state of charge would net viewing time for the television at about 13 hours in ideal conditions.

The run time figure varies greatly with the actual state of charge of the battery bank when the discharge process begins. Ambient temperature, combined with other working loads, such as lights and parasitic loads applied to batteries, affect run times. Calculating the exact run time is not precise due to all the variables and equations involved; however, an approximate time figure can be obtained. Proper battery maintenance and charge cycles affect battery performance. Observe the battery condition with hydrometer and voltage readings. Use only distilled water when filling batteries. To achieve the highest quality of battery performance and longevity keep batteries in their proper operating range.

SOLAR PANEL (OPTIONAL)

The motorhome is equipped with a solar-powered battery charging system. The system consists of one solar panel with mounts, a Combiner Box (this allows additional panels to be wired to the system) and a charge controller that can handle up to five 100 watt solar panels.

Solar Panel:

The solar panel is a laser-grooved, buried-grid panel that is capable of delivering about five amps of charge per hour, per panel, in full sunlight (usually between 9:30 a.m. and 2:30 p.m.). Extensive testing has shown that one 100 watt solar panel delivers enough power to offset the normal day-to-day drain on batteries caused by various parasitic electrical loads. These parasitic loads are usually associated with transmission memories, alarm systems, natural self-discharge of batteries and other like items. This means that the first solar panel is only intended to cover these parasitic loads. Adding a second, third or more solar panels (depending upon needs and electrical consumption) can replace what is drawn out of the batteries from the operation of lights, water pumps, inverters, etc., while dry camping.

NOTE:

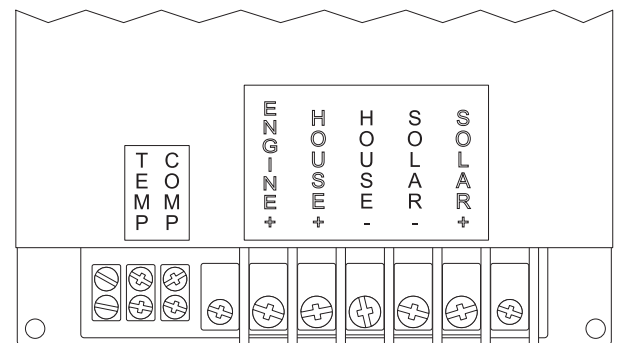
The solar panel needs to be cleaned monthly. The solar panel may need to be cleaned more frequently depending on weather conditions.

Combiner Box:

The Combiner Box has four standard “knock outs” to allow additional solar panels to be added to meet dry-camping needs.

Charge Controller:

The Charge Controller, built specifically to meet the needs of a motorhome, can be set to accommodate either Flooded Lead-Acid batteries or Absorb Glass Mat (AGM) batteries. Status of the charge controller is viewed through the Aladdin System electrical status display. The controller is used as a heat sink for the electronics attached to it. It is normal for the controller to become warm to the touch, especially when processing higher amperage. The charge controller automatically enters Thermal Shutdown if it gets too warm.



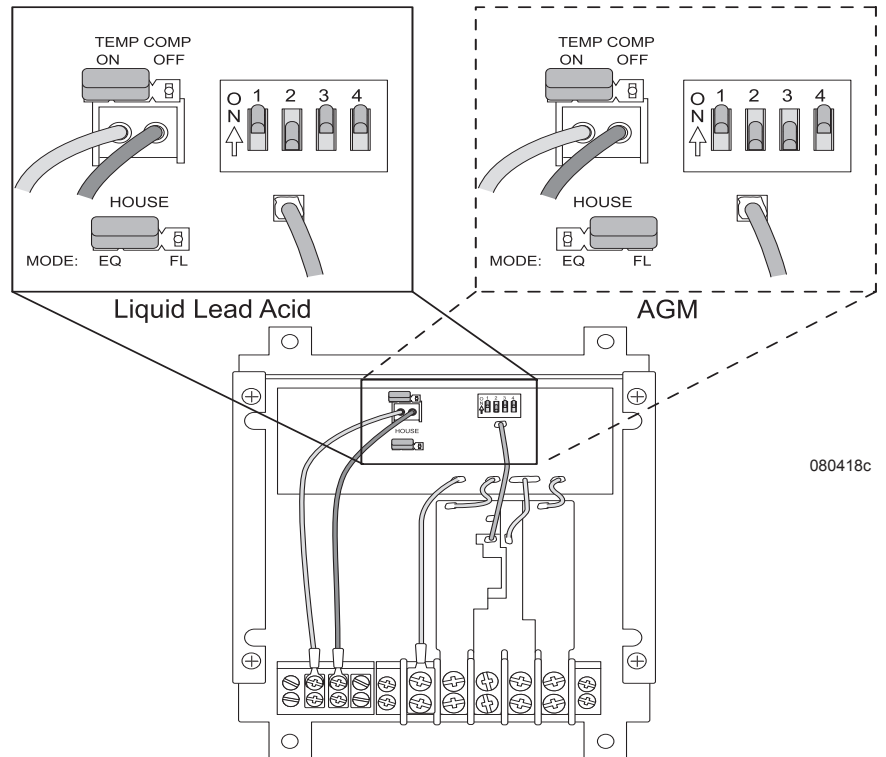
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Charge Controller

The Charge Controller can be set to accommodate either Liquid Lead-Acid (LLA) or Absorb Glass Mat (AGM) batteries. The Charge Controller is located in the large pass-through bay. The controller is used as a heat sink for the electronics attached to it. It is normal for the controller to become warm to the touch, especially when processing higher amperage. The charge controller automatically enters Thermal Shutdown if it gets too warm. Status of the charge controller is viewed through the Aladdin System electrical status display.

The RV-45D Charge Controller includes the following:

- **Dual Battery Bank Charging** - The controller automatically sends charge to both the House and Engine batteries at the same time.
- **Pulse Width Modulation** - Delivers all the available charging amperage until the batteries reach their set point voltage (Bulk) and then it begins to taper off amperage (Absorption) until it is reduced to all that is needed to simply hold the batteries at their set point voltage (Float).
- **Temperature Compensation** - Protects the batteries from excess water loss and/or plate sulfating by automatically compensating for temperature changes, and adjusting the charging voltage accordingly.



Charge Controller: Shown with cover removed to change battery settings.

- **Automatic Equalization (Only when set to Liquid Lead-Acid Batteries)** - Activated once per day. Allows weaker battery cells a chance to catch up with stronger cells. To assure all LLA battery cells are at an equal state of charge, a delay timer is activated to allow a short duration of slightly higher voltage.
- **Automatic Float (Only when set to Absorbed Glass Mat Batteries)** - Resets the charge parameters to work with AGM batteries and removes the equalization cycle. AGM batteries are sealed and are not designed to withstand the higher voltage reached during equalization. The feature also changes Float setting from 14.2 to 13.4 Volts DC, which is the AGM battery manufacturer's recommendation.

CAUTION:

The Charge Controller may be warm to the touch. This is a normal function of the Charge Controller.

Solar Panel Care

A critical part of maintaining the solar electric battery charging system is to keep the panel clean. The amount of power that a panel produces is directly related to the intensity of sunlight. A dirty panel allows less light to reach the panel, resulting in less power produced. A single layer of dust or road grime can reduce the power output by 15 to 25%. Debris that covers 2 or 3 of the 36 cells can reduce output power by 50 to 75%. Use of basic maintenance tips, regular inspections and regular cleaning assures maximum charging from the solar charging system. To clean the panel, use non-abrasive cleaners and paper towels. The environment and the amount of road dust encountered determines how frequently the panel should be cleaned. (1 to 2 times a month is preferred.)

NOTE:

Solar panels should be cleaned at least monthly depending upon weather conditions.

Tips:

1. The panel should be cleaned if a film or a layer of dust is on the windshield.
2. On a bright sunny day, the charging amps should be 3.5 to 5 Amps per panel.
3. High winds can blow debris, causing dirt build up. Frequently inspect the panels and clean as necessary.

CAUTION:

To avoid arcing at the battery connector when replacing batteries or performing battery cable maintenance, be sure to remove the fuse for the solar panel charge controller, or cover the solar panel, to stop the production of electricity at the source.

LIGHTS

Interior Halogen

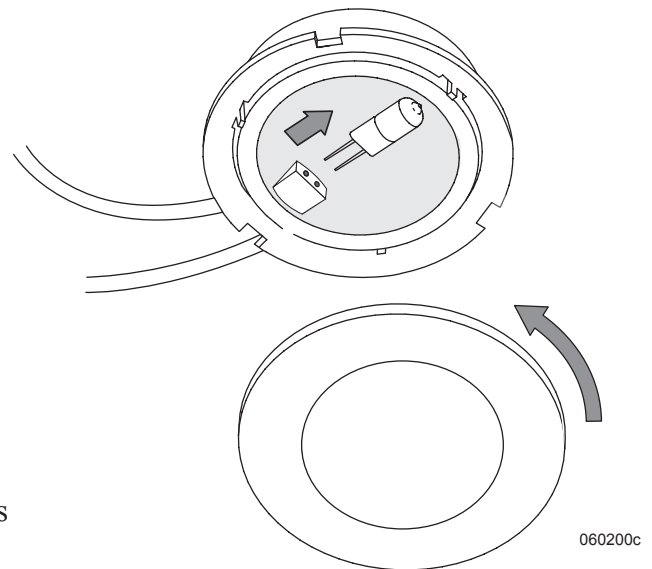
The bulbs inside the halogen lighting are replaceable.

To Replace a Bulb:

1. Rotate the outer trim ring counterclockwise and remove.
2. Carefully grasp bulb and pull from socket.
3. Use a clean cloth or piece of tissue to grasp new bulb. Do not touch bulb directly as this can cause a “hot spot” and result in immediate bulb failure.
4. Align contacts of bulb with terminals in fixture base. Insert bulb until contacts are firmly seated.
5. Align tabs in trim ring with slots in fixture base. Rotate lens clockwise until trim ring locks into place.

CAUTION:

Do not touch halogen lighting while on. They can cause a burn. Do not touch replacement bulbs. Oil in the hands can cause a “hot-spot” to occur. If the bulb is touched, allow it to cool and clean the bulb with alcohol.



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ELECTRICAL SYSTEMS - CHASSIS — SECTION 9

CHASSIS ELECTRICAL - INTRODUCTION	235
BATTERY DISCONNECT - CHASSIS	235
BATTERY - CHASSIS	236
DASH	236
Indicator Lamps	236
Gauges & Indicator Lights	237
Parking Brake	239
Switches	239
Controls	241
AIR CONDITIONER & HEATER CONTROLS	242
About Refrigerants	246
STEERING COLUMN	248
Tilt & Telescope	248
STEERING COLUMN & SMART WHEEL	249
Smart Wheel Operation	249
Wiper Function	250
FUSE & CIRCUITS	251
Front Distribution Panel	251
ALTERNATOR	253

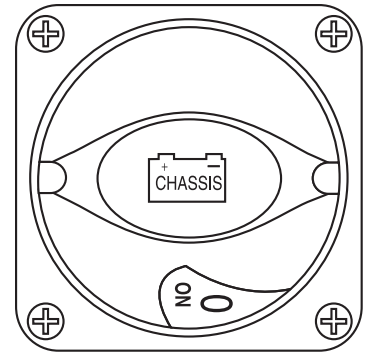
CHASSIS ELECTRICAL - INTRODUCTION

A majority of the chassis electrical functions are designed to operate from 12 Volt DC (direct current) power. This is why the chassis batteries play such an important role in the function of the motorhome. Therefore, it is important to keep the 12 Volt DC system(s) in good working order. These systems, with their incorporated electronics, are voltage sensitive. If DC voltage is not within specification, some electronic items may be damaged.

The two different systems, engine and house, have separate battery banks. The engine batteries supply 12 Volt DC power to the front distribution panel located in an outside compartment by the roadside front wheel. This panel contains mostly engine system fuses and wiring such as headlights, taillight, dashboard functions, gauges, etc. The house batteries supply 12 Volt DC power to the distribution panel located in the bedroom. This panel contains fuses for the house, interior lighting and appliances.

BATTERY DISCONNECT - CHASSIS

The chassis battery disconnect is located in the rear curbside electrical. The battery disconnect for the chassis battery turns the DC power on or off to the front electrical bay. Chassis and engine functions are interrupted when the battery disconnect is turned off. Some electronic items require a constant power source for memory retention such as the dash and CB radios. Some electronic components of the engine and transmission require a constant power source. Turn the main battery disconnect switch off when the motorhome is going to be stored, or when performing electrical maintenance.



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NOTE:

The solar panel (optional) will charge the batteries with the disconnect switch off.

WARNING:

When welding is involved for motorhome repair or modification, only qualified, experienced technicians should weld on the chassis. Improper welding procedures and materials may weaken the assembly or result in damage that is not obvious and may not cause an immediate problem or failure. Unauthorized modifications or repairs to the chassis could result in a forfeiture of warranty coverage.

DANGER:

Due to the sensitive nature of the electronics on the chassis, the following precautions are required to protect electrical components in the motorhome chassis:

- 1. Disconnect the (+) positive and (-) negative battery connection.**
- 2. Cover electronic control components and wiring to protect from hot sparks.**
- 3. Disconnect the terminal plugs from the engine Electronic Control Unit, located on the passenger side of the engine block.**
- 4. Disconnect all the plugs from the transmission Electronic Control Unit, located in the storage bay between the frame rails.**
- 5. Disconnect the wiring from the alternator.**
- 6. Do not connect welding cables to electronic control components.**
- 7. Attach the welding ground cable no more than two feet from the part to be welded.**

BATTERY - CHASSIS

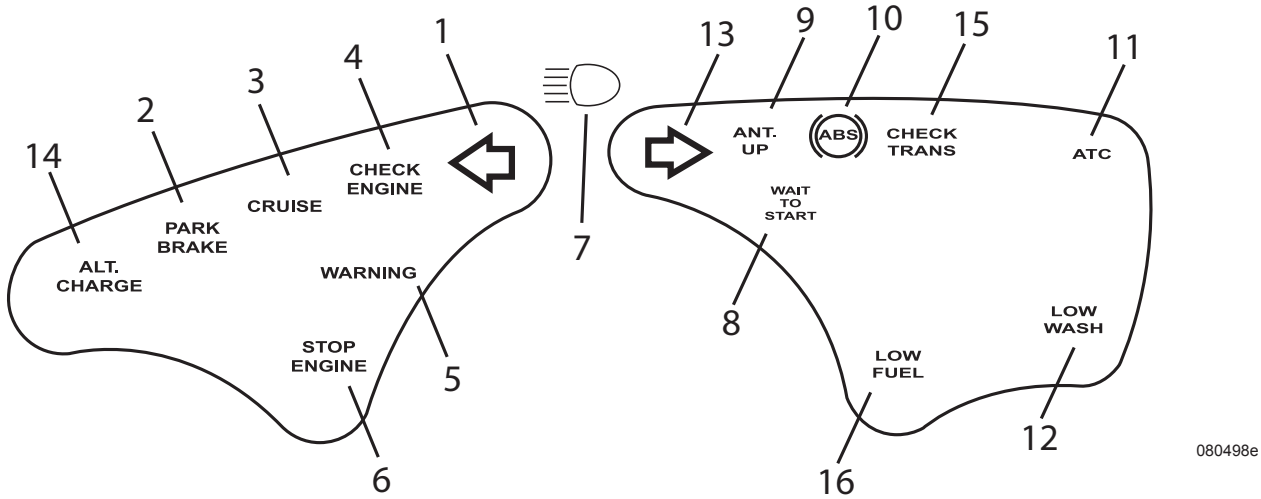
The chassis battery is a crank type battery designed to produce high amperage necessary to start the engine. Maintain the chassis battery through regular electrolyte level inspections and hydrometer readings. High electrolyte consumption, or inconsistent hydrometer cell readings, may indicate a charging system problem. Perform a charging system and current draw check if the battery is exhibiting abnormal hydrometer readings.

NOTE:

Replacement batteries should have the same cold cranking amp (CCA) rating.

DASH

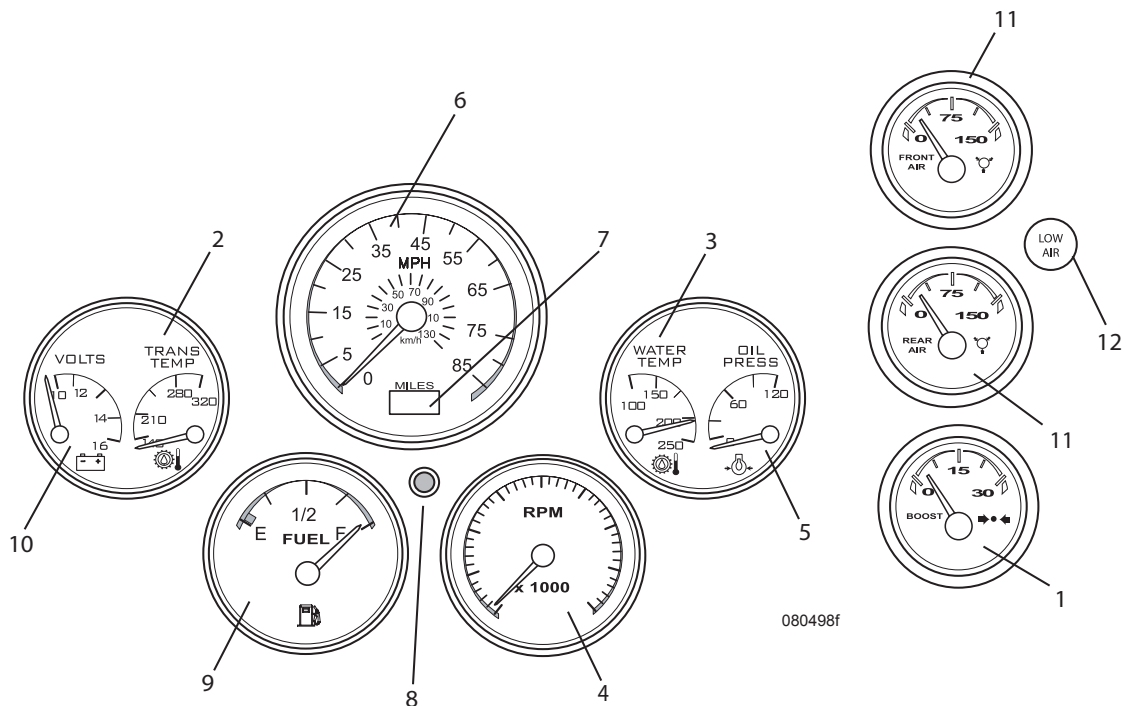
Indicator Lamps



1. **Left Arrow:** Audible Turn Indicators: Left turn indicator circuits active. Audible indicator cancels when the brake is applied.
2. **Park Brake:** Parking/emergency brake is applied.
3. **Cruise:** Cruise control is engaged. Will disengage when brakes have been applied.
4. **Check Engine:** Problem with the engine.
5. **Warning:** Out of range condition exists within the engine protection circuits. Stop coach, check all fluid levels.
6. **Stop Engine:** Alerts driver of severe out of range condition within the engine protection circuits. Pull over and stop as soon as possible. Shut-off engine to avoid engine damage.
7. **Headlight Beam:** High beams when illuminated.
8. **Wait to Start:** Monitors the air intake heater at engine start up.
9. **Antenna Up:** TV antenna is in the raised position. Lower the antenna before moving the motorhome.
10. **ABS:** ABS possible fault in the ABS Brake system. Also indicates fault codes for service technicians.

- 11. ATC (Automatic Traction Control):** The ATC indicator light will illuminate steady when the ignition key is turned **ON**. The light remains illuminated until the first brake application. The indicator flashes slowly when the ATC switch is pressed. The indicator light will flash quickly when an ATC event occurs.
- 12. LOW WASH:** Windshield washer fluid is becoming low.
- 13. Right Arrow:** Audible Turn Indicators: Right turn indicator circuits active. Audible indicator cancels when the brake is applied.
- 14. Alt Charge:** Failure within the alternator charging system.
- 15. Check Trans:** Problem related to the Allison Transmission. The light should momentarily illuminate when the ignition is **ON**. When starting, the lamp extinguishes, indicating the circuits are working properly. If the lamp fails to illuminate or remains **ON** the transmission needs to be checked immediately. Contact the nearest Allison dealer.
- 16. Low Fuel:** Motorhome is low on fuel.

Gauges & Indicator Lights



- 1. Turbo Boost:** Boost pressure produced by engine turbocharger.
- 2. Trans Temp:** Shows temperature of transmission fluid. Normal transmission operating temperature is 160 to 250° F. The maximum transmission to cooler oil temperature is 300° F. Do not let the transmission temperature exceed 275° F. If excessive temperature is indicated stop motorhome and shift to neutral. Accelerate engine to 1200 to 1500 RPM and allow temperature to return to normal.
- 3. Water Temp:** Under average conditions the gauge reads between 180° F and 205° F. Monitor this gauge frequently when CLIMBING HILLS, TOWING or in HIGH AMBIENT TEMPERATURES. If the gauge shows that over-heating exists (the needle moving above the 212° F area) IMMEDIATE ACTION should be taken.

Overheating may be a result of any of the following conditions:

- Low coolant level.
- Hydraulic fan motor failure.
- Mechanical failure of hoses or belts.
- Blocking of charge air cooler fins.
- Idling for long periods of time.
- Towing a heavy trailer.
- Climbing a long hill on a hot day.

4. Tachometer: Displays engine speed in revolutions per minute (RPM).

5. Oil Pressure: Indicates pressure of oil and not the amount of oil in system. Refer to manufacturer's instructions for specific pressure recommendations.

6. Speedometer: Indicates the speed of the motorhome. The gauge reads MPH and KPH.

7. Odometer/Trip Meter: This meter records mileage driven and keeps track of mileage on a trip. To operate trip meter, push the round black button under the speedometer. This changes odometer mileage reading to the trip mileage reading. The black reset button sets the trip mileage back to zero when held for 2 to 3 seconds. Release the button and momentarily press the button again. This changes the trip mileage reading to the odometer mileage reading.

8. Mileage/Trip Reset Button: Operates the trip meter, changes the odometer mileage reading to the trip mileage reading. Press and hold to reset the trip meter.

9. Fuel: Fuel gauge registers relative fuel level in the tank when ignition switch is in the run position.

NOTE:

Fuel mileage varies with driving style and road conditions. Always average more than one tankfull to obtain a more accurate figure. The diesel Generator uses fuel from main tank and will affect fuel mileage figures. Diesel Generators will not operate below 1/4 tank to ensure there is enough fuel to run main engine.

10. Voltmeter: This gauge shows the charge condition in the chassis battery. The normal voltage with the ignition switch **ON** and the engine **OFF** varies between 12.0 and 13.0 Volts. With the engine operating without a heavy load the battery charging voltage is about 14.0 Volts. Battery readings of less than 10.5, or more than 15.0 Volts, usually indicates a battery or electrical system problem.

11. Air Pressure Gauge: These gauges indicate air system pressures. The normal air system operating pressures are 105 to 120 psi. These air pressures are preset at the factory. If a problem occurs with air system not maintaining normal operating pressure it is an indication of a malfunction in the air system. Use caution and stop the motorhome in a safe area. Contact your dealer immediately.

NOTE:

It is not safe to drive the motorhome with low air pressure. Damage can occur to the suspension and drive line. The operation of the air brake system is also affected.

12. Low Air: Air tank pressures are out of operating range. Check air pressure.

NOTE:

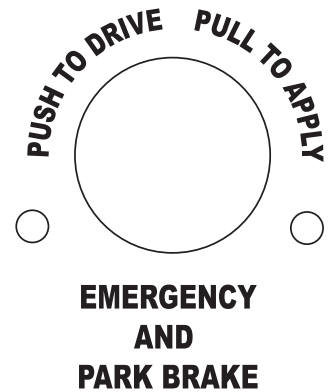
Layouts may vary with different models and options.

Parking Brake

The parking brake system is activated when the push-pull control knob (located on the driver's left console panel) is pulled. When the knob is pushed, the brake is released. Prior to driving, allow time for the air compressor to build up sufficient air to shut off the air warning lamp.

WARNING:

If the air tank is not dumped, an accidental release of the parking brake could occur. Traveling with small children and/or pets may require a small block to be fabricated to prevent accidental release. The block should be placed under the knob and rested on the dash panel. A wooden clothes pin clamped at the base of the shaft works. Wooden clothes pin is not shipped with unit.



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Switches

There are two types of switches used, one is lighted and the other type is non-lighted. Each switch has the function it controls printed on the switch. Press the top of the switch to start the function and press the bottom to stop the function. Following is a list of switches used and their functions.

PEDAL IN/OUT: Use the Pedal In/Out switch to adjust the brake and throttle pedal to be either closer or farther away. The switch moves the pedals inward or outward approximately three inches. If it is necessary to move the pedals inward, push the same switch in the opposite direction. When the pedal comes to the end of the traveling distance there will be a different sound in the noise of the motor. Stop by releasing the switch. Do not continue moving the pedals. Damage to the motor and or fuse may result if operation of the switch continues after reaching the fullest extend or retract position.

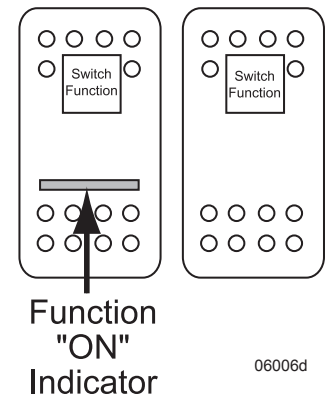
BATT BOOST: In the event the motorhome chassis battery has been drained and cannot start the engine, this switch momentarily "jumps" the domestic battery to the motorhome chassis battery to assist in starting the engine.

FOG LIGHTS: Turns fog lights **ON** and **OFF** for better visibility. The fog lights will operate with the Low Beam of the headlights.

SIDE DOCK: Operates the side docking lights to increase visibility when parking.

FANS: Operates dash fans for use with windshield defrosting, cooling and recirculation.

ATC: The ATC system improves traction on slippery or unstable surfaces by preventing excessive wheel slip. (See SECTION 10 for detailed information.)



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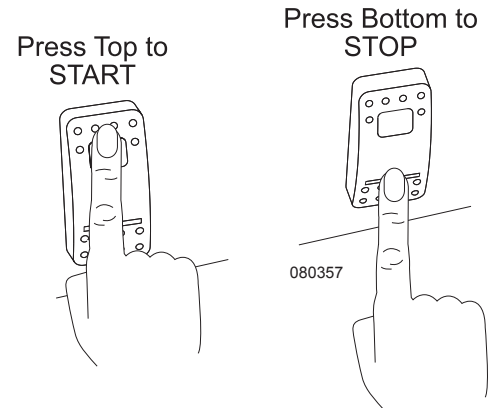
EXH BRAKE: The exhaust brake is an auxiliary braking device for slowing down the motorhome. The exhaust brake is an effective device for speed control in town and on local routes. The exhaust brake is not a substitute for service brakes. Do not neglect service brake maintenance.

ENG DIAG: Checks engine functions.

GEN SET: The generator automatically initiates a preheat cycle when the switch is pressed to **START**. The preheat cycle is indicated by the light on the switch flashing rapidly. Depending on ambient temperature the preheat cycle may last up to 15 seconds.

To Start the Generator: Press and hold the switch to **START**. The light flashes rapidly indicating the preheat cycle. At the end of the preheat cycle the engine will crank and start. Release the switch after the generator has started and is operating smoothly.

To Stop the Generator: Momentarily press the switch to **STOP**. It is not necessary to hold the switch until the generator has stopped.



STEP COVER: Extends and retracts the step cover.

DRIVER SHADE: Operates the power sun visor located on driver's side.

PASS SHADE: Operates the power sun visor located on passenger side.

MAP LIGHT: Turns **ON** and **OFF** map light

ENTRY STEP: Provides power to operate the Entry Step through magnetic switches.

CEILING LIGHT: Illuminates the front ceiling light from the Entry Area.

STOR LIGHTS: Turns the bay lights **ON** and **OFF**.

PORCH LIGHT: Turns **ON** and **OFF** the outside Porch Light.

WARNING:

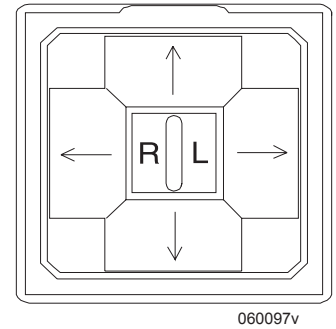
Stepwell cover is under air pressure. When operating the stepwell cover be sure there are no pets, shoes or other obstructions in the stepwell area. Do not operate the stepwell cover while standing in the stepwell area.

RADIO: Turns **ON** either radio or TV. Top position for TV and bottom position for radio.

AIR DUMP: Deflates air suspension with hydraulic leveling.

Controls

MIRROR ADJUST: To adjust the rear view mirror the small selector in the middle of the switch must be placed in the desired side. The middle position is to prevent accidental bumping of the switch and changing the mirror position. The outside mirrors have been placed so that they can be easily adjusted with the Allen wrench. After taking delivery of the new motorhome it is necessary to sit in the driver's seat and adjust the mirrors to driver's needs. Both the driver and the passenger mirrors should be adjusted.



MIRROR HEATER: This switch turns on the heaters in outside rear view mirrors. The mirror heaters should be used when defogging or deicing is needed. To use the mirror heat, press the switch to **ON**.



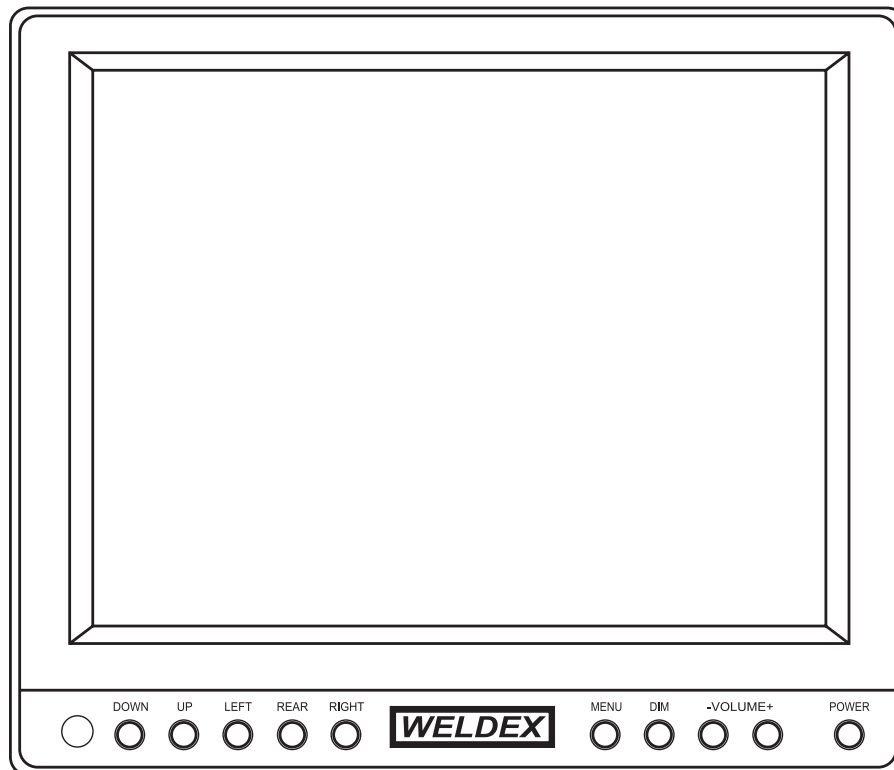
Headlight Control

NOTE:

Mirror heat should not be left on unless continuous fogging conditions occur.

HEADLIGHT: Pull one click to operate the parking lights. Pull two clicks to operate the headlights. Rotating the headlight switch clockwise dims the dash lights. Counterclockwise rotation illuminates the map light in the overhead compartment.

BACK UP MONITOR: Used with the back up camera and displays the rear view of motorhome.



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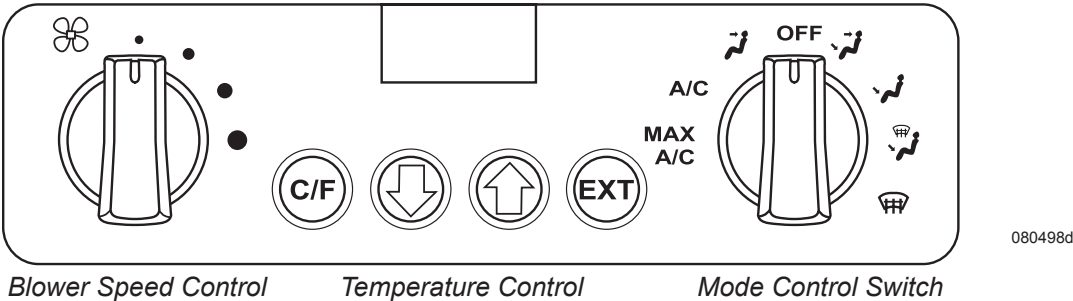
AIR CONDITIONER & HEATER CONTROLS

The system is designed to only provide heating, cooling and defrost for the pilot and co-pilot area. The system is not capable of heating or cooling the entire motorhome.

Blower Control Switch: This switch controls the four speeds of the blower motor. This is one of the best and most effective ways of controlling temperature. The blower will not activate until the Mode Control Switch is set to any position other than **OFF**.

Temperature Control Switch: Setting the switch to the Red zone controls an electric water valve regulating the amount of engine coolant passing through the heating coils in the system. Rotating to the blue zone sets the cut-in/cut-out temperature of the air conditioning compressor on the engine.

Mode Control Switch: This switch directs air flow by opening or closing damper doors. Use the Mode Control Switch to direct airflow where it is needed to maximize comfort in the cockpit area.



MAX A/C - Recirculated air is drawn from the passenger area and discharged through the dash louvers.



A/C - Fresh Air is drawn from outside into the system and discharged through the dash louvers.



VENT - Fresh air is drawn in and discharged throughout the dash louvers.



OFF - The blower motor does not operate. The fresh air inlet door will close, minimizing outside air infiltration into the motorhome.



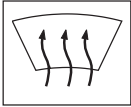
BI-LEVEL - Fresh air is drawn in and discharged through the dash and the floor.



FLOOR - Fresh air is drawn in and discharged through the floor louvers.



MIX - Fresh air is drawn in and discharged through the floor and defrost louvers. The A/C system operates to dehumidify the discharged air.



DEFROST - Fresh air is drawn in and discharged through the defrost louvers. The A/C compressor operates to dehumidify the discharged air.

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Heat and Defrost Operation:

- Set the Mode Control Switch to the desired position.
- Set the Temperature Control Switch to the red zone.

A/C Operation:

The air conditioning compressor operates in all modes, except vent, floor and off, to dehumidify the air. Rotate the temperature control switch to set discharge air temperature.

- Setting the Mode Control Switch to **A/C** allows outside air into the system.
- Setting the Mode Control Switch to **MAX A/C** recirculates inside air. When maximum cold air is desired, select this position.
- Set the Temperature Control Switch to the blue zone.

NOTE:

The temperature control switch must be set to the blue zone for cool air.

NOTE:

Activate the A/C system monthly to keep internal components of the compressor lubricated.

Winter Use:

- De-ice the windshield using the **DEFROST** mode.
- The system heats up faster with a slower blower speed until normal engine operating temperature is obtained.

Summer Use:

- Close all windows and vents preventing hot and humid outside air from entering the motorhome.
- **MAX A/C** and **HI** blower provides quick cool down.
- Using a lower blower speed produces cooler air.

Operating Tips and Hints:

- Air intake and discharge temperatures are greatly effected by ambient temperature and relative humidity.
- A large amount of cooling capacity is used to dehumidify air as well as cool it. After three to five minutes of A/C compressor operation, the discharged air temperature should be about 30° F cooler than the fresh or recirculated air entering the A/C system.
- The air system on the motorhome must have adequate pressure to operate the vacuum generator or damper doors will not function.
- At the beginning of the day, activate the compressor with the engine at idle. This avoids sudden high speed activation resulting in damage from lack of internal compressor lubrication.
- The dash A/C and heater system should be used monthly to keep the compressor lubricated.

Trouble Shooting:

The dash A/C/Heat system uses a combination of compressed air (developed by the chassis system), vacuum air (developed by the vacuum generator) and electric relays and vacuum switches. Therefore, any repair can be classified in one of five categories:

- **Electrical** • **Vacuum** • **Air Conditioner** • **Heater** • **Defroster**

The following information is provided for troubleshooting common operational problems which may occur.

No Heating:

1. A/C switch is turned off.
2. Blower switch is turned off.
3. Verify the proper engine coolant level.
4. Verify that the engine is reaching operating temperature.
5. Verify engine coolant is reaching water valve attached to unit.
6. Verify operation of water valve to permit engine coolant to pass through valve to heater core.
7. Check unit fuses.
8. Check power supply to water valve and grounding.
9. Check wiring.
10. Engine thermostat faulty.

No Cooling:

1. Check blower is operating, A/C switch is in A/C or Max position, temperature control is turned to Max cooling (blue area).
2. System fuses are not blown.
3. Condenser fan is operating.
4. Check power supply to unit and grounding of system.
5. Check wiring.
6. Coolant valve is leaking.
7. Drive belt is loose or broken.
8. Compressor Clutch is inoperative, will not engage.
9. Expansion Valve is faulty or frozen.
10. Thermostat control is faulty.
11. Mode control switch is faulty.
12. Compressor is faulty.
13. Loss of refrigerant.

Reduced Cooling:

1. Coolant valve not operating correctly.
2. Air passages are obstructed.
3. Loose or worn drive belt.
4. Check blower and select switch.
5. Thermostat control valve is faulty.
6. Expansion valve is faulty.
7. Compressor is faulty.
8. Low refrigerant charge.

Blower Does Not Operate or Runs Slow:

1. Check fuses.
2. Check for loose or corroded connection.
3. Check wiring.
4. Check to ensure ignition switch is **ON**.
5. Check blower and select switch.
6. Motor shaft has seized.
7. Blower wheel is out of alignment.

Damper Doors Do Not Operate:

1. Does the motorhome air tank have pressure?
2. Is the vacuum generator being powered and producing a vacuum?
3. Check the vacuum line entering the unit for vacuum.
4. Check that the vacuum solenoid mounted on unit is receiving power from the mode switch. If operating properly, the vacuum solenoid feels hot if current is engaging the solenoid.
5. Check the mode switch.
6. Check wiring.
7. Check for a pinch in the vacuum line leading to the vacuum motor that operates the damper door in question.

Air Conditioner Refrigeration Components:

Compressor - The compressor is belt driven from the engine through the compressor and electronic clutch pulley. The compressor pumps Freon from a low pressure gas into a high pressure, high temperature gas. This is the start of the refrigeration process.

Condenser - The condenser in front of the radiator is made of coils and fins which provide rapid transfer of heat from the refrigerant as external air passes over the coils. The high pressure gas is changed to a high pressure liquid.

Condenser Fan - A steady flow of cooling air is maintained across the condenser during system operations. The fan is part of the hydraulic system.

Receiver-Drier - Freon leaves the condenser, enters the dehydrator and is stored until needed. The drier filters out moisture in the system. It only takes one drop of moisture to cause a malfunction in the cooling unit.

Expansion Valve - The expansion valve suppresses the refrigerant into the evaporator according to the cooling requirements. The pressure is reduced in the restrictive effort of the expansion valve. A part of the valve is the capillary tube assembly. The capillary tube is the sensing bulb at the outlet of the evaporator.

Evaporator - A tube core and fins are used in the evaporator similar to the condenser. Air is blown through the fins to allow the evaporator to cool and reduce the pressure.

Blower and Motor - Just as the condenser has a fan, the evaporator has a fan called the blower. The blower draws air from the cab area and forces the air over the evaporator coils and fins. This forced air ensures continuous vaporizing of the R134a.

Relays and Switches - Both electronic and vacuum switches are used in the control and operations of the system.

About Refrigerants

Chemical Stability:

The air conditioning system life and efficient operation depends upon the chemical stability of the refrigeration system. The refrigeration system is made of Refrigerant-R134a and Polyakylene Glycol (PAG) synthetic lubricant. It is very important that all materials contained within the refrigerant system be chemically compatible.

The only suitable compound for use with R134a is PAG. The total amount of PAG within the refrigerant system is about 18% of the total refrigerant in the system.

How much refrigerant is in the system? How much should be used when charging? Use 1 oz. of PAG for each 7 feet of hose after the first 15 feet of hose. Roughly, a 40 foot motorhome uses 92 feet of refrigerant hose. Take 15 feet off the measurement and the result is 77 feet. This 77 feet is then divided by 7 for total of 11. This represents the number of ounces of PAG oil needed for the A/C system (11 oz.).

Carrying the formula one step further, the 11 oz. equal about 18% of the entire system. The total equates to about 61 oz. or 3.8 lbs. of R134a.

High pressure readings are another way to determine the amount of charge. The ambient temperature reading is measured one inch away from the condenser. The ambient temperature reading, plus 40° F, equates to a value from the pressure table.

EXAMPLE:

90° F 1 inch from condenser + 40° F = 130° F ----- 198.90 PSIG -

On fully charged system the expected pressure that should be seen on the HIGH-SIDE gauge is around 200 PSIG.

NOTE:

All systems are charged at the factory with 4.0 lbs of R134A.

TEMPERATURE	PSI GAUGE	TEMPERATURE	PSI GAUGE	TEMPERATURE	PSI GAUGE
16° F	15.69	60° F	57.47	112° F	151.30
18° F	17.04	65° F	64.10	114° F	156.10
20° F	18.43	70° F	71.19	116° F	161.10
22° F	19.73	75° F	78.75	118° F	166.10
24° F	21.35	80° F	86.80	120° F	171.30
26° F	22.88	85° F	95.40	122° F	176.60
28° F	24.47	90° F	104.40	124° F	182.00
30° F	26.10	91° F	106.30	126° F	187.50
32° F	27.79	92° F	108.20	128° F	193.10
34° F	29.52	93° F	110.20	130° F	198.90
36° F	31.32	94° F	112.10	135° F	213.70
38° F	33.17	95° F	114.10	140° F	229.40
40° F	35.07	100° F	124.30	145° F	245.80
42° F	37.03	102° F	128.50	150° F	263.00
44° F	39.05	104° F	132.90	155° F	281.00
45° F	40.09	106° F	137.30	160° F	300.10
50° F	45.48	108° F	141.90	165° F	320.00
55° F	51.27	110° F	146.50	170° F	340.80

psi gauge pdf.pdf

R-134a Refrigerant:

R-134a is classified non-explosive, non-flammable and non-corrosive. There is hardly any odor and it is much heavier than air. R134a is ozone friendly; however, it is not technician friendly. Proper care in handling and adequate ventilation must be observed. Under normal atmospheric pressures and temperatures R-134a will evaporate so quickly it freezes anything it comes in contact with. The open container boiling point for R-134a is minus 21.7° F. This low boiling point makes for an ideal refrigerant. The tremendous amount of heat transfer which occurs when a liquid boils, or vapors condense, forms the basic principles of all A/C systems. The amount of heat required to raise or lower the temperature of one pound of water by 1° F equals one British Thermal Unit (BTU). The BTU is the standard measurement of an air conditioner system.

Safety and Handling of R-134a and Pag Oil:

- When working with any refrigerant system wear eye protection and hand protection.
- Pag Oil irritates the skin. Flush with water immediately if in contact with any body part.
- Ensure any service work performed on the A/C system is in a well ventilated work area.
- Keep open flame away from service area. The discharge of a refrigerant gas near an open flame can produce a very poisonous gas.

NOTE:

O-rings used in a R-134a system are Hydrogenated Nitrile Butadiene Rubber (HNBR). These are green in color and required for the R-134a system.

A/C Heater:

The A/C system also produces heat to warm the air in the dash area. Much like the refrigeration side of the system, a liquid is used in the process. This liquid is the engine coolant. The coolant is passed from the radiator to an electronic water valve. The water valve, when open, allows the coolant to flow through the heater core. The heater core is tubing and fins. Air is drawn into the system by a blower motor through the outside recirculation door opening. Air is blown through the A/C evaporator core and then through the heater core. When the temperature control is in the **WARM** position coolant flows through the heater core. When the temperature is in the **COOL** position coolant flow bypasses the heater core. In either position the air flow is felt at the discharge vents.

Diagnosis of Electric Water Valve:

Theory of Operation: The thermostat is a potentiometer. The water valve, which controls the water flow to the heater core, is opened and closed by a stepper motor mounted on the water valve. A control module compares the output voltage from the potentiometer to the feedback for the stepper motor of the water valve. The control module then drives the motor to within one-half volt of the control potentiometer voltage.

Functional Test:

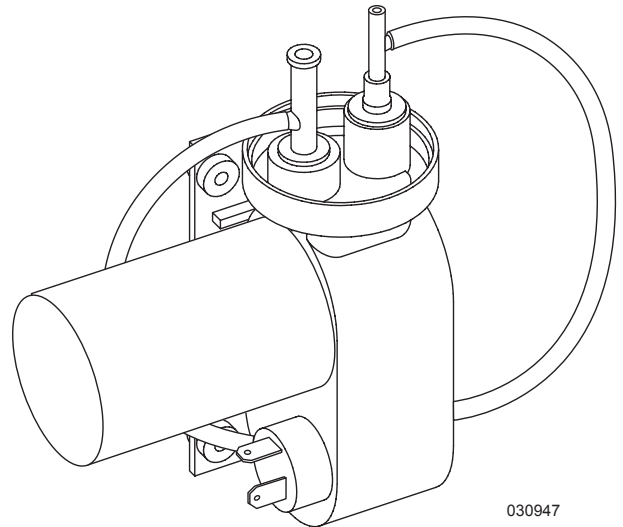
- Start and operate the engine until the water reaches normal operating temperature.
- Set the HVAC temperature control to the full hot position.
- The discharge air outlets should have hot air.
- Rotate the temperature control to full cold position.
- Allow 10 minutes for the temperature to stabilize.
- The discharge air outlets should have cold air.

No Heat:

- Check the blower and air mode operations. Repair prior to proceeding.
- Verify the engine is reaching normal operating temperature. (Check with engine manufacturer for proper procedure.)
- Check the inlet hose at the water valve. The hose has hot water at the valve inlet. The inlet water temperature should be the same as the engine water temp.
- With the temp control on full hot position, check the outlet hose of the water valve. The hose should be at engine water temperature.

Vacuum Generator:

The vacuum generator is important to the operation of the dash heating and A/C systems. This provides the vacuum to open and close the vacuum switches. When the vacuum generator is operating it creates 15 inches of vacuum and is passed to a reservoir ball. Most dash heater and A/C systems only requires 10 inches of vacuum to operate the switches. The output from the reservoir is sent to the vent control knob. The control knob then directs the vacuum operation to the appropriate vacuum switch to open or close vents and switches. The vacuum generator uses the air from the front air storage tank through a 1/4 inch red air line. Whenever the ignition is **ON**, and the A/C is operating, the vacuum generator operates.



030947

STEERING COLUMN

Tilt & Telescope

Tilt and Telescope Steering Wheel Control Lever: Located on the Steering Column.

- To tilt the steering wheel pull the lever up. Tilt the steering wheel where desired. Releasing the lever locks the steering wheel in the new position.
- To telescope the steering wheel push and hold the lever down. Push down or pull up on the steering wheel until the wheel is in place. Release the lever and the steering wheel locks in the new position.

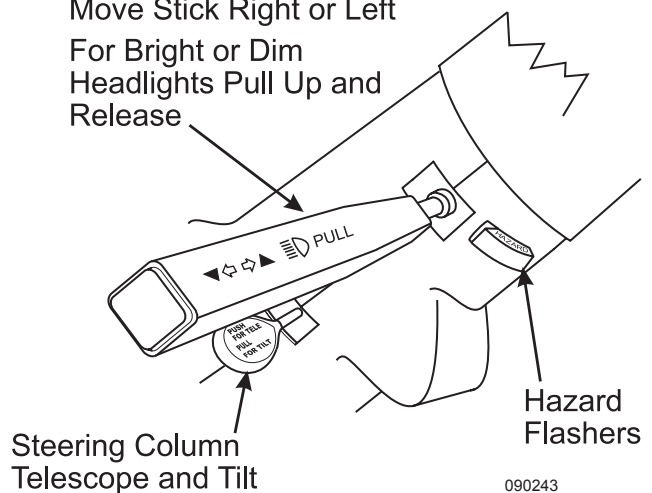
Turn Indicator and Headlight High/Low Dimmer Control Lever: Located on the Steering Column.

- Pushing the lever forward activates the right turn indicator circuits when the ignition is on.
- Pulling the lever down activates the left turn indicator circuits when the ignition is on.
- Pulling the lever up selects high/low beam circuits when the headlights are **ON**.

Hazard Flasher Button: Located on the Steering Column:

- Pull out on flasher button to turn four-way flasher **ON**.
- Push button inward to turn flasher **OFF**.

For Turn Signals
Move Stick Right or Left
For Bright or Dim
Headlights Pull Up and
Release

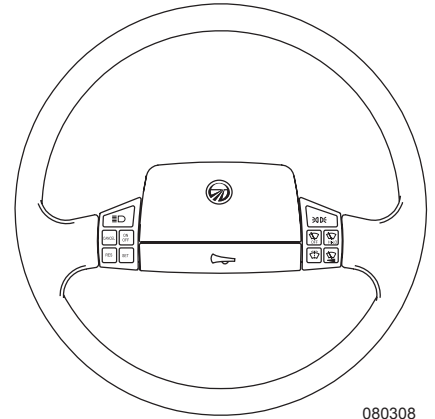


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STEERING COLUMN & SMART WHEEL

The steering wheel system consists of electronic modules enclosed in the steering wheel and the Master Controller typically located in the front run box. Four wires utilizing a “clock-spring” connector in the steering column accomplish communication between the steering wheel and the Master Controller. The Master Controller decodes the signal for the closed switch and operates the corresponding outputs for that function. Two additional wires provide power and ground for the steering wheel backlighting.

The 3 Amp fuse on the Master Controller is for backlighting the switch panel. LED draw is about 20 mA. Another function of the smart wheel is the “High Idle” feature.



Smart Wheel Operation

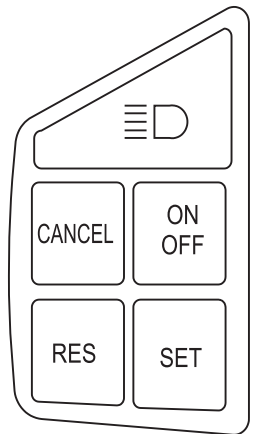
HORN:



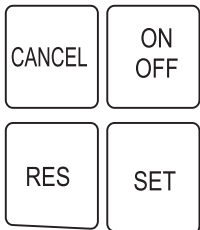
The horn bar on the steering wheel sends the appropriate signal to the Master Controller causing the HORN output to activate while the switch is pressed.

HEADLAMP FLASH:

When headlights are **ON**, pressing the switch turns them off as long as the switch is pressed. Similarly, when the headlamps are **OFF**, pressing the switch causes the headlights to illuminate as long as the switch is pressed.



Cruise Function:



- **CANCEL** - Signals cruise system to disengage without losing the current speed memory setting.
- **ON/OFF** - Cycles cruise system **ON** and **OFF**.
- **RES (RESUME)** - Actuates cruise resume function of engine controller.
- **SET** - Actuates cruise set function of the engine controller.

WARNING:

Do not use cruise control in heavy traffic or on roads that are winding, slippery or unpaved. Do not shift the transmission into “N” (Neutral) with the cruise control on. High engine RPM run up will occur until the cruise control is turned off.

NOTE:

Cruise Control cannot be used if exhaust brake switch is ON.

Wiper Function

The windshield wipers are driven by a single motor. Any wiper function generates a Headlamp On signal from the Master Controller. To disengage automatic headlight illumination, turn off the ignition, or activate and then deactivate the dashboard headlamp switch.



Marker Flashlamp:

Pressing Marker Flash lamp causes the taillights and all marker lights to momentarily flash.



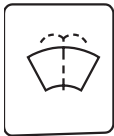
OFF:

Cancels all wiper operations. Wiper function is also cancelled when the ignition is turned off.



HI-LO:

When the button is pressed, wipers activate on low speed. If the button is pressed again, the high wiper speed setting is activated. Subsequently pressing the **HI-LO** button will alternate wiper operation between low and high speed mode.



Wiper Wash:

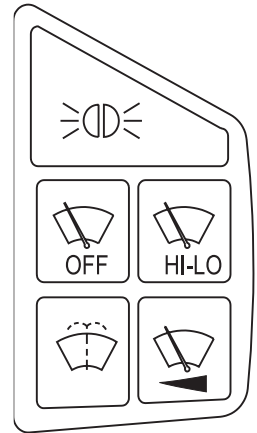
Activates the wash pump relay while the button is pressed. If no wiper function has been selected, the low wiper will activate for a period of approximately three wiper cycles after the switch is released. If any wiper functions have been selected, the wipers will continue to run in the selected mode after the wash button is released.



Wiper Variable:

Operation of the Wiper Variable button causes the low speed wiper function to activate for one wipe. If the button is pressed again within approximately 30 seconds, the low speed wiper function activates again and repeats at an interval determined by the time between the last two operations of the button. Additional button operations will shorten the cycle. Activating other wiper modes cancels the variable mode.

An example: In light rain or misting conditions, press the button once to initially clear the windshield. If the windshield requires a second clearing, press the button again, setting the timed interval between subsequent wipes required by the current conditions. To extend the wipe interval, press the intermittent button twice more, or switch the wipers off and use the same method to set the desired interval.



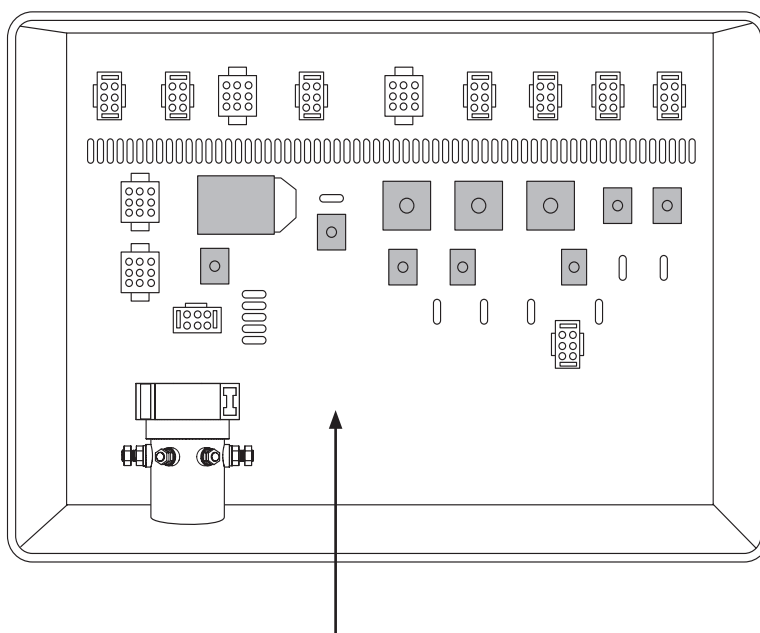
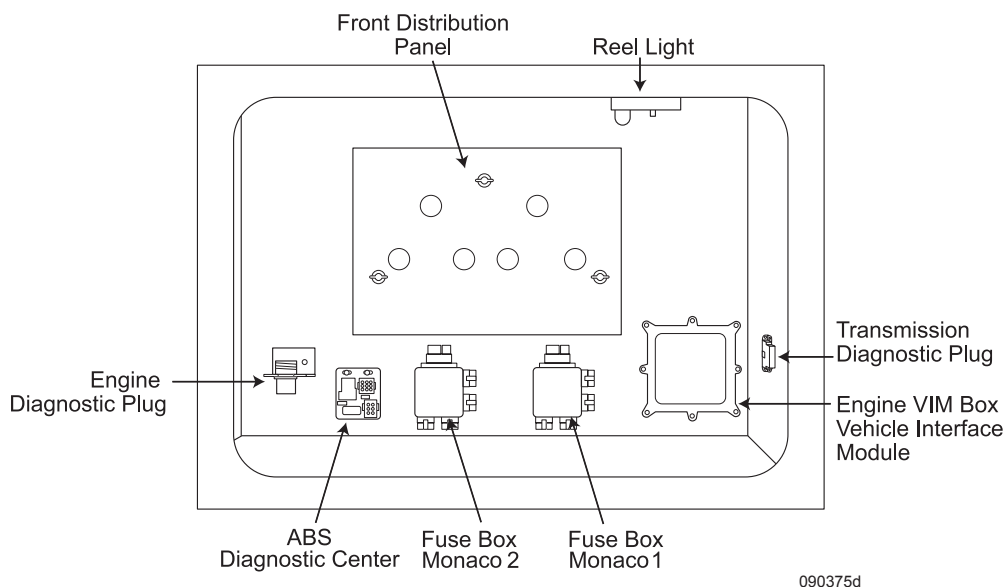
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FUSE & CIRCUITS

Front Distribution Panel

The front electrical panel is located in the outside roadside front compartment and contains the fuses, self resetting and manual reset supply circuit breakers, solenoid and relays.

The automotive fuses are located in the front electrical panel. The fuses are the standard plug-in type (ATM). When a fuse “BLOWS,” the wire in middle of the plastic case will be broken. A bad or blown fuse must be replaced with a fuse of the same rating and type. Using a fuse of a different type rating will defeat the circuit protection provided by the fuse, which could result in damage to the motorhome electrical system. If a fuse has been replaced and it “BLOWS” repeatedly, that may be an indication that a fault exists or an electronic component has failed. It is recommended that the motorhome be taken to a qualified RV technician before any future use to diagnose and repair the problem. Circuits are identified on the fuse label located on the inside of the electrical door. Remove 3 wing nuts, turn cover over to view.



Inside of Front Distribution Panel

060307

ALTERNATOR

The alternator is designed for output through the engine operating range. When traveling, keep an eye on the voltmeter in the dash area. Normal readings should be between 13 to 14.5 Volts DC. Voltage indications higher or lower indicate a potential problem with the charging system. If the alternator output drops below an acceptable level, a charge indication warning lamp illuminates.

The alternator replaces amp hours the chassis battery used to start the engine. The amount of charge the alternator sends to the chassis battery is dependent on the amount of time the engine is operated. Repeatedly starting the engine for short periods may not be enough operating time to adequately replace the amp hours the chassis battery uses to start the engine.

The function of the alternator is an electrical system voltage maintainer, not a battery charger. When the engine is operating, the alternator maintains electrical system voltage relative to a load, such as headlights and windshield wipers. When a heavy load is placed on the alternator, such as trying to charge dead house batteries, the operating temperature of the alternator increases. Excess operating temperature of the alternator for extended periods of operation can lead to premature failure of the alternator.

NOTE:

The alternator is not designed to charge the house batteries from a complete discharge to a full state of charge. The alternator will maintain the battery charge during travel, supplying the DC current necessary to operate running lights or other DC loads.

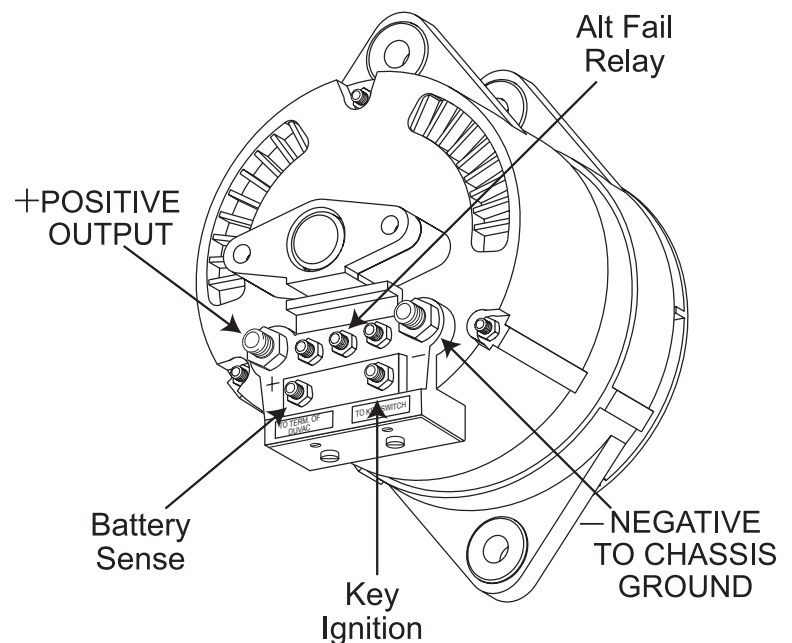
If the house batteries are in a low state of charge, it is recommended to charge the house batteries with the inverter or an auxiliary battery charger before driving the motorhome.

CAUTION:

Long-term use of the inverter to operate the microwave while in transit damages the alternator. Use the generator to operate the microwave while in transit.

CAUTION:

Standard is 160 Amp.



090347b

Specifications:

- 160 Amp standard
- The integral rectifier system utilizes 12:50 Amp diodes mounted in multiple aluminum heat sinks for efficient heat dissipation during high-output operation.
- Aluminum housings
- Bi-directional fan
- Front bearing: 305 cartridge type
- Enclosed brush system
- Operation Ambient Temperature Range (-40° to 200° F.)
- Negative Ground Configuration
- Regulator Adjustment Range 13.6 to 15.4 Volts
- Batteries may start to gas at 14.3 Volts
- Max. Operating RPM 8000

Alternator Testing Procedure:

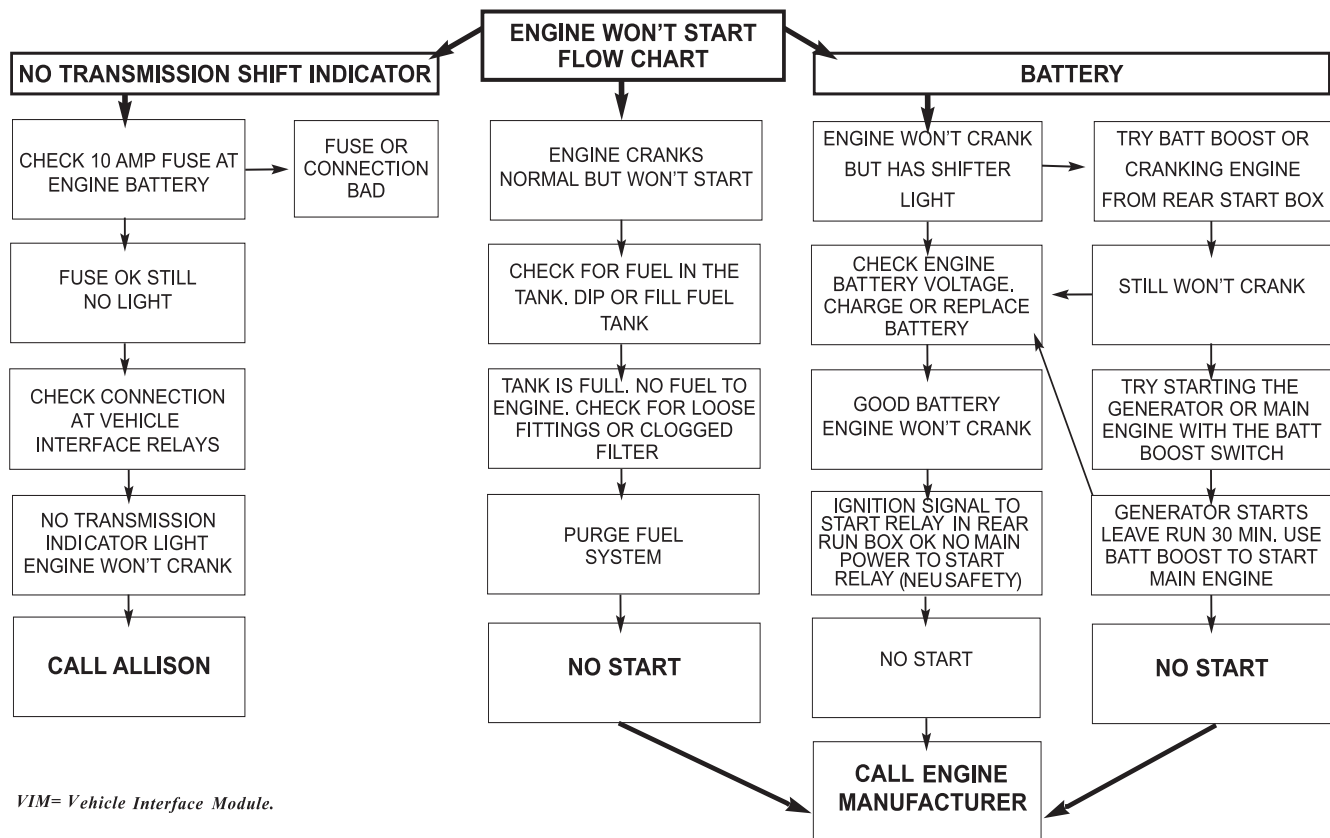
- Check all wiring for burnt or loose electrical connections. Repair as needed.
- Check all grounds and electrical connections to be sure they are clean and tight.
 - a. Alternator ground to chassis frame.
 - b. Motor block ground to chassis frame.
 - c. Chassis battery ground to chassis frame.

Inspect the alternator for damage. A broken fan blade can damage an alternator or make it out of balance.

- Check belt, pulley and fan for wear. Replace as needed.
- Never attempt to disconnect the battery or battery wire from the alternator with the engine running. This can cause damage to the alternator or the regulator.
- The pulley for the alternator should be torqued to 80 foot pounds.
- Chassis battery voltage, with the engine **OFF**, should range from 12.2 to 12.7 Volts DC.
- Chassis battery voltage with the engine at idle, should range 13.5 to 14.2 Volts DC.
- The output of the alternator range is 13.6 to 15.4 Volts DC. Connect a voltmeter to the (B+) terminal of the alternator and chassis ground. Idle the engine up to 1200 RPM.
- Connect a clamp-on amp-meter, if available, to the positive battery cable to verify the battery state/rate of charge.

NOTE:

Remember the alternator is not a battery charger, but designed to maintain proper electrical system voltage. A battery with a low state of charge, or a dead battery, may overheat and damage the alternator.



NO START CHART PANTHER 05

CAMELOT 2006

CHASSIS INFORMATION — SECTION 10

CHASSIS - INTRODUCTION	257	OIL RECOMMENDATIONS.....	289
AIR SUPPLY SYSTEM.....	258	Routine Oil Maintenance.....	290
Air Governor	259	Cold Weather Engine Operation.....	290
Air Storage Tanks.....	259	ENGINE SHUTDOWN	291
AIR SYSTEM CHARGING (EXTERNAL).....	260	Extended Engine Shutdown	291
Air Coupler.....	260	CONSOLE	292
BRAKE SYSTEMS	261	Transmission Shift Selector	292
Air Brakes	261	Transmission Check Light	293
Park & Emergency Brake System	261	Periodic Inspections	294
Brake Adjustment/Slack Adjuster	262	TRANSMISSION LUBRICATING FLUID	295
Brake Systems - Back-up.....	262	Fluid Levels - Cold Check	296
ENGINE EXHAUST BRAKE	262	Fluid Levels - Hot Checks	297
Maintenance	263	COOLANT SYSTEM.....	297
AIR DRYER.....	264	Coolant.....	298
Desiccant Cartridge.....	265	Coolant Additive (SCA).....	299
Desiccant-Type Air Dryer	265	Maintenance Procedures	299
Air Dryer Cycle.....	265	CHARGE AIR COOLER	301
Air Springs Inspection	266	FUEL SYSTEM.....	302
RIDE HEIGHT VALVES	266	Fuel Sender.....	303
Adjusting Ride Height.....	267	Fuel Filters	304
ABS/ATC SYSTEM (ANTI-LOCK BRAKES)	268	Fuel Line & Hoses	304
Automatic Traction Control System.....	270	HYDRAULIC SYSTEM	305
FRONT AXLE	271	Hydraulic Pump	305
Alignment Specifications	272	Hydraulic Cooler	305
Lubrication Maintenance Safety	274	Hydraulic Fan System.....	306
Steering Components.....	275	Thermostat	306
Intermediate Steering Shaft	276	Switching Valve.....	306
Drag Link.....	276	Hydraulic Reservoir.....	306
Center Link	277	Air Filter	307
Steering Spindles	277	Air Filter Minder.....	307
Control Arm Bushings	277	LUBRICATION CHARTS.....	308
DRIVE AXLE & DRIVE SHAFT	278	SPECIFICATIONS DIMENSIONS CHART.....	310
Lubrication Maintenance	279	CHART - FILTERS & BELTS.....	311
U-Joint Angles Phasing & Driveline Balance	280	BATTERY SPECIFICATION CHART	312
TAG AXLE.....	281	METRIC/U.S. CONVERSION CHART.....	313
SHOCK ABSORBER.....	282	MAINTENANCE RECORD	314
LEVELING SYSTEM	283		
ENGINE - GENERAL INFORMATION	285		
STARTING PROCEDURE	287		
Normal Starting.....	287		
Cold Weather Starting	287		
Tips	288		

CHASSIS - INTRODUCTION

This section contains knowledge and information on various components of the motorhome chassis. Following the guidelines and procedures will help you to understand and operate your motorhome. Complete instructions for engine and transmission are located in their respective operators manual included in the Owner's Information File box.

WARNING:

When welding is involved for motorhome repair or modification, only qualified, experienced technicians should weld on the chassis. Improper welding procedures and materials may weaken the assembly or result in damage that is not obvious and may not cause an immediate problem or failure. Unauthorized modifications or repairs to the chassis could result in a forfeiture of warranty coverage.

DANGER:

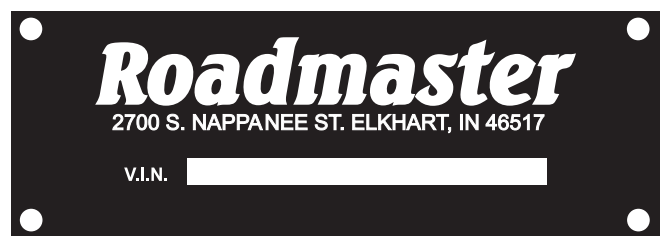
Due to the sensitive nature of the electronics on the chassis, the following precautions are required to protect electrical components in the motorhome chassis:

- 1. Disconnect the (+) positive and (-) negative battery connections.**
- 2. Cover electronic control components and wiring to protect from hot sparks.**
- 3. Disconnect the terminal plugs from the engine Electronic Control Unit, located on the passenger side of the engine block.**
- 4. Disconnect all the plugs from the transmission Electronic Control Unit, located in the storage bay between the frame rails.**
- 5. Disconnect the wiring from the alternator.**
- 6. Do not connect welding cables to electronic control components.**
- 7. Attach the welding ground cable no more than two feet from the part to be welded.**

The Roadmaster chassis design provides exceptional balance, handling and braking characteristics. The Roadmaster chassis is an engine and frame unit featuring an all steel frame design, providing greater structural integrity and uniform stress distribution. Incorporated in the Roadmaster chassis is the air suspension system using eight air bags and gas shock absorbers. The design and set up is intended to provide the smoothest ride, best handling and trouble free service while delivering excellent drivability. The chassis has a three-point hydraulic leveling system. The Roadmaster chassis design offers unsurpassed ease of maintenance and service.

The towing system rating incorporated in the construction of the frame is 10,000 lbs. towing and 1,000 lbs. tongue weight.

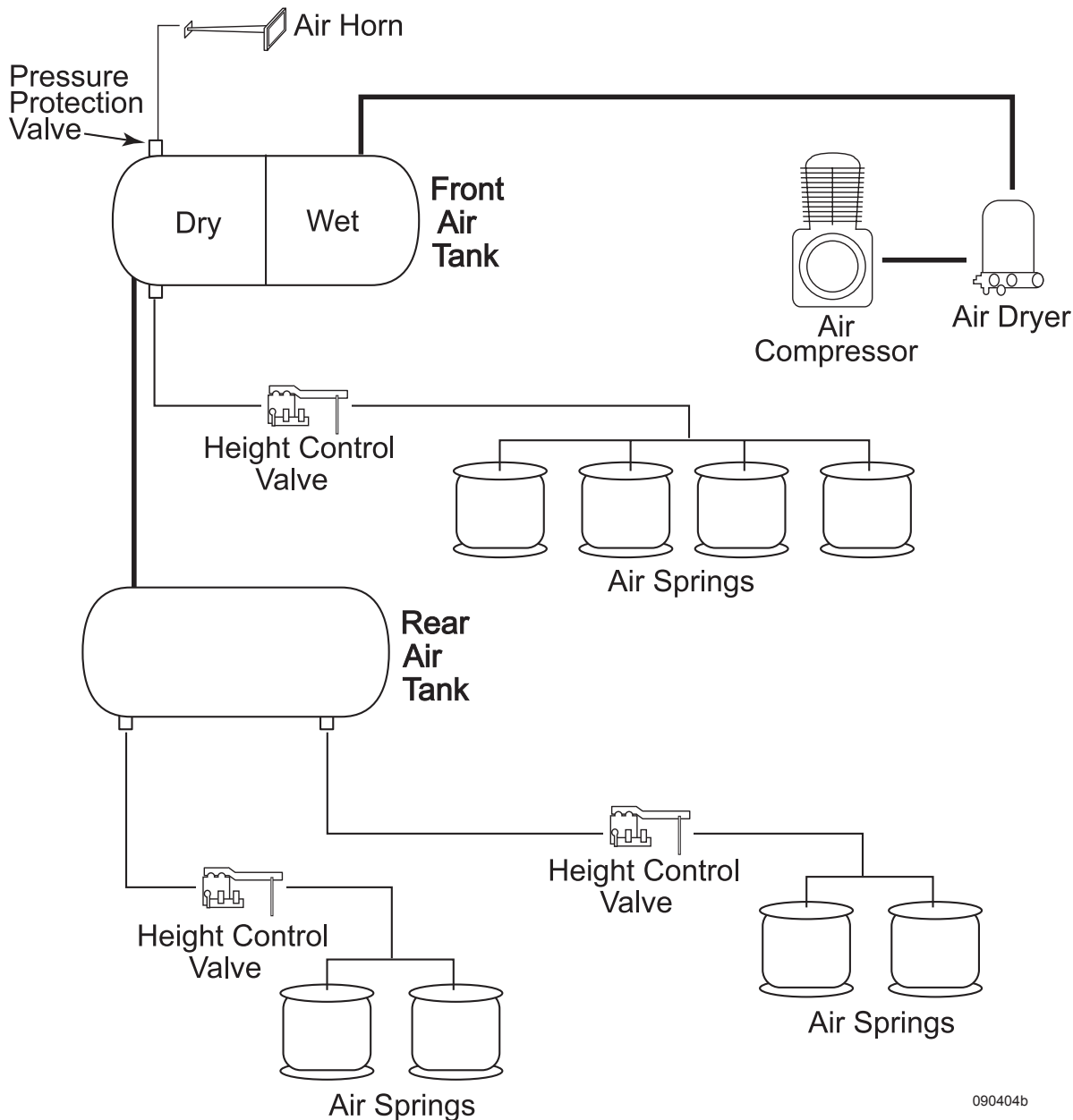
The Roadmaster's exclusive stacked-rail chassis with air suspension consists of front and rear axles, with trailing links. A panhard bar on each axle controls side motion. Each axle mounts to the trailing links that are connected to the chassis. The stacked rail design of main chassis offers increased bay storage space. The suspension control arms attach to the frame through bushings, which require no lubrication. The preset suspension ride height automatically maintains proper suspension height throughout the load range.



100168c

AIR SUPPLY SYSTEM

The air compressing system on the motorhome is comprised of several items: air compressor, air governor, air dryer, a front air tank and a rear air tank. The compressed air system operates several items, some of which include brakes, suspension, air horns, air gauge. The air system is charged by a gear driven air compressor mounted on the engine. As engine speed increases, compressed air output increases. When air is compressed, heat is generated. Heat dissipates as air is discharged from the compressor. Moisture condenses in the compressed air as it cools. The moisture laden air then enters an air dryer where the air is filtered. The filtered air charges the front air tank. The front air tank is divided in two halves: a wet side and a dry side. The compressed air enters the wet side before entering the dry side. A discharge line from the dry side of the front air tank charges the rear air tank. Discharge lines use inline check valves to prevent back flow of compressed air.

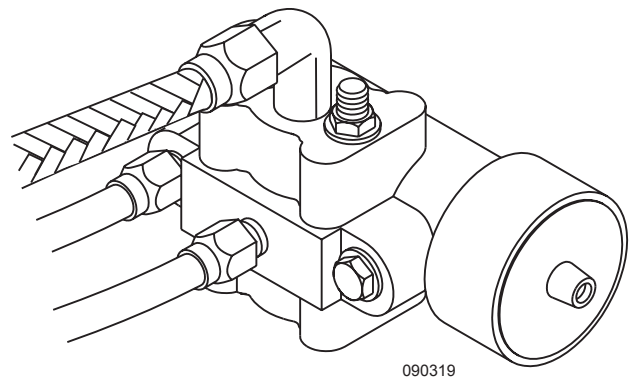


The pneumatically operated items are divided into two categories: brakes and accessory air. Brakes have full use of supplied air pressure. Accessory air items, such as air horns, receive air through pressure protection valves (PPV). The PPV will not allow compressed air flow until about 60 psi. In the event of an air system problem, the pressure protection valve will leave a reserve air charge for braking. Pressure protection valves are installed for safety.

Air Governor

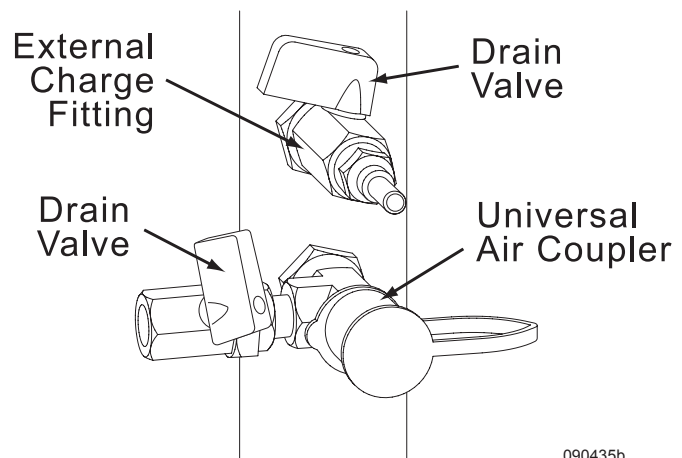
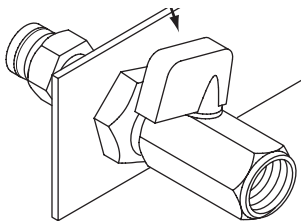
The air governor, located in the engine compartment, regulates the air compressor to cut-in and cut-out, keeping the air system in the specified operating range of 105 to 120 psi, then sends an air “purge” signal to the Air Dryer.

Cut-in pressure of about 105 psi is factory preset from the governor manufacturer and is not adjustable. Cut-out pressure is calibrated to 120 psi. When cut-out pressure is reached, the governor will send an air purge signal to the Air Dryer. This opens the purge port of the Air Dryer, expelling moisture. The purge action of the Air Dryer is identified by the short release of air at the rear of the motorhome.



Air Storage Tanks

The front and rear air tanks should be manually drained once a month, or more, depending on operating conditions where humidity is high.



Air Drains:

Air system tank drains are located in the generator compartment and in the rear engine compartment. The air tanks should be drained at least once a month or more often in areas of high humidity and where temperature fluctuates 40° F or more daily.

To Drain the Tanks:

- Slowly open the drain valves as moisture will be expelled under pressure. After all moisture and air is purged from the tanks, the valves should remain open an additional five minutes to allow any moisture remaining a chance to drain.
- Close valves and start engine. Check valves for leaks.

WARNING:

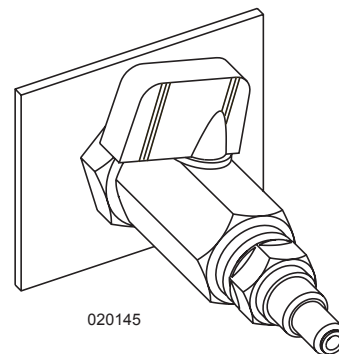
Wear safety glasses to prevent eye injury from expelled moisture. Open drain valves slowly as moisture will be expelled under high-pressure.

NOTE:

Both air tanks have a pressure relief valve which is set to release at about 130 psi.

AIR SYSTEM CHARGING (EXTERNAL)

The air system on the motorhome can be charged from an external air supply source. Located in the front generator compartment is a type C automotive male fitting. Caution should be used when charging the air system from this fitting. The air supplied from an external source may contain moisture. Compressed air introduced into the air system from this fitting is not filtered by the air dryer. The auxiliary air charge fitting will charge the front and rear air tanks. A shut-off valve is installed to prevent air from escaping.

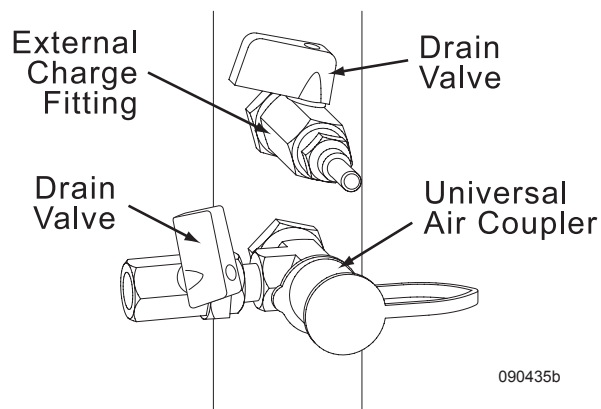


CAUTION:

The external air supply source should be regulated to charge the air system on the motorhome no higher than 120 psi. Damage to the air system or pneumatically operated items may occur.

Air Coupler

Provided for convenience is a remote air supply coupler located in the generator compartment. This female fitting will accept type C automotive connectors. This auxiliary air fitting may be used to inflate tires, air mattresses or other pneumatic items. This fitting is not designed to charge the air system on the motorhome. The air supply for the auxiliary air fitting is charged from the front air tank through a pressure protection valve.



To use this feature:

- Slide the locking collar back. Using a firm grip, fully insert the air fitting into the auxiliary air supply. Release the locking collar to retain the air fitting after the fitting is properly inserted.

To remove fitting:

- Firmly grip the air hose near the fitting to prevent recoil.
- Slide the locking collar back to release fitting.

NOTE:

There are small air pressure restrictions in the pressure protection valve and tire stem valve. Due to this restriction, the maximum amount of tire pressure achieved when the system is used to fill a tire is about 95 to 105 psi with air system on the motorhome charged to 120 psi. Maximum outlet air pressure is achieved when the air system completes the fill cycle indicated by the purge cycle of the air dryer.

BRAKE SYSTEMS

Air Brakes

The air brake system on the motorhome differs from a conventional automotive hydraulic braking system and should be treated differently. Proper maintenance and lubrication are the keys to keeping the air brake system in proper working order.

The air system supplies air to the foot brake, or treadle valve. Pushing down on the treadle valve supplies an air charge signal to a sealed brake chamber that consists of a spring and air bladder. The air charge signal pushes on the bladder and extends a threaded rod connected to the automatic slack adjuster. The slack adjuster rotates the S-cam expanding the shoes against the drum. Air disc brakes follow much the same principle, with the exception of the threaded rod directly activating calipers.

Consideration needs to be given to stopping distances and air system pressures. The motorhome requires longer stopping distances. Each brake application uses air from the air system, and engine speed is directly proportional to how fast that air system is replenished. Prepare for downhill grades. It may be necessary to select a lower gear and/or use the engine brake. Use individual short brake applications down long hills, rather than “riding” the brakes, to extend the life of the brake lining. Avoid overheating the brakes. Hot brakes have less stopping power. When maneuvering the motorhome around small areas, or backing into spaces, several individual brake applications might be made. Watch the air gauge. When preparing to back into a space swing the motorhome so it is aligned with the parking slot before backing up.

The air braking system on the motorhome is equipped with a low air pressure warning system safety feature. Should a low air condition arise while the vehicle is in operation, a warning buzzer will sound and a dash warning light will illuminate at approximately 60 to 65 psi (pounds per square inch) to alert the operator.

Park & Emergency Brake System

The Park and Emergency Brake System (Spring Brakes) applies to the rear drive axle only. When the park brake is applied, air is released from the rear brake chambers, allowing the large spring in each rear brake chamber to manually push the brake pads against the rotor. The air system must be charged above 35 psi to allow the park brake to release. Pushing down on the park brake handle charges the rear brake chambers with air pressure, overriding the emergency brake springs and releasing the brakes. In the event of air loss while the vehicle is under operation, the park brake automatically applies (this occurs at about 30 psi), acting as an automatic emergency brake system.

When preparing to depart, allow the air system to achieve full air pressure as indicated by the air gauge needles. Listen for the air dryer to purge, indicating that the air dryer is functioning. Look and listen for abnormalities. Abnormal air pressure readings by either needle of the air gauge alerts the operator to have the air system checked to avoid an untimely failure.

Should a failure occur in the air system, preventing the air pressure from building, it may become necessary to “cage” the spring brakes (“cage” procedure in **Section 2 Towing Procedures - Disabling Parking Brake**). This is an emergency procedure only. Caging the rear air brake chambers manually overrides the spring brakes and allows the vehicle to move. This procedure does not affect normal service braking.

NOTE:

When the park brake is released, the park illumination lamp remains lit until air system pressure is above 65 psi.

WARNING:

When parked, if the air tank is not depleted, there is the possibility of an accidental release of the parking brake. Traveling with small children and/or pets may require a small block to be fabricated to prevent accidental release. The block should be placed under the knob on the dash panel. A wooden clothes pin, clasped at the base of the shaft, will work.

Brake Adjustment/Slack Adjuster

The motorhome is equipped with automatic slack adjusters. As brake lining wears, the slack adjusters will automatically ratchet on the return stroke as needed. This ratchet action keeps the brake lining at proper adjustment. Brake adjustment should not be necessary. Indications of a vehicle needing possible brake adjustment may be noticed by the park brake not holding on a hill, or gradual loss of braking power. Automatic slack adjusters and the connecting S-camshaft require periodic lubrication.

NOTE:

Replacement parts should be of the same original equipment size and type. Mixing brake components may result in unequal braking action. Brake adjustments are part of normal maintenance of the motorhome. Brake adjustments are not covered by the manufacturer warranty.

WARNING:

Brake lining may contain asbestos material and should only be serviced by qualified service technicians who are trained in the appropriate precautionary procedures. If any loss of braking effectiveness or abnormal braking indications are noticed, the brakes and slack adjusters should be inspected by a qualified brake technician.

Brake Systems - Back-up

The motorhome air braking system is equipped with back-up safety systems and warning alarms in case of an air system failure. Refinements to air braking systems have been instituted with safety as top priority.

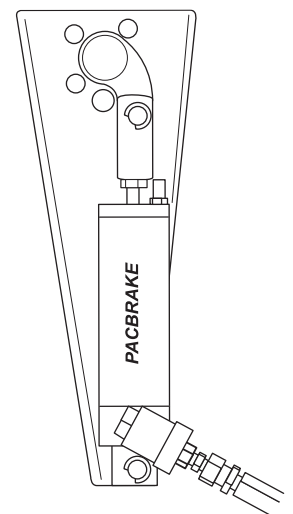
One back up safety is the air system separation of the front and rear brakes, implemented by using two air tanks. One tank is located in the front and the other is located in the rear. This separation allows the front air tank to operate the front brakes; the rear tank operates the rear drive axle brakes. This tank division gives reassurance in case one tank experiences a failure of an accessory air item allowing the compressed air to escape.

In another situation, whereby all compressed air has escaped from the rear air tank, a pneumatic back-up safety valve is installed. This is the safety inversion valve. The inversion valve senses the absence of rear air tank pressure. In this case the inversion valve allows the operator to make a modulated spring brake application, made in conjunction with the emergency spring brake relay valve. The inversion valve allows the front air tank pressure to recharge the rear brake chambers after the modulated spring brake application has been made. This back-up system implements use of all the brakes, allowing the operator to bring the vehicle to a safe stop. In case of all compressed air charge escaping from the front air tank, the operator still has full use of the rear brakes.

ENGINE EXHAUST BRAKE

The Pac Brake exhaust retard system is an auxiliary braking device that is attached directly to the engine turbocharger. The exhaust brake operates by using a dash switch. The dash mounted switch operates the exhaust brake when dash switch is "ON" and throttle is "RELEASED."

When the exhaust brake is activated, a flapper inside the exhaust brake moves and restricts the flow of exhaust gases. This causes an increase of exhaust pressure within the engine. Increased exhaust back pressure quickly slows engine speed, resulting in powerful engine braking action. When the exhaust brake is activated, the amount of engine braking power developed is related to engine speed (RPM). When an exhaust brake application is made, the engine braking affect increases with higher engine RPM.



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The exhaust brake is wired to the electronically controlled transmission. When the exhaust brake is activated going down a hill, it helps control road speed or sufficiently slow the road speed until the Allison Transmission can automatically downshift to the next lower gear. Downshifting automatically occurs from high gear down to second gear. Certain road conditions and engine speeds may require the transmission be manually shifted down in order to generate adequate engine RPM and increase the engine brake effect.

NOTE:

The brake lights illuminate while the PAC Brake is applied.

NOTE:

Cruise Control will not engage with the exhaust brake switch in the ON position.

Maintenance

The exhaust brake system, used routinely at normal exhaust operating temperatures, is virtually maintenance free. There are contributing causes which can result in failures with the exhaust brake, including moisture, dirt, carbon, and improper usage.

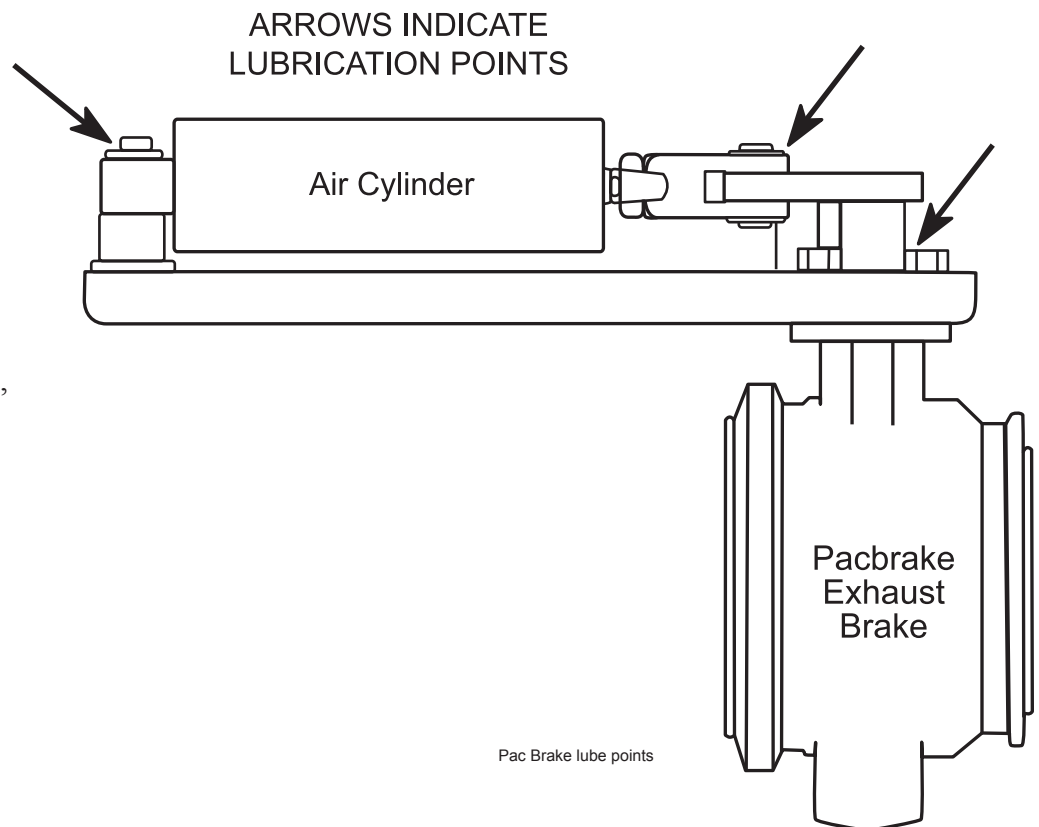
Starting the engine and idling for short periods of time is not recommended. Moisture is created within the engine and the exhaust system during cold startups. When normal operating temperatures are not obtained, moisture may get trapped in the valve housing resulting in rust and leading to insufficient operation of the exhaust brake.

To help prevent exhaust brake freeze-up, caused by periods of non-use, it is recommended to use silicone spray at the points shown. Apply liberal amounts of silicone spray to the moving joints whenever the motorhome is parked for storage. Use a pair of pliers to manually operate the valve several times to work the lubricant into moving parts.

NOTE:

Do not use petroleum-based lubricants as these will burn off and possibly create a fire hazard.

Some problems that may be encountered with the exhaust brake include, but are not limited to, will not activate or deactivate, intermittent on/off operations or actuates with the switch off. These are commonly related to electrical symptoms. Other problems such as slow operations, delays in operations, and limited performance are mechanical symptoms. Refer these problems to the dealer for diagnosis.



AIR DRYER

The air dryer is located underneath the motorhome next to the transmission. The air dryer removes moisture from the compressed air system. This is important because if air contains moisture it can freeze and prevent operation of brakes or other pneumatic operated items.

The air dryer has three functions: cooling, filtering and drying the air going through the motorhome air system. If an excessive amount of water is present when performing the monthly air tank drain service, it may be an indication that the filter for the air dryer needs to be changed.

Operation:

During system pressure build-up, compressed air passes into the air dryer where the filter system removes contaminants and passes the air into the drying stage. When the compressor unloads, the water is expelled and the dry air flows back through the dryer, drying the desiccant for the next cycle. Initially, moisture condenses in the base of the dryer. Moisture-laden air passes through the desiccant bed in the air dryer cartridge and is dried.

- The compressor intakes water vapor with the air. The water vapor condenses as it cools.
- The air dryer prevents water accumulation in air lines that could damage seals and valves and wash away lubricants.
- The air dryer also prevents water in the air lines that can freeze and damage air system components.

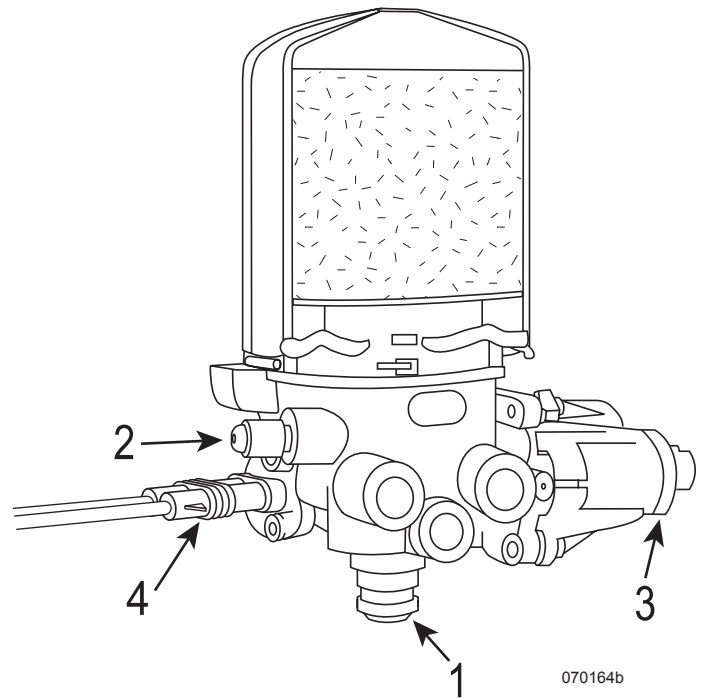
Air Dryer Components:

1. Purge Valve: A valve located on the bottom of the air dryer base that remains open during a compressor unload cycle. The purge valve allows collected moisture, condensation and contamination to be expelled from the air dryer during the purge cycle.

2. Pressure Relief Valve: Protects the air dryer from over-pressurization.

3. Regeneration Valve: Controls regeneration of the desiccant. The regeneration valve allows air from the supply and secondary tanks to bypass the outlet check valve. The air expands and back flushes moisture off the desiccant through the dryer's purge valve.

4. Heater Power Harness: Twelve-inch cable with Metri-Pack plug provides electrical connection to air dryer heating unit.



In extreme cold, verify that the air dryer heater is in good working order. The heater in the air dryer is a 100-watt heater controlled by ignition power and turned off when the ignition is switched off. The heater turns on below 45° F and off when the air dryer temperature is above 86° F. The fuse is located in the front electric bay, roadside.

WARNING:

Remove all pressure from the air system before disconnecting any component, including the desiccant cartridge. Pressurized air can cause serious personal injury.

Desiccant Cartridge

1. The replacement kit contains one cartridge and one O-ring.
2. Place wheel chocks firmly against wheel before removing cartridge.
3. Remove all air pressure from the air system.
4. Loosen and remove the old cartridge. Use a strap wrench, if necessary.
5. Remove and discard the O-ring from the dryer base.
6. Inspect and clean the seal seat. Repair any minor damage.

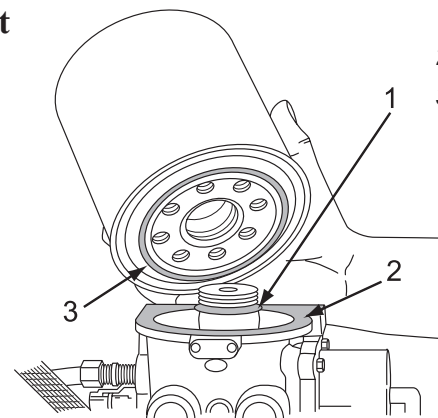
NOTE:

If the seats are damaged so badly that a tight seal cannot be maintained, replace the air dryer.

7. Lubricate the O-Ring on the stem with a thin layer of grease.
8. Lubricate the cartridge seal with a thin layer of grease.
9. Thread the replacement cartridge onto the base until the seal touches the base. Tighten the cartridge ONE additional turn. **DO NOT OVERTIGHTEN.**



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1. O-Ring
2. Seal Seat
3. Seal

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Desiccant-Type Air Dryer

1. Warm, humid air from the compressor condenses into water or water vapor before entering the air dryer.
2. A desiccant-type air dryer protects the motorhome air brake system by drying moisture-laden air before it passes through the air reservoirs and into the brake system.
3. Water collects in the base of the dryer when warm air condenses the water before it enters the dryer, or inside of the dryer before the water reaches the desiccant.
4. The desiccant material then removes additional water vapor, further drying the air.
5. During regeneration phase, the regeneration valve and pressure-controlled check valve remove water from the desiccant bed with a backflow of dried, expanded system air.

Air Dryer Cycle

The governor turns the compressor on when the supply tank pressure drops below cut-in pressure. Compressed air passes into the air dryer at the inlet port:

1. Moisture-laden air and contaminants pass through the desiccant.
2. Moisture is retained by the desiccant. Moisture also collects in the base of the dryer.
3. When the compressor unloads the purge valve opens. The governor turns the compressor off when the system reaches cutout pressure (approximately 120 psi).
4. The dryer purges and expels water collected in the dryer base.
5. When the regeneration valve opens, the dry system air flows back through the dryer. A small charge of air from the front tank back flows through the filter. The backflow dries the desiccant, preparing it for the next cycle.

Air Springs Inspection

Listed below are items that can be checked when the motorhome is in for periodic maintenance.

NOTE:

Never attempt to service air suspension on a motorhome with the air bags inflated.

- Inspect the OD (outside diameter) of the air springs. Check for signs of irregular wear or heat cracking.
- Inspect the air lines to make sure contact does not exist between the air line and the OD of the air springs. Air lines can rub a hole in an air spring very quickly.
- Be sure sufficient clearance exists around the circumference of the air spring while at maximum diameter.
- Inspect the OD of piston for buildup of foreign materials. (On a reversible sleeve style air spring, the piston is the bottom component of the air spring.)
- The correct ride height should be maintained. All motorhomes with air springs have a specified ride height established by the manufacturer.
- The leveling valves (or height control valves) play a large part in ensuring that the total air spring system works as required. Clean, inspect and replace if necessary.
- Check shock absorbers for leaking hydraulic oil and worn or broken end connectors. Replace broken shocks immediately. The shock absorber limits the rebound of an air spring and keep it from over extending.
- Check the tightness of all mounting hardware (nuts and bolts). If loose, tighten. Do not over-tighten.

Cleaning:

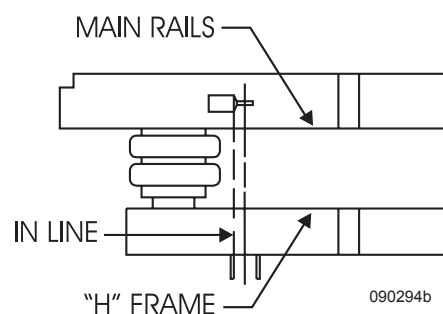
The approved cleaning method is soap and water, methyl alcohol, ethyl alcohol and isopropyl alcohol. Unapproved cleaning methods include organic solvents, open flames, abrasives and pressurized steam cleaning.

RIDE HEIGHT VALVES

Height control valves (HCV) inflate or deflate the air springs maintaining the proper suspension height throughout the load range. Two valves are used at the drive axle. These valves control rear suspension height and left or right tilt of the motorhome. One valve controls the front suspension height (hydraulic leveling) and two valves on air leveling. The height control valves mount to the main frame of the motorhome above the axles with a linkage rod connecting the valve to the axle.

The actuating components inside the valves allow for momentary suspension bounce and rebound. When a constant suspension change occurs, such as a load change or weight transfer through a sustained corner, the valve reacts adding or purging air from the air springs as needed. The air springs mount between the main frame rails and the trailing links. The air spring must maintain a specified distance between the mounting plates. Other than specified distance between the plates not only compromises ride quality and handling, it adversely affects shock absorber travel, drive shaft angle and various other running gear components.

Should it be necessary to check the suspension ride height, start with the motorhome on a flat level surface. The air system must be fully charged with the suspension normalized at ride height. Specified distances may vary plus or minus 1/4". Ride height values require special equipment for adjustment by a qualified technician.



NOTE:

Drive shaft angle is affected by the suspension ride height. Improper drive shaft angle can damage suspension or shorten the life of universal joints. Shock absorbers and air springs are in travel centers at proper ride height.

Adjusting Ride Height

To adjust the suspension ride height begin with:

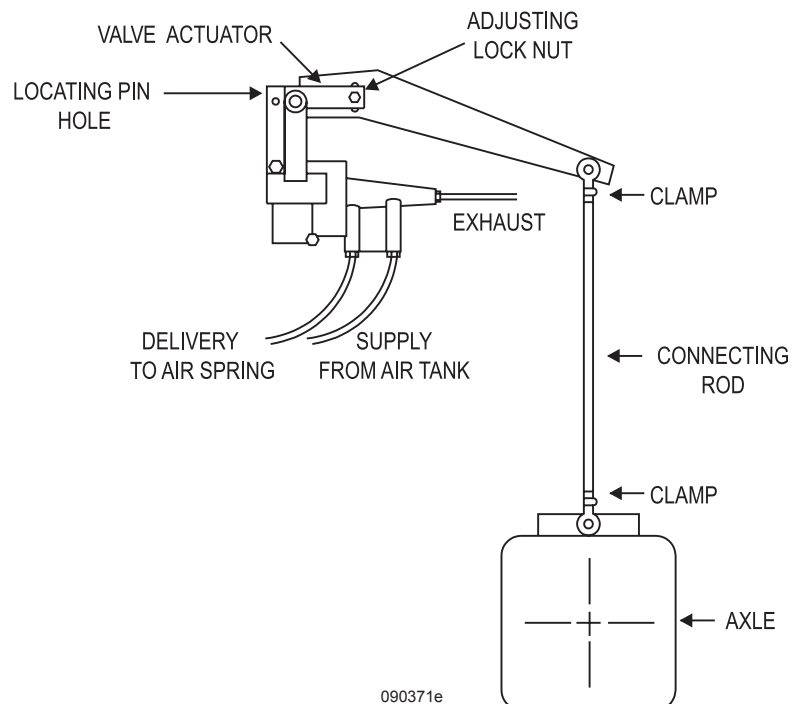
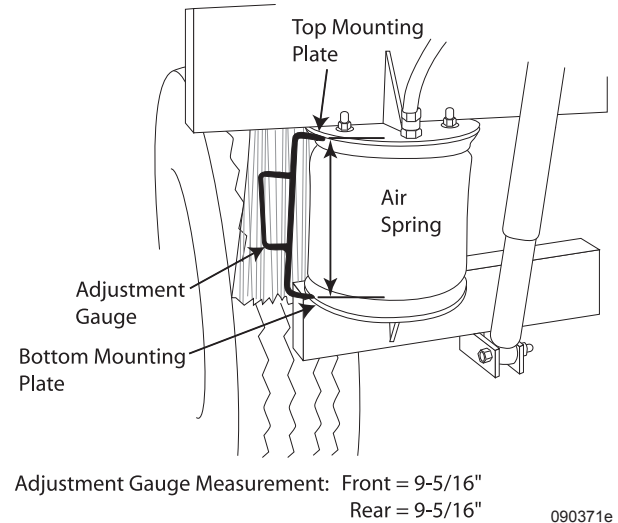
- The motorhome on flat level surface.
- Air system fully charged.
- Suspension at normal ride height.
- Air Level System in travel mode.

Start by checking the distance in the front.

1. Measure the distance between the lower air bag mounting plate and the upper air bag mounting plate of the air springs.
2. If the measurement is off, loosen the adjusting lock nut at the eccentric slot on the valve.
3. Move the plastic arm up to raise suspension height, inflating the front air springs. Move the plastic arm down to lower suspension height, this deflates the air springs. Make adjustments in small increments.
4. After obtaining the specified distance, insert a 1/8" or 7/64" inch twist drill bit into the plastic arm and valve body. This centers the travel of internal piston. Tighten adjusting lock nut between 60 to 80 in/lbs.
5. Check adjustments made by using the Air Dump switch to deflate air springs. Start the engine and allow the air system to become fully charged. Allow the suspension to reach a neutral setting.
6. Re-check the suspension height measurement. Follow the same procedure for each rear control valve.
7. Re-check the front suspension height after adjusting the rear height control valves.

NOTE:

Do not modify length of the linkage rods. Make any necessary adjustments using eccentric slot on the ride height control valve.



ABS/ATC SYSTEM (*Anti-lock Brakes*)

The motorhome is equipped with an anti-lock braking system (ABS) and automatic traction control system (ATC). The ABS system monitors wheel rotation speeds by using a 100-tooth magnetic tone ring mounted to the hub. Revolving with the wheel, the magnetic tone ring is polarized giving positive and negative pulsations. A stationary sensor is mounted adjacent to the tone ring monitoring the magnetic pulses. The pulses are monitored by the ABS electronic control unit (ECU).

The ECU monitors all available wheel sensors at the rate of 100 times per second. The ECU controls Pressure Modulator Valves. Pressure Modulator Valves have two electric over air solenoids, a hold solenoid and a release solenoid. The modulator valves are open under normal braking, allowing a straight through air signal from the treadle valve to the brake chamber. Should a wheel lose traction under a braking application, the ECU will energize the hold solenoid of the Pressure Modulator Valve to interrupt the air signal from the treadle valve to the brake chamber. The release solenoid vents the existing air signal, at the brake chamber to the atmosphere, allowing the skidding tire to regain traction. Skidding tires have less tractive efficiency. It is possible, under certain conditions, to have the wheel(s) skid with a normal functioning ABS system.

The ABS itself does not apply additional braking power. The purpose of the ABS is limiting brake torque to prevent wheel locking that results in the loss of lateral stability, and increased stopping distances. Cautious driving practices and maintaining adequate safe distances when following vehicles is the key to safe vehicle operation.

WARNING:

The ABS/ATC system is designed to increase tire to road surface traction. The system cannot overcome naturally occurring laws of physics. The ABS/ATC system combined with safe driving practices reduce the possibility of wheel skid and loss of lateral stability.

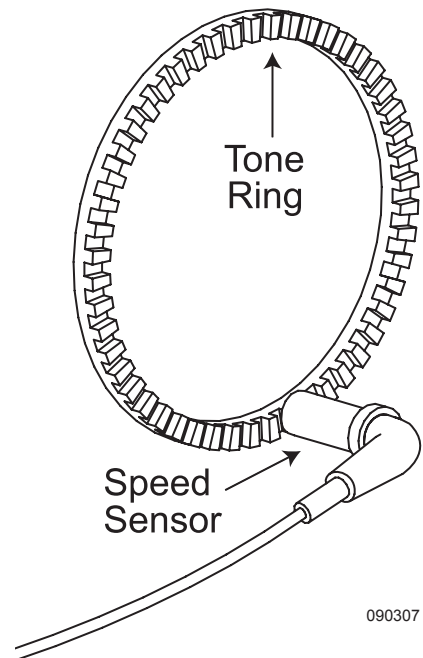
ABS Component Function:

- Speed sensors and tone rings on each wheel monitor wheel rotation.
- Each speed sensor communicates wheel rotation pulses to the Electronic Control Unit.
- ECU receives the speed sensor inputs, interprets the signal pulses, calculates speed and acceleration rates of each wheel.
- Based on the speed sensor input, the ECU detects impending wheel lock and operates the ABS Modulator Valves required for proper control. The Modulator Valves can be operated in the air, release or hold modes to regulate air pressure to the brake chambers.
- The braking force is applied at a level which minimizes the stopping distances while maintaining as much lateral stability as possible.

ABS Warning Lights:

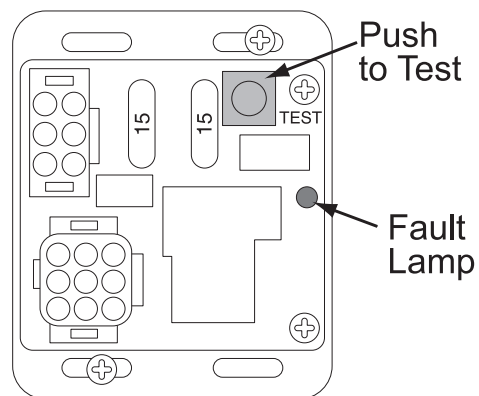
The ABS will perform a dash indicator lamp check and self-diagnostic test each time the ignition is switched to the on position.

- When the ignition is turned on, the ABS indicator illuminates momentarily (2.2 seconds), verifying the self-diagnostic test. If the ABS light illuminates while the motorhome is being operated, there is a fault in the anti-lock brake system on the drive axle or steer axle. This fault will not affect normal service braking. The motorhome will need to go to a service center to repair the problem.



ABS Diagnostic Button:

By properly actuating the test button on the ABS diagnostic center, system configuration codes and fault codes can be retrieved as blinked sequences on the fault lamp. System configuration codes are sequences of four blinked digits while fault codes are sequences of two blinked digits. Refer to an authorized Eaton/Roadranger for a list of blink code sequences. If the test button is not pressed correctly for a specific readout, stop and start over at the beginning of the procedure. All blink codes are displayed by the ABS warning light only. The ATC light does not display blink codes.



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NOTE:

All blink codes are displayed by the ABS warning light only. The ATC light does not display blink codes.

NOTE:

Contact a certified Eaton service repair center at (800-826-4357) for more information.

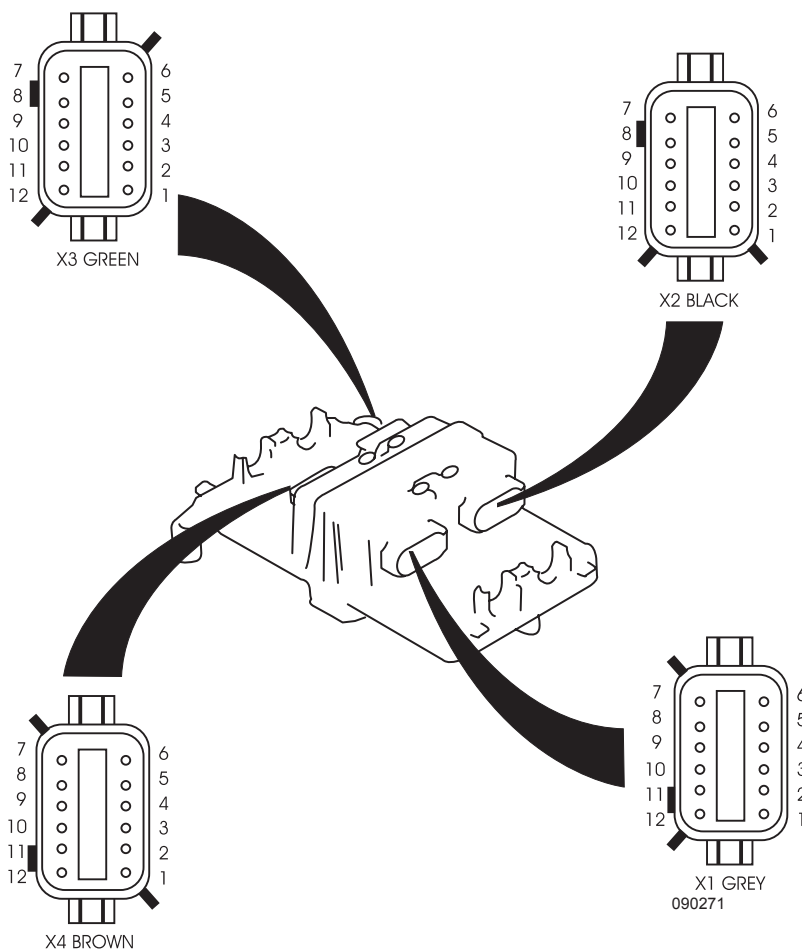
1. Write down system configuration codes and fault codes.
2. If the system configuration is correct, clear the fault codes. The process for clearing the fault codes and reconfiguring the ECU is the same when using the diagnostic button.
3. After clearing fault codes, retrieve the fault codes once again to make sure inactive fault codes were cleared. Only active codes will now be displayed.

Reading Configuration Codes:

1. Turn the ignition key to **ON**.
2. Apply and release brakes once before proceeding.
3. Press and hold the diagnostic button for two seconds and release, immediately press the diagnostic button a second time for two seconds and release.
4. The four-digit configuration code is retrieved and displayed. It should read 1-2 pause 4-5.

Retrieving Fault Codes:

1. Turn the ignition key to **ON**.
2. Apply and release brakes once before proceeding.
3. Press and hold the diagnostic button for two seconds and release.
4. Two-number blink codes are retrieved and displayed. A two-digit display of 1-1 indicates no faults; the ABS system is functioning properly.



Clearing Fault Codes and/or System Configuration:

1. With the ignition **OFF**, press and hold the diagnostic button.
2. Turn the ignition key to **ON** while pressing the diagnostic button.
3. Wait two seconds and release the diagnostic button.
4. Press and release the brake pedal.
5. The ECU is reconfigured to match connected components and fault codes are cleared.
6. Repeat the “Retrieving Fault Codes” procedure to verify that fault codes are cleared.

Disabling ATC for Dynamometer Testing:

1. Turn the ignition key to **ON**.
2. Press and hold the diagnostic button for at least 3 seconds and release.
3. The ATC light turns **ON** and the fault lamp blinks 17-8, indicating the ATC system is disabled. All subsequent flashes are active ABS fault codes.
4. The ATC system will be enabled when the ignition is switched off then back to on.

Automatic Traction Control System

The ATC (Automatic Traction Control) system improves traction on slippery or unstable road surfaces by limiting excessive drive wheel slip. This is accomplished by limiting engine torque to the drive wheel or engaging a brake to the spinning drive wheel. During normal operation engine torque is not affected. The ATC system works in conjunction with the ABS Electronic Control Unit. The ECU monitors tone ring speed of the drive wheel in relation to the other wheels. If a speed differential occurs in the drive wheel, the ECU enters Automatic Traction Control mode.

During an ATC event, the ECU will automatically react to optimize traction and safety if the motorhome encounters a slippery road surface. Engine torque is normally reduced to limit drive wheel slip.

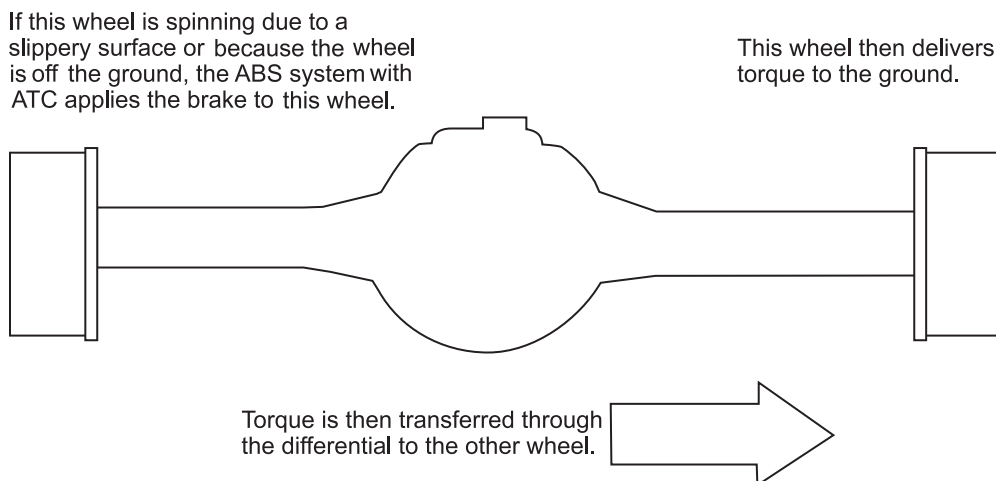
NOTE:

The ATC system is always active.

ATC reacts to drive wheel slip by:

- Reducing engine torque to the drive wheel if road speed is above 25 mph.
- Reducing engine torque and activating drive axle brake controls if road speed is below 25 mph. If the brake control activates, it remains active regardless of road speed.

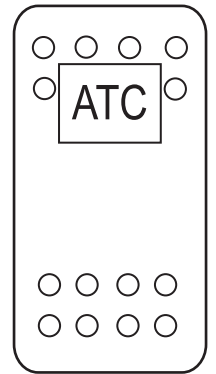
How Automatic Traction Control (ATC) Works



09372

ATC Switch:

Activating the ATC switch reduces ECU control over engine torque. Momentarily pressing the ATC switch allows the ECU to increase the amount of engine torque applied to the drive wheel in an ATC event. The amount of engine torque applied to the drive wheel varies with the amount of drive wheel slip versus road speed. In an ATC event, the ECU remains active regardless of road speed or switch position. The indicator light flashes slowly when the ATC switch is activated.



ATC Indicator Light:

During normal operation, the ATC indicator light illuminates steady when the ignition key is turned **ON**. The light remains illuminated until the first brake application. If an ATC event occurs, the indicator light flashes quickly. The indicator light flashes slowly if the ATC switch is activated.

CAUTION:

Normally the switch should remain inactive. During an ATC event (drive wheel slip) the ECU will automatically optimize drive wheel traction in most situations. Activating the switch during periods of wheel slip can increase torque to the spinning drive wheel. Drive train damage can occur if the spinning drive wheel should suddenly regain traction. If the motorhome is stuck it is advised to call a professional towing company to limit the possibility of body and drive train damage.

FRONT AXLE

While driving the motorhome, be aware of any changes in the feel of steering and have the system checked if there are any apparent differences. It is normal to hear some hydraulic noise from the steering, especially when the steering is at maximum or while turning the wheel when the motorhome isn't moving. Investigate any unusual or loud noises that occur. Begin by checking the level of the hydraulic fluid level. Traveling at slow speeds over rough surfaces may cause a "clunking" noise to emanate from the steering column, but if noise is heard on smooth surfaces while turning back and forth sharply, the noise should be inspected and a cause determined.

Shimmy and looseness should be checked and corrected as soon as possible. If any looseness is felt in the steering, the steering linkages can be observed while someone turns the steering wheel left and right. Watch the linkages for any evident play or uneven interaction between components to help pinpoint a problem. Have the steering system checked for damage after a severe impact, such as striking large potholes or curbs, and front-end collisions. Observe the alignment of the steering wheel spokes; a change in the alignment may indicate damage to the steering components or suspension.

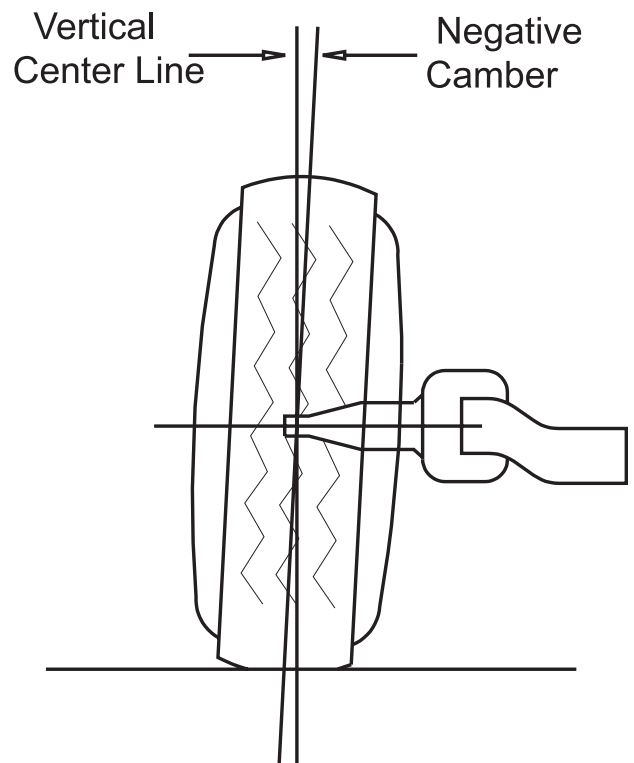
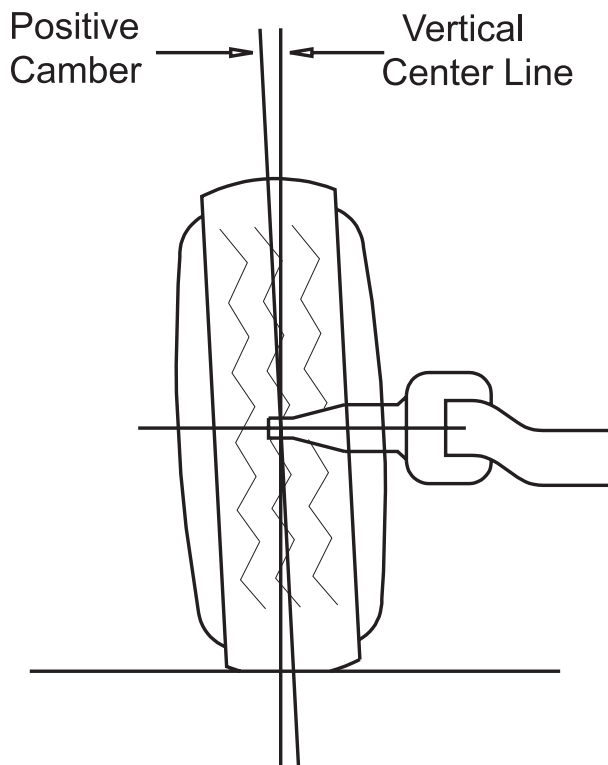
Maintenance for the system entails adequate lubrication of the system. Use only a hand operated grease gun on the fittings. Grease fittings for the steering system are found on the both ends of the drag link (the bar connecting the steering gear to the axle), and on the steering drive shaft located between the steering wheel and steering gear. The correct wheel alignment promotes longer tire wear and ease of handling while minimizing the strain on the steering system and the axle components. Use NLGI #2 Lithium soap base lubricant for all steering linkage and brake components.

Alignment Specifications

Camber:

Camber, as shown, is vertical tilt of wheel as viewed from the front of the vehicle. This is machined into the axle when manufactured and is not adjustable.

- “Positive” camber is an outward tilt of the wheel at the top.
- “Negative” camber is an inward tilt of the wheel at the top.



090267

Toe Setting:

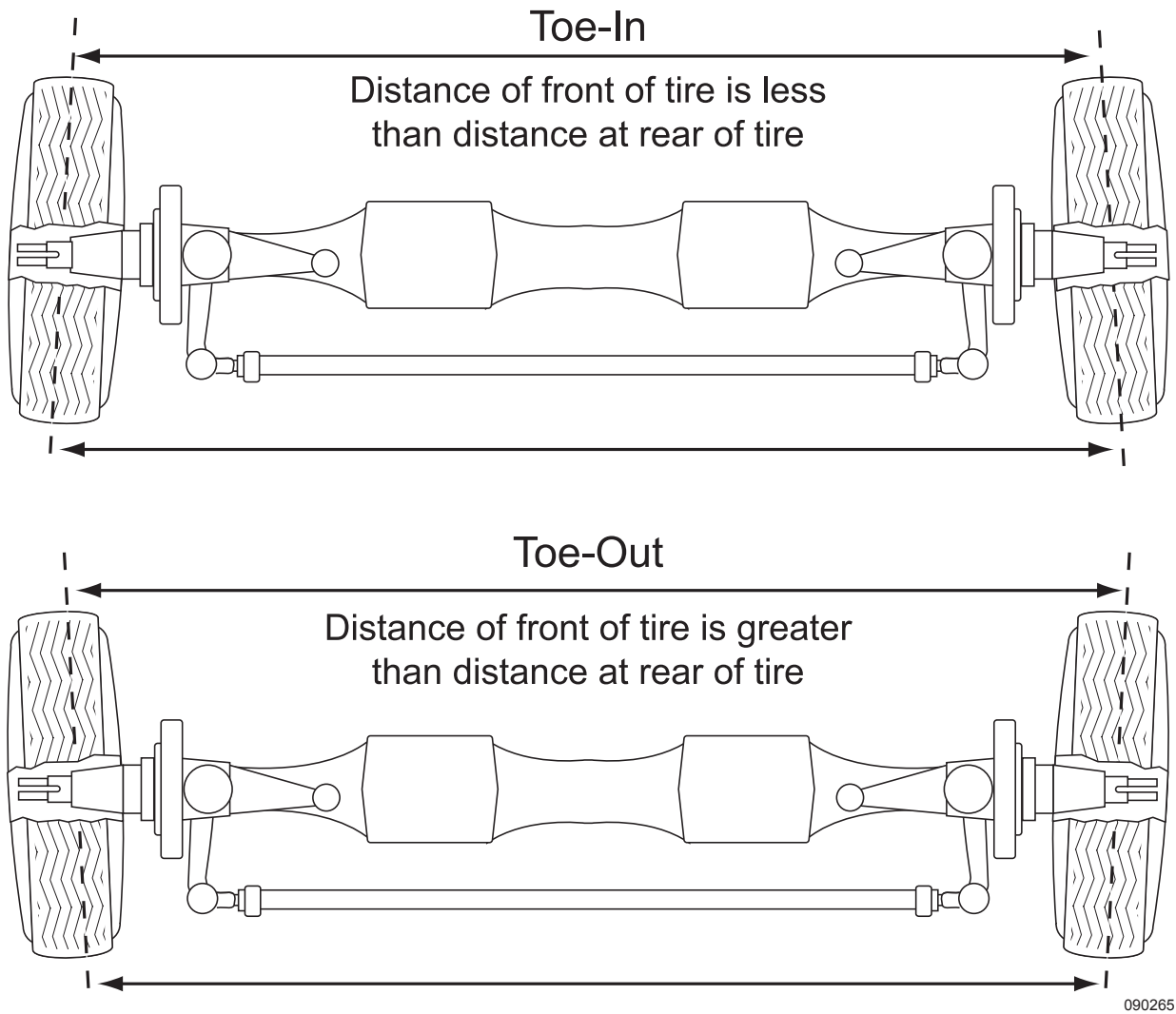
The toe setting represents different distances between the front and rear of the tires (measured at the vertical center line of the tires).

- Toe-in: Occurs when the tire front distance is less than the tire rear distance.
- Toe-out: Occurs when the tire front distance is greater than the tire rear distance.

Wheels are generally set with initial toe-in. As the vehicle operates tires tend toward a toe-out condition. By starting with an initial toe-in setting, a desirable “near zero toe-in” can be achieved when the vehicle is in motion.

Incorrect toe settings, where toed-in or toed-out, can have a significant affect on tire wear. The toe setting is adjusted by lengthening or shortening the cross tube.

FRONT OF MOTORHOME (Top View of Axle)



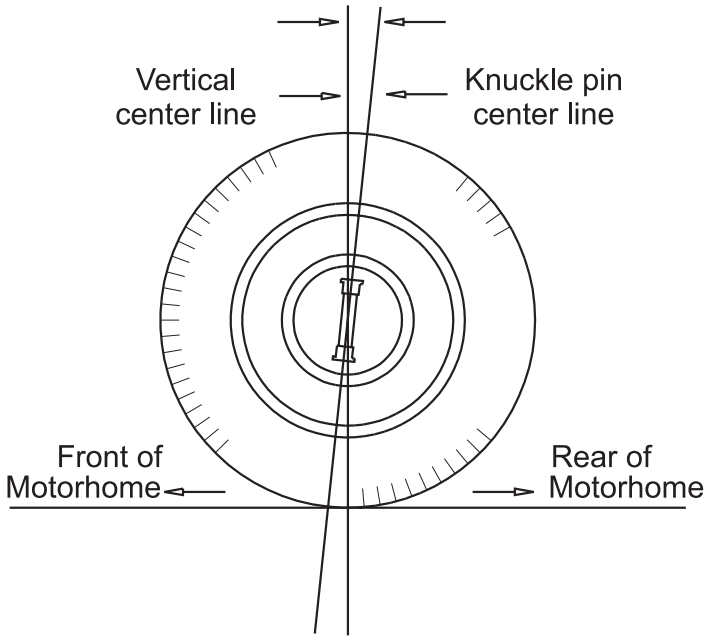
Caster Adjustments:

Caster is the fore and aft tilt (toward the front or rear of the motorhome) of the steering kingpin as viewed from the side of the motorhome.

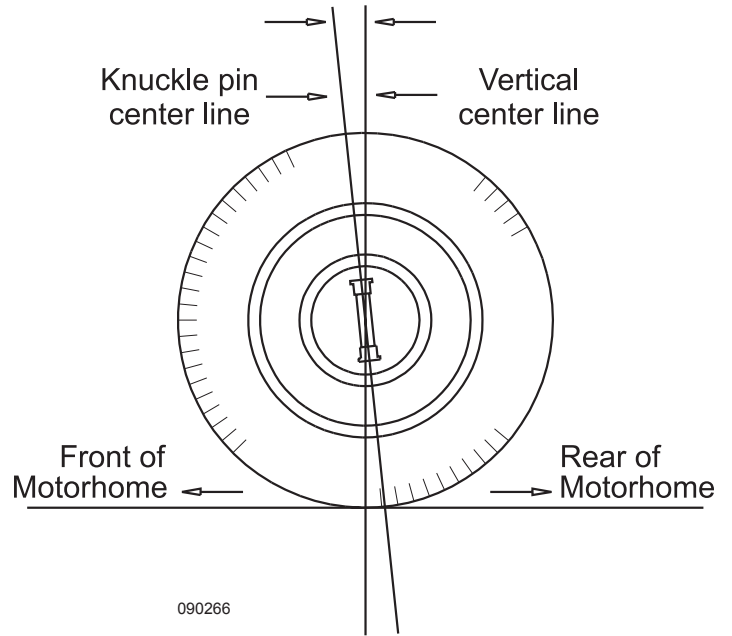
- “Positive” caster is the tilt of the top end of the kingpin toward the rear of the motorhome.
- “Negative” caster is the tilt of the top end of the kingpin toward the front of the motorhome.

Setting the caster angle more positive than specified may result in excess steering effort and/or shimmy. Decreasing the angle may result in vehicle wander or poor steering return to center. The caster angle is determined by the installed position of the steer axle.

Positive Caster



Negative Caster



090266

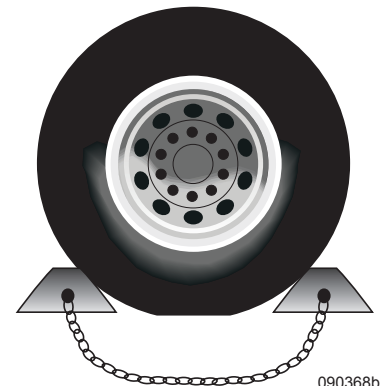
	Left Front		
	Minimum	Nominal	Maximum
Camber	-0.15°	-0.35°	-0.65°
Caster	3.50°	4.5°	5.50°
Toe	0.018°	0.03°	0.042°

	Right Front		
	Minimum	Nominal	Maximum
Camber	-0.15°	-0.35°	-0.65°
Caster	3.50°	4.5°	5.50°
Toe	0.018°	0.03°	0.042°

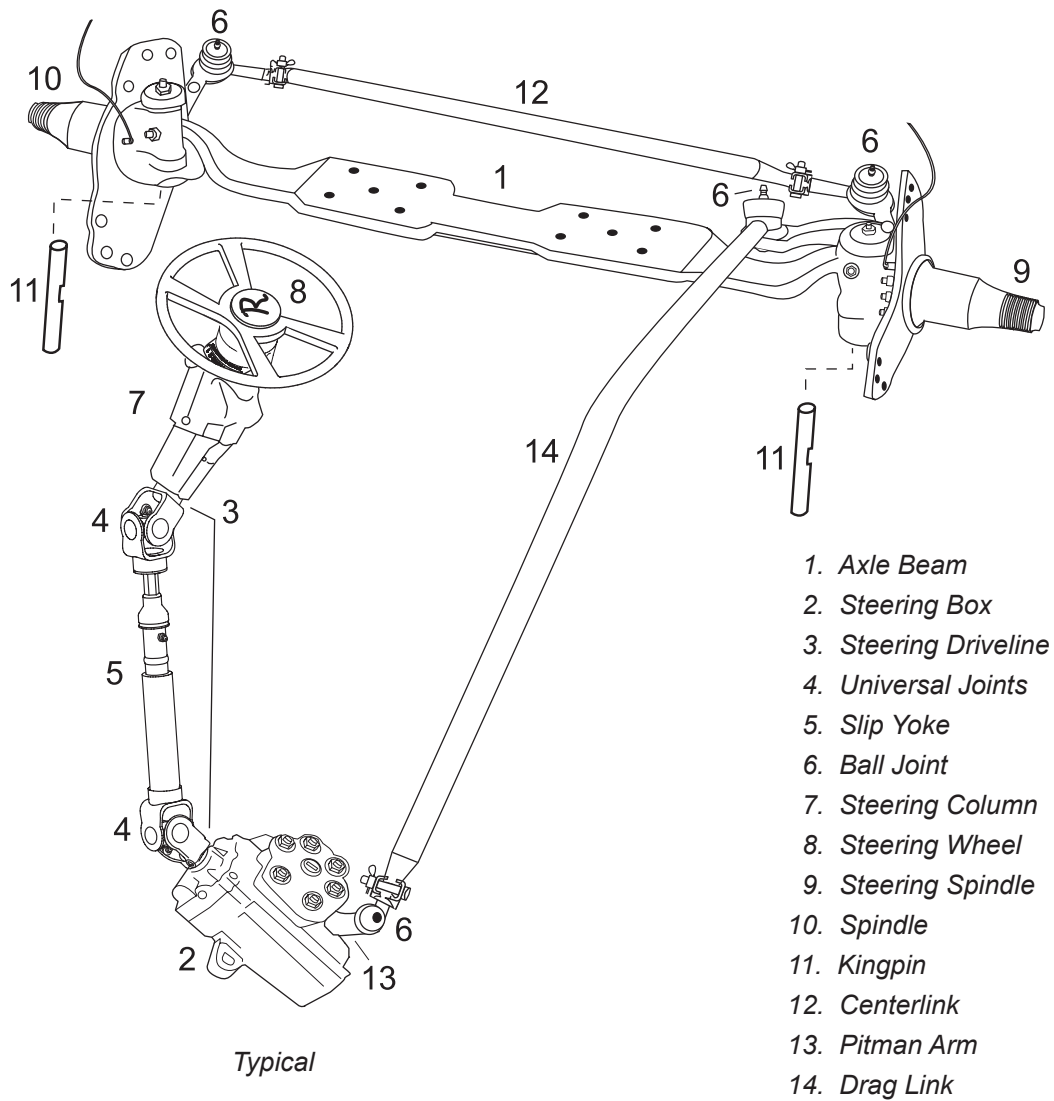
caster chart.eps

Lubrication Maintenance Safety

The front axle components require periodic lubrication maintenance. Chock the wheels for safety prior to accessing components underneath the motorhome.



090368b



Steering Components.eps

Intermediate Steering Shaft

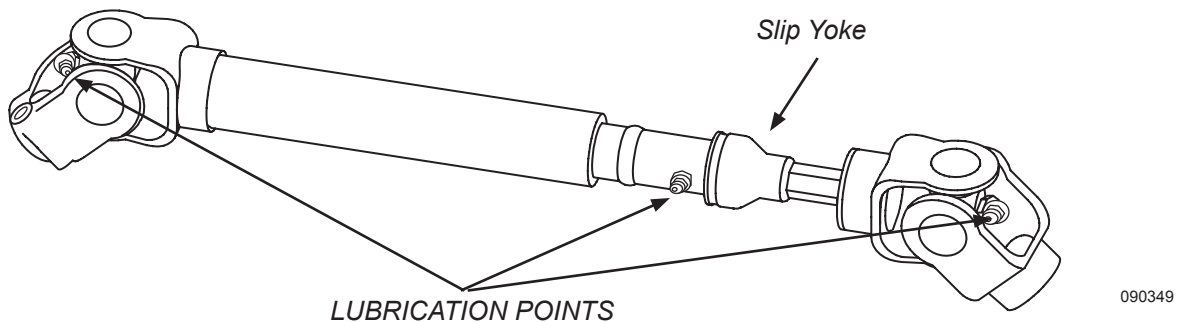
The steering wheel connects to the steering box using a driveline. Service the steering drive shaft universal joints and slip yoke every 30,000 miles or annually. Remove the steering column cover to access the upper universal joint and slip yoke. The lower universal joint is accessed from underneath in the generator compartment behind the front electrical box.

Greasing the Intermediate Steering Shaft Universal Joints:

1. Check the drive shaft for looseness. If loose or worn, repair the drive shaft as necessary.
2. Apply the specified grease at the grease fitting on the universal joint. Apply new grease until the new grease purges from all the seals.
3. If the new grease does not purge from the seals, disassemble and clean the joint or replace the universal joint. Do not lose any of the needle bearings.

Greasing the Intermediate Steering Shaft Slip Yoke and Splines:

1. Check the drive shaft for looseness. If loose or worn, repair the drive shaft as necessary.
2. With finger, cover the rear air hole so grease flows to the front seal. Apply the specified grease at the grease fitting on the slip yoke. Apply grease until new grease purges and forces finger away from the air hole in the end of the slip yoke. Greasing interval is yearly or every 30,000 miles.

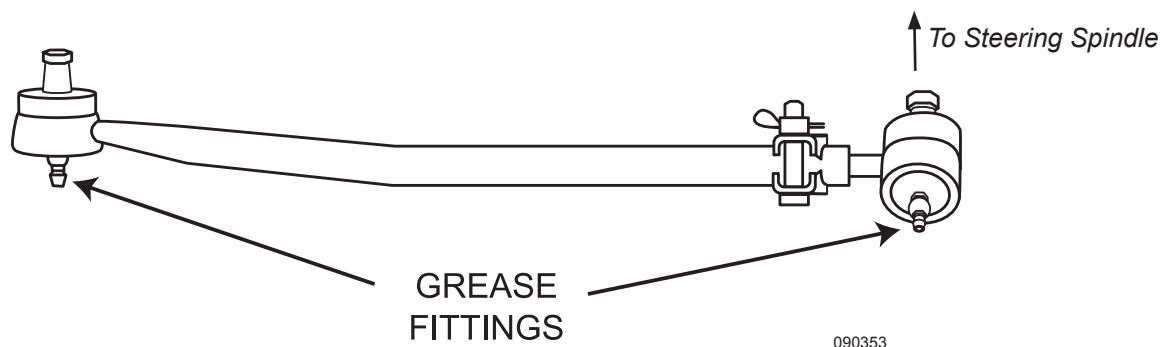


Drag Link

The drag link connects the steering box pitman arm to the steer axle. The movable joint (ball joint) uses sealed boots to prevent water intrusion. Do not rupture the boot when applying grease. Grease interval is six months or every 5,000 miles.

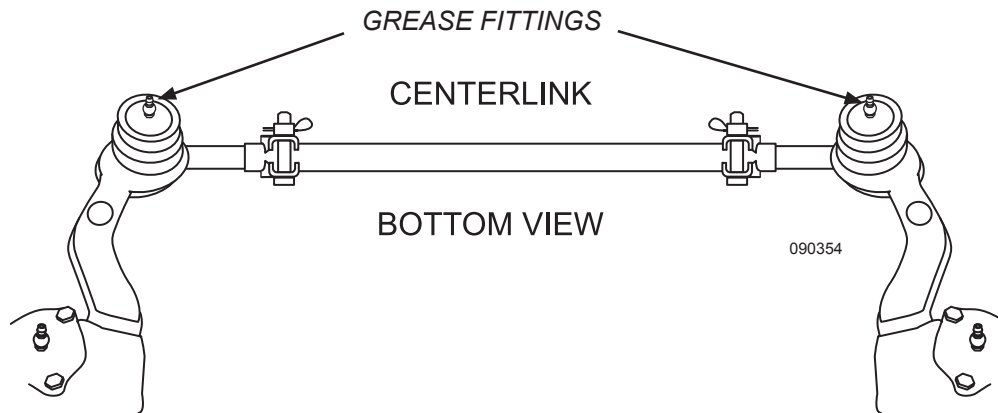
NOTE:

It will be necessary to start the motorhome and turn the steering wheel to access fitting(s).



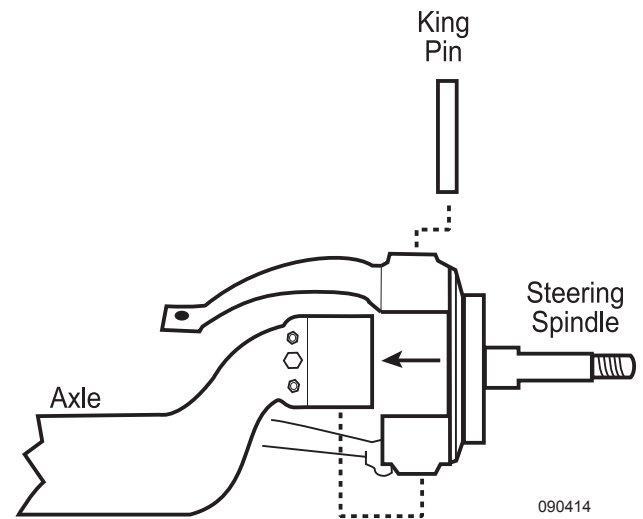
Center Link

The center link is located on the backside of the steer axle. The center link attaches the two wheels together causing the right front to track with the left front. Greasing interval is every six months or 5,000 miles.



Steering Spindles

The steering spindles attach to the front axle and pivot on the kingpin. The wheel end assembly and brake system attach to the spindle. There are upper and lower lubrication points for the kingpin. The drag link attaches to the roadside spindle. After initially lubricating the roadside and curbside kingpins, rotate the steering assembly lock to lock (full left to right) then move assembly back to center. This purges any remaining air pockets. Continue lubricating the kingpins until new grease purges with no air pockets. Greasing interval is every six months or 5,000 miles.



Control Arm Bushings

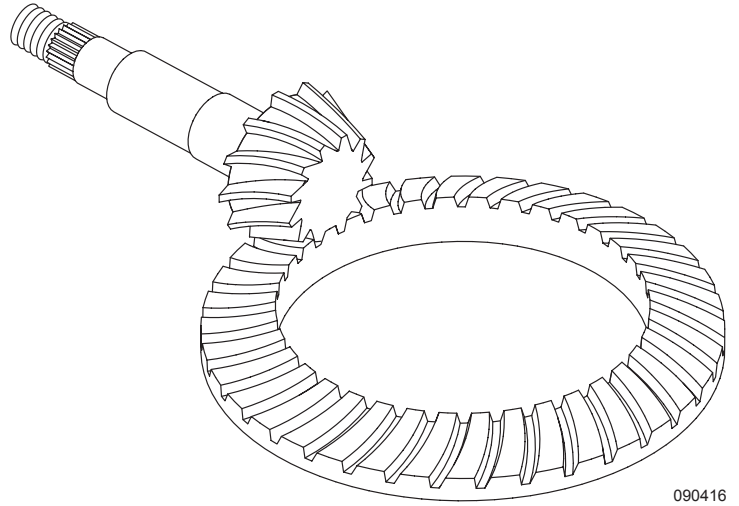
Control arms align the axles perpendicular with the frame. The panhard bar controls side to side motion of the axles in the frame. Control arm bushings and panhard bar bushings do not require lubrication.

DRIVE AXLE & DRIVE SHAFT

Drive Axle:

The chassis drive axle is a single reduction axle, with a gear ratio of 4.30:1. The differential gears consist of a hypoid pinion and ring gear set and bevel differential gears. The differential carrier can be removed from the axle housing as a unit in order to perform repairs.

All power from the engine to the rear tires is transferred through the rear axle. For this reason, it is important that maintenance be performed on the axle as required to avoid premature wear of the gears and bearings in the axle.



Drive Axle Lubricant:

The rear axle is filled with synthetic gear oil meeting MIL-L-2105D specifications. Change interval is every 250,000 miles, or 36 months, whichever occurs first.

During lubricant change, fine metal particles will be observed clinging to the magnetic fill and drain plugs of the axle. These particles are normal wear particles from the axle components, but will cause faster than normal wear of the axle components if allowed to circulate through the lubricant. It is recommended that the magnetic plugs be tested, if not replaced, at each lubricant change when petroleum-based lubricants are used, or every 100,000 miles when synthetic lubricant is used. These plugs should have sufficient magnetic strength to pick up a 1.5-pound weight of low carbon steel. Never replace a magnetic plug with a non-magnetic “pipe plug” as they will not keep the lubricant clear of metal particles or seal properly.

The level of lubricant in the rear axle should be checked every 30,000 miles or annually, whichever comes first. This will ensure adequate lubricant in the axle for proper operation.

Proper Drive Axle Lubricant Level:

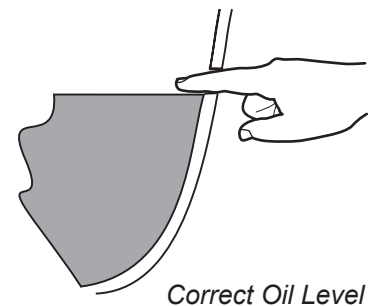
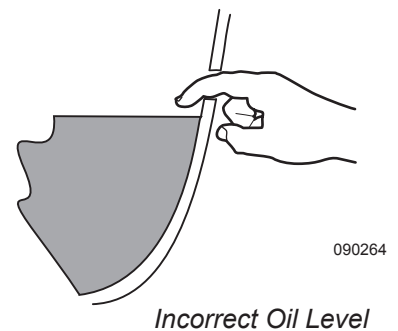
- Regular inspection of the drive axle lube levels is an essential maintenance procedure.
- Clean the area around the fill plug, which is located about halfway up the axle housing bowl.
- Remove the fill plug and observe the lubricant level.
- The lubricant should be level with bottom of the hole.
- Important: The lube level close enough to the hole to be seen or touched is not sufficient. The lube must be level with the hole.
- Correct the level as necessary.
- Re-install the fill plug and tighten to 35-50 ft-lbs.

NOTE:

When checking the lube level also check the housing breathers. Clean the breathers if dirty or replace them if damaged.

To Drain and Replace Lubricant:

With vehicle parked on a level surface and rear axle warm, place a large container under axle.



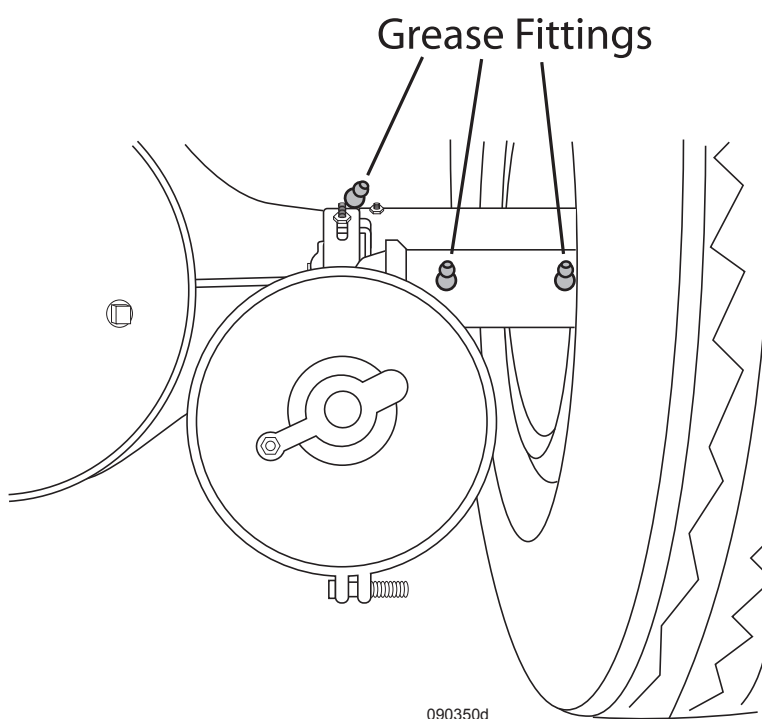
1. Remove drain plug and allow axle to drain completely.
2. Dispose of oil properly.
3. Clean the drain plug and test (replace the drain plug if needed).
4. Install and tighten drain plug to 35-50 ft-lbs.
5. Clean the area around the fill plug from the axle-housing bowl.
6. Fill the axle with approved lubricant until the level is even with the bottom of the fill plug hole.

WARNING:

When checking or changing the lubricant, always ensure that the axle is not “hot.” Oil temperature 90° or hotter can easily cause severe burns.

Lubrication Maintenance

The slack adjuster and camshaft need to be lubed periodically to ensure proper brake operation. Lubricate every 10,000 miles or annually.



Drive Shaft:

The drive shaft transfers the power produced by the engine to the drive axle. A worn or out of balance driveline causes chassis vibration that generally increases in intensity with road speed.

NOTE:

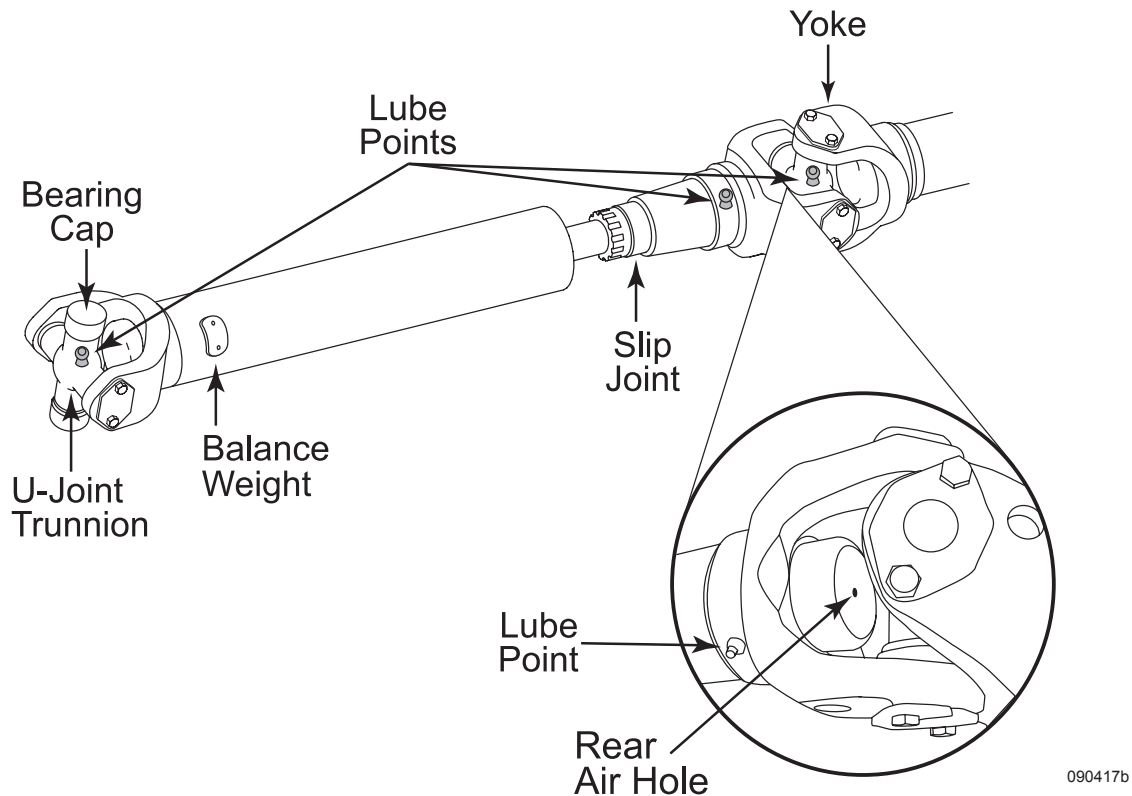
It will be necessary to move the motorhome forward or backward to access all fittings on the drive shaft.

Greasing the Drive Shaft Universal Joints:

1. Check the drive shaft for looseness. If loose or worn, repair the drive shaft as necessary.
2. Apply the specified grease at both grease fittings on the universal joints. Apply new grease until new grease purges from all the seals.
3. If new grease does not purge at the seals, loosen (Do Not Remove) the bearing cap bolts and re-grease until all four caps purge. If new grease still does not purge, disassemble and clean or replace the universal joint.

Greasing the Drive Shaft Slip Yoke and Splines:

1. Check the drive shaft for looseness. If loose or worn, repair the drive shaft as necessary.
2. With finger, cover the rear air hole so grease flows to the front seal. Apply the specified grease at the grease fitting on the slip yoke. Apply grease until new grease purges and forces finger away from the air hole in the end of the slip yoke. Greasing interval is 10,000 miles or annually.



WARNING:

Rotating shafts can be dangerous. Rotating shafts can snag clothes, skin, hair, hands, etc. causing serious injury or death. Do not work on or near a shaft “with or without a guard” when the engine is running.

U-Joint Angles Phasing & Driveline Balance

Correct U-joint working angles U-joint phasing, and driveline balance is vital to maintaining a quiet-running drivetrain and long life of drivetrain components (including driveline components).

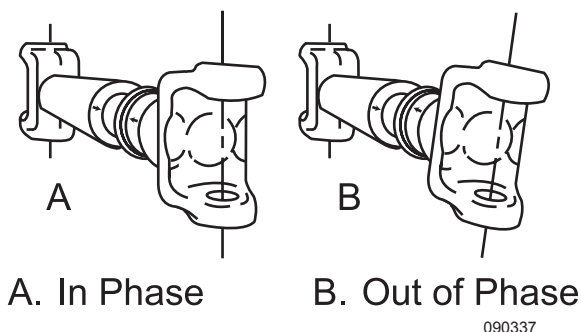
When in phase, the slip yoke lugs (ears) and tube yoke lugs (ears) are in line. Normally this is the ideal condition and gives the smoothest running shaft. There may be an alignment arrow stamped on the slip yoke and on the tube shaft to assure proper phasing when assembling these components. If there are no alignment marks, they should be added before disassembly of the shaft to assure proper reassembly.

Phasing is relatively simple on a two-joint set, be sure that the slip yoke lugs and the tube yoke lugs are in line.

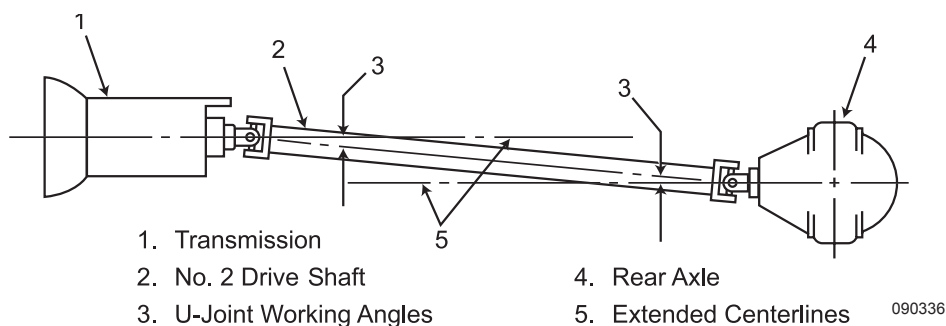
The U-Joint working angle is the angle formed by the intersection of the driveshaft centerline and the extended centerline of the shaft of any component to which the U-joint connects. Because the double oscillating motion of a U-joint that connects angled shafts causes a fluctuating speed difference between the shafts, the effect created by the U-joint at one end of the shaft must cancel the effect created by the U-joint at the other end. This is done by making U-joint working angles at both ends of the driveshaft about equal, with the U-joints in phase. If the yoke lugs at both ends of the shaft are lying in the same plane (a plane which bisects the shaft lengthwise), the U-joints will be in phase.

Any condition which allows excessive movement of a driveshaft will cause driveline imbalance: loose end yoke nuts, loose U-joint bearing cap retaining capscrews, worn U-joint trunnions, bearings and worn slip-joint splines.

Among the most common causes of U-joint and slip joint damage is lack of lubrication. To keep the motorhome operating smoothly and economically, the driveline must be carefully checked and lubricated at regular intervals.



090337



090336

TAG AXLE

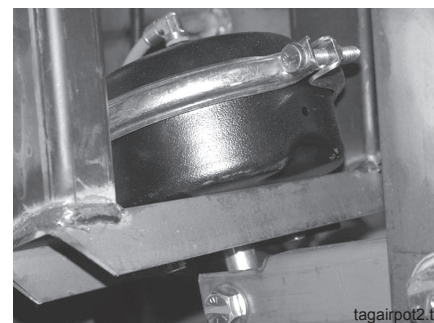
The switch for the tag axle is located on the roadside switch panel. Two lights are located on the switch. The tag axle icon illuminates with the park lights. The lower bar light illuminates when the tag axle switch is on and the transmission is in neutral, reverse or first gear. When the transmission is in second through sixth gear and the tag axle is lowered, the light will be off. Raise the tag axle when performing severe or tight maneuvering under 5 mph to prevent scuffing the tag axle tires. A beeping alarm sounds when the switch is on.

The tag axle raises in the following modes:

- Interior house power must be **ON**.
- When the switch is on and the transmission is in Neutral, Reverse or First Gear.
- With the tag axle in the up position there is not a specific height requirement other than the tire should be off the ground.

Tag Axle Switch On:

- The tag axle switch supplies 12 Volt DC to the air valve located at the roadside rear.
- The rear air valve applies air pressure to both tag axle lift chambers to raise the axle.
- Air pressure in the tag axle air spring is released. The tag axle remains up in reverse, neutral, first gear or until the switch is turned off.



tagairpot2.tif

Tag Axle Lift Chamber (Type 30)

Adjusting the Tag Axle Load:

Changing the amount of weight carried by the tag axle affects weight distribution between the tag, drive and steering axles. The amount of down force applied to the tag axle is controlled by the amount of air pressure in the tag axle air bags. An adjustable pressure regulator located in the engine compartment sets the amount of air pressure in the tag axle air bags. Regulator pressure needs to be adjusted by the owner after weighing the motorhome. The axle regulator pressure needs to measure just under 20,000 lbs.

NOTE:

The tag axle pressure regulator valve is located in the engine compartment on the roadside.

Tag Axle Lubrication:

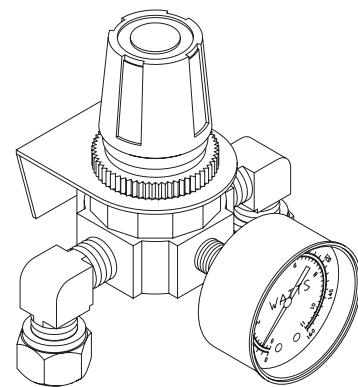
All tag axles use oil to lubricate the wheel bearings. The oil is drained and refilled without removing the wheel end assembly. Remove the hubcap to access the bearing cover and drain plug.

INSPECTION:

Inspect the oil level before every trip or every 5,000 miles. The motorhome should remain motionless for at least 30 minutes in order to stabilize the oil level before inspecting.

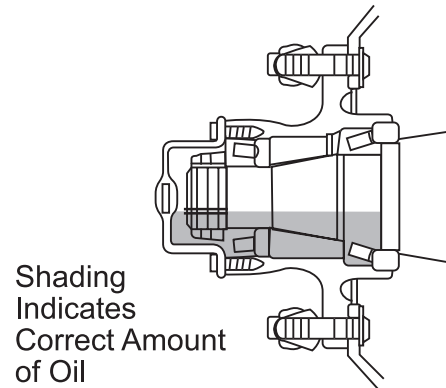
To inspect the oil level:

- The motorhome must remain stationary for 30 minutes.
- Remove the chrome hubcap.
- Locate the full and add mark on the outside of the clear plastic cover.
- If the lubricant is low, add recommended fluid to proper level.



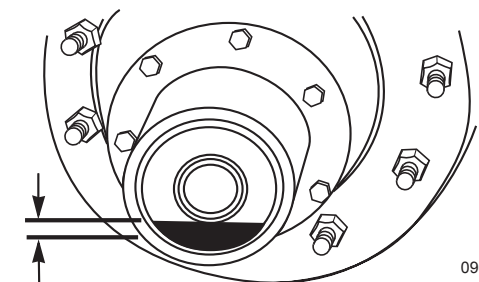
Tag Axle Pressure Regulator

090256



Shading
Indicates
Correct Amount
of Oil

090312b



BELOW 0.25" - ADD OIL

090311

SHOCK ABSORBER

The shock absorber by definition is a hydraulic device used to dampen suspension/body movement. Road surface irregularities are compensated for by the shock absorber. The roadmaster chassis incorporates the shock absorber in the design of the exclusive air glide suspension system. This shock absorber is a telescopic, mono tube unit filled with nitrogen gas and hydraulic oil. The result of the mixture is uninterrupted damping for the smallest of wheel deflection.

By design, a self lubricating seal is used which will allow about 10% of the total oil capacity to pass onto the piston rod. The gradual process of oil loss does not affect the performance of the shock absorber during the service life. This process is evident after a long period of service by an oil film on the body of the shock absorber. The appearance of a coating or film on the body or rod is completely normal, it is an indication the shock is functioning normally.

Road holding, handling, balance and braking characteristics all can be contributed to the shock absorber. The operating conditions for which the shock absorber must endure will determine the life span. However, since the only moving part is the piston rod, there are no springs, hinges or pins to wear out, get weak or deteriorate.



090315

LEVELING SYSTEM

A remote control panel located next to the pilot's seat operates the three-point, fully automatic, electro-hydraulic leveling system. The warning system consists of a Jacks Down light and an alarm that sounds when any jack is extended and the transmission is shifted out of Park or the parking brake is released. The leveling system pump is located in the roadside generator compartment. A 15 amp system fuse is located in the front distribution box.

CAUTION:

The hydraulic jack system is designed to reduce sight selection problems and to stabilize the motorhome when parked. No single jack should be used solely to level the motorhome. Using an improper leveling process can result in applying excess torsion stress/twist to the chassis, frame and body, resulting in damage to the windshield and/or entry door. The leveling jacks are not designed for changing tires. This can cause problems with the suspension system, frame alignment and damage to the windshields. Never use the jacks to elevate any wheel off the ground.

CAUTION:

Before leveling the motorhome, survey the area around and under the motorhome to ensure potential jack contact points are clear of obstructions and depressions.

CAUTION:

Hot asphalt, gravel or dirt may not support the weight placed on the hydraulic jack pads. Place thick plywood under the jack pads to help disperse the weight. If blocking up a rear jack pad to gain added clearance when the motorhome is on a slope, place a wheel chock at the opposite set of rear wheels to prevent the motorhome from rolling.

WARNING:

Never access the underside of the motorhome when jacks are in place. Serious personal injury may occur.

Leveling System Safety Features:

The control panel does not activate until these safety features are in place, to prevent jacks from extending during travel:

- The ignition switch is in the **ON** or **ACC** position.
- The transmission is in **PARK**.
- The parking brake is applied.

Warning Features Include:

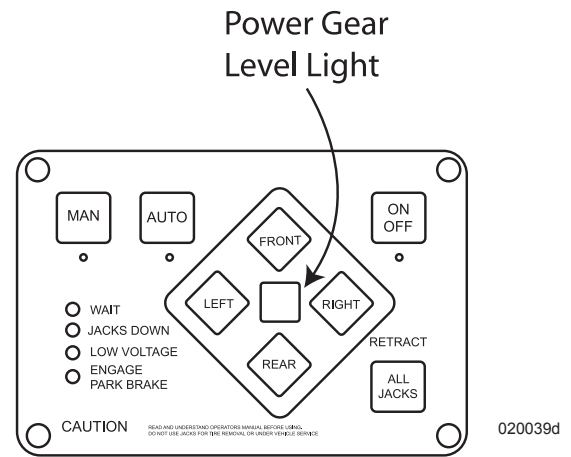
- Flashing lights on the control panel and an alarm that sounds when a jack is down and the parking brake is released or the transmission is shifted out of Park.
- The alarm may activate momentarily when driving over rough roads, or negotiating curves and corners. This usually indicates a low fluid level in the reservoir.

WARNING:

Keep all people clear of the motorhome during the leveling procedure. Never expose hands or other parts of the body to hydraulic leaks. Hydraulic lines are under high pressure. Oil leaks may cut and penetrate the skin causing serious injury.

Automatic Leveling Procedure:

- Select a level site if possible. Excessive slopes may prevent the jacks from leveling the motorhome.
- Place the gear selector in Park.
- Apply the parking brake.
- Turn the ignition switch to the **ON** or **ACC** position. Do not start the engine.
- Press the **ON/OFF** button on control panel. The ON/OFF LED illuminates when the system is operational.
- Push the **AUTO** button to begin leveling.



NOTE:

While automatic leveling is engaged, do not allow people or pets to move around in the motorhome until the green Power Gear level light illuminates. Movement may prevent system from functioning properly.

- When the motorhome is level, the green Power Gear level light will illuminate.
- To make further adjustments, push and hold the manual (MAN) button for approximately 5 seconds until it illuminates. Push the appropriate jack button to adjust motorhome to preference.
- Push the **ON/OFF** button to turn system **OFF**.

CAUTION:

Never lift the wheels off the ground when leveling motorhome.

CAUTION:

DO NOT move the motorhome while jacks are in contact with the ground or extended. Damage to the jacks may occur.

Jack Retract Procedure:

- Turn coach ignition switch to **ON** or **ACC**.
- Push the **ON/OFF** button on control pad. The **ON/OFF** light and **JACKS DOWN** light illuminate.
- Push and release the **RETRACT ALL JACKS** button. All jacks automatically return fully retracted.
- After the **JACKS DOWN** light goes out, push the **ON/OFF** button to turn system off.

NOTE:

Always perform a visual inspection of leveling jacks to make sure they are fully retracted prior to moving the motorhome.

If the jacks fail to extend or retract:

- Apply the Park Brake, turn the ignition to the **ON** or **ACC** position and place the transmission in Park.
- If jacks still don't operate, check the leveling system fuse in the front distribution box.

NOTE:

The hydraulic pump is equipped with an internal thermal breaker for protection against overheating. If the pump is used repeatedly in a short period of time the breaker will trip. It resets automatically in 5 to 30 minutes.

Drive-away Protection:

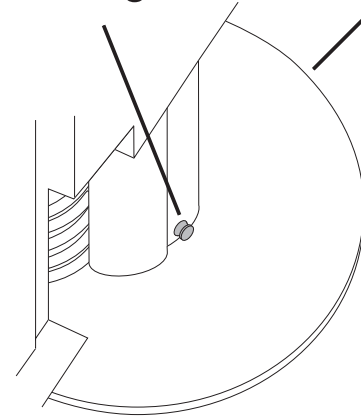
When the ignition switch is set to the **RUN** position with the jacks extended, the **JACKS DOWN** indicator lights and the warning bell activates if the transmission is taken out of park or the park brake is released. The system then automatically retracts all jacks until jacks are fully retracted or the park brake is reset and the transmission is placed in Park. A full visual inspection is required to confirm full retraction of jacks before moving motorhome.

Maintenance:

Occasionally, while the jacks are fully extended, use Dexron III to wipe and clean the jack rod. This serves as a solvent as well as a lubricant and helps prevent moisture damage to surface of the jack rod. Occasional oil or grease on the extended jack rod is normal and aids in the lubrication of the rod.

- Remove dirt and road debris from the jacks as needed.
- Check the fluid level every month. The fluid level should be within $\frac{1}{4}$ " inch of fill port lip and checked with all jacks retracted.
- Inspect and clean all hydraulic pump electrical connections every 12 months.
- For Jacks equipped with a grease fitting at the bottom of the cylinder, two pumps of grease should be sufficient for 20 to 30 uses. **DO NOT** over grease. Damage to the rod seal occurs with over greasing.

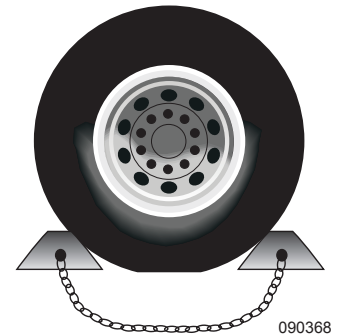
Grease Fitting Jack Pad



Adding Fluid:

When the leveling system makes unusual noise during jack operation, it may indicate a low fluid level. If the system alarm sounds when driving around corners or over bumpy roads, this usually indicates low fluid level.

1. Chock a wheel fore and aft for safety.
2. Ensure all jacks are retracted.
3. Unscrew the reservoir cap from the top of the pump. Slowly fill the reservoir with Dexron III automatic transmission fluid until $\frac{1}{4}$ " from fill plug.
4. Replace the reservoir cap. The reservoir is now at the proper level.



ENGINE - GENERAL INFORMATION

The diesel engine operates differently from the conventional gasoline engine. Gasoline engines control engine speed using a butterfly throttle plate controlling air/fuel mixture inlet flow. As the throttle plate opens, vacuum created by the piston velocity draws the metered fuel/air charge into the combustion chamber, then ignites from a controlled electric ignition source. Closing the throttle plate limits the fuel/air supply, slowing engine speed, increasing intake manifold vacuum.

The diesel engine in the motorhome controls engine speed by varying fuel supply only. No throttle plates are used. An exhaust driven turbine system (turbocharger) compresses the fresh air supply into the engine. The fuel is injected under pressure into the combustion chamber. Ignition of fuel/air charge occurs from heat generated by rapid high compression. The turbo boost gauge registers amount of intake manifold pressure measured in lbs./in². Therefore, no intake manifold vacuum exists.

Diesel engine RPM (revolutions per minute) operating speeds are generally much lower than that of the gasoline engine. Peak torque and horsepower output values occur at much lower engine speeds. Idle speeds between the two engine types are similar, however maximum engine speeds are quite different. The gasoline engine generally is not regulated to a maximum engine speed. The maximum engine speed on a diesel engine is controlled by an engine speed governor set by the engine manufacturer.

WARNING:

Do not operate a diesel engine where there are or can be combustible vapors. Vapors can be drawn through the air intake system and cause engine acceleration and over-speeding, resulting in fire, explosion and extensive property damage. Numerous safety devices are available, such as air intake shutoff devices, to minimize risk of an engine over-speeding where an engine (due to its application) might operate in a combustible environment, such as fuel spills or gas leaks.

INFORMATION:

The equipment owner and operator is responsible for safe operation of engine. Consult your engine manufacturers owners manual or authorized repair location for more information.

The Cummins diesel engine is a 6-cylinder in-line engine, utilizing an electronic fuel control system to supply fuel to the cylinders for precise fuel delivery, as well as built-in diagnostics to monitor engine operation.

Engine electronics also enable the use of programmable monitoring features that may cause limited engine power/vehicle speed when certain conditions arise. These features limit the operation of the engine when conditions that may damage the engine are encountered. These conditions may include such events as low oil pressure and high coolant temperature. When the engine electronics encounter such a condition, it limits the amount of power produced by the engine to help prevent or limit damage. It is possible however, for the engine to be damaged if corrective action is not taken immediately when such a condition exists. Operation of the vehicle while in the limited operation mode may result in serious engine damage. If a sudden loss of power is noticed in conjunction with the engine warning light illuminating **STOP ENGINE**, pull to the side of the road as soon as it is safely possible. Evaluate the situation.

Refer to the engine manufactures OEM for additional information concerning the operation, description, maintenance, and warranty information for the engine.

Diagnostic Fault Codes:

The engine ECM records three types of fault codes; Electronic Control System Faults, Protection System Faults and Maintenance Indicators. All faults recorded are **ACTIVE** or **INACTIVE**. Not all faults light an indicator when they are **ACTIVE**.

Three Lamps that Can Illuminate Are:

Engine Warning - Indicates a need to repair the fault at the first opportunity.

Stop Engine - Indicates a need to shut down and remain shut down until the fault can be repaired.

Maint Reminder - Indicates a maintenance function needs to be performed.

Eng Diagnostic:

Uses the Engine Warning and Stop Engine dash warning lamps to emit engine diagnostic codes.

NOTE:

To retrieve engine diagnostic codes requires an Insight Diagnostic Display or a Shorting Plug hooked to the engine diagnostic harness.

To Retrieve Active Fault Codes:

1. Turn the ignition key **OFF**.
2. Hook up an Insight diagnostic display or Shorting Plug to the engine diagnostic harness.
3. Turn the ignition key **ON**; observe **Engine Warning** and **Stop Engine** lamps.
 - a. If no active codes are recorded, both lamps remains illuminated.
 - b. If an active code is recorded, both the **Engine Warning** and **Stop Engine** dash warning lamps illuminate briefly then go out followed by the **Engine Warning** lamp illuminating briefly. This is an indication one or more fault codes will be displayed by the **Stop Engine** lamp. A three-digit code group displays as a series of blinks-pause-blinks-pause. Record the code(s) as a three-digit number. Codes are separated or ended by the Engine Warning lamp flashing once.
 - c. Use the Fast Idle switch to scroll through all ACTIVE faults.
 - d. When codes are retrieved, turn **OFF** the Engine Diagnostic switch.
 - e. Contact **Cummins** help line, **1-800-DIESELS**, or an authorized distributor.

STARTING PROCEDURE

Normal Starting

The engine is equipped with an intake manifold grid heater. The grid heater helps engine starting in cold weather. Intake manifold air temperature is monitored by the Electronic Control Module (ECM) on the engine. If intake manifold temperature is below specified level (about 40° F) manifold grid heater will be activated. Grid heater activation is indicated by the **WAIT TO START** indicator lamp.

WARNING:

Use of ether starting fluids may cause an explosion upon grid heater activation.

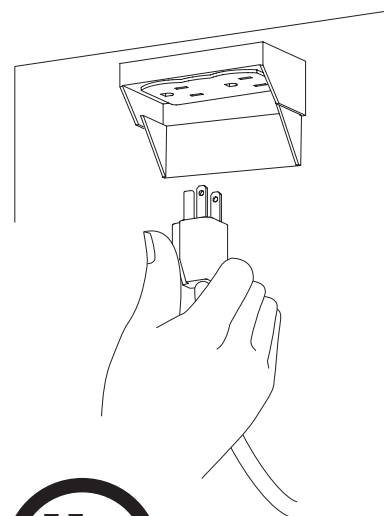
With the throttle at idle position, turn the ignition key to **ON** allowing the **WAIT TO START** lamp to extinguish. Turn the key to **START**. When the engine is started, the grid heater again energizes for a time period determined by the intake air temperature and fuel temperature. Allow the engine to idle with no load for three to five minutes. The engine coolant temperature should be up to normal operating range (140°F/60°C to 212°F/100°C) before operating the engine under full throttle.

Cold Weather Starting

Starting and operating the motorhome during cold weather requires extra care and consideration. Use the following guidelines and refer to the *OEM Engine Manual* to help ensure safe, trouble-free operation of the motorhome:

The Block Heater requires 120 Volt AC to operate. Hook to shore power, as this is more efficient. The generator may be difficult to start and the time required to pre-heat the engine may be lengthy. The block heater receptacle is located inside the rear engine access doors along the left side. The block heater is rated at 1000 watts.

An extension cord may be used, however, the power cord should be rated at 15 Amps and the outlet used is GFCI protected rated at 20 Amps. The engine may require several hours of pre-heating prior to starting. It is recommended to start pre-heating the engine the night before departure. Remember to unplug the block heater before departure.



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To Use the Block Heater:

- Hook to a shore power receptacle and plug in the block heater cord.

WARNING:

All extension cords require a UL rating. Use only a 15 Amp, 120 Volt AC extension cord.

NOTE:

The inverter should never be used for the power source. Rapid battery drain and inverter shut down occurs.

Engine Heat with Hydro-Hot (Optional):

The diesel burner inside the Hydro-Hot heats an internal engine coolant loop. When the Engine Heat switch is turned on, an engine coolant pump inside the Hydro-Hot circulates heated coolant through the engine. The time it takes for the Hydro-Hot to pre-heat the engine depends on ambient temperature. Allow at least three hours of pre-heating before attempting to start the engine.

To Use the Hydro-Hot System:

- Turn the Hydro-Hot switch **ON**.
- Turn the Engine Heat Switch **ON**.
- This activates the engine pump inside the Hydro-Hot.

Tips

1. When operating below 32° F, an engine block heater or other means to warm the engine can enhance engine starting. This eases cranking and helps prevent engine misfiring and white smoke during starting.
2. Always follow the recommended oil, fuel, and coolant specifications as outlined in the OEM Engine Manual. Proper oil viscosity and coolant concentration eases engine starting and helps to avoid engine damage.
3. Allow the engine to idle until it warms sufficiently for operation. Utilize the fast idle feature to quicken the process. Wait to operate the vehicle for at least three minutes or until the coolant temperature begins to move.
4. Check the air inlet and filter daily, or as necessary, when driving in snow conditions.
5. The demand on batteries increases during winter; check and service the batteries frequently to help ensure trouble-free starts.
6. Start out slowly with the motorhome to allow the transmission and axle lubricants time to circulate and warm before putting them under full load.

WARNING:

Do not use ether cold starting aids to start the engine as damage may occur.

OIL RECOMMENDATIONS

Following the maintenance guidelines in the engine manufacturer OEM Manual recommendations for the engine helps to extend engine life and improve performance, resulting in cost efficient operations. A good maintenance schedule begins with a daily awareness of the engine and its various systems.

A high grade 15W-40 multiviscosity heavy duty lubricating oil meeting Cummins Engineering Specification CES 20071 or CES 20076, American Petroleum Institute (API) specification CH-4 which can be used as an alternative to CES 20071 is recommended. Lubricating oils meeting API CG-4 specifications may be used at a reduced drain interval. The engine uses Pennzoil 15W-40 heavy duty engine lubricating oil that meets Cummins specifications. A critical factor in maintaining engine performance and durability is the use of high grade multigrade lubricating oil and strict adherence to the maintenance service intervals.

A straight weight or monograde lubricating oil is not recommended. Shortened drain intervals may be required as determined by a close monitoring of the lubricating oil condition by means of an oil-sampling program. The use of oil analysis to extend drain interval is not recommended. There are numerous variables, which is the basis of the recommendation.

Synthetic oils API category III specifications are recommended for extreme cold temperatures only. Low viscosity oils, used for winter operations, will aid in starting. Synthetic oils, or oil with adequate low temperature properties used for Arctic operations where the engine cannot be kept warm when shut down, helps with starting.

The use of synthetic oils should not be used to extend drain intervals. Extended oil change intervals can decrease engine life and possibly affect the engine warranty.

Oil additives should not be used unless the oil supplier or oil manufacturer has been consulted and provided positive evidence or data establishing satisfactory performance in the engine.

NOTE:

The engine does not require a “break-in” procedure.

Function of Engine Oil:

If a lubricating oil is to work in an engine it must be capable of performing various functions. Lubrication of the moving parts is the primary function. The lubricating oil should be able to form a film between metal surfaces preventing metal to metal contact and reducing friction. When there is a metal to metal contact, friction heat is generated. Welding of the part can occur and metal transfer results in scuffing or seizing. The film of oil contacting the surfaces provides cushioning and shock dampening as well.

Cleaning is another function. The oil should perform as a cleaner in the engine by flushing contaminants from critical components. These contaminants should be removed in the filtration system or during the course of an oil change. Oil provides a protective barrier to prevent corrosion of non-ferrous metals.

Internal components of the engine require cooling. The primary coolant system cannot provide this cooling. Oil transfers heat by contacting the various components then transferring to the primary cooling system at the oil cooler. The uneven surfaces in the combustion chamber are filled to act as a combustion seal within the cylinder liner and other internal components.

Synthetic Engine Oil:

In extreme environments, where ambient temperatures can be as low as 45° C (-50° F), a petroleum-based oil will not perform satisfactorily in diesel engines. Synthetic oils were developed for these type applications. These synthetic oils are blended from ether and/or hydrocarbon based oils. Chemically reacting lower molecular weight materials to manufacture lubricants of desired properties produce these base oils. All synthetic based oils must meet the API category III classifications and SAE viscosity grades.

NOTE:

Synthetic oils and petroleum based oils should never be mixed.

Viscosity:

Viscosity is simply a measure of resistance of molecule layers moving relative to an adjacent layer. All fluid viscosity is affected by temperature. A multigrade lubricating oil tends to be less sensitive to temperature changes due to formulation. Lubricating oils are generally selected for use with viscosities appropriate for the expected operating temperature. The correct selection of a lubricating oil of correct viscosity is critical for optimum performance. Some effects of incorrect viscosity when the oil is too thick range from difficulty in starting, to increasing fuel consumption and reduced power output. When the oil is too thin, oil consumption is increased as well as wear from the metal to metal contact. This will also increase engine noise.

Low temperature viscosity specifications are identified by a “W” (winter). High temperature viscosity that meets the 100° C (212° F) requirements has no suffix. When lubricating oil meets both high and low temperature requirements they are classified as multi-viscosity or multigrade.

Routine Oil Maintenance

1. Check oil level daily.
2. Replace oil filter at every oil drain interval.
3. Cummins Engine Company, Inc. recommends the use of high quality, API (American Petroleum Institute) licensed CH-4 or CES20071, 15W-40, multiviscosity oil or premium oil.
4. The recommended oil drain interval is defined by the API oil performance classification and the engine duty cycle. Refer to the Cummins Operation & Maintenance Manual for complete details.

To change oil start with the motorhome at normal operating temperature. Park on a level surface and stop the engine. Remove the two crankcase drains plugs from both the deep and shallow portions of the oil pan to allow the oil to drain. Install the drain plugs back into the oil pan and tighten to 40 to 60 ft-lbs. Remove the oil filter.

NOTE:

It is recommended that the used oil filter be opened and the element examined for excessive wear particles; see the OEM Engine Manual for information on this procedure.

Wipe the filter base sealing surface and ensure that the old gasket is removed. Apply clean engine oil to the gasket of the new filter and install the filter until the gasket contacts the filter base. Tighten the filter an additional $\frac{3}{4}$ turn. Do not over-tighten. Remove the oil filler cap located at the rear of the engine. Fill the crankcase with the amount of oil determined by dipstick readings (about 20 quarts).

Allow time for the oil to drain into the sump and start the engine. Observe the engine for proper oil pressure. Run the engine at low idle for three minutes while observing engine and filter for leaks. Stop the engine and allow the oil to settle for five minutes. Check the level of the engine oil with the dipstick. Correct the level as necessary.

- The recommended oil drain interval is defined by the API oil performance classification and the engine duty cycle. Refer to the OEM Engine Manual for complete details.

Cold Weather Engine Operation

It is possible to operate diesel engines in extremely cold environments. The engine must be properly prepared and maintained. The appropriate lubricants, fuels and coolant **MUST** be used for the cold weather range for which the motorhome is being operated. In colder climates lubricants, coolant and even fuel can thicken. Be aware of oil viscosity, coolant to antifreeze mixture and fuel grade used. Fuels purchased in warmer climates may not flow properly in colder climates.

Cold weather operation can be defined in two categories: Winter and Arctic.

WINTER (32° to -25° F) (0° to -32° C): Use a 50% antifreeze to 50% water coolant mixture. Use multiviscosity oil meeting Cummins specifications and fuel to have maximum cloud pour points 10° F (6° C) lower than the ambient temperature in which the motorhome operates.

ARCTIC (-25° to -65° F) (-32° to -52° C): Use a 60% antifreeze to 40% water coolant mixture. Use oil meeting Cummins specifications and fuel to have maximum cloud pour points 10° F (6° C) lower than the ambient temperature in which the motorhome operates.

INFORMATION:

There are numerous diesel fuel additives to help remove moisture, prevent microbe growth in cold weather. Before adding any type of fuel additive or extender, consult the Engine Manufacturer's Owner's Manual. More detailed information on Cold Weather Operations can also be found in the Engine Manufacturer's Owner's Manual.

ENGINE SHUTDOWN

General guidelines for shutting the engine down are fairly simplistic. Allow the engine to idle three to five minutes after a full load operation. This allows adequate cool down of pistons, cylinders, bearings and turbocharger components. Under normal driving conditions, exiting the highway is generally lighter engine operation and the need for the three to five minutes is not necessary. It is recommended to fill the fuel tank at the end of the day to help prevent condensation and drive out moist air. Do not fill the fuel tank to the top, as fuel expands when warm and may overflow.

Extended Engine Shutdown

When the motorhome has been sitting for extended periods, 30 days or more, verify all the fluid levels are correct. Follow the normal starting procedures. If the oil pressure gauge does not register within 15 seconds, shut off the engine immediately to avoid damage. Consult the OEM Engine Manual for guidelines on troubleshooting low oil pressure, or contact a qualified service technician. If oil pressure is normal, allow the engine to idle for three to five minutes before operating under a load.

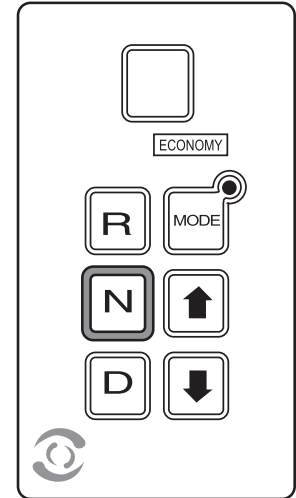
CONSOLE

Transmission Shift Selector

Transmission Key Pad:

The function of each position of the keypad push-button shifter is as follows:

- Select **NEUTRAL** by pressing **N**. The area around the **N** button has a raised ridge so the driver can locate the Neutral button by touch.
- Select **REVERSE** gear by pressing **R**.
- Select the forward **DRIVE** range by pressing **D**. The highest forward gear (**6**) appears on the display and the transmission shifts to first gear. Gear “**6**” remains on the display through subsequent upshifts or downshifts.
- The **UPSHIFT** and **DOWNSHIFT** arrow buttons are used to select a higher (if not in sixth gear) or lower (if not in first gear) forward range. These buttons are not functional in **NEUTRAL** or **REVERSE**. One press changes the gear selected by one range. If the up or down button is held continuously, the range continues to change up or down until the button is released or until the highest/lowest possible gear is selected.
- The **Mode** button enables Economy Mode.



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- **To Enter Economy Mode:** Press the **MODE** button. The LED illuminates.

- **To Exit Economy Mode:** Press the **MODE** button. The LED extinguishes.

Economy Mode:

Economy Mode affects the upshift schedule 3-4, 4-5, 5-6 and downshift schedule 6-5, 5-4, 4-3. During highway driving, with cruise control set between 55 and 65 miles per hour, setting the transmission to Economy Mode eliminates about 99% of transmission downshifts from sixth to fifth when advancing an incline or overpass.

In city driving, with the transmission set to Economy Mode, the transmission upshifts about 200 RPM sooner using less fuel with reduced engine noise. **Do Not** use Economy Mode while traveling in mountain terrain. The lower RPM shift schedule reduces the flow of antifreeze, lubricating oil and air flow through the radiator, resulting in increased transmission and engine temperature.

CAUTION:

Do not use the Economy Mode in heavy stop and go traffic or mountainous terrain. Frequent shifting occurs when in economy mode while using heavy throttle, increasing transmission fluid temperature. Exit Economy Mode until road conditions improve.

NOTE:

When the Auxiliary Braking device is used, the display changes to a default reading of 2 or 3. This setting is pre-selected at the factory and can only be altered by an authorized Allison Service center. The transmission is not actually in second or third gear. This is only a reference point so the transmission optimizes engine braking efficiency.

Transmission Check Light

The electronic control system of the transmission is programmed to inform the operator of a problem with the transmission system and reacts automatically to protect the operator, motorhome and transmission. When the Electronic Control Unit (ECU) detects a DO NOT SHIFT (DNS) condition the ECU restricts shifting, turns on the CHECK TRANS light in the instrument panel and registers a fault code.

NOTE:

For some problems, fault codes may be registered without the ECU activating the CHECK TRANS light. An Allison Transmission authorized service outlet should be consulted whenever there is a transmission related concern. They have the equipment to check diagnostic codes and correct problems which may arise.

Each time the engine is started the **CHECK TRANS** icon lights, then turns off after a few seconds. This momentary lighting is to indicate that the status light circuit is working properly. If the **CHECK TRANS** light does not illuminate during start up, or if the light remains on after start up, the transmission system should be checked immediately.

Continued illumination of the **CHECK TRANS** light during vehicle operation (other than start up) indicates that the ECU has signaled a diagnostic code. Illumination of the **CHECK TRANS** light is accompanied by a flashing display from the shift selector. The shift selector display shows actual range attained and the transmission will not respond to shift selector requests.

Indications from the shift selector are provided to inform the operator that the transmission is not performing as designed and is operating at reduced capabilities. Before turning the ignition off, the transmission may be operated for a short time in the selected range in order to “limp home” for service assistance. Service should be performed immediately in order to minimize potential damage to the transmission.

When the **CHECK TRANS** icon illuminates the keypad will not respond to command and the transmission generally will downshift to 4th gear. The torque converter will not “lock-up” and engine speed is automatically reduced. Direction changes (i.e. forward to reverse) will not be allowed. Locate a safe secure place to park the motorhome. If the engine is shut off, then engaged after a **CHECK TRANS** indication, the transmission remains in Neutral until the fault causing the **CHECK TRANS** light has been corrected.

Diagnostic Codes:

The diagnostic codes are numerical representations of malfunctions in the transmission operations. Each code is a two digit main code and a two digit sub code. The codes, when detected, are logged in the ECU memory. These codes fall in two classes: active and inactive. Active codes are codes currently effecting the ECU process. Inactive codes are retained but may not effect the ECU process. The diagnostic mode must be entered. A maximum of five codes, **D1** to **D5**, may be listed at one time. The highest priority code is listed in **D1**. The **MODE** button enables selection of sequential codes.

To Enable Diagnostic Code Selection Display:

- Stop the motorhome at a safe location.
- Apply the parking brake.
- Simultaneously press the **UP** and **DOWN** arrows twice to enter the stored codes. The first time the arrows are pressed indicates the oil level display. Press the **UP** and **DOWN** arrows again.
- The codes display one digit at a time.
- The mode button is pressed to scroll through the codes.
- Any code obtained should be noted and reported to an Allison Service Center for evaluation and possible repair.
- Inactive codes can be cleared by holding the **MODE** button for about three seconds. Some codes are self clearing while others require service or ignition on/off cycles to clear.

Periodic Inspections

The Allison MH Series requires minimum maintenance. Careful attention to fluid level and connections for the electronic and hydraulic circuits is very important.

For easier inspection the transmission should be kept clean. Make periodic checks for loose bolts and leaking fluid lines. Check the condition of the electrical harnesses regularly. Check the engine cooling system occasionally for evidence of transmission fluid which would indicate a faulty oil cooler. Report abnormal conditions to an Allison dealer.

Prevent Major Problems:

Help the WTEC III control system oversee the operation of the transmission. Minor problems can be kept from becoming major problems if an Allison Transmission distributor or dealer is notified when one of these conditions occur:

1. The shifting feels odd.
2. The transmission leaks fluid.
3. There are unusual transmission-related sounds (changes in sound caused by normal engine thermostatic fan cycling while climbing a long grade with a heavy load have been mistaken for transmission-related sounds).
4. The **CHECK TRANS** light comes on frequently.

The Importance of Proper Fluid Levels:

Transmission fluid cools, lubricates and transmits hydraulic power. Proper fluid levels must be maintained at all times. If fluid level is too low, the converter and clutches do not receive an adequate supply of fluid. If fluid level is too high, the fluid can aerate. Aerated fluid can cause the transmission to shift erratically or overheat.

The MH Series oil level sensor (OLS) allows the operator to check the transmission fluid level from the keypad shift selector. Frequently check for the presence of oil level diagnostics in the transmission. If the OLS has not been detected, troubleshooting of the OLS circuit is required. This has to be performed by an Allison Service Center. After the OLS circuit is repaired, ensure that reset of the “autodetect” or manual selection of the OLS function is enabled by using a Pro-Link transmission diagnostic center.

Fluid Level Check with the Keypad:

To Enter Oil Level Sense Mode:

- Park the motorhome on a level surface. Place the transmission in “**N**” and set parking brake.
- The transmission temperature must be at least 140° F/60° C, otherwise an error code appears.
- The motorhome must be stationary and in **Neutral** for about two minutes, allowing fluid to settle in sump.
- The engine must be idling lower than 800 RPM.
- Simultaneously press the **UP** and **DOWN** buttons once.

The transmission is now in **Oil Level Sense** mode. The display indicates one character at a time. An “o” followed by “L” represents **oil level check** mode. One of the following will be indicated.

- “o K” represents the level is okay.
- “Lo” represents a low fluid level followed by a numeric indication of the number of quarts needed to fill the sump.
- “HI” represents an overfull condition followed by a numeric indication of the number of quarts the sump is overfull.
- A countdown of flashing numbers indicate the fluid is still settling. When the fluid has stabilized in the sump the true level will be indicated.
- If an “o” “L” “-” followed by a number displays, the oil level sensor could not read the level due to one of conditions listed in the chart.

Common Oil Level Fault Code	
Display	Cause of Code
o,L - 0,X	Setting time too short
o,L - 5,0	Engine speed (RPM) too low
o,L - 5,9	Engine speed (RPM) too high
o,L - 6,5	Neutral must be selected
o,L - 7,0	Sump fluid temperature too low
o,L - 7,9	Sump fluid temperature too high
o,L - 8,9	Output shaft rotation
o,L - 9,5	Sensor failure

To Exit Oil Level Sense Mode:

- Press Neutral, Reverse or Drive.

NOTE:

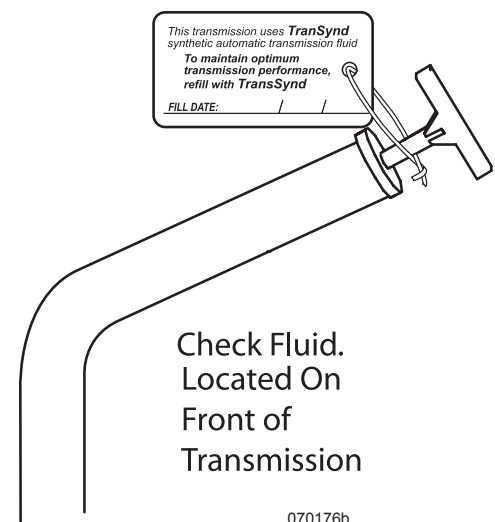
Reading between the Oil Level Sensor and the dipstick may not agree because the OLS compensates for fluid temperatures.

NOTE:

To correctly check the transmission fluid level using the dipstick, the transmission fluid must be at operating temperature. The oil level sensor method of checking the fluid level compensates for transmission fluid temperature between 60° C to 104° C (140° F to 220° F). Any temperature below 60° C (140° F), or above 104° C (220° F), results in an error code.

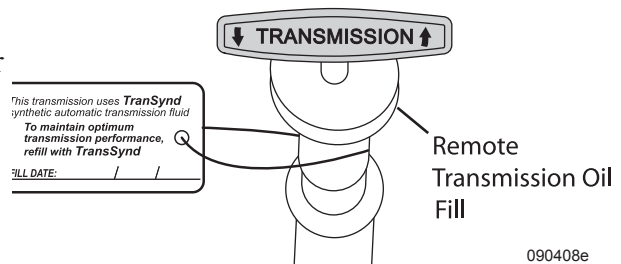
TRANSMISSION LUBRICATING FLUID

Transmission performance, reliability and durability are dependent on the type of lubricating fluids used. From the factory, the transmission has been filled with TranSynd™ synthetic transmission fluid. TranSynd™ synthetic transmission fluid extends the service intervals. A small tag has been attached to the dipstick located on the curbside of the transmission next to the engine, to identify that the transmission is filled with TranSynd™ synthetic transmission fluid. The remote dipstick/oil fill also has a tag attached and is located in the rear engine service compartment.



Fluid and Internal Filters Change Interval:

Fluid and internal filters may require changing earlier depending on the severity of operating conditions. Fluid must also be changed whenever there is evidence of dirt or high temperature operation as indicated by discoloration, strong odor or fluid analysis. Local conditions, severity of operation or duty cycle dictates more or less frequent service intervals.



NOTE:

Refer to the Allison transmission owner's manual or contact an authorized Allison service center for change intervals.

Fluid Levels - Cold Check

Cold Check - Manual Check Procedures:

The concept of a cold check is to determine adequate fluid level for safe operating until hot check can be performed.

To Check the Fluid When Cold:

- Park the motorhome on a level surface. Set the parking brake.
- With the engine operated at a low idle, put the transmission in **N** (Neutral).
- Chock the wheels to prevent the motorhome from moving.
- Allow the engine to run at idle (500 to 800 RPM) for one minute.
- Apply service brakes and shift to **D** (Drive), then to **N** (Neutral) and next to **R** (Reverse) to fill the system. Finally shift to **N** (Neutral) and release service brakes. Allow the engine to continue to run at idle (500 to 800 RPM).
- Remove the dipstick and wipe clean. Reinsert the dipstick fully into the tube and remove to check fluid level. Repeat this to verify reading if needed.
- Safe operating level is anywhere within the **COLD CHECK** band on the dipstick. The fluid level is sufficient enough to operate until a **HOT CHECK** can be performed.
- If the level is not within this band, add or drain the fluid as necessary to put the level to the middle of the **COLD CHECK** band.
- Perform the **HOT CHECK** at the first opportunity after reaching normal operating temperatures (160° to 200° F/71° to 93° C).

CAUTION:

Low or high fluid level can cause overheating and irregular shift patterns. These conditions can damage the transmission if not corrected.

- Fluid level rises as temperature increases. Fluid must be hot to ensure an accurate check.
- Be sure fluid has reached normal operating temperature (160° to 200° F /71° to 93° C). If a transmission temperature gauge is not present, check the fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under the load for at least one hour.
- Park the motorhome on a level surface and shift to **N** (Neutral). Apply the parking brake and allow the engine to idle (500 to 800 RPM).
- After wiping the dipstick clean, check the fluid level. Safe operating level is anywhere within the **HOT RUN** band on the dipstick.
- The width of the **HOT RUN** band is approximately one quart of fluid at normal temperature range.
- If the level is not within this band, add or drain the fluid as necessary to put the level within the **HOT RUN** band.
- Be sure that the fluid level checks are consistent. Check the level more than once. If the readings are not consistent, ensure that the transmission breather is clean and not clogged. If the readings are still not consistent, contact the nearest Allison distributor or dealer.

COOLANT SYSTEM

The cooling system consists of a radiator mounted on the roadside of the motorhome, a hydraulic powered fan, an in-line transmission cooler, as well as an external hydraulic cooler and charge air cooler that are mounted to the radiator. Steel tubes and radiator hoses allow engine coolant to flow between the radiator and the engine. The hydraulic fan draws air from the outside of the motorhome, through the radiator and into the engine compartment. These components working together ensure that all the chassis systems maintain proper operating temperatures as they are inner-related. A problem with one component may cause problems with an entirely different system.

After the engine reaches proper temperature, the water regulator (thermostat) on the engine opens and allows coolant to flow from the engine, through the upper radiator hose and into the radiator. The coolant is cooled in the radiator and flows back to the engine through the lower radiator tube. A by-pass tube installed between the thermostat housing and lower radiator tube functions to supply coolant to the transmission cooler under certain conditions to ensure proper cooling.

The charge air cooler, which is mounted on the outboard side of the radiator, cools the intake air for the engine after it has passed through the turbocharger. This is necessary due to the heat generated as the intake air is pressurized, and subsequently heated, as it passes through the turbocharger.

With all the components working together to maintain the engine, transmission, and hydraulics operating at the proper temperatures, proper maintenance of the cooling system is very important. One neglected component could result in cooling problems. Maintenance of the cooling system includes maintaining a proper coolant level with the correct mixture of coolant and additives, inspection of cooling system components, flushing the engine coolant system with approved cleaners, and ensuring that the exterior of the radiator and other external coolers are kept clean and free of debris.

Understand that adding straight water or antifreeze to the system creates an imbalance of the coolant mixture. While adding small amounts occasionally may not affect the mixture greatly, but large amounts (1/2 gallon) or frequent “top-offs” may.

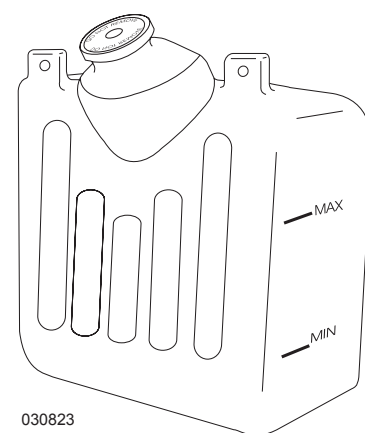
Three components necessary for the proper coolant mixture are clean water, glycol antifreeze (ethylene or propylene), and Supplemental Coolant Additives (SCA). The water in the coolant system serves as the “base.” It is critical to use as pure of water as possible. Salts and other minerals in the water can solidify in the cooling system causing scaling and “clogging” of the radiator. Distilled or de-ionized water is recommended for use in the cooling system in order to avoid these problems.

Glycol antifreeze, usually in the form of ethylene glycol or propylene glycol, provides an increased boiling point of the coolant mixture, increased freeze protection, and helps prevent water pump cavitation (air bubbles in the coolant mixture that can result in wear of the engine). While the ratio of water and glycol can be adjusted to meet differing anti-boil and freeze protection, it is recommended that a mixture of 50% water and 50% glycol be used. This 50/50 mixture provides freeze protection to -34° F.

A minimum mixture of 30% glycol and 70% water is required in order to minimize water pump cavitation and corrosion protection.

Coolant

Fully formulated antifreeze or coolant containing a precharge of Supplemental Coolant Additives (SCA) is recommended. The use of either will significantly simplify coolant system maintenance. The difference between a fully formatted antifreeze and a fully formatted coolant is the percentage of water. Both contain balance amounts of antifreeze, SCA, buffering compounds and a percentage of good clean quality water. The antifreeze of coolant must meet ethylene glycol or propylene glycol recommendations. A good clean quality water in a 50/50 ratio (40 to 60% working range) mixed with fully formatted antifreeze will provide protection from -34° F to 228° F. The 50/50 mix ratio must be premixed prior to being put in the system. Placing antifreeze and water in the cooling system is not recommended. Consult the Cummins Operation & Maintenance Manual for more details.



NOTE:

An over concentration of antifreeze, or the use of high silicate antifreeze, can cause damage to the coolant system and engine. Antifreeze is essential in every climate.

WARNING:

Do not continue engine operation when engine temperature rises above 220° F. At 220° F an engine warning light will illuminate and the engine will begin to de-rate in power output. Continued operation will result in engine damage.

The coolant level and fluid freeze point should be checked with every oil change interval, at 15,000 miles, 500 hours or six months, whichever comes first. Also change the coolant filter (not on all engines) at the same interval unless SCA concentration is over three units. The coolant should be drained and flushed at 6,000 hours or two years of service, whichever comes first.

Engine Coolant Reservoir:

A “see-through” plastic reservoir, similar to the familiar windshield washer jar, is connected to the radiator by a hose. As the motorhome is driven, coolant is heated and expands. A portion of fluid displaced by this expansion flows from the radiator into the reservoir tank. When the engine is stopped, the coolant cools and contracts. Displaced coolant is drawn back in the radiator by a vacuum. Thus, the radiator is kept filled with coolant to the desired level at all times resulting in increased cooling efficiency. The coolant level should be at or slightly above the appropriate mark on the reservoir tank when the system is cold.

CAUTION:

To avoid scalding hot steam or coolant from escaping from the engine cooling system, do not remove the reservoir cap while the engine is running or when the engine is hot. Failure to follow this warning may result in damage to the engine cooling system, and possibly cause severe personal injury.

- Check the coolant level daily or when refueling.
- Drain and flush the coolant system every 60,000 miles or two years, and refill with a heavy-duty coolant (50/50 mix of water and antifreeze).
- If the coolant is below the **MIN** mark, the low coolant alarm sounds and the low coolant light appears on the dash.
- The coolant level remains between the **MAX** and **MIN** level in the reservoir.

INSPECT:

Stop the motorhome and inspect the coolant level before continued operation.

Coolant Additive (SCA)

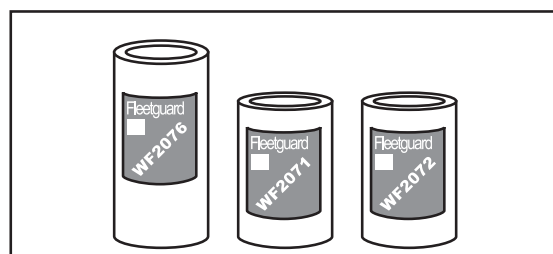
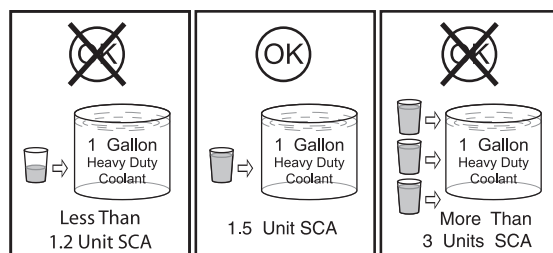
Fully formulated products contain SCA and are required to protect the cooling system from fouling, solder blooming and general corrosion. Supplement coolant additives, or equivalent, are used to prevent cylinder liner pitting, corrosion and scale deposits in the cooling system.

CAUTION:

Insufficient concentration of the coolant additives will result in cylinder liner pitting and engine failure. The SCA concentration must not fall below 1.2 units or exceed 3 units per gallon of cooling system capacity.

INFORMATION:

For more information refer to the Cummins manual.



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Routine Maintenance Recommendations:

1. Check the SCA concentration level every 15,000 miles/6 months.
2. Drain and flush the system every 240,000 miles/2 years, and refill with a heavy-duty coolant (50/50 mix of water and antifreeze).
3. Always use antifreeze. In addition to freeze protection, it helps with overheat and corrosion protection.
4. The supplemental coolant additive (SCA) is required.
5. Freeze point should be measured every 15,000 miles/6 months.

Maintenance Procedures

When performing maintenance, it is also necessary to **inspect** other components of the cooling system.

Have an **inspection** performed of the surge tank cap seal and have the cap pressure tested. Also replace the thermostat, gasket and seal. The charge air cooler and radiator also requires an **inspection** for cracks, broken welds, secure mounting, and general cleanliness.

It may be necessary to clean the radiator and external coolers more often under certain conditions. Leaves, twigs, road debris and other contaminants can block the radiator and cooler fins resulting in reduced cooling system performance. Blockage can vary depending on road conditions, climate, and regional conditions. Check the radiator and external coolers weekly for blockage and clean as required. To clean the radiator and external coolers, compressed air is recommended. In the event that road grime, oil, or inadequate cleaning with compressed air is encountered, a high pressure washer and degreaser may be used with caution, as excessive pressure can bend the radiator fins.

Please refer to the Cummins OEM Manual for detailed information regarding the 24 month/60,000 mile maintenance interval. This service includes draining the engine coolant, flushing/cleaning the cooling system, inspecting the water pump standpipe and replacing the thermostat, gasket and seal.

Coolant Hoses:

Rotten, swollen and worn hoses, as well as loose connections, are frequent causes of coolant system problems. Overheating can be caused by a collapsed hose or a clog caused by rubber shedding from a rotten hose. Replace hoses found to be cracked, swollen or damaged. Connections should be inspected periodically and hose clamps tightened.

Every 12 months - Inspect all hoses, clamps, and fittings for leaks due to cracking, softness, and loose clamps/fittings. Look for signs of fluid leaks, damaged end fittings, ballooning, chafed, kinked, or crushed hoses, and loose clamps and fittings. Correct deficiencies.

Coolant Overheated:

If the engine is overheated, never pour cold coolant into a hot engine. The sudden change in temperature may crack the cylinder head or block. If the engine is hot, fill slowly to prevent rapid cooling and distortion of engine castings.

Coolant Changing:

24 months/60,000 miles - **Inspect** and clean the cooling system and charge air systems to promote system cleanliness and to enhance engine cooling. Stop the engine and allow it to cool. Remove the cap from the surge tank and place a large container beneath the drain valve on the radiator. Open the drain valve and allow the cooling system to drain. With the drain valve open, flush the cooling system with clean water to remove debris. Dispose of the old coolant mixture appropriately. Close the drain valve and fill the cooling system with a mixture of clean water and sodium carbonate. One pound of sodium carbonate is needed for every six gallons of water. Operate the engine for five minutes at temperature above 176 ° F. Stop the engine and allow the system to cool. Open the radiator drain valve to allow the system to drain. Fill the system with high quality water. Again, operate the engine for five minutes at temperature above 176 ° F. Flush the system with clean water until the draining water is clear. Allow draining completely. **Inspect** the water pump standpipe for blockage.

Replace the thermostat. Loosen the hose clamps and remove the hose assembly from the radiator to thermostat housing assembly. Remove the thermostat housing assembly from the cylinder head. Remove the thermostat and gasket from the housing, along with the seal in the housing. Install the new thermostat, seal and gasket into the housing. Re-install the thermostat housing and connect the hose assembly. Tighten the hose clamps. Ensure that the drain valve for the radiator is closed. Fill the cooling system with the recommended coolant / water / coolant additive mixture. Start the engine with the surge tank cap removed and allow the coolant to warm and the thermostat to open. Add coolant mixture until the coolant level in the surge tank is between MIN and MAX. Replace the surge tank cap. Allow the engine to warm to operating temperature while observing for coolant leaks. Stop the engine.

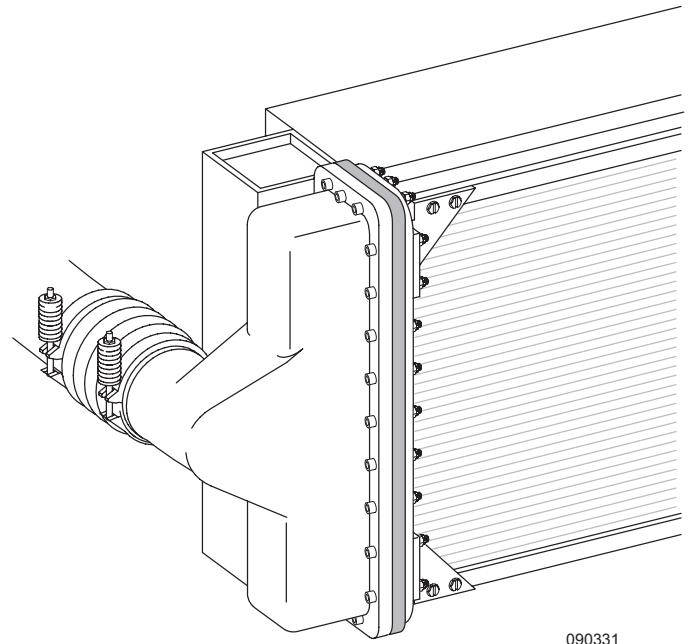
Inspect the radiator core and CAC for dirt and debris build-up. Wash accumulations using high-pressure water, being careful not to damage the fins from excessive pressure. Grease or oil build-up should first be treated with a non-caustic degreaser to ensure a thorough cleaning.

Coolant System - Thawing:

If the coolant system becomes frozen solid, place the motorhome in a warm area until completely thawed. At this point the motorhome must be towed. If the engine is operated when the cooling system is frozen it will result in engine overheating due to insufficient coolant circulation. Once thawed, check engine, radiator and related components for damage caused by expansion of frozen coolant.

CHARGE AIR COOLER

The diesel engine uses compression to ignite the fuel/air charge. To increase compression inside the combustion chamber (resulting in increased power output) a turbocharger is added to the engine. The turbocharger is a paired housing assembly with impellers inside each housing connected by a common shaft. One impeller is propelled by the engine exhaust, which drives the other impeller. The function of the other impeller is to increase compression inside the combustion chamber by forcing air into the intake manifold. The intake air charge is heated two different ways: through convection by the exhaust gases driving the turbocharger, and any time air is compressed heat is produced. This has a negative effect inside the combustion chamber resulting in lost power potential. Therefore, a Charge Air Cooler (CAC) is installed to cool the intake air before it enters the engine. The CAC may be mounted to either the top or side of the radiator.



The CAC performs the same function as a radiator, cooling air instead of liquid. Ambient air passing through the CAC cools the engine's intake air charge.

After leaving the turbocharger, intake air is compressed and heated to about 300° to 375° F, depending on the engine load and throttle position. Before the air enters the intake manifold, the CAC cools the intake air temperature to the engine manufacturer's specifications. Lower intake air temperatures reduce exhaust emissions, improve fuel economy and increase horsepower. The CAC continually expands and contracts up to 1/4" as throttle increases and decreases.

Visually inspect the charge air cooler every six months for dirt and debris that may be blocking the fins. If the motorhome develops an oil leak, there is a possibility that the oil will coat the fins of the CAC. Dust will adhere to the oil film and eventually clog the fins, greatly reducing cooling efficiency. When the oil leak is repaired, the CAC must be thoroughly cleaned.

Spraying degreaser on the charge air cooler, as well as using a steam cleaner, will not damage the CAC. However, pressure washer and steam cleaner nozzles placed too close to the CAC can bend the fins. The recommended cleaning procedure for the CAC, and the radiator, is to use a bucket of mild soap and water. Carefully wash with a bristle brush then rinse using a garden hose with minimum water pressure, standing back a distance to avoid bending the fins.

FUEL SYSTEM

The fuel tank, fuel lines, fuel/water separator, secondary fuel filter, fuel transfer pump, and fuel injectors are primary components of the fuel system. When the fuel transfer pump is operating, fuel is drawn from the fuel tank through the fuel supply hose to the primary water/separator. Most contaminants that may be present in the fuel are removed at this point. The fuel then flows to the secondary filter that removes any remaining contamination in the fuel down to five microns. From the filter, the fuel flows to the injectors, where the ECM controls injection timing and the amount of fuel delivered to the cylinder through the use of an electric solenoid on the injector. Fuel that is not used is returned to the fuel tank.

The fuel passes through the fuel transfer pump, which is a fixed clearance gear transfer pump, and through passages in the electronic control module (ECM) in order to provide cooling for the electronics.

Prevention of problems associated with the fuel system and performance of the vehicle begins with the quality and cleanliness of the fuel used. Fuel contaminated with water, dirt, and even algae can quickly clog fuel filters and cause problems with the fuel system. Try to obtain fuel from large fueling stations, such as truck stops, that do a large amount of business and the supply of fuel is replenished often.

Always keep the fuel tank full whenever possible, this helps prevent water condensation from forming inside the fuel tank. Condensation can cause problems in the fuel system not only with the filters, but can also eventually cause corrosion of the fuel tank. Always store the motorhome with a full tank of fuel.

Fuel Requirements:

Low sulfur #2 diesel fuel or #1 and #2 commercial blend diesel fuels are the most common commercially available and recommended for use. The use of #2 diesel fuel will result in optimum engine performance. Try to obtain fuel from sources that are serviced often such as large truck service facilities. The fuel supply is fresh and the possibility of introducing contaminants or water into the fuel system is reduced.

If driving in cold climates or extreme cold climates, consider winter blend diesel fuel. The winter blend diesel fuel contains a blend of additives to prevent it from forming wax crystals or gelling, which can solidify and plug fuel filters, causing problems starting and operating. It is important to consider fuel purchased in one climate may not perform in another climate.

Fuel additives are the responsibility of the owner or operator. Winter blend diesel is widely available in the northern United States and Canada during colder months. It is important not to empty the engine of fuel. The fuel system on the engine is sensitive to air.

WARNING:

Do not mix gasohol with diesel fuel. This mixture can cause an explosion.

NOTE:

Due to the precise tolerances of diesel injection systems, it is extremely important that fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injector. Fuel additives for lubricity are not recommended. There are numerous diesel fuel additives to help remove moisture from fuel, prevent microbe growth and to prevent freeze-up during cold weather. Before adding any type of fuel additive or extender, consult the Manufacturer's Owner's Manual.

Fuel Tank:

The diesel fuel tank is made of 13-gauge steel. The total capacity is 130 gallons. The engine pick-up tube is cut at a 45-degree angle to allow optimum flow to the engine.

NOTE:

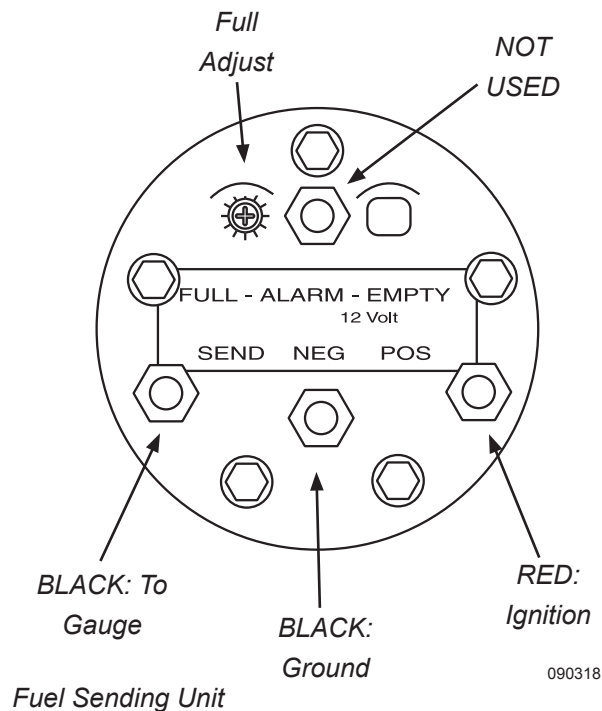
If the motorhome has been stored for any length of time, check the vent for blockage. It is not uncommon for insects to plug the vent tube. If the tank appears to be pressurized the vent tube may be blocked. To inspect the vent tube check on the curbside of the fuel tank, near the bottom. Always store the motorhome with a full fuel tank.

Fuel Sender

The “Centroid” fuel sender has no moving parts and works by measuring capacitance (electrical property) between its inner and outer tubes in the tank. The more fuel between the tubes, the higher the reading. Electronics in the “hockey-puck” head of the sender convert the capacitance to current to drive the fuel gauge.

The “Centroid” sender has four connections:

- **Positive (POS) and Negative (NEG):** Battery voltage to run the electronics in the sender head.
- **SEND:** Connects to the SEND terminal of the gauge on the dash.
- **ALARM:** Makes a connection internally to the negative (NEG) terminal when the low fuel alarm level is reached (when the fuel gauge is reading about 1/8 tank). This turns on the low fuel indicator light on the dash and is not adjustable.



Adjustments:

The “Centroid” sender has two adjustments:

- **EMPTY:** Adjusts for length of sender. It has been set at the factory, covered with a sealant and should not be changed.
- **Full Adjustment (FULL):** The full adjustment can be used to correct for slight differences between fuel meters. During installation, it has been calibrated for the meter and should not need readjustment.

The correct adjustment technique, with a full tank of fuel, is to start with the full adjustment screw completely clockwise. This should cause the reading to be above full. Adjust slowly, rotate counterclockwise until the full mark on the gauge is reached. The intent is to always adjust downscale rather than upscale.

Troubleshooting:

- A. Electronic Output:** The sender has a transistorized output to prevent an ohmmeter from getting a correct reading of its output resistance.
- B. Fuel Only:** The sender will not work correctly in conducting fluids such as water (it will read above full all the time in water). One possibility is that when there is a constant above-full reading there may be water in the bottom of the fuel tank.
- C. Contact Centroid:** Probably 90% of the time, the Centroid tests work okay on the bench. If you have incorrect readings contact **Centroid** (telephone: 800-423-3574, or preferably, fax: 386-423-3709) with the symptoms. A short, “fill in the blanks” troubleshooting test is provided to test the sender. It is easier to find the problem that way than after the sender has been removed from the system, since the problem is not necessarily with the sender.

Fuel Filters

The fuel filters are located in the rear engine compartment. The primary fuel filter has a drain located at the bottom of the filter. Water (by weight) is heavier than fuel and will collect in the sediment bowl. Water can accumulate in the fuel from condensation in the fuel tank or contamination upon refueling. If water passes through the filters it can cause engine misfire and damage fuel injectors. The primary filter should be drained before each trip.

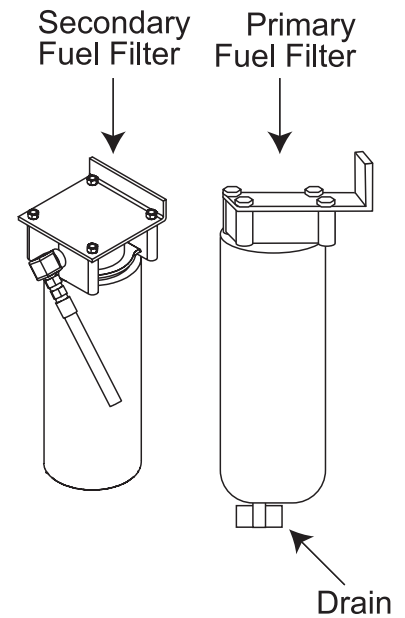
NOTE:

Replace both primary and secondary filters every 20,000 miles or one year.

To Drain the Primary Filter:

- Shut off the engine.
- Turn the valve counterclockwise approximately 1½ to 2 turns until draining occurs.
- Drain the filter of water and sediment until clear fuel is visible.
- Turn the valve clockwise to close the drain valve.
- Depending on the amount of contamination it may be necessary to replace the filters at the first opportunity.

In the event the engine runs out of fuel, the lift pump on the fuel pump runs for about one minute with the ignition on. The ignition may need to be turned on and off several times before attempting a start. If unable to restart, contact the nearest **Cummins Center** or phone **1-800-343-7357** for Cummins Customer Assistance Center.



Fuel Line & Hoses

Make a visual check for fuel leaks at all engine-mounted fuel lines and connections and at the fuel tank pick-up and return lines. Leaks in this area may best be detected by checking for accumulation of fuel under the tank. Engine performance and auxiliary equipment is dependent upon the ability of flexible hoses to transfer lubricating oil, air, coolant and fuel oil. Diligent maintenance of hoses is an important step in ensuring efficient, economical and safe operation of engine and related equipment.

INSPECT:

Check hoses daily as part of the pre-start-up inspection. Examine hoses for leaks. Check all fittings, clamps and ties carefully. Make sure that the hoses are not touching shafts, couplings and heated surfaces, including exhaust manifolds, sharp edges or other obvious hazardous areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. To ensure continued proper support, inspect fasteners frequently and tighten or replace them as necessary.

Engine oil levels above the dipstick full mark, or a decrease in lube oil consumption, may indicate internal fuel leaks into the crankcase. Check oil level frequently for fuel contamination.

HYDRAULIC SYSTEM

The motorhome uses an engine driven hydraulic pump to operate both the power steering system and the engine hydraulic cooling fan system. The hydraulic pump is a dual stage pump that uses one half of the pump to supply pressurized hydraulic fluid to the power steering. The other half of the pump supplies the engine cooling fan motors. The hydraulic system uses the same fluid for both systems, sharing one common reservoir. The hydraulic fluid used is an automatic transmission fluid (Dexron III®) which has a wide ambient temperature operating range.

CAUTION:

If ambient temperatures approach 0° F, Pennzoil Arctic Blue hydraulic fluid, or equivalent hydraulic fluid, should be used. Using incorrect hydraulic system fluid weights in cold or arctic temperatures raises the hydraulic system operating pressure and may damage the hydraulic cooler.

Hydraulic fluid passing through the system also goes through an air-to-fluid cooler mounted on the outside of the charge air cooler, as well as a filter. Maintenance requirements for this system include fluid level checks, filter and fluid replacement, and inspection.

Hydraulic Pump

The hydraulic pump creates pressure by meshing sets of gears together inside a close tolerance housing. A filtered supply of hydraulic fluid from the hydraulic reservoir enters the intake side of the pump. The meshing gear assembly “squeezes” oil through the pump to the output side, delivering the pressurized fluid to the power steering gear and the switching valve of the engine cooling system. Each half of the pump is equipped with an internal bypass pressure relief spring. If the hydraulic pressure should exceed the specified pressure limit, the internal bypass relief valve will be forced open to keep the hydraulic fluid at operating pressure. The hydraulic pressure generally is not rated in psi but is rated in the term bar. One bar is equivalent to approximately 14.5 psi. Hydraulic system pressures with a system at no load may be as low as eight bars on the output side of the pump. This is due to the hydraulic fluid flow of the pump. When a load is placed on the hydraulic pump, such as turning the steering wheel, hydraulic fluid flow slows from hydraulic fluid restriction and pressure increases.

This may be understood as a faucet with a garden hose attached. Crimping the hose with the faucet on creates pressure from the restriction. This principle applies to the hydraulic system. The hydraulic pump is the supply, the load is the power steering gear or the hydraulic fan motors. Hydraulic system pressure at full load can exceed 130 bar or 2000 psi. Hydraulic system pressure falls dramatically after the load. The return line pressure may be as low as six to eight bars. The fluid enters the hydraulic cooler where the heat is dissipated.

Hydraulic Cooler

The hydraulic cooler is an important part in the hydraulic system. This helps keep the hydraulic fluid from overheating. When a load is placed on the hydraulic system, heat is created in the fluid. The hydraulic pump builds pressure that creates heat in the fluid. Restriction from the loads applied also creates heat. This heat must be dissipated to keep the hydraulic fluid from overheating and breaking down. After cooling, the fluid is filtered before returning to the reservoir.

Care must be used when starting an engine in very cold or arctic climates. As with any oil, lower temperatures thicken the oil. Hydraulic system pressure increases due to the viscosity of the fluid. Although the hydraulic pump is equipped with pressure relief valves, the thick oil on the return line can exceed the operating pressure of the hydraulic cooler.

Hydraulic Fan System

The hydraulic fan drive system cools the radiator, charge air cooler, hydraulic fluid cooler and transmission cooler. The components of the hydraulic fan system are: hydraulic reservoir, filter, pump, one hydraulic fan motor, hydraulic switching valve and thermostatic valve. Cooling fan speed is proportional to engine speed and radiator temperature. When radiator temperature rises above 185° F, the wax thermostatic valve, located in the upper radiator tube, slowly closes off the bypassing hydraulic fluid from the switching valve. As radiator temperature rises, a spool valve begins to move in the switching valve. The spool valve directs the pressurized hydraulic fluid to the fan motors. The higher the radiator temperature, the further the spool valve is moved in the switching valve, providing a higher volume of pressurized hydraulic fluid to the fan motors. Fan motor speed is increased to meet the demand for cooling. The action of the thermostatic valve is designed to move the spool in the switching valve to ramp up fan motor speed. This design saves horsepower and increases fuel mileage by precise control of hydraulic fan motor speed. The fan motors will increase in speed when the motorhome is ascending long hills or operating in high ambient temperatures. It is normal for the fans to “roar” when they are operating. Fan motor speed and engine RPM are about the same with the switching valve at full engagement.

Thermostatic Valve

The wax filled thermostatic valve is mounted at the top of the radiator sensing coolant temperature. The thermostatic valve controls the action of the switching valve. When the radiator is cool, the hydraulic fluid is allowed to flow through the inlet and outlet ports of the thermostatic valve and return to the hydraulic reservoir. As the coolant temperature inside the radiator rises to about 185° F, the wax inside the thermostatic valve begins to melt and expand. This begins to restrict hydraulic fluid flow through the thermostatic valve. The restricted hydraulic fluid pressure then begins to move the internal spool valve of the switching valve. This process continues until coolant temperature inside the radiator reaches about 199° F. At this temperature hydraulic fluid flow through the thermostatic valve is stopped, moving the spool valve to full open position.

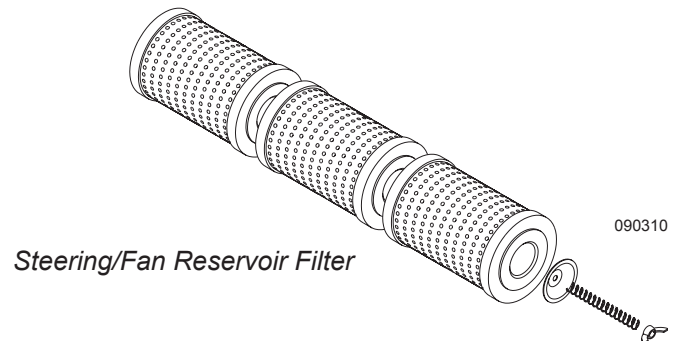
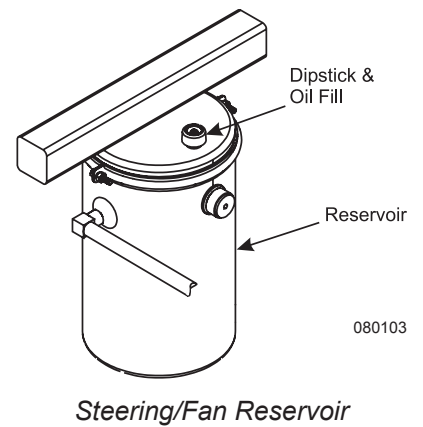
Switching Valve

The switching valve is mounted to the fan motor. This valve controls direction of high pressure hydraulic fluid flow. High pressure hydraulic fluid comes from the hydraulic pump to the switching valve before returning to the reservoir. The thermostatic valve directs the fluid to the spool in the switching valve. When the radiator is cool, pressurized hydraulic fluid will bypass the fan motors and return to the fluid reservoir. As radiator temperature rises, the thermostatic valve signal is slowed or stopped to the switching valve. High pressure fluid is then directed to the fan motors, cooling the radiator.

Hydraulic Reservoir

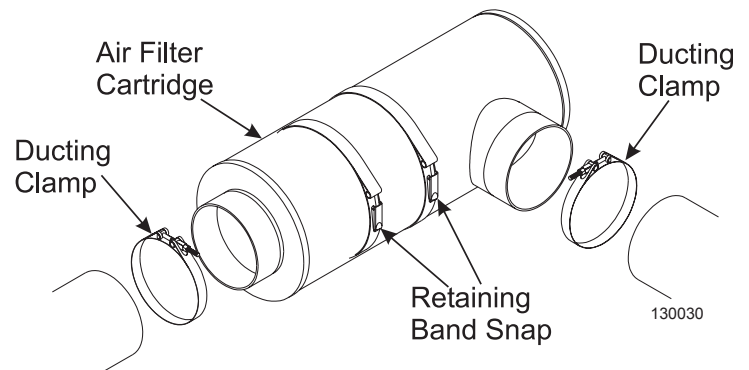
The Nelson hydraulic reservoir with internal filter system is located in the engine compartment. It is the reservoir for both the hydraulic fan drive system and power steering system. The hydraulic filter assembly is located inside the reservoir. The 25 micron* filter system is designed to protect the precision tolerance hydraulic system components. Check the oil level in the reservoir when the oil is at operating temperature. This should be done every 6000 miles or three months. The oil dipstick/oil fill is located on top of the reservoir. The oil level should be checked every 6000 miles or three months. The oil dipstick/oil fill is located on top of the reservoir.

The oil level should be kept between the full and add marks on the dipstick. Change the hydraulic oil filters every 15,500 miles or once a year. When performing fluid level checks, inspect fittings and hoses for signs of leakage. Avoid untimely and costly failures by having leaks repaired. To change the filter system a five gallon drain bucket is needed. Loosen the band clamp at the top of the reservoir and remove the lid. Place the drain bucket under the reservoir and loosen one of the bottom fittings to drain the reservoir. Drain only enough fluid from the reservoir to expose bottom filter, then tighten fitting. Remove the wing nut, filter spring and filter washer. Remove the three drop in filters and install the new ones. Install the filter washer and filter spring. Tighten the wing nut until wing nut reaches end of threaded rod. It is recommended to install new hydraulic fluid. Old fluid may contaminate the hydraulic system. Fill the reservoir with about three to four gallons to the full mark. Install top and band clamp. Run engine to purge trapped air. Check fluid level after fifteen minutes of operation. Total system capacity is about 44 quarts.



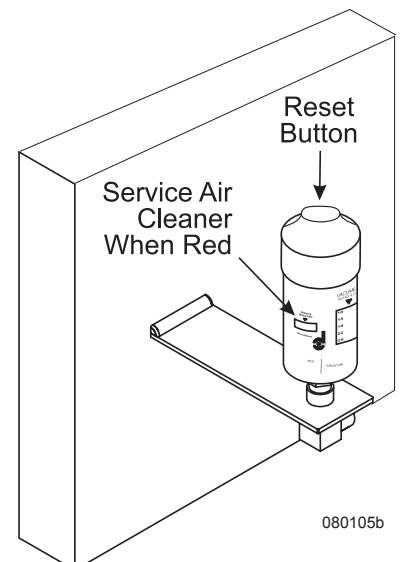
Air Filter

Proper air filter servicing results in maximum engine protection. The service interval is based upon the amount of air restriction through the air cleaning system. The air filter located in the rear engine compartment is a disposable container. When the air filter needs to be changed, the entire air filter cartridge is discarded and replaced by loosening the inlet and outlet ducting clamps and releasing the retaining band snaps.

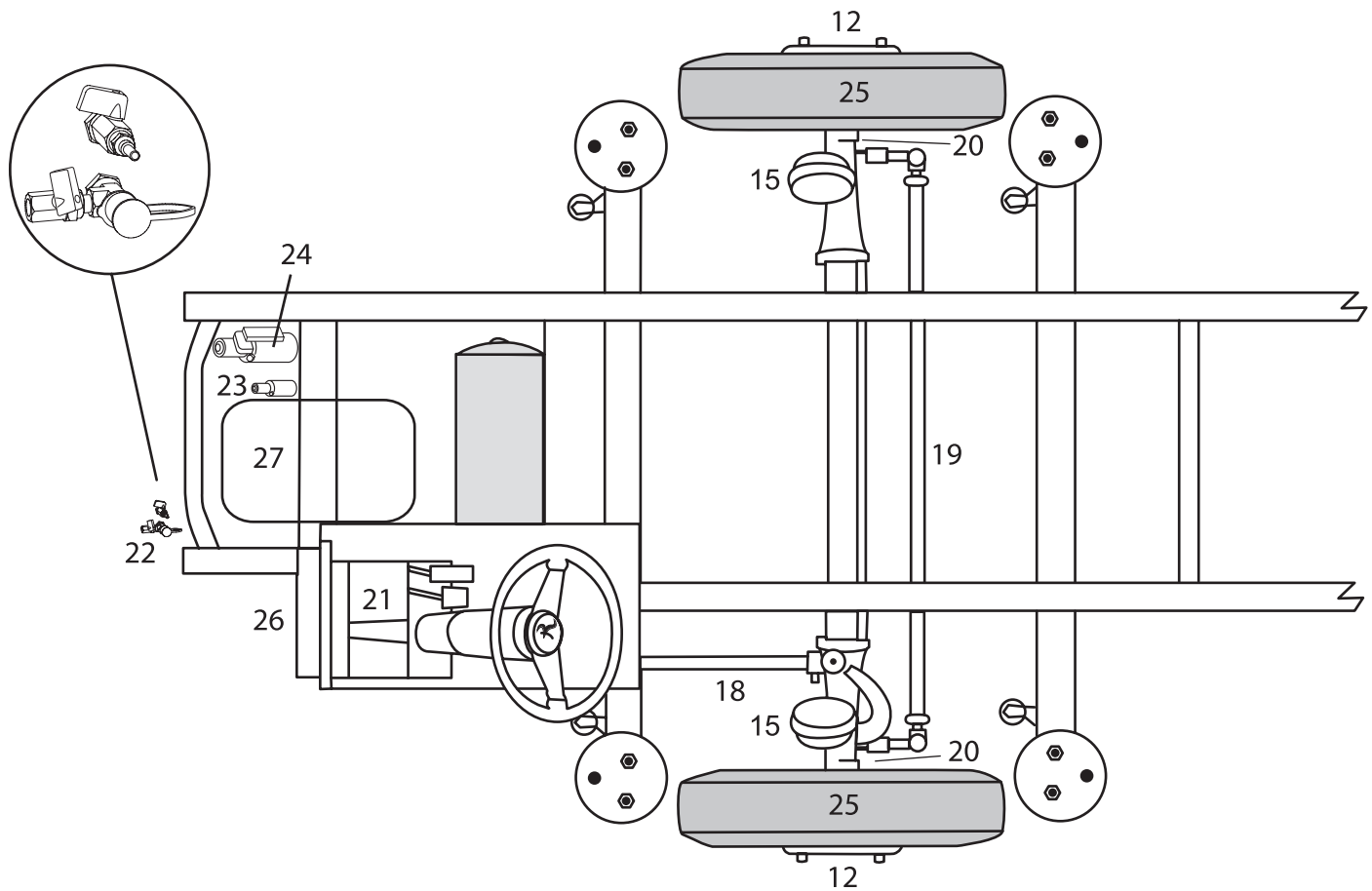


Air Filter Minder

The air filter restriction indicator relays the amount of restriction present in the air intake system and should be inspected before each trip. If the yellow indicator approaches the red (top) area of the air restriction indicator, it is signaling that the air filter is beginning to become excessively dirty.

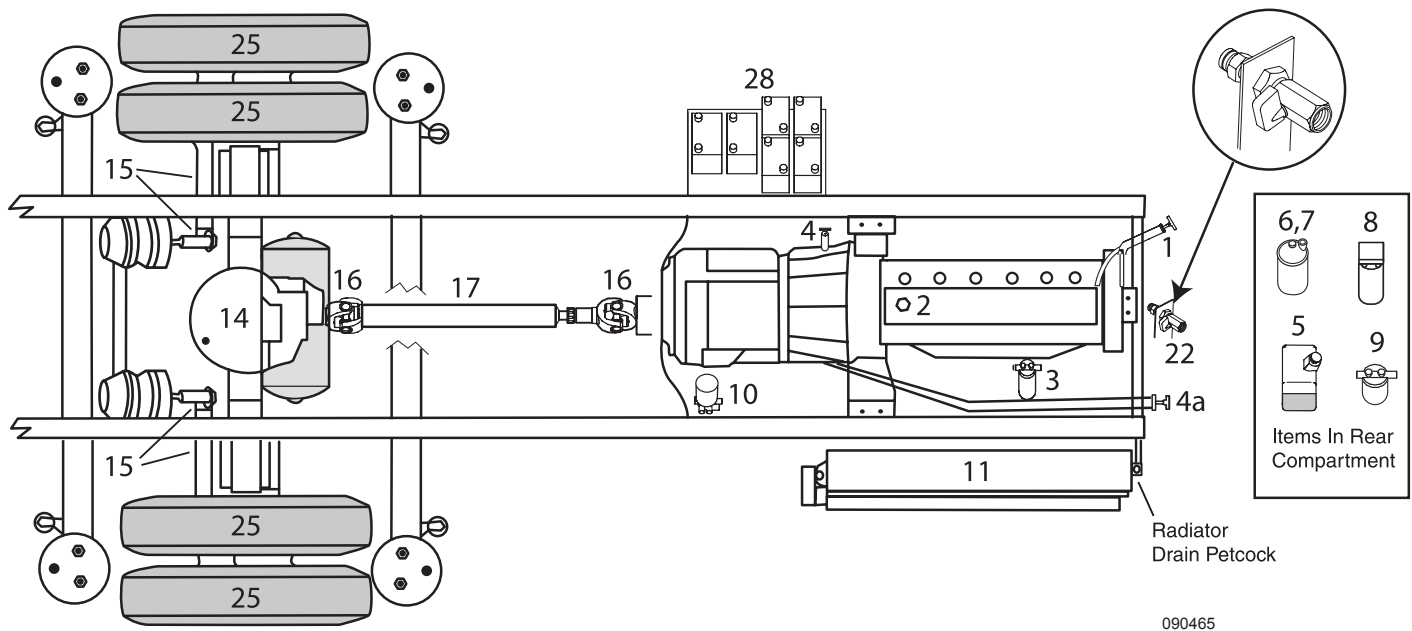


LUBRICATION CHARTS



Component	Action	When	Code-Refer to Chart
1 Engine Oil Dipstick	Keep to Full Mark	Before Each Trip + Daily Enroute	EO
2 Engine Oil Fill	Change Oil	20,000 or Annually	EO
3 Engine Oil Filter	Replace	At Oil Change	OEM
4 Transmission Check/Fill	Keep to Full Mark	Refer to OEM Manual	TS
5 Transmission Remote Fill	Keep to Full Mark	Refer to OEM Manual	TS
6 Engine Coolant	Replace	Refer to OEM Manual	AF
7 Hydraulic Fluid Reservoir	Keep to Full Mark	Monthly	TF
8 Hydraulic Filter	Replace	15,000 or Annually	TF
9 Filter Fuel/Water Separator (Primary)	Replace	20,000 or Annually	FF
10 Filter Fuel (Secondary)	Replace	20,000 or Annually	FF
11 Air Dryer Filter	Replace	2 -3 Years	-
12 Radiator/Charge Air Cooler	Inspect	Weekly	-
13 Wheel Bearings	Re-pack	30,000 or Annually	HT
14 Rear Differential	To Filler Plug	250,000 or 3 Years	MP
15 Slack Adjusters/S-Cams (Drive Axle)	Grease-3 Fittings	10,000 or 3 Months	CBL
16 Drive Shaft Universal Joints	Grease-2 Fittings	10,000 or Annually	CL
17 Drive Shaft Slip Yoke	Grease-1 Fitting	10,000 or Annually	CL
18 Drag Link	Grease-1 Fitting	5,000 or 6 Months	CL
19 Center Link	Grease-2 Fittings	5,000 or 6 Months	CL
20 Spindles/Kingpins	Grease-2 Fittings ea.	5,000 or 6 Months	CL
21 Steering Drive Shaft	Grease-3 Fittings	30,000 or Annually	CL-4
22 Air Tank Drains	Drains	Monthly	-
23 HWH Reservoir	Keep to Full Mark	6,000 or 3 Months	TF
24 RVA Reservoir	Keep to Full Mark	6,000 or 3 Months	TF
25 Tire Pressure	Check	Before Each Trip + Daily Enroute	-
26 Steering Box	Grease-1 Fitting	Twice a Year	CL
27 Generator	Refer to Service Manual	Refer to OEM Manual	OEM
28 Batteries	Inspect	Bi-Monthly	DW
Batteries	Apply	10,000 or Quarterly	P

lube chart new.eps



090465

Lubrication Code Chart	
CL-4	U-Joints located inside the motorhome under the steering cover
EO	Engine oil as recommended by engine manufacturer
OEM	Refer to Equipment Manufacturer's Manual
MP	API GL-5 or MT-1 type gear lubricant - Penzoil Gear Plus SUPER-ew 75w-90, Synthetic
GO	EP-SAE 90 Gear oil
CL	Chassis lubricant should be high quality non-corrosive multi-purpose lithium soap pressure gun lubricant that is water resistant and designed to withstand extremely high operating temperature
P	Petroleum jelly or commercial battery terminal corrosion inhibitor
AF	Antifreeze as recommended by the engine manufacture
TF	Transmission fluid. Use <i>Dexron III</i> ® transmission fluid only
FF	Fuel filter
BF	Dot-3 Brake Fluid
TS	TranSynd™ synthetic transmission fluid (identified by tag on dipstick)
CBL	Clay-based lubricant
DW	Distilled water
HT	High temperature bearing grease

lube code chart.eps

SPECIFICATIONS DIMENSIONS CHART

2006 Camelot Specifications	38PDQ	40 PDD	40 PET	40 PLQ	40PAQ	40PDQ
Weights						
Gross Vehicle Weight Rating	34,600	34,600	34,600	34,600	34,600	34,600
Gross Combined Weight Rating	44,600	44,600	44,600	44,600	44,600	44,600
Front Gross Axle Weight Rating	14,600	14,600	14,600	14,600	14,600	14,600
Rear Gross Axle Weight Rating	20,000	20,000	20,000	20,000	20,000	20,000

Measurements						
Wheelbase	248"	272"	272"	272"	272"	272"
Overall Length						
Overall Length						
Overall Height with A/C (w/o DSS option)						
Interior Height	84"	84"	84"	84"	84"	84"
Interior Width	96"	96"	96"	96"	96"	96"
Exterior Width	100.5"	100.5"	100.5"	100.5"	100.5"	100.5"

Tank Capacities						
Water Heater	10 gal	10 gal	10 gal	10 gal	10 gal	10 gal
Grey Tank [Amerikart]	60	60	60	60	60	60
Black Tank [Amerikart]	40	40	40	40	40	40
Fresh Tank [Amerikart]	100	100	100	100	100	100
LP Tank * [Manchester]	55	55	55	55	55	55
Fuel Tank [Steel] [Usable capacity] [Roadmaster]	130	130	130	130	130	130

* Actual filled LP capacity is 80% of listing due to safety shut off required on tank.

NOTE:

This Chart reflects product specification available at the time of printing. Therefore any floor plans thereafter may not be reflected in the chart. All other information contained throughout the manual still applies.

NOTE:

All tank capacities are estimated based upon calculations provided by the tank manufacturers and represent approximate capacities. The actual "usable" capacity may be greater or less then the estimated capacities based upon fabrication and installation of the tanks.

CHASSIS LIQUID CAPACITIES	ISL 400	
	QUARTS	GALLONS
Engine Oil	24 quarts	6.0 gallons
Transmission (initial fill)	22 quarts	5.5 gallons
Transmission (service fill)	19 quarts	4.75 gallons
Coolant	39 quarts	9.75 gallons
Rear Differential	16 quarts (approximately)	4.0 gallons (approximately)
A/C Refrigerant	4 pounds of R134a	4 pounds of R134a

chassis liq cap.eps

Engine Specifications - Cummins Engine ISL 400	
Displacement	8.8 Liter / 540 Cu. In.
Horsepower	350 HP @ 2100 rpm
Torque (lbs. ft. Max. Net at 1,400 RPM)	1200 lb-ft @ 1300 rpm
Governed Speed	2200 rps
Firing Order	153624
Alternator / Leece Neville	160 amp
Rear Axle Ratio	4.30:1
Tire Size / Goodyear	295/80R/22.5

06 cam engine specs.eps

SERVICE INFORMATION

Refer to operator's manual for maintenance specifications and adjustments.

Air Cleaner	–	Check Label No.
Oil Filter	–	Check Label No.
Fuel Filter	–	Check Label No.
Oil Capacity	–	3 Qts w/oil filter
API Designation	–	CE

Temp	SAE Viscosity
5° - 120°F	15W-40
(-13°F) - 68°F	10W-30
(-40°F) - 68°F	5W-30

If service/parts are needed the Onan distributor can be located in the yellow pages under Generators-Electric.
In the USA or Canada call 1-800-888-Onan

DC Fuse & Radiator Cap Under Cover.



Diesel Generator Label

om020159g.pdf

CHART - FILTERS & BELTS

ISL Filters & Belts	Manufacturer	Number
A/C Belt	Dayco	15465
Air Filter	Donaldson	P537448
Alternator Belt	Dayco	3911581
Fuel Filter Primary	Fleetguard	FS1003
Fuel Filter Secondary	Fleetguard	FF5488
Oil Filter	Fleetguard	LF9009
Transmission Filter	Allison	Internal Filters
Hydro-Hot	Garber	FLX-120-000

chart filter belt.eps

BATTERY SPECIFICATION CHART

Application	Ah (20 hr.)	CCA†	RC (25A@80° F) minutes
12 Volt Chassis* Group 31p - LHD (2 each)		750	180 x 2 = 360
6 Volt Domestic** U2200 (4 each)	450		75 Amp @ 80° = 230 min.

*Batteries connected in parallel.

**Battery connections are made in a Series/Parallel connection.

†CCA Ratings are at 0° F. These are the minimum requirements.

Battery State of Charge vs. Voltage/Specific Gravity			
Voltage	Specific Gravity	State of Charge	Depth of Charge
12.66	1.265	100%	0%
12.45	1.225	75%	25%
12.25	1.190	50%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%

Voltage Reading: Battery fully charged at rest for one hour.

Cummins Engine Cold Cranking Amps Requirements			
ISL	1500	CCA	12 Volts
CCA Ratings are at 0° F. These are minimum requirements.			

METRIC/U.S. CONVERSION CHART

U.S. Customary to Metric			Metric to U.S. Customary			
Measurement	Multiplied By	Equals/Measurement	Multiplied By	Equals		
<u>Length</u>						
inches (in)	25.4	millimeters (mm)	0.03937	inches (in)		
inches (in)	2.54	centimeters (cm)	0.3937	inches (in)		
feet (ft)	0.3048	meters (m)	3.281	feet (ft)		
yards (yd)	0.9144	meters (m)	1.094	yards (yd)		
miles (mi)	1.609	kilometers (km)	0.6215	miles (mi)		
<u>Area</u>						
square inches (in ²)	645.16	square millimeters (m ²)	0.00155	square inches (in ²)		
square inches (in ²)	6.452	square centimeters (cm ²)	0.15	square inches (in ²)		
square feet (ft ²)	0.0929	square meters (m ²)	10.764	square feet (ft ²)		
<u>Volume</u>						
cubic inches (in ³)	16387.0	cubic millimeters (mm ³)	0.000061	cubic inches (in ³)		
cubic inches (in ³)	16.387	cubic centimeters (cm ³)	0.06102	cubic inches (in ³)		
cubic inches (in ³)	0.01639	liters (L)	61.024	cubic inches (in ³)		
fluid ounces (fl oz)	29.54	milliliters (mL)	0.03381	fluid ounces (fl oz)		
pints (pt)	0.47318	liters (L)	2.1134	pints (pt)		
quarts (qt)	0.94635	liters (L)	1.0567	quarts (qt)		
gallons (gal)	3.7854	liters (L)	0.2642	gallons (gal)		
cubic feet (ft ³)	28.317	liters (L)	0.03531	cubic feet (ft ³)		
cubic feet (ft ³)	0.02832	cubic meters (m ³)	35.315	cubic feet (ft ³)		
<u>Weight/Force</u>						
ounces (av) (oz)	28.35	grams (g)	0.03527	ounces (av) (oz)		
pounds (av) (lb)	0.454	kilograms (kg)	2.205	pounds (av) (lb)		
U.S. tons (t)	907.18	kilograms (kg)	0.001102	U.S. tons (t)		
U.S. tons (t)	0.90718	metric tons (t)	1.1023	U.S. tons (t)		
<u>Torque/Work Force</u>						
inch-pounds (lbf.in)	11.298	Newton-centimeters (N.cm)	0.08851	inch-pounds (lbf.in)		
foot-pounds (lbf.ft)	1.3558	Newton-meters (N.m)	0.7376	foot-pounds (lbf.ft)		
<u>Pressure/Vacuum</u>						
inches of mercury (inHg)	3.37685	kiloPascals (kPa)	0.29613	inches of mercury (inHg)		
pounds per square inch (psi)	6.895	kiloPascals (kPa)	0.14503	pounds per square inch (psi)		
Measurement	Subtract	Divide By	Equals/Measurement	Multiply By	Add	Equals
<u>Temperature</u>						
degrees Fahrenheit (°F)	32	1.8	degrees Celsius (°C)	1.8	32	degrees Fahrenheit (°F)

MAINTENANCE RECORD

After scheduled services are performed, record the date, odometer reading and who performed the service in the boxes provided after the maintenance interval. Additional information from “Owner Checks and Services” or “Periodic Maintenance” can be added on the following record pages. In addition, retain all maintenance receipts. The owner information file is a convenient place to store them.

LUBRICATION SERVICE RECORD

KEY TO SERVICES

A -- Lubrication & Inspection
A1 -- Motor Oil & Filter Change
A2 -- Transmission Oil Change

A3 -- Drive Axle Oil Change
A4 -- Wheel Bearing Service
B -- Prescribed Service

C -- Prescribed Service
D -- Prescribed Service
E -- Prescribed Service

MILEAGE	SERVICES										JOB PERFORMED	
	A	A1	A2	A3	A4	B	C	D	E	DATE	BY	
1												
2												
3												
4												
5												
6												
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8												
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BATTERY RECORD

[illegible]

TIRE RECORD

[illegible]

[illegible]

[illegible]

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Index

A

ABS/ATC SYSTEM (Anti-lock Brakes)	268
Automatic Traction Control System	270
Air Conditioner & Heater Controls	242
About Refrigerants	246
Air Conditioning - Roof	117
Heat Pump Mode	118
Operations	118
Return Air Filters	119
Air Dryer	264
Air Dryer Cycle.....	265
Air Springs Inspection	266
Desiccant-Type Air Dryer	265
Desiccant Cartridge.....	265
Air Supply System	258
Air Governor	259
Air Storage Tanks	259
Air System Charging (External)	260
Air Coupler	260
Aladdin™ System	169
Operations	169
Alternator	253
Appliances - Introduction	105
Awnings	146
Awning Care & Cleaning	150
Front Door Awning - Mirage Automatic	147
Patio Awning	147
Patio Awning - Eclipse (Optional)	149
Patio Awning - Mirage (Optional)	150
Slide-out Cover	146
Storm Precautions	151
Window Awning (Optional)	147

B

Backing Up The Motorhome	38
Battery	225
Battery Charge Time & Consumption Rate ..	228
Battery Maintenance	227
Battery Types	225
Battery Voltage & Current	227
How It Works	225
Testing the Battery	226
Battery - Chassis	236
Battery Cut-off Switch	211
Battery Disconnect - Chassis	235
Battery Disconnect - House	210
Battery Specification Chart	311
Brake Systems	261
Air Brakes	261
Brake Adjustment/Slack Adjuster	262
Brake Systems - Back-up	262
Park & Emergency Brake System	261
Breaking Camp	41

C

Carbon Monoxide Detectors	68
Alarm	69
Cleaning & Maintenance	70
Operation	69
Testing	69
Ceiling	88
Charge Air Cooler	300
Chart - Filters & Belts	310
Chassis - Introduction	257
Chassis Electrical - Introduction	235
Citizens Band (CB) Radio - Prep	165
Citizen Band (CB) Radio (Optional)	165
Cold Weather Use	187
Console	291
Periodic Inspections	293
Transmission Check Light	292
Transmission Shift Selector	291
Cooktop	113
Cooktop Range/Oven (Optional)	114
Burner Grate	116
Cooktop Cover	115
Lighting the Burners	115
Coolant System	296
Coolant	297
Coolant Additive (SCA).....	298
Maintenance Procedures	298
Countertops	92
Solid Surface	92
Stainless Steel Surfaces	92

D

Dash	236
Controls	241
Gauges & Indicator Lights	237
Indicator Lamps	236
Parking Brake	239
Switches	239
Dinette Bed Conversion (Optional)	157
Distribution Panel (50 Amp)	220
Energy Management System	221
Fuses	222
Drain Traps & Auto Vents	187
Drive Axle & Drive Shaft	278
Lubrication Maintenance	279
U-Joint Angles Phasing & Driveline Balance	280
Driving & Safety	27
Familiarize Yourself	27
Inspections	27
Ramco Mirrors	27
Safety Seat Belts	28
Driving Tips	30
Dry Camping	40

E

Egress Window	71
Emergency Procedures - Roadside	42
Dead Chassis Battery	45
In Case of Flat Tire	44
Light - Retractable	44
OnStar® (Optional)	43
Running Out of Fuel	45
Engine - General Information	284
Engine Exhaust Brake	262
Maintenance	263
Engine Shutdown	290
Extended Engine Shutdown	290
Entertainment Systems	158
Cell Phone Antenna	159
DVD/VCR/CD	161
Hook-ups - TV Cable, Computer & Telephone	159
LCD TV Auxiliary Equipment Hook-up (Optional)	164
Satellite System - Prewire	164
Television/Entertainment System - Front	162
Television/Entertainment System – Bedroom	163
Television (Front) w/Lock-out Feature	159
Television Antenna	160
Video Selector Box	162
Entry Door	140
Screen Door	140
Entry Step	139
Operation	139
Stepwell	140
Tips	139
Equipment - Introduction	139
Exterior Care	75
Aluminum Wheels (Accuride)	77
Bright Metal	78
Corrosion	75
Drying	75
Paint Codes	77
Tire Care	77
Washing	75
Waxing	76
Exterior Maintenance	79
Roof Care & Seal Inspections	79
Sealant Types	79

F

Fabrics	80
Fabric Cleaning Codes	84
General Care & Cleaning	80
Leather	83
Ultra-Leather	83
Vinyl	81
Fans	151
Bathroom Exhaust Fan	151
Rain Sensor Exhaust Fan (Optional)	152
Faucet Water Filter	179
Fire Extinguisher	70
Floors	85
Carpet Cleaning	85
Laminate Floor (Optional)	88
Tile Floor	87
Front Axle	271
Alignment Specifications	272
Center Link	277
Control Arm Bushings	277
Drag Link	276
Intermediate Steering Shaft	276
Lubrication Maintenance Safety	274
Steering Components	275
Steering Spindles	277
Fuel System	301
Fuel Filters	303
Fuel Line & Hoses	303
Fuel Sender	302
Furnace	119
If the Furnace Fails to Light	121
Operating Instructions	120
Using the Furnace	120
Fuse & Circuits	251
Front Distribution Panel	251

G

Generator - 120 Volt AC	215
Generator Exercise	217
Generator Fuel	216
Powering the Equipment	216
Pre-Start Checks	215
Resetting the Circuit Breaker	217
Starting the Generator	215
Stopping the Generator	216
GFCI Breakers & Outlets	223
Know When to Say No	224
Tools of the Trade	224
Glossary of Terms	16

H

Hitch	35
Brake Control	36
Tow Plug Connection	37
Using the Rear Receiver	35
House Electrical - Introduction	209
Hydraulic System	304
Air Filter	306
Air Filter Minder	306
Hydraulic Cooler	304
Hydraulic Fan System	305
Hydraulic Pump	304
Hydraulic Reservoir	305
Switching Valve	305
Thermovalve	305
Hydro-Hot (Optional)	125
Fuel Filter/Water Separator	129
Garber Filter - Hydro-Hot FLX-120-000	130
Hydro-Hot Overall View	130
Troubleshooting	127

I,J,K

Interior Care	80
Cockpit	80
Inverter	217
Auto Generator Start (Optional)	219
Battery Charging with the Inverter	218
Battery Temperature Sensor	219
Factory Default Settings	219
Pass-Through AC Power	219
Providing AC Power with Inverter	218
Keyless Entry	141
Operation	141

L

Leveling System	282
Lights	231
Interior Halogen	231
Limited Warranty Application/ Change of Owner Information	23
LP-Gas Consumption	203
LP-Gas Detector	196
Alarm	197
Maintenance	198
Testing	197
LP-Gas Distribution Lines	203
LP-Gas Emergency Procedures Checklist	198
LP-Gas Fundamentals	200
LP-Gas Hose Inspection	202
LP-Gas Regulator	201

LP-Gas Safety Tips	204
LP-Gas Systems	195
LP-Gas Tank	198
Measurement	198
Tank Capacity	198
Tank Filling	199
Tank Operation	200
Lubrication Charts	307

M,N

Maintenance Record	313
Metric/U.S. Conversion Chart	312
Microwave/Convection Oven	111
Care & Cleaning	112
Mold & Mildew	94

O,P

Oil Recommendations	288
Cold Weather Engine Operation	289
Routine Oil Maintenance	289
Pest Control	96
Plumbing Manifold	175
Power Sunvisor	153

R

Radio - Dash	168
Rear Ladder	151
Rear View System	37
Refrigerator	105
Air in LP-Gas Supply Lines	110
Control Panel - Four Door (Optional)	108
Control Panel - Two Door	107
Cooling Unit Fans (Four Door Models)	109
Doors	109
Icemaker	108
Interior Light	110
Operation Specifics	105
Refrigerator Alarm	109
Service	110
Storage Procedures	110
Reporting Safety Defects	19
Ride Height Valves	266
Adjusting Ride Height	267

S

Safety Terms	15
Satellite Systems (Optional)	166
In-Motion Satellite System (Optional).....	168
Stationary System	166
Seat Controls	154
Swivel Seats	154
Service Center	174
Set-up Procedures	39
Shock Absorber	281
Shore Power Hook-up.....	211
Power Cord Reel (Optional)	214
Shower.....	88
Slide-out Operation.....	142
Bedroom Slide-out.....	144
Main Room Slide-out.....	143
Manual Override - Bedroom Slide-out	145
Smoke Detector	67
Maintenance.....	67
Operation.....	67
Testing.....	67
Troubleshooting	68
Sofa	155
Air Mattress (Optional).....	156
Easy Bed Conversion	155
Hide-A-Bed Conversion (Optional).....	155
J-Lounge (Optional).....	157
Magic Bed Conversion (Optional).....	156
Solar Panel (Optional)	229
Charge Controller.....	230
Solar Panel Care.....	231
Specifications Dimensions Chart	309
Starting Procedure.....	286
Cold Weather Starting.....	286
Normal Starting.....	286
Tips.....	287
Steering Column	248
Tilt & Telescope.....	248
Steering Column & Smart Wheel.....	249
Smart Wheel Operation.....	249
Wiper Function	250
Storage	98
Long Term.....	99
Removal From Storage	101
Short Term.....	98
Winter Storage - Checklist.....	100
Storage - Cold Weather	188
Storage - Under Bed.....	158
Storage Bay Slide-out Tray (Optional).....	158
Survey.....	21

T,U,V

Tires.....	49
Importance of Air Pressure	49
Tire Pressure Inflation Guideline	50
Tire Chart - Goodyear	50
Air Pressure Checklist.....	53
Inspecting & Pressure	52
Storage of Tires - Long Term	54
Supporting When Leveling	53
Tire Rotation	54
Tire Vibration	54
Tread	54
Toilet.....	185
Cleaning	186
Maintenance.....	186
Operation.....	185
Towing Procedures.....	47
Disabling the Parking Brake	48
To Extend Fixed Dinette	157
Transfer Switch	214
Transmission Lubricating Fluid	294
Fluid Levels - Cold Check	295
Fluid Levels - Hot Checks	296
Trip Preparation	34

W,X,Y,Z

Wall Coverings	89
Wall Thermostat.....	117
Warranty - Limited: 2006	
Roadmaster Chassis.....	5
Disclaimer of Consequential & Incidental Damages.....	8
Events Discharging Warrantor from Obligation Under Warranty	8
How to Get Service.....	7
Legal Remedies.....	9
Limitations of Implied Warranties	6
What the Warranty Covers	6
What the Warranty Does Not Cover	8
What We Will Do to Correct Problems.....	6
Warranty - Limited: Scepter 2006.....	1
Disclaimer of Consequential & Incidental Damages.....	4
Events Discharging Warrantor from Obligation Under Warranty	4
How to Get Service.....	3
Legal Remedies.....	5
Limitations of Implied Warranties	2
What the Warranty Covers	2
What the Warranty Does Not Cover	4
What We Will Do to Correct Problems.....	2
Warranty Information File	10
Washer-Dryer Prepared	131

Washer - Dryer (Optional)	132
Operation.....	133
Washer/Dryer Maintenance.....	134
Winterizing the Washer/Dryer	134
Waste Water Systems	181
Black Tank Flush	182
Gravity Drain Hose Dumping.....	183
Gravity Waste Drain Hose	182
Pressure Pump Dumping (Optional).....	184
Proper Waste Disposal	181
Waste Drain & Sewage Tanks.....	182
What Not to Put into the Holding Tanks	181
What to Put in Holding Tanks.....	181
Water - City Hook-up	176
Water Heater	121
Before Using the Water Heater	121
Burner Compartment	124
Draining & Storage	125
Ignition Module Function	123
Operation.....	122
Pressure - Temperature Relief Valve.....	123
Tips.....	124
Troubleshooting	125
Water Heater Bypass.....	123
Water Pump	176
Troubleshooting	177
Water Systems - Introduction	173
Water System - Troubleshooting	179
Disinfecting Fresh Water	180
Faucet Screens	180
Water System Filter	178
Water Tanks	173
Measurements & Calibration	173
Water Tank - Fresh Fill	174
Water Tank - Fresh Gravity Fill	175
Weighing the Motorhome	56
Cargo Carrying Capacity Flowchart	63
Four Point Weighing Example.....	60
Weighing Procedure Worksheet	64
Weight Label.....	59
Weight Record Sheet.....	66
Weight Terms	56
Wheel Mounting	55
Windows	93
Condensation.....	93
Window Treatments	93
Day/Night Shades	94
Mini-Blinds.....	93
Winterizing	188
Using Air Pressure	188
Using Non Toxic Antifreeze	189
Using Prevent-A-Freeze	
System (Optional).....	190
Wood Care	90