

HOLIDAY RAMBLER MOTORHOME LIMITED WARRANTY

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's sole and exclusive obligation is to repair and/or replace, at its option, any covered defect if: **(1)** you notify Warrantor or one of its authorized servicing dealers of the defect within the warranty coverage period and within five (5) days of discovering the defect; and **(2)** you deliver your 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 that are excluded from coverage shall be considered "good will" repairs, which shall not alter the express terms of this limited warranty. If the repair or replacement remedy fails to successfully cure a defect after Warrantor received a reasonable opportunity to cure the defect(s), your sole and exclusive remedy shall be limited to Warrantor paying you the cost of having an independent third party perform repair(s) to the defect(s).

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

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 repair attempt for the purpose of performing a successful repair to the identified defect(s).

WHAT THE PERIOD OF COVERAGE IS:

This Limited Warranty provided by Holiday Rambler® ("Warrantor") covers those components, assemblies and systems of your new motorhome not excluded under the section "What is Not Covered" and 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, this Limited Warranty provided by Warrantor covers the steel or aluminum frame structure, only, 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, only, 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.

LIMITATION AND DISCLAIMER OF IMPLIED WARRANTIES:

IMPLIED WARRANTIES, IF ANY, ARISING BY WAY OF STATE LAW, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY AND ARE LIMITED IN SCOPE OF COVERAGE TO THOSE PORTIONS OF THE 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.

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). The mailing address is:

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

In the event the motorhome cannot be driven to a servicing dealer to have warranty repairs performed to it due to a 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 moisture inside the motorhome; blistering, crazing, thermal fatigue, cracking, chalking, fading, discoloration, rot, corrosion, mildew, wood separation and core voids of the exterior fiberglass; defacing, scratching, dents and chips on any surface or fabric of the motorhome, not caused by Warrantor; owner maintenance, including by way of example wheel alignments and resealing exterior sealant areas; 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 exterior fiberglass panels, microwave, refrigerator, icemaker, 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 AND 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, INCLUDING BY WAY OF EXAMPLE FUEL AND TRANSPORTATION EXPENSES TO DELIVER THE PRODUCT TO THE SERVICING DEALER, HOTEL ROOMS, LOST WAGES AND MOISTURE DAMAGE SUCH AS MOLD AND MILDEW. THE EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES SHALL BE DEEMED INDEPENDENT OF, AND SHALL SURVIVE, ANY FAILURE OF THE ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above exclusions may not apply to you.

LEGAL REMEDIES:

THIS LIMITED WARRANTY DOES NOT “EXTEND TO FUTURE PERFORMANCE”. ANY ACTION TO ENFORCE THIS LIMITED WARRANTY OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN ONE YEAR 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 THIS LIMITED WARRANTY 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.

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

ROADMASTER CHASSIS LIMITED WARRANTY

WHAT THE PERIOD OF COVERAGE IS:

This 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, this Limited Warranty covers your new Roadmaster Chassis for Ninety (90) days from the original retail purchase date 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.

This Limited Warranty applies to all owners, including subsequent owners, of the Roadmaster Chassis. However, a subsequent owner must submit a warranty transfer form. 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.

LIMITATION AND DISCLAIMER OF IMPLIED WARRANTIES:

IMPLIED WARRANTIES, IF ANY, ARISING BY WAY OF STATE LAW, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY AND ARE LIMITED IN SCOPE OF COVERAGE TO THOSE PORTIONS OF THE 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 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. Also see the section “What the Warranty Does Not Cover” set out below.

WHAT WE WILL DO TO CORRECT PROBLEMS:

Warrantor’s sole and exclusive obligation is to repair and/or replace, at its option, any covered defect if: **(1)** you notify Warrantor or one of its authorized servicing dealers of the defect within the warranty coverage period and within five (5) days of discovering the defect; and **(2)** you deliver your 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 that are excluded from coverage shall be considered “good will” repairs, which shall not alter the express terms of this limited warranty. If the repair or replacement remedy fails to successfully cure a defect after Warrantor received a reasonable opportunity to cure the defect(s), your sole and exclusive remedy shall be limited to Warrantor paying you the cost of having an independent third party perform repair(s) to the defect(s).

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

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:

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). The mailing address is:

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

In the event the Roadmaster Chassis 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: 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, radiator, 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 AND INCIDENTAL DAMAGES:

THE ORIGINAL 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 ROADMASTER CHASSIS, INCLUDING BY WAY OF EXAMPLE FUEL AND TRANSPORTATION EXPENSES TO DELIVER THE PRODUCT TO THE SERVICING DEALER, HOTEL ROOMS, LOST WAGES AND WATER DAMAGE. THE EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES SHALL BE DEEMED INDEPENDENT OF, AND SHALL SURVIVE, ANY FAILURE OF THE ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above exclusions may not apply to you.

LEGAL REMEDIES:

THIS LIMITED WARRANTY DOES NOT "EXTEND TO FUTURE PERFORMANCE". ANY ACTION TO ENFORCE THIS LIMITED WARRANTY OR ANY IMPLIED WARRANTIES SHALL NOT BE COMMENCED MORE THAN ONE YEAR AFTER THE EXPIRATION OF THE THIRTY-SIX (36) MONTH WARRANTY COVERAGE PERIOD DESIGNATED ABOVE. IF YOU USE YOUR MOTORHOME FOR COMMERCIAL OR BUSINESS PURPOSES, ANY ACTION TO ENFORCE THIS LIMITED WARRANTY 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.

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

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

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

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GENERAL INFORMATION

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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.

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: 1-800-424-9153 for hearing impaired) (or 1-202-366-0123 in the Washington D.C. area), visit their websites at www.nhtsa.gov or www.safercar.gov, or write to:

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

SAFETY TERMS

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

WARNING:

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

CAUTION:

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

POISON:

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

NOTE:

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

INSPECTION:

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 or 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 in the motorhome.

TIP:

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

GLOSSARY OF TERMS

AC Electricity - Alternating current also known as household power.

AGM Batteries - A type of battery that suspends acid in a special glass mat.

Air Compressor - Pumps air to and builds 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 pressure in the supply tank of the air system. The air governor initiates the unload cycle when the cut-out pressure is reached.

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 0° 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 is 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 pressure.

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

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 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. May apply to some water systems, such as water pump, accumulator tank, etc.

Cut-Out Pressure - The pressure level in the air system supply tank which triggers the compressor unload cycle. May apply to some water systems, such as water pump, accumulator tank, etc.

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

Desiccant - A granular substance with a high affinity for water 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. Direct current is also known as battery power. Current only flows one way.

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 rear of 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 DC 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 water will drain out of the lower end of the motorhome. These drains must be closed when you fill the water tank.

OEM - Term for Original Equipment Manufacturer.

OHM - A unit for measuring electrical resistances.

Ohm's Law - Expresses the relationship between Volt (E), 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 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 AC electrical supply.

Shore Line Plug - The 120/240 Volt AC 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 the motorhome for towing purposes.

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.

OWNER'S MANUAL SURVEY: 2007 Scepter

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?

NAME: _____

PHONE: (_____) _____

ADDRESS: _____

VIN # _____

TEAR OFF PAGE AND MAIL TO:

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

LIMITED WARRANTY TRANSFER APPLICATION/CHANGE OF OWNER INFORMATION

Mail to:

**Monaco Coach Corporation
Warranty Transfer
91320 Coburg Industrial Way
Coburg, OR 97408**

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:

First Name Initial Last Name

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.

TEAR OFF PAGE AND MAIL TO:
WARRANTY TRANSFER, MONACO COACH CORPORATION,
91320 COBURG INDUSTRIAL WAY
COBURG, OR 97408

2007 SCEPTER | DRIVING & SAFETY | SECTION 2

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DRIVING & SAFETY

Section Two 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**. Undetected problems could cause problems on the road and may result in lost time and increased repair costs. Several states require a special license endorsement and motorhome inspection prior to registration. Know and observe the laws of the states in which you will be traveling. Laws may vary from state to state. A systematic **inspection** conducted prior to moving the motorhome can help ensure nothing is overlooked and will assist 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 of the motorhome. Look high and low when walking around the motorhome.

Familiarize Yourself

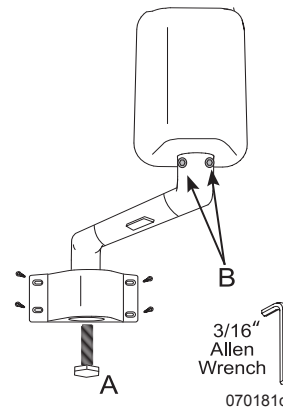
Because the location of the driver's seat in the motorhome is higher and farther to the left than most vehicles, a different perspective of the roadway is created. Rely on the outside mirrors to line up with the center of the road and to check conditions behind the motorhome. The dashboard may include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

Mirror Adjust

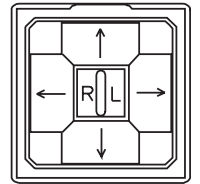
Adjust the mirrors prior to starting out. It is recommended that an assistant help to simplify the mirror adjustment process.

Mirror Adjust:

- ◆ Adjust the driver seat to travel position.
- ◆ Using a 1/2" socket, have an assistant loosen the bolt located at the base of the mirror (see A on illustration).



- ◆ Tighten the bolt when properly adjusted.
- ◆ Use a flat-head screwdriver to remove the screw caps at point **B**.
- ◆ Using a 3/16" allen wrench, have an assistant loosen the set screws at point **B**.
- ◆ Adjust the mirror. Tighten set screws and screw caps.
- ◆ Fine tune mirror placement with the mirror adjust switch on the driver's console.



Mirror Adjust Switch

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 seats that are not equipped with a safety belt while the motorhome is in motion. 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 sound when the tab locks into the buckle. Seat belt lengths automatically adjust to your 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. Seat belts must only be used on permanently mounted seats. **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 in two places: the front passenger (co-pilot) seat and the forward facing permanently mounted booth dinette seat.

WARNING:

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

WARNING:

Children must not be transported unrestrained. Infants must be placed in approved safety seats. Small children must be restrained in child safety seats. **DO NOT** use a single seat belt on more than one child. 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 your obligation to know and comply with the laws in the state or province in which you travel.

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 to the rear. The top of the head must be below the top of the safety seat. Secure safety seat harness straps at or below the shoulders (*Example 1*).
- ◆ **Toddlers** - Children over one year and between 20-40 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 below the shoulders (*Example 2*). Most seats require a top slot for facing forward.
- ◆ **Young Children** - Children (ages four to eight) over 40 pounds and under 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 (*Example 2*).



020231b

Example 1: Convertible seat facing to the rear.



020230

Example 2: High back booster seat facing forward.

WARNING:

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

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. Clean with mild soap and lukewarm water. **DO NOT** clean seat belts with bleach, dye or abrasive cleansers that may weaken the belt material. Periodically **inspect** belts for cuts, frays or loose parts, and replace damaged parts. **DO NOT** disassemble or modify the system. Replace the seat belt assembly after a severe impact, even when damage is not obvious.

DRIVING TIPS

The motorhome is a complex vehicle requiring increased driving awareness because of its size and various components. Due to the motorhome length the turning radius will be much wider than a standard automobile. Always pay close attention to the perimeter of the motorhome including 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 including tires, bay doors, blind spots, etc. Use a push-pull method of steering, with both hands parallel on the steering wheel.

The motorhome is heavier than an automobile and has a higher center of gravity, which both affect the reaction time of the motorhome. Swerving and sharp turning, especially performed at high speeds, could result in loss of control. Keep the size of the motorhome in mind and drive with extra caution to avoid situations which might require quick momentum change. Increase reaction time by paying attention to traffic and road conditions 12 to 15 seconds ahead of the motorhome's 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, manually shift to a lower gear and begin the descent at a slow speed. **DO NOT** allow the motorhome to gain momentum before trying to slow down. Use the engine brake in conjunction with the service brakes to help maintain a safe, slow descent. The transmission and engine will help control downhill speed and can extend the service life of the brake lining. Distance required to stop the motorhome is greater than an automobile. Practice stopping away from traffic to get the "feel" of distance required to stop the motorhome.

Adjust the pilot seat to a comfortable position. Adjust the outside mirrors to gain a clear line of vision down both sides of the motorhome. Confirm the rear view camera system is working and clear of any obstruction.

In the normal course of travel, a variety of roads will be encountered along with different weather and terrain. Adjust to road, weather and terrain conditions to keep the motorhome under control. Pay attention to road signs that advise of local road hazards and driving conditions.

The cockpit, dash area and windshield are larger than those found on passenger cars and trucks. Pay special attention to keeping the windshield clear of humidity in the form of water or ice. Start the motorhome and turn on the dash defrost and overhead blowers to help remove moisture from inside the windshield.



It may also be necessary to use a clean cloth to wipe away moisture.

Keep windshield wipers in good working order at all times. Keep the windshield clear. **DO NOT** operate the motorhome when road, weather and terrain conditions seem unsafe.

Check tonnage limits of bridges before crossing to ensure they can support the weight of the motorhome. 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.

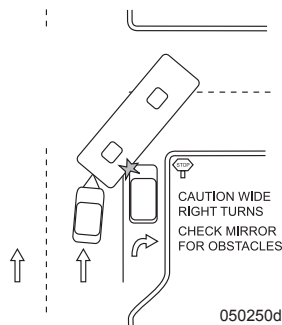
Driving Cautions:

- ◆ Avoid getting too close to the shoulder of the road, which may be too soft to 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 that can damage the undercarriage of the motorhome or become lodged in the dual tires and cause damage to the tires, wheel rims or tow vehicle.

- ◆ On back roads and single divided roads, tree branches and shrubbery can protrude into the roadway. Watch for low hanging branches, especially during inclement weather as rain and snow will cause branches to hang lower than usual.
- ◆ Keep in consideration that posted speed signs are usually passenger automobile rated. Be extra aware of driving conditions and use the appropriate speed for a motorhome, especially on corners and mountain roads.
- ◆ Downgrade speed should be at least 5 mph less than upgrade speed, or downgrade speed should be attainable within three seconds of a brake application.
- ◆ Use a four second rule when following other vehicles at speeds under 40 mph. Use a five second rule when following at speeds over 40 mph.

Right Turns:

Negotiating a right hand turn 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 making the right turn, the left rear wheel should touch the center line of the road and the driver's hips should be parallel to the roadside curb of the corner being turned to aid in avoiding a premature turn.
- ◆ Make the turn slowly.
- ◆ Check mirrors frequently. Stay 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 your 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, assess the grade and length before beginning the 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 operate 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 that produces power most efficiently.

- ◆ **Fuel/Air mixture** - At a given RPM, the engine, even with the help of a turbo-charger, can only "pump" a given volume of air into the combustion chamber. This volume of air can efficiently combine with only so much fuel; so it follows logically that feeding more fuel to the fire will simply waste fuel.

Determine ranges where the motorhome works best by driving long grades when temperatures remain stable for the duration of the climb.

IMPORTANT SAFETY TIP:

Turn on the four way flashers if road speed degrades to the point where the motorhome is moving significantly under the posted speed. Use pullouts if traffic is building. Once in a 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 will also cool. 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 (the 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.

The exhaust brake switch is located on the driver's console. Use the auxiliary brake to help maintain a slow, safe downhill speed. When the brake switch is on, the brake will activate when the throttle is released.

With the exhaust brake applied, road speed may increase until the transmission automatically shifts to the next highest 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. This can result in a loss of air pressure. Riding the brakes can cause the brakes to overheat. Either method can result in loss of brake effectiveness or brake failure.

Night Driving:

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

Extreme Heat and Hot Weather Conditions:

- ◆ Frequently observe all gauges. Variations from normal conditions should be promptly evaluated.
- ◆ Check tire pressure before traveling in hot conditions. Tire air pressure increases with heat. **DO NOT** 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 that 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. Make moves gradually and increase visual distance for a gain in reaction time.
- ◆ If road or weather conditions are treacherous, find a safe stopping place and wait for conditions to improve.
- ◆ Using an engine braking device on wet or slippery surfaces may cause the drive wheels to skid.
- ◆ Wiper blades should be in good condition. Fill the washer reservoir with antifreeze formula window washer fluid.
- ◆ Use mirror heat to keep mirrors clear.
- ◆ Remove any ice build-up from the entry step to avoid accidental slipping.

Wet Conditions:

- ◆ Worn or improperly inflated tires can increase the risk of hydroplaning.
- ◆ Heavy rain or deep standing water can cause brakes to apply unevenly or grab.

Refueling:

- ◆ Truck stops are good refueling points for motorhomes.
- ◆ Check overhead clearance heights before pulling through the fuel island.
- ◆ Be aware of concrete/steel posts installed around fuel islands.

- ◆ Avoid running over the fuel hose as it can get hung up on the motorhome and cause body damage.
- ◆ Use of gloves is recommended for refueling. Store gloves in the outside compartment.
- ◆ To prevent grease and fuel deposits from being tracked into the motorhome when refueling, change shoes before entering. Store the extra pair of shoes near the entry door.

WARNING:

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

Fuel Economy:

Driving style, wind resistance, terrain, vehicle weight, and engine-driven accessories are some of the factors that affect fuel economy.

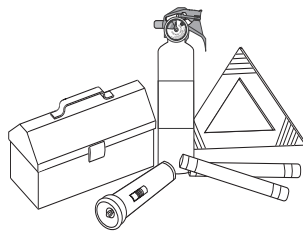
Guidelines to Help Increase Fuel Efficiency:

- ◆ 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, but creates rolling resistance, which increases fuel consumption.
- ◆ 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 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 (idling engine) incomplete combustion occurs, causing carbon build-up and raw fuel to wash lubricating oil from the cylinder walls and dilute the crankcase oil.
- ◆ Excessive idling (more than 10 or 15 minutes) can clog fuel injectors, eventually causing 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.
- ◆ Follow the maintenance schedule for the engine.

TRIP PREPARATION

The following suggestions are general guidelines to follow when preparing for a trip:

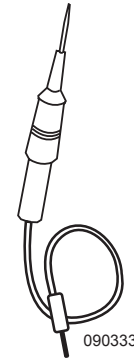


Tool Box & Emergency Road Supplies

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Items to Carry:

- ◆ An emergency road kit containing a flashlight, road flares, warning signs and a fire extinguisher.
- ◆ Local, State and National Maps, as well as a “Motor Carrier” road atlas (for refueling station and truck repair facility locations).
- ◆ Hand tools, a 12 Volt DC test light, a 120 Volt AC polarity tester, battery hydrometer, an assortment of blade fuses and alternator belt.
- ◆ Potable and non-potable water hoses, a water pressure regulator and various termination connectors for sewage.



Test Light



Polarity Tester

Inspection:

- ◆ Ensure all exterior items are stowed or secured (i.e. TV antenna, ceiling vents and windows).
- ◆ Check belts, hoses, battery and engine fluid levels. **Inspect** the engine, transmission and generator per the OEM manuals.
- ◆ Evenly distribute and secure cargo. Store heavy items near the rear axle and lighter items toward the front to prevent uneven stress and handling problems.

- ◆ Check all tires outside the motorhome for accurate pressure and physical condition. Look around, above and under the motorhome for obstruction or leaks. Test all exterior lighting: headlamps, taillights, brake and clearance lights.
- ◆ Inside the motorhome store and secure heavier objects in the lower cabinets to maintain a low center of gravity for sway reduction. Secure loose items to prevent weight shifts. Store lighter items in the overhead cabinets. Close and secure all cabinet doors and drawers, shower and pocket doors. Turn off interior lighting. Adjust exterior mirrors and check dash gauges for proper operation.

INFORMATION:

For chassis maintenance details refer to the chassis section.

CAUTION:

Open the bay doors slowly after a trip as cargo may shift during travel.

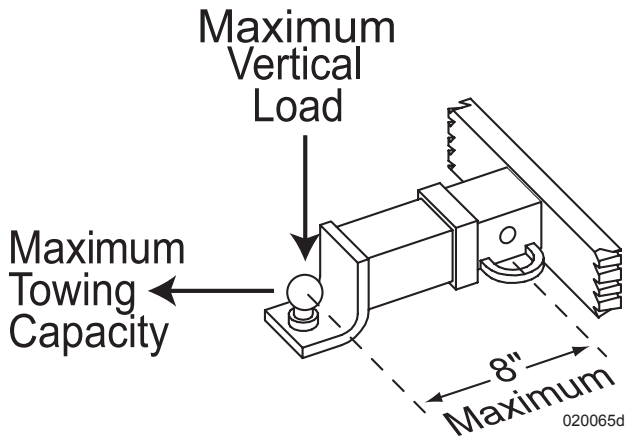
WARNING:

To avoid injury, never place hands or fingers 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.

TIPS:

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

HITCH
Using the Rear Receiver



The motorhome is intended for towing light loads and is primarily designed 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 will affect fuel economy. Weight pushing down on the rear hitch (tongue weight) must not exceed 10% of maximum tow capacity. Weigh the motorhome while fully loaded to ensure proper weight distribution of the GCVW (Gross Combined Vehicle Weight).

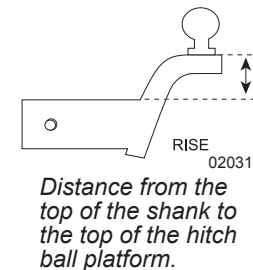
Add all passenger weight to the GCVW total. The motorhome fully loaded, including fresh water, LP-Gas and any vehicle or trailer towed, must not exceed the GCWR (Gross Combined Weight Rating).

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

Ball Mount:
Ball mounts have various configurations and weight limitations. There are three things to consider when selecting a ball mount: weight rating, pin to ball center length and rise/drop. The weight rating of the ball mount, tongue weight and tow weight must meet or exceed the total load weight.

Pin to ball center should not exceed 8". Ball mounts of longer length will significantly reduce the weight rating of the hitch receiver. Observe weight reduction percentages that may be listed on ball mounts longer than 8". Selecting how much rise or drop a ball mount will need is relative to hitch receiver height and height of the towed load with respect to the type of towing equipment between the motorhome and towed load.

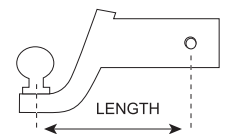


Weight Distributing Hitches:

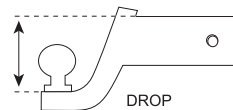
A weight distributing hitch uses spring bars of spring steel to compensate for lack of adequate rear suspension of the tow vehicle. This type of hitch is generally used for towing heavier loads as tongue weight and gross tow weight increases. The spring bars attach to the hitch head assembly and the trailer frame.

Hitch Ball:

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



Distance from the center of the hitch ball hole to the center of the pin hole.



Distance from the shank to the top of the hitch ball platform.

<p>MONACO COACH CORPORATION</p> <p>Coburg, Oregon Springfield, Oregon Wakarusa, Indiana Elkhart, Indiana Nappanee, Indiana</p>	Do Not Cut, Weld or Modify	03213019
	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 (454 kg) Should Have Separate Functioning Brake System.	
	Refer To Owner's Manual For Additional Towing Guidelines	

100200

Safety Chains:

Safety chains are required by law when towing any load. The chains and any fasteners used to attach the chains to the hitch receiver, must be rated for the load being towed. Attach chains so they crisscross under the towing equipment. Allow just enough slack in the chains to make sharp corners. Too much slack will allow the chains to drag on the road surface. If the towed load should become uncoupled from the hitch ball, the towing equipment will be cradled by the safety chains. If the towed load does uncouple, do not attempt to make a sudden stop. Apply the brakes with gentle, steady pressure. Pull over to the side of road at a safe location.

Tow Capacity and Class Ratings:

The weight rating of individual towing system components must be greater than the gross weight of the load being towed. To help define weight capacity of towing equipment, components are classified into weight groups. Maximum tow capacity is limited to the component with the lowest weight rating in the tow hitch system. Example: a ball mount may have a weight rating of 5,000 pounds but the hitch ball is rated 3500 pounds. Maximum tow capacity is reduced to 3500 pounds. Many times a component will have a Class weight rating. These groups are shown in chart:

WARNING:

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

Taillight Configuration:

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

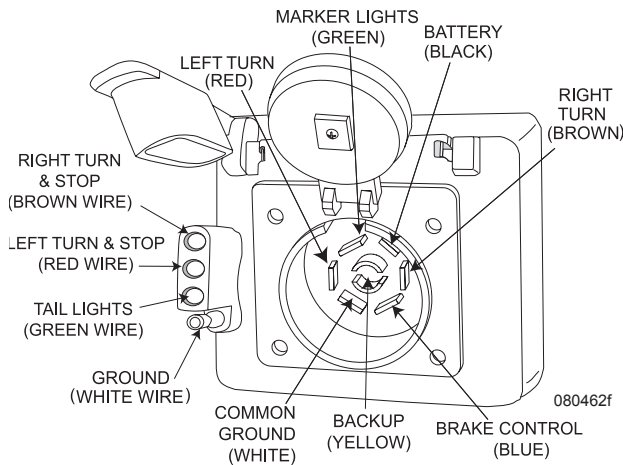
	CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V
Weight Carrying Hitch	TW - Up to 200 lbs.	WC TW - Up to 350 lbs.	TW - Up to 500 lbs.	TW - Up to 750 lbs.	TW - Up to 1,200 lbs.
	GTW - Up to 2,000 lbs.	WC GTW - Up to 3,500 lbs.	GTW - Up to 5,000 lbs.	GTW - Up to 7,500 lbs.	GTW - Up to 12,000 lbs.
Weight Distributing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

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

Tow Plug Connection:

The motorhome is pre-wired from the factory with an electrical connection for towing. The connection is located on the rear cap near the hitch receiver. Convoluted tubing protects the tow harness wires. 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. Current draw should not exceed 7.5 amps for each designated light circuit.

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** accidentally mirror image the trailer connection.



CAUTION:

Positive terminal connection 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.

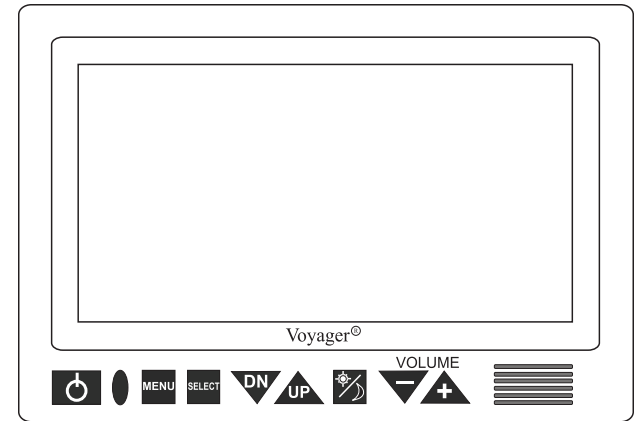
To Tow Car or Trailer:

1. Connect a tow car or trailer to the motorhome with safety chains rated for the weight being towed.
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 will cause extensive damage.

REAR VIEW SYSTEM

The motorhome is equipped with a rear vision system. This system includes up to three cameras and a dash mounted monitor. The cameras are located at the rear and sides (optional) of the motorhome. The select button on the monitor is used to alternate camera views.

When the rear view system is on, the camera view will automatically change to the rear view when the transmission is placed in reverse. The camera view will also change when a turn signal is activated to display the corresponding camera view. This system may be used while driving in forward, reverse or when parked.



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Monitor Controls

Power Button:

Press this button to turn the unit on or off. Turn the unit on to allow continuous operation of the rear vision system when the ignition key is on.

Menu:

Press to enter or exit the main menu mode. Functions that can be adjusted include brightness, contrast, color, tint, initial setup, auto-scan, split screen and distance markers.

Select:

Press this button to sequence through input channels. In addition, the "Select" button is used to select a highlighted function or option setting.

Up/Down:

Adjusts rear camera position upward and downward. In addition, while in the Menu mode, the "Up/Down" button navigates through the available menu options.

Day/Night:

Press this button to change setting for daylight or nighttime driving conditions.

Volume (+/-):

Adjusts volume. In addition, while in the Menu mode, the “-” and “+” button adjusts settings and navigates through the available menu options.

NOTE:

The rear camera view will automatically display when the transmission is placed in reverse if the monitor is on.

NOTE:

On motorhomes equipped with optional side cameras, the camera views will automatically change with turn signal activation.

INFORMATION:

For more detailed instructions, consult the OEM manual or visit the manufacturer’s website at www.asaelectronics.com.

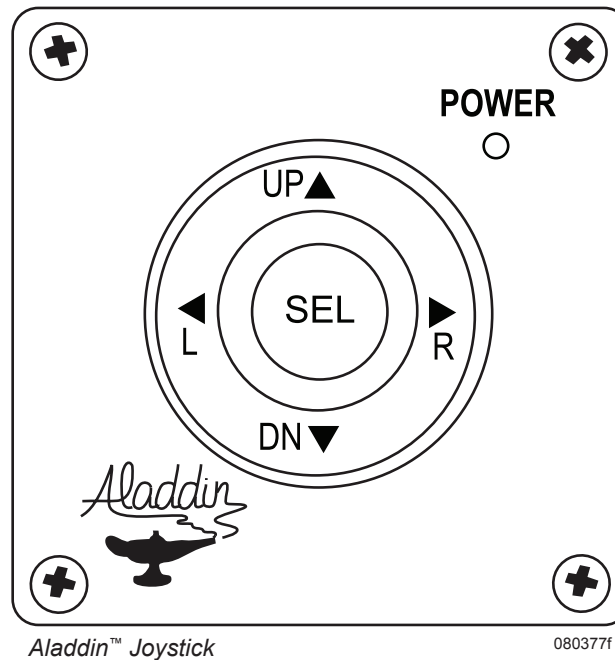
To Display the Aladdin System:

- ◆ Turn on the battery cut-off switch to engage house power.
- ◆ Turn on the monitor.
- ◆ Press the select button on the Aladdin controller to display the main menu.

- ◆ Press the up and down buttons to scroll through the main menu. Press the select button to enter a menu option and left to exit.

To Display Camera Views:

- ◆ Turn on the battery cut-off switch to engage house power.
- ◆ Turn on the monitor.
- ◆ Press the “Select” button on the monitor repeatedly to change camera views. The monitor will display each input channel separately, and then will display a split-screen, tri-screen and quad-screen view.

**BACKING UP A MOTORHOME**

Whether a long time owner of recreational vehicles or just starting out, backing up can be a challenge. Following some simple guidelines may help to reduce that challenge. When backing up, the driver (pilot) should be comfortable using the mirrors, the back-up camera and the co-pilot’s directions (ground guide) for assistance. Practice backing up with the co-pilot’s guidance in a large, unobstructed parking lot. Backing up is a team effort.

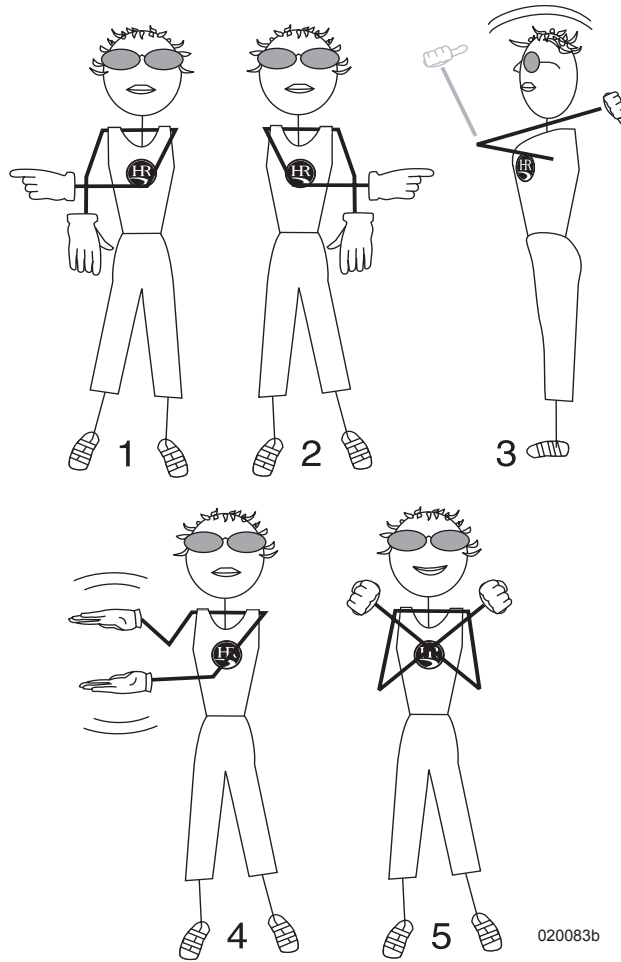
The backing process should begin while the motorhome is in forward motion. Maneuver the motorhome to align with the chosen site. Aligning the motorhome with the site after the backing process begins may require more than one attempt. When the motorhome is properly aligned with the site, the parking area will be visible in both mirrors. Use road markings as reference points when possible.

When pull-through sites are not available, pick a solid, level site on the left side for a better field of vision using the roadside mirror. If the site is on the right, use the curbside mirror for backing up, but stay aware of blind spots. Get out and walk the area prior to backing in. Look for potential hazards or obstacles that may damage the motorhome. If the site is satisfactory, prepare to back in carefully. Have the co-pilot provide guidance using the five hand signals. Use of walkie-talkies will also aid in guidance.

The co-pilot will perform just as important a job as the driver. 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 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. If necessary, stop the backing up process to have co-pilot **inspect** other areas or angles of concern.

The driver should receive directions only from the co-pilot. When the co-pilot is guiding the driver, only five clearly defined signals should be used, with only one signal given at a time. Flailing arms with indecisive signals only confuse the driver. Signals should be given with purpose and confidence. Directional signals are directing travel of the rear of the motorhome.

If the desired direction is left, the co-pilot points left. **For example:** The co-pilot will use his/her right arm and forefinger pointing distinctly left with arm and finger held on a horizontal plane, indicating desired direction of travel of the rear of the motorhome. The directional signal given should remain steady until the desired movement is complete.



Five Directional Signals:

1. Co-pilot uses left hand and arm held horizontal, with forefinger pointing right, to direct rear of motorhome to the right.
2. Co-pilot uses right hand and arm held horizontal, with forefinger pointing left, to direct rear of motorhome to the left.
3. Co-pilot uses both arms and hands parallel with thumbs pointing up and to rear in a waving vertical motion. This signals driver to maintain a straight back direction.
4. Co-pilot holds arms horizontally, hands open with palms facing one another. Start with a wide separation, gradually closing distance of hands in a rate appropriate to vehicle speed to indicate amount of distance to the stop point.
5. Closed fists and crossed arms indicate **STOP**.

Backing Up Trailers:

Towed vehicles using a tow bar or tow dolly have more than one pivot point and are not suitable for backing. Attempting to back up the motorhome while connected to a tow bar or tow dolly can jack-knife the tow device causing the wheels of the towed vehicle to move in a forward “sideways” motion that will cause irreparable and expensive damage. If necessary, disconnect the tow vehicle to avoid a backing up situation.

Trailers have one pivot point and may be backed up. The same rules for backing a motorhome can be applied to backing a trailer. When preparing to back the trailer into a space, maneuver the motorhome while sweeping wide. Turn back to the opposite direction to maneuver the trailer into the space. Keep the bottom of the steering wheel in the desired direction of travel for 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 undesired 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 guidance.

CAUTION:

Tow bars or car dollies are generally 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.

SET-UP PROCEDURES

If the site for the motorhome provides full hook-ups, use this quick reference as a guide only. This information is an overview on hooking up the utilities and preparing appliances for use. Specific information on slide room, awning and leveling system operations is discussed in detail in other sections.

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. 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:

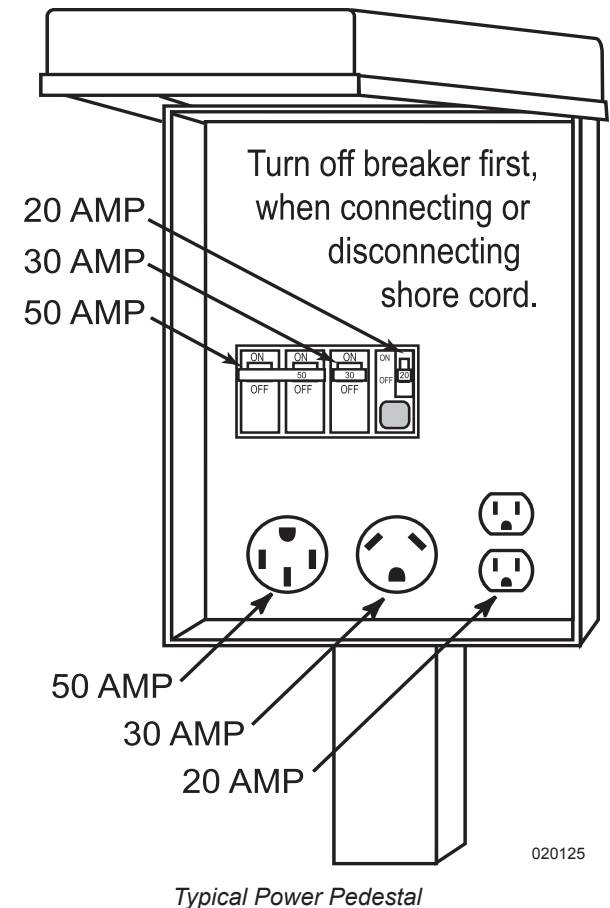
If shore power service is limited to 15 or 20 Amps, use of light duty extension cords and electrical adapters will create a voltage loss through the cord and at each electrical connection. Line voltage loss and the resistance at each electrical connection can be a hazardous combination. Damage to sensitive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

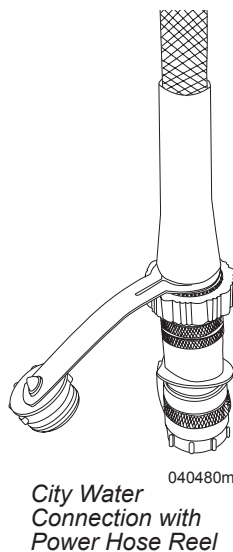
To avoid shore power overload when hooked to 30 Amp service, determine appliances current load prior to turning on appliances or using interior outlets.



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Typical Power Pedestal

- ◆ If cable service is provided, hook-up a 75 Ohm RG59 or RG6 cable to the cable connection in the 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.
- ◆ 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.

**NOTE:**

Reverse this procedure when preparing to depart.

DRY CAMPING

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

Before arriving at the site, ensure batteries are fully charged and properly maintained (see **Section 8, 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:

- ◆ Operate the refrigerator on LP-Gas. Plan what is needed from the refrigerator prior to opening. Conserve LP-Gas by cooking over a campfire.
- ◆ Operate the water heater on LP-Gas. Turn the system on about twenty minutes prior to use. Once heated, water will remain hot for several hours. Turn the system off when not in use.
- ◆ Set the thermostat temperature slightly lower than desired to prevent frequent cycling of the heating system.
- ◆ Know 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.
- ◆ Keep the optional solar panel clean for optimum performance.
- ◆ Turn on the water pump only when using water.
- ◆ If weather does not permit or an outdoor table is not available, eat at the dinette table by candlelight.
- ◆ Operate the generator when using microwave/convection oven.

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

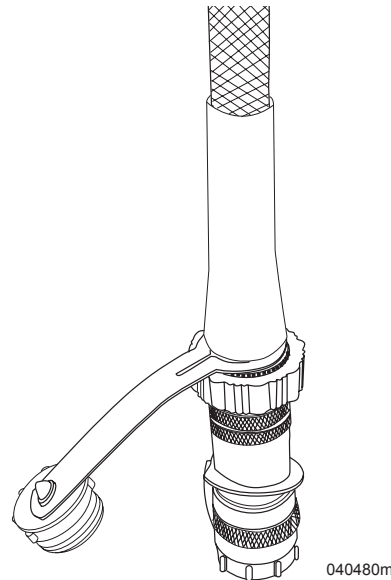
BREAKING CAMP

Preparing the motorhome for travel will require several small tasks. Properly secure and store items to 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. 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.



City Water Connection with
Power Hose Reel

- ◆ 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.

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 noise.
- ◆ **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.

NOTE:

Ignition must be OFF and the park brake set to extend the slide-out room. The slide-out room can be retracted with the ignition on; however, the jacks must be retracted and the motorhome supported by the air suspension before retracting the slide-out.

- ◆ Secure and fasten all interior 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 obstruction. Check for debris stuck between the rear dual tires.
- ◆ 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 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 ROADSIDE PROCEDURES

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 or an emergency service provider.

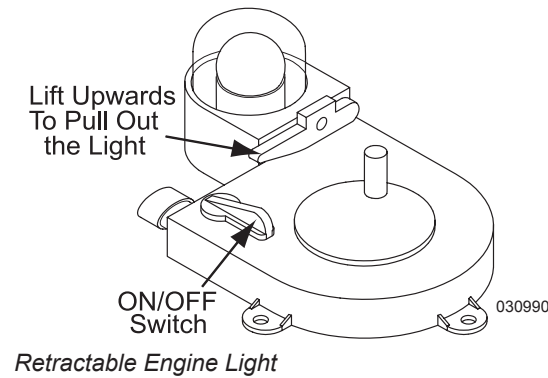
Road flares or reflective warning signs should be displayed if the motorhome is on the side of the road for any length of time. Guidelines for placing warning triangles depend upon the road characteristics and visibility. **For example:** The standard placement is 10, 100 and 200 ft. from the rear of 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 ft. behind the motorhome in order to safely warn approaching traffic.

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	Cummins Customer Assistance Center	1-800-343-7357
Transmission	Allison Transmission	1-800-524-2303
Towing	Owner’s Advantage Program	1-877-882-0614
Tires: Goodyear	Goodyear	1-877-484-7376

In Case of Flat Tire

In the event of a flat tire, it is recommended to call for roadside assistance. 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.



- To rewind, crank the handle in the retract direction. When fully retracted, push down on the lever handle to keep the light locked into place.
- To replace bulb, push down on the clear plastic cover and twist.

Engine Light - Retractable

A retractable light is installed for use in places of limited lighting, such as outside access to the rear engine compartment and roadside electrical compartments.

To Use the Retractable Light:

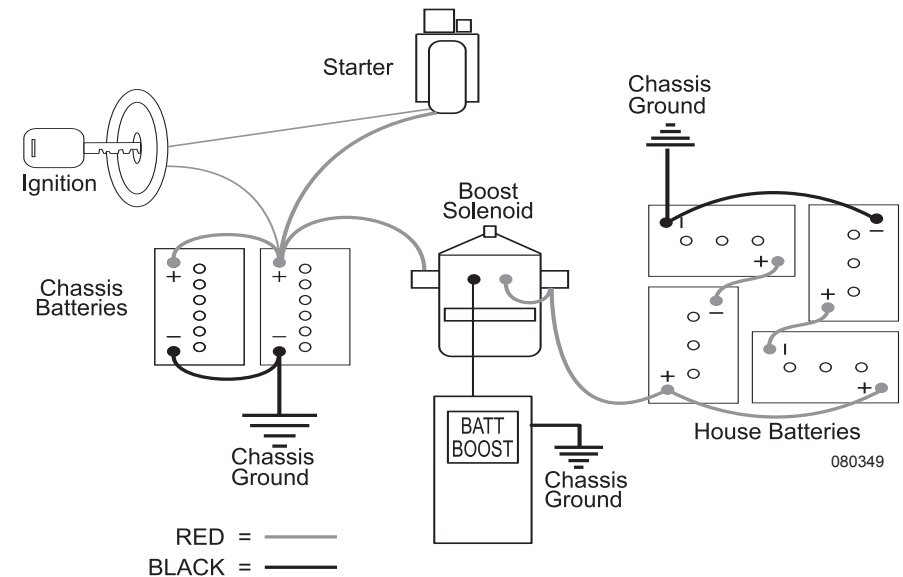
- Activate the light by turning **ON** the Bay Lights switch on the right side of dash. Turn **ON** the switch on the light.
- The light is on an 18' retractable reel cord. To operate, lift the lever and pull the light out.
- A magnetic base attached to the light enables you to securely position the light for hands free operation.

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 will damage the solenoid.



Jump Starting Using the Battery Boost Switch:

- With the ignition key **OFF**, press and hold the Battery Boost switch for ten seconds. After ten seconds, continue to hold the switch down and turn on the ignition. The battery volt gauge on the dash 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 chassis battery. Once the generator is operating, the electrical combination of the generator and the inverter will charge the batteries.
- ◆ Allow the generator to run approximately 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 three to five times.
- ◆ 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:

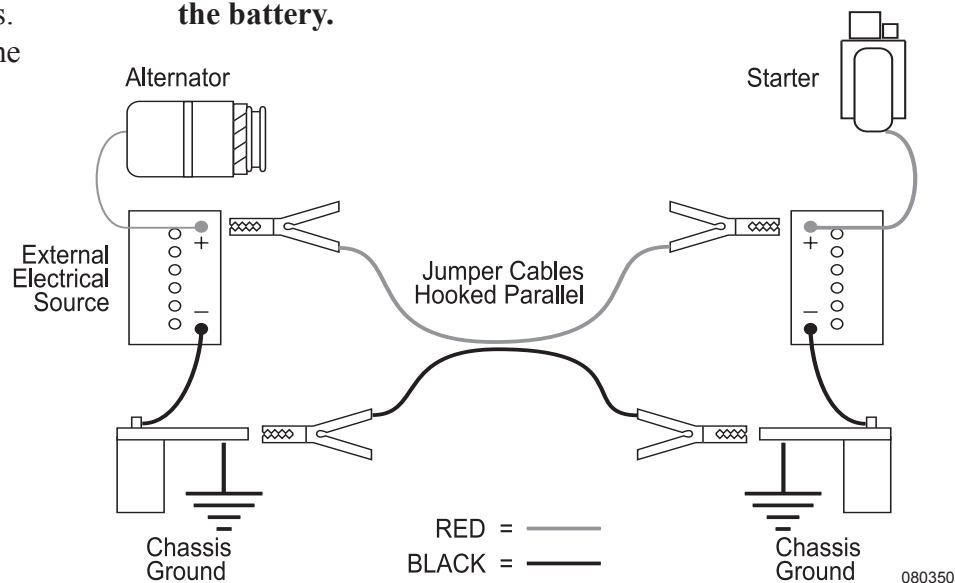
Always ventilate the battery compartment prior to any work or service to the batteries. Gas emitted by the batteries can explode when exposed to smoking material, flames, sparks or other sources of ignition, resulting in injury or vehicle damage. Batteries contain sulfuric acid that can burn skin, eyes 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, it is recommended to call Roadside Assistance. They will have the equipment necessary to jump-start the motorhome.

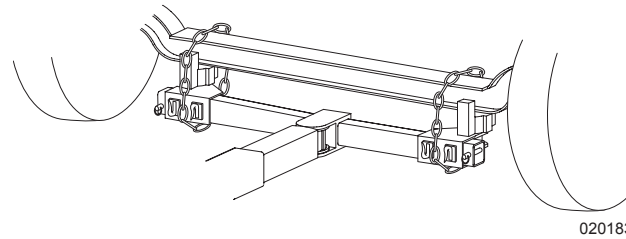
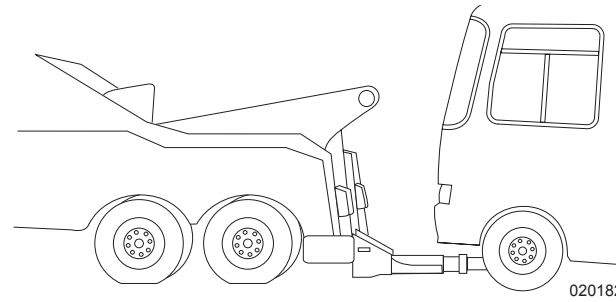
CAUTION:

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 and render the towed vehicle disabled.



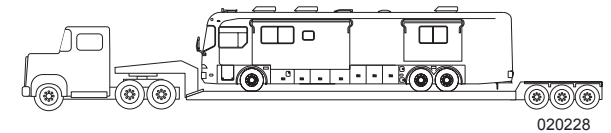
Typical jump-start connection.

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. Obtain help from a qualified technician.



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

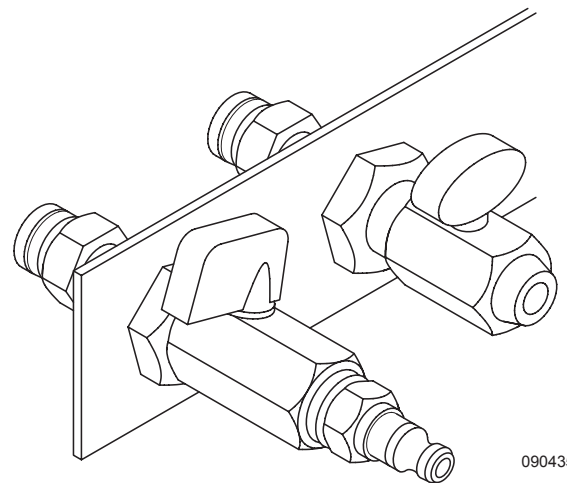
- ◆ Secure any loose or protruding parts if the motorhome is damaged.
- ◆ **Inspect** the points of attachment on a disabled motorhome. If attachment points are damaged, select other attachment points at a substantial frame structural member.
- ◆ Never allow anyone to go under a motorhome while it is 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.



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 to tow the motorhome and to tow a trailer or tow vehicle if it is not operational.



Air Nipple: Located in generator compartment.

- ◆ 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 end caps to prevent losing or contaminating the needle bearings.
- ◆ The 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.

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 Parking Brake

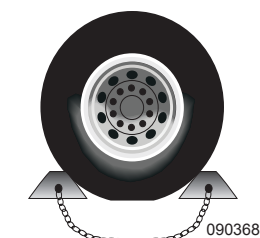
The park/emergency brakes apply to the drive axle only. The brakes can be manually released if the air system will not build sufficient air pressure. This emergency procedure is to be used by trained technicians or towing personnel to move the motorhome to a safe location or repair facility.

WARNING:

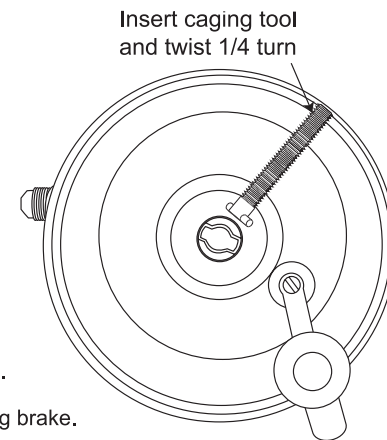
Only trained personnel should perform this procedure. Brake chamber spring is under high pressure. Removal of retaining band could result in serious injury or death.

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.

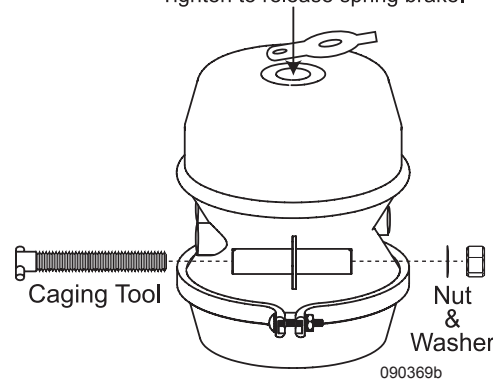


Example of a properly chocked wheel.



Insert Caging tool here. Twist 1/4 turn clockwise. Install nut & washer. Tighten to release spring brake.

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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

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 their components and functions.

Tire Components:

Tread: Provides traction and cornering grip.

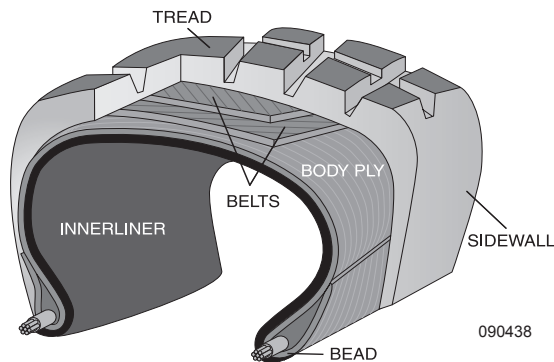
Belts: Stabilize and strengthen the tread.

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

An over-inflated tire will reduce the tire's footprint/contact patch with the road, thus reducing traction, braking capacity and handling of the motorhome. Over-inflation of a tire for the load will result 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's **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.

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

NOTE:

Every load range has a maximum rating as well as a minimum rating. **DO NOT** exceed those ratings.

WARNING:

DO NOT exceed tire manufacturer's maximum speed rating.

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	2410	2540	2680	2835	2955	3075	3195	3305	3415	3525(F)			
		D	2350	2460	2610	2755	2865	2975	3085	3195	3305	3415	3415(F)		
225/70R19.5	75	S		2895	3040	3195	3315	3450	3640(F)	3715	3845	3970(G)			
		D		2720	2860	3000	3115	3245	3415(F)	3490	3615	3750(G)			
245/70R19.5	75	S		3640	3740	3890	4080(F)	4190	4335	4540(G)					
		D		3415	3515	3655	3970(F)	4115	4265	4410(G)					
265/70R19.5	75	S				3970	4180	4355	4540	4685	4850	5070	5170	5355(G)	
		D				3750	3930	4095	4300	4405	4560	4805	4860	5070(G)	
9R22.5	75	S		3370	3560	3730	3890	4080	4235	4390	4540(F)				
		D		3270	3410	3550	3690	3860	4005	4150	4300(F)				
10R22.5	65	S		4080	4280	4480	4675	4850	5025	5205(F)	5360	5515	5675(G)		
		D		3860	4045	4230	4410	4585	4760	4940(F)	5075	5210	5355(G)		
11R22.5	75	S		4530	4770	4990	5220	5510	5730	5950	6175(G)	6320	6465	6610(H)	
		D		4380	4580	4760	4950	5205	5415	5625	5840(G)	5895	5950	6005(H)	
12R22.5	75	S		4940	5200	5450	5690	6005	6205	6405	6610	6870	7130	7390(H)	
		D		4780	4990	5190	5390	5675	5785	5895	6005	6265	6525	6780(H)	
245/75R22.5	75	S		3470	3645	3860	3980	4140	4300	4455	4610	4675(G)			
		D		3260	3425	3640	3740	3890	4080	4190	4335	4410(G)			
255/70R22.5	75	S				4190	4370	4550	4675	4895	5065	5205	5400	5510(H)	
		D				3970	4110	4275	4410	4455	4610	4675	4915	5070(H)	
265/75R22.5	75	S		3875	4070	4255	4440	4620	4800	4975	5150	5205(G)			
		D		3870	4040	4205	4370	4525	4685	4805(G)					
275/70R22.5	75	S					5170	5400	5630	5850	6070	6290	6510	6730	6940(H)
		D					4770	4980	5180	5390	5590	5800	6000	6200	6395(H)
275/80R22.5	75	S						5500	5745	5985	6225	6460	6700	6930	7160(H)
		D						5080	5305	5530	5750	5965	6185	6400	6610(H)
295/75R22.5	75	S			4725	4940	5155	5370	5510	5780	5980	6175(G)	6370	6610(H)	
		D			4690	4885	5070	5260	5440	5675(G)	5800	6005(H)			
295/80R22.5	75	S				5480	5750	6020	6285	6550	6810	7070	7320	7580	7830(H)
		D				4855	5100	5335	5570	5805	6035	6265	6490	6720	6490(H)
315/80R22.5	75	S					6415	6670	6940	7190	7440	7610	7920	8270(J)	
		D					5840	6070	6395	6540	6770	6940	7210	7610(J)	
11R24.5	75	S				5310	5550	5840	6095	6350	6610(G)	6790	6970	7160(H)	
		D				5070	5260	5510	5675	5840	6005(G)	6205	6405	6610(H)	
285/75R24.5	75	S			4770	4990	5210	5420	5675	5835	6040	6175(G)			
		D			4740	4930	5205	5310	5495	5675(G)					

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. **WARNING: DO NOT exceed tire manufacturer's maximum speed rating.**

Inspecting & Pressure

The Load and Inflation Table will help 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 ambient temperature or the heat generated while driving have caused the tire pressure to temporarily increase. Check tire inflation pressure every morning before driving. 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. Extension hoses on the valve stem should be good quality reinforced stainless steel braid. Attach hoses securely to the outer wheel.

The valve stem cap guarantees the valve core will remain free of dirt and foreign material. Material lodged between the valve core and internal stem can cause slow leaks resulting in tire failure.

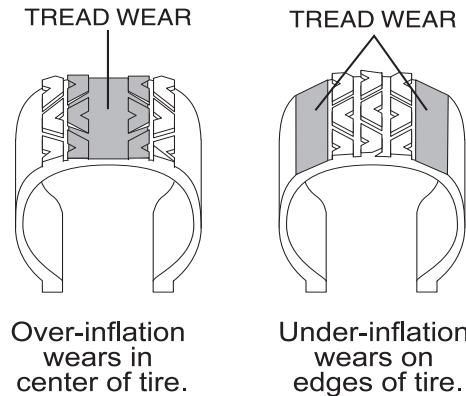
Optimum tire performance is achieved at proper inflation pressure for the load carried. **DO NOT** mix tires of different tread patterns, size or construction on the same axle. The difference in traction could cause rear end gear bind and mechanical damage to the drive train.

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.



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Under-inflation can cause:

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

WARNING:

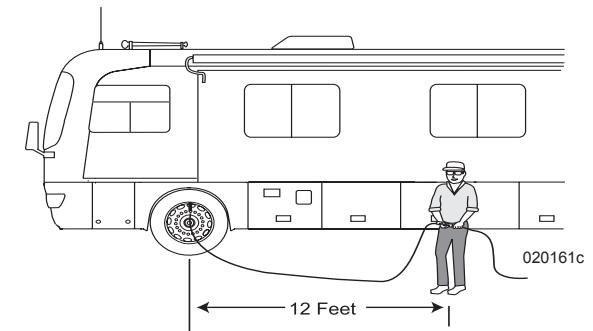
A slow leak may go unnoticed on one of the dual tires. This can cause the good tire to fail by exceeding the load limit. Tires with damaged sidewalls can burst upon inflation. A flat or nearly flat tire can also generate enough heat from friction to ignite.

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.



Air Pressure Checklist

1. When inspecting the tires, confirm the tires are cool before increasing or reducing air pressure. 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 recorded calculation when reaching the pump. It is normal for tires to heat up and the air pressure inside to go up as driven. **NEVER** “bleed” or reduce air pressure when tires are hot.

2. Remove 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. Recheck the pressure with the tire gauge.
6. Replace the valve cap.
7. Repeat with each tire.
8. Visually inspect all the tires for nails or other objects that could be embedded or puncture the tire and cause an air leak.
9. Check the sidewalls for gouges, cuts, bulges or other irregularities.

NOTE:
Air pressure in a tire goes up (in warm weather) or down (in cold weather) one to two pounds for every 10° F of temperature change.

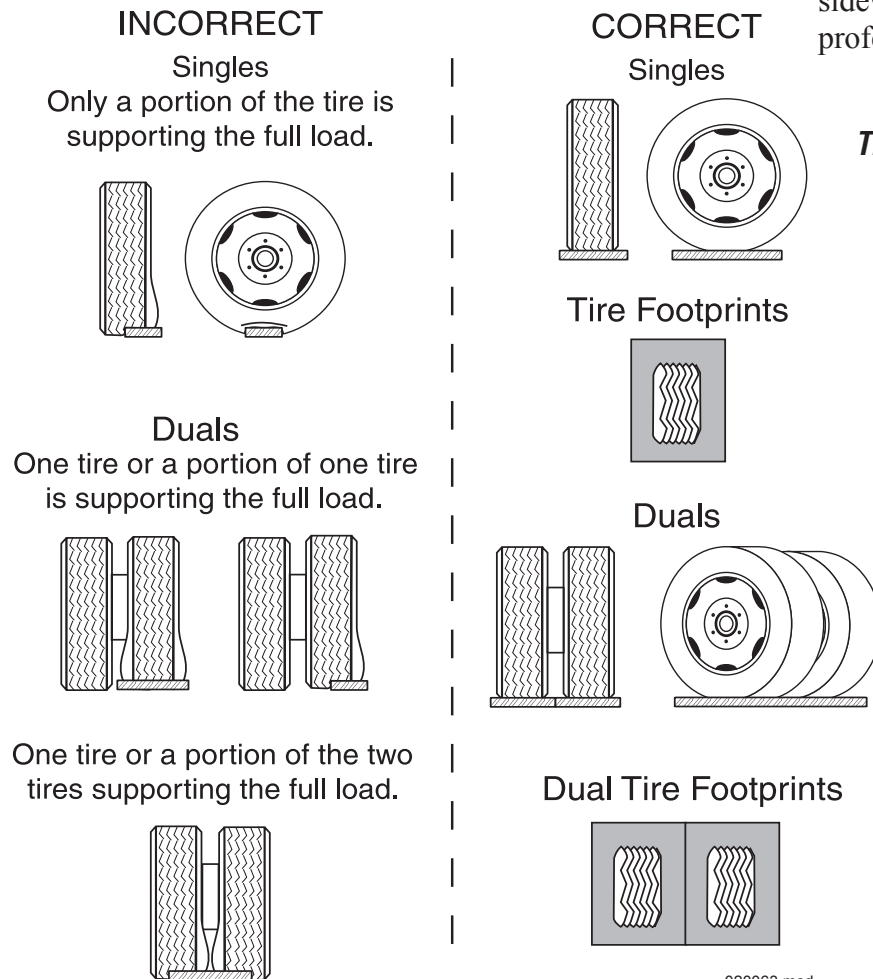
Supporting When Leveling

Extreme caution must be taken to ensure that the tires are fully supported when placing blocks under the tires. The load on the tire should be evenly distributed on the support block. 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 but does not prevent tire roll.

Tire "Support" Methods



Tire Vibration

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

Tire Rotation

Tire rotation can increase the useful life of the tires by achieving uniform wear on all of the tires. Have the tire manufacturer determine the 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 to be corrected prior to rotation.

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Tread

To prevent skidding and hydroplaning, replace tires when the tread is worn down to 4/32" on the front and 2/32" 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 2/32". The tire should be replaced when the "wear bars" are noticed.

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

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 structurally sound, weathering can occur inside the well of the tread. 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 the preferred method of 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:

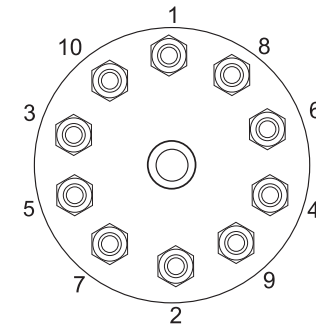
Before removing the motorhome from long-term storage, thoroughly **inspect** each tire's tread area and air pressure. If the tires have lost air during storage, inflate them to the correct pressure.

WHEEL MOUNTING

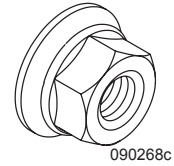
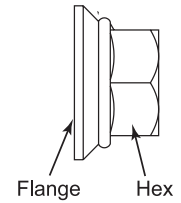
Hub Piloted Mounting:

- ◆ 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.



Nut Tightening Sequence
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Flange Nut:
Front & Side
View.

NOTE:

Loosen and tighten lug nuts in sequence (see illustration). Sequence tighten to 50 ft. lbs. first, then sequence tighten to 500 ft 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 motorhome is in motion.

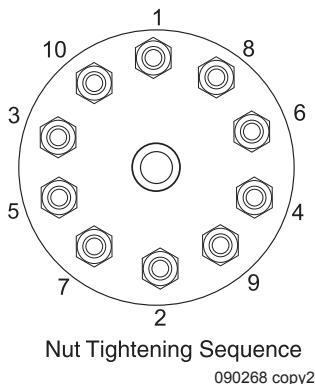
Front Wheels:

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 the nuts to 500 ft. lbs. in sequence (as in illustration).

Dual Rear Wheels:

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

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

**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 air wrench output and adjust 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 weight 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 in which they travel.

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 weigh the motorhome to calculate **Cargo Carrying Capacity (CCC)** and 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 **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 details 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, motorhome frame and/or other components of the motorhome may 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 must not exceed the **GAWR**, the motorhome must be weighed in a loaded condition to determine actual weight. Separately weigh the front axle, rear axle and tag axle, if equipped. It is possible for a motorhome to be within the **GVWR** yet overloaded on one 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, LP-Gas, 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), full LP-Gas weight, 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. Tire inflation pressure of the heavier side tires determine the inflation pressure for all tire(s) on that axle due to the weight transfer that occurs when cornering.

Improperly inflated tires, or an incorrectly loaded suspension, can result in poor fuel economy, poor handling and over-stressed chassis components. How the motorhome is loaded 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:

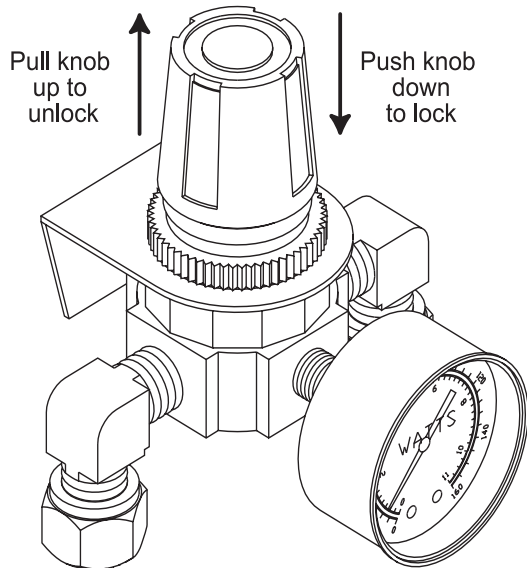
When weighing a motorhome, each tire on any axle must be inflated to the same pressure. The wheel position carrying the most weight will determine the tire inflation pressure for each tire of that particular axle.

Tag Axle Motorhome (42' Only):

Motorhomes equipped with a tag axle will require adjustment to the air pressure regulator for the tag axle to maintain proper axle weight distribution ratios. The adjustable regulator and gauge package are located in the engine compartment on the roadside. The regulator is designed to control the amount of air pressure in the tag axle air bags. Increasing the regulator pressure gauge reading will increase the amount of air pressure in the tag axle air bags and downward force of the tag axle. Applying downward force to the tag axle decreases the weight carried by the drive axle.

Tag Axle Regulator Adjustment:

The pressure regulator adjustment knob has a positive lock. Pull up on the knob to unlock; push down on the knob to lock. Turn the knob clockwise to increase air pressure; turn the knob counterclockwise to decrease air pressure. Decreasing regulator air pressure will release excess air through the regulator discharge port. Air pressure stabilization procedures will be performed each time an increase or decrease of air pressure to the regulator is made, equalizing the regulator to hold a constant air pressure setting.



Tag Axle Regulator: Located in Rear Engine Compartment.

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To perform the stabilization procedure:

- ◆ Start the motorhome and allow the air system to reach a full charge, indicated by release of air from the air dryer.
- ◆ Raise the tag axle using the tag axle switch on the shift panel. Allow approximately 20 seconds for the system to discharge air from the tag axle air bags.
- ◆ Lower the tag axle. The regulator will hold the new air pressure setting.
- ◆ Push down on the regulator adjustment knob to lock the setting.

When increasing the air pressure setting allow approximately a two-pound pressure increase before the stabilization process.

Example: If the desired setting is 30 psi, slowly rotate the regulator adjustment knob clockwise to 28 psi. Perform the stabilization procedure. Regulator setting will stabilize to approximately 30 psi. When decreasing the air pressure setting rotate the regulator adjustment knob counterclockwise, allowing the excess air to be discharged, and then perform the stabilization procedure.

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 access, 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 six-point weigh, to accurately determine the correct tire inflation pressure.

NOTE:

The most accurate method to determine proper tire pressure is six-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 an 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: _____

		LBS.	KGS.
GVWR	(Gross Vehicle Weight Rating) is the maximum permissible weight of this fully loaded motorhome	_____	_____
UVW	(Unloaded Vehicle Weight) is the weight of this motorhome as manufactured at the factory with full fuel, engine oil and coolants.....	_____	_____
SCWR	(Sleeping Capacity Weight Rating) is the manufacturer's designated number of sleeping positions multiplied by 154 pounds (70 kilograms)	_____	_____
CCC	(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).....	_____	_____
GCWR	(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.

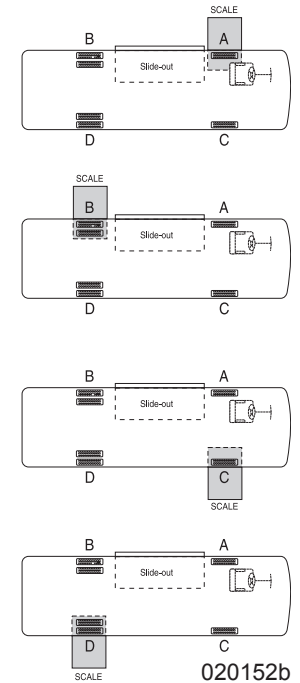
WARNING: DO NOT EXCEED THE GVWR, GCWR AND/OR GAWR AFTER LOADING YOUR MOTORHOME WITH WATER, FUEL, PASSENGERS AND CARGO.
GAWR (Gross Axle Weight Rating) means the maximum permissible load weight a specific axle is designed to carry. See Federal Certification Label for disclosure of The GAWR for each axle.

(*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 you Owner's Manual for further towing 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.

100179d

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.



020152b
 Four Point Weighing Example Chart

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.

1. Take the **FRONT** axle Gross Axle Weight Rating (**GAWR**) and divide it by two. Example: **FRONT** axle **GAWR** taken from the motorhome Vehicle Certification Label is 13,000 lbs. Divide the figure by 2, using chart , record 6500 lbs. on line 1.
2. Weigh the driver side **FRONT** corner (Scale A) and record weight on chart scale A, line 2. Example: 5000 lbs.
3. Weigh the passengers side **FRONT** corner (Scale C) and record weight on chart Scale C, line 2. Example: 4000 lbs.

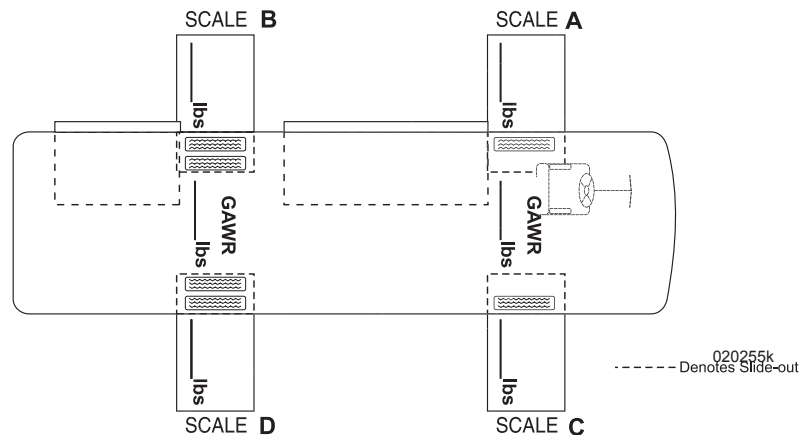
4. Add Roadside and Console side from line 1, for Gross Axle Weight Rating (**GAWR**) and record on chart under Totals. Example: 13000 lbs.
 5. Add chart scale A and C, line 2 for actual Gross Axle Weight (**GAW**) and record on chart under Totals. Example: 9000 lbs.
 6. Actual Gross Axle Weight (**GAW**). Example: 9000 lbs is not to exceed Gross Axle Weight Rating (**GAWR**). Example: 13000 lbs.
- ◆ Refer to the Tire Chart (Tire size 295/80R22.5) Use the highest actual weight, Scale **A** or **C**, line 2. Example 5000 lbs. Determine the proper tire pressure for each tire using the Load Inflation chart. Example: 80 psi or stamped on the sidewall of the tire.
 - ◆ Repeat above procedures to determine **REAR** axle Scale **B** and **D**, tire pressures.

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.

	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	4,000
	2.(A) 5000	(C) 4,000	9,000		
DRIVE AXLE	1. 10,000	10,000	20,000	+ 20,000	6,000
	2.(B) 7,100	(D) 6,900	+ 14,000		
		Total Axle Weight	= 23,000 UVW	= 33,000 GVWR	= 10,000 CCC

NOTE:

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



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.

Load and Inflation Tables:

The Load and Inflation Table will help determine correct inflation for the motorhome tires after properly weighing the motorhome. All pressures are rated at a cold PSI. Cold conditions are 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 that the pressure should be checked early and when the motorhome has not been driven more than one mile. The check interval should be in the morning, before the "drive" trip and every morning on extended trips. A quality truck tire gauge with a multiple angle airhead is needed to ensure access to both dual wheel positions of the drive axle. Ensure the valve cap is replaced on the stem after the inflation is checked. This guarantees the valve core will remain free of dirt and foreign material. Material lodged between the valve core and internal stem can cause slow leaks resulting in tire failure.

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 water, LP-Gas, passengers and cargo weight.

It is important to understand that the weighing process is performed in two phases. First, by determining the **Cargo Carrying Capacity (CCC)**; and 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**.

$$\text{GVWR } 35,000 - \text{UVW } 20,000 = \text{A } 15,000$$

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 10-gallon water heater with a 40-gallon fresh tank would total 50 gallons times 8.3, or 415 pounds.

A 30-gallon LP-Gas tank will have 24 gallons of LP-Gas due to the 80% valve. This would mean 24 gallons multiplied by 4.2, or 100.8 pounds.

$$\text{A } 15,000 - 415 = \text{B } 14,585$$

$$\text{B } 14,585 - 100.8 = \text{C } 14,484.2$$

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

The 154 pounds (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 4 (616 pounds) and there are four people who weight 200, 200, 178 and 138 pounds, totaling 716 pounds, that doesn't mean the sleeping capacity is reduced to three individuals, but rather the CCC is reduced by 100 pounds due to the actual passenger weight.

$$\text{C } 14,484.2 - \text{SCWR } 716 = \text{CCC } 13,768.2$$

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. Once the motorhome is fully loaded it is ready to be weighed to obtain an accurate scale reading and determine the proper tire pressure. All slide rooms must be in the retracted position when weighing the motorhome. The motorhome must remain as level as possible on the scale, even when an axle or side is not physically on the scale.

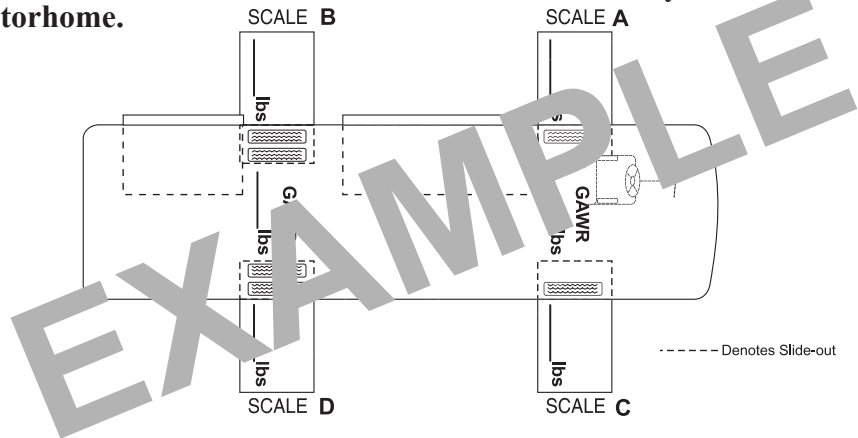
- ◆ Each wheel position must be weighed to accurately determine the weight carried at each wheel position.
- ◆ Refer to the previous examples on how to weigh each wheel position. Each wheel position weight must be weighed and recorded to determine proper tire inflation.
- ◆ Wheel position weights are not to exceed **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. If wheel position weights exceed maximum specifications, items will need to be removed until rating weight is within specification.

Weight Example 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	4,000
	2.(A) 5,000	(C) 4,000	= 9,000		
DRIVE AXLE	1. 10,000	10,000	= 20,000	+ 20,000	6,000
	2.(B) 7,100	(D) 6,900	= +14,000		
		Total Axle Weight	= 23,000 UVW	= 33,000 GVWR	= 10,000 CCC

NOTE:

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



	FORMULA	UVW 23,000 CAPACITY	CCC
FRESH WATER	Subtract Gallon @ 8.3 lbs/gal	100 X 8.3 = 830	- 10,000
WATER HEATER	Subtract Gallon @ 8.3 lbs/gal	10 X 8.3 = 83	- 9,170
LP-GAS	Subtract Gallon @ 4.2 lbs/gal	40 X 4.2 = 168	- 9,087
SLEEP CARRYING WEIGHT RATING	Subtract Persons @ 154 lbs/person	5 X 154 = 770	- 8,919
		Maximum Cargo Carrying Capacity CCC	8,149

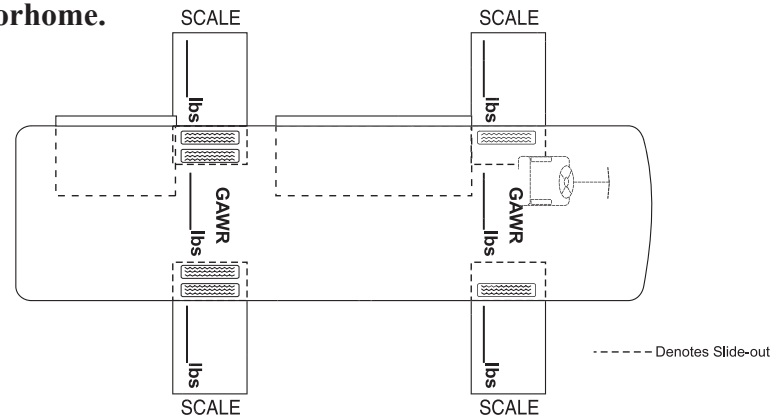
Maximum Cargo Carrying Capacity will change by varying any of the capacities. Tongue Weight of a towed vehicle will reduce the Cargo Carrying Capacity (CCC).

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:

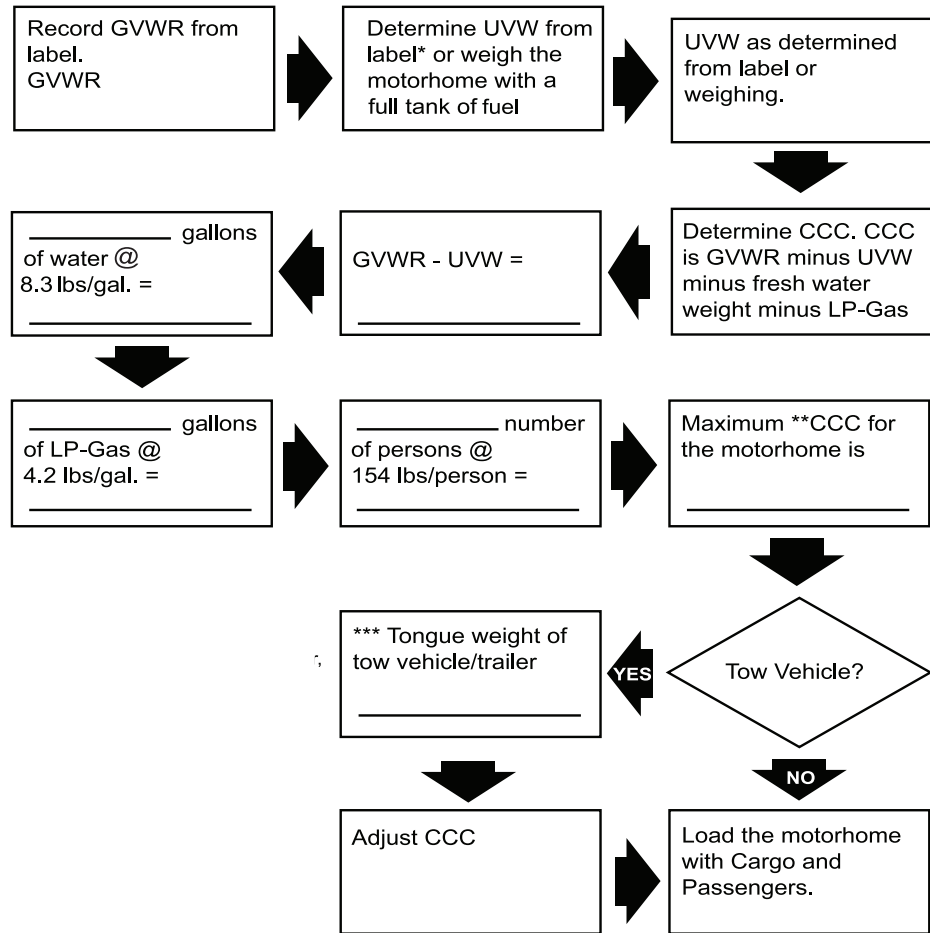
These measurements are with a full tank and nobody in the motorhome.



	FORMULA	UVW CAPACITY	CCC
FRESH WATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
WATER HEATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
LP-GAS	Subtract Gallon @ 4.2 lbs/gal	X 4.2 =	-
SLEEP CARRYING WEIGHT RATING	Subtract Persons @ 154 lbs/person	X 154 =	-
		Maximum Cargo Carrying Capacity CCC	

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).

Cargo Carrying Capacity Flowchart



* Actual UVW may vary based upon options ordered.
 ** Maximum CCC can be adjusted with amount of water, LP-Gas, number and weight.
 *** Actual CCC will vary with number and weight of passengers. Amount of water and LP-Gas and Tow Vehicle/Trailer Tongue weight.

□ = Process
 ◇ = Decision

Figure Cargo Carrying Capacity (CCC)

020254d

Six-Point Weighing Example (Tag Only)

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 the retracted position.

- ◆ Record the Front Axle **Gross Axle Weight Ratings (GAWR)** and divide it by two. **Example:** Front Axle GAWR as listed on the Vehicle Certification Label is 13,000 lbs. Using the chart, record 6,500 lbs. on Scale A and D, line 1.
- ◆ Weigh driver side steer axle (**Scale A**) and record weight on chart Scale A, line 2. **Example:** 5,000 lbs.
- ◆ Weigh passenger side steer axle (**Scale D**) and record weight on chart Scale D, line 2. **Example:** 4,000 lbs.
- ◆ Record the rear axle **Gross Axle Weight Ratings (GAWR)** and divide it by two. **Example:** Rear Axle GAWR as listed on the Vehicle Certification Label is 20,000 lbs. Using chart below, record 10,000 lbs. on Scale B and E, line 1.
- ◆ Weigh driver side drive axle (**Scale B**) and record weight on chart Scale B, line 2. **Example:** 7,100 lbs.
- ◆ Weigh passenger side drive axle (**Scale E**) and record weight on chart Scale E, line 2. **Example:** 6,900 lbs.
- ◆ Take the Tag Axle **Gross Axle Weight Rating (GAWR)** and divide it by two. **Example:** Tag axle GAWR taken from the Vehicle Certification Label is 10,000 lbs. Using the Six-Point Weighing Example Chart (on preceding page), record 5,000 lbs. on Scale C and F, line 1.

- ◆ Weigh driver side tag axle (**Scale C**) and record weight on chart **Scale C**, line 2. **Example:** 4,500 lbs.
- ◆ Weigh passenger side tag axle (**Scale F**) and record weight on chart **Scale F**, line 2. **Example:** 4,000 lbs.
- ◆ Add chart **Scale C** and **F**, lines 1, for the **Gross Axle Weight Rating (GAWR)** and record on chart under Totals. **Example:** 10,000 lbs. Add chart **Scale C** and **F**, line 2 for actual Gross Axle Weight (**GAW**) and record on chart under Totals. **Example:** 8,500 lbs.
- ◆ Actual Gross Axle Weight (**GAW**). **Example:** 8,500 lbs., is not to exceed **Gross Axle Weight Rating (GAWR)**. **Example:** 10,000 lbs.
- ◆ If necessary, adjust tag axle regulator to compensate for payload carried by tag, drive and front axles.
- ◆ Perform the regulator stabilization procedure.

NOTE:

Adjustments made to the Tag Axle Regulator will require repeated weighing procedures.

- ◆ If necessary, adjust the payload so the GAWR is not exceeded. Total combined weights must not exceed the GVWR.
- ◆ Refer to the Tire Chart in this section (the example tire size is 295/80R22.5). Use the highest actual weight, **Scale A** or **D**, line 2. **Example:** 5,000 lbs.; **Scale B** or **E**, line 2. **Example:** 7,100 lbs.; **Scale C** or **F**, line 2. **Example:** 4,500 lbs. Determine the proper tire pressure for each axle. Front axle tire pressure is 115 psi, Rear axle tire pressure is 85 psi. Tag axle tires are 80 psi using the Load Inflation chart.

WARNING:

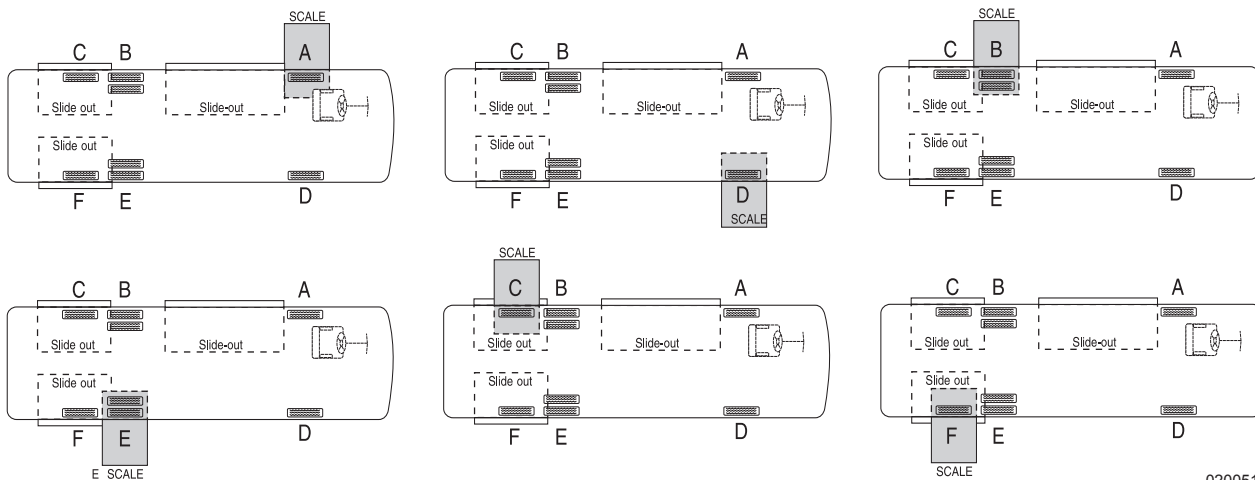
Improperly inflated or overloaded tires can cause a blowout. An overloaded axle can cause a component failure of the suspension system. Tire blowout or broken suspension components can lead to loss of vehicle control resulting in property damage, personal injury or death.

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** limits the weight of the entire load combination, regardless of the water, LP-Gas, passengers and cargo weight.



020051d

It is important to understand that the weighing process is performed in two phases. First, by determining the **Cargo Carrying Capacity (CCC)**; and 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**.

GVWR 35,000 - UVW 20,000 = A 15,000

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 10-gallon water heater with a 40-gallon fresh tank totals 50 gallons times 8.3, or 415 pounds. A 30-gallon LP-Gas tank has 24 gallons of LP-Gas due to the 80% valve. This is 24 gallons multiplied by 4.2, or 100.8 pounds.

A 15,000 - 415 = B 14,585

B 14,585 - 100.8 = C 14,484.2

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

The 154 pounds (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.

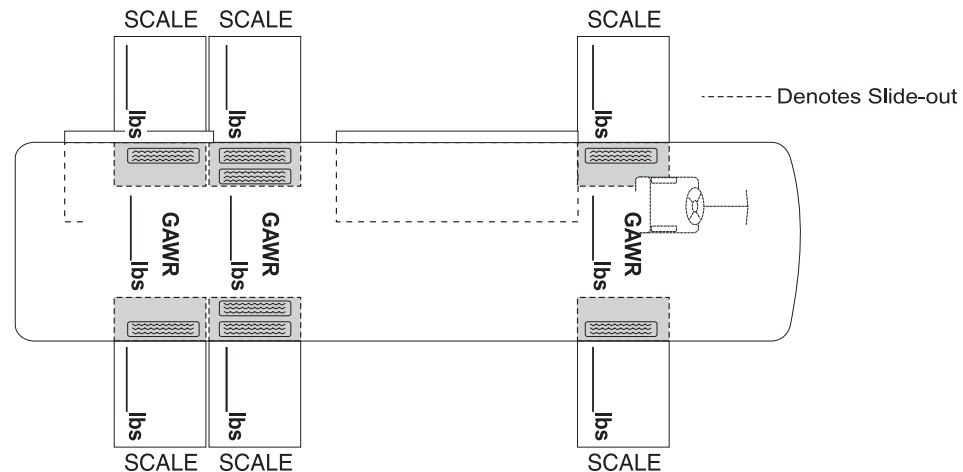
Example: If the manufacturer has designated the motorhome sleeping position at 4 (616 pounds) and there are four people who weigh 200, 200, 178 and 138 pounds, totaling 716 pounds, that doesn't mean the sleeping capacity is reduced to three individuals, but rather the **CCC** is reduced by 100 pounds due to the actual passenger weight.

C 14,484.2 - SCWR 716 = CCC 13,768.2

	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	4,000
	2.(A) 5,000		(D) 4,000		9,000		
DRIVE AXLE	1. 10,000	+	10,000	=	20,000	+ 20,000	6,000
	2.(B) 7,100		(E) 6,900		+ 14,000		
TAG AXLE	1. 5,000	+	5,000	=	10,000	+ 10,000	1,500
	2.(C) 4,500		(F) 4,000		+ 8,500		
TAG AXLE REGULATOR	SETTING @ 24 psi		Total Axle Weight		= 31,500 UVW	= 43,000 GVWR	= 11,500 CCC

NOTE:

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



020255o

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. Once the motorhome is fully loaded it is ready to be weighed to obtain an accurate scale reading and determine the proper tire pressure. All slide rooms must be in the retracted position when weighing the motorhome. The motorhome must remain as level as possible on the scale, even when an axle or side is not physically on the scale.

- ◆ 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 **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. If wheel position weights exceed maximum specifications, items will need to be removed until rating weight is within specification.

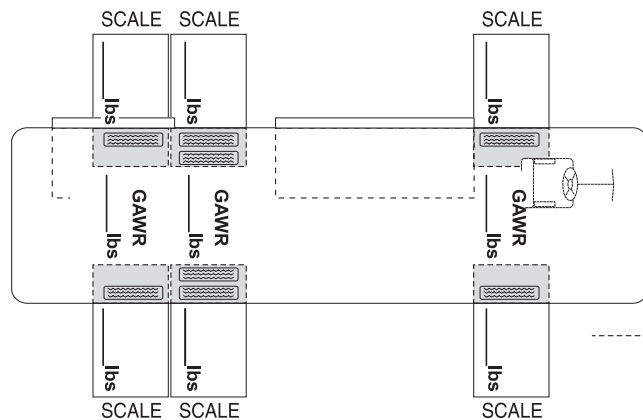
Weighing Procedure Worksheet (Tag Only)

	ROADSIDE		CURBSIDE		TOTAL AXLE WEIGHT	GROSS AXLE WEIGHT RATING GAWR	GAWR Minus Total Axle Weight
FRONT AXLE	1.	+	(D)	=			
	2.(A)						
DRIVE AXLE	1.	+	(E)	=	+	+	
	2.(B)						
TAG AXLE	1.	+	(F)	=	+	+	
	2.(C)						
TAG AXLE REGULATOR	SETTING @ _____ psi		Total Axle Weight	=	UVW	=	GVWR
						=	CCC

NOTE:

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

	FORMULA	UVW CAPACITY	CCC
FRESH WATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
WATER HEATER	Subtract Gallon @ 8.3 lbs/gal	X 8.3 =	-
LP-GAS	Subtract Gallon @ 4.2 lbs/gal	X 4.2 =	-
SLEEP CARRYING WEIGHT RATING	Subtract Persons @ 154 lbs/person	X 154 =	-
		Maximum Cargo Carrying Capacity CCC	



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).

020255c

Weight Record Sheet

DATE: _____
 PLACE: _____
 FRONT: _____ + _____ = _____
 LEFT RIGHT TOTAL
 REAR: _____ + _____ = _____
 LEFT RIGHT TOTAL
 TAG: _____ + _____ = _____
 LEFT RIGHT TOTAL
 = _____
 TOTAL GROSS VEHICLE WEIGHT

DATE: _____
 PLACE: _____
 FRONT: _____ + _____ = _____
 LEFT RIGHT TOTAL
 REAR: _____ + _____ = _____
 LEFT RIGHT TOTAL
 TAG: _____ + _____ = _____
 LEFT RIGHT TOTAL
 = _____
 TOTAL GROSS VEHICLE WEIGHT

DATE: _____
 PLACE: _____
 FRONT: _____ + _____ = _____
 LEFT RIGHT TOTAL
 REAR: _____ + _____ = _____
 LEFT RIGHT TOTAL
 TAG: _____ + _____ = _____
 LEFT RIGHT TOTAL
 = _____
 TOTAL GROSS VEHICLE WEIGHT

SMOKE DETECTOR

Statistics show that most fire casualties are not caused by direct flame, but by less visible smoke (products of combustion). 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:

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



Smoke Detector

Operation

When a 9 Volt DC battery is correctly connected, the LED will flash every minute and a loud alarm will sound when a product of combustion 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

Simply press the test button on the smoke alarm cover for approximately three seconds. The alarm will sound if all electronic circuitry, horn and battery are properly working. 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 this may ignite the alarm or surrounding area and set fire to the motorhome.

Maintenance

Maintenance for Proper Operation:

- ◆ 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 after the unit has been vacuumed.
- ◆ The smoke alarm will beep once a minute when a low battery condition exists to signify battery must be immediately replaced.

Troubleshooting

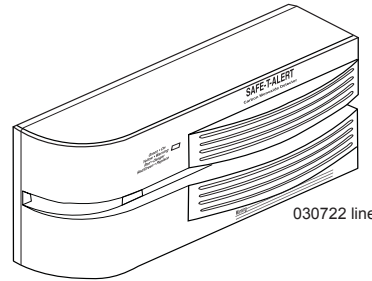
If the alarm does not sound when the test button is pushed, or with a smoke test, try the following:

- ◆ **Inspect** alarm 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 fail to 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 your 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 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 approximately in 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 include the elderly and those 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, produce CO Gas. Consequently, it is uncommon for household smoke from cigarettes or normal cooking to cause the alarm to sound.

CAUTION:

Activation of this device indicates the presence of carbon monoxide (CO), which can be fatal. A concentration of above 100 PPM will cause a warning condition. Individuals with medical problems may consider using detection devices with lower carbon monoxide alarming capabilities. Prolonged exposure to the alarm at a close distance 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 the house batteries. There are no switches that can accidentally turn the system off. Once the unit is powered, it will run through a brief warm-up and self check prior to monitoring for CO gas.

Operation

The detector is equipped with a self-cleaning CO sensor and requires a ten minute initial warm-up period to clean the sensor element and achieve stabilization. During the warm-up period, the green power light will flash **ON** and **OFF**. The green power light should be lit when the power is on. If the light is not lit, turn off the power and check all wire connections. If the power is on and the connections are correct, but the indicator still does not light, 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 will not sound.
- ◆ Flashing **red** indicates low CO alarm condition along with **four** beeps then **OFF** for five seconds. The alarm horn will sound and can be reset by the **TEST/RESET** button. The CO detector has detected the presence of 60 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 will continuously sound 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. Do a head count to check that all persons are accounted for. Call the nearest fire department and ask them to determine the source of the Carbon Monoxide. **DO NOT** re-enter the motorhome until it is aired out and the problem corrected.

Potential Sources of CO when operating the motorhome:

- ◆ Engine Exhaust
- ◆ Portable Grills
- ◆ Portable Space Heaters
- ◆ Camp Fires
- ◆ Gas Stoves and Ovens
- ◆ Generator Exhaust
- ◆ Portable Generators
- ◆ Nearby Motorhomes
- ◆ 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 will sound four beeps and the indicator lamp goes steady **red**. Six seconds later the alarm will again beep four 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 **one 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 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 recommend 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.**

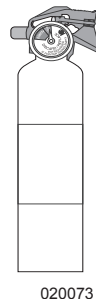
INSPECT:

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

FIRE EXTINGUISHER

The fire extinguisher in the motorhome is located near the main entrance door. Please read the operating instructions that are printed on the fire extinguisher. If there is any doubt on how to operate the fire extinguisher practice using it. Be sure to replace or recharge the extinguisher immediately after use.

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



Use the PASS word!

Pull the pin to unlock the extinguisher.

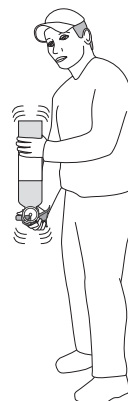
Aim at the base (bottom) of the fire and stand 6 to 10 feet away.

Squeeze the lever to discharge the agent.

Sweep the spray from left to right until totally extinguished.

WARNING:

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



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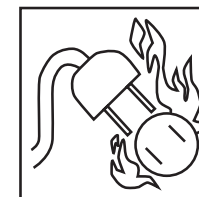
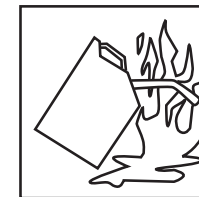
There are three classes of fire to be concerned with in a motorhome. Any fire can fall into more than one class; a fire that involves both burning paper and kitchen grease is a Class AB fire.

Classes of Fire:

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

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

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

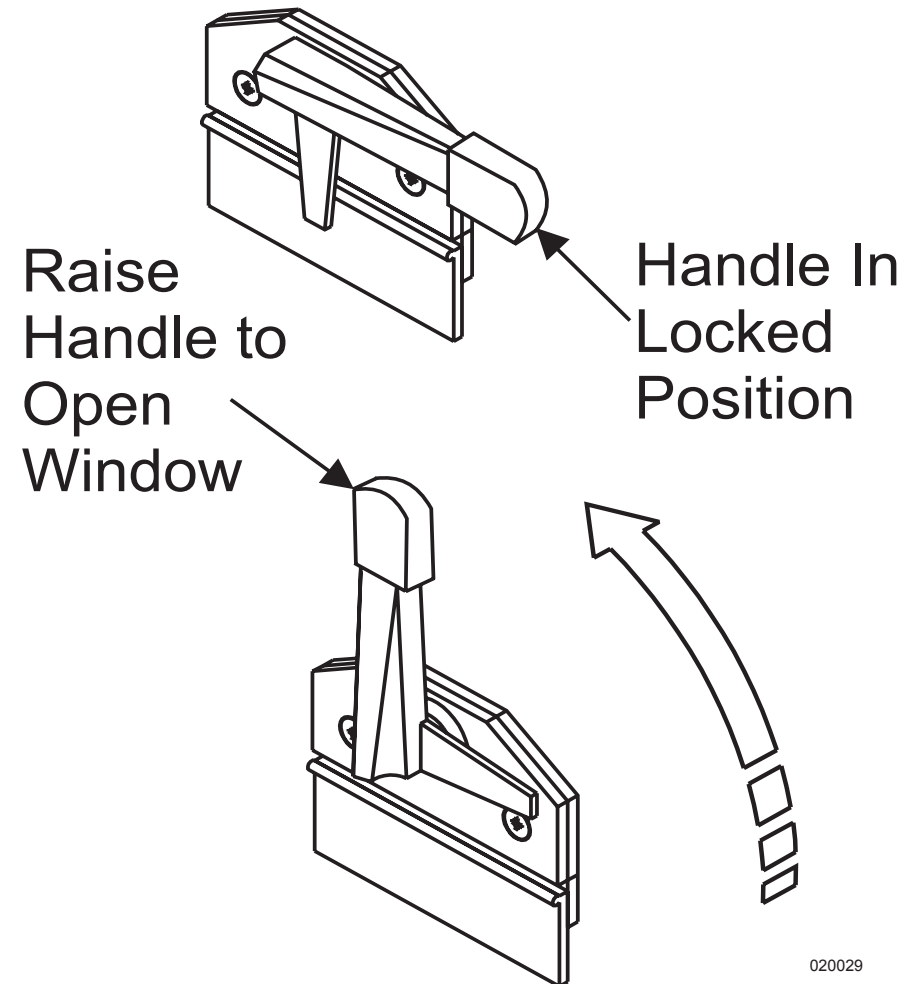


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ESCAPE (EGRESS) WINDOW

The Egress window, designated for use as an emergency exit, is identified inside of the motorhome by a red locking handle and Exit label. To open, lift the red handle and push outward. Pull closed and lower handles to lock the Egress window.

Hinges along the outside window top identify the Egress window on the motorhome exterior. The glass slider in the Egress window operates the same as all other windows in the motorhome. Occasionally open and close the Egress window to prevent the rubber seal from sticking.



Egress Window Handle

NOTES

Lined writing area for notes, consisting of two columns of horizontal lines.

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EXTERIOR CARE***Corrosion***

The most common cause of corrosion to the motorhome exterior is accumulation of road salts, grime and dirt. These elements, combined with moisture, may possibly cause early component failure. The undercarriage, around wheel openings and the radiator charge air cooler package require periodic cleaning to prevent component failure from corrosive materials collected on roadways. 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.

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 1800 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 to preserve the paint finish. The motorhome is painted with a “base coat, clear coat system.” Clear coat is a polyurethane-based material which brings out the shine and 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 abrasive cleansers or laundry detergents that will scratch the clear coat and leave a soap film. Use a soft cloth to wash the paint finish. Avoid brushes as they can scratch the surface and damage the paint. 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 build up is excessive, run water over a soft cotton cloth while gently wiping the surface in one direction. This will help 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 all detergent residue.

Drying

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

Waxing

It is recommended to wax the motorhome twice a year: spring and 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 and possibly damage the paint finish.

INFORMATION:

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. Most contain cleaning agents, lubricants and wax. The cleaning agents remove oxidation and leave a high gloss while the wax leaves a clear film that protects the finish.

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

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

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

To Obtain 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).
3. This formula can be mixed at a local BASF paint store.

NOTE:

All special paint schemes require contacting Monaco Coach Corporation directly for paint codes.

Tire Care

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.

Wheels - Coated Aluminum**Inside:**

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

WARNING:

DO NOT use a flammable solution to coat the inside of the rim. This can lead to an explosion during tire inflation or in subsequent operation of the motorhome.

Outside:

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

1. Frequently clean using high-pressure water.
2. Wash with a 100% cotton cloth and a mild soap solution (dish soap or carwash soap is recommended).
3. Rinse all remaining soap residue with high-pressure water and wipe the surface 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 heated wheels to cool before spraying with cold water.

CAUTION:

DO NOT use the following items on coated aluminum wheels:

- ◆ Polishes (unless marked “safe for clear coat” or Alcoa Aluminum Care).
- ◆ Synthetic cleaning pads, wire or abrasive brushes, steel wool or scouring pads (these can mar or scratch the finish).
- ◆ Strong detergents, alkaline or acidic cleaners, acids or lye-based chemical products or solvents.

CAUTION:

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

INFORMATION:

Instructions for cleaning, handling and minor scratch repair to the coating can be found in Accuride service bulletin 2.0037 Rev 1. Contact Accuride at 1-800-823-8332 for further information.

Bright Metal

All chrome and stainless steel should be washed and cleaned each time the motorhome is washed. Use only automotive approved non-abrasive cleaners and polishes on exterior bright work. **DO NOT** use rubbing compounds. **DO NOT** use abrasive cleaners or compounds to clean the mirrors.

NOTE:

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

EXTERIOR MAINTENANCE

When parked, the motorhome is exposed to extreme temperatures, humidity, ultraviolet rays, rain and other environmental conditions. While in operation the motorhome is subject to twisting and flexing caused by rough roads, potholes and winding mountain roads. Maintenance is necessary not only to keep the exterior looking nice, but also to keep it in proper working order.

Fiberglass

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

Roof Care & Seal Inspections

Wherever there is something affixed to the motorhome, such as the “belt line” or vent attached on the roof, there is a seal preventing water intrusion. There are many types of sealants and each has a specific use. While the belt line uses a silicone or urethane base sealant to prevent water intrusion, roof openings use an acrylic based sealant. Moisture intrusion can occur at any time for a number of reasons. Therefore regular sealant inspection and maintenance will greatly reduce the likelihood of moisture intrusion and costly repairs.

The motorhome is sealed at the factory. However, extreme weather conditions can shorten the life of the sealant while harsh road conditions can compromise sealant integrity. Maintaining sealant integrity is part of regular motorhome maintenance. Inspect all joints, seams and openings at least once every six months.

While sealant integrity may appear fine, a small void under the right conditions can quickly cause major damage. Make a full interior inspection for signs of moisture intrusion every two weeks if the motorhome is in storage.

CAUTION:

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

INSPECTING:

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

WARNING:

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

Sealant Replacement:

Carefully remove sealant that is cracking, flaking, bubbling, peeling or pulling away from the surface. The area underneath the removed sealant will need to be cleaned and dried before applying new sealant. Applying new sealant over a dirty or moisture laden surface will not allow proper adhesion. Sealant application may require simple hand tools and paper towels or rags for cleanup. Some sealants may be labeled hazardous or require chemicals for cleanup. Follow all of the manufacturer’s warnings and precautions when dealing with these substances.

WARNING:

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

Sealant Types

Acryl-R®:

Product Manufacturer Schnee-Moorehead Part # 5504. 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 will 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. Work the caulking gun in a manner that will 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 approximately a 1/2".

Acrylic Sealants:

Product Manufacturer Geocel Part # 2300

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

Black Urethane:

Product Manufacturer Bostik Part # 1100

Used for sealing windshields only. Black Urethane is available in a tube that applies similar to silicone. Clean up using solvents such as paint thinner. Gloves are required as this considered a hazardous material.

Silicone:

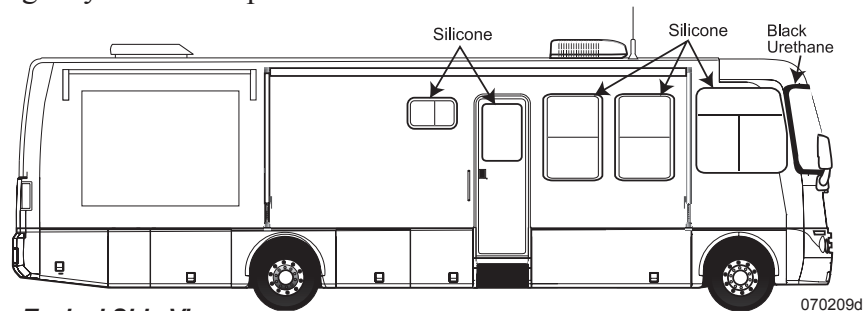
Product Manufacturer Dow Corning Part # 733

Product made in several colors. Primarily used on the sidewalls around windows, doors, handles, belt line 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. Wear a disposable latex

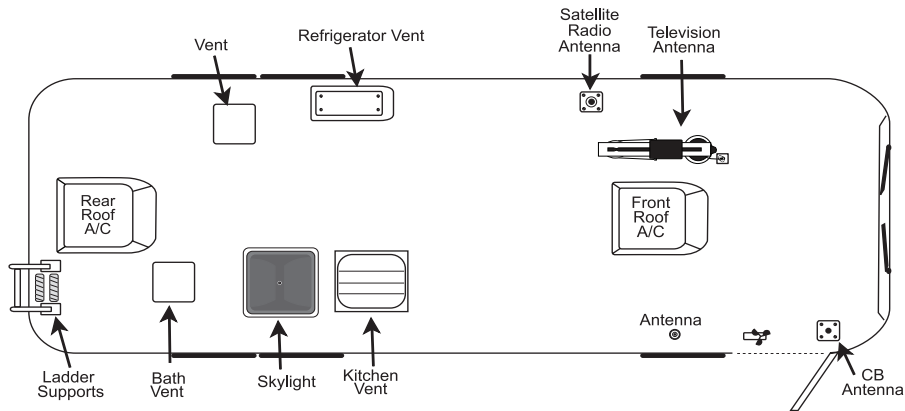
glove and use finger at a 45° angle on beaded surface to smooth out product. Keep rags or paper towels handy for clean up. Use care when applying silicone and plan ahead before applying. Look for obstacles that may impede application.

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 or bulkhead opening.



Typical Side View:
Side window seals require silicone. Windshield requires Black Urethane.



Typical Roof Layout:
Inspect each item for sealant integrity. Acryl-R is used as a roof sealant. Roof A/C's use a special foam gasket.

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:

DO NOT allow glass cleaners to come in contact with the plastic. Most glass cleaning products are volatile to plastics, and will cause it to become brittle or dull the finish.

TIP:

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

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.
- ◆ Some solvents may have an adverse reaction on a specific backing of the upholstery fabric and are not recommended.
- ◆ To prevent overall soiling, frequently vacuum or lightly brush to remove dust and grime.
- ◆ Clean spots using a mild water-free solvent or dry cleaning product.
- ◆ Clean only in a well ventilated area and avoid any product containing carbon tetrachloride or other toxic materials.
- ◆ 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 while in a well-ventilated area. Exercise proper caution by notifying any persons in the area. Keep away from any ignition source. Always wear protective gloves.

Oil-Base Paint:

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

CAUTION:

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

Latex Paint:

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

Crayon, Mustard or Ketchup:

Sponge with mild soap and water. For stubborn stains 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.

Blood or Plant Residue:

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

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

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

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

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

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.

“O” Vinyl & Optima Leather**Cleaning Suggestions:**

The following steps are to be performed in sequence. Each subsequent step is to be used if the previous step was not successful.

For General Cleaning:

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

For Oil-based Stains:

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

For Marker-type Stains:

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

Clean area with warm water after each process.

WARNING:

When using an alcohol solution, avoid open flames or hot lighting.

CAUTION:

It is not recommended to use any abrasive cleaner with this material.

NOTE:

When disinfecting is necessary, a 5:1 bleach and water solution is recommended

Ultra-Leather**Care Instructions:**

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

Removing ballpoint pen stains:

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

If the stain remains, use the following procedure:

1. Dilute household bleach (sodium hypochloride) with the same amount of water. (One part to one part solution.)
2. Apply the bleach/water solution to a piece of tissue (do not apply too much). Place the tissue on the stained surface and cover it with polyethylene film to prevent the solution from drying.
3. Periodically remove the tissues to check on the condition of the stain. When the stain is almost gone, remove the tissues completely. **DO NOT** leave on for more than one hour.
4. Wash the stain with sufficient amount of clean water.

CAUTION:

If there is residue of bleach, the polyurethane resin and back cloth will deteriorate.

Neutralize bleach by the following method:

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

Sodium hypochloride (household bleach) is the only chemical that will remove ballpoint pen stains. However, this chemical may cause polyurethane to yellow or the back cloth to deteriorate. It is recommended to remove ballpoint pen stains as early as possible with ethanol.

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

Leather

Spots & 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.

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 overall 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” - Press as following if necessary:

- ◆ 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.

Fabric Specifications Charts

Blackberry Ice			
COLOR/PATTERN	APPLICATION	CONTENT	CODE
Cortland/B Mushroom	Sofa, LR Lambrequin, BR Chair		
Daiquiri Regal	LR Pillow, FSD, LR Lambrequin	25% Viscose Chenille, 51% Polyester, 24% Cotton	S
Pong Biscuit	LR Pillow	34% Rayon Chenille, 9% Rayon, 31% Polyester, 6% Cotton	S
Kalkan Industrial	Bedspread, BR Lambrequin	75% Silk, 25% Polyester	S
Shantung-SH 66 Raisin-C/O 06 Scepter 1	BR Lamb., BR Pillow, Headboard, B'Spread Welt and Trim	57% Cotton 43% Rayon	Dry Clean
Supreme Satin Acorn	BR Pillow, Headboard Accent	69% Rayon 31% Acetate	Dry Clean
Oceanside Cabernet	Recliner, Optional Leather Furniture	Leather	Leather
Illusion Cabernet	Surround for optional Leather Furniture	Vinyl	Vinyl
Optima Leather Embossed Cabernet	Euro Recliner	100% Polyurethane facing Rayon backing	Optima Leather
Fairview Natural w/ Suede Back	Windshield Privacy Curtain	64% Cotton, 36% Polyester	*
Palomino	Dash Vinyl	Vinyl	Vinyl
Buffalino Palomino	Dr/Pass Chair Surround	100% Polyurathane Blend w/ 100% Rayon Backing	Ultraleather
O Vinyl Hammered Palomino	Dr/Pass Chair Insert	100% Vinyl facing 100% Polyester backing	O Vinyl
TB-1387 Egnog rope w/ 22" spread	Windshield Drape Tieback	90% Rayon, 8% Cotton, 2% Polyester	S
CD-1234 Caldwell	Decorative Cord Trim	90% Polyester, 10% Rayon	S
FRB-1234 Caldwell	Decorative Fringe	45% Polyester, 45% Acrylic, 10% Rayon	S

*Not available at time of printing.

Sand Fossil			
COLOR/PATTERN	APPLICATION	CONTENT	CODE
T810 Shakespeare Color 5 Beige	Sofa, LR Lamb., LR Pillow, BR Chair	42% Viscose, 32% Cotton, 26% Polyester	S
Romney Pearl	LR Pillows, FSD, LR Lambrequin	34% Rayon Chenille, 9% Rayon, 31% Polyester, 6% Cotton	S
Raphael Marble	Bedsread	100% Polyester	S
Roxana Marble	BR Pillow, BR Lambrequin, Headboard	100% Polyester	S
Raines Marble	BR Lambrequin, Bedsread Welt and Trim, BR Pillow, HB Accent	100% Polyester	S
Oceanside Moleskin	Recliner, Optional Leather Furniture	Leather	Leather
Optima Leather Embossed Moleskin	Euro Recliner	100% Polyurethane facing Rayon backing	Optima Leather
Illusion Moleskin	Surround for Optional Leather Furniture	Vinyl	Vinyl
Buffalino Surfside	Dr/Pass Ch. Surround	100% Polyurathane Blend w/ 100% Rayon Backing	Ultraleather
O Vinyl Hammered Milkweed	Dr/Pass Chair Insert	100% Vinyl facing 100% Polyester backing	O Vinyl
Milkweed	Dash Vinyl	Vinyl	Vinyl
Fairview Natural w/ Suede Back	Windshield Privacy Curtain	64% Cotton, 36% Polyester	*
TB-1387 Egnog rope w/ 22" spread	Windshield Drape Tieback	90% Rayon, 8% Cotton, 2% Polyester	S
50596 Salon 1/2" Cord	Decorative Cord Trim	21% Chenille, 28% Polypropylene, 23% Acetate, 24% Spun Polyester, 9% Rayon, 4% Acrylic, 1% Polyester	S
20549 Salon 2" Fringe	Decorative Fringe	33% Chenille, 22% Acetate, 19% Rayon, 25% Spun Polyester, 1% Polyester	S

*Not available at time of printing.

Malachite Green			
COLOR/PATTERN	APPLICATION	CONTENT	CODE
Vinton Olive	Sofa, LR Lambrequin, LR Pillow, BR Chair	42% Polyester, 22% Polypropylene, 14% Acrylic, 11% Rayon, 11% Cotton	W
Bachman Sage	FSD, LR Pillows, LR Lambrequin	100% Polyester	S
Beker Sage	BR Pillow, Headboard	100% Polyester	Dry Clean
Daydream 003 Coffee	Bedsread, BR Lambrequin, Headboard Accent	100% Cotton	S
Berkshire - Whimsical Spearmint	BR Pillows, BR Lam, Bedsread Welt and Trim	43% Polyester, 57% Rayon	S
Oceanside Sea Turtle	Recliner, Optional Leather Furniture	Leather	Leather
Optima Leather Embossed Sea Turtle	Euro Recliner	100% Polyurethane facing Rayon backing	Optima Leather
Illusion Sea Turtle	Surround for Optional Leather Furniture	Vinyl	Vinyl
Fairview Natural w/ Suede Back	Windshield Privacy Curtain	64% Cotton, 36% Polyester	*
Milkweed	Dash	Vinyl	Vinyl
Tumbleweed Milkweed	Dash Vinyl	Vinyl	Vinyl
Buffalino Milkweed	Dr/Pass Ch. Surround	100% Polyurathane Blend w/ 100% Rayon Backing	Ultraleather
O vinyl Hammered Milkweed	D/P Seat Insert	100% Vinyl facing 100% Polyester backing	O Vinyl
TB-1387 Egnog rope w/ 22" spread	Windshield Drape Tieback	90% Rayon, 8% Cotton, 2% Polyester	S
CD-754 Oak Hill Olive Cord	Decorative Cord - Bedsread, BR Pillow	43% Acrylic, 39% Olefin, 9% Polyester, 9% Rayon	S
FRB-754-A Oak Hill Olive Brush Fringe	Decorative Fringe - LR & BR Pillow	80% Acrylic, 15% Rayon, 5% Polyester	S

*Not available at time of printing.

Moonflower			
COLOR/PATTERN	APPLICATION	CONTENT	CODE
Woodlot GDV-3	Sofa	85% Rayon 15% Polyester	S
Recital Raven	FSD, LR Pillows	64% Viscose Chenille, 34% Polyester, 2% Cotton	S
Repaupo Raven	LR Lambrequin , LR Pillow, BR Chair	41% Viscose, 29% Polyester, 21% Viscose Chenille, 9% Cotton	S
Bolero Ebony	LR Lambrequin	42% Viscose, 32% Cotton, 26% Polyester	S
Cherrington Ebony	Bedsread, BR Lambrequin, HB Accent, BR Pillow	52% Linen, 48% Cotton	S
Shauna Bramble	Bedroom Lambrequin, BR Pillow, Bedsread Welt and Trim, HB	60% Cotton, 40% Polyester	Dry Clean
Oceanside Charcoal	Recliner, Optional Leather Furniture	Leather	Leather
Illusion Coal	Surround for Optional Leather Furniture	Vinyl	Vinyl
Optima Leather Embossed Coal	Euro Recliner	100% Polyurethane facing Rayon backing	Optima Leather
Buffalino Surfside	DR/Pass Chair Surround	100% Polyurathane Blend w/ 100% Rayon Backing	Ultraleather
O Vinyl Hammered Milkweed	DR/Pass Chair Inserts	100% Vinyl facing 100% Polyester backing	O Vinyl
Milkweed	Main Dash Color	Vinyl	Vinyl
Fairview Natural w/ Suede Back	Windshield Privacy Curtain	64% Cotton, 36% Polyester	*
TB-1387 Egnog rope w/ 22" spread	Windshield Drape Tieback	90% Rayon, 8% Cotton, 2% Polyester	S
CD-1220 Pyramid	Decorative Cord Trim	50% Acrylic, 40% Olefin, 6% Polyester, 4% Rayon	S
FRB-1220 Pyramid	Decorative Fringe	67% Acrylic, 21% Polyester, 6% Rayon, 6% Cotton	S

*Not available at time of printing.

FLOORS

Carpet Cleaning

Spot Removal Guide

Use the solution specified in order from 1-8 until stain is removed.	A	B	C	D	E	F	G	H	I
	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.

Cleaning Solutions:

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

NOTE:

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

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 will chip or break. 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, cleaning with a window cleaner such as *Windex*® should do the job. 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 will dull the surface. Grout sealers are available that protect the porous surfaces. If a sealer is used, follow the sealant manufacturer guideline 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 or buffed to maintain its finish.

NOTE:

Before using any solution to clean the tile, check the manufacturer's warning label to ensure 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:

Grout used is a two part concrete mix and can develop surface cracks over time. In motorhome application, due to the constant flexing of the flooring, this process may accelerate. If the grout requires cleaning, scrub with a plastic brush. **DO NOT** use steel wool as small particles may remain and produce unsightly stains.

Sealing the Tile:

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

CAUTION:

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



050250d

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.

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

WALL COVERINGS

Immediately remove solvent based or pigmented substances from wall coverings. **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.



Before applying a 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.

Specific Stain Removal Procedures:

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

For general cleaning, regularly wipe wood surfaces using a soft cloth lightly dampened with clear warm water, and thoroughly dry to prevent streaking. For stubborn stains, use a clean cloth dampened with a solution of mild non-alkaline soap (dishwashing liquid) and water and rinse. Dry thoroughly, buffing in the direction of the wood grain. Never use abrasive cleaners, scouring pads or powdered cleansers. Polishing products used on the solid wood surface depends on individual preference. Always follow product instructions.

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, but this may vary with wood type. The key to sanding is using the right sandpaper for the repair that is needed. Always sand with the grain.

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

Steel Wool:

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

Nail Holes and Small Cracks:

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

TIP:

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

Scratches and Nicks:

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

Fixing scratches in stained woodwork:

Light scratches will often disappear when carefully rubbed with furniture polish or paste wax. When scratches appear lighter than the surrounding dark-stained woodwork, it usually means either that the scratch 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 additional coats. Rub away excess stain with a dry rag. If the wood becomes too dark, use a rag moistened in mineral sprits to lighten the wood. Select a lighter color stain and continue.

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

COUNTERTOPS
Solid Surface**Routine Care:**

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

Preventing Heat Damage:

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

Other Important Tips:

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

NOTE:

DO NOT cut directly on the solid surface. When pouring boiling water into the Solid Surface sink, run the cold water faucet to dilute the excess heat.

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, wire brushes or abrasive sponge pads. These will 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 will develop water spots when not properly cleaned. Water spots are magnified on 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 interior air.
- ◆ Install a dehumidifier. Continuous use of a dehumidifier is effective in removing excess moisture from interior air. Using a dehumidifier is not a cure-all, however, it will reduce the amount of outside air needed for ventilation.
- ◆ Run the range vent fan when cooking and the bath vent fan (or open the bath vent) when bathing, to reduce water vapor. Avoid excessive boiling or use of steam producing hot water.
- ◆ **DO NOT** heat the motorhome interior with the range or oven. Heating with the range or oven increases the risk of toxic fumes and depletes oxygen. Open flames also add moisture to the interior air and increase condensation.
- ◆ In very cold weather, leave cabinet and closet doors partially open. Air flow will warm and ventilate the interior storage compartments and exterior walls to reduce or eliminate condensation and prevent the possibility of ice formations.

WINDOW TREATMENTS

Mini-Blinds

Dusting:

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

Vacuuuming:

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

Compressed Air or Hair Dryer

(non-heat setting):

Blow dust off each slat. Dust will be air-borne using this method so ventilate the 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 that does not contain abrasives. Rinse the blinds using a clean cloth and water to prevent water spots. Place a towel directly under the blinds to absorb water that may drip.

Ultrasonic Cleaning:

Professional ultrasonic cleaning may be preferred.

Day/Night Shades

Guidelines for care and maintenance of polyester blended 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.

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 and can leave a musty odor, discolor fabrics, stain surfaces and cause considerable damage to the motorhome.

What Does Mold Need to Grow?

Mold requires a food source to grow such as grease or soil. Synthetic fabrics, such as acetate, polyester, acrylic and nylon, are mildew resistant, but soil on the surface of these fabrics are susceptible to mold.

Temperate climate and moisture also help to cultivate mold growth. Moisture in the 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 should eliminate mold growth in the motorhome. Take the following steps to eliminate mold growth in the motorhome:

1. Carefully examine items for signs of mold before loading them in the motorhome. Potted plants (roots and soil), furnishings, clothing and linens, as well as many other household items, may contain mold.
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. If mold growth is severe, call on the services of a qualified professional cleaner.
7. If mold cannot be removed from an item, throw the item away.

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 the area one lives in or travels to, it is safe in stating there will be pests waiting. These pests are not only annoying; they can pose a 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 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.
- ◆ 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 Volt DC 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 you are unable to identify the type of insect, purchase sticky traps from the hardware store and place the tape where the insects have been seen. Once a sample is caught, seek assistance in identifying the insect to determine what will be required to remove the infestation.

Regularly **inspect** the exterior of the 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 will leave to seek food. Spraying pesticides will only kill the ants that are away from the colony. The colony must be destroyed to eliminate all ants. Keep ants away from the sewer hose by spraying the hose ends with a soap and water solution.

Fleas can be removed by properly treating pets with a veterinarian approved treatment and by thoroughly cleaning the 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 will be attracted to docking lights, or other 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. 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 is defined as storing the motorhome for a period of thirty days or less. Properly preparing the motorhome during periods of short term storage will make bringing the motorhome out of storage a much easier process. Winterize the plumbing system if the motorhome is stored in winter months, or if stored when temperatures are below 32° F.

Checklist - Short Term Storage:

- ◆ Retract the slide rooms. **DO NOT** store the motorhome with slide rooms extended.
- ◆ Shut off all appliances. Close the primary LP-Gas valve.
- ◆ Remove all articles from refrigerator/freezer and clean thoroughly.
- ◆ If equipped with residential refrigerator, drain icemaker and icemaker tray. See manufacturers manual for more details.
- ◆ Prop doors open to prevent mildew.
- ◆ Holding tanks should be drained and fresh water system winterized with potable antifreeze and winterize the plumbing system using air pressure.

- ◆ Retract and secure all awnings.
- ◆ Turn **OFF** the interior house power.
- ◆ Cancel the Automatic Generator Start program to prevent safety hazards such as unexpected exhaust fumes, power generation and a hot exhaust line.
- ◆ Batteries should be stored fully charged. Batteries stored in a discharged state will readily freeze.
- ◆ If possible, position the motorhome so 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 in the interior will help control moisture. Desiccate filter systems will 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 twice a month 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.
- ◆ Perform a full interior **inspection** for water leaks twice a month. Be sure to check behind all cabinet doors and drawers.

Long Term

Long term storage of the motorhome can be defined as leaving a motorhome unattended for a period of thirty days or more. A motorhome requires protection from the elements. When left out in the environment without proper storage or maintenance, a motorhome is vulnerable to moisture and oxidation.

NOTE:

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

If AC power is not available in storage area:

- ◆ Turn **OFF** all appliances.
- ◆ Turn **OFF** interior house power using the battery cut-off switch.
- ◆ If possible, situate the motorhome so the batteries remain accessible. This allows 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 to prevent safety hazards such as unexpected exhaust fumes, power generation and hot exhaust lines.
- ◆ Turn the main battery disconnects **OFF**.

- ◆ Use the Aladdin™ system to check battery voltage while the motorhome is in storage. If the motorhome is stored outside, solar panels may offset the parasitic loads. Preventative measures should be used if the voltage readings are low. Removing the motorhome from storage or moving the motorhome in case of an emergency will be a much easier process.

NOTE:

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

If AC power is available:

The main battery disconnect switches should remain **ON**. The inverter will charge both house and engine battery banks. A 30 Amp shore power service will be more than adequate.

CAUTION:

A 20 Amp service using light duty extension cords and the required adapters create serious voltage losses. 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!

Surfaces types to park and store the motorhome on:

- ◆ Avoid parking the motorhome on a grass or gravel surface to prevent moisture accumulation.
- ◆ Concrete pads seal the surface and allow better ventilation under the motorhome.
- ◆ Storage buildings with concrete floors, or heated storage facilities, greatly reduce the amount of moisture accumulation and protects the motorhome from moisture damage.

Outdoor Storage Area:

- ◆ The interior should be heated to help prevent mold and mildew growth. Moisture removing desiccant 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 will prevent potential damage in extreme cold.
- ◆ Ultraviolet radiation affects soft goods and rubber products such as privacy curtains, window shades and tires. These items should be protected. 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 under-inflation.
- ◆ Regularly wash the exterior and wax the motorhome twice a year 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 vents or other 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 fuel tank will minimize moisture condensing at the top of the tank. Diesel fuel is an organic material which will develop 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 during periods of storage. The bare metal machined surfaces of brake drums or rotors have only a light coating of dust from the brake lining friction material. The brake dust is the only thing protecting the bare metal surfaces from rusting. 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. Only occasional use keeps these surfaces from oxidizing. Rusty brake drum or rotor surfaces permeate the brake lining upon 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 will 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 all engines at least twice a month.

Electric Motors:

Electric motors in the motorhome should be occasionally operated to help lubricate and keep surfaces freely rotating. These items include the 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. (See *Winterizing - Section 6*)
- ◆ **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** - Cover windows by pulling blinds, closing shades or using a separate cover such as a sheet.
- ◆ **Holding Tank** - Drain and rinse. Close valves.

NOTE:

Add a small amount of antifreeze to waste holding tanks to keep valves and gaskets lubricated.

- ◆ **Drain Traps** - Pour RV antifreeze down all drains.
- ◆ **Refrigerator** - Clean and leave both doors propped open. Cover exterior panels and roof vents.
- ◆ **Batteries** - Add distilled water and recharge if needed. If necessary, disconnect the cables, remove the batteries and store them in a cool dry place. Check and recharge as needed.
- ◆ **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

Extensive freeze damage or other serious deterioration can occur if the motorhome is not properly winterized. If the motorhome is properly and carefully prepared for storage, removal from storage will not be difficult. The following checklist pertains to items or areas that should be inspected when it is time to take the motorhome out of storage and put back into operation. If you have any questions regarding storage or winterization, consult a qualified service technician.

- ◆ 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 LLA cells with distilled water only. Charge as necessary. **Inspect** the cable ends and terminals. They should be secure 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 indicate 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** around the engine and 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 being charged. 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 operational checks for steering, brakes, engine and transmission. Operate the motorhome slowly during these checks to allow sufficient circulation of fluids.
- ◆ If desired, have the dealer or repair center make necessary adjustments and/or correct defects.

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APPLIANCES - INTRODUCTION

This section covers operation and care of various appliances found in the motorhome: a refrigerator, cooktop range, microwave, roof air conditioner and optional appliances. These appliances operate on AC or DC current, LP-Gas or a combination of the three.

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.

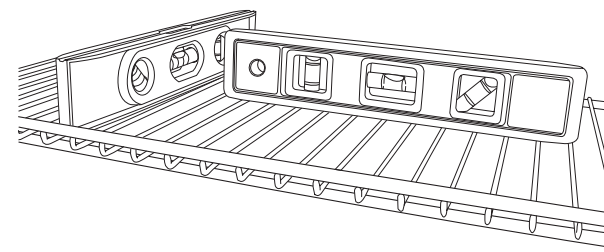
NOTE:

To reduce the possibility of food spoilage, keep the interior box temperature at or below 40° F. The refrigerator will consume 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. Place the torpedo levels on the bottom shelf of the refrigerator. The level should be within the circle by half a bubble. Generally, this is within comfortable living conditions.



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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 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).

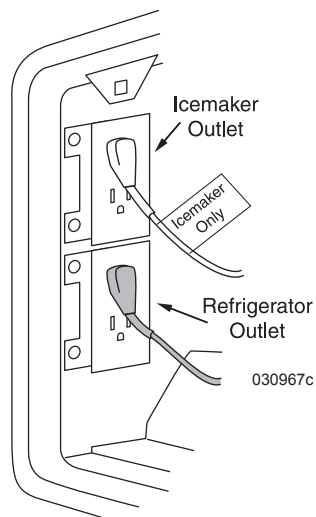


Figure A

◆ **Figure B:** The water valve must be open if the refrigerator is equipped with an icemaker.

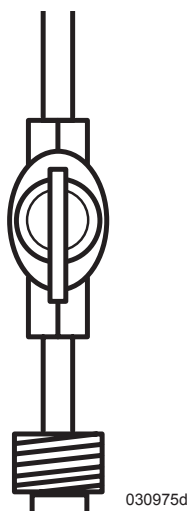


Figure B
Located behind the water service center with the water pump.

◆ **Figure C:** If controls do not light up, check the 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).

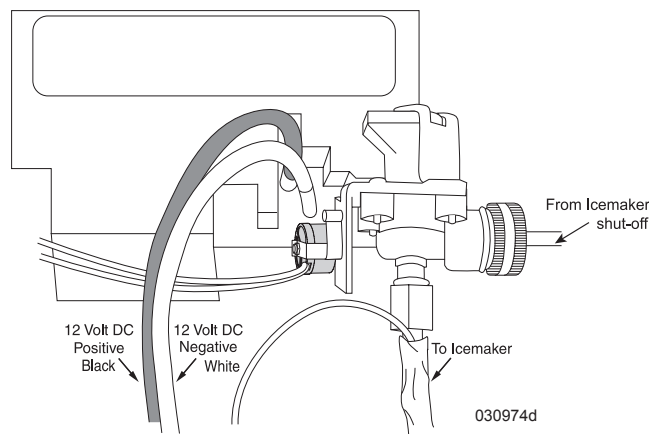
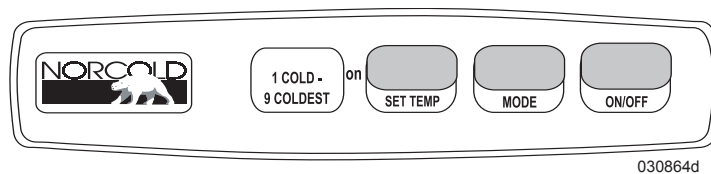


Figure B

Control Panel



- ◆ **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.

- Press the **MODE** button to select between **Automatic AU**, **AC** or **LP** operation.

◆ **SET TEMP Button** - Adjusts the temperature.

- To adjust, push and hold the **SET TEMP** 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 (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.

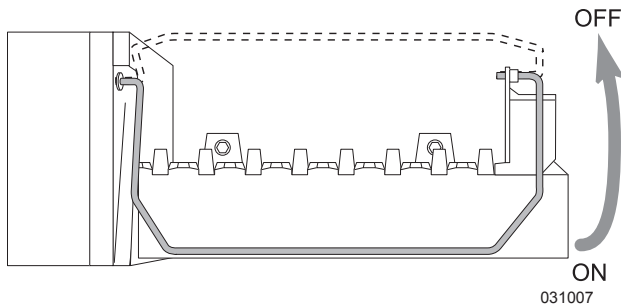
- ◆ Press the **MODE** button until **AU** displays.
- ◆ Press and hold the **SET TEMP** button until the desired temperature displays. Release button.
- ◆ In **AUTO** mode, **AU/AC** or **AU/LP** will alternate three times when a mode has changed.

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” “FL” 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. The icemaker supply valve is located in the basement compartment (accessed from the roadside) with the water pump.

- ◆ Pull the metal arm (bail) down to turn the icemaker **ON**.
- ◆ Push the arm up to turn the icemaker **OFF**.

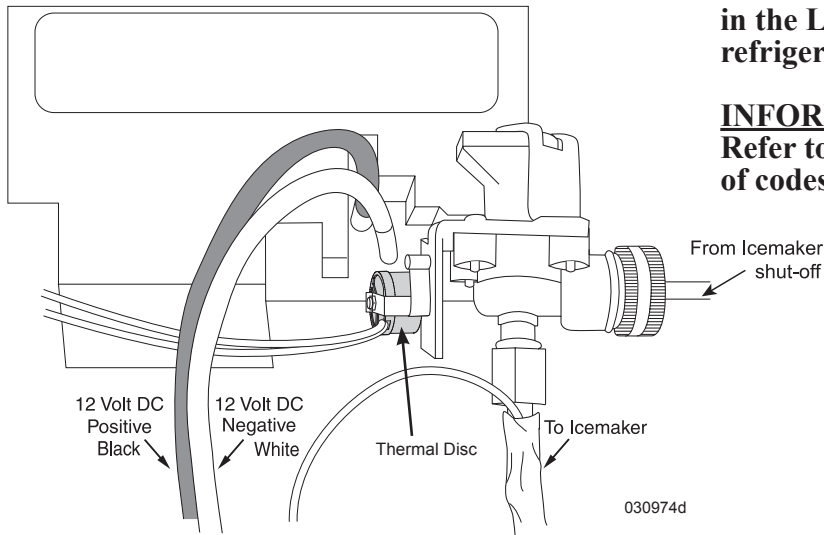


NOTE:

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 one or two trays of ice if the refrigerator has been in storage. Ice cubes may have contaminates. 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 temperature greater than 48° F (+/- 5°). The water line heater is only for the line from the solenoid to the icemaker.



Refrigerator Alarm

The refrigerator audible 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** will display, followed by **NO FL**, and the alarm will sound. Consult the OEM manual.
4. Door is open longer than two 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 the refrigerator off to silence the alarm.

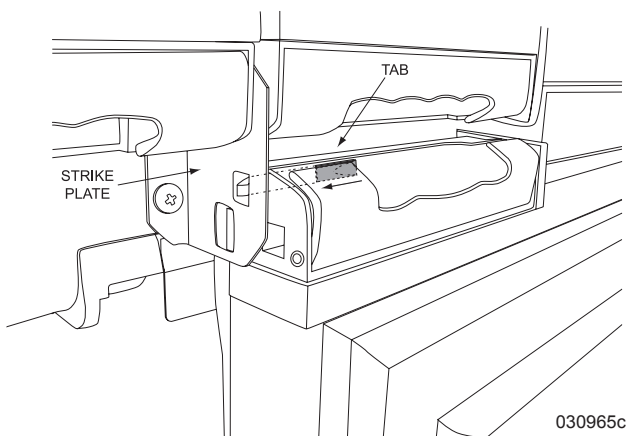
INFORMATION:

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

Cooling Unit Fans

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:

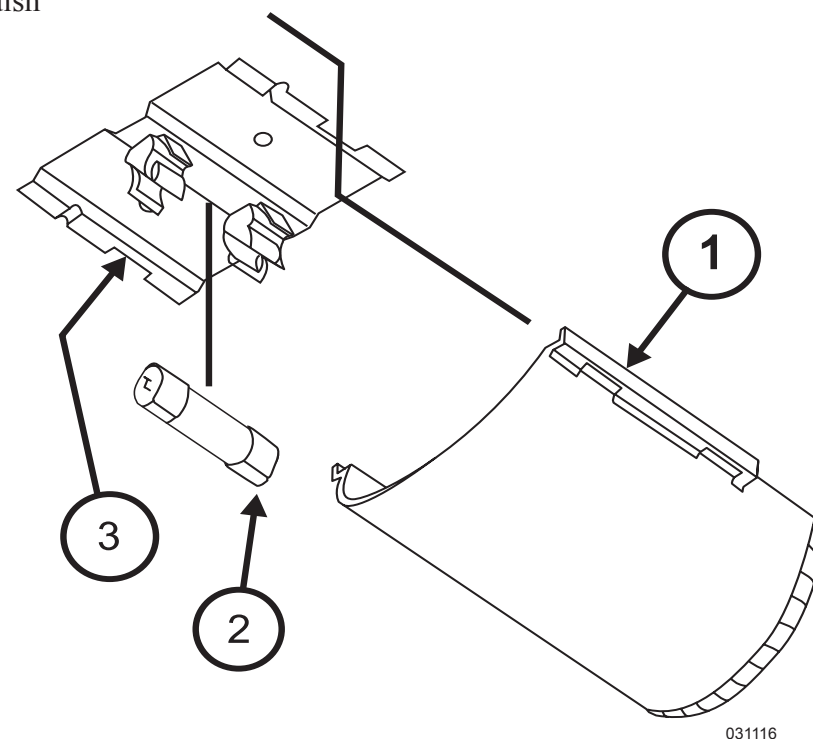
When defrosting, do not use a hot air blower. Permanent damage could result to plastic parts. DO NOT use a knife, ice pick or any other sharp instrument to remove ice from the freezer as they can puncture the system.

Interior Light

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

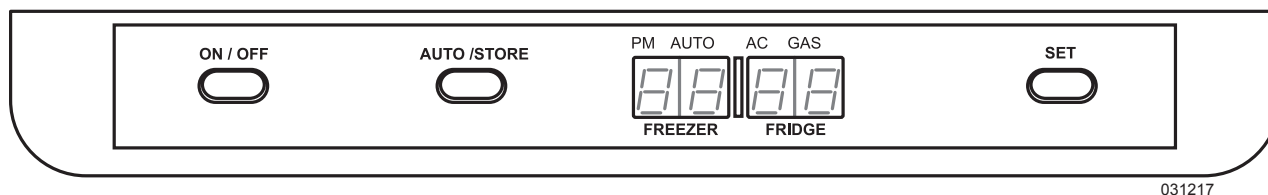
Bulb Replacement:

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



REFRIGERATOR (OPTIONAL)

Control Panel



- ◆ **ON/OFF Button** – Turns the refrigerator on or off.
- ◆ **AUTO/STORE Button** – Used to select energy mode between **AUTO AC**, **AUTO Gas**, or LP-Gas. The **AUTO/STORE** button is also used to save settings.
- ◆ **LED Display** – The screen displays temperature, the different modes of operation and status messages.

This includes:

- Temperature in frozen food compartment.
- Temperature in fresh food compartment.
- **AUTO AC** mode.
- **AUTO Gas** mode.
- LP-Gas mode.
- Temperature setting.
- Clock.
- Status and error messages.

- ◆ **SET Button** – Used to adjust the temperature range and to set the clock.

Operation

- ◆ Press the main power **ON/OFF** button. If the clock has to be set the LED display will show flashing horizontal bars “-- --”.

Setting the Clock:

1. Press the **SET** button until figures flash on the LED display.
2. Press the **SET** button to adjust time. PM is indicated by a dot under PM on the LED display.
3. Save settings by either pressing the **AUTO/STORE** button, or waiting 5 seconds (the settings will automatically save).

Setting the Temperature:

1. Press the **SET** button to the desired temperature setting (1 to 5, with 5 the coldest).
2. Save settings by either pressing the **AUTO/STORE** button or waiting 5 seconds (the settings will automatically store).

Selecting Mode of Operation:

The mode of operation ranges between **AUTO AC**, **AUTO Gas**, or LP-Gas.

1. To select automatic operation press the **AUTO/STORE** button until **AUTO** is displayed. In this mode the system will automatically select the most suitable energy source that is available, either AC or LP-Gas operation.

2. To select LP-Gas operation only, press the **AUTO/STORE** button until a dot is indicated above LP.

NOTE:

Current mode of operation and the energy source, AC or Gas, will be indicated by a dot on the LED display.

Automatic Defrost:

The refrigerator will automatically defrost the frozen and fresh food compartments every 24 hours.

Manual Defrost:

The refrigerator may be defrosted manually. A defrost cycle usually takes about 1 hour depending upon the amount of frost in the refrigerator.

1. Press the **ON/OFF** button to turn off the refrigerator.
2. Press and hold the **AUTO/STORE** button, then press the **ON/OFF** button. “dE Fr” will show in the LED display.

Status Message:

At times the LED display may show either a status message or error message. Refer to the manufacturer’s manual for the list of codes and their meanings.

Cleaning:

Cleaning the refrigerator is usually done after it is defrosted or put into storage. Use a lukewarm, weak soda solution to clean the interior of the refrigerator. Use only warm water to clean the finned evaporator, ice trays and shelves.

WARNING:

Never use strong chemicals or abrasives to clean the refrigerator. Damage to the protective surfaces will occur.

NOTE:

If the refrigerator will not be in operation for a period of weeks, it should be emptied, defrosted, cleaned and the doors left ajar. The ice trays should be dried and kept outside the refrigerator.

Tips:

- ◆ Cool items first, if possible, before putting them into the refrigerator.
- ◆ Keep the doors shut. Know what is needed 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.

Automatic Ice Dispenser

To Operate:

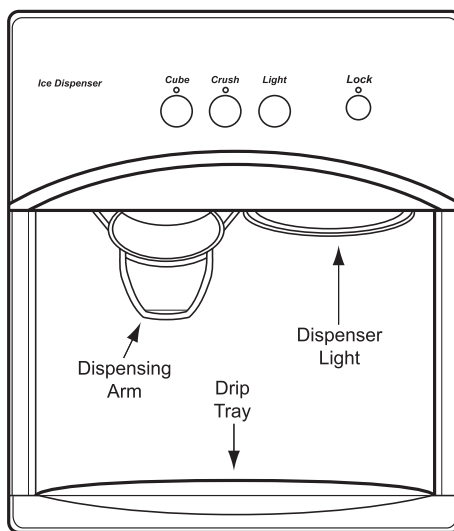
1. Press either the Cube or Crush button, and place a glass against the dispensing arm.
2. To stop dispensing ice, pull the glass away from the dispensing arm.

Drip Tray Feature:

The drip tray located beneath the dispenser catches small spills. The tray is removable and dishwasher safe.

NOTE:

The drip tray is not a drain. DO NOT pour water into the drip tray.



NOTE:
Optional Stainless Steel Models include a water dispenser.

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Lock Out Feature:

The ice dispensing system can be “locked out” to prevent unwanted use.

1. To Lock Out press lock button for 3 to 5 seconds until the red light comes on.
2. To Unlock press the lock button for 3 to 5 seconds until the red light goes out.

Dispenser Light:

The light illuminates the dispenser area and can be turned on and off by pressing the light button. The dispenser light will also turn on automatically when ice is dispensed.

INFORMATION:

For safety reasons, when opening the freezer door the ice dispensing and ice making system will automatically shut off. Closing the freezer door automatically resumes operation of ice dispensing and ice making operation.

Ice Maker

The ice maker works from 120 Volts AC only. The water valve supplying the refrigerator must be turned on, and the ice level bail arm must be in the down position. The valve is located behind the water service bay with the water pump

NOTE:

If the ice maker is in operation while the motorhome is in motion, water may spill out of the ice tray. Raise the bail arm to the full UP/OFF position about 1 ½ hours before departing. This will allow water in the ice tray to freeze. **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 ice maker assembly.

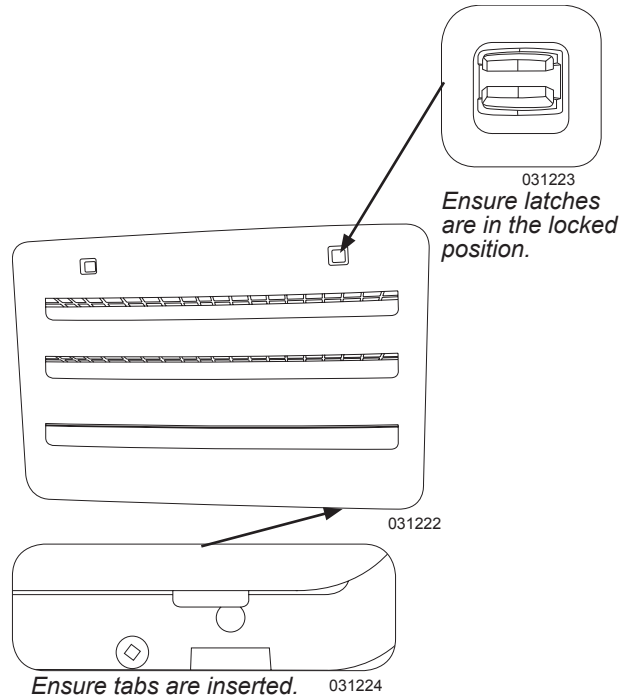
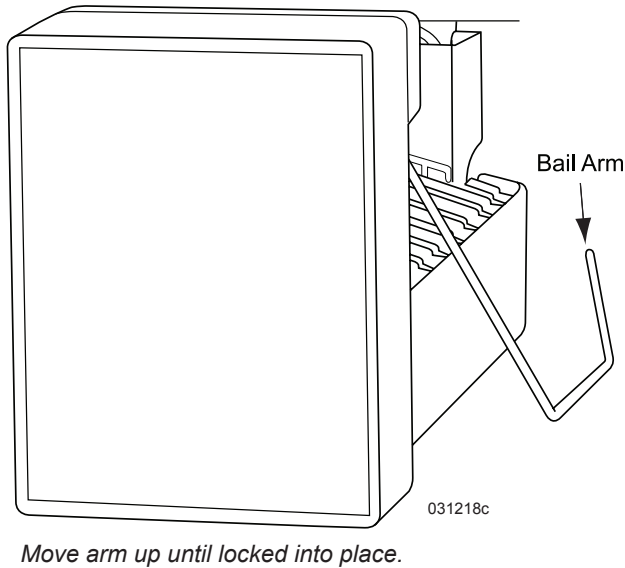
REFRIGERATOR MAINTENANCE Service

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.

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

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 from 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:

The ventilation fan cannot be manually turned off if it has started automatically from a heated cooktop. The microwave AC Breaker will need to be cycled.

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.

Setting the Clock

To Set the Clock:

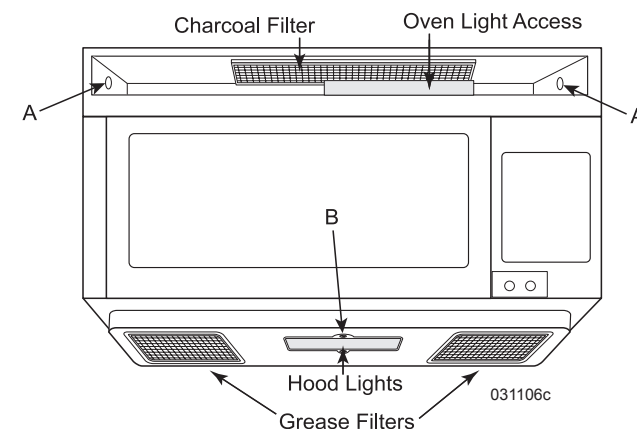
- ◆ Press the **STOP/CLEAR** button.
- ◆ Press the **CLOCK** button.
- ◆ Enter the time using the number buttons.
- ◆ Press the **CLOCK** button to start time.

NOTE:

The clock is a 12 hour clock only.

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 one lemon, several whole cloves and 8 oz. of water into a two cup bowl. Place in oven on high power; bring to a boil for several minutes. Let cool in the oven for several minutes.
- ◆ 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

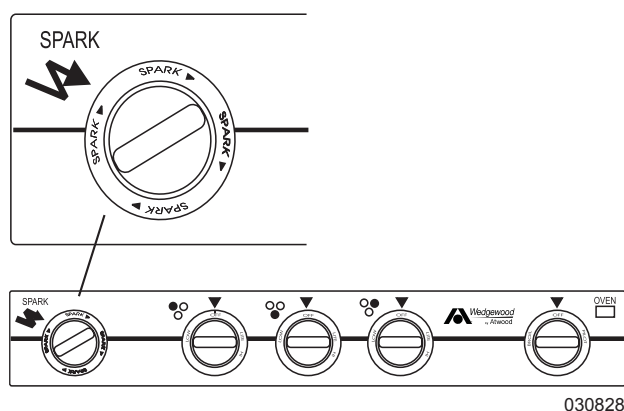
The cooktop uses LP-Gas as a fuel source. The cooktop burners use a piezo type igniter. The cooktop should be used for cooking purposes only and not as a heating source. When the burner valve is opened, the fuel flows through the valve into the mixture tube. The fuel passes by a hole or venturi in the 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.

The cooktop will operate when the following conditions are met:

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

Operating the Cooktop

- ◆ Turn the appropriate burner knob counterclockwise to **LITE**. **DO NOT** attempt to light more than one burner at a time.



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- ◆ Turn the **SPARK** knob located at the left hand side of the cooktop, 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.

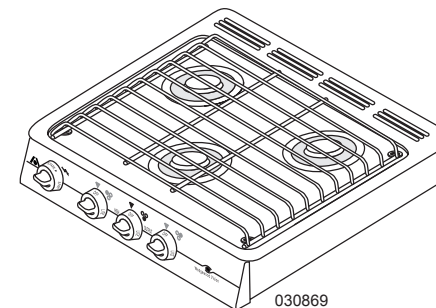
Operation Tips

1. A yellow flame or yellow tips indicate a rich fuel mixture or incorrect fuel/air ratio. This results in lowered BTU output and can cause carbon build up to occur, thus leaving a black color or carbon on the bottom of a pot or pan.
2. Flame appearance may change and BTU output will lower when operating the cooktop at an altitude above 5,000 feet. Allow extra cooking time.
3. **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.
4. 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 airflow of mixture tubes.
5. Pre-heat the oven for 10 minutes prior to use.

Burner Grate

Removing the Burner Grate and Cooktop Cover for cleaning:

- ◆ Place a towel on the counter next to the cooktop.
- ◆ Remove the burner grate by lifting out of rubber inserts of cooktop cover and place on towel.
- ◆ Remove the cooktop cover up by pushing cover toward rear of cooktop and lift cover at the front edge. Place cooktop on the towel.



Cleaning

- ◆ Clean all surfaces as soon as possible after boil-overs or spills.
- ◆ Use warm soapy water to clean the burner grates, 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 (such as lemon or tomato juice, or 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. Burns from the heated surface may occur or the cooktop porcelain can crack.

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 will be more difficult if spills bake on to 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.

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 that can dull the finish of the enamel. To avoid dulling the finish, wipe

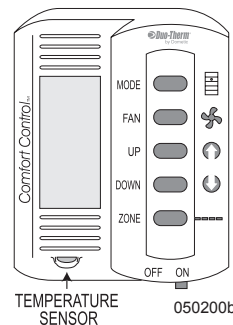
up the spill before it is baked-on. The surface is glass and must be given consideration when cleaning. Steel wool and coarse, gritty cleanser will scratch or mar the surface. Any gentle kitchen cleanser powder or grease cleaner will be suitable. For further information on care of the porcelain, call: “Hopes Cultured Marble Polish at **800-325-4026**.”

AUTOMATIC APPLIANCE SELECTOR

The Automatic Appliance Selector limits the possibility of shore power overload by allowing only the priority appliance to operate. The system uses automatic switching relays to control AC power to the washer-dryer (optional) and bedroom air conditioner. Only one appliance may be used at a time. When operating the washer-dryer, the bedroom roof air conditioner will not operate until the washer-dryer is turned off.

WALL THERMOSTAT

The Comfort Control thermostat, located on the hallway monitor panel, operates the HVAC (Heating, Ventilation and Air Conditioning) functions throughout the motorhome.



36'-40' Models:

The motorhome is divided into two operating zones: Living Room and Bedroom/Bathroom. Press the zone button to change zones. The selected zone number will blink at the bottom of the Comfort Control display.

- ◆ **Zone 1** = Living Room.
- ◆ **Zone 2** = Bedroom/Bathroom.

42' Models:

The motorhome is divided into three operating zones: Living Room, Hallway/Bathroom and Bedroom. Press the zone button to change zones. The selected zone number will blink at the bottom of the Comfort Control display.

- ◆ **Zone 1** = Living Room.
- ◆ **Zone 2** = Hallway/Bathroom.
- ◆ **Zone 3** = Bedroom.

NOTE:

The comfort control must be in Zone 1 or Zone 3 for the furnace to operate.

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.

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.

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 will not operate in Heat Pump mode with ambient temperatures of 30° F and below.

Operations

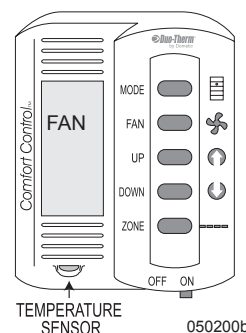
Roof air conditioner operation requirements:

- ◆ 120 Volts AC from either shore power or the generator.
- ◆ The interior house power is ON and the house batteries are charged.

Fan Operation:

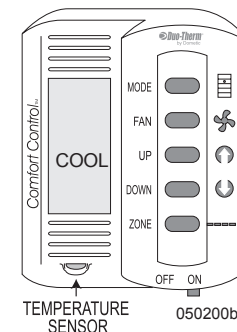
Circulate interior air by using the roof air conditioner blower. The fan speed controls the roof air conditioner blower speed in the following modes: Fan, Cool or Heat Pump.

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



Air Conditioner Operation:

- ◆ Press the **MODE** button repeatedly until **COOL** is displayed.
- ◆ Select desired zone (see “wall thermostat” for zone designations).
- ◆ Set desired fan speed by pressing the **FAN** button.
- ◆ Set desired cooling temperature by pressing the **UP** or **DOWN** buttons.

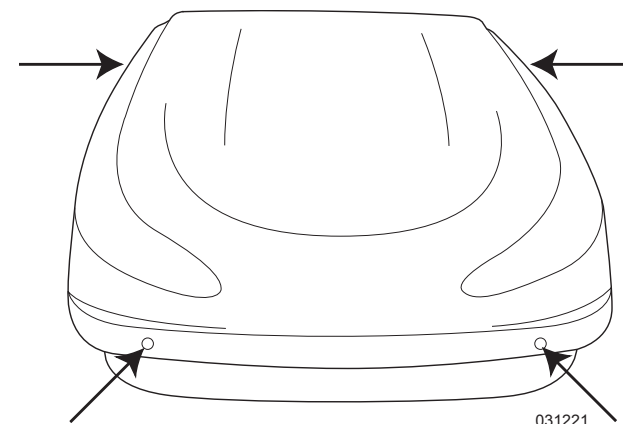


NOTE:

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

TIPS:

Whenever the roof is accessed, ensure that the AC cover screws are tight.



Ensure the A/C cover screws (location as illustrated by arrows) are tight when the roof is accessed.

Heat Pump Operation

Heat Pump mode offers heat by using the air conditioner as a heat source. The air conditioning principle is reversed, supplying heated air to the ceiling registers instead of refrigerated air. There are ambient temperature limitations in 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 Hydro-Hot will be selected as the auxiliary heat source and will begin operation. The Hydro-Hot will remain the primary heat source until ambient temperature rises above 42° F.

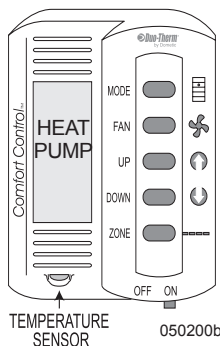
When ambient temperature is between 30 and 42° F, a defrost cycle is initiated approximately every 40 minutes of compressor operation. The blower motor will stop for five minutes and **Defrost** will be displayed. After the defrost cycle, the Heat Pump operation will resume.

NOTE:

If equipped with the optional Hydro-Hot, it needs to be on for the Aux Heat to function. Turn on the Hydro-Hot diesel burner or electric element. The exchanger blowers automatically begin operation in the Auxiliary Heat mode.

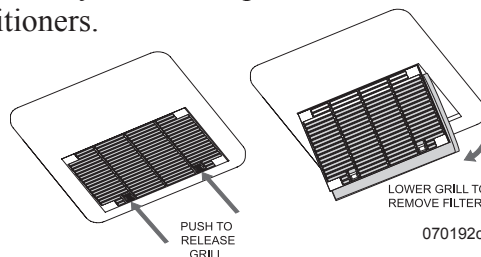
Heat Pump Operation:

- ◆ Turn **ON** the interior house power.
- ◆ 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.



Return Air Filters

Frequently clean the return air filters. The filters are located inside the motorhome behind the intake vent covers. To access the filters, firmly grasp the leading edge and push back on both tabs. Never run the air conditioner without the return air filters in place. Dust and other particles will plug the evaporator core and substantially reduce the performance of the air conditioners.



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 cover.

FURNACE

The furnace and its 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 may 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 LP-Gas primary valve. Liquid propane is a highly volatile, extremely dangerous gas. It can explode or ignite, which may result in property damage, injury or death. Propane is heavy and can float on the floor or hide in corners. Open all windows and doors. **DO NOT** touch electrical switches. 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 correctly diagnosed and repaired before resuming operation.

Operation

Operation Requirements:

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

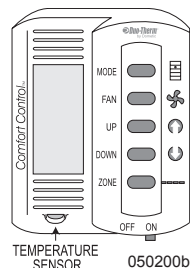
- ◆ The LP-Gas primary valve on the LP-Gas tank is open.
- ◆ The house batteries in the motorhome are fully charged.

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.

Operation:

- ◆ Slide the **ON/OFF** switch (on wall thermostat) to the **ON** position.
- ◆ The motorhome is equipped with two furnaces. Select Zone 1 or Zone 2 (36' - 40' models).
- ◆ Select Zone 1 or 3 on 42' models.
- ◆ 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 servicing 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.

NOTE:

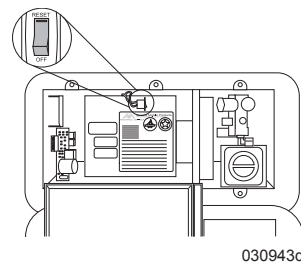
When washing the exterior of the motorhome, avoid a direct stream of water into the outside furnace vents. This can cause damage to the furnace.

Troubleshooting

If the furnace fails to light make sure the LP-Gas primary supply valve is 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: Hook-up to shore power, start the generator or start the main engine.

If the blower fails to operate after verifying the batteries are charged, use a flat-tip screwdriver to open the outside access door. Ensure the Reset switch is in the Reset position.



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WARNING:

If you smell gas and the blower motor is spinning, do not attempt additional furnace operation as this may result in an explosion, fire or personal injury. Contact a qualified technician.

WATER HEATER

The water heater uses two different methods to heat water: 120 Volt AC (supplied either by shore power or the on board generator) or LP-Gas. The 120 Volt AC function is most energy

efficient when operated from shore power. The burner for LP-Gas operation is controlled by an automatic ignition circuit board powered by 12 Volt DC. Two thermostats control water temperature, one for 120 Volt AC and the other for LP-Gas. Thermostat temperature is preset by the water heater manufacturer and not adjustable. For ease of winterization, the water heater is equipped with a tank drain plug and bypass valve.

NOTE:

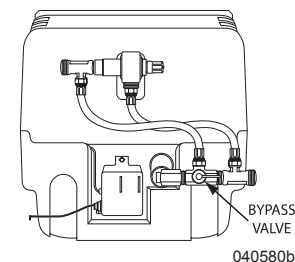
Refer to the Water Heater OEM manual for detailed instructions.

Before Using the Water Heater:

Use water to purge air from the water system and water heater and if necessary, purge FDA approved RV antifreeze from the system.

To Purge Air and Pressurize the System:

- ◆ Turn the water heater bypass valve (located at the back of the water heater) to Normal Flow. If necessary install drain plug.
- ◆ Fill the fresh water tank or hook to city water.
- ◆ Turn on the water pump or city water.
- ◆ One at a time, open the hot and cold valves of all faucets until a steady stream of clear water flows with no bubbles or pockets of air.
- ◆ Inspect the water heater and water system for leaks after the water system is purged of air.



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CAUTION:

After purging the water lines and water heater, small air pockets may be present. After the first heat cycle of the water heater, initially open hot water faucets slowly to minimize potential spattering of hot water.

WARNING:

IF YOU SMELL GAS extinguish all open flame and turn off the primary LP-Gas valve. DO NOT touch any electrical switches. They may cause a spark that can ignite. Open all windows and doors. Evacuate the motorhome. Propane is a heavy gas and will lie on the floor and hide in corners. Liquid propane is highly volatile, explosive and extremely dangerous. Explosion, fire, property damage, injury or death can result. Contact a qualified service center to repair LP-Gas leaks before resuming operation.

Water Heater Operation:

- ◆ Turn on interior house power.
- ◆ 120 Volt AC is supplied from shore power (preferred) or the generator.
- ◆ The house batteries are charged.
- ◆ Open the primary LP-Gas valve on the LP-Gas tank.

NOTE:

DO NOT operate the water heater without water. Damage to the thermostats and electric heating element can occur.

Heating Water with 120 Volt AC:

- ◆ Have either shore power (preferred) or the generator supplying AC voltage.
- ◆ Press the water heater switch.

NOTE:

It is not fuel efficient to use the generator to operate the water heater on 120 Volt AC.

Heating Water with LP-Gas:

- ◆ Make sure the LP-Gas is turned on.
- ◆ Press the LP-Gas water heater switch. The indicator lamp will glow steady. A flashing lamp will indicate lockout. Press the switch twice to reset the ignition cycle.

NOTE:

LP-Gas and 120 Volt AC functions can be on at the same time. This will speed up the 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.

NOTE:

Due to potential air in the LP-Gas lines, the water heater will attempt three ignition cycles. If the burner does not light after the third attempt, the LP-Gas function will lock-out. Reasons for lockout may be air in the gas system or burner tube obstructions caused by an insect or spider web.

High-Temperature Thermostat:

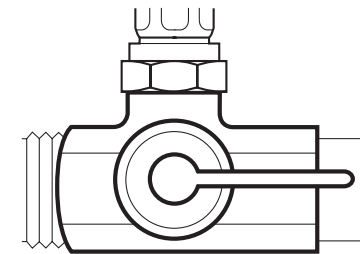
Separate thermostats are used for LP-Gas and AC electric. If a thermostat fails, a high-temperature safety limit switch will open.

CAUTION:

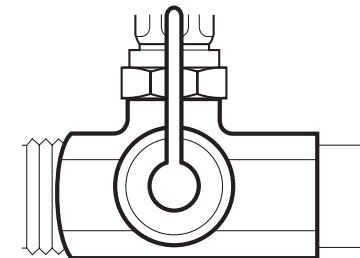
If the high-temperature safety limit should open, discontinue using the water heater. Have the water heater inspected by a qualified technician to determine the cause of the over temperature condition.

Water Heater Bypass Valve:

The bypass valve is located at the back of the water heater. Turning the valve to the bypass position prevents water from entering the water heater. Turn the valve to the bypass position when winterizing. For normal operation, turn bypass valve to normal flow.



Normal Flow



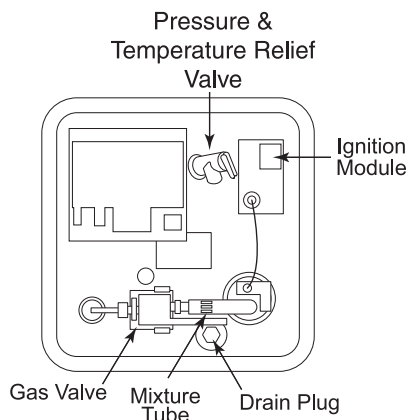
Bypass

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Water Heater Bypass Valve

Pressure & Temperature Relief Valve:

The water heater is equipped with a Pressure & Temperature (P & T) relief safety valve. The P & T valve is designed to open if water temperature in the tank exceeds 210° F (98.8° C) or internal pressure exceeds 150 psi. If water begins to weep from the valve, it may be due to a loss of the air pocket in the tank and not a defective valve. See re-establishing the air pocket.

**Re-establishing the Air Pocket:**

Water may weep from the P & T valve under normal operation. This is not necessarily a faulty valve but more likely caused by lack of an air pocket and water expansion. The water heater tank is designed with an internal air pocket. Eventually, the cyclic expansion of water will absorb the air pocket. When weeping from the valve occurs, the air pocket will need to be re-established utilizing the following procedure. If the valve continues to weep after establishing the air pocket, contact a qualified service center to evaluate the valve.

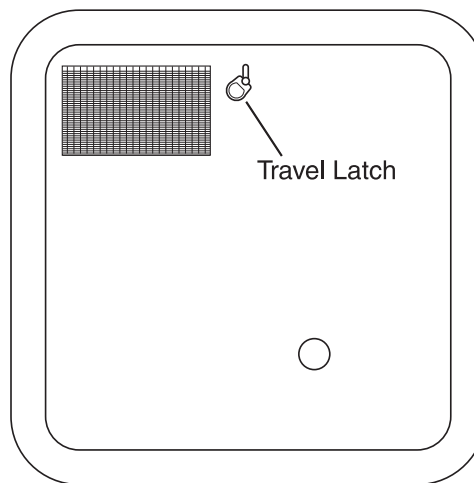
CAUTION:

Ensure the water heater is cool prior to establishing the air pocket.

1. Turn Off the water heater.
2. Turn Off the incoming water supply.
3. Open the hot water faucet closest to the water heater.
4. Open the handle of the P & T valve.
5. Allow excess water to drain from the water heater through the P & T valve. When draining is complete, close the P & T valve by allowing it to snap shut. Close the faucet and turn on the water supply.
6. Turn on the water heater.

Burner Compartment:

Periodically inspect the burner compartment and door screen for foreign material that can prevent the flow of combustion and ventilating air.



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CAUTION:

DO NOT block any opening.

Tips:

- ◆ Turn off the water heater when not in use to conserve energy.
- ◆ Shut the water off when not rinsing.
- ◆ 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. When the water heater element is in operation, it will use approximately 12 Amps at 120 Volts AC. Appliances that operate from 120 Volts AC may need to be operated in sequence to avoid tripping a breaker.

Draining & Storage:

Drain the water heater to prevent freeze damage if the motorhome is to be stored during the winter months.

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 valve to the bypass position.

NOTE:

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

Troubleshooting:

- ◆ Check the burner tube for obstructions if the water heater fails to light. Insects 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 interior house power 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.

NOTE:

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

Diesel Burner:

The Hydro-Hot will consume approximately ½ gallon of diesel fuel for each hour of continuous burner operation (about one or two gallons a day). 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 with the diesel burner, turn the Diesel switch to the **ON** position. The switch will illuminate when the Hydro-Hot is **ON**. The burner will have to operate for 20 to 30 minutes before maximum heat is available for interior heating or hot water.

Electric Heat Element:

The electric element works well when 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 two to three hours for the Hydro-Hot to reach operating temperature when operating from the electric element.

Interior Heat Exchangers:

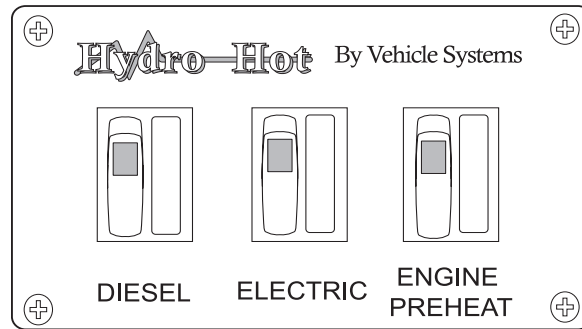
The heat exchangers are small radiators with 12 Volt DC blower motors. Current consumption is approximately ½ Amp per large heat exchanger. The small heat exchanger used in the private bath and the holding tank bay is ¼ Amp.

HYDRO-HOT (OPTIONAL)

The Hydro-Hot appliance is a water heater and furnace in one. 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 within the motorhome to provide interior heat. Potable water is heated by the Hydro-Hot for domestic use. The Hydro-Hot can also preheat the engine, making it easier to start on cold mornings.

NOTE:

The Hydro-Hot antifreeze is propylene glycol based boiler antifreeze. DO NOT mix antifreeze types.



WARNING:

DO NOT operate the diesel burner if the motorhome is located inside a building. Carbon Monoxide can accumulate and cause asphyxiation.

Engine Preheat (Optional):

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

To Use Engine Preheat:

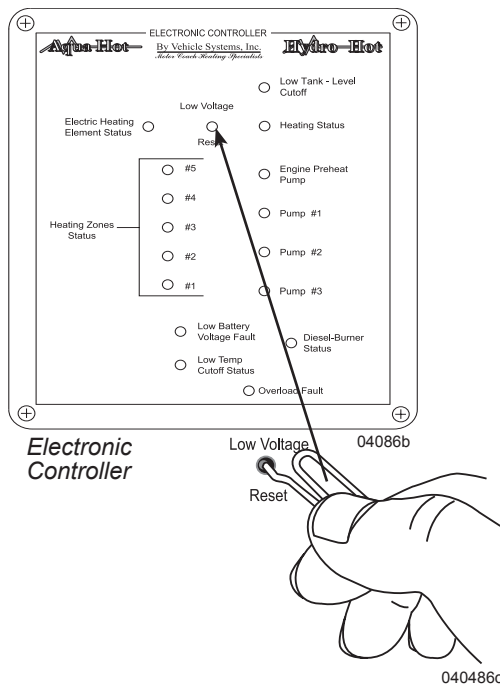
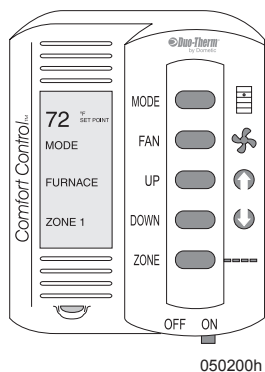
- ◆ Turn on the Diesel switch at the galley and allow the system to warm up.
- ◆ Turn on the Engine Preheat switch. The time required to preheat the engine varies with ambient temperature. Allow two or three hours of engine pre-heat time.

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.

To Heat the Interior While Traveling:

- ◆ Turn **ON** the interior house power.
- ◆ Set the Comfort Controls to Furnace.
- ◆ Select the desired Zone and Temperature.



- ◆ **Pump Status:** When a pump is operating, LED is green. A red LED indicates a short in the pump.
- ◆ **Low Battery Voltage Fault:** Red LED indicates that battery voltage is low. Hook to shore power or start the generator. The Hydro-Hot will not function until the Electronic Controller is reset by cycling the Diesel Burner switch off then back to on, or by inserting a paperclip or similar tool into the Low Voltage Reset hole. Press the Reset button.

Troubleshooting

An electronic display panel (Electronic Controller) is located next to the Hydro-Hot in the curbside bay. The display panel has LED fault indicators that are used for diagnostics. 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.

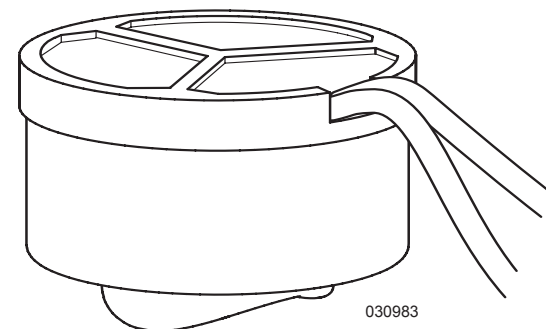
- ◆ **Low Tank Level Cutoff:** Heating function has shutdown due to low level of coolant in the Hydro-Hot. Check coolant level.

- ◆ **Electric Heating Element Status:** Green indicator means the Hydro-Hot is being heated by 120 Volts AC.
- ◆ **Low Voltage Reset:** The Low Battery Voltage Fault LED will illuminate. Reset the Controller by cycling the Diesel burner switch or inserting a paperclip into the hole. Press the reset button.
- ◆ **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. Normal LED is green. Red LED means a short has occurred in that zone.

Bay Thermostat

During cold weather, a thermostat in the holding tank compartment will turn on the exchanger in the storage bay to prevent freezing. The thermostat turns on at 45° F +/- 10°. Ensure the Hydro-Hot is **ON** to heat the bay.

NOTE:
Turn the Hydro-Hot ON when heating the bay.



Bay Thermostat

Care & Maintenance

Antifreeze:

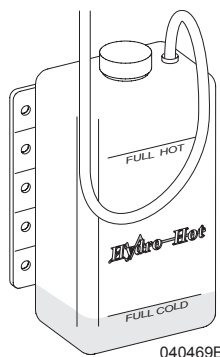
The antifreeze is a special “boiler type” propylene glycol base. The antifreeze has low silicate content with corrosion inhibitors and heat transfer compounds. This type of antifreeze provides freeze protection and excellent heat transfer for operating efficiency. The antifreeze is mixed to a 50/50 ratio with de-ionized water (water purified by reverse osmosis). **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. This antifreeze is affirmed GRAS (Generally Recognized as Safe by the EPA). 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 when the diesel burner has just shut off. The coolant level should be at the Full Hot level. 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:

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

CAUTION:

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.

Annual Tune Up:

The Hydro-Hot tune up consists of fuel nozzle and fuel filter replacement and a thorough cleaning of the combustion chamber. A 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:

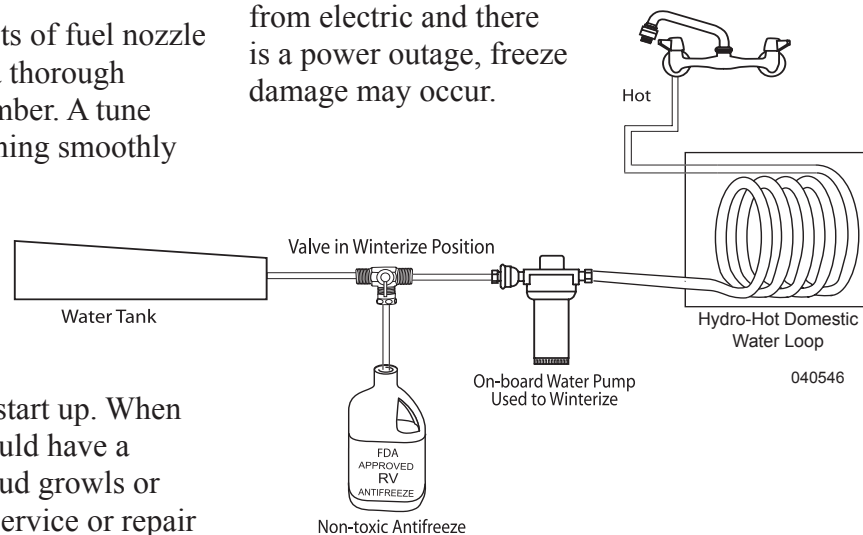
Disconnect all power supplies before cleaning or servicing.

Winterization:

The Hydro-Hot can remain on during the winter months or it must be winterized with FDA approved RV antifreeze to prevent freeze damage. The RV antifreeze must be pumped through the Hydro-Hot until the solution appears at the hot water side of a faucet.

The on-board water pump can be used (see illustration), or a separate pump can be hooked to the city water fitting. Refer to the OEM owner’s manual for complete winterizing instructions.

If the Hydro-Hot is not winterized, it must remain operational. If the system is operating from electric and there is a power outage, freeze damage may occur.



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 OEM Owner's manual for detailed winterizing instructions.

CAUTION:

If the motorhome is hooked to shore power during the winter months and the Hydro-Hot is operating on the electric element, a temporary power outage can allow the Hydro-Hot to freeze resulting in damage.

WARNING:

DO NOT operate the diesel burner when the motorhome is located inside a building. Carbon Monoxide can accumulate which can be fatal.

Fuel Filter

Hydro-Hot Fuel Filter:

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

Filter 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 filter when clogged (first indication of heat loss) or at the beginning of each heating season. Always carry an extra filter, as one tank of contaminated fuel can plug a fuel filter. Replacement filters must have a 10-micron rating.

Garber Filter: Model #R, 10 micron.

To Replace the Filter:

- ◆ Ensure the Hydro Hot Diesel switch at the galley is turned **OFF**.
- ◆ Spin the filter counterclockwise and remove from head. Remove old O-ring gasket on threaded stud.
- ◆ Install new O-ring supplied with filter. Ensure the gasket is seated in the groove around the filter canister.
- ◆ Apply clean lubricating oil to the new filter gasket and washer.
- ◆ Spin filter onto head until filter makes contact then tighten $\frac{3}{4}$ of a turn.
- ◆ 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.

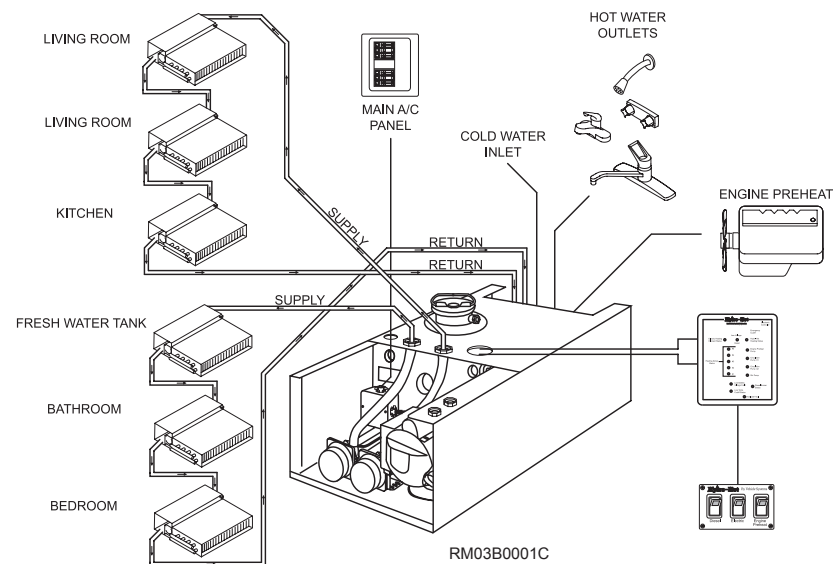


Replacement filter

Hydro-Hot Overview

General Layout:

An understanding of the general layout of the Hydro-Hot system will help in operating and troubleshooting the system.

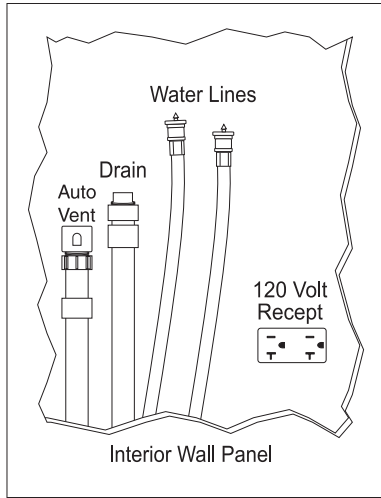


WASHER-DRYER PREPARED

The washer-dryer "prep" package includes the following items:

1. Color coded water supply lines: red for hot and blue for cold.
2. A 1½" waste water drain line with threaded cap, P-trap, and an automatic vent cap. This will drain the waste water into the grey water holding tank.
3. A 120 AC Volt receptacle located in the compartment.

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. 040495c

If a washer-dryer is to be installed at a later date, follow all the manufacturer installation instructions. Listed here are further instructions which should be adhered to for safe and reliable operation:

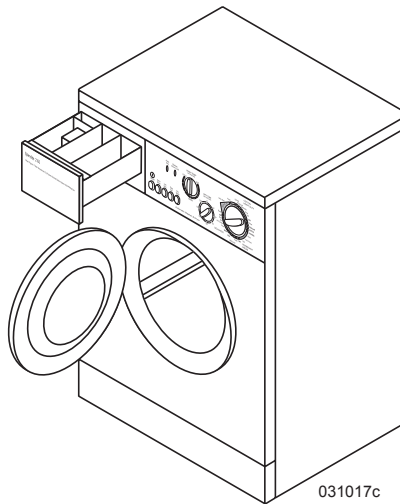
- ◆ **DO NOT** connect the clothes dryer exhaust duct to any other duct, vent or chimney.
- ◆ **DO NOT** terminate the exhaust duct beneath the motorhome.
- ◆ Use proper length fasteners when attaching exhaust vent to exterior sidewall. Stainless steel fasteners are best suited for this as they will 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, for sufficient circulation of air.

CAUTION:
It is highly recommended to hook the motorhome to shore services when using the washing machine due to limited fresh water supply and limited grey tank capacity. The washer may drain into the black tank on some floor plans.

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.



- ◆ Washer-dryer operates on 120 Volt AC from shore power or generator.
- ◆ Washer-dryer uses approximately 12 to 20 gallons of water per wash cycle.

INFORMATION:
Refer to the washer-dryer manufacturer's manual in the owner's information file 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.

Test Procedure

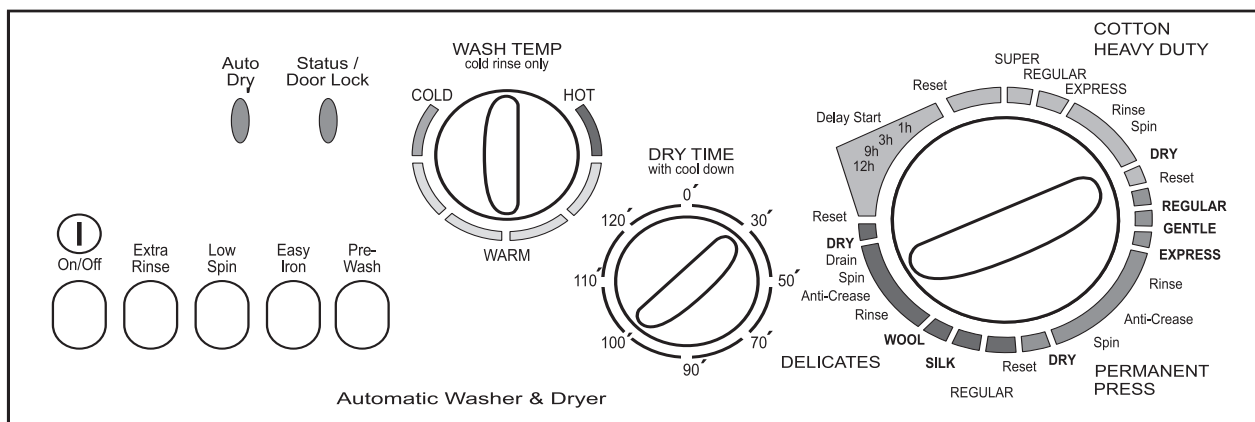
Before using the washer for the first time, after winter storage or a long period of non-use, conduct a simple test procedure to verify that all the hardware and electronic components are functioning. Wipe the interior and exterior of the washer-dryer with a damp cloth to remove dust that has accumulated.

NOTE:

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

Test Procedure Requirements:

- ◆ Ensure water lines are secure and water valves are open.
- ◆ Hook to city water or turn on the water pump.
- ◆ Hook to shore power or start the generator.



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To Conduct the Test Procedure:

1. Set selector knob to **Reset**.
2. Set **Dry Timer** knob to 30 minutes. Push the **ON/OFF** button to **ON**. Wait five 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 flow into washer and the drum should rotate both directions.
4. Set selector knob to **Reset**. Wait five seconds.
5. Set selector knob to **Spin**. Water should drain and drum rotation should increase.
6. Set selector knob to **Reset**. Wait five seconds.
7. Set selector knob to **Dry**. Dryer fan should begin and the drum should rotate both directions.
8. Set selector knob to **Reset**. Wait five seconds.

9. Set **Dry Time** knob to zero. The **Auto Dry** light should go off.
10. The door will unlock in two 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.

WARNING:

DO NOT wash or dry articles that have previously been cleaned, washed, soaked or spotted with gasoline, dry cleaning solvents or other flammable or vaporous substances that could ignite or explode. DO NOT add gasoline, dry cleaning solvents or other flammable or explosive substances to the wash water.

CAUTION:

DO NOT use heat to dry articles containing foam rubber or similar textured, 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 two tablespoons).
- ◆ Load wash tray with detergent.
- ◆ Load the laundry 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.
- ◆ Turn the power **ON**.
- ◆ After cycle is complete, wait two minutes for the door lock to release before attempting to open the door.

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 will protect 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.

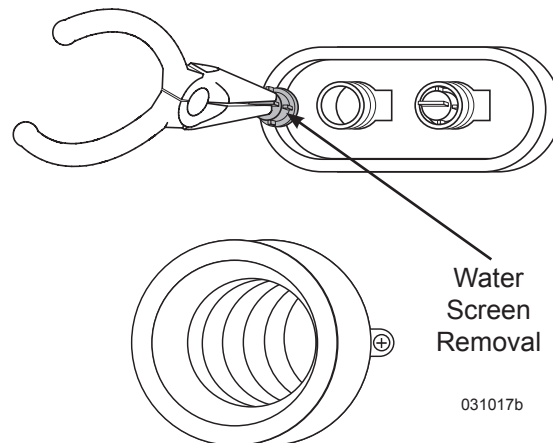
NOTE:

Should the washer-dryer need removal for service, care should be taken as the washer-dryer weighs approximately 170 lbs. Proper accommodations should be made to avoid risk of injury or damage to the cabinetry.

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 will clear 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 will unlock in two minutes or less. Open door and pour in $\frac{1}{4}$ gallon of RV antifreeze.
5. Set selector knob to Spin. The pump will prime with antifreeze. Set selector knob to Reset and turn the power off.



CENTRAL VACUUM (OPTIONAL) Operation

- ◆ Start generator or plug into shore power.
- ◆ Lift lid on wall receptacle to start vacuum. Insert the hose in the receptacle and release lid.
- ◆ Connect desired attachment on hose and start vacuuming.

NOTE:

Consult OEM manual for detailed operation and maintenance.

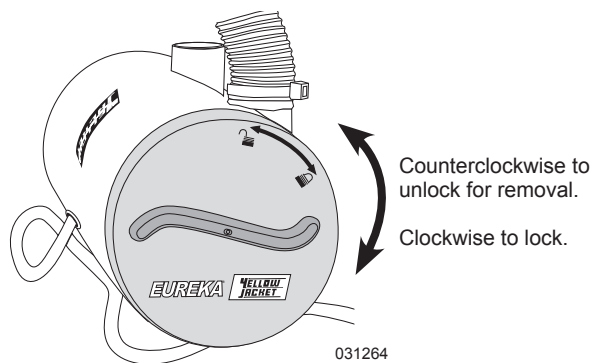
Maintenance

Vacuum has a thermal protector built into the motor to prevent overheating. If motor will not operate, it will automatically reset in about $\frac{1}{2}$ hour. If motor brushes or bearings are worn out, the circuit protector will trip off again after a short period of time. If this happens, contact a qualified service representative.

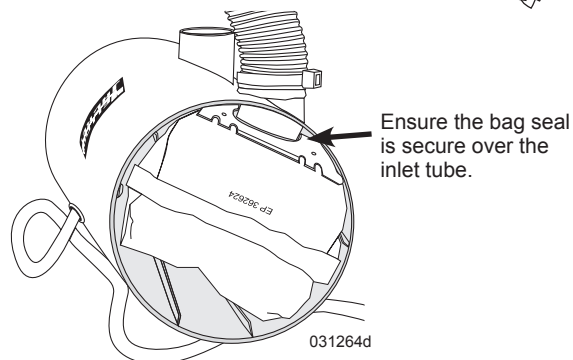
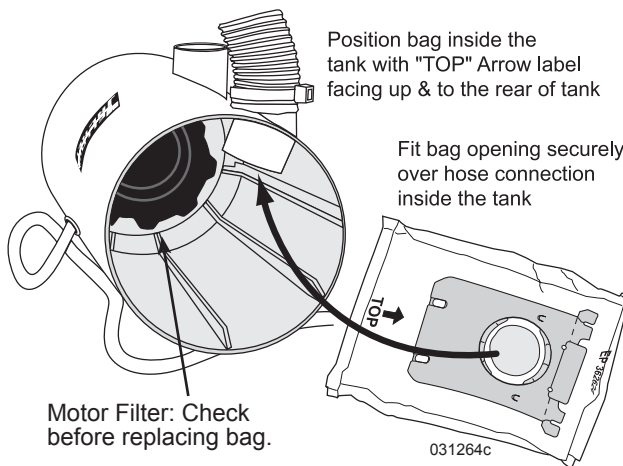
Changing the Bag:

To keep your vacuum at top efficiency, change the filter bag at regular intervals. To maintain cleanability, replace filter bag when it is about ¾ full.

1. Unplug the power unit from grounded outlet.
2. Rotate the bag cover counterclockwise and remove cover.
3. With a finger on each side of the inlet, slide the bag off the inlet tube.
4. Pull the center cardboard tab to automatically seal the bag and prevent dust from leaking out.
5. Remove the bag from the vacuum and discard. **DO NOT** reuse.
6. Check motor filter in back of canister.
7. Unfold the new “OX” bag and insert into the vacuum so the center cardboard seal tab is toward bag cover. The top arrow should point to the bag cover.
8. With a finger on each of the cardboard tabs, slide the bag on the inlet tube.



9. Line up the mark on the bag cover with the unlock symbol and rotate clockwise to lock symbol.



Replacing & Cleaning the Motor Filter:

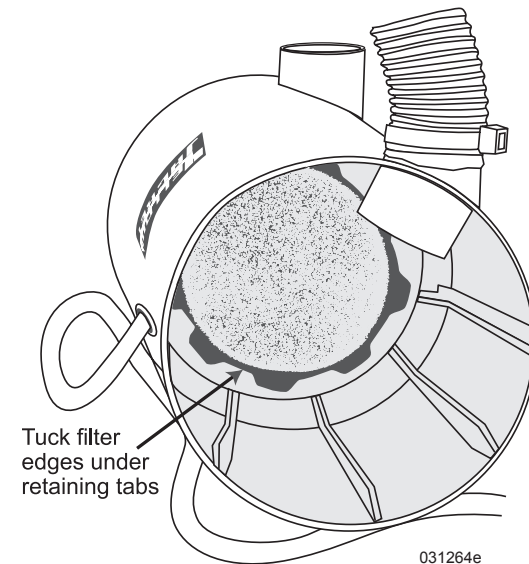
1. Inspect during each bag change. The filter should be cleaned every fifth bag replacement or when excessively dry.
2. Remove dust bag as previously instructed.
3. Locate the motor filter in the back of the vacuum and lift out.
4. Clean by rinsing under warm water and let air dry if heavily soiled. If the filter is torn or obstructed it must be replaced.

5. Reinstall dry motor filter before use, making sure filter is tucked under retaining tabs.
6. Reinstall bag as previously instructed.

WARNING:

To reduce the risk of fire, electric shock or injury:

- ◆ Unplug and disconnect power before servicing.
- ◆ Avoid wet surfaces.
- ◆ Use only manufacturer’s recommended attachments.
- ◆ **DO NOT** use without dust bag and/or filters in place.
- ◆ **DO NOT** pick up anything that is burning or smoking, such as cigarettes, matches, or hot ashes.
- ◆ Use extra care when cleaning on stairs.
- ◆ **DO NOT** use to pick up flammable or combustible liquids such as gasoline or use in areas where they may be present.



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EQUIPMENT - INTRODUCTION

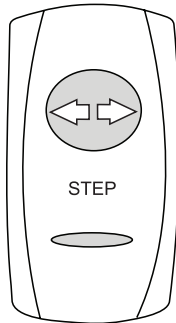
This section covers the basic operation and care of equipment found in the motorhome, most of which are provided for entertainment and comfort. More detailed information about specific equipment may be found in that particular manufacturer's manual. Optional equipment will also be discussed in this section 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 exterior electric entry step features retractable steps, automatic retraction with the ignition key in the RUN position and a last out feature. The bar light indicates the circuit is active when illuminated.



Located on dash.

NOTE:

When dry camping it is important to note that when the switch is illuminated, all step circuits are active and drawing current from the chassis battery.

Operating the Entry Step:

1. With the entry door open, turn the step switch on.

2. Close the door. The step should retract and lock in the **IN** position.
3. Open the door. The step should extend and lock in the **OUT** position. The step will retract when the door is closed.
4. When the switch is turned off, the step should remain in the extended position. Close the door and turn on the ignition switch. The step will retract for travel.
5. With the power switch off, the step extended, the entry door closed and the ignition turned on, the ignition override system will engage to automatically retract the step.
6. Turn the ignition off and open the door. The step will extend and lock in the **OUT** position. This is the "last out" feature. When the ignition is on the step will always activate with door movement, regardless of the power switch position.

CAUTION:

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

CAUTION:

Ensure the exterior step is fully extended before exiting or entering the motorhome.

If the step fails to operate:

- ◆ Verify that the step switch is ON.
- ◆ A magnetic door jam switch is used to control step operation. Use a separate magnet to apply a "trigger" to the door jam switch. Rotate test magnet to align polarity field.

WARNING:

If the motorhome is driven with the step in the extended position there is the possibility of causing major damage to both the step and the motorhome.

CAUTION:

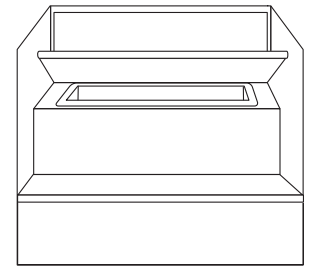
If the Step Out warning indicator lamp illuminates while the motorhome is in motion, the entry step is either partially or fully extended. Repair the step as soon as possible to avoid serious damage to the entry step or motorhome.

Stepwell

The interior stepwell features a cover, step lighting and a storage compartment in the upper step. This compartment is ideal for storing items such as gloves, tire pressure gauge, flashlights or outside slippers.

Cover:

An electrically operated stepwell cover will extend and retract using the switch on the dash console.



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To operate the Stepwell Cover:

1. Turn **ON** the Battery Cut-Off switch.
2. Press and hold the Step cover switch to the desired direction. Release the switch to stop movement.

CAUTION:

When operating the stepwell cover, make 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.



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Located on center dash console.

Latch Adjustments**Adjusting the Entry Door Latch:**

- ◆ Determine which bolt needs adjustment.
- ◆ Observe the latch and strike bolt alignment while slowly closing the entry door. **DO NOT** attempt to latch if alignment is off. If the alignment is correct, allow the latch to catch in the first (primary) position only.
- ◆ The latch should move to the second position with just slight pressure applied to the entry door. Upper and lower latches should be evenly timed. Press on the entry door to see if there is further movement of the door.
- ◆ The handle should operate with little effort to open the entry door. Excess amounts of pressure indicate the bolts are set too far back.
- ◆ Use an Allen Wrench to loosen the movable strike bolt. Make all adjustments in small increments. Tighten the bolt firmly after making adjustments. The bolts should have slight up and down movement for vibration control in travel.
- ◆ Test the operation of the dead bolt lock to ensure proper function.
- ◆ Apply silicone weekly to the entry door rubber gaskets to prevent squeaking while the motorhome is traveling. Use a one inch sponge paint brush, sprayed with silicone, for easy application.

CAUTION:

When operating the entry door ensure the dead bolt latch is fully in the unlock position prior to closing the entry door. Failure to do so can result in damage to the dead bolt and/or entry door.

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:

- ◆ Loosen the chrome bolts on the hinge side of the screen door: Two on each of the three hinges (six hinges 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 to allow clear viewing through the entry door glass while traveling.
- ◆ Rotate the clips to remove the top half of the screen door. Store for travel.

Assist (Grab) Handle

The assist handle is made of clear acrylic. Though normally UV resistant, the assist handle can be weakened or damaged by using improper cleaning agents which cause small stress fractures that can eventually lead to failure of the assist handle. Approved cleaning solutions are mild soap and water solution only. Cleaning agents containing alcohol, such as commonly found in window cleaners, or cleaning agents containing petroleum distillates will damage the assist handle. **DO NOT** use waxes, plastic or upholstery conditioners as these substances can also cause damage.

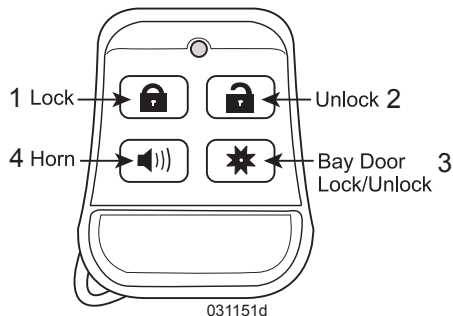
ENTRY DOOR

The door uses two separate 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 help maintain entry door performance.

KEYLESS ENTRY Operation

Key Fob:

1. Locks entry door.
2. Unlocks entry door.
3. Locks and unlocks all compartment doors.
4. Horn.

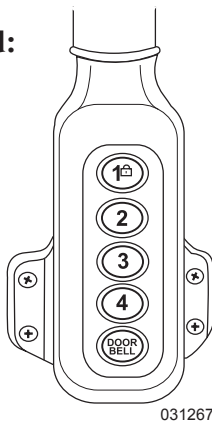


NOTE:

Key fob operation distance is approximately within 50 ft. of the motorhome. If the door locking mechanism is not audible, marker lights will flash when the doors are unlocked or locked.

Locking Doors with Keypad:

Regardless of the configuration of the system, locking operation (lock all doors) is accomplished by pressing and holding down the first button (1) one to two seconds. An access code is not needed to lock the doors.



Keyless Entry:
Located on entry door grab handle.

Unlocking doors with keypad and other secure operations:

After access codes have been assigned, secure operations can be accomplished by enabling the keypad. The keypad is enabled by entering a valid five digit access code. Entering the correct access code alone will not initiate a secure operation. If the lock/unlock (1) button is not pressed within five seconds after the access code was entered, then the keypad reverts back to a disabled state. If an unassigned button or no button is pressed while the system is enabled, the keypad reverts back to disabled state.

NOTE:

Use of entry door deadbolt along with door lock will reduce unauthorized entrance into motorhome.

Factory Access and Authority Default Codes:

NOTE:

Consult OEM manual for Access and Authority codes.

WARNING:

Ensure possession of entry door keys prior to testing new personal code.

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

INFORMATION:

Consult the OEM manual for further information.

NOTE

During any service work, it is recommended all key fobs be left with the motorhome for thorough testing procedures.

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:

- ◆ The ignition must be OFF when extending slide rooms.
- ◆ 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:

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.

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 water 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, **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 and grit 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. Trapped dirt or grit under the slide room can scratch the floor surface. Never move the motorhome with the slide room extended.

NOTE:

DO NOT use petroleum based products on the slide seal. Petroleum based products can damage the paint and will cause premature aging of the rubber seal.

Extending & Retracting Slide Rooms**To Extend or Retract Slide Rooms:**

- ◆ Confirm the house batteries are fully charged.
- ◆ Turn on interior house power.
- ◆ Ensure the cab seats are in the forward position. Clean the floor of dirt or grit that could result in damage during operation.
- ◆ Confirm there is enough clearance inside/outside the motorhome for the room to extend/retract.
- ◆ Retract hydraulic jacks. Start the engine. Press Travel Mode on air level control panel (if equipped). Allow time for the air suspension to support the chassis.
- ◆ Turn off the engine. Ensure park brake is applied when extending the slide room.

- ◆ Ensure all people, pets and objects are clear of the slide room path.
- ◆ The switch for the slide rooms are located on the hallway monitor panel. Press and hold the slide room switch to the desired (**IN** or **OUT**) position.
- ◆ Release the switch anytime to stop room movement. The drive motor will not automatically stop; the switch must be released. A change in motor sound indicates full extension/retraction.

CAUTION:

Continuous operation of the slide room can drain the batteries and damage the motor by overheating.

WARNING:

The outside area must be clear of obstruction that can restrict slide room operation. Ensure there is five or more feet of clear space outside the slide room prior to extending the room or damage to the slide, the motorhome or property can occur. When retracting the slide room, ensure there is sufficient clearance inside the motorhome.

Manual Override

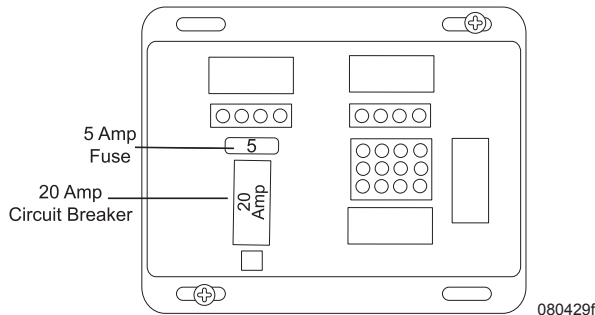
A safety feature may be engaged and preventing operation if the slide room does not operate.

If the slide room does not operate:

- ◆ Ensure ignition key is **OFF** when extending room.
- ◆ Ensure park brake is applied.

If the slide room does not operate after checking the safety requirements:

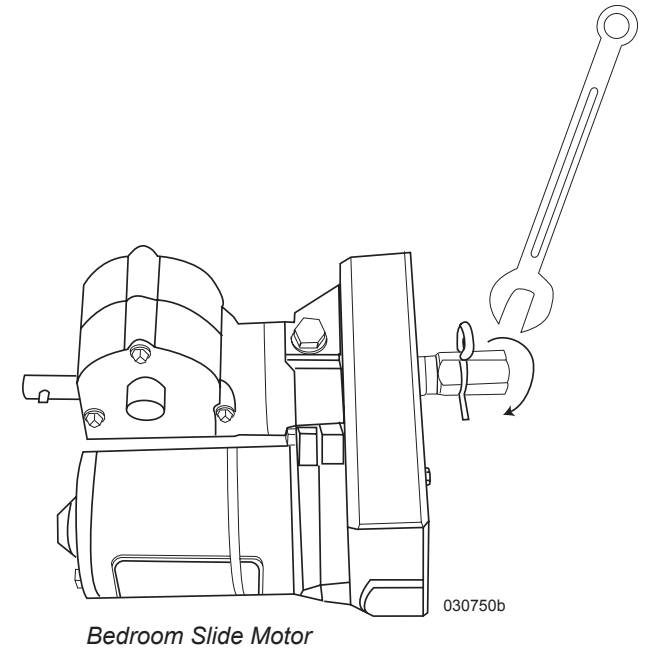
- ◆ Ensure all electrical connections at the switch are good.
- ◆ Ensure the house batteries are fully charged and interior house power is on.
- ◆ Check fluid level in reservoir (full slide only) located in curbside bay. Maintain fluid within ½" from top of reservoir when slide-outs are retracted.
- ◆ Check the fuse and auto-reset circuit breaker on the slide-out relay module located in the rear curbside electrical bay.
- ◆ It may be necessary to contact a repair facility to have the problem diagnosed and repaired.



Slide-room module located in rear curbside electrical bay.

Main, Galley and Bed Slide (Electric Gear Drive):

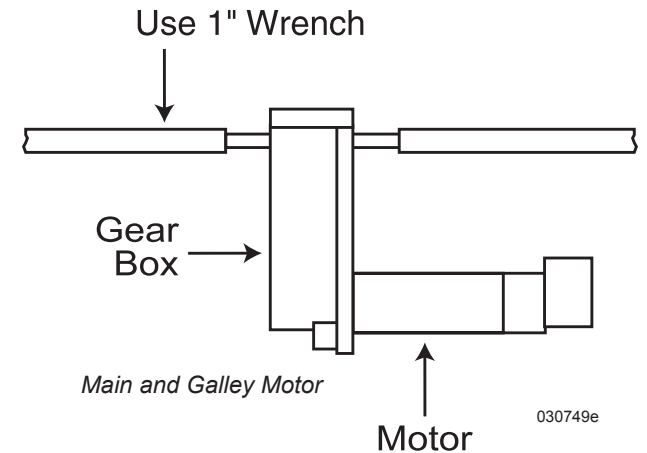
1. The bedroom slide-out motor is located under the bed. Lift the bed and remove the access panel. The main slide and galley motors are located inside the exterior storage bays under the slide-outs.
2. Turn off the house and chassis battery disconnect switches (located in rear curbside bay).
3. Remove 12 Volt DC from the motor by disconnecting the plug from the slide-out motor to the power supply.
4. Use a 5/8" wrench (bed slide) or 1" wrench (main and galley) to turn driveshaft and retract room (see illustrations).



CAUTION:

DO NOT continue to turn the motor after the room is fully extended or retracted. Damage to the slide mechanism can occur.

5. Once the slide room has been manually retracted, apply pressure to the wrench to firmly set the room. This will prevent room drift.
6. Take the motorhome to an authorized repair center.



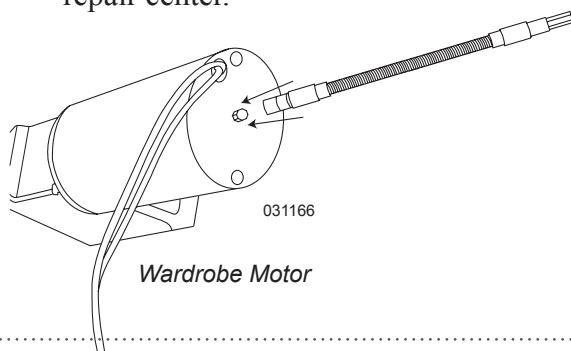
Wardrobe Slide (Electric Cable Drive):

1. Turn off both the battery and house disconnect switches (located in rear curbside bay).
2. Locate the slide room motor near the ceiling of the slide-out. Remove the fascia, valance, or both. The fascia and valance may be attached by velcro or screws.
3. Disconnect the slide room motor electrical plug. Locate by following the wires that run from the motor to the plug. This removes 12 Volt DC power from the slide-out motor.
4. Attach the flexible shaft to the 1/4" fitting on the end of the slide-out motor.
5. Attach a 1/4" socket and ratchet or drill to the other end of the flexible shaft.
6. Turn in proper direction to move the room. Reverse direction if the cables tighten and the motor is difficult to turn.

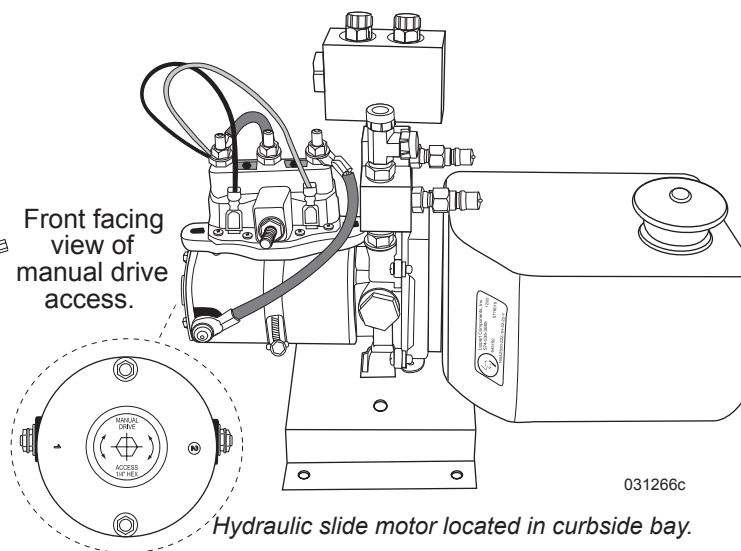
CAUTION:

Over-torquing can result in severe damage.

7. Take motorhome to an authorized repair center.

**Full Slide-Hydraulic (N/A All Models):**

1. Turn off house and chassis battery disconnect switches (located in rear curbside bay).
2. Remove vertical slide fascia on both ends of slide room inside motorhome.
3. Disconnect 12 Volt DC wires leading to locking mechanism.
4. Remove six self-tapping screws holding lock to sidewall.
5. Slide lock out along wall.
6. Access the slide room hydraulic pump at curbside front compartment.
7. Remove plastic cover labeled "Manual Drive" at end of pump assembly.
8. Insert a 1/4" hex bit connected to a cordless drill, ratchet or screwdriver.
9. Turn clockwise to extend slide-out or counterclockwise to retract slide-out.
10. Remove hex bit and reinstall plastic cover.
11. Take motorhome to an authorized repair center.

**AWNINGS*****Slide-Out Cover***

The slide-out cover automatically reacts to slide-out direction. A fixed edge of the slide-out cover is installed into an awning rail, mounted just above the slide-out. A spring-loaded roller with special brackets mounts to the slide-out. In a hard rain, the cover helps prevent water from penetrating the seal of the slide-out. The slide-out cover will automatically reach full extension when the slide-out room is fully extended.

The slide-out cover automatically rolls up into the travel position when the slide-out room is completely retracted.

NOTE:

When retracting the slide-out, stop the room approximately halfway. Confirm that the fabric is properly rolling before fully retracting the slide-out.

CAUTION:

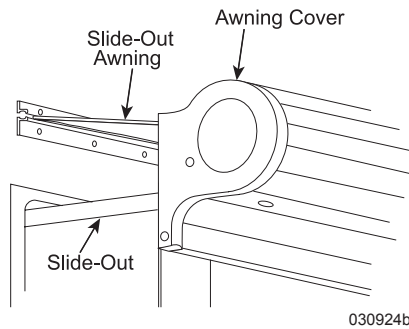
The slide room and slide-out awning should be retracted before heavy wind, rain or snow to prevent damage to the awning or motorhome. Wind can drive rain under the slide-out awning and into the motorhome.

CAUTION:

Rain water can pool on the slide-out awning. The added weight will cause 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 will be necessary to retract the room in small increments and allow the water time to run off.

CAUTION:

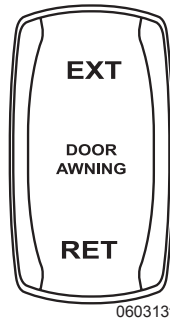
At least five feet of clearance is needed between the side of the motorhome and any objects, such as trees or fences, to allow the slide room and slid-out awning to fully extend.



030924b

Entry Door Awning**To Operate the Awning:**

- ◆ Ensure interior house power is on.
- ◆ Verify the extend/retract path of the awning and related hardware is clear and unobstructed.
- ◆ Turn the ignition key off. Press and hold the door awning switch to extend/retract.
- ◆ Release the switch to the neutral position when fully extended or retracted.



060313f

CAUTION:

The awning should be retracted if the motorhome is left unattended or high wind conditions exist. Otherwise wind damage to the awning may occur.

NOTE:

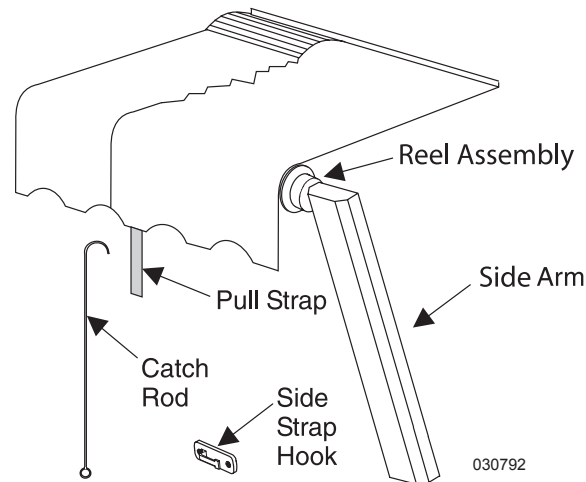
It is not required to have the awning at full extension. The awning may be stopped at any point of extension or retraction by releasing the momentary switch.

Window Awning**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.



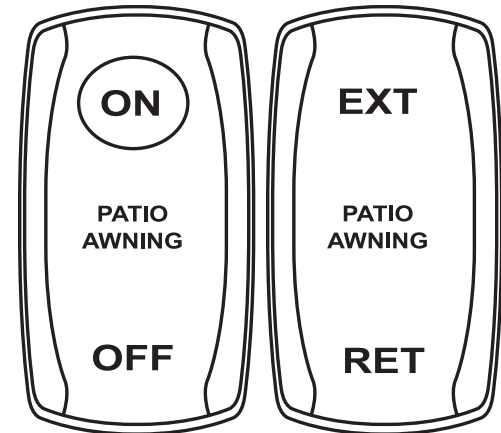
030792

Patio Awning

The Eclipse awning operates on 12 Volts DC. The awning requires 10' of lateral side clearance.

To Operate Awning:

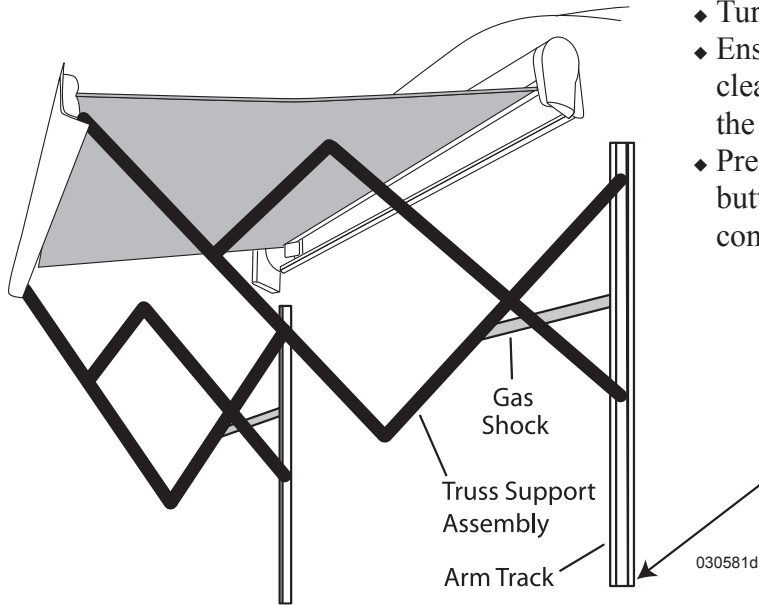
- ◆ The interior awning power switch (mode switch) needs to be on before interior and exterior awning switches will operate.
- ◆ Push and hold the retract/extend switch to extend the awning. Release the switch at any time for partial extension.
- ◆ Push and hold the switch to retract awning.



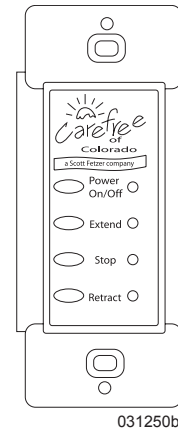
060313g

If the awning fails to operate:

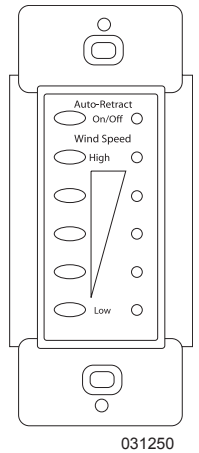
- ◆ Ensure ignition is off.
- ◆ Check power at 15 Amp mini breaker in front electrical bay on the roadside.

**To Operate Awning:**

- ◆ Connect to shore power, start the generator or turn on the inverter.
- ◆ Turn the ignition switch off.
- ◆ Ensure there is sufficient clearance before extending the awning.
- ◆ Press the “Power On/Off” button on the awning control.

**Auto-Retract System:**

The Auto-Retract system detects awning motion caused by windy conditions. The system can be set at five levels of wind sensitivity. The system operates by monitoring the motion of the awning’s front edge. When awning motion exceeds a preset sensitivity level for more than 2 seconds, the awning will automatically retract.

**To Operate the Auto-Retract System:**

- ◆ Press the “Power On/Off” button on the awning control.
- ◆ Press the “Auto-Retract On/Off” on the Auto-Retract control.
- ◆ Set the sensitivity to the desired level.

NOTE:

The Awning Power button must be on, and AC power must be available for Auto-Retract to operate.

NOTE:

If the Auto-Retract LEDs flash, this indicates that the motion sensor has been disengaged or otherwise disabled. Contact a Carefree service center for service.

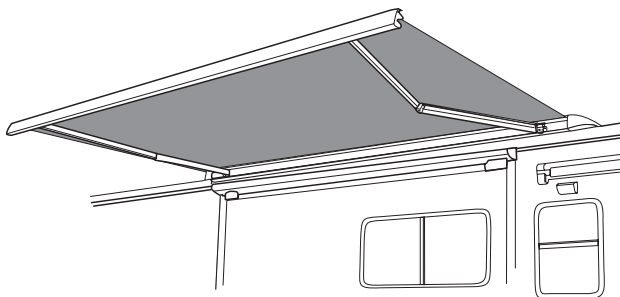
- ◆ Press and release the “Extend” or “Retract” button. The awning will completely extend or retract.
- ◆ Press and release the “Stop” button to stop extension or retraction at any time.
- ◆ Turn awning power off when not in use.

NOTE

When any button is activated, the LED illuminates and stays on until another function is performed.

Patio Awning (Optional)

The Apex patio awning is a roof-mounted box awning that requires 120 Volts AC to operate. The Apex awning includes an adjustable Auto-Retract feature that (when activated) will automatically retract the awning in windy conditions.



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 cleaning products. 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.

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.

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.

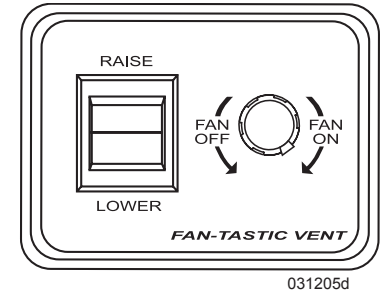
FANS

Ventilation fan controls are mounted on a wall or cabinet in whichever room the fan is located. The fans operate from the house batteries.

Exhaust Fan

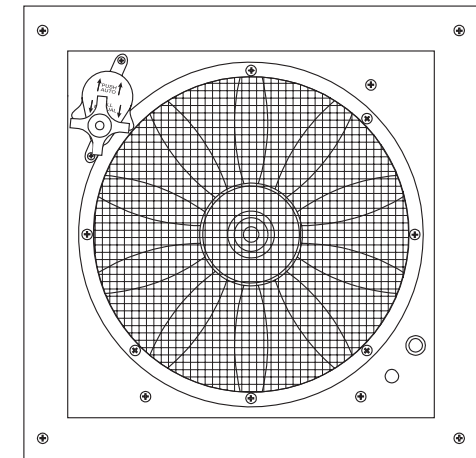
Fan Operation:

- ◆ Turn on the battery cut-off switch.
- ◆ Ensure the vent cover knob is pressed **IN** to the Automatic position.
- ◆ Use the wall switch to raise the vent cover. The vent cover must be open at least 2" before the fan will run.
- ◆ Turn power knob clockwise to turn fan on. The power knob also adjusts fan speed.



NOTE:

To override the automatic setting, pull the vent cover knob out to the manual position and close vent. The fan blade will stop spinning when the vent cover is closed.

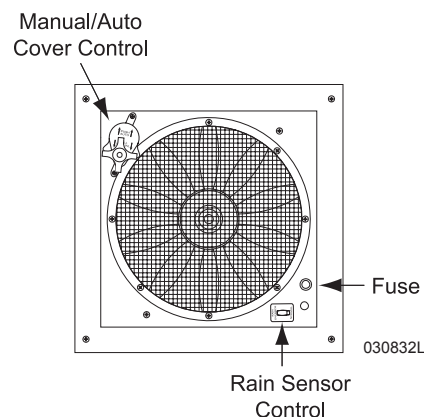


030832k

Automatic Fan

Fan Operation:

- ◆ Turn on the battery cut-off switch.
- ◆ Ensure the vent cover knob is pressed **IN** to the **Automatic** position.
- ◆ Press the **Auto/Manual/Off** button on the wall switch once. The vent cover will open automatically.
- ◆ Use the **up** or **down** arrows to set the thermostat temperature. The fan speed will adjust automatically according to the disparity between ambient and selected temperatures.
- ◆ Press the **Auto/Manual/Off** button once more to manually control fan speed. Fan speed is displayed on the wall control in 10% increments. The thermostat is no longer operational in this mode.
- ◆ Press the **Auto/Manual/Off** button until all wall control lights are off. The fan blade will stop spinning and the vent dome will automatically close.
- ◆ To use the fan as a vent only: Leave the wall control switch off. Pull the vent cover knob down to the manual position and turn the knob to open the vent.



NOTE:

To override the automatic setting, pull the vent cover knob out to the manual position and close vent. The fan blade will stop spinning when the vent cover is closed.

Rain Sensor Operation:

- ◆ Ensure the rain sensor switch located on the fan is set to Normal.
- ◆ The dome will automatically close and the fan will shut off if the rain sensor gets wet.
- ◆ The dome will reopen and the fan will start after the sensor dries.
- ◆ Turn the fan off at the wall control to avoid automatic restart.

NOTE:

Setting the rain sensor switch to “Rain Override” while the fan is running will prevent the fan from automatically turning off and closing during rainy weather.

CAUTION:

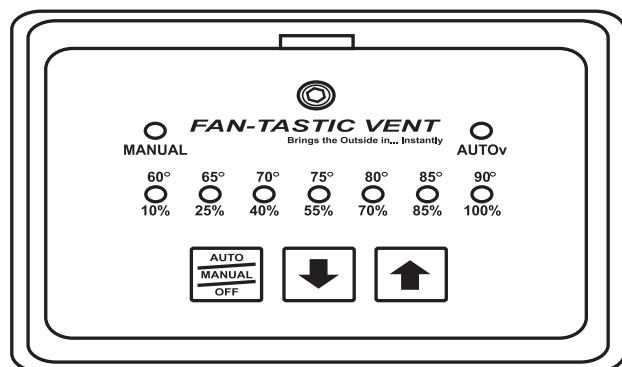
It is recommended to travel with the vents closed. High winds and vibration can damage the dome.

Tips for Fan Operation:

- ◆ To keep condensation from accumulating, operate the fans. 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 use is another source of condensation.
- ◆ If the fan fails to operate, check for a blown fuse either in the domestic fuse panel or the fuse on the fan.
- ◆ To remove the screen, loosen the eight screws holding the screen in place. Use a non-abrasive soap and water to clean and reinstall.
- ◆ Direct airflow by slightly opening selected windows (choose the shaded side of the motorhome to create the most airflow on hot, sunny days). Maximum airflow is achieved between an open window and the Fantastic Vent.

NOTE:

DO NOT leave the fan on while the motorhome is stored or unattended for extended periods. High winds, unusual conditions or obstructions may prevent the fan cover from fully closing, resulting in leakage and serious damage.



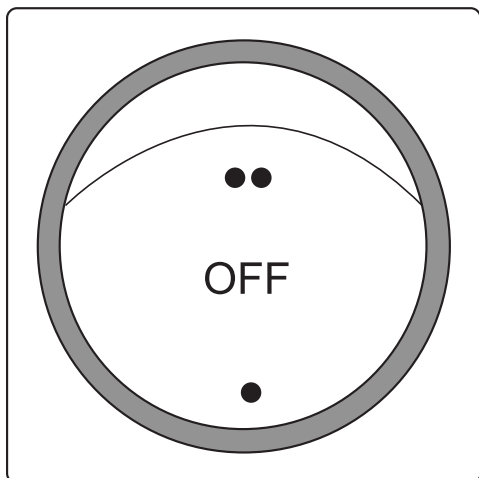
031205c

Bedroom Ceiling Fan (Optional)

A bi-directional, 12 Volt DC powered ceiling fan is located in the bedroom. Fan operation is controlled by a switch located next to the bed. Periodic maintenance consists of cleaning the blades with a soft cloth towel or a vacuum to remove dust build up.

CAUTION:

Fan blades are not enclosed. Use caution not to enter into fan path when on. Serious injury can occur.



Bedroom ceiling fan switch. 031271

POWER SUNVISOR

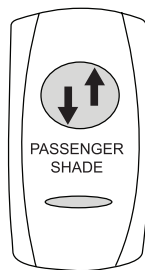
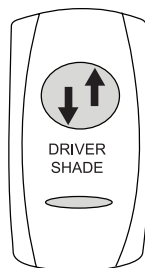
The windshield visors are 12 Volt DC operating from the house batteries. One visor assembly is used for the driver and another for the passenger.

To Operate the Visors:

- ◆ Use the **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.

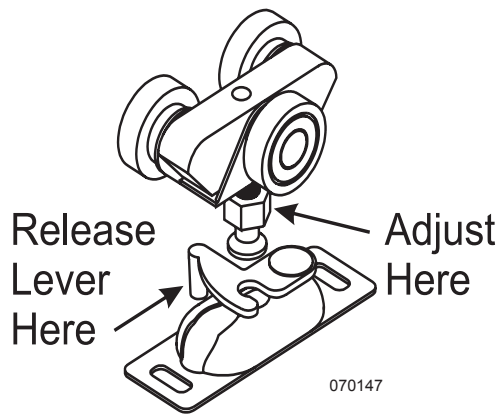


080375j

DOOR - SLIDING

The sliding pocket door uses two rollers at the top of each door. During the life of the motorhome, the sliding door may require adjustment. Locate the small wrench and turn the adjusting screw upward or downward.

If, for any reason, the pocket door needs to be removed, locate the portion that is secured to the top of the pocket door and rotate the small lever outward to release the latches.



070147

LUBE:

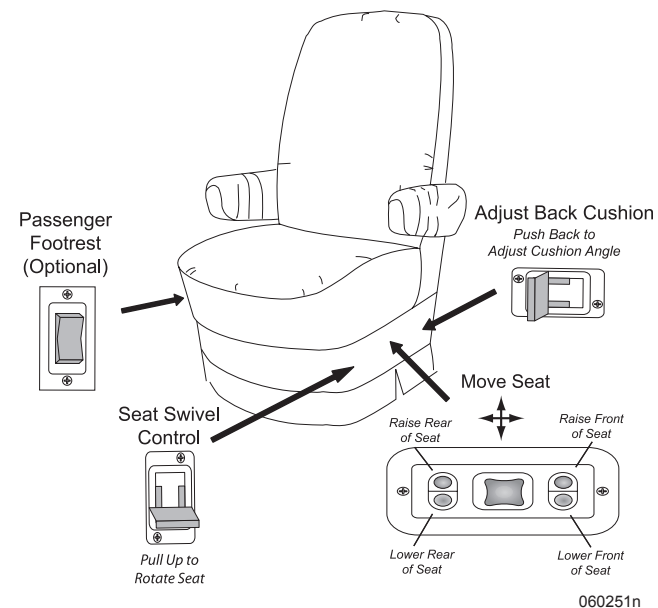
Lube the pocket door rollers with a small drop of oil once a year to help increase the life of the rollers and improve the sliding of the door.

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.

NOTE:

The seats operate from 12 Volt DC house power.



060251n

Swivel Seats

Swivel Seat Operation:

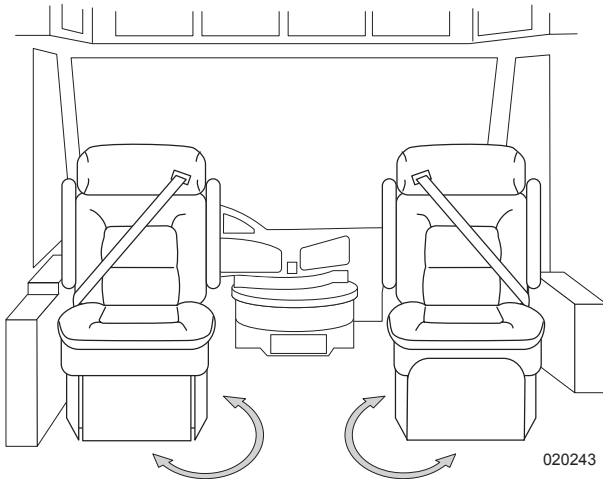
- ◆ To swivel, lift up the lever located on the side control panel.
- ◆ The passenger seat swivels all the way around when the slide-out is extended.
- ◆ When rotating the driver seat, put the steering wheel in the upright position.
- ◆ Move the seat forward, then pull the swivel lever up and rotate to the desired position.

WARNING:

Seats must be locked in the forward facing position while the motorhome is 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°.

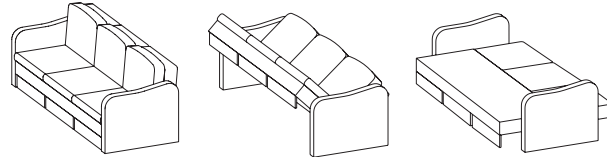


SOFA BED CONVERSION

The sofa will convert easily into a bed. The sofa comes equipped with safety belts to use during travel.

Sofa to Sleeper:

- ◆ Lift up from the center of sofa, just below the seat cushions, to form a “V” shape with the seat base and back rest.
- ◆ Push down on seat base, then pull out until the seat base and backrest are flat.
- ◆ Fold seat belts out of the way.



Sleeper to Sofa:

- ◆ Lift up the seat base and pull up the backrest until they are in a “V” position.
- ◆ Push down on seat base.

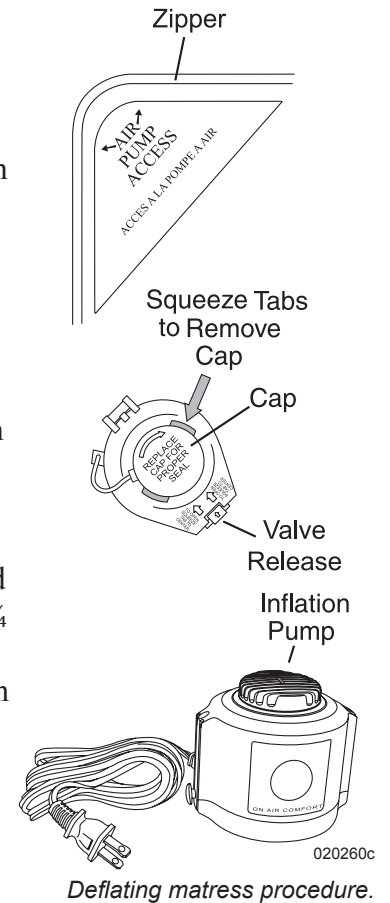
Air Mattress:

Use the hand-held electric pump to inflate the mattress. The pump operates from any 120 Volt AC outlet.

To Inflate the Mattress:

- ◆ Remove and store seat cushions.
- ◆ Open the convertible sofa and fully extend the mattress (may be necessary to extend slide-room).
- ◆ **Unzip** the corner of the mattress labeled “Air Pump Access” to access the pump valve.

- ◆ Push down on the valve to ensure it is locked in place.
- ◆ Open the cap on the valve.
- ◆ Plug the pump motor into a wall outlet. Hook to shore power, start the generator or turn on the inverter.
- ◆ To turn on the pump, place it on the valve and turn the pump ¼ turn. The pump will be locked in place.
- ◆ Inflate the mattress to desired firmness.
- ◆ Remove the pump, replace the valve cap and zip up the mattress cover.



To Deflate the Mattress:

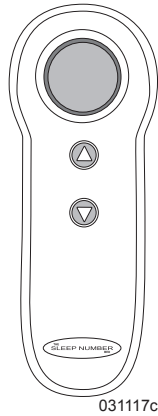
- ◆ Remove bedding items.
- ◆ Unzip the corner of the mattress where the air valve is located.
- ◆ Lift the valve release.
- ◆ Once deflated, close the valve release, zip up the mattress cover and close the convertible sofa.

AIR MATTRESS BED (OPTIONAL)

The air mattress includes two separate air chambers to allow different firmness settings. Each side is equipped with a remote control. The air pump, located under the bed, is powered by 120 volt AC.

Operation:

- ◆ Hook to shore power, start the generator or turn on the inverter.
- ◆ Use the up and down arrows on the remote to adjust firmness setting. The display on the remote will change in increments of 5 (5 is maximum soft and 100 is maximum firm).



031117c
Air Mattress Remote

Troubleshooting:

- ◆ Ensure the pump power cord is plugged in at the pump and at the 120 Volt outlet under the bed.



031117d
Air Mattress Pump

CAUTION:

Set bed to a maximum of 20 before traveling in higher elevations.

NOTE:

See the manufacturer's website, www.selectcomfort.com, for more information.

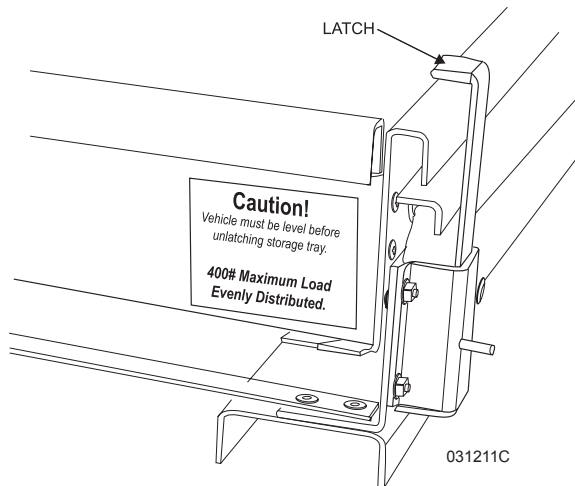
STORAGE SLIDE (OPTIONAL)

The storage slide is an option that is available for use in the storage compartment bays of the motorhome. The storage slide allows for the pay load to slide outward for easier access.

- ◆ The motorhome must be level before opening the storage slide.
- ◆ Push down on yellow lever to release slide. Be ready to control slide after releasing.
- ◆ Maximum weight capacity is 400 lbs. Never exceed this amount.

WARNING:

The motorhome must be level when sliding the drawer out of the bay compartment. If the motorhome is not level, the drawer can slide out abruptly and cause bodily harm.



031211C

LADDER - REAR

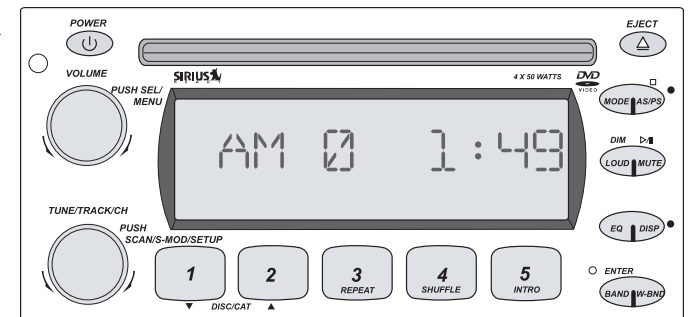
The rear ladder allows access to the roof. Care should be used when climbing the ladder. Access to the roof should be limited to cleaning and sealing purposes only. Stow the lower portion of the ladder in the cargo bay during travel.

NOTE:

Maximum weight capacity for the ladder is 300 lbs.

RADIO - DASH

The dash radio features include AM/FM tuner, CD/DVD player, Sirius ready and Weather Band. There is a "Home Theater" switch in the overhead cabinet above the pilot seat. This controls the ceiling speakers in the cockpit and living area and a subwoofer.



031088c

Operation:

- ◆ Turn ON battery cut-off switch located at the entry door.
- ◆ Turn the main Radio power switch ON (rocker switch located on dash).
- ◆ Turn ON the radio.
- ◆ Insert CD or select AM/FM or Weather Band with the button in the lower right corner.

NOTE:

See "TV and Entertainment Components" for DVD operations.

Clock Adjust:

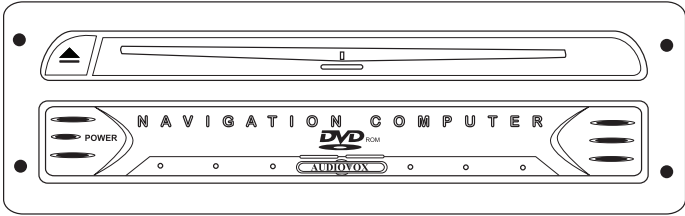
- ◆ Press and hold the Display (DISP) button until clock starts flashing.
- ◆ Use the tuning knob to adjust time.
- ◆ Press the Display (DISP) button when finished.

NAVIGATION SYSTEM (OPTIONAL)

The Navigation system provides map views, and turn-by-turn instructions. The system includes a DVD ROM player, monitor and a map DVD of the entire continental US and Canada.

INFORMATION:

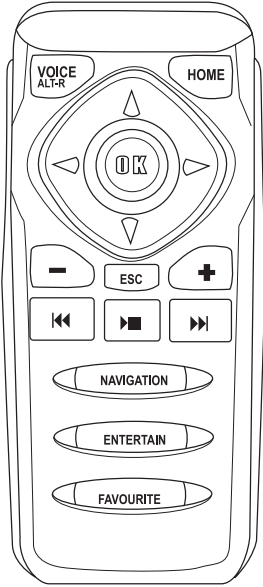
Complete information and instruction are found in the OEM instruction manual.



031219c

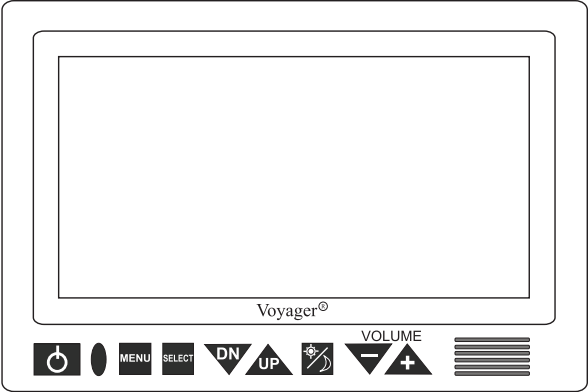
Perform the following instruction only when the motorhome is parked:

- ◆ Turn ignition to ACC or ON position.
- ◆ Insert the DVD map disc into the navigation unit.
- ◆ Use the Aladdin joystick to enter the Main Aladdin Menu on the Voyager monitor. Select Coach Info.
- ◆ Press the right arrow on the Aladdin control two times to bring up the navigation screen.
- ◆ Point the navigation remote at the Voyager monitor and press the OK button.
- ◆ Perform desired functions.
- ◆ Press the left arrow on the Aladdin controller to exit.



031219b

Navigation Remote



031276

SATELLITE RADIO (OPTIONAL)

The satellite radio is a digital signal decoder and tuner. Signals are transmitted from a ground station to satellites orbiting over the continental United States. The satellite then transmits the signal to an antenna in the motorhome. The radio receiver decodes the transmission and plays the selected channel within that transmission. Signals are also transmitted to ground repeaters for listeners in urban areas where the satellite signal can be interrupted.

NOTE:

For information regarding subscriptions and service coverage areas, contact the system provider.

Sirius® Radio
1-888-539-7474
www.siriusradio.com

INFORMATION:

For detailed information, account activation and operating instructions on the satellite radio, refer to the manufacturer's manual located in the Owner's Information File box.

SYSTEM MONITOR PANEL

The System Monitor Panel is a central location for many of the switches and monitors used to operate the motorhome. This unit is generally located in the hallway.

1. Comfort Control Thermostat:

Thermostat controls for roof AC, furnace and fan.

2. System Heat:

Activates basement heater and fresh water tank heat pad.

3. Generator:

Starts and stops the generator.

4. Tank/House Battery Monitor:

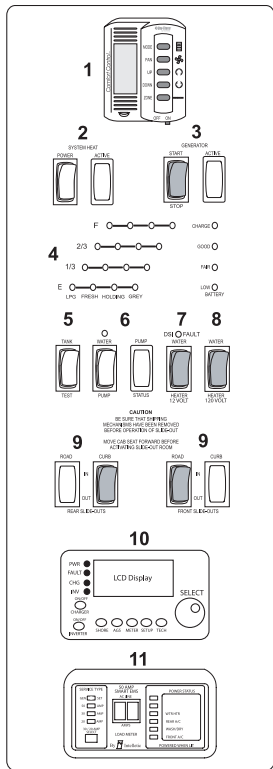
Displays the status of the holding tanks, fresh tank, LP tank and house batteries.

5. Tank Test Switch:

Spring loaded switch used to display tank and house battery status on the monitor panel.

6. Water Pump Switch:

Activates the water pump. The pump status light illuminates when the water pump is on.



060306v

7. Water Heater Switch:

Applies 12 Volt DC power to ignite and operate the water heater with LP Gas. If the water heater fails to ignite, the DSI FAULT lamp will illuminate.

8. Water Heater Switch:

Operates water heater from 120 Volt AC power.

9. Slide-out Room Controls:

Extends and retracts the slide rooms.

10. Inverter Control:

Turns the inverter on or off and monitors battery charging status. See Section 8 for more information.

11. Energy Management System:

Helps prevent overloading limited shore power supply by shedding electrical loads. See Section 8 for more information.

ALADDIN™ SYSTEM (OPTIONAL)

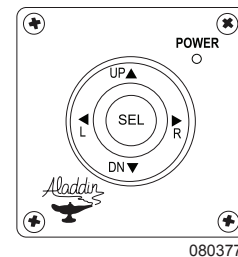
The Aladdin™ gathers and display information from the chassis system. This allows the operator to make informed decisions regarding motorhome operation. Other Aladdin features include trip logs, compass heading, basement and outside temperature.

Aladdin Controller:

The controller (located on the driver's console) allows the operator to control cursor movements. Press the right button or the center select button to enter a menu item; press the left button (L<) button to return to the previous menu. Press the up or down buttons

to scroll through or change information.

An LED provides system-on power indication. The LED blinks whenever the controller is used. The LED will also blink every few seconds when the Aladdin system is powered on.



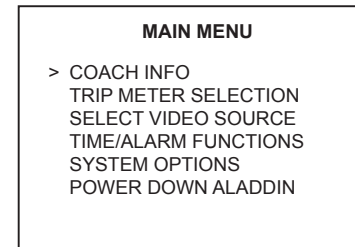
Operations

The Aladdin is turned on either with the motorhome ignition switch or pressing the select button on the controller. The Aladdin will power down when ignition is turned off unless the operator presses the select button.

Main Menu:

The main menu appears when the Aladdin is powered on. Press the up or down arrows to scroll through the menu. An arrow indicates the current menu item. Press the select button to enter any menu item. Press the left button to return to the previous screen.

NOTE:
The ignition key must be in the ACC, ON or START position for the monitor to operate.



NOTE:
Interior 12 Volt DC house power must be on for the Aladdin screen to display.

Coach Info:

This screen displays current transmission and engine data. Compass heading, outside temperature and time are displayed at the top of each screen.

NE 030	69.1F	02:34 PM
ENGINE		TRANS
0.0 MPH		N GEAR SEL
675 RPM		NC GEAR ATT
177 F TEMP	135 F TEMP	
5 PCT LOAD		
30 PSI OIL		BATTERY
0.8 PSI BOOST		14.7 VDC
0.0 CRUISE OFF		
0.0 MPG		CAMERA→

From this screen, press the right button once to display the rear camera view, and press the right button again to display an engine/transmission data screen. An enlarged engine and transmission screen will display, showing only four parameters at a time, with five screens available. The screens automatically scroll every few seconds. Press the up or down buttons to manually scroll through the screens and disable automatic scrolling. Press the right button to enable automatic scrolling. Press the left button to return to previous menus.

Trip Meter Selection:

This screen allows selection of trip information for ten different trips, dedicated trip leg status and fuel status screens. Trip screens selected by the operator are independent of each other and can be started, paused, resumed or cleared, and provide time and distance information as well as average speed and fuel mileage. Trip leg status gives trip information, distance-to-go and time-to-go based on trip leg averages. Fuel status provides estimated fuel remaining and range based on current averages.

TRIP METER SELECTION	
>	NUMBERED TRIP SELECT
	TRIP LEG STATISTICS
	TRIP FUEL STATISTICS
ENGINE TOTALS	
TOTAL HOURS	20.81
TOTAL MILES	42.7
TOTAL FUEL GAL	26.0

Changes made to any of the Trip Meter selections, with the single exception of clearing a numbered trip, should be done while the ignition is on to enable the Aladdin to collect necessary information from the engine. The last available information will be used if the ignition is off when changes are made.

The status screen display may take several minutes after a change is made before it starts updating values. In the case of Duration, the display will not update for approximately six minutes because Duration is displayed to the tenth of an hour (six minutes).

The Aladdin requests engine statistics periodically from the engine for use with trip calculations. After such a change the next valid engine data will not be available for approximately one minute. The rate of data change is also influenced by motorhome speed, fuel rate and time.

Time and Alarm Functions:

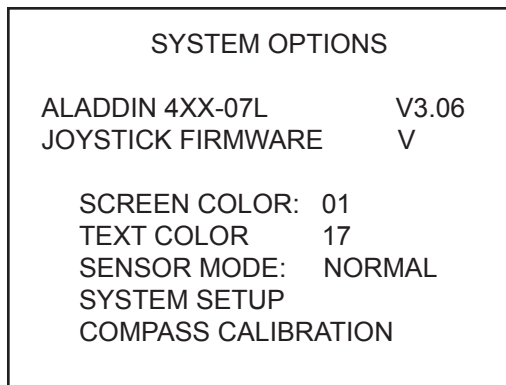
This screen displays menu options for viewing and setting the time, date, alarms and alarm sounds.

TIME AND ALARM FUNCTIONS	
>	VIEW CURRENT TIME
	SET DATE AND TIME
	SET ALARM CLOCK
	ALARM CLOCK ON/OFF
	SET COMPARE ALARM
	MAINTENANCE SCHEDULER
ALARM CLOCK SOUND:	1
ALARM SOUND:	1

System Options

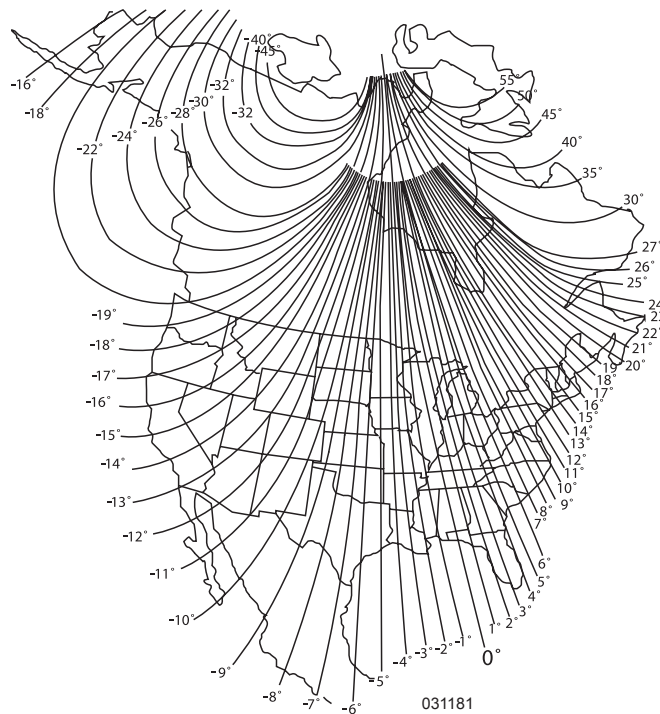
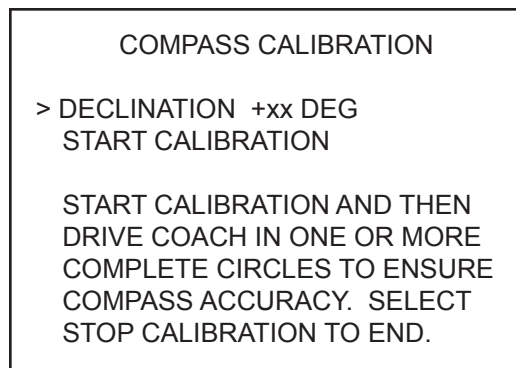
This screen provides the operator with a submenu for Aladdin functions that are less frequently used and includes screen appearance adjustments. Only service personnel should access System Setup.

Screen and text colors are selected by first selecting the menu item and then scrolling through the available colors. Selected colors display immediately and remain in effect until changed.



The Compass Calibration screen allows the owner to either calibrate the compass or enter a declination. Calibration will compensate for the metal construction within the motorhome and increase accuracy. Entering a declination will allow for true North or magnetic North compass headings.

Calibration is accomplished by selecting Start Calibration and then driving in a full 360° circle. At the end of driving this loop, select Stop Calibration. A successful calibration will cause a Calibration Successful message to display. A calibration that fails will display Calibration Fail along with a failure code.



Power Down Aladdin:

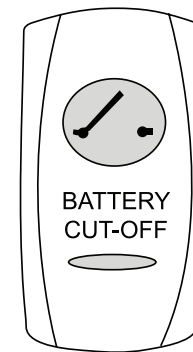
Turning off the ignition will cause the Aladdin to power down. A ten-second countdown is performed prior to power down. Pressing the select button will abort this countdown and the Aladdin will remain on. The Aladdin can be manually powered down when desired by selecting the Power Down Aladdin option.

TV & ENTERTAINMENT COMPONENTS

The following paragraphs discuss the operations and various components that make up the entertainment center.

INFORMATION:
It is recommended to become familiar with individual components. Refer to the respective manual for detailed instructions on operating individual components.

NOTE:
All components of the entertainment system require 120 Volts AC to operate. Hook to shore power, start the generator or turn on the inverter. Turn on the interior house power using the battery cut-off switch.



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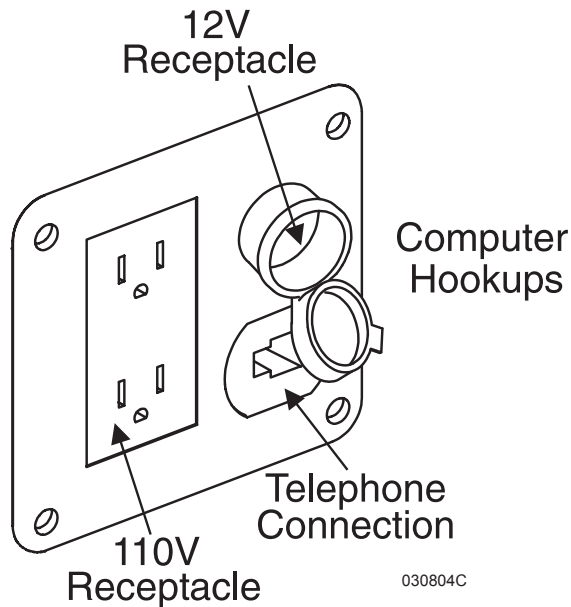
Turns on interior house power.

Television (Front) Lockout Feature

The ignition switch controls the outlet for the front TV, allowing the front TV to be operated only while the vehicle is at rest. Viewing time of the front TV from the inverter depends on state of charge of the house batteries and any additional 12 Volt DC lighting being used.

Connections - Cable TV, Computer & Phone

The motorhome is equipped with cable TV and phone hook-ups located in the water service bay. For convenience, the auxiliary outlet is located at the cockpit.



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TV Antenna

To Raise the Antenna:

- ◆ Rotate the crank handle clockwise to raise the antenna (approximately 14½ turns).
- ◆ Pull down on the outside directional wheel and rotate the antenna until the best picture is obtained. The directional wheel is spring loaded.

To Lower the Antenna:

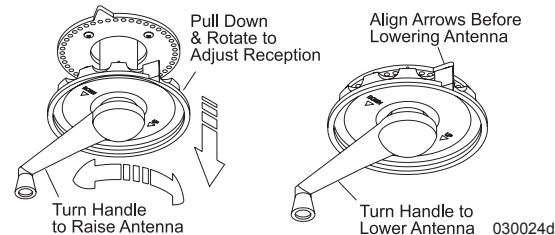
- ◆ Pull down on the directional wheel and align arrows together.
- ◆ Rotate the crank handle counterclockwise to lower the antenna fully into the cradle. Make an outside visual inspection to ensure the antenna is properly stowed.

CAUTION:

DO NOT move motorhome with antenna in the raised or partially raised position and risk damage by tree limbs or wires. Worm gear damage or breakage may result.

WARNING:

Before raising antenna, make an outside visual inspection for any obstructions or overhead electrical wires. Damage to the antenna, severe shock, personal injury or death can occur from inadequate clearance.

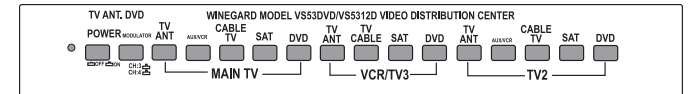


Video Selector Box

The motorhome is equipped with a video selector box that connects the various components to the front and rear televisions.

Features Include:

- ◆ Five Inputs: Satellite Receiver (N/A), TV Antenna, AUX/VCR, Cable TV and Auxiliary.
- ◆ Three Outputs: MAIN TV (Front TV), TV2 (Bedroom TV), VCR/TV3.
- ◆ Built-in 12 Volt TV antenna amplifier.
- ◆ Independent viewing of signals at different televisions.



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Operating the Components

To Operate Any Component:

- ◆ All components require 120 Volt AC from shore power, the generator or inverter to operate.
- ◆ Ensure the battery cut-off switch is on and the house batteries are charged.
- ◆ The ignition key must be off.

To Watch TV Using the Antenna:

- ◆ Press the TV ANT button located above the section marked MAIN TV (TV2 for bedroom) on the switch box.
- ◆ Turn TV on and select channel.
- ◆ Fringe area reception can be improved by pressing the "Power" button on the switch box to activate the antenna boost.

NOTE:

Turn antenna boost off when not viewing from the antenna.

To Watch TV Using the Shore Cable Signal:

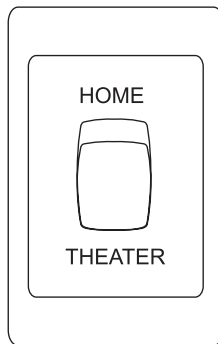
- ◆ Press the **CABLE TV** button above the section marked **MAIN TV** (TV2 for bedroom) on the video control box.
- ◆ Turn the TV on and select channel.

NOTE:

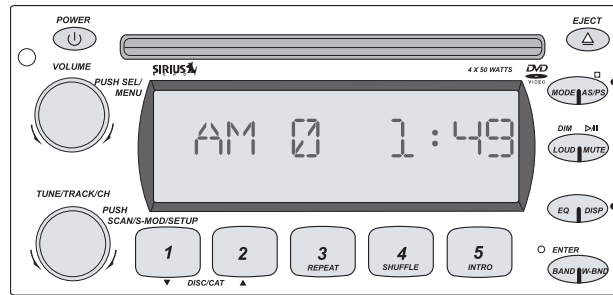
To view Cable TV signals, hook a 75-Ohm cable from the supplied service to the Cable TV input in the Water Service Compartment. Cable TV inputs are available at many of today's campgrounds.

To Play a DVD:

The motorhome dash radio is also a DVD/CD player with surround sound capabilities. DVD audio will play through a subwoofer located in the galley area and overhead speakers located in the cockpit, living room and bedroom. A "Home Theater" switch, located in the overhead cabinet above the pilot seat, will turn the subwoofer, cockpit and living room speakers on and off. Adjust volume on the front TV when the "Home Theater" switch is off.

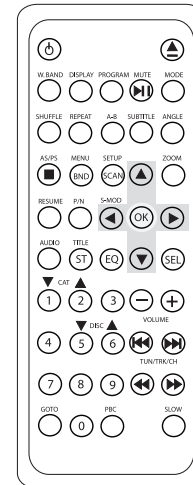


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- ◆ Turn the main Radio power switch on (rocker switch located on dash).
- ◆ Turn the "Home Theater" switch to the desired setting.
- ◆ Turn on the TV and select channel 3.
- ◆ Press the DVD button above the section marked Main TV (TV2 for bedroom) on the video control box.
- ◆ Insert DVD into Radio/DVD player.
- ◆ Navigate DVD menus and adjust volume using the DVD/Radio remote.

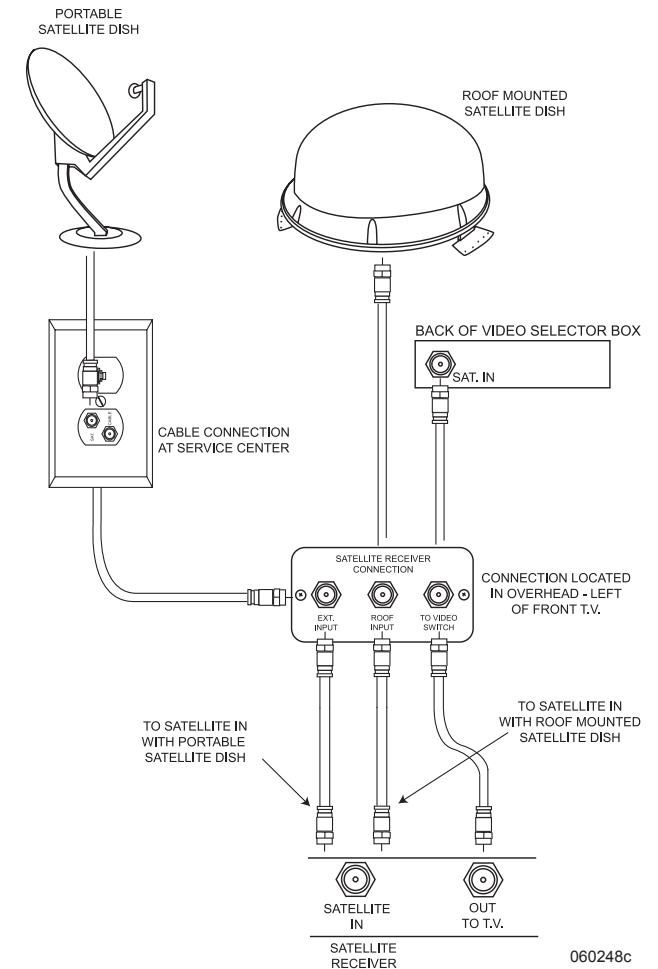


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SATELLITE PREP

The motorhome is pre-wired for a roof-mounted or portable satellite system. The pre-wire consists of a satellite receiver connection, a 12 Volt DC power connection and a phone cable for pay-per-view programming. These connections are located in the front overhead cabinet next to the television. A sticker on the

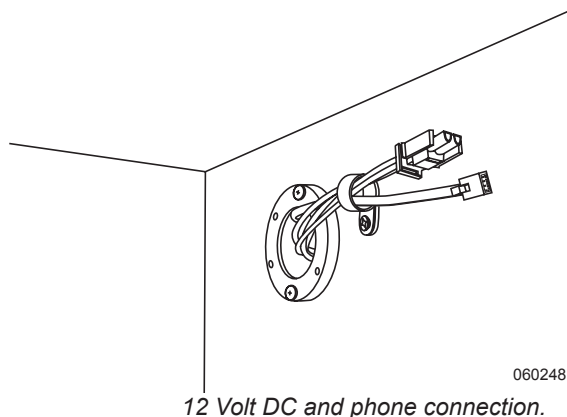
roof denotes access and mount points for a roof-mounted dish. This sticker is located forward of the front roof air conditioner. The exterior connections for a portable system are located in the water service bay.



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Connecting the satellite receiver:

- ◆ **Roof-mounted System:** Connect a coax from “Roof Input” on the satellite receiver connection (in the overhead cabinet above the pilot seat) to the “Satellite In” connection on the back of the receiver.
- ◆ **Portable Dish System:** Connect a coax from the “Exterior Input” on the satellite receiver connection to the “Satellite In” on the back of the satellite receiver.
- ◆ Connect a coax from “Satellite Out” on the back of the satellite receiver to “To Video Switch” on the Satellite Receiver Connection.
- ◆ Connect the provided phone cable to telephone line input on the back of the satellite receiver.
- ◆ A 12 Volt DC power connection is provided for use with satellite systems that require 12 Volt DC power to control satellite dish movement. Power comes from the roadside front electrical box.
- ◆ Use the “SAT” button on the video selector box to route satellite output to the front and/or rear televisions.

**SATELLITE (OPTIONAL)
Stationary System (Optional)**

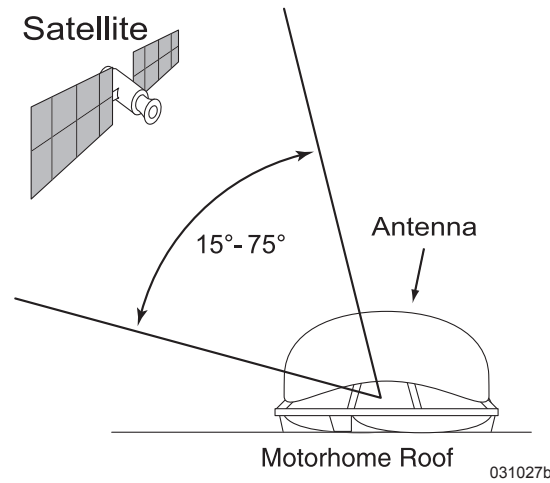
The optional satellite TV system includes a satellite dish and controller and pre-wire for a receiver.

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 satellite system requires a clear view of the southern sky to receive signal. 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 outside of motorhome for blockage 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 back and forth between the 110 and 119 satellites.

To switch satellites:

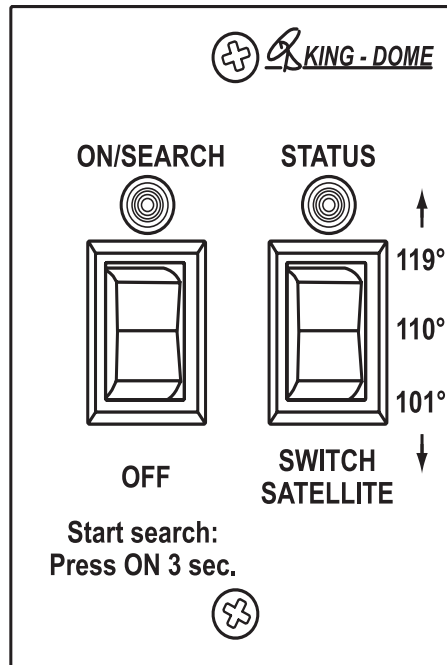
Press and hold the three- position switch for one second. Up will switch to 119, while down will switch to 110.

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.



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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:

The satellite routinely saves its position to memory as part of operation. When turned on, the system stores the last saved position and if the motorhome has not changed location, the antenna will immediately acquire the signal.

If the motorhome moves after the system is turned off, the antenna will quickly carry out normal initialization routine to re-acquire the satellite. Press the **Power** button to turn the system off.

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 motorhome is in motion.

The system requires the following preventive maintenance 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 signal strength and reception quality.

INFORMATION:

Refer to the complete warranty statement provided with the OEM Manual for information on warranty, repair, and/or liability policies.

NOTE:

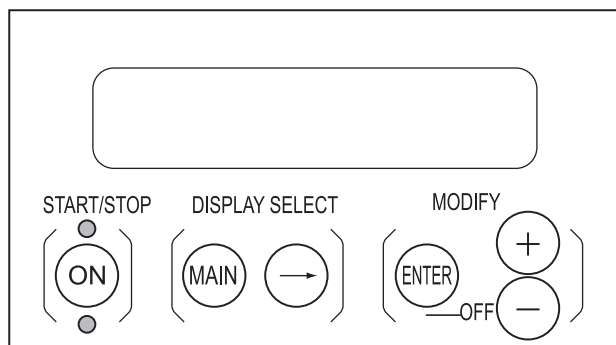
For optimum signal strength, keep the dome clean from dirt, bugs and other debris. Periodic washing of the dome using mild soap and water is recommended. If the motorhome is to be stored for long periods of time, it is recommended that the system be put through a search procedure on a quarterly basis to keep all moving parts in good working order.

In-Motion System (Optional)

The in-motion system includes a satellite dish and controller and pre-wire for a receiver.

In-Motion Satellite System:

The In-motion system will automatically track 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. To turn the control panel off simultaneously press the **ENTER** and **-** buttons.



Control Panel

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To Use the In-Motion System:

- ◆ Press the **On** button on the satellite control panel. The dish will automatically acquire the signal from the satellite.
- ◆ Ensure the access card is inserted and press the **Power** button on the satellite receiver (not included).

NOTE:

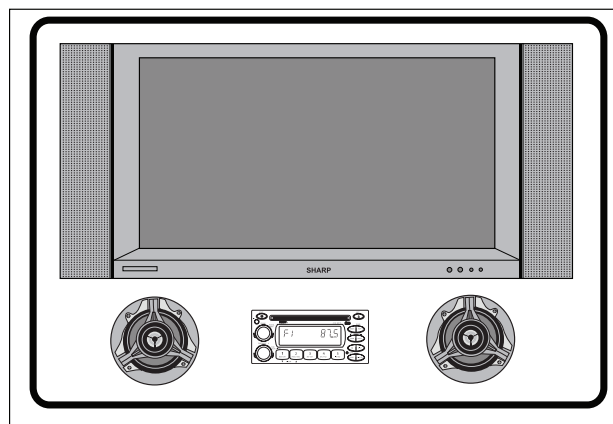
Inclement weather conditions may adversely affect the satellite signal acquisition. Degraded audio and video signals through the receiver will result.

EXTERIOR ENTERTAINMENT CENTER (OPTIONAL)

The exterior entertainment has a LCD television, AM/FM radio, CD/DVD player and two speakers.

To Operate Any Component:

All the entertainment components require 120 Volt AC from shore power, the generator, or the inverter. Ensure the interior battery cut-off switch is on and the house batteries are charged.



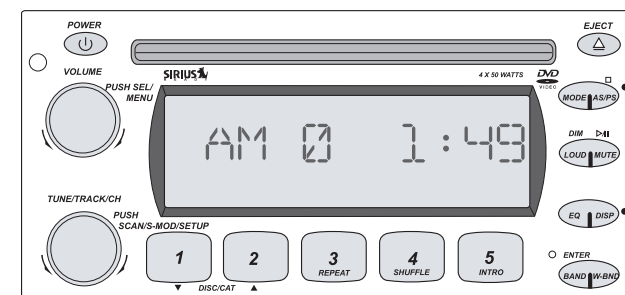
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NOTE

For detailed information on features and operating procedures refer to the OEM manual.

To Watch a DVD:

- ◆ Turn on TV. Press Input button until Input 2 is displayed on the input menu in the upper right hand corner.
- ◆ Turn on exterior DVD player.
- ◆ Insert DVD. Press “Play” (Mute button) if necessary.
- ◆ Adjust volume at exterior DVD player.



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Radio Operation:

- ◆ Turn radio ON.
- ◆ Select AM/FM or Weatherband.
- ◆ Select station.
- ◆ Set volume to desired level.

CD Player Operation:

- ◆ Turn CD player ON.
- ◆ Insert CD. CD will load and play automatically.
- ◆ Adjust volume.

NOTES

Lined writing area with two columns of horizontal lines for notes.

2007 SCEPTER | WATER SYSTEMS | SECTION 6

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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.

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 and then turned back on to rinse. In this way a shower uses two 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, water filter and a water hose for potable water use only. Proper care of the hose is necessary. After each use, drain the water hose and attach the 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.

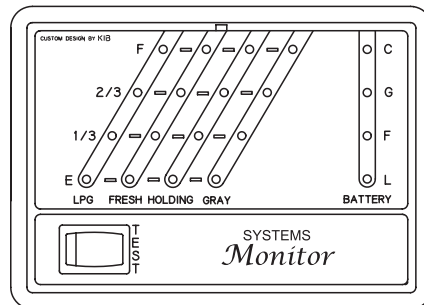
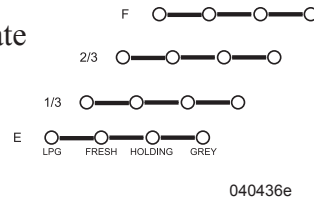
WARNING:

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 TANKS Measurements

The motorhome is equipped with two tank monitor panels. One is located on the hallway monitor panel, and the other is located in the water service bay. Hold down the “Test” switch to view tank levels. Levels are displayed on a LED scale with a corresponding scale reading.

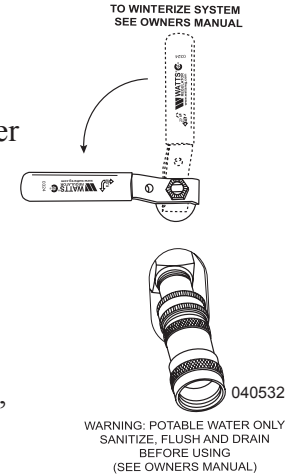
- ◆ Green lamps indicate good or normal ranges.
- ◆ Yellow lamps indicate fair ranges.
- ◆ Amber lamps indicate partial ranges.
- ◆ Red lamps indicate full or empty ranges.



Monitor Panel Found in Water Service Center 030446e

WATER- POTABLE Fresh Tank Fill

- ◆ Install a pressure regulator on potable water hose.
- ◆ Connect a potable water hose from a city water source to the “City Water” connection in the water service bay. For motorhomes with the optional hose reel, pull the hose to extend, and connect to a city water source.
- ◆ Turn the “Tank Fill” lever to the tank fill position to fill the fresh water tank.
- ◆ The water pump should be off.
- ◆ Turn on the city water supply.
- ◆ Monitor the tank filling process at all times at the service bay monitor.
- ◆ Water will flow from an overflow pipe when the tank is full.
- ◆ Shut the water supply off as quickly as possible when the fresh tank is full.

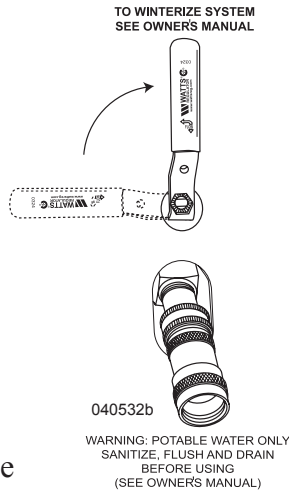


CAUTION:

DO NOT leave the hose unattended when filling the fresh water tank. Turn water off immediately when water flows from the overflow discharge.

City Water Hook-up

- ◆ Install a pressure regulator on potable water hose.
- ◆ Connect the potable water hose to the “City Water” connection.
- ◆ Ensure the “Tank Fill” lever is in the city water position.
- ◆ Turn on the city water supply.
- ◆ The water pump can be either off or on. It will not affect the water pump to leave it ON.



CAUTION: Some outside water sources develop high water pressure, particularly in mountainous regions. High water pressure is anything over 55 psi (pounds per square inch). Excess pressure on a hot day can cause the water hose to swell and burst. Excess pressure on a hot day can cause the water hose to swell and burst. An additional pressure regulator can be connected to the city water faucet to regulate the pressure to the potable water hose.

Hose Reel (Optional)

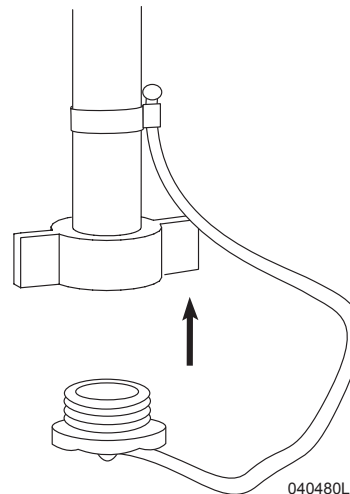
The potable water hose reel is located behind the water service center. The hose extends through an opening in the service center panel. The hose reel includes a 12 Volt DC motor for retraction.

To Retract the Hose Reel:

- ◆ Turn off the city water source and the water pump.
- ◆ Disconnect the water hose from the faucet.
- ◆ Press and hold the “Water Hose Reel” switch (located in the service bay).
- ◆ Guide the hose into the service center panel opening.
- ◆ Install plug in hose end.

Maintenance:

- ◆ Look for and prevent kinks while using the hose.
- ◆ Fully extend the hose. Straighten and clean the hose before retracting.



WATER PUMP

The water pump pressurizes the fresh water system when not connected to city water. The water pump is self-priming, operating on demand as water is used. The water pump is located behind the water service panel. Access the water pump by removing an access panel in the pass-through storage bay next to the water service center.

WARNING:

Before leaving the motorhome for extended periods of time (i.e. overnight or longer) be sure that the city water supply and water pump have been turned off. Damage from neglect will be the responsibility of the owner, not the manufacturer.

The water pump can be operated from the following locations:

- ◆ Bathroom/Vanity
- ◆ Galley
- ◆ Water Service Bay
- ◆ Hallway Monitor

To turn the water pump ON or OFF:

- ◆ Momentarily press the water pump switch. The indicator lamp on the interior switch will illuminate when the water pump is turned on.



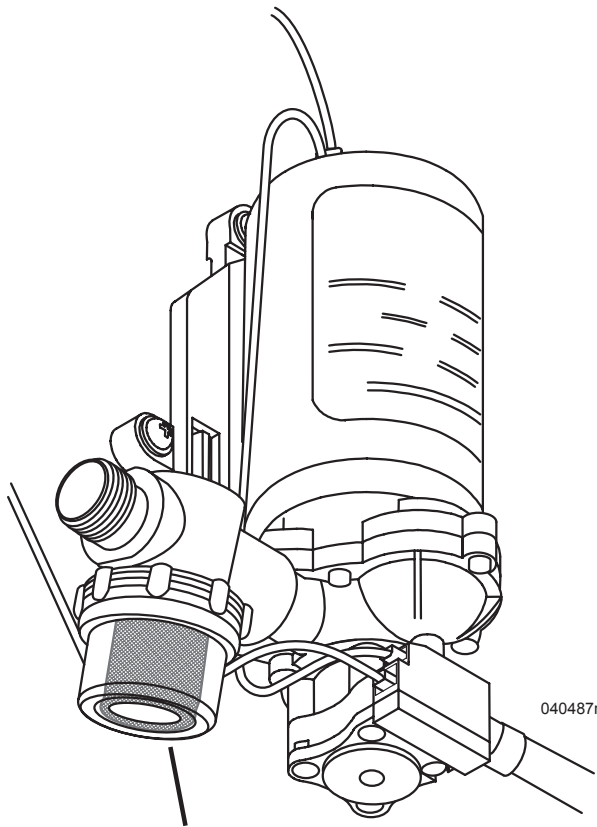
060297d
Interior Switch

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.

To operate the water pump:

- ◆ 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).

**Inlet Screen**

Clean every two months.

Water Pump Troubleshooting

Vibration induced by road conditions can cause the plumbing or pump hardware to loosen. Check the water pump system for components that are loose. Many symptoms can be resolved by tightening the hardware. Check the following items:

Water pump will not start or blows the fuse:

- ◆ Check the electrical connections, fuse or breaker, main switch and ground connection.
- ◆ Is voltage present at the pressure switch on the pump? If voltage is present, the pressure switch may be faulty. As a test, temporarily bypass the pressure switch.
- ◆ Check the charging system for correct voltage and good ground.
- ◆ Check for an open or grounded circuit or motor.
- ◆ Check for a seized or locked diaphragm assembly (water frozen).

Water pump will not prime or sputters (No discharge/motor runs):

- ◆ Is the pump inlet strainer clogged with debris?
- ◆ Is there water in the tank or has air collected in the water heater?
- ◆ Is the inlet tubing and plumbing sucking in air at plumbing connections (vacuum leak)?
- ◆ Check for proper voltage with the pump operating.
- ◆ Check the pump housing for cracks or loose drive assembly screws.

Water pump will not shut-off or continues to run when the faucet is closed:

- ◆ Check to see if the fresh water/tank fill valve is completely closed.
- ◆ Check the output (pressure) side plumbing for leaks and inspect for a leaky toilet or valves.
- ◆ Look for a loose drive assembly or pump head screws.

Water pump is noisy or rough in operation:

- ◆ Check for plumbing that may have vibrated loose.
- ◆ Does the mounting surface multiply noise (flexible)?
- ◆ Check for mounting feet that are loose or compressed too tight.
- ◆ Look for loose pump head to motor screws.

Water pump is rapid cycling:

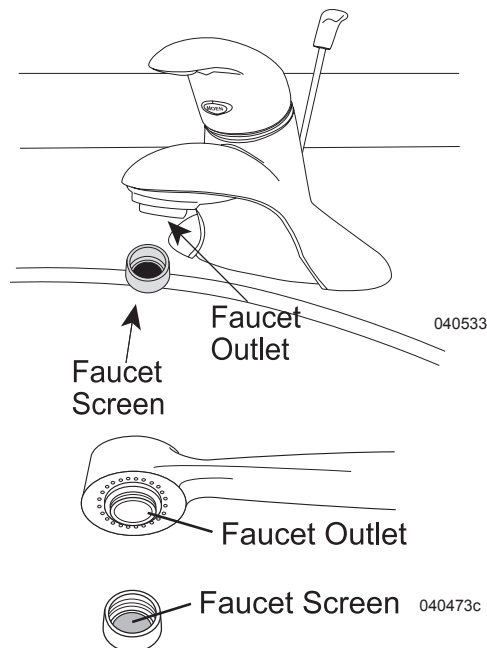
- ◆ Look for restrictive water flow in the faucets or shower heads.

FAUCETS

The kitchen faucet head has a flexible hose allowing the faucet head to be removed from the base. O-rings seal the faucet head to the base preventing water from dripping into the cabinet. Push the button to select either stream or spray. A liquid soap dispenser is also provided in the bath and vanity for hand washing.

To clean faucet screens:

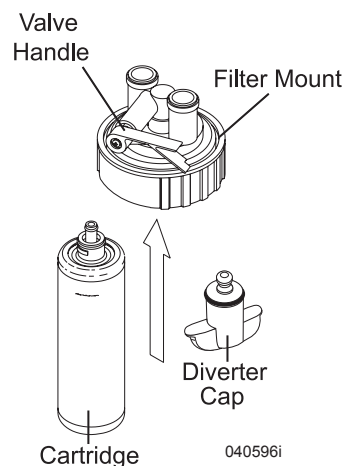
- ◆ Unscrew kitchen - screen retainer from faucet head.
- ◆ Lavatory/vanity - remove threaded collar from faucet outlet.
- ◆ Clean screen using a small, soft brush, and a de-liming solution if necessary.
- ◆ Install screen and check water flow.

**WATER FILTER**

A water filter, located in the water service bay, filters all water used in the motorhome. The filter mount is installed with a diverter cap in place for winterization purposes. The diverter cap is FDA approved for use with potable water, but it will not withstand sustained water pressure. Install the water filter before pressurizing the water system.

Filter/Diverter Removal and Installation:

- ◆ Turn off water supply and lower the valve handle to stop water flow to the filter mount.
- ◆ Turn the filter/diverter counterclockwise until it stops. Pull it down and out of the filter mount.
- ◆ Insert the filter/diverter into the filter mount.
- ◆ Turn the filter/diverter clockwise until it stops. Gently pull down on the filter/diverter to ensure it is locked in place.
- ◆ Raise the valve handle to restore water flow through the filter mount.

**NOTE:**

Save the diverter cap for winterization and water system flushing procedures.

Filter Activation:

- ◆ Run cold water through a faucet for three minutes to activate the filter.
- ◆ Filtered water may appear cloudy for a few days after activation because of air in the filter cartridge. This does not affect water filter performance or water quality.

When to Replace Filter:

Replace the filter when water flow is diminished, the filter system capacity is reached, or at least once a year.

**WATER SYSTEMS
Troubleshooting**

Water system problems are generally caused by 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. Close drain valves. If the pump continues to run, take the motorhome to an authorized dealer for service.

Disinfecting Fresh Water

Disinfecting the water system with household bleach protects against bacteriological or viral contamination from common water sources.

When to disinfect the fresh water system:

- ◆ If the motorhome is new.
- ◆ If the motorhome has been in storage.
- ◆ Every three months during use.

Disinfecting the water system with household bleach protects against bacteriological or viral contamination from common water sources. Read the following instructions completely before attempting to disinfect the fresh water system.

When to disinfect the fresh water system:

- ◆ If the motorhome is new.
- ◆ If the motorhome has been in storage.
- ◆ Every three months during use.

To Disinfect the Water System:

1. Drain the fresh water tank. Close drain when done.
2. Remove water filter and install diverter cap.
3. Turn the "Tank Fill" lever to the tank fill position.
4. Prepare a disinfecting solution: Multiply tank capacity (in gallons) by 0.13. The result is the amount (in ounces) of household bleach to pour into fresh water tank. This yields a 50 PPM (parts per million) disinfecting solution in the water system that will act 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.
5. Attach a 5' to 10' potable water hose to the fresh water fill connection.
6. Use a small funnel to pour the correct amount of disinfecting solution into the hose.

7. Hook one end of another potable water hose to the short hose and the other end to a water source.
8. Use the water pressure to push the disinfecting solution into the tank.
9. Top off tank with fresh water.
10. Turn on the water pump in the motorhome.
11. Open each faucet and run the water until you smell a distinct bleach odor.
12. Turn off all faucets and allow the system to stand for four hours.
13. Drain the fresh water tank of the mixed solution.
14. Fill the water tank with fresh water. Thoroughly flush hot and cold lines with fresh water. Repeat this process until the chlorine bleach smell is no longer detectable in the water system.

NOTE:

For motorhomes equipped with water filters: remove them prior to disinfecting the system.

INFORMATION:

Household bleach is 5.25% Sodium Hypochlorite. Higher concentrations increase PPM Ratio.

Hydro-Hot (Optional):

The Hydro-Hot copper tubing is rated for use with fresh water and winterizing solutions only. Periodic flushing with other common household chemicals, including bleach, will have little or no effect on the product if properly rinsed with the fresh water afterwards. Failure of copper tubing, especially soft or flexible copper, can result if materials other than water

or winterizing solutions are allowed to reside inside the piping for extended periods of non-use. The most common cause for failure is due to an extended exposure to chlorine, solutions containing chlorine (i.e. bleach) or hydrochloric acid.

CAUTION:

DO NOT use vinegar to disinfect the water system. Vinegar will deteriorate the copper tubing inside the Hydro-Hot domestic water loop. Thoroughly rinse chlorine bleach or other concentrated chlorine bearing chemicals as they can also cause failure to the Hydro-Hot domestic water loop (copper tubing).

WASTE WATER SYSTEMS

Proper Waste Disposal

Dumping raw sewage from toilet holding tanks, except at authorized dumping stations, is universally prohibited. Most National, State and private parks have either a central dump facility or campsite hook-up for sewage. Many modern rest areas along the interstate now have dump stations available. Woodall's Campground Directory, Trailer Life's RV Campgrounds and Services Directory, Rand McNally's Campground and Trailer Park Guide, Good Sam Park Director (Good Sam Club) and other similar publications list dumping stations. Some major oil companies offer dump facilities at selected stations also.

What Not to Put in Waste Holding Tanks

- ◆ **DO NOT** use strong or full strength detergents to deodorize and disinfect. Use odor control chemicals made especially for holding tanks.
- ◆ Automotive antifreeze, ammonia, alcohol or acetone in holding tanks will dissolve plastic.
- ◆ **DO NOT** put large table scraps in the tanks. They could be stuck in or damage the valve seals.
- ◆ Facial tissue is thicker, softer and stronger than a rapidly dissolving tissue. White toilet paper dissolves faster than colored. To test tissue dissolving ability, immerse one tissue square into a jar of water. Shake the jar five times to determine if the tissue disintegrates into pieces or remains in one piece. **DO NOT** use any type of tissue that remains in one piece. Paper designed specifically for holding tanks is available at most RV supply stores.

NOTE:

Never dispose of sanitary supplies or other non-dissolving items into the system. Facial tissue, wet strength tissue, paper towels or an excessive amount of toilet tissue can create clogging in the holding tank system.

CAUTION:

DO NOT use any products that contain petroleum distillate or ammonia in place of RV odor controlling chemicals. Petroleum distillate or ammonia will damage the ABS plastic holding tanks and seals.

What to Put in Holding Tanks

Grey Water 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 that there is enough liquid 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.

Black Water Tank:

Before initially operating the toilet, treat the sewage holding tank with a pre-charge of water and an odor-control chemical (available at most RV supply stores). First, add approximately three gallons of water to the holding tank. Next, mix the chemicals, in accordance with the manufacturer instructions, with approximately one gallon of water. Pour mixture through toilet to the holding tank. Be careful not to spill the chemical on hands, clothing, toilet bowl or carpet. Hot weather conditions may require adjusting the amount of chemical used to control odor. Repeat the chemical pre-charge to the holding tank each time the tank is cycled.

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. Petroleum distillate or ammonia will damage the ABS plastic holding tanks and seals.

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.

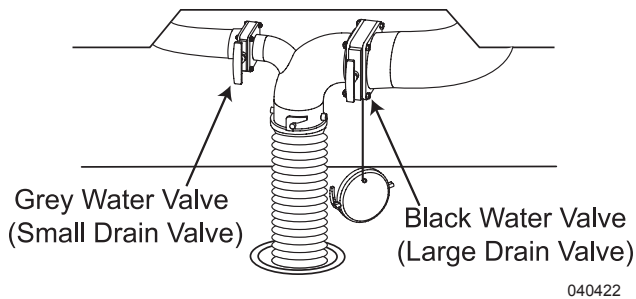
Drain valves and a tank flush system dispose of waste through a common termination. Each holding tank has a separate drain valve dumping the waste water (grey water) and sewage (black water) through a common single discharge outlet. The tank drain valves are located service center on the roadside. Use the Aladdin™ System 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 tank. Drain the grey water tank. Using this sequence helps to flush solids from the sewer hose. It is recommended that both holding tanks are less than half full when traveling.

Waste Drain System

The waste drain system includes waste valves and a flexible sewer hose. When it is time to dump either the grey or black holding tanks, connect the flexible sewer hose to the dump port at the service center. Place the other end of the hose in the appropriate waste dump site, and open the desired tank valve.

A flexible, 3" sewer hose connects the termination drain and the shore facility. Sewer hoses usually come in 10 or 20 foot lengths. The sewer hose is stored in a tube accessed through a door on the roadside next to the service bay. The shore fitting for the sewer hose may be a three or four-inch, male or female thread pipe; or a four-inch pipe with no threads, covered by a metal plate. Different styles of adapters are available to fit most configurations. Hose ladders may also be purchased to support the hose.

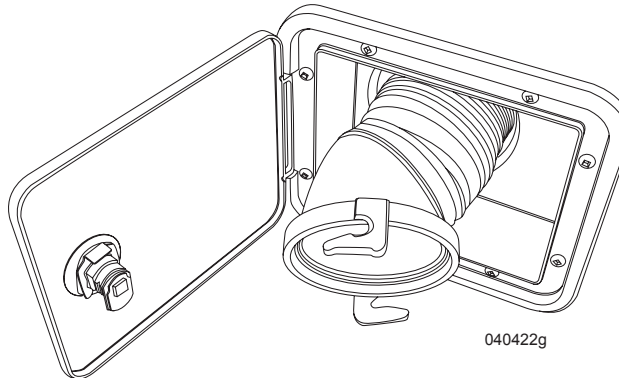
It is important that the hose remains secure. Always tighten clamps and restraining devices before use. Lay the hose inline between the termination outlet and the shore fitting. Restrain the hose to prevent movement during use. Wear protective and/or disposable gloves when handling the sewer hose.



To Attach the Hose:

- ◆ Remove sewer hose from carrier.
- ◆ Unscrew the access deck plate and feed the drain hose through the opening.
- ◆ Remove termination cap. Align coupler tangs with termination tabs. Twist coupler clockwise 90° to lock the coupler to the termination outlet.
- ◆ Attach the other end of the hose to the drain service. Restrain hose to prevent movement during use.
- ◆ Open the grey water valve.

The black water valve remains closed until the tank is full or until time of departure to help prevent clogging. Use the outside faucet or shower attachment for washing or rinsing the sewer hose after dumping the black tank.



LUBE:

Lubricate the O-ring on the sewer hose adapter periodically with silicone spray.

NOTE:

Close the grey water valve 24 hours prior to departing to allow the tank to fill with liquid to help in the dumping process.

NOTE:

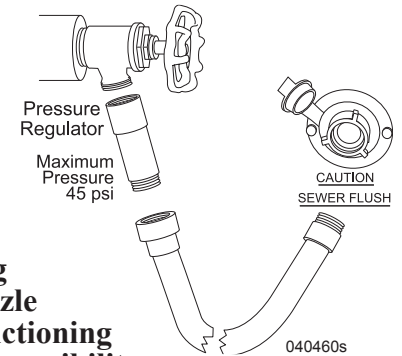
Use care when connecting the sewer hose adapter to the termination outlet in cold weather.

Tank Flush

The motorhome comes equipped with a power flush nozzle, located in the black tank to help reduce solid build-up. Flush the tank each drain cycle. Failure to thoroughly rinse the black tank may result in accumulated solids and a clogged spray nozzle.

NOTE:

The spray nozzle is a maintenance item, and as such is not a warrantable item. Keeping the spray nozzle clean and functioning is the sole responsibility of the owner.



Dumping the Tanks:

1. Close the grey water valve.
2. Fill the grey tank to at least 50% by running water in the shower or sinks.
3. Use the tank monitor in the service bay to observe tank levels. Stop filling the tank when the grey tank is half full.
4. Open the black water valve, and allow the black tank to drain.
5. Connect a non-potable water hose, with pressure regulator, to the flush system fitting located in the service center.

6. Turn on the faucet and allow water to rinse the black tank for at least three minutes. Never operate the system unattended. Ensure water flows freely through the drain hose.
7. Turn off the faucet and close the black water valve when completed.
8. Open the grey water valve. The water in the grey tank will flush remaining solids from the hose. The grey valve remains open until the next drain cycle or time of 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 will result in a clogged spray nozzle. Turn off the water supply when finished flushing the tank.

9. Close both valves when preparing for travel. Undo restraining devices from the hose. Disconnect the hose from the termination outlet by rotating the fitting counterclockwise 90°.
10. Install sewer hose in carrier and lock door.
11. If desired, add chemicals to the tanks to control odor. Follow the directions given by the manufacturer of the chemical.

NOTE:

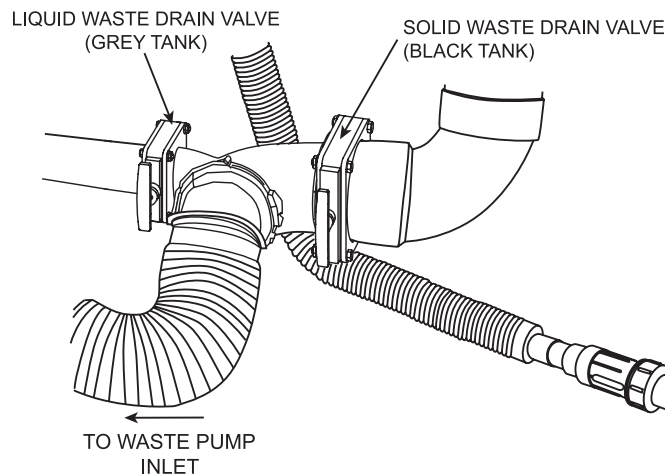
Dump the black tank before traveling.

Waste Pump (Optional)

The waste pump is a self-priming impeller pump designed to minimize clogging when draining the tanks.

To Empty the Black Tank:

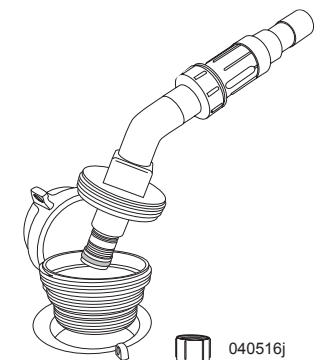
- ◆ Secure the macerator pump to the dump connection. Secure the waste pump outlet hose.
- ◆ Remove the drip cap at the bottom of the sewer pipe adapter.
- ◆ Insert the adapter into the sewer connection.
- ◆ Open the solid (black) waste drain valve at the plumbing service center.
- ◆ Turn on the macerator pump using the switch on the service center panel.
- ◆ Turn off the pump when the black tank is empty.



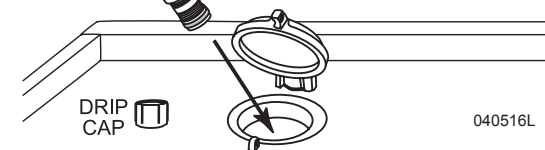
Insert hose end into sewer connection.

To Flush the Black Tank:

- ◆ Insert the sewer pipe adapter in the facility sewer connection.
- ◆ Open the solid waste drain valve. Close the liquid waste drain valve. Fill the grey tank at least 50% full.
- ◆ Connect a non-potable water hose with pressure regulator to the flush system fitting in the plumbing service center. Turn on the water supply and waste tank to rinse the black tank for at least three minutes. Never operate the system unattended. The water must flow freely through the waste pump outlet hose.
- ◆ When completed turn off the faucet.
- ◆ Close the solid waste drain valve and open the liquid waste drain valve. Turn on the waste pump. The water in the grey tank will flush the remaining solids from the sewer hose. The liquid waste drain valve remains open until the next drain cycle or time of departure.



Sewer hose end with adapter.



When Preparing for Travel:

- ◆ Empty the tanks and close both the solid and liquid waste drain valves. Undo restraining devices from the waste pump outlet hose. Drain the hose using a hand over hand method while working the hose toward the shore connection. Remove sewer pipe adapter from shore fitting and install drip cap. Coil and store hose in water bay.
- ◆ If desired, add chemical to the tanks to control odor. Follow the directions given by the manufacturer of the chemical.

NOTE:

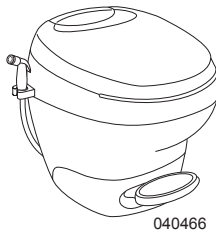
Drain both waste tanks before traveling.

Troubleshooting:

- ◆ The house battery disconnect switch (in battery compartment) must be on to operate the macerator pump.

**TOILET
Operating Instructions**

The toilet operates from either the fresh water tank or city water supply. Turn on the water pump, or connect to a city water source. The toilet flushes directly into a sewage holding tank (black water tank).



NOTE:

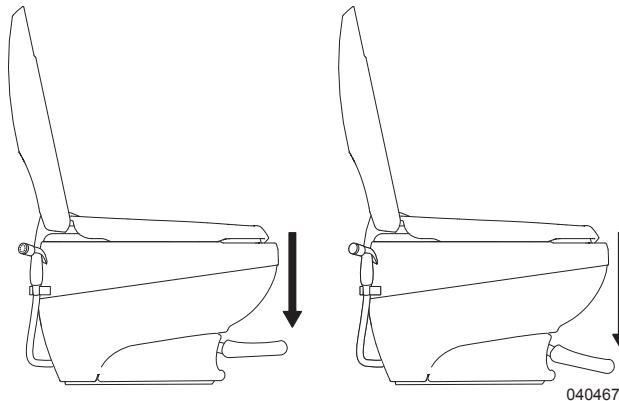
Add several gallons of water to the holding tank before use to prevent accumulation of solids.

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.

Toilet Operation:

- ◆ Push the flush down halfway to add water to the bowl. Generally, more water is required only when flushing solids.
- ◆ Push the lever all the way down to open the flush ball.



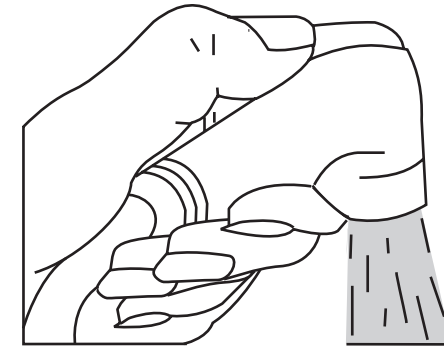
Water flow pressures vary at different locations; therefore, holding the flush lever down for several seconds may be required. Release the flush lever by allowing it to snap back, which permits positive sealing around the flush ball. A small amount of water should remain in the bowl.

NOTE:

Holding the flush lever down longer than necessary will result in excessive water usage.

Spray Nozzle:

- ◆ Depress the thumb lever and step on the foot pedal.



Cleaning & Maintenance

Cleaning the Toilet:

The toilet should be cleaned regularly for maximum sanitation and operational efficiency. Clean the toilet bowl with a mild bathroom cleaner. Do not use chlorine or caustic chemicals, such as drain opening types, as they will damage the seals.

Clean out the system by flushing several gallons of fresh water through with one cup of dry laundry detergent. Add odor control deodorant, in the amount specified for the holding tank capacity, after cleaning and every few days during use

Maintenance - Checking for leaks:

Check for leaks behind or under the 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, spray silicone on the toilet bowl valve and work it back and forth. Perform this maintenance monthly (silicone will evaporate in about 30 days).

Troubleshooting:**Leaks:**

- ◆ Back of toilet: check water supply line connection.
- ◆ Between closet flange and toilet: Check the screws for tightness. If the leak continues, remove the toilet and check flange height. Adjust the height, if necessary, to 7/16" above floor. Replace the flange seal if it is damaged.

Poor flush:

- ◆ A good flush should be obtained within two to three seconds. If the problem persists, remove the water supply line and check the flow rate. The flow rate should be at least ten quarts (9.5 liters) per minute.

Bowl will not hold water:

- ◆ Check for foreign material in the valve blade groove in the flush drain.

NOTE:

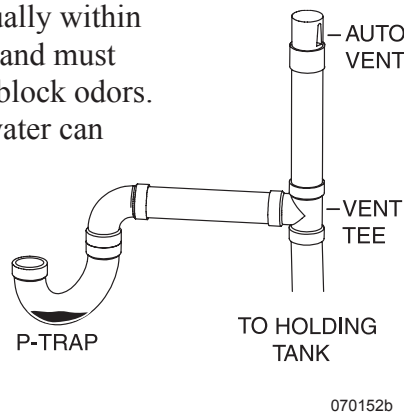
Most chemical mixtures for holding tank odor control are poisonous. Follow the product manufacturer's directions and warnings when using any holding tank additive.

Drain Traps & Auto Vents

Sinks, shower and clothes washer drains incorporate a water trap (P-Trap) and auto vents to prevent waste water holding tank odor from entering the motorhome.

Drain Traps:

P-Traps are usually within 54" of a vent tee and must contain water 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 P-traps.

**AutoVents:**

The auto vent is designed to assist in the smooth flow of water in the drain without creating a vacuum. If stuck in the open position, the auto vent can allow grey odors to enter the motorhome. Some auto vents can double as "clean outs" in the event the line needs to be snaked out.

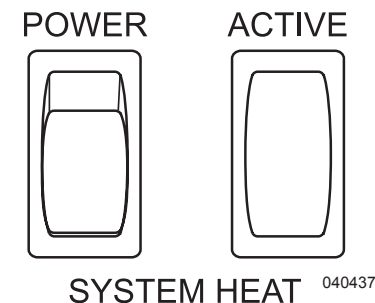
COLD WEATHER CONDITIONS

The motorhome is not designed for extended use in below freezing (32°F/0°C) weather. There are precautionary measures that can be taken during 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 temperatures can adversely affect water systems below the floor level because the LP-Gas furnace heat does not provide heat to these components. A supplemental 12 Volt bay heater is located in the water service bay. The System Heat switch on the hallway monitor panel operates the bay heater and should be turned on when ambient temperature approaches 44°F (+/- 6°F) and freezing temperatures may occur.

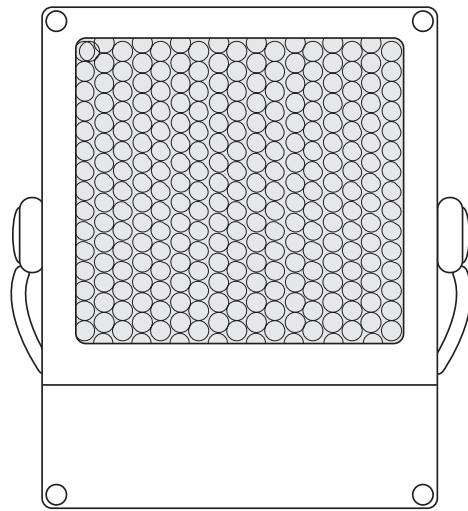
System Heat

A 12 Volt bay heater is located behind the water service bay. The bay heater will prevent waterlines from freezing and should be turned on when ambient temperature approaches 44°F (+/- 6°F) and freezing temperatures may occur. The System Heat switch on the hallway monitor panel operates the bay heater.



System Heat Operation:

1. Turn the Systems Heat switch on.
2. The bay heater will activate when the bay temperature reaches 40°F (+/- 6°F). The bay heater and the systems heat active light will turn on. The heater will continue to operate until bay temperature reaches 55°F (+/- 6°F). The bay heater and active indicator light will then turn off.



Bay Heater: Located behind Water Service Bay. 030981e

NOTE:

The bay heater consumes about 20 Amps when operating. House battery power can be quickly consumed. It is recommended to connect to shore power when using the bay heater.

Hydro-Hot Bay Heater (Optional):

The optional Hydro-Hot includes a heat exchanger in the basement that operates when the Hydro-Hot is on and temperatures drop below 45° F.

Cold Weather Storage

If the motorhome is stored where freezing temperatures may occur, drain the domestic fresh water loop. Begin draining the fresh water tank by opening the low point drain for the fresh tank and allowing the water to drain.

NOTE:

Icemakers, water filters, water heater and the Optional Hydro-Hot all use domestic water and should be drained and stored in accordance with the manufacturer’s recommendation for winterization.

WINTERIZATION

Water, plumbing and sewer systems require winterization when the motorhome is placed in storage. The recommended method of winterizing the motorhome is using air pressure to remove liquids that may freeze and cause damage to the various systems and appliances. The lines can then be left empty or filled with an FDA approved RV antifreeze. When plumbing lines are drained, antifreeze is not necessary, and the decision to use antifreeze is left to the motorhome operator.

NOTE:

ONLY FDA approved RV antifreeze should be used to winterize the water systems in the motorhome.

Using Air Pressure

Access to an air compressor, and an adapter to connect the air line regulator to the water system, is necessary. Air adapters used for winterizing are available at RV supply locations. Air pressure should not exceed 40 PSI. Higher pressure can damage the lines.

1. Empty and flush the holding tanks.
2. Drain the fresh water tank by opening the drain valve located in a front roadside bay.
3. Open all low-point drain valves (located in service bay). Let all the water drain. If equipped with a LP-Gas water heater, position the winterize valve to by-pass. Remove drain plug to drain tank.
4. Remove water filter and install diverter caps.

CAUTION:

Neglecting to winterize the optional Hydro-Hot during freezing temperatures will result in serious damage to the domestic water heating system. Vehicle Systems recommends winterizing the Hydro-Hot domestic water loop with FDA approved antifreeze. Instructions for this procedure can be found in the Hydro-Hot owner’s manual.

5. Connect an air hose with regulator to the City Water connection. Turn the tank fill lever to the “City Water” position. Set regulator for 40 psi and turn on air. (Air adapters for winterizing are available at RV supply locations.)
6. When water stops flowing from the drain valves, open and close the faucets one at a time, hot and cold, until only air comes out. **DO NOT** forget the toilet and any outside faucets.
7. Hold the toilet flush mechanism open until the water has stopped running.
8. Disconnect the air hose with adapter and turn the tank fill lever to the “Tank Fill” position.
9. Close all valves and faucets.
10. If applicable winterize the washer/dryer (see “Winterize the washer/dryer”).
11. Use one (1) gallon of FDA approved RV antifreeze 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. This will protect the P-traps, with some of the antifreeze going into grey tank to protect the drain valve. Open the valve on the toilet. Pour another 3 pints into the toilet, letting the antifreeze run into the black tank to protect the drain valve. Use a soft cloth to wipe out the sinks, shower and toilet (after the antifreeze is poured in) to protect the surfaces from stains. Pour the last pint into the washer/dryer drain.

WARNING:

Ensure the water is not hot when opening the low-point drain lines. Hot water from the lines can cause burn injuries.

Using Nontoxic Antifreeze

About eight gallons of FDA approved RV antifreeze will be required to winterize the motorhome.

WARNING:

Use only specifically designed, non-toxic, FDA Approved RV antifreeze for potable water systems. NEVER use automobile engine antifreeze. If ingested, antifreeze can cause serious injury or death. ALWAYS keep antifreeze away from pets.

WARNING:

Turn off the Hydro-Hot (optional) and allow it to cool before starting winterizing procedures. Hot water can result in burn injuries.

CAUTION:

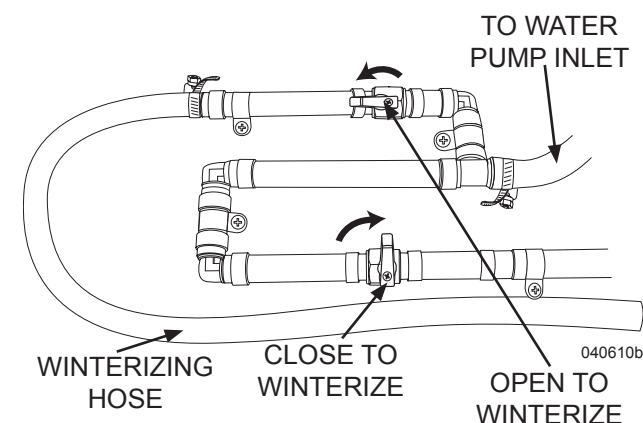
It is recommended that a qualified RV service technician familiar with motorhomes, such as an authorized dealer, perform the winterizing procedure.

1. Empty and flush the holding tanks.
2. It is not necessary to blow out the lines with air. Close valve located between water pump and fresh water tank.

CAUTION:

Ensure the fresh water tank is completely drained as antifreeze will not enter the fresh water tank.

3. Drain the fresh water tank (valve located on fresh water tank in roadside bay).
4. Remove water filter and install diverter cap.

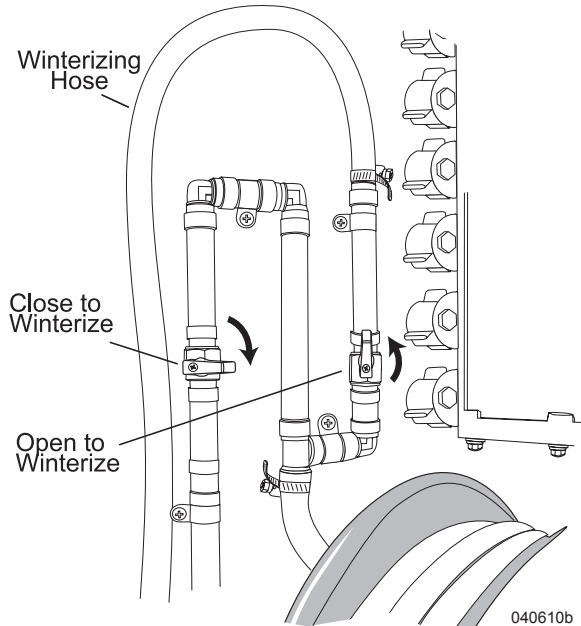


5. Open all low point drains and allow to drain.
6. Close all faucets, drain valves and low point drains.
7. If equipped with a water heater, remove drain plug and allow to drain. Replace plug and place the bypass valve (located on interior side of water heater) to the bypass position.

CAUTION:

Ensure water is cool before draining the water heater.

- Turn winterizing valves at the inlet side of the water pump to the Winterize position (see illustration). Set the winterizing tube into the container of non-toxic FDA approved RV antifreeze.



Winterization hose located in Service Bay.

- Turn on the pump.
- Turn on all the faucets, one at a time, hot and cold, starting with the faucet farthest from the pump. When antifreeze is present, pour one cup into the drain to fill traps and turn the faucet off. **DO NOT** forget the toilet and all outside faucets.

- Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
- Disconnect the power supply line for the water pump.

NOTE:
Some items (optional and otherwise) such as the icemaker, washer/dryer and dishwasher may require special instructions. Check all OEM manuals for instructions and recommendations.

NOTE:
Clean up spilled antifreeze immediately to prevent permanent staining.

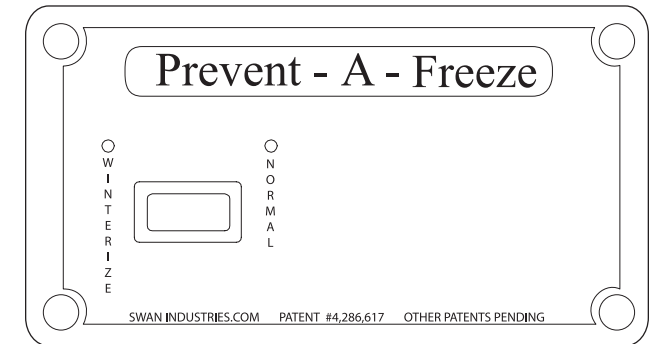
De-Winterization

To de-winterize: drain and fill the fresh tank with water. Connect the power supply line for the water pump. Switch the winterizing valves back to normal flow position. Operate all faucets, one at a time, until clear water is present. Add water to water heater. Install new water filters if so equipped.

NOTE:
The first two trays of ice from the icemaker may contain contaminants. Discard and replenish the icemaker as necessary.

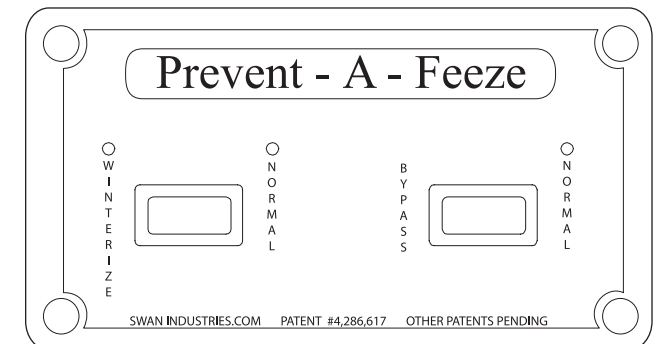
Prevent-A-Freeze System (Optional)

Depending on the size of the motorhome as much as eight gallons of FDA RV winterizing antifreeze will be needed to be added to the storage tank. The Prevent-A-Freeze switch is located in the service center.



With Optional Hydro-Hot

040578B



For Motorhomes without Hydro-Hot

040578c

- Turn the water pump off.
- Fill the storage tank (located behind service center) with FDA RV winterizing antifreeze.

3. Open all low point drains and drain valves to drain the fresh water tank and fresh water lines. The fresh water tank drain is located in a front roadside bay, and low point drains are located in the water service bay.
4. Remove water filter and install diverter cap.
5. Drain the holding tanks. Close valves when tanks have drained.
6. Close all faucets, drain valves and low point drains.
- 7a. On motorhomes equipped with a water heater, set the Prevent-A-Freeze switches to “Winterize” and “Bypass”.
- 7b. On motorhomes equipped with the optional Hydro-Hot, set the Prevent-A-Freeze switch to “Winterize.”
8. Turn the water pump on and operate each faucet individually until a small amount of antifreeze is present. Allow about a cup to run into the drain to fill traps.
9. Close all faucets.
10. Open the shower faucets and toilet valves to allow a small amount of antifreeze to run into the holding tanks.
11. Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
12. Exterior faucet should be opened and closed using the same procedures as the interior faucets.
13. If applicable winterize the washer/dryer (see “Winterize the washer/dryer”).
14. If the motorhome is equipped with an icemaker, see the refrigerator manual for winterization procedure.
15. Turn water pump off.
16. Open a hot and cold faucet to relieve line pressures then close the faucets.
17. Leave Prevent-A-Freeze switch in “Winterize” position until de-winterization.

WARNING:

Use only non-toxic RV antifreeze for potable water systems. Automotive antifreeze, if ingested, can cause blindness, deafness or death. Always keep antifreeze away from pets.

De-winterization:

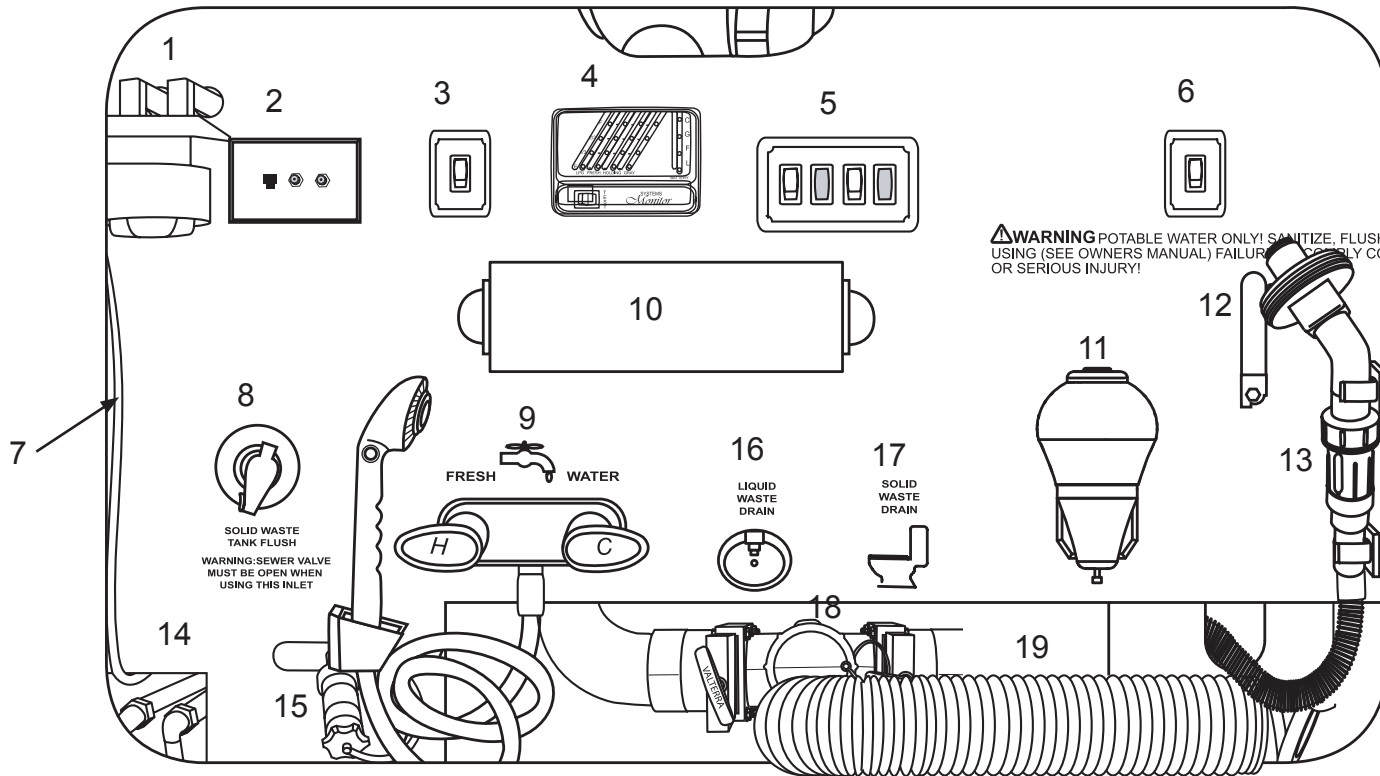
1. Fill the fresh tank with water.
2. Turn the Prevent-A-Freeze switches to Normal position.
3. Turn water pump on and operate all faucets, one at a time, until clear water is present.
4. Open the shower faucets and toilet valves until clear water is present.
5. Install a new water filter.
6. If applicable, cycle icemaker several times until fresh water is present.
7. If applicable, operate washer/dryer to purge antifreeze from washer.
8. The antifreeze can be collected in a container for reuse in the system.

CAUTION:

Discard the first two trays of ice from the icemaker. They may contain contaminants.

SERVICE CENTER

1. Water Filter Mount.
2. TV and Phone Hookups.
3. Power Hose Reel (Optional) Switch.
4. Monitor Panel.
5. Storage Light and Water Pump Switches.
6. Waste Pump (Optional) Switch.
7. Winterization Hose.
8. Black Tank Flush Connection.
9. Exterior Shower.
10. Paper Towel Dispenser.
11. Soap Dispenser.
12. City/Fresh Water Fill Valve.
13. Waste Pump (Optional) Sewer Connection.
14. Low Point Drains.
15. Potable Water Hose.
16. Grey Tank Drain.
17. Black Tank Drain.
18. Termination Drain.
19. Sewer Hose.



Typical Service Center Layout.

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2007 SCEPTER | LP-GAS SYSTEMS | SECTION 7

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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 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 ignition 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 personnel 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 authorized service personnel 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 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:

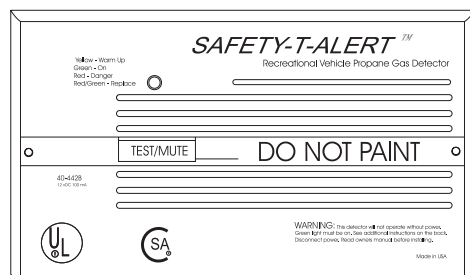
LP-Gas is highly volatile and extremely explosive. DO NOT use matches or a flame to test for leaks. Only use approved LP-Gas leak testing solution for leak detection. Unapproved solutions can damage copper tubing and brass fittings. A liquid dish soap solution of 10 parts water may be used. Shake the 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 State and Canadian province 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.*”



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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, which may 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 expands outward. If a burner is left on, the area around the burner, range and adjoining counter space is combustible and can cause injury and damage when ignited. This condition will exist for an extended time. Eventually, 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, 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 cases has not masked an actual LP-Gas alarm condition.

The LP-Gas 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 at a rate of less than 1/10th of one amp.

CAUTION:

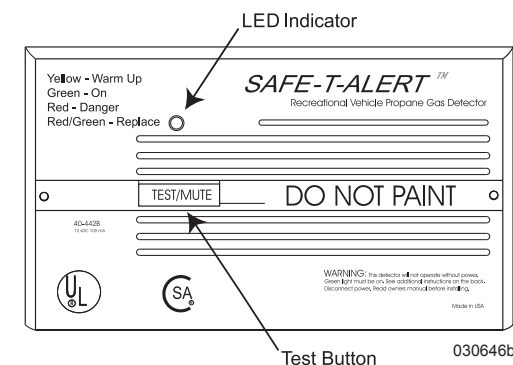
The detector will not alarm during the three minute warm up cycle.

Testing

Press the TEST switch any time during the warm up cycle or while in normal operation. The LED will turn red and an alarm will sound. Release the switch. This is the only way to test 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.



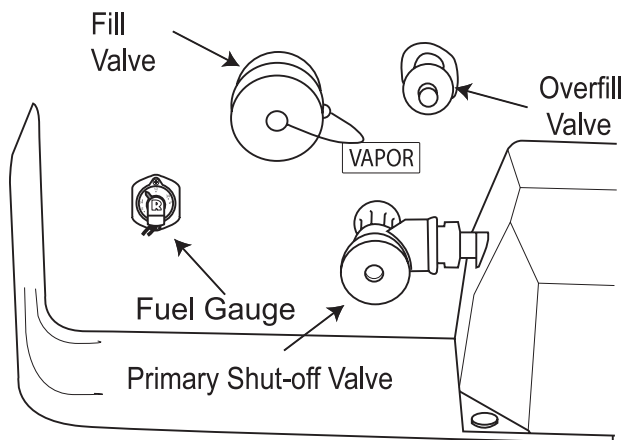
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Alarm

The red LED will flash and the alarm will sound whenever dangerous levels of LP-Gas or natural gas are detected. The detector will continue 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 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 switch** when the detector is in alarm.

1. The red LED will continue to flash and the alarm will beep 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:

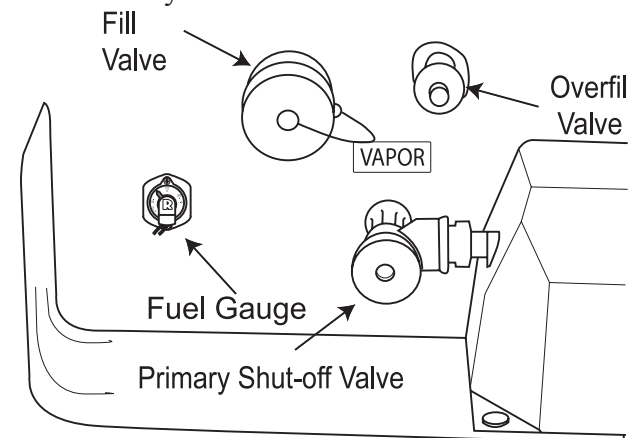
Should the microprocessor sense a fault in the gas detector, a fault alarm will sound twice every 15 seconds. The LED will alternately flash red to green and the **MUTE** switch will not respond to any command. The gas detector must be repaired or replaced.

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:



Located in Curbside Bay

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WARNING:

A fire or explosion from ignited gas or gas fumes can cause serious injury or death.

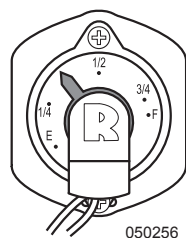
POTENTIAL SOURCES OF LP-GAS LEAKS WHEN OPERATING THE MOTORHOME

- | | |
|-------------------|---------------------------------------------------|
| ◆ Cooktop Burners | ◆ Defective LP-Gas Connection |
| ◆ Oven | ◆ Defective Regulator |
| ◆ Refrigerator | ◆ Portable Propane Powered Appliances/Accessories |

- ◆ Shut off LP-Gas appliances.
- ◆ Manually turn off the 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.

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 LP-Gas tank provides a quick view of the LP-Gas level and the Aladdin™ System will also provide a percentage full reading on the **COACH TANK/MISC STATUS** screen.



050256
Located on LP-Gas tank.

Tank Capacity

LP-Gas Tank Capacity
*31 Gallons
<small>*Actual filled LP-Gas capacity is 80% of listing due to safety shut-off required on tank.</small>

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:
Turn off all pilot lights and LP-Gas operated appliances before entering a refueling station. Most LP-Gas appliances used in motorhomes are vented to the outside. Fuel vapors can enter those vents when a motorhome 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. The tank must be filled to the proper level to allow for expansion. A overfilled tank may cause the safety valve to release pressure emitting a strong rotten egg odor near the tank and/or a hissing noise may be detected.

WARNING:
Small amounts of LP-Gas can escape and evaporate during the fueling process. Protect bare skin. Instant freezing will occur if exposed to LP-Gas.

LP-Gas exists in both liquid and vapor form within the tank. A full tank is approximately 80% liquid. The pressure inside the tank varies with liquid temperature. All tanks are required to have a safety pressure relief device to release excess pressure. When the tank is full, the gauge on the tank will only read 3/4.

NOTE:
If the tank is new and being filled for the first time, inform the service technician to purge any air from the tank prior to filling.

COACH TANK/MISC STATUS		
FRESH TANK	PCT	XXXXXXX
	GAL	XXXXXXX
GRAY TANK	PCT	XXXXXXX
	GAL	XXXXXXX
BLACK TANK	PCT	XXXXXXX
	GAL	XXXXXXX
LP TANK	PCT	XXXXXXX
BASEMENT TEMP	F	XXXXXXX
OUTSIDE TEMP	F	XXXXXXX

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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. This will over-tighten 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-Gas tank is open.

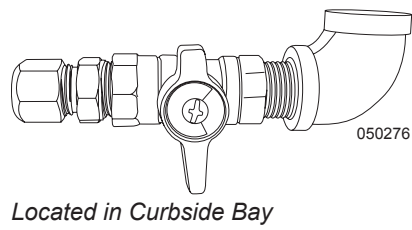
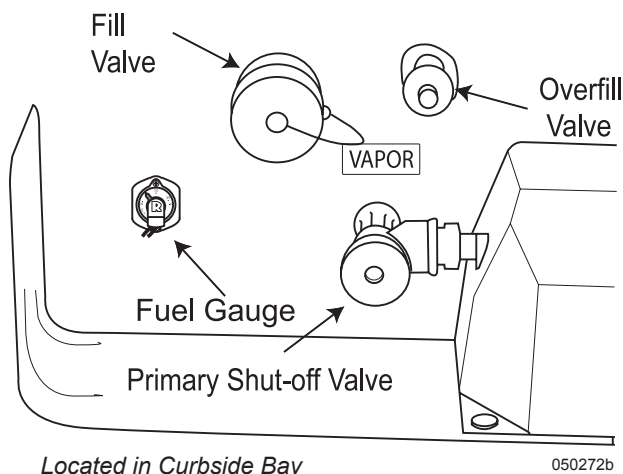
Accessory Hookup

Exterior Gas Line Hookup Prep:

An auxiliary remote LP-Gas hookup is for external LP-Gas accessories and is to be used for external components only. For safety, only approved LP-Gas quick disconnect fittings and flexible hose should be used to connect external accessories to the remote hookup. A LP-Gas quick disconnect fitting should be installed by a qualified agency as defined in the National Fire Protection Association NFPA (Fire) 54-02 code.

NOTE:

Check for leaks on all connections each time the remote hook-up is used. If a leak is detected, turn off the primary valve at the main LP-Gas tank. Contact a qualified service center for the necessary repairs.



QUICK DISCONNECT FITTING

NOTE:
COUPLING TO BE INSTALLED BY A QUALIFIED AGENCY AS DEFINED IN THE NATIONAL FUEL GAS CODE (NFPA 54)

INSTALLATION INSTRUCTIONS

- 1) INSTALL SOCKET WITH SHUT-OFF V VALVE ON THE GAS SUPPLY SIDE
- 2) INSTALL PLUG ON THE ACCESSORY SIDE
- 3) LEAK TEST USING SOAPY WATER SOLUTION

OPERATING INSTRUCTIONS

TO CONNECT:

- 1) CLOSE SHUT-OFF VALVE
- 2) PULL SOCKET SLEEVE BACK
- 3) INSERT PLUG; RELEASE SLEEVE
- 4) PUSH PLUG INTO SOCKET UNTIL SLEEVE SNAPS FORWARD
- 5) OPEN SHUT-OFF
- 6) LEAK TEST USING SOAPY WATER SOLUTION

TO DISCONNECT:

- 1) CLOSE SHUT-OFF VALVE
- 2) TO RELEASE PLUG, PULL SLEEVE BACK AWAY FROM PLUG; PULL OUT PLUG
- 3) INSERT PLUG; RELEASE SLEEVE
- 4) LEAK TEST USING SOAPY WATER SOLUTION

! WARNING

Hazardous vapors, explosive and flammable gas. Can cause suffocation severe injury or death.

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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

The above capacities allow for 20% vapor space on each cylinder. Data taken from the National Fire Prevention Association (NFPA). Pamphlet #58-1998.

CONVERSIONS

Gallons to Liters (1 Gallon = 3.785 Liters)
 Fahrenheit to Celsius (F° - 32 ÷ 1.8 = C°)
 11 in. Water Column = 6 1/4 ozs. per sq. in. pressure.
 27.7 in. Water Column = 1 lb. per sq. in. pressure.

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
BTU Per Gallon	91,502
BTU 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 BTU (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 ¼ ounces per square inch.
- An inch of Water Column is a measurement of applied pressure to one side of a U-Tube ½ filled with water at sea level. The amount of pressure required to raise the water level 11", represents 11" of Water Column.

NOTE:

This 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.

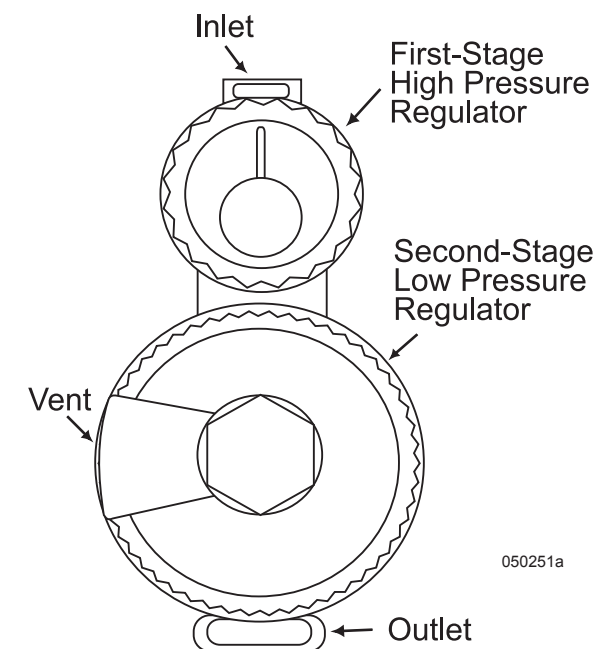
Under normal atmospheric conditions an LP-Gas regulator will not freeze, nor will the LP-Gas. Vapor passing through the regulator will expand and cool, condensing moisture in the gas. The moisture will freeze, build up and block the vent. The possibility of freeze up is greatly reduced with the two-stage 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 in the tank.



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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. Vaporizing liquid 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.

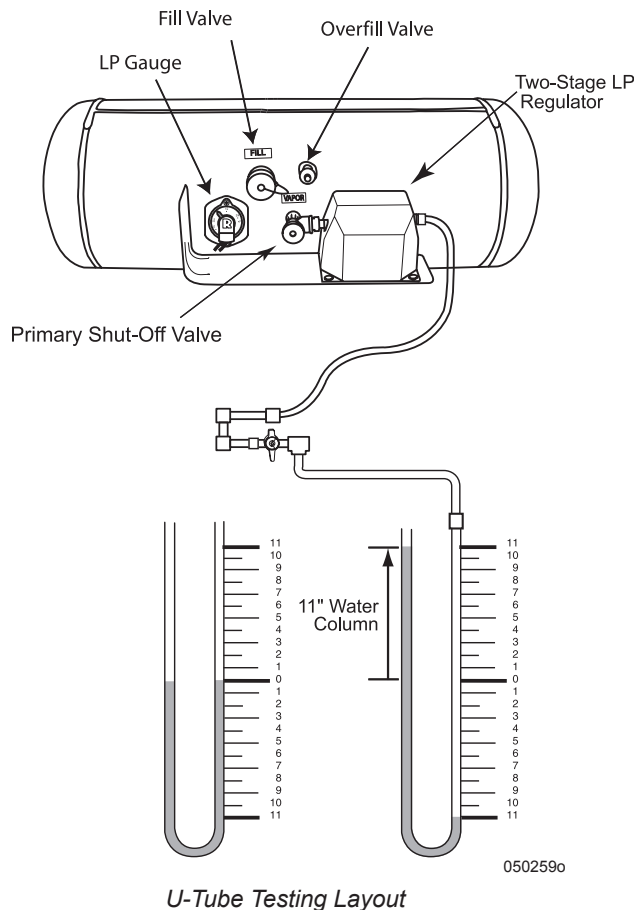
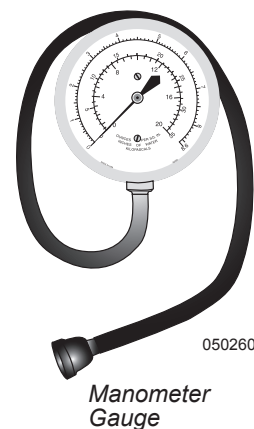
WARNING:

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 Inches of Water Column.

TIP:
Attach the manometer gauge to the accessory hookup line to avoid loosening any interior LP-Gas line connections.



LP-GAS HOSE INSPECTION

The hose manufacturer suggests that a flexible LP-Gas supply hose 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. 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 that has kinked or been flattened so as to permanently deform the wire braid in the un-pressurized state.
- ◆ Blistering or loose outer cover.
- ◆ Slippage evident by the misalignment of the hose and coupling and/or the scored or exposed area where slippage has occurred.

NOTE:

Only a qualified RV service technician should complete replacement of 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 ten (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.

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. It is recommended that gas distribution work be performed by an authorized dealer or an authorized service technician.

INSPECTION:

Inspect the rubber flexible lines twice a year for abrasions, tears, kinks or other signs of damage.

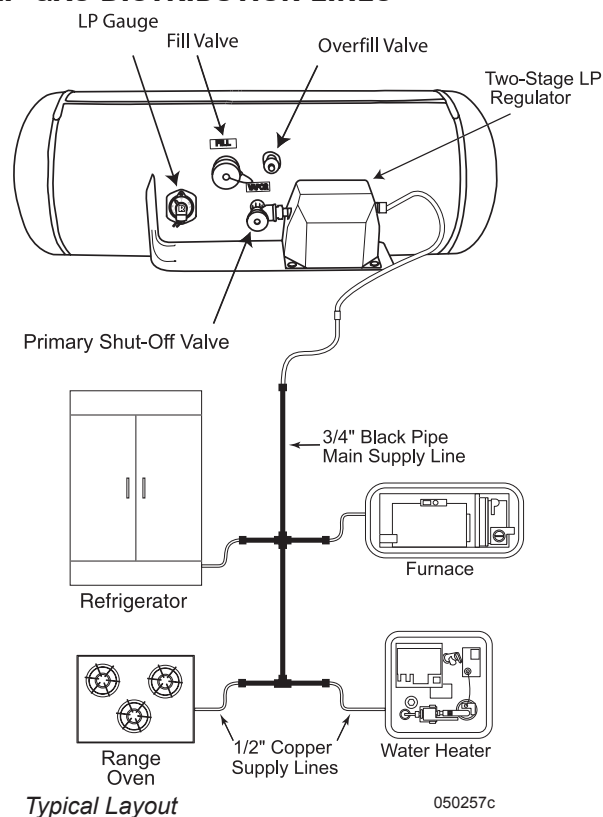
If a gas leak is suspected, have the system inspected and repaired by a qualified service technician as soon as possible.

- ◆ 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 approximately 9.2 hours.

The above formula can be useful when trying to determine the approximate length of time a tank of LP-Gas will last. Generally, LP-Gas appliances do not continuously operate. An example would be 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. This equals the approximate number of operation hours of before refueling.

LP-GAS DISTRIBUTION LINES**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 the rate of usage by each appliance and the operating time. The stove typically uses the most LP-Gas.

Determine Fuel Consumption:

Use the following formula to determine approximately how many hours an LP-Gas appliance will operate on one gallon of LP-Gas:

- ◆ 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.

Typical Appliance BTU Ratings

Cooktop

Large Burner - 12,500 BTU

Small Burner - 5,000 BTU

Refrigerator (Norcold)

4-door - 2,200 BTU

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 of enforcing 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 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**.

Maintenance and Safety Tips for the LP-Gas Refrigerator and Furnace:

- ◆ Have the refrigerator and furnace systems inspected annually by an authorized service center.
- ◆ Have the venting system checked for blockage before using the refrigerator or furnace for the first time each season. 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. 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, which indicates 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.
- ◆ Ensure children understand never to turn or play with the knobs on the front of the LP-Gas range.

Maintenance and Safety Tips for the LP-Gas Water Heater:

- ◆ Have the water heater venting system inspected annually or before first use of the season.
- ◆ Keep flammable substances away from the water heater. **DO NOT** store items close to it as this may block the airflow the water heater needs to operate completely.
- ◆ At the first indication of incomplete combustion (yellow flame instead of a blue flame or soot is present) call a service technician immediately. Improper combustion can cause Carbon Monoxide buildup, which is potentially fatal.

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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 component operating instructions.

General Overview:

The motorhome can utilize various sources of electrical power: shore power connection, generator, inverter, solar panels, chassis batteries and house 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. However, the inverter/charger AC power output is limited and should be used sparingly to conserve house battery power.

Two different sources supply the 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.

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 a 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 DC distribution panels.

The chassis and house systems 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 circuits 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. 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 DC 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.

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 are required to allow a proper and safe connection to the electrical service supply.

NOTE:

When 50 Amp shore service is not available, take care 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 ft. 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:

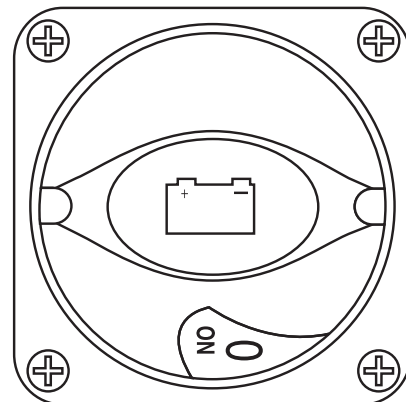
The Inverter/Charger is an auxiliary 120 Volt AC power source that inverts 12 Volt DC house battery power to 120 Volts AC. This device has limited AC power output, measured in watts, and operates only selected appliances and outlets. The Inverter/Charger also converts 120 Volts AC power, supplied from 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, and the fuse panel in the front electrical bay. The switch is located in the rear curbside bay on 36' - 40' motorhomes and in the rear engine compartment on 42' motorhomes (those equipped with a tag axle). Turn the house battery disconnect switch off when the motorhome is going to be stored for more than 48 hours or before performing electrical maintenance. If possible, leave the motorhome plugged into outside electrical service 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.

NOTE:

The optional solar panel will charge the batteries with the disconnect switches off.



Located in the rear curbside or engine compartment. 060077

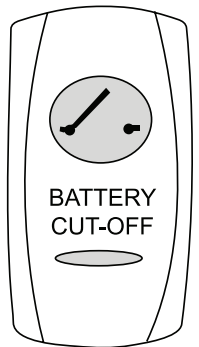
BATTERY CUT-OFF

The battery cut-off switch is located inside the motorhome next to the entry door. This switch controls the 12 Volt DC power to the domestic fuse panel and Multiplex System. When the switch is activated, power is supplied to all interior DC lighting and DC operated appliances. Some appliances will 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, it is not a substitute for the main battery disconnect switch.

CAUTION:

Avoid flash damage to electrical contacts. Turn off the interior lighting before operating the battery cut-off switch.



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SHORE POWER HOOK-UP

The power requirement for the motorhome is 50 Amp 240 Volt AC single phase. The motorhome can operate from 30 Amp 120 Volt AC with limited capacity. 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 and power consumption must be reduced to avoid tripping the shore power breaker.

CAUTION:

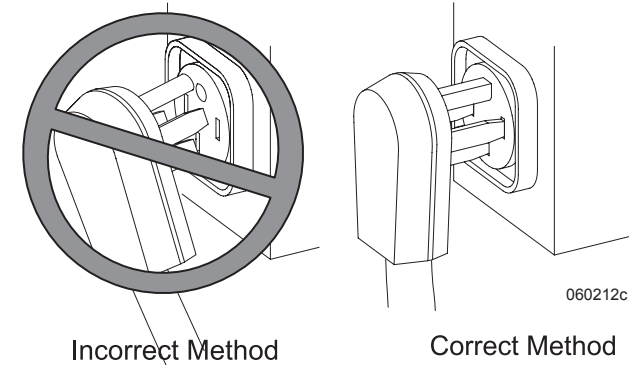
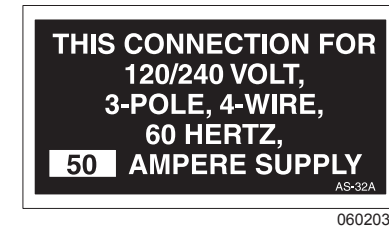
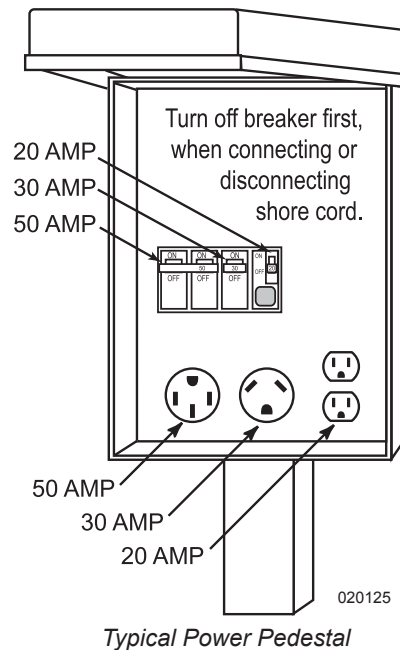
Avoid flash damage to the electrical system contacts. Before plugging the motorhome into shore power, starting the generator or using the inverter make sure all the appliances are off.

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 pedestal.



Plugging in Shore Cord:

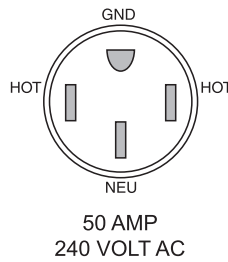
- ◆ The shore power cord is located in a roadside bay.
- ◆ Extend a sufficient amount of cord to reach the power supply. If 50 Amp service is not available, install the proper electrical adapter(s) to the cord.
- ◆ Always turn **OFF** the shore power breaker at the power supply, before connecting or 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.

Disconnecting Shore Cord:

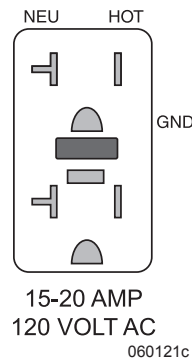
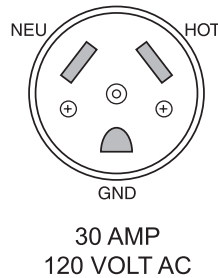
- ◆ Turn off all AC appliances.
- ◆ Turn off the shore power breaker. This will prevent accidental shock and flashing of electrical contacts when disconnecting.
- ◆ Grasp housing of electrical plug. Without touching electrical contacts, work plug out and away from socket.
- ◆ Wind or stow shore cord.

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.

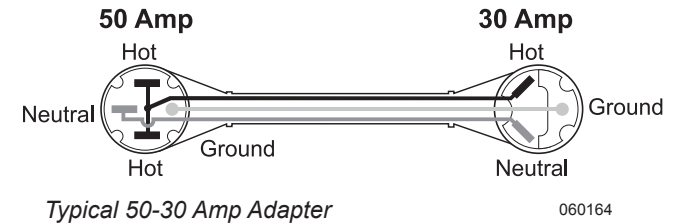
Power Supply:

Amperage supplies vary greatly depending on the amount of available current.

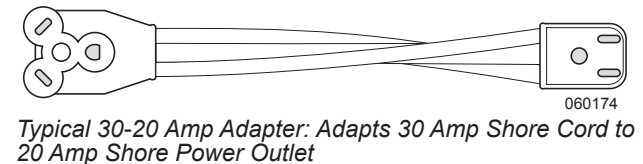
- ◆ The continuous amount of current through a breaker or fuse is only 80% of its rated capacity.
- ◆ 50 Amp 240 Volt AC shore power service consists of two power supply conductors, a neutral and a safety ground. The 50 Amp breaker simultaneously limits each power supply conductor to no more than a short-term maximum of 50 Amps for each conductor. The 50 Amp 240 Volt AC 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 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. This 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.



Power Cord Reel (Optional)

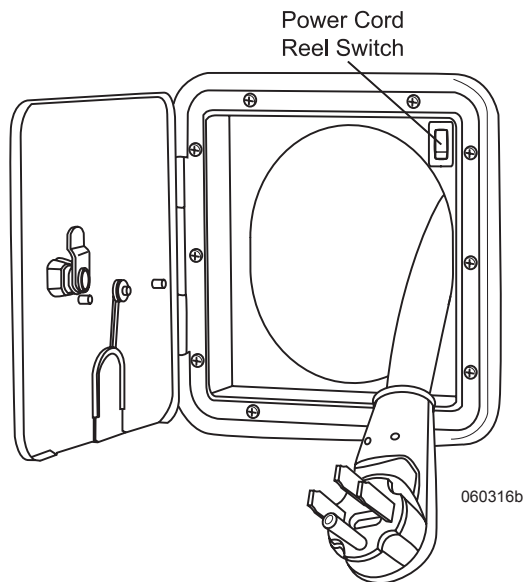
The Power Cord reel is a 12 Volt DC motorized assembly designed to mechanically coil and stow the shore cord. The power cord reel is located in a roadside hatch at the rear of the motorhome. The power cord switch operates a 12 Volt DC motor that retracts the cable.

Assist the cord when retracting. When connected to shore power, the cord should be slightly slack.

Maintenance:

Kinks may form in the shore power cable when only a short section is frequently used. Routinely extend the cable full distance and straighten the power cable on the ground to relieve kinking.

It is important the cable remains clean. Accumulated dust and dirt on the cable may cause difficulty in retracting the cord. Clean and straighten the cord before retracting.

**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 batteries. 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 occur causing personal injury, explosion or fire.

TRANSFER SWITCH

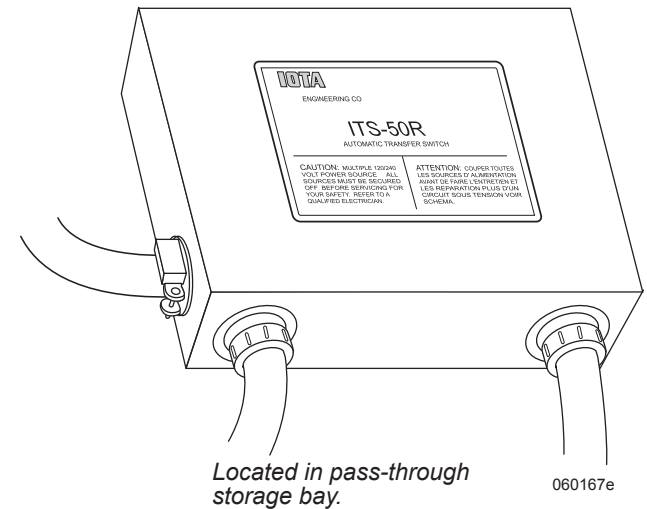
The transfer switch automatically transfers AC power from the shore power cord or generator through the transfer switch to the 120/240 Volt AC breaker panel. When using the generator as the power source, the transfer switch has a time delay built into it before transferring power to the AC breaker panel. This allows the generator time to warm up before applying an AC load. When operating the generator while hooked to shore power, the transfer switch automatically selects generator power as priority over shore power.

NOTE:

The shore cord is NOT electrically connected to the generator. When the generator is operating, the electrical contacts of the unplugged shore cord are not electrically energized.

NOTE:

DO NOT have appliances on or AC loads plugged into outlets when hooking to shore power or starting the generator. Damage to the transfer switch contacts may result. The transfer switch will begin to disengage at approximately 90 Volts AC. Operation at this voltage may damage the transfer switch, appliances or other items plugged into outlets. Start the generator and disconnect from shore service until the shore service supply voltage stabilizes.

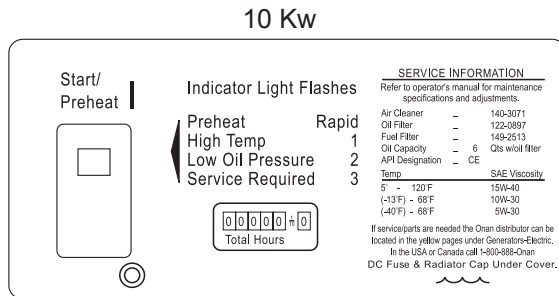


GENERATOR - 120/240 VOLT AC

The generator is located in the front compartment of the motorhome.

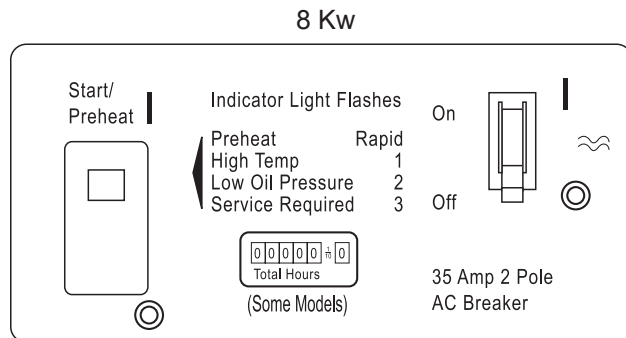
The generator can be started from the following locations:

- ◆ Generator remote switch on the dash.
- ◆ Generator control panel located on the generator.
- ◆ Hallway Monitor Panel.



42' models only.
240 Volt AC.

060144p

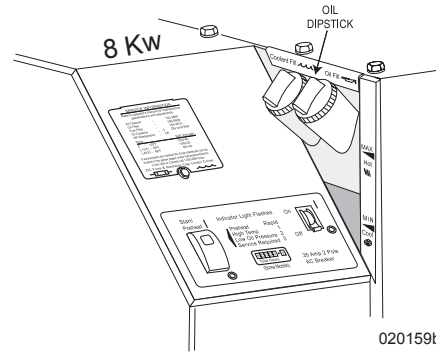


40' and smaller only.
120 Volt AC.

020159d

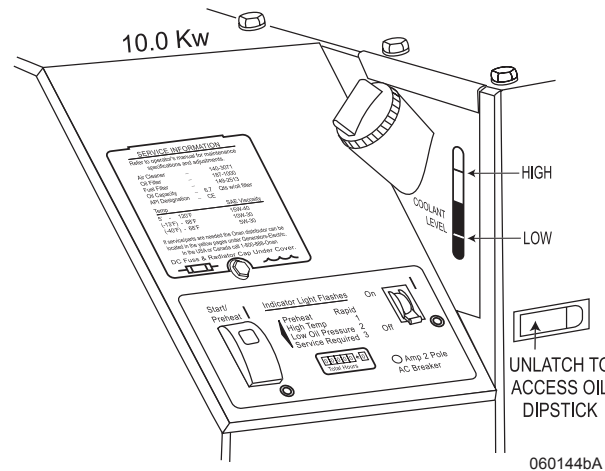
Pre-Start Checks

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.



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WARNING:
Disable the Auto Gen Start feature before servicing the generator.



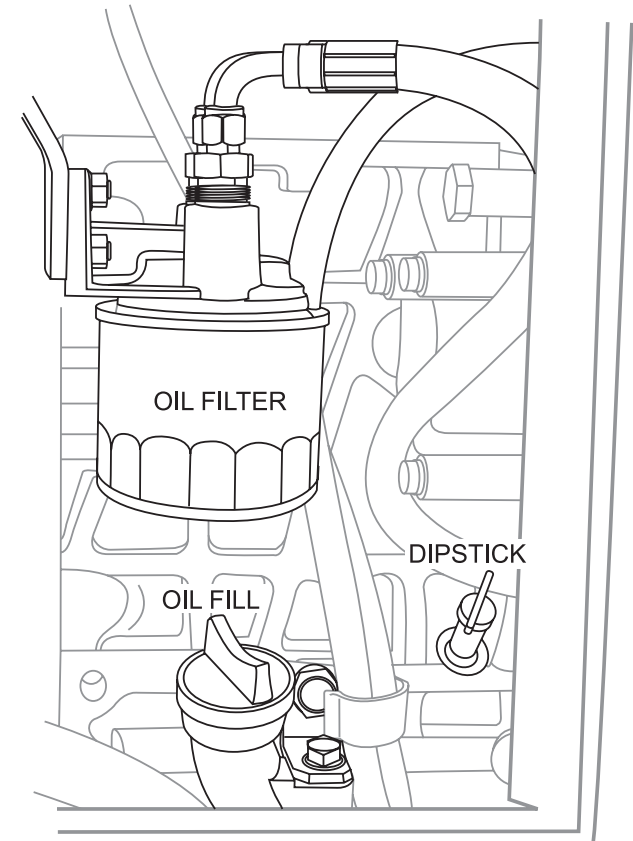
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Before Starting the Generator:

- ◆ Clear people and animals from hazards of electrical shock and moving parts.
- ◆ All appliances and other large AC electrical loads must be off.

NOTE:

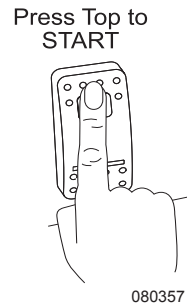
The generator may require priming. To prime hold control switch in the OFF position. Repeat if necessary. The diesel generator fuel pick-up tube is cut to approximately 1/4 tank so as not to run the main engine out of fuel.



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Starting the Generator

Push and hold the control switch in **START** position until the generator starts. Release switch. On diesel models, 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 more than 30 seconds at any one time. Wait at least two minutes before resuming. If the generator fails to start refer to the manufacturer's manual.

WARNING:

When the motorhome is parked, position the dash air conditioner vent control in the **OFF** position to prevent exhaust gases from entering the motorhome. The engine exhaust contains Carbon Monoxide, which is 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 the exhaust may accumulate either outside, underneath, or inside the motorhome or any nearby vehicles. Operate the generator only when safe dispersion of exhaust can be assured. Monitor the outside conditions to be sure that the exhaust continues to disperse safely.

WARNING:

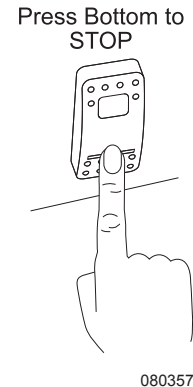
When parking near high grass, hot exhaust pipe or hot exhaust gases can ignite the grass.

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 the **STOP** position. Release the switch.



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.

Compensation for temperature and elevation may also be necessary. The generator's maximum output is rated at 500 ft. above sea level. Beyond this point, the generator will lose approximately 3.5% of its rated power for every 1000 ft. gained in elevation. High and low temperatures can also affect generator output. Power decreases 1% for every 10° F above 85° F. Counteract these effects by operating appliances in sequence rather than at the same time.

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 will greatly reduce the total output of the generator and may cause erratic AC output.

NOTE:

The motorhome manufacturer does not cover damage to the generator caused by fuel contamination, or to appliances due to erratic AC voltage.

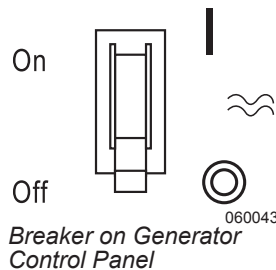
Average Fuel Consumption	Diesel 8,000 Watts (gal./hrs.)	Diesel 10,000 Watts (gal./hrs.)
No Load	.13	.1
Half Load	.49	.6
Full Load	1.02	1.1

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 will continue 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 to **OFF**, then switch back to **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 reconnecting loads.

NOTE:

An appliance or load may have a short if it causes a circuit breaker to trip after reconnection. 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 will help 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.

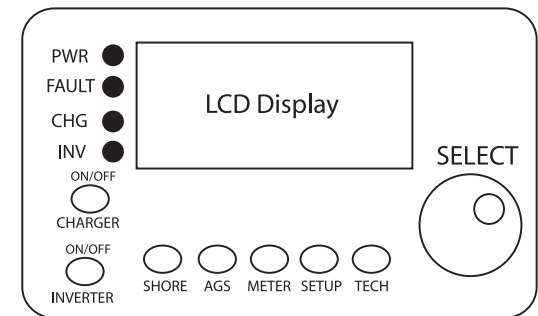
INVERTER

The inverter changes DC battery power to AC electrical power, and it also 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. 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 panel is used to change the variable settings.

Providing AC Power with Inverter

To turn the inverter on:

Press the **INVERTER ON/OFF** switch at the remote panel. If the inverter does not sense AC power from the generator or shore power, it will provide 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 will automatically begin charging.



Remote Panel: Located on hallway monitor.

Battery Charging with the Inverter

The inverter will automatically begin charging when AC power is supplied from shore service or the generator. The inverter uses a three-stage charge cycle to charge the batteries. The charger may be turned off if desired.

To turn the charger on and off:

- ◆ Press the switch marked **CHARGER ON/OFF** on the remote panel.

Shore Setting:

The Shore setting in the remote panel adjusts the amount of AC current the battery charger can use. If hooked to less than 50 amp service, select the proper Shore setting to help prevent combined AC loads such as the roof air conditioner and the charger from overloading limited shore power service.

To Adjust Shore Power Setting:

- ◆ Press the Shore button on the inverter remote.
- ◆ Turn the knob on the inverter remote left or right to scroll through shore setting options.
- ◆ Press the knob to select. An arrow will appear next to the selected setting.

NOTE:

Settings 20 Amp and below limits battery charge capacity and may hamper ability to efficiently operate DC electrical loads. Remember to reset to higher amperage when available.

Set To:

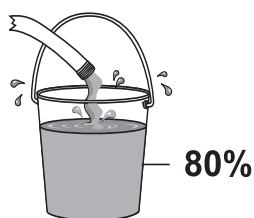
Shore Setting	AC Power
50 Amp	When hooked to 50 Amp Shore Service.
30 Amp	When hooked to 30 Amp shore service.
20 Amp	When hooked to 20 Amp shore service.
10 Amp	Used when shore service is severely limited or experiencing shore power overload.
5 Amp	Minimum charge capacity setting. Used when shore service is severely limited or experiencing shore power overload.

Inverter three-stage charging cycle:

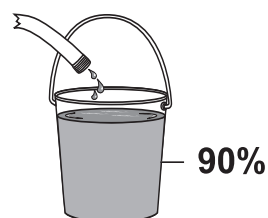
- ◆ **Bulk Charge Cycle:** Brings the DC voltage up high, initially between 14.2 - 14.6 Volts DC. The length of time the inverter is in Bulk Charge depends the state of charge of the batteries.
- ◆ **Absorb Cycle:** Absorb Cycle battery voltage is the same as the Bulk Charge Cycle, between 14.2 - 14.6 Volts DC. 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 DC. 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 (charger) on full until bucket (battery) is 80% full.



Absorb Charge
Water (charger) slows until bucket (battery) is 90% full.



Float Charge
Water (charger) slowly trickles into bucket (battery) until 100% full. Water (charger) will adjust flow to maintain level.

*Hose = Inverter in Charge Mode
Bucket = Battery*

Auto Generator Start

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 the front electrical bay. Refer to the OEM manual located in the Owner's Information File Box for detailed instructions.

To Enable AGS:

- ◆ Press the AGS button on the inverter remote panel. 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:

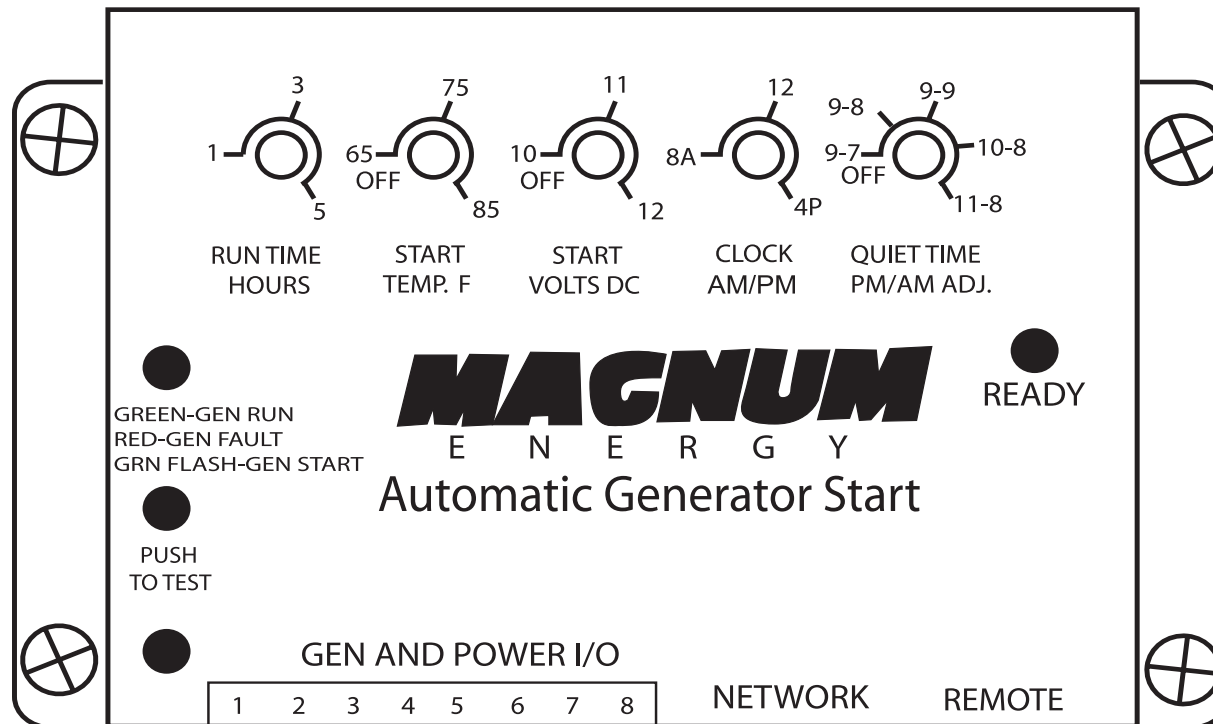
- ◆ Press the AGS button on the inverter remote panel. Use the select knob to scroll through the AGS menu options until “**AutoGenSt OFF**” appears. Press the select knob to deactivate the AGS.

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 %

Battery Temperature Sensor

A **Battery Temperature Sensor (BTS)** is affixed to one of the house battery terminals 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 will raise 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 will use a temperature default setting of 77° F/25° C as a reference point.



AGS Controller: Located in pass through storage bay with inverter.

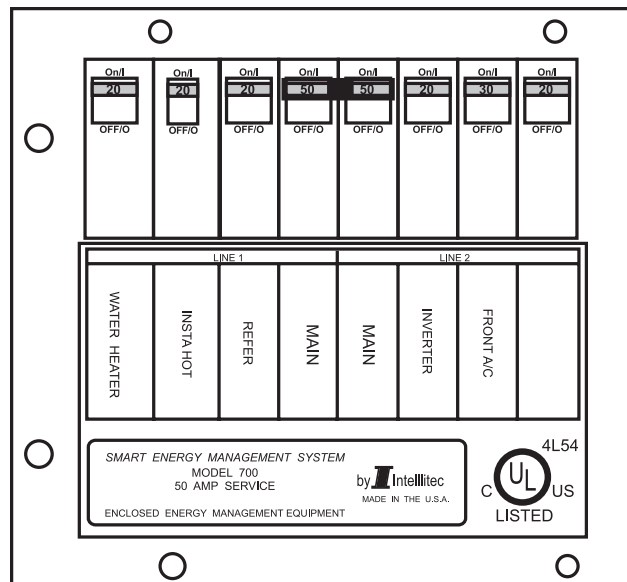
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DISTRIBUTION PANEL - HOUSE 120/240 VOLT AC

The AC distribution panel is 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. The 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.

WARNING

The 120/240 Volt AC panel contains high voltage which can cause serious injury or death. Before beginning any work or testing procedures involving the electric panels, or any of the branch circuits, be sure the motorhome is unplugged from shore power, the generator is not running and the inverter is in the off position. Certain testing procedures may require the AC power to be on. Only qualified personnel with electrical backgrounds should attempt any testing procedures.



AC Distribution Panel.
NOTE: This panel will change with options.

060101F

Circuit Breaker

The internal configuration of the circuit breaker is designed to trip when excess current causes the breaker to heat up. The trip action of the circuit breaker can occur within milliseconds. Breakers are designed to operate at a continuous load of 80% of the breaker's rated capacity.

For example: A breaker with a 20 Amp rating will operate a continuous 16 Amp load. This design leaves a small amount of working capacity within the breaker. When an inductive load is applied, such as when an electric motor turns on, the motor starts to spin and 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 decrease. 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, such as air conditioners. When using outlets, care should be considered when applying loads such as electric motors, heaters, coffee makers, toasters, hair dryers or other large current consuming loads. The current rating is usually stated on most electrical items. The current rating will either be rated in amps or watts. Current ratings stated on electrical items will change 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 AC which equals 11.913 Amps. Use this formula to calculate the amount of load and compare to the available power supply.

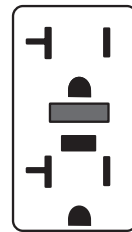
GFCI Breakers & Outlets

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 making contact with an electrical ground such as a water fixture 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 (eg. a light bulb or appliance) and coming back on the neutral (white) wire. If a small amount of current comes back on the safety ground wire, the electronics will trip the breaker or outlet, stopping the flow of electricity.



060072



The amount of current it takes to trip the device from a ground fault varies slightly from the different outlet or breaker manufacturers (approximately 4 to 6 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. People with medical conditions that make them susceptible to shock, can still be seriously injured. A GFCI outlet or breaker will not protect against shock from a normal current flow. **For example:** a shock from touching both metal prongs of an electrical cord or appliance while plugging it in.

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:

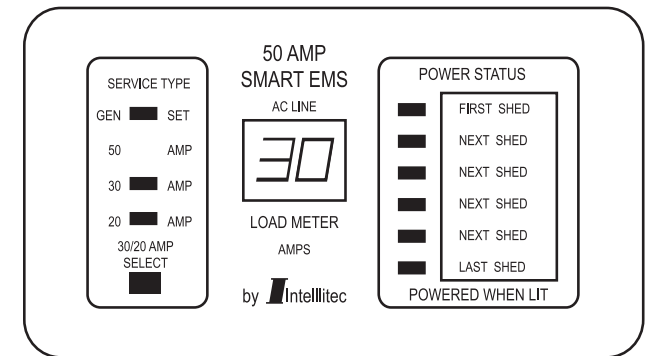
The ground fault outlet or breaker should be tested once a month to ensure it is operating. Use the TEST button on the outlet or breaker. It should trip with an audible “click.” The breaker or outlet will not trip if AC power is not present at the device. If power is present and the device will not trip, replace it before using that circuit.

NOTE:

One milliamp is 1/1000 of one amp.

Energy Management System

The Energy Management System remote display panel is located on the hallway monitor panel. The 50 Amp Smart EMS consists of two elements: the display panel and the bedroom distribution panel. The distribution panel is a self-contained 120/240 Volt AC power distribution and energy management system intended to be used in recreational vehicles. It is housed in a sheet metal enclosure with a removable front panel. It provides circuit protection for all the 120 Volt AC loads in the motorhome and an energy management system that minimizes the over-loading and tripping of circuit breakers.



060082

Circuit Breakers:

The distribution panel offers slots for eight single or dual standard 120 Volt circuit breakers. Two of these breakers, located in the center position, are 50 Amp and act as input protection for each of the lines supplying the remainder of the branch breakers.

Energy Management:

The 50 Amp Smart EMS automatically senses the available power to the motorhome and determines 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 are typically heavier loads that can be postponed until the correct current is available. 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, 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. On 50 Amp shore power, the load meter will not indicate Amp load.

If the generator is running, 120 Volt AC will be present at the distribution panel L1 (Line 1) and L2 (Line 2) 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. The load meter will indicate the Amp's Load. 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.

All relay contacts are initially 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 and calculate the amount of current that was removed. This value is placed in memory. If the current remains above the service limit, the system will turn off the next load in the shedding table, again calculating the amount of current that was removed and placing this value in memory. The system continues to turn off loads until the total current falls below shore power amperage 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:

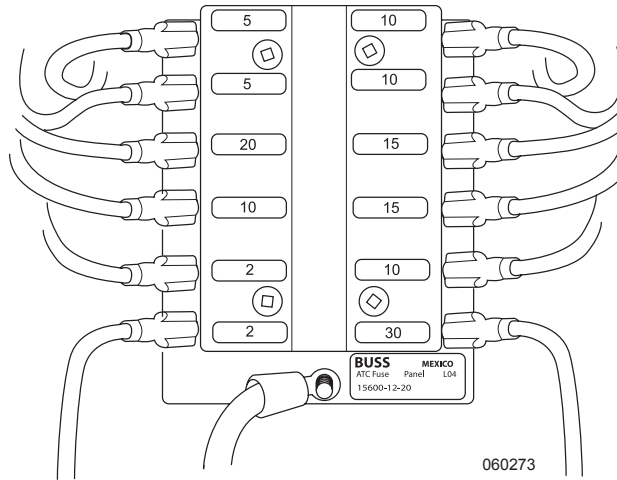
The RVIA (Recreational Vehicle Industry Association) in conjunction with the NEC (National Electrical Council) have established rules regarding the rating of electrical systems and the use of energy management systems. One of these rules requires that, if any energy management system is used, the average total load current for the system over a 3 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 will translate to 16 Amps. Because the EMS calculates a running 3 hour average, if the average load current drops below the limit the system will restore 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 on the display panel will illuminate.

Display Panel:

The display panel connects to the distribution panel located in the bedroom. Six power status LEDs indicate power is applied to those loads. These LEDs 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 LEDs 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.



Distribution panel.

NOTE:

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.

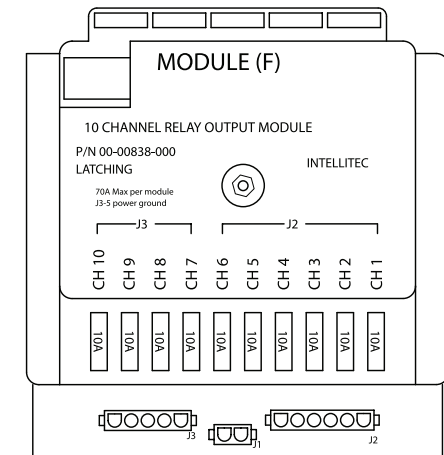
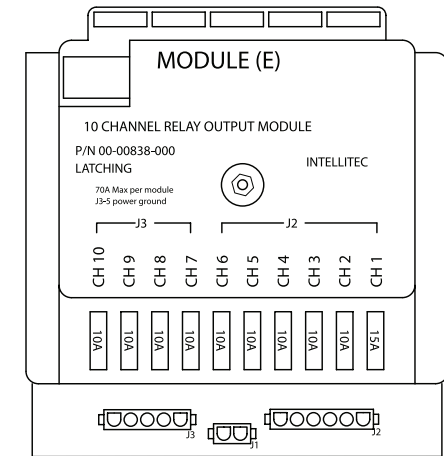
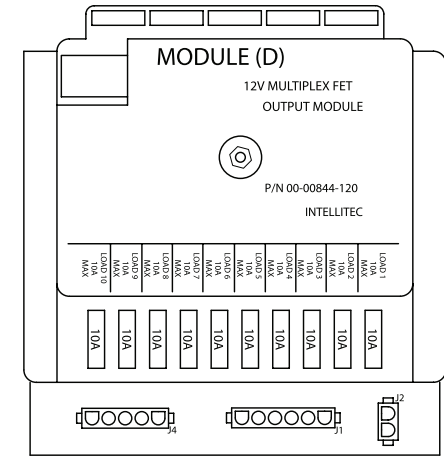
DISTRIBUTION PANEL - HOUSE 12 VOLT DC

The 12 Volt DC house distribution panel (located with the AC circuit breaker panel) contains fuses that protect the electrical circuits. These fuses are a standard automotive type.

Multiplex

The Programmable Multiplex Control (PMC) consists of three basic components. The CPU (Central Processing Unit), fuse modules and switches located throughout the motorhome.

The CPU continually monitors the status of all switches and fuse modules. When a switch is pressed, the CPU identifies the address and command of the switch. The CPU processes the command then activates or deactivates the corresponding circuit on a fuse module.



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Troubleshooting:

- ◆ The Battery Cut-off switch must be on.
- ◆ If a switch is pressed and the backlighting doesn't turn on, check the fuse located on the ATO fuse panel on the Multiplex board.
- ◆ If the backlighting turns on and the yellow communication LED illuminates but the item does not turn on, check the fuse for that circuit.

Fuses

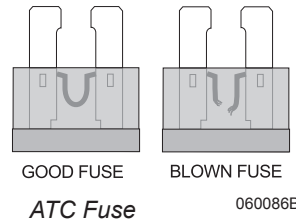
The 12 Volt DC fuses, located in the distribution panel, service the interior house lighting, ventilation fans and monitor panel. Should a fuse blow it will be evident by the broken metal strip located in the center of the fuse. Replacement fuses should be of the same amperage. If a higher rated fuse is installed it can damage the wiring. Fuse current set points follow much of the same electrical principle as the 120 Volt AC breakers. Using 12 Volt DC as the electromotive force can make it more susceptible to outside influences, such as corrosion from weathering or oxidation.

The danger from shocks with this voltage is minimized, but can still occur. A good example is when a magnetic field is generated, then collapses when the power supply is cut.

The result is a discharge that can reach tens of thousands of volts for a short time period. Care should be used when working with this voltage as current values can be quite high, as in the case of battery cables.

Shorting a battery cable to ground with a battery at a reasonable state of charge can result in a fire or serious personal injury from a burn.

AMPERAGE	COLOR
1	BLACK
2	GRAY
3	VIOLET
4	PINK
5	GOLD
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	CLEAR
30	GREEN

**BATTERIES - HOUSE**

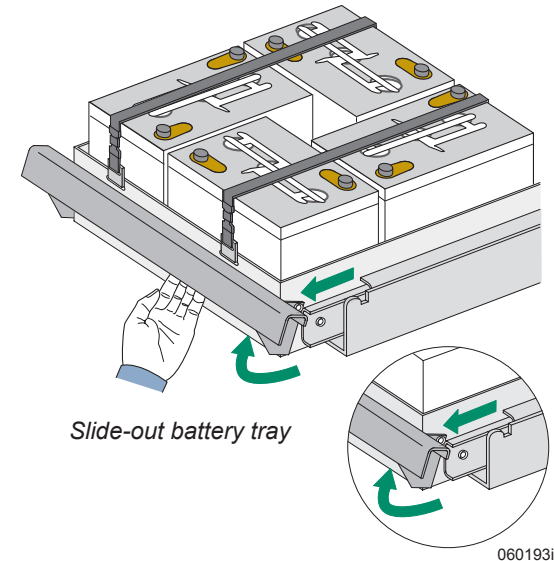
House batteries are designed for use with 12 Volt DC operated lights, appliances and inverters.

NOTE:

Tap water contains minerals which can alter battery chemistry and ruin the battery. Use only distilled water when refilling the LLA battery.

Slide Tray Operation:

The slide-out battery tray is secured in place by a locking mechanism at the front of the tray. To slide the tray out, lift up on the handle and pull until the tray stops. To secure the battery tray, push it back in until the tray latches.

**Slide Tray Maintenance:**

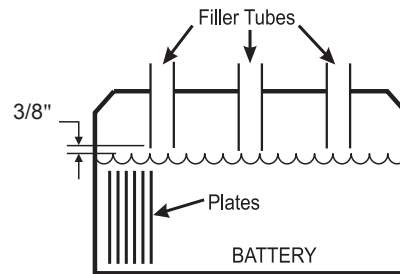
The battery tray slide will occasionally require lubrication. When performing maintenance to the batteries, remove old lubricant and dirt from the battery tray slide with solvent, brake cleaner or equivalent. **DO NOT** allow any cleaning solution or battery acid by-products to splatter onto and damage the painted surfaces. Lubricate all moving parts of the battery tray slide with white lithium grease or Kwikiee brand spray lubricant.

NOTE:

Driving without the tray secured can result in damage.

CAUTION:

Many types of petroleum based products or battery by-products can damage the paint finish. **DO NOT** allow these types of chemicals to get on the paint finish. If the chemicals splatter on to the painted surfaces, immediately rinse the surface using plenty of water and a mild automotive detergent.



Battery State of Charge	Spec. Gravity	Voltage
100%	1.265	12.7
75%	1.225	12.4
50%	1.190	12.2
25%	1.155	12.0
Discharged	1.120	11.9 or Less

NOTE: The distilled water level in battery should be 3/8" below the filler tube. 020034c

Periodically check the batteries for corrosion and cracks. Replace vent plugs that 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.

Check the battery connections for tightness and corrosion. If corrosion is found, disconnect the cables (mark cable locations) and carefully clean them with a mild solution of baking soda and water, or an aerosol product specifically designed for battery maintenance. **DO NOT** allow cleaning solution to seep into the battery and damage 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. The battery cable to battery terminal connections should be metal to metal. Coat the terminals with petroleum jelly or an anti-corrosion grease.

**WARNING:**

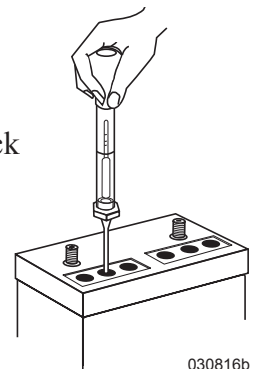
Liquid lead acid batteries produce hydrogen gas while being charged. This is highly explosive. **DO NOT** smoke around batteries and keep all sources of ignition or flames away from batteries. The hydrogen gas may explode resulting in fire, personal injury, property damage or death.

Testing the Battery

A battery can be tested and/or monitored several ways. The Aladdin system will show the voltage and amperage of the house batteries on the Coach Electric Status screen.

Checking the Electrolyte Solution (LLA Only)

The most 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. Many styles are available, from types with cylinder graduation (shown here) to types with floating balls.



Hydrometer (cylinder type) shown testing LLA type battery.

Battery Maintenance

Liquid Lead Acid (LLA) battery cells should be checked at least once a month. The level should be above the top of the plates, but not overfull. The electrolyte level should be approximately 3/8" below the well to allow room for expansion while the battery is being charged. Over-filling the battery will allow the electrolyte solution to boil or gas out of the battery cap. Remember to use only distilled water to refill the battery. A battery with a low electrolyte level will rapidly boil out the water once the plates have been exposed to air.

IMPORTANT!**IMPORTANT!**

This motorhome is equipped with Non-sealed Liquid Lead Acid (LLA) house batteries which require regular maintenance. Lack of maintenance will result in a shortened battery life.

NOTE:

Read your owners manual for storage, dry camping and battery maintenance.

MONACO CUSTOMER SERVICE: 1-877-4-MONACO

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Hydrometers can be purchased from most auto parts stores. 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 will 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 will come up. At the same time, do not over charge the healthy cells.

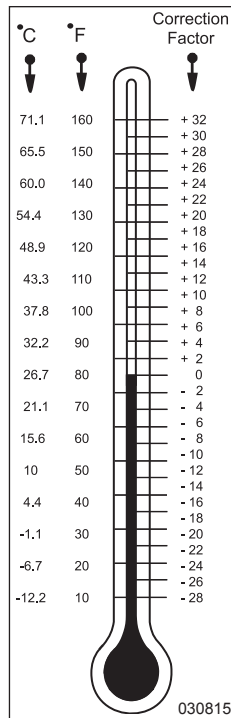
If the low cell does not come up after charging, this battery can damage the rest of the battery bank and should be replaced. An accurate digital Volt meter + - .5% will also give an indicator of the battery's state of charge.

Placing a load on the Battery:

Another test that can be performed is to place a specific load on the battery for a predetermined length of time equal to that particular battery's rating. This machine is usually an adjustable carbon pile that can vary the load being applied to the batteries while monitoring voltage to see if they will perform to their specific rated capacities.

NOTE:

See the chart for temperature compensation. Liquid levels should be even between the cells of the battery being tested as it will affect the accuracy of the test.



Temperature Correction Chart

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 Charge Time & Consumption Rate

Calculating Run Times:

Calculating run time figures when operating 120 Volt AC electrical items with an inverter can be exponential 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 ten hours of discharge time. This is due to the internal reactions which occur when a battery is discharging. Actual discharge time for a 10 Amp load may be closer to eight hours of discharge time. Increasing the load applied to the battery to 20 Amps will not yield five hours discharge time but may be less than three hours. It might be understood as a point of diminishing return.

Calculating applied loads to an inverter 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 is used to operate an AC load it uses approximately ten times the DC current needed from the battery when inverting 12 Volts DC to operate the 120 Volt AC item. There is also a small efficiency loss of about 10% when inverting. **For example:** When using the inverter to operate an AC electrical item,

which has a current draw rating of 2 Amps, the inverter 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 AC. 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 will use, 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 approximately 13 hours in ideal conditions.

The run time figure will vary 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 maintain the batteries in their proper operating range.

SOLAR PANEL

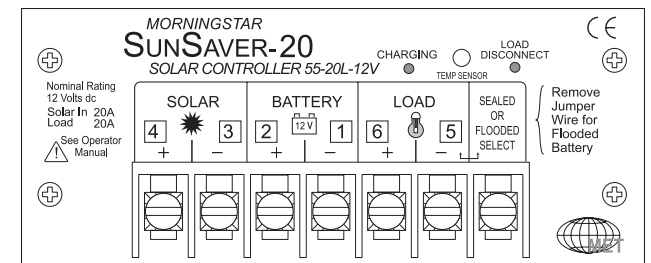
The solar power system consists of a 65 watt solar panel and a charge controller. This system can deliver enough power to offset the normal day-to-day drain on batteries caused by various parasitic electrical loads, such as transmission memories, alarm systems and natural self-discharge of batteries.

Charge Controller

The Charge Controller automatically charges the house batteries whenever sunlight is available. The charge controller is located in the rear curbside electrical bay on 36'- 40' models and in the electrical box in the rear engine compartment on 42' models (those equipped with tag axles). It is normal for the controller to become warm to the touch, especially when processing higher amperage. The green Charging LED (see illustration) will be lit whenever sunlight is reaching the solar panel.

NOTE:

The charge controller is limited to 300 watts maximum input.



Located in the rear curbside or engine compartment electrical bay.

NOTE:

The jumper wire that connects the two right terminals on the charge controller is removed at the factory. This allows the charge controller to work with Flooded Lead Acid batteries rather than Absorbed Glass Mat batteries.

The Charge Controller includes the following:

- ◆ Pulse Width Modulation - Delivers full charging amperage until the batteries reach their set point voltage (Bulk), and then it begins lower amperage (Absorption) to 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.

CAUTION:

The charge controller may be warm to the touch. This is a normal function of the charge controller.

Maintenance:

- ◆ Periodically check the terminal connections at the charge controller for tightness.
- ◆ Also inspect wires and connections for corrosion. It may be necessary to apply a coating of dielectric grease.

Solar Panel Care

The solar panel must be kept clean. The amount of power that a panel will produce is directly related to the intensity of sunlight. A dirty panel will allow less light to reach the panel, resulting in less power produced. A single layer of dust, road grime, or other debris can greatly reduce power.

Regular inspections and regular cleaning will assure maximum charging from the solar charging system. To clean the panel, use a non-abrasive cleaner and paper towels. The surrounding environment, and the amount of road dust encountered, will determine how frequently the panel should be cleaned.

- ◆ Solar panels should be cleaned monthly, or more frequently depending upon weather conditions.
- ◆ The panel should be cleaned if a film or a layer of dust is on the windshield.
- ◆ High winds can blow dust and debris around causing dirt build up. Frequently inspect the panel 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.

NOTE:

See OEM manuals for more information.

Map Lights**Operation:**

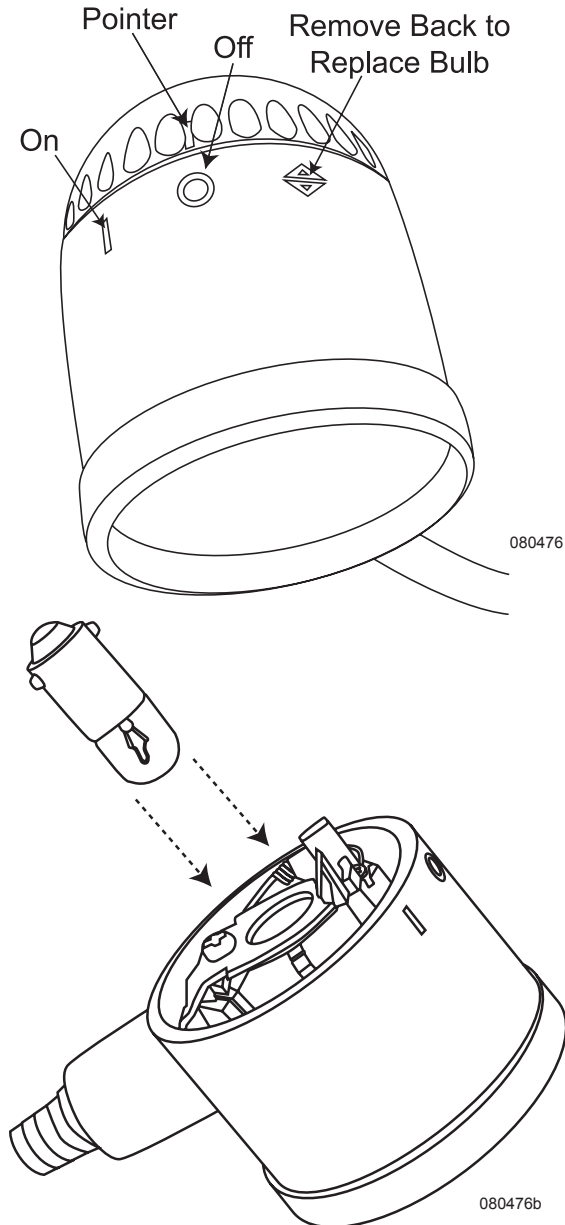
Turn the light on and off by aligning the pointer on the back of the light with the **ON** and **OFF** indicator on the front portion of the light.

To Replace a Bulb:

1. Align the pointer on the back of the light to the position to remove the cover.
2. Remove cover and lift bulb from holder.
3. Replace with a 12 Volt DC 4 Watt type 1816 bulb and install cover by realigning the pointer to the same location. Turn cover to **OFF** or **ON** position.

If Map Lights Fail to Operate:

- ◆ Ensure interior house power is turned **ON**.
- ◆ Check fuses in front electrical bay on the roadside.

**Bulb Usage – Interior**

INTERIOR BULB CHART	
LOCATION	BULB NUMBER
FLUORESCENT CEILING LIGHTS	F15T8 - CW
DINETTE	12V DC C912 or 921
MAP LIGHT	1816 12V DC 4W
STEPWELL LIGHTS	90416
CLOSET LAMP	12V DC 10W Type T-3
OVERHEAD CEILING LIGHTS	1383

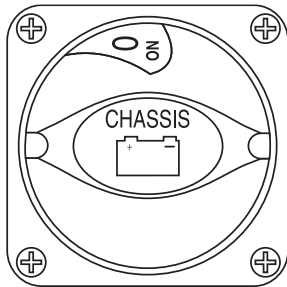
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CHASSIS ELECTRICAL - INTRODUCTION

This section contains guidelines, procedures and information that will assist in understanding the chassis 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.

BATTERY DISCONNECT - CHASSIS

The main battery disconnect switch, located in the rear curbside bay or engine compartment, controls the DC power to the front electrical bay. Most chassis and engine functions are interrupted when the battery disconnect is turned off.



080240

Battery Disconnect:
Located in rear curbside bay or rear engine compartment.

Some electronic components of the engine and transmission require a constant power source and will continue to draw power when the disconnect is engaged.

Turn the main battery disconnect switch off when the motorhome is going to be stored or when 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.

If an AC source is not available, and the motorhome is going to be stored more than 48 hours, it is recommended to turn the battery 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:

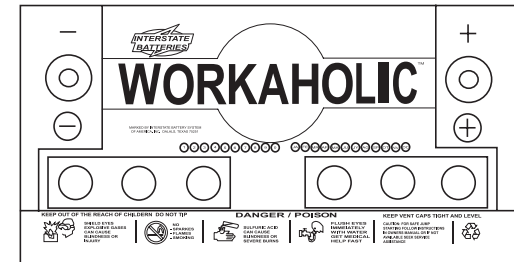
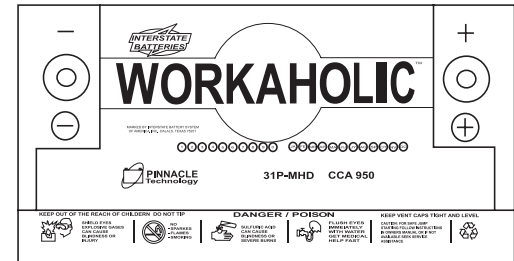
1. Disconnect the (+) positive and (-) negative battery connection.
2. Cover electronic control components and wiring to protect from hot sparks.
3. Disconnect the terminal plugs from the engine Electronic Control Unit, located on the passenger side of the engine block.
4. Disconnect all the plugs from 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 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.



Battery with cover removed. Cut plastic to remove cover.

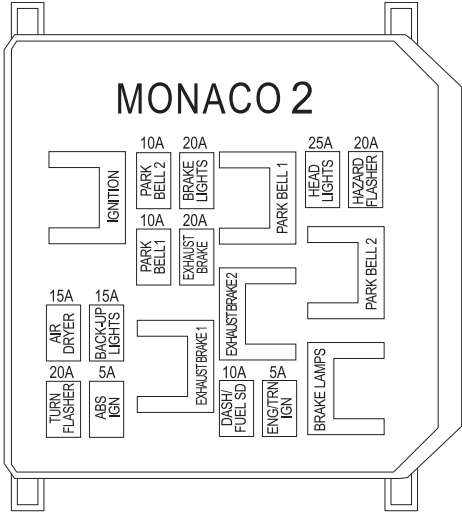
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FUSES & CIRCUITS

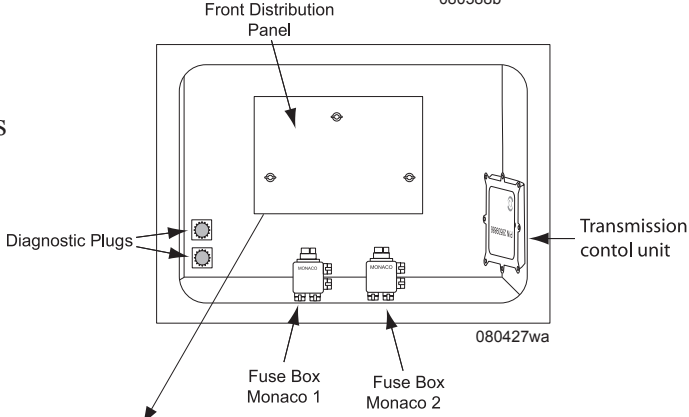
The front electrical panel, located roadside ahead of the front wheel, contains relays and mini-fuses. Specific assignments are noted on a label on the inside of the distribution panel cover. The Monaco 1, Monaco 2 and Transmission Relay module also contain fuses. Fuse assignments are noted on the covers.

The wire in the middle of the fuse will break when a fuse blows. A bad or blown fuse must be replaced with a fuse of the same rating and type. Using a fuse of a different type or rating will defeat the circuit protection provided by the fuse and may result in damage to the motorhome electrical system.

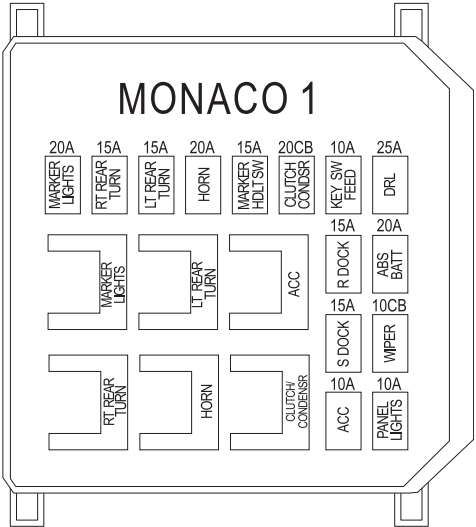
A fuse that continues to blow may indicate that a fault exists or an electronic component has failed. It is recommended that the motorhome be taken to a qualified RV technician before any future use to diagnose and repair the potential problem.



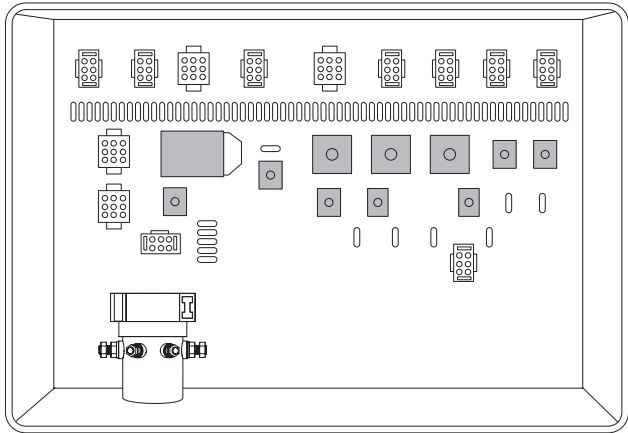
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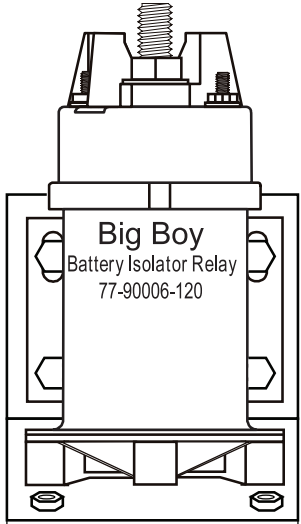
Isolator Relay

The Isolator Relay provides a simple means of isolating the two battery systems, house and chassis, and connecting the batteries together when the engine is running.

A momentary dash-mounted switch is added to provide a boost for the engine batteries from the domestic batteries.

When using the battery boost switch, the relay may have to deliver the full starting current to the engine batteries. The relay contacts must close and provide low resistance without the harmful effects of arcing.

To be sure relays can perform under harsh conditions, the contacts are protected with a unique antioxidant coating. The relay is of heavy construction and can easily deliver the needed current. In a battery charging situation, both batteries will charge at equal voltage.



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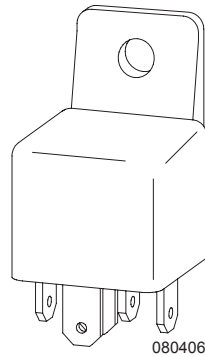
Isolator Relay:
Located in Rear curbside bay or engine compartment.

Relays

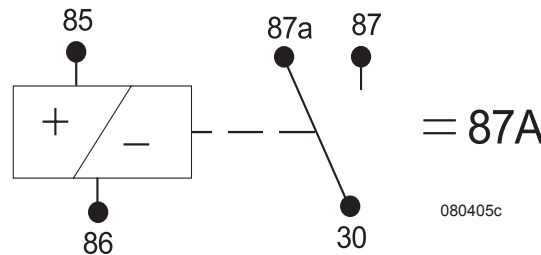
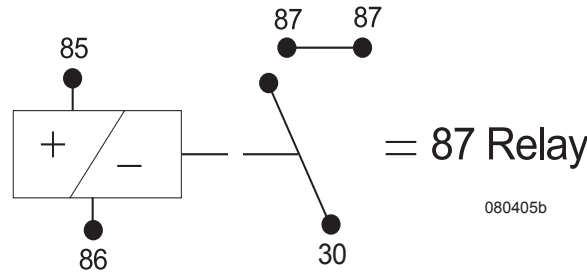
The motorhome uses various relays to operate electrical equipment such as lights and motors. If a relay needs to be replaced, carefully record the location of each wire and all markings or labels.

Relays can look the same in appearance, but differ in function. Note that on the side of the relay is a schematic drawing identifying if the relay is 87 or 87a relay. These current ratings differ, and if mixed, will create problems. Ensure the replacement relay is of the current rating to assure proper operation.

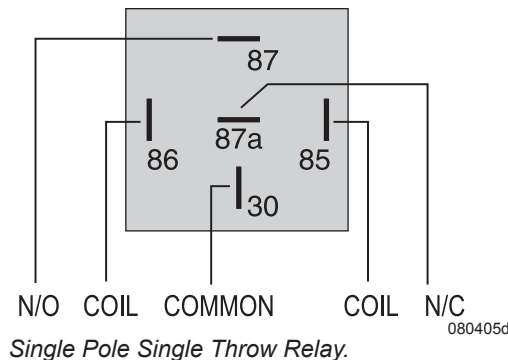
Another indicator to the type of relay is the post or legs. Turn the relay over and look at the post.



- Using an 87a relay, the 30 post and the 87a post are common. When the coil is tripped, the 87a post becomes inactive and the 30 post becomes common to the 87 post located on the outside of the relay.



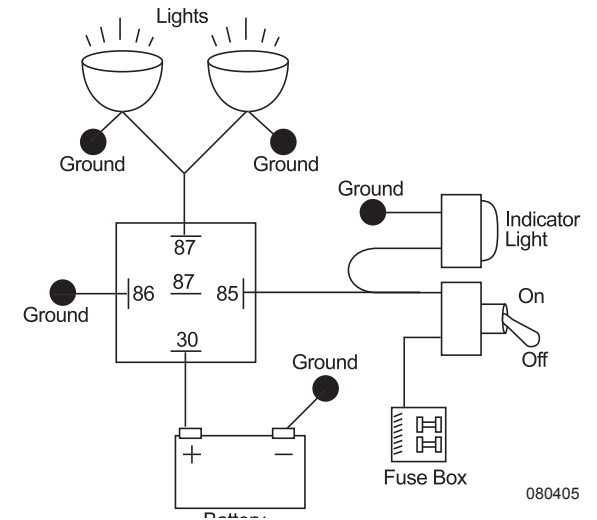
A Single Pole Single Throw relay (SPST) is an electro-magnetic switch consisting of a coil (terminals 85 & 86), one common terminal (30), one normally closed terminal (87a), and one normally open terminal (87).



When the coil of the relay is at rest (not energized) the common terminal (30) and the normally closed terminal (87a) have continuity. When the coil is energized, the common terminal (30) and the normally open terminal (87) have continuity.

NOTE:

When there is power applied to the coil, the coil sets up a magnetic field in the windings. When the power is removed, the field collapses. A momentary high voltage discharge will occur. This is how an ignition coil works.

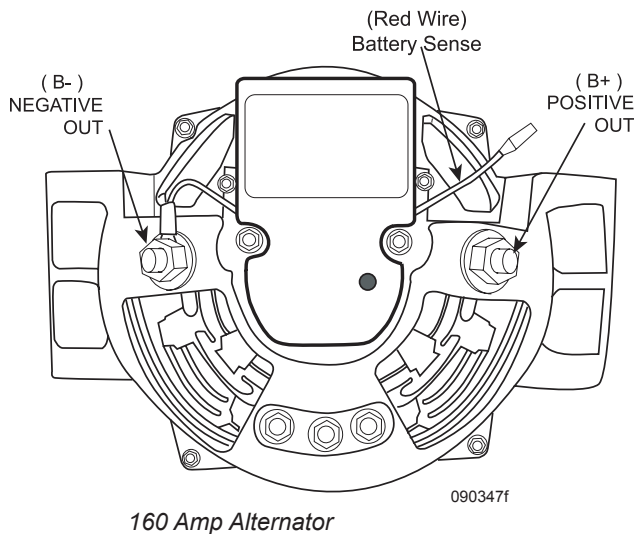


Note differences between numbered posts:

- The 30 post is the incoming fuse and/or breaker power. Some relay applications supply power to the 30 post. Some use it for ground. The 30 post can be used many different ways.
- The 85 post is one side of the coil, tripped different ways.
- The 86 post is the opposite side of the coil, tripped different ways.
- The 87 posts are not common to the 30 post until the relay is tripped. When the relay trips, both 87 posts are common to the 30 post.

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 will illuminate.



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 will increase. 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 will damage the alternator. Use the generator to operate the microwave while in transit.

Alternator Testing Procedure

Alternator Testing:

- ◆ Check all wiring for burnt or loose electrical connections. Repair as needed.
- ◆ Check all grounds and electrical connections to confirm they are clean and tight.
 - Alternator ground to chassis frame.
 - Motor block ground to chassis frame.

- Chassis battery ground to chassis frame.
- Alternator positive output to isolator relay terminal.

- ◆ **Inspect** the alternator for damage.
- ◆ Check belt pulley for wear. Replace as needed.
- ◆ **DO NOT** disconnect the battery, or battery wire, from the alternator with the engine running as this can damage the alternator or regulator.
- ◆ The pulley for the alternator should be torqued to 80 ft. lbs.
- ◆ Chassis battery voltage with the engine **OFF** should range from 12.2 to 12.7 Volt 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 volt meter 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.

CAUTION:

The alternator is not a battery charger. The alternator is 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.

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 approximately 20 mA.

Another function of the smart wheel is the “High Idle” feature.



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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:

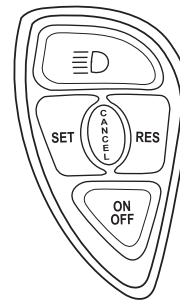
When headlights are **ON**, press and hold the switch to turn them off. When the headlamps are **OFF**, press and hold the switch to turn them on.

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.



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To use the High Idle Feature:

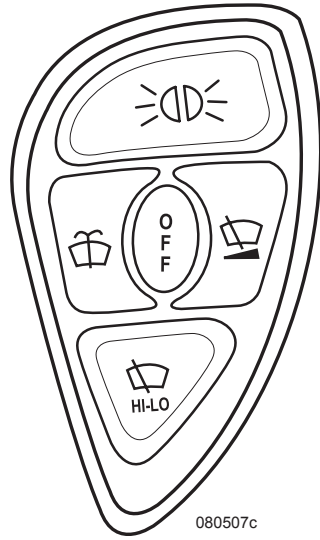
- ◆ With the cruise control **OFF** (see dash light), press and release the **RES** button. Each time the switch is pressed and released, the idle will rise 25 RPMs, from 500-800 RPM. To lower the idle, press and release the **SET** button. Engine idle speed will decrease in 25 RPM increments.
- ◆ With the Cruise Control **ON**, press and release the **RES** button once. Engine speed will increase to 1000 RPM. Push and hold the **RES** button, engine speed will increase to 1500 RPM. Use **CANCEL** or turn the cruise control **OFF** to return the engine to an idle.
- ◆ With the Cruise Control **ON**, press the **SET** button once. Engine will increase to 1200 RPM. Press and hold the **SET** button, engine speed will decrease to 800 RPM. Use **CANCEL** or turn the cruise control **OFF** to return the engine to idle.

NOTE:

The transmission will not shift into gear if the engine RPM is at or above 900. The display will flash “6” indicating the engine RPM is excessive. Select “N” and lower the engine RPM. The brake also deactivates high idle.

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.



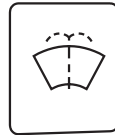
OFF:

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:

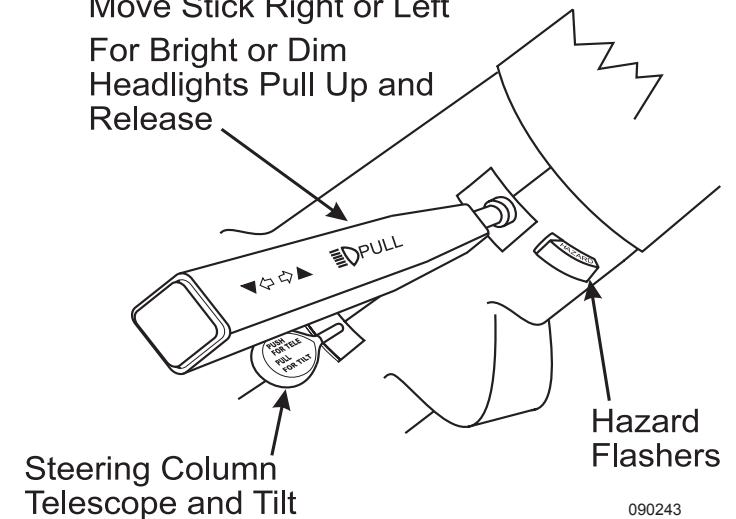
Operation of the Wiper Variable button causes the low speed wiper function to activate for one wipe. If the button is pressed again within approximately 30 seconds, the low speed wiper function activates and repeats at an interval determined by the time between the last two operations of the button. Additional button operations will shorten the cycle. Activating other wiper modes cancels the variable mode.

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.

Tilt & Telescope

Tilt and telescope steering wheel control lever is located on the steering column.

For Turn Signals
Move Stick Right or Left
For Bright or Dim
Headlights Pull Up and
Release



- ◆ To tilt the steering wheel: Pull the lever up and tilt the steering wheel to the desired level. Release the lever to lock the steering wheel in the new position.
- ◆ To telescope the steering wheel: Push and hold the lever down. Move the steering wheel to the desired location. Release the lever to lock the steering wheel in the new position.

Turn indicator and headlight high/low dimmer control is located on the steering column.

- ◆ Push the lever forward to activate right turn indicator circuits when the ignition is on.
- ◆ Pull the lever back to activate left turn indicator circuits when the ignition is on.
- ◆ Pull the lever up to select high/low beam circuits when the headlights are on.

Hazard Flashers:

- ◆ The flasher button is located on the steering column.
- ◆ To turn on the four way flashers, pull **out** on the flasher button. The turn signal alarm will sound.
- ◆ To turn off the flashers, push the button **in**.

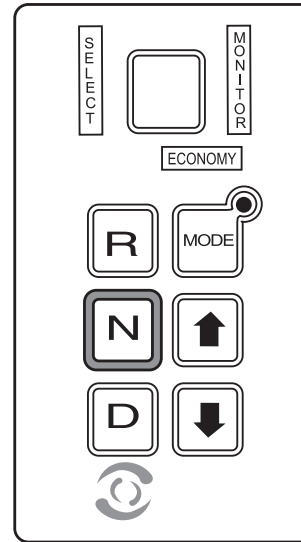
CONSOLE

NOTE:

Switch and component placement on panels may vary.

Transmission Shift Selector

The keypads on the shift control are **R** (Reverse), **N** (Neutral), **D** (Drive), Arrow up, Arrow down, Mode button. A digital display window shows gear selection, various transmission modes, oil level and transmission fault codes. Generation 4 keypads have a split screen displaying two number sets while in drive. The left number displays the highest forward range available. The right number is the range that the transmission is currently in. **NN** (Neutral) will appear in the display window when the ignition is turned On. This indicates the transmission is in neutral and it is safe to start. If the **NN** does not display when the ignition is turned on, there is no power to the shift selector and the transmission will not allow the engine to start. No display is an indicator of electrical problems with the engine batteries, ECU or the shift selector.



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Keypad Functions:

- ◆ Select the Reverse gear by pressing **R**. **RR** will display.
- ◆ Select Neutral by pressing **N**. The area around the **N** button has a raised ridge so the driver can orient his hand to the push buttons by touch without looking at the display. **NN** will display.
- ◆ Select Drive range by pressing **D**. The highest forward gear (6th gear) appears in the display and the transmission will shift to first gear indicated as 6 1.
- ◆ The **Up** and **Down** arrow buttons are used to select a higher (if not in “6”) or lower (if not in “1”) forward range. These buttons are not functional in Neutral or Reverse. When in Drive, one press changes the gear range selected by one. If the button is held continuously, the selected range will continue to change up or down until the button is released or until the highest/lowest possible range of gears is selected.
- ◆ The Mode button enables a secondary shift point to be selected. This is commonly referred to as 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 the cruise control set between 55 and 65 m.p.h., setting the transmission to economy mode will eliminate about 99% of transmission downshifts from sixth to fifth when incurring a slight incline or overpass.

DO NOT use economy mode while traveling in mountain terrain. The lower RPM shift schedule will reduce 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 will occur and increase transmission fluid temperature. Exit economy mode until road conditions improve.

NOTE:

When the Auxiliary Braking device is used, the display will change to a default reading of 6-2. 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 gear. This is only a reference point indicating the transmission will automatically downshift to second gear when auxiliary braking device is engaged.

Parking Brake

The parking brake system is activated by pulling the push-pull control knob located on the driver's left console panel. When the knob is pushed, the brake is released. The air system must be fully charged and



the motorhome at ride height prior to driving. Start the engine and allow the air system to fully pressurize (approximately 120 psi). The air system will audibly purge air when it reaches maximum air pressure.

WARNING:

It is possible for the parking brake to be accidentally released if the air system is charged. It is advised to fabricate a device to be placed under the parking brake handle to prevent children or pets from releasing the brake when parked. A wooden clothespin, clasped to the shaft, is suitable.

Leveling Controls

Power Gear Control - Hydraulic Systems:

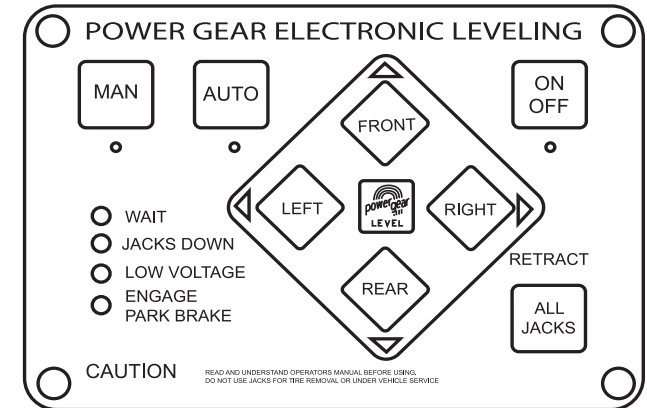
The three-point hydraulic leveling system is operated from the control module to manually or automatically level the motorhome. The control features a multiple warning system with flashing lights and an alarm to alert of a jack down.

Power Gear/Valid - Optional Air Leveling:

The touch panel, computer controlled, four-point air leveling system controls air-leveling operations. The ignition must be on and park brake set in order for the leveling system to function.

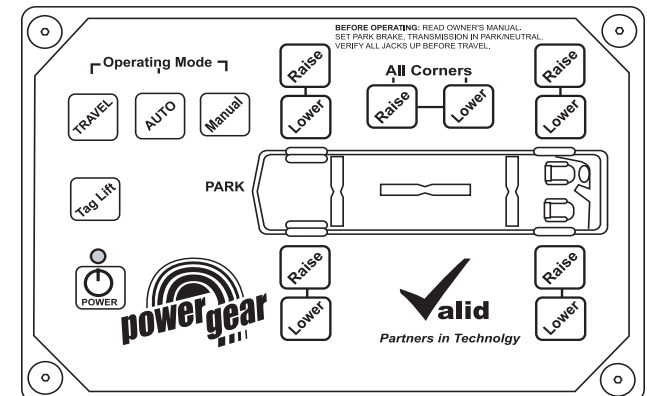
NOTE:

Air leveling will NOT operate unless ignition is on and park brake set.



Power Gear Hydraulic Level

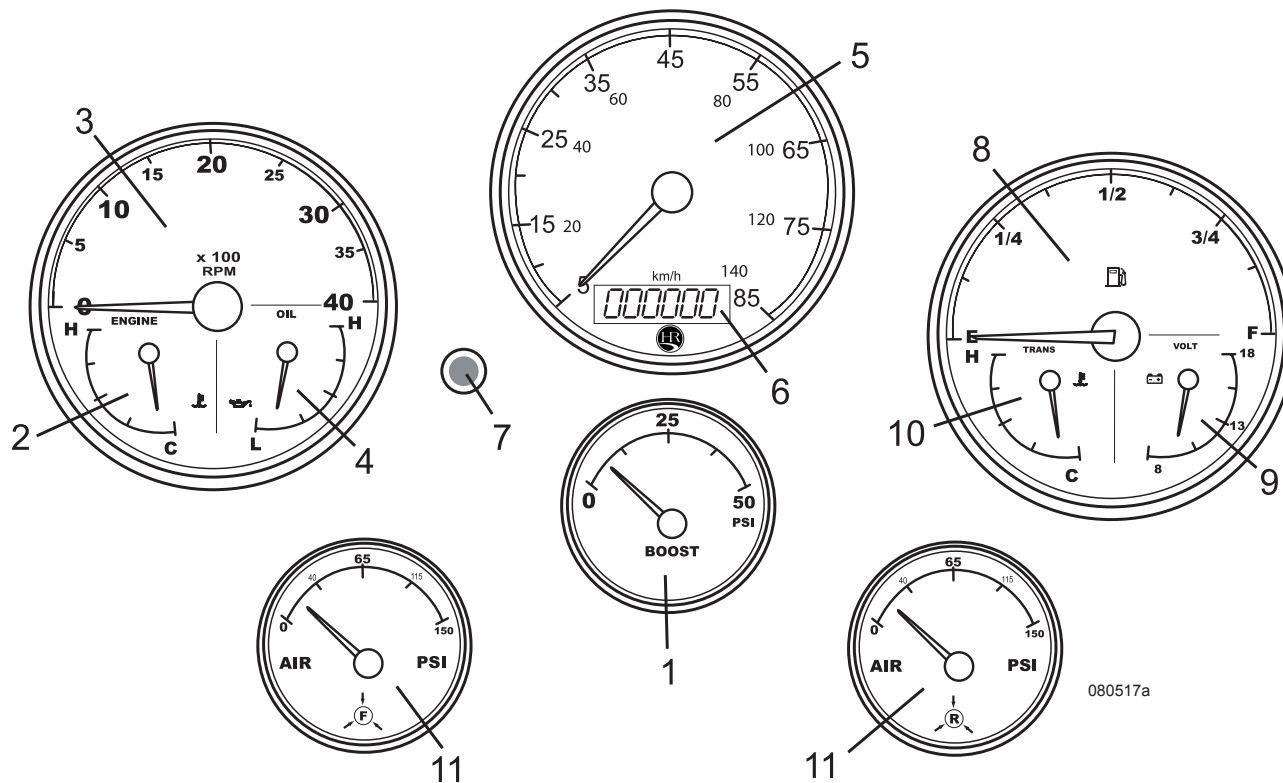
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Power Gear/Valid Air Level (Optional)

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DASH Instrument Panel



1. TURBO BOOST (0-50 psi):

Indicates boost pressure produced by the engine turbocharger.

2. COOLANT TEMPERATURE:

This gauge indicates an approximate normal operating range. Monitor this gauge frequently in all conditions, especially when climbing hills, towing and/or traveling in high ambient temperatures. Take immediate action to avoid engine damage. Refer to the OEM instructions for specific temperature recommendations.

3. TACHOMETER:

Displays engine speed in revolutions per minute (RPM).

4. OIL PRESSURE:

Indicates oil pressure (not the amount of oil in the engine). Please refer to manufacturer's instructions for specific pressure recommendations.

5. SPEEDOMETER:

Indicates the speed of the motorhome. The gauge indicates MPH and KPH.

6. ODOMETER/TRIP METER:

Displays odometer mileage, trip meters and transmission temperature. Use the select button to change views.

7. SELECT BUTTON:

The trip button located below the speedometer is used to switch between the odometer, two trip meters and the transmission temperature. Select trip meter 1 or 2 and hold the trip button down for 3 seconds to reset.

8. FUEL:

The fuel gauge will register approximate fuel tank level when the ignition switch is in the run position.

NOTE:

Fuel mileage varies with driving style and road conditions. Always average more than one tank of fuel to obtain a more accurate figure. The diesel generator and the optional Hydro-Hot system both use fuel from the main tank and will affect fuel mileage figures. Diesel generators and Hydro-Hot will not operate below $\frac{1}{4}$ tank to ensure there is enough fuel to run the engine.

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9. VOLTMETER:

Shows the charge condition of the chassis battery. The normal voltage with the ignition switch ON and the engine OFF varies between 12.0 and 13 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 Volts, usually indicate a battery or electrical system problem.

10. TRANS TEMP:

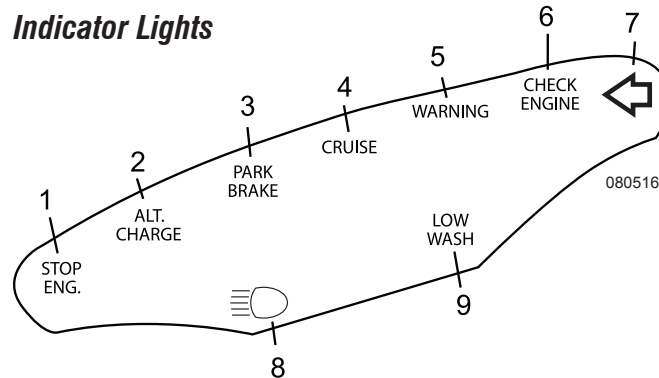
Shows approximate temperature of the transmission fluid. **DO NOT** let the transmission cooler oil temperature exceed OEM specifications. Refer to the Aladdin system if the needle indicates an out of range condition. Stop the motorhome and shift into neutral if excessive temperature is indicated. Idle the engine at 1200 to 1500 RPM and allow transmission fluid temperature to return to normal.

11. AIR PRESSURE GAUGES:

One gauge is for the front air tank, and the other is for the rear air tank. The normal air system operating pressures are 115 to 145 psi. These air pressures are preset at the factory. If a problem occurs with either 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 driveline and also affect operation of the air brake system.

Indicator Lights**1. STOP ENGINE:**

Alerts 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.

2. ALT. CHARGE:

Indicates a failure in the alternator charging system.

3. PARK BRAKE:

Parking/emergency brake is applied.

4. CRUISE:

Cruise control is active.

5. WARNING:

An out of range condition exists within the engine protection circuits. Stop the motorhome and check all fluid levels. The warning light may also signify that there is water in the fuel. Water will collect in the primary fuel filter collection bowl (located in the engine compartment). Drain the primary filter bowl using the valve on the bottom of the filter bowl.

6. CHECK ENGINE:

Alerts of 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. LEFT ARROW: Audible Turn Indicators:

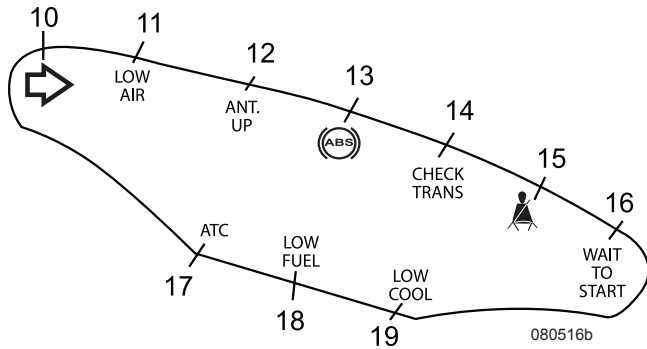
Left turn indicator circuits active. Alarm cancels when service brake is applied.

8. HEADLIGHT BEAM:

Indicates high beams are on.

9. LOW WASH:

Windshield wash fluid is low.



10. RIGHT ARROW - Audible Turn Indicators:

Right turn indicator circuit is active. Alarm cancels when service brake is applied.

11. LOW AIR:

Air tank pressures are out of operating range. Check air pressure gauge.

12. ANTENNA UP:

Illuminates when the TV antenna is raised. Lower the antenna before moving the motorhome.

13. ABS:

Indicates possible fault in the ABS Brake system.

14. CHECK TRANS:

Alerts of problems related to the Allison Transmission. The light should momentarily illuminate when the ignition is switched ON. When starting, the lamp will extinguish 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.

15. SEATBELT LIGHT:

Stays lit for eight seconds after the key is turned on.

16. WAIT TO START:

Monitors manifold preheat. Wait for lamp to cycle off before cranking engine.

17. ATC:

The ATC light flashes slowly when the ATC switch is pressed and flashes quickly during an ATC event.

18. LOW FUEL:

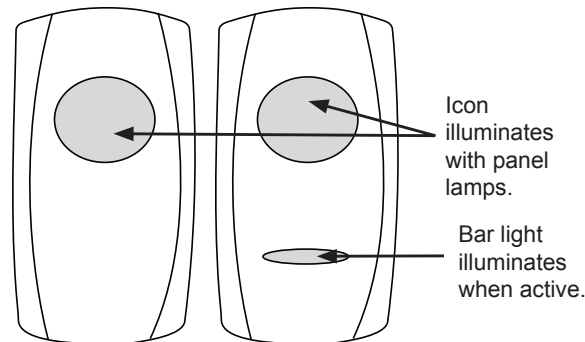
Indicates low level in fuel tank.

19. LOW COOLANT (N/A on all models):

Indicates low coolant level. Check coolant level and temperature.

Switches

Dash switches come either with or without a Bar Light. The Bar Light indicates the item/function is active. Icon lighting for both switch types illuminate with panel lamps.



Dash Switches

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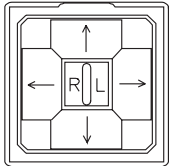
DRIVER CONSOLE:

MIRROR HEAT:

The switch turns on the heaters in outside rearview mirrors. Mirror heaters should be used when defogging or de-icing is needed.

MIRROR ADJUST:

To adjust the outside mirrors, place the small selector in the middle of the switch to the desired side. The middle position is to prevent accidental bumping of the switch and changing the mirror position. The outside mirrors are easily adjusted with the Allen wrench. After taking delivery of the new motorhome it will be necessary to sit in the driver's seat and adjust both the driver and the passenger mirrors.



080378

DRIVER SHADE:

Operates the driver shade.

PASSENGER SHADE:

Operates the passenger shade.

PEDAL IN/OUT:

This switch moves both the brake and throttle pedals closer or farther away from the driver.

ATC:

Activating the ATC switch allows greater torque during an ATC event.

EXH BRAKE:

This is an auxiliary braking device. On flat, dry road conditions apply the exhaust brake until speed is reduced. The exhaust brake is very effective for speed control in town and on local routes. Use the exhaust brake to slow down when preparing to exit onto an off-ramp, when approaching traffic lights or when approaching slowed or stopped traffic. The exhaust brake is not a substitute for the service brakes. **DO NOT** neglect service brake maintenance.

TAG AXLE (42' Models Only):**Hydraulic Leveling:**

Switch on driver console raises and lowers tag axle. The bar light on the switch is illuminated when the tag axle is up.

Air Leveling (Optional):

The tag axle touchpad is incorporated into the air leveling control panel. Pushing the "Tag Lift" button will raise or lower the tag axle. The engine must be running with level control in Travel Mode for two minutes before it is possible to raise the tag axle. This allows extra time to pressurize the air system.

NOTE:

Raise the tag axle when making sharp turns under 5 mph.

NOTE:

DO NOT drive the motorhome over 5 MPH with tag axle raised. The manufacturer will not be held responsible for any damage that may occur from driving with the tag axle raised.

DASH:**HEADLIGHT:**

Pull one click to operate the parking lights. Pull two clicks to operate the headlights. Rotating the headlight switch clockwise will dim the dash lights. Turn counterclockwise to power both sets of map lights.



080332

Air Dump (Hydraulic Level Only):

Dumps air from the air bags, which may aid in leveling the motorhome with the hydraulic levelers. Releasing the air from air bags will give the leveler more range of travel for leveling. Ignition must be in accessory or run position.

NOTE:

Never drive the motorhome with the air bags deflated. This may damage the motorhome.

BATTERY BOOST:

This switch connects the house batteries to the chassis batteries to assist in starting the engine in the event that the motorhome chassis battery has been drained and cannot start the engine.

RADIO:

Main power switch to the dash radio.

FOG LIGHTS:

Operates the fog lights with the ignition key on and the headlights in the low beam position. The fog lights will go off when the headlights are switched to high beam.

STEP COVER:

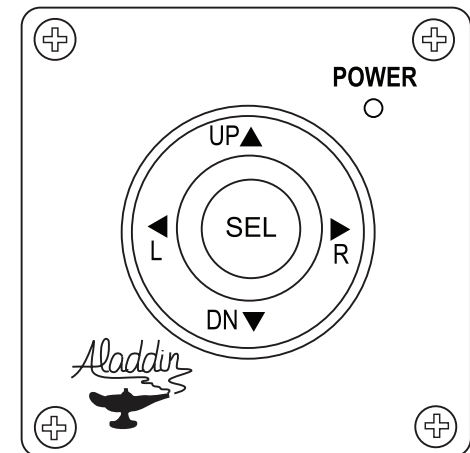
Extends and retracts the step cover.

ENG DIAG:

Checks engine functions.

ALADDIN JOYSTICK:

Selects different menus of the Aladdin system.



080377f

CENTER CONSOLE:**SIDE DOCK:**

Operates the side docking lights.

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 rapidly flashing. Depending on ambient temperature the preheat cycle may last up to 10 seconds. For detailed operating instructions, *see Section Eight of this manual.*

O'HD DEFROST (Optional):

This three-way switch operates overhead fans. Middle position is off, top position high and bottom position low. Use the overhead blower in conjunction with the dash HVAC system to help defrost the windshield.

NOTE:

Extreme weather conditions combined with elevated interior humidity levels may require additional manual assistance to clear the windshield for safety. It is not safe to drive with obscured vision due to moisture or snow accumulating on the windshield.

PASSENGER CONSOLE:**MAP LIGHTS:**

Turns map lights on and off.

STEP COVER:

Extends and retracts the step cover.

PASS SHADE:

Operates the passenger side power sun visor.

STEP LIGHT:

Operates the step light.

PASSENGER CONSOLE BASE:**BATTERY CUT OUT:**

Turns power **ON** and **OFF** to interior 12 Volt panel.

ENTRY STEP:

Provides power to the Entry Step.

PORCH LIGHT:

Turns the outside porch light on and off.

CEILING LIGHT:

Turns the front overhead lights on and off.

STOR LIGHT:

Turns bay lights on and off.

DOOR AWNING:

Extends and retracts door awning.

PATIO AWNING ON:

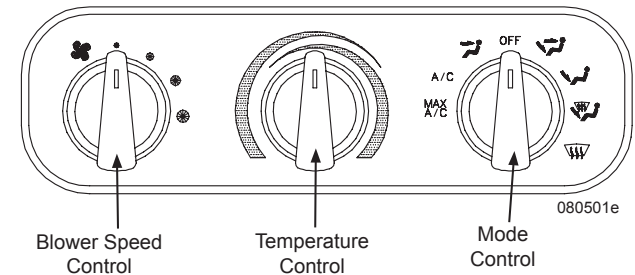
Turns patio awning power on and off.

PATIO AWNING:

Extends and retracts the patio awning.

DASH AIR CONDITIONER & HEATER CONTROLS**Dash AC and Heater Control:**

Designed to provide heating, cooling and defrost capabilities for the pilot/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 most effective ways of controlling temperature. The Mode Control Switch must not be in the OFF position in order for the blower to activate.

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.

NOTE:

The air conditioning compressor is activated when using MAX A/C, A/C, MIX and DEFROST.



**MAX
A/C**

MAX A/C - Recirculated air is drawn from the passenger area and discharged through the dash louvers.



A/C

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.



OFF

OFF - The blower motor does not operate. The fresh air inlet door will close, minimizing outside air infiltration into the motorhome.



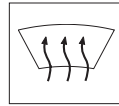
BI-LEVEL - Fresh air is drawn in and discharged through the dash and the floor.



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.



090273 - 277

DEFROST - Fresh air is drawn in and discharged through the defrost louvers. The A/C system operates to dehumidify the discharged air.

A/C Operation:

The A/C dash system will operate in all modes except **BI LEVEL**, **FLOOR** and **OFF**. When the Mode Control Knob is positioned in the **A/C** mode, fresh air is drawn through the front air intake of the unit through the A/C coil. The Mode Control Knob in the **MAX A/C** position closes off a damper door to outside air and recirculates air from inside the motorhome. Select this position when maximum cold air is desired or to keep outside air from entering the motorhome.

Heat and Defrost Operation:

- ◆ Set the Mode Control Switch to the desired position.
- ◆ Set the Temperature Control Switch to the red zone.

Operating Tips & Hints

Air intake and discharge temperatures are greatly affected by ambient temperatures and relative humidity. A large amount of cooling capacity is used to dehumidify as well as cool air. After three to five minutes of A/C operations, discharged air temperature should be approximately 20°-30° F cooler than the fresh or recirculated air entering the A/C system.

Winter Use:

- ◆ De-ice the windshield using the **DEFROST** mode.
- ◆ Air will heat up faster with a slower blower speed until normal operating temperature ranges are reached.

Summer Use:

- ◆ Close all windows and vents to hot, humid outside air.
- ◆ The recirculation blower provides quick cool down.
- ◆ Use a lower blower speed to produce cooler air.

Heater:

The heater warms the air in the dash area. Much like the refrigeration side of the system, a liquid will be 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, will allow the coolant to flow through the heater core. The heater core is much like a miniature radiator. 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 airflow is felt at the discharge vents.

Electric Water Valve:

The water valve controls the water flow to the heater core. A control module compares the output voltage from the thermostat 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 thermostat 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.
- ◆ 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.

System Components

Compressor - The compressor is belt driven from the engine through the compressor and electronic clutch pulley. The compressor will pump freon from a low-pressure gas into a high-pressure, high-temperature gas. This is the start of the refrigeration process.

Condenser - The condenser 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.

Receiver-Drier - Freon leaves the condenser, enters the receiver-drier 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.

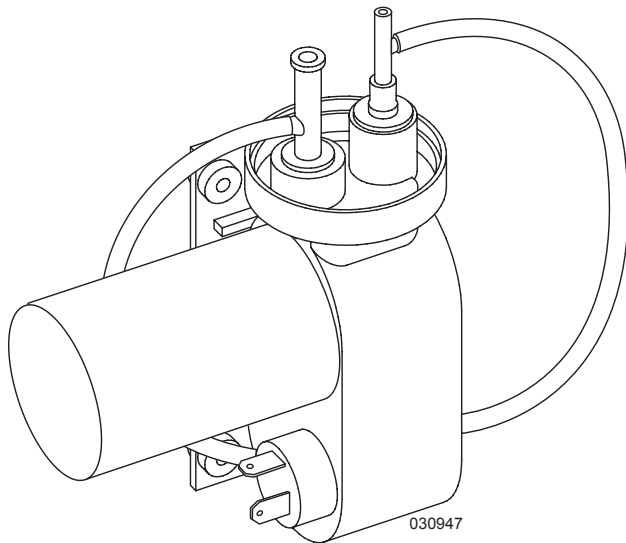
Expansion Valve - The expansion valve suppresses the refrigerant into the evaporator according to the cooling requirements. The pressure is reduced in the restrictive effort of the expansion valve. A part of the valve is the capillary tube assembly. The capillary tube is the sensing bulb at the outlet 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 pressure.

Blower and Motor - The evaporator has a fan called the blower. The blower will draw air from the cab area and force the air over the evaporator coils and fins. This forced air will ensure continuous vaporizing of the R134a.

Relays and Switches - Both electronic and vacuum switches are used in the control and operations of the system.

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. The vacuum generator creates 15 inches of vacuum that is passed to a reservoir ball. Most dash heater and A/C systems will only require 10 inches of vacuum to operate the switches. The output from the reservoir is sent to the vent control knob. The control knob will then direct the vacuum operation to the appropriate vacuum switch to open or close vents and switches. When the ignition is on and the A/C is operating, the vacuum generator will operate.



Vacuum Generator: Located at front firewall.

Troubleshooting

The dash A/C and 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

No Cooling:

1. Check that the blower is operating, A/C switch is in **A/C** or **MAX A/C** position, temperature control is turned to **MAX** cooling (blue area).
2. Verify system fuses are not blown.
3. Verify 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.

NOTE:

An Ultraviolet or UV blue light is used for leak detection when dye is introduced to the A/C System.

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.

No Heating:

1. Verify A/C switch is turned off.
2. Verify blower switch is turned on.
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.

Blower Does Not Operate or Runs Slow:

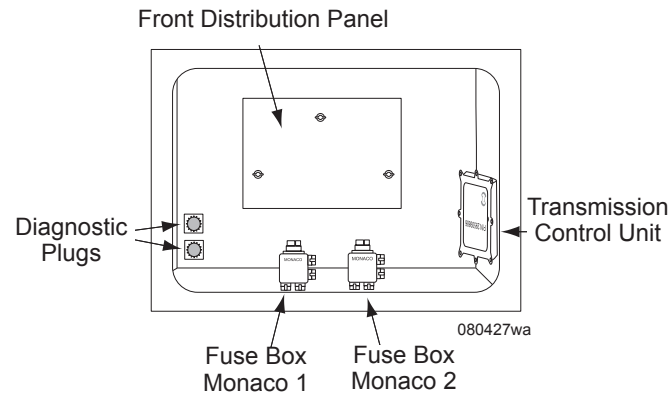
1. Check fuses.
2. Check for loose or corroded connection.
3. Check wiring.
4. Check to ensure ignition switch is on.
5. Check blower and select switch.
6. Motor shaft has seized.
7. Blower wheel is out of alignment.

Damper Doors Do Not Operate:

1. Does the motorhome air tank have pressure?
2. Is the vacuum generator 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 will feel 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.

DIAGNOSTIC PLUG LOCATION

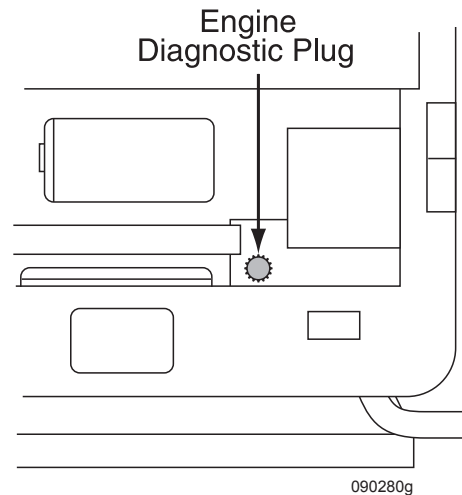
The ABS/ATC, engine and transmission systems communicate electronically over SAE J1939. J1587 is used to retrieve diagnostic codes from a particular system. There are two diagnostic plug locations. The plug located in the engine compartment and the black plug in the front electrical bay has both J1939 and J1587. The grey diagnostic plug located in the front electrical bay is J1587. Power and ground for ABS/ATC operate on J1587.



Front Distribution Panel.

Engine Diagnostics:

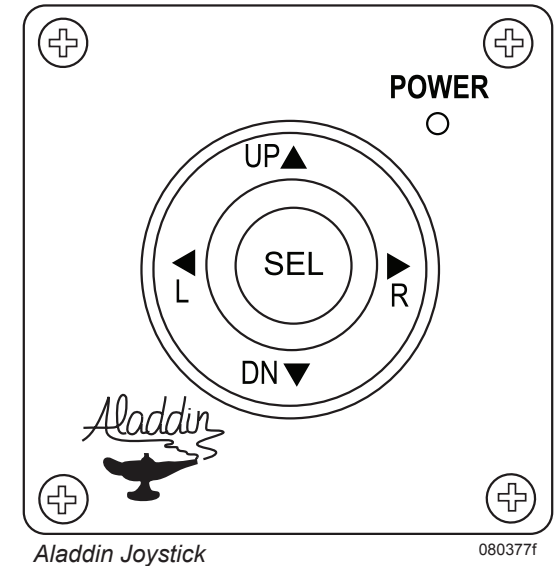
The engine diagnostics will notify the operator of deviations from the programmed limits of the engine through the “Check Engine” lamp in the dashboard. Should a system component with the engine develop a deviation, the “Check Engine” lamp will illuminate and a diagnostic code will be logged and stored in the system memory. These codes are accessed by a service technician using special equipment.

**ALADDIN™ ENGINE DISPLAY**

The Aladdin System will display engine and transmission statistics at a quick glance. Four additional engine and transmission screens can be accessed. These screens can be set to a rolling display, or use the joystick to pick an individual screen.

NOTE:

The backup camera and engine/transmission screens cannot simultaneously display.



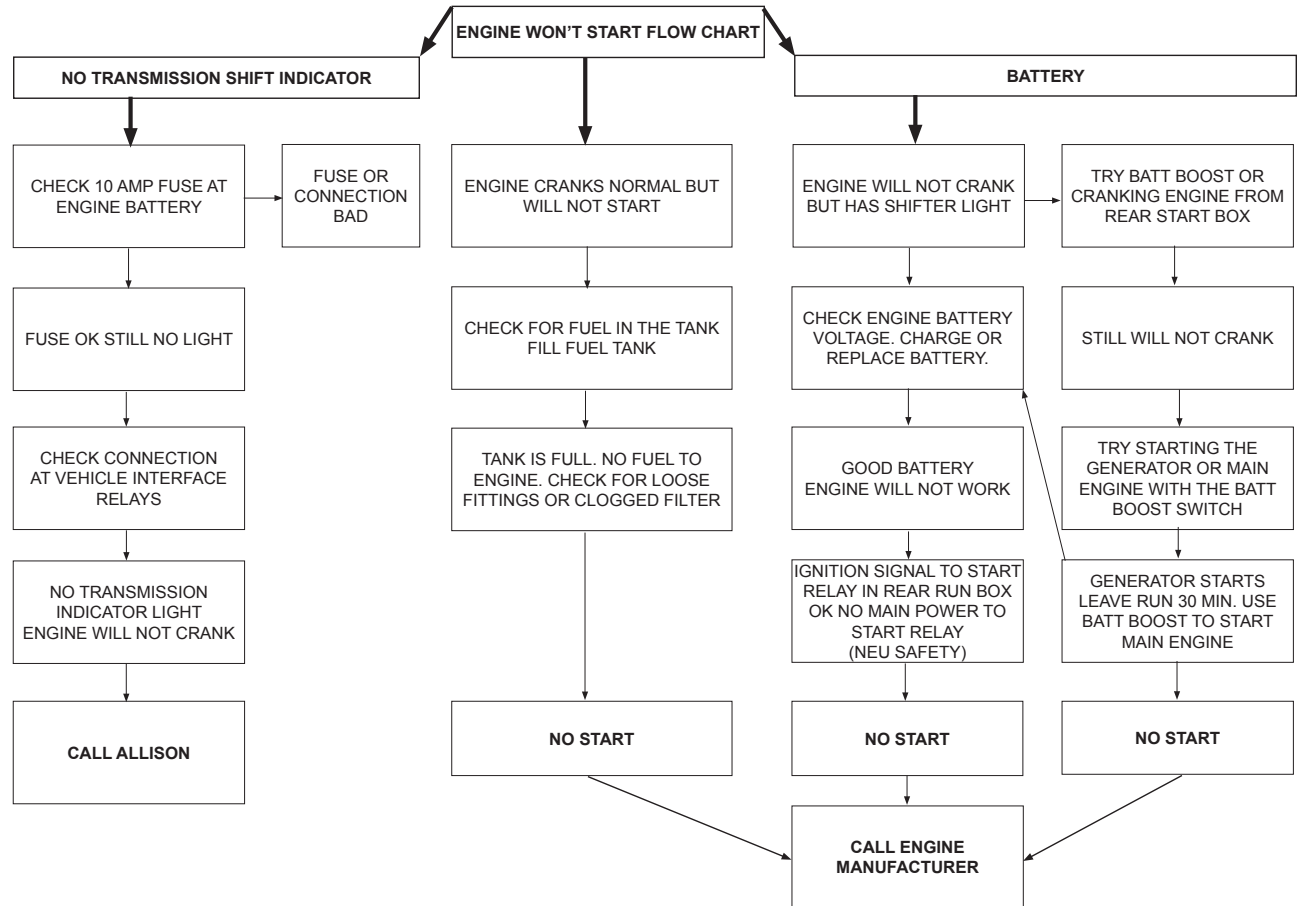
To Display Engine and Transmission Status:
 Use the joystick to enter the **Engine/Trans Status** screen from the **Main Menu**. After entering the **Engine/Trans Status** screen, move the joystick right to view the back up camera and right again for a rolling display of the four sub-screens. Move the joystick up/down to select the desired sub-screen.

MAIN MENU

- > ENGINE/TRANS STATUS
- COACH ELECTRICAL STATUS
- COACH TANK/MISC STATUS
- TRIP METER SELECTION
- TIME/ALARM FUNCTIONS
- SELECT VIDEO SOURCE
- SYSTEM OPTIONS
- POWER DOWN ALADDIN

SW 225	11:55 AM
ENGINE	TRANS
0.0 MPH	57 F TEMP
5 RPM	
59 F TEMP	
0 PCT LOAD	
0 PSI OIL	BATTERY
0.5 PSI BOOST	12.0 VDC
0.0 Cruise OFF	
0.0 MPG	
	CAMERA >

ENGINE "NO START" - FLOW CHART



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CHASSIS - INTRODUCTION

This section contains information and instructions regarding various components of the motorhome chassis. Follow the guidelines and procedures to help understand and operate the motorhome. Complete instructions for engine and transmission are located in their respective operator's 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 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 curbside side of the engine block.**

4. **Disconnect all the plugs from the transmission Electronic Control Unit, located in the front electrical bay.**
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 is a semi-monocoque design using all tubular steel. The semi-monocoque design provides greater structural integrity and overall uniform stress distribution.

The location of the air springs and shock absorbers combined with the semi-monocoque chassis provides the smoothest ride, best handling and trouble free service while delivering top notch drivability. The chassis has a three-point hydraulic leveling system or an air leveling system or both.

The front and drive axles are affixed in the chassis with trailing arms in a parallel four link arrangement while the tag axle uses leading arms. A panhard bar attached to the axle and frame prevents side motion of the axle in the chassis. The front and drive axles are mounted to a wide platform H-frame that carries the coach body on 8 outboard mounted air springs, four front and four rear. The tag axle uses two in-board mounted air bags. Suspension bushings require no lubrication for ease of maintenance. Unlike suspension that uses springs, the air suspension system automatically maintains the same attitude and ride height throughout the entire load range.

The towing receiver is rated at 10,000 lbs. towing weight and 1,000 lbs. tongue weight.

NOTE:

Only 42' models are equipped with a tag axle.



100168b

Tag located on curbside frame behind front wheel and in generator compartment.

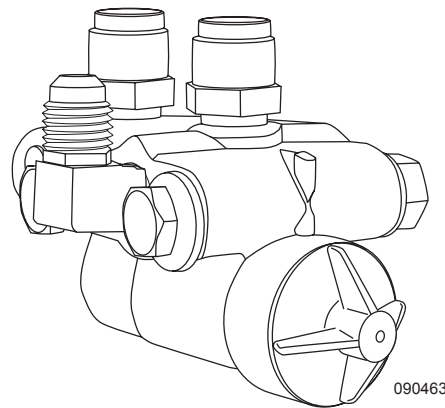
AIR SUPPLY SYSTEM

The air compressing system on the motorhome includes: a compressor, governor, dryer, front tank and rear tank. The compressed air system operates several items, including brakes, suspension, air horns, air gauge and the stepwell cover. The air system is charged by a gear driven air compressor mounted on the engine. As engine speed increases, compressed air output increases. When the air is compressed, heat is generated. Heat dissipates as the air is discharged from the compressor. Moisture condenses in the compressed air as it cools and enters the air dryer to be filtered. The filtered air charges the front air tank, which is divided in to a wet and 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 in-line check valves to prevent a 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 the air horns, receive air through **pressure protection valves (PPV)**. The PPV will not allow compressed air flow until the system reaches approximately 60 psi. In the event of an air system problem, the pressure protection valve will leave a reserve air charge for braking. The pressure protection valve is 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 115 to 145 psi and sending an air purge signal to the Air Dryer.

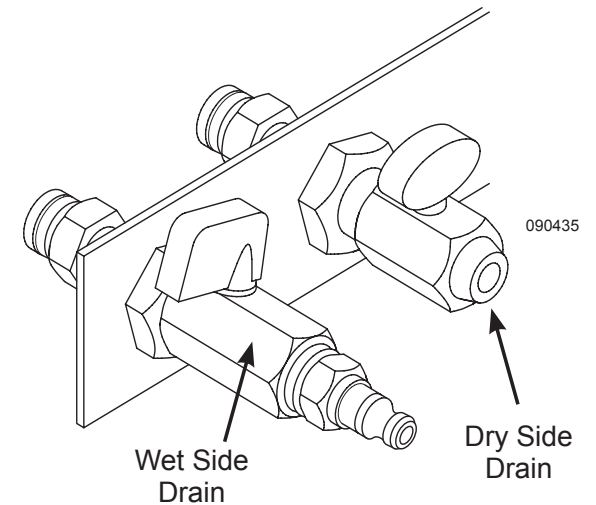
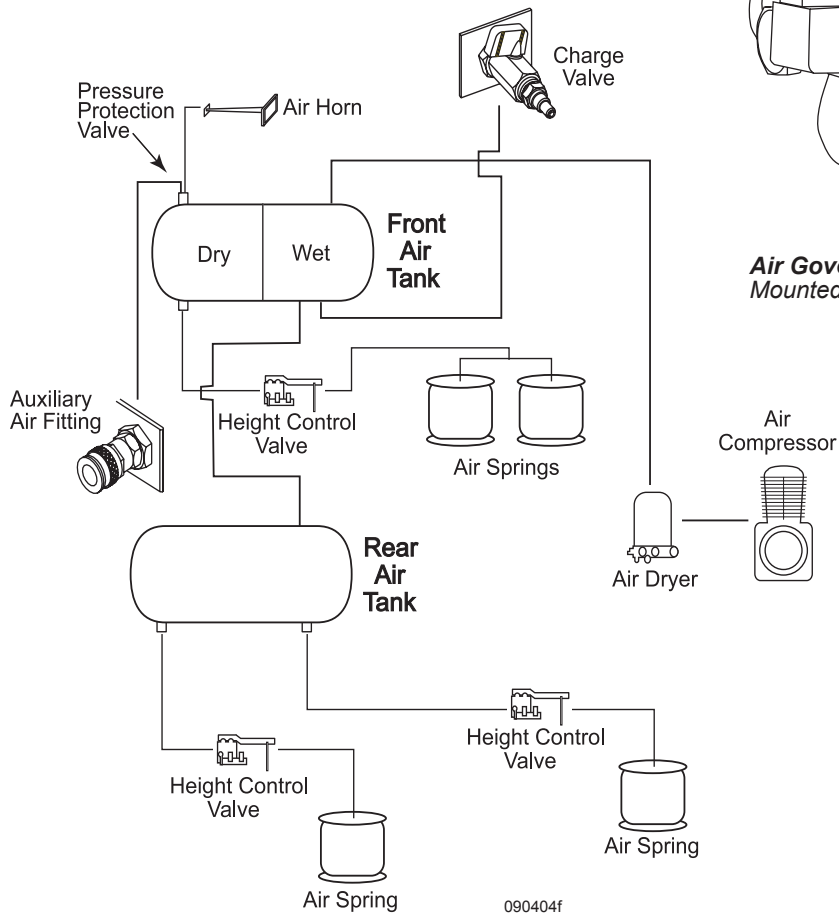


Air Governor:
Mounted in engine compartment

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. The front air tank has a drain valve for both the wet and dry side. The rear air tank only has one drain valve. Open the drain valves until all air is purged from the tanks, allowing five extra minutes for moisture to expel. Remember to close the tank drain valves. Both air tanks have a pressure relief valve that is set to release at approximately 150 psi.

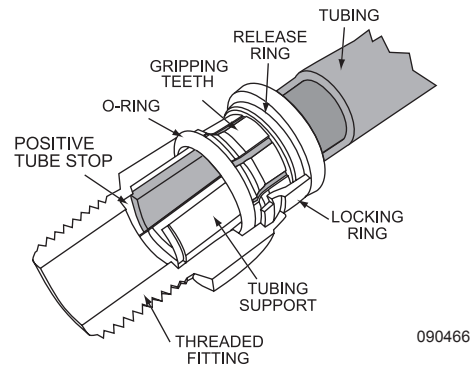
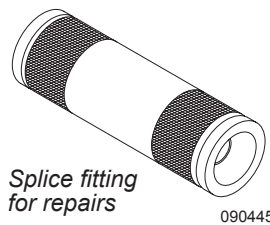


Front Tank drains are located in generator compartment on roadside.

Rear Tank Drain is located on hitch.

Air Fittings

Push-in fittings, used to connect air hoses between pneumatically operated items, are designed for quick and easy maintenance and repair. Sizes and types of fittings vary for different applications. Threaded fittings adapt the push-in fittings to connect pneumatically operated items. Main parts include the release ring, locking ring, solid brass body and special rubber compound O-ring. Damaged hoses can be repaired by splicing.



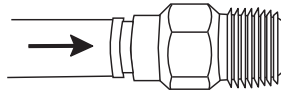
Cut-away of push-in fitting.

To Disconnect Hose:

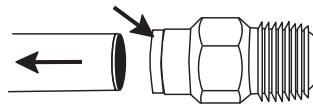
- ◆ Push hose into fitting.
- ◆ Push release ring down against locking ring portion of the fitting body.
- ◆ While holding the release ring down, pull hose away from fitting.

DISCONNECT

Push hose and ring in.

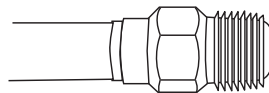


Hold release ring in place.



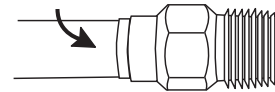
Pull hose away from fitting.

CORRECT

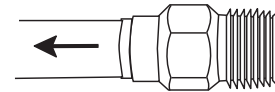


CONNECT

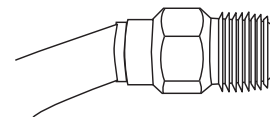
Twist hose into fitting.



Pull hose to secure.



INCORRECT



WARNING:

DO NOT remove air hoses from fittings while system is pressurized. Serious injury may occur.

WARNING:

Never place yourself under motorhome without first properly blocking frame (jackstands) from coming down in case of rapid deflation of air system.

NOTE:

When putting air hose back into fitting, be sure that hose is cut as squarely as possible so that the hose will evenly seal in the fitting. The cavity of the positive tubing stop provides support to prevent leakage.

Air Coupler - Universal

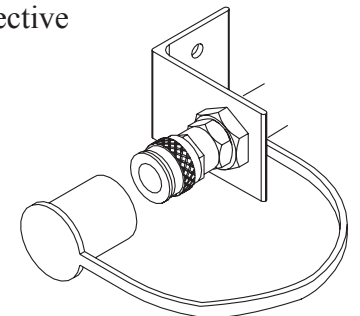
A remote air supply coupler, provided for convenience, is located in the generator compartment. The universal female fitting will accept several types of 1/4" ID male air fittings, including type C automotive. The auxiliary air fitting may be used to inflate tires, air mattresses or other pneumatic items. 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 the Universal Air Coupler:

- ◆ Remove the plastic protective dust cap.
- ◆ Using a firm grip, insert the air fitting into auxiliary air supply. The locking collar is spring loaded and will automatically lock when 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. The collar will lock into the open position when fully retracted.
- ◆ Replace the protective dust cap when finished.



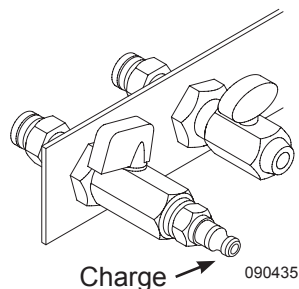
Located in generator compartment

NOTE:

Due to air pressure restrictions in the pressure protection valve and tire stem valve, the maximum amount of tire pressure achieved when the system is used to fill a tire is approximately 115 psi with the air system on the motorhome charged to 130 psi. Maximum outlet air pressure is achieved when the air system completes the fill cycle indicated by the purge cycle of the air dryer. Use a short hose to reduce tire fill time.

Air System - Charging (External)

The air system on the motorhome can be charged from an external air supply source. Located in the 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 on the motorhome 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.



Located in generator compartment.

CAUTION:

The external air supply source should be regulated to charge the air system on the motorhome no higher than 140 psi. Damage to the air system or pneumatically operated items may occur.

AIR DRYER

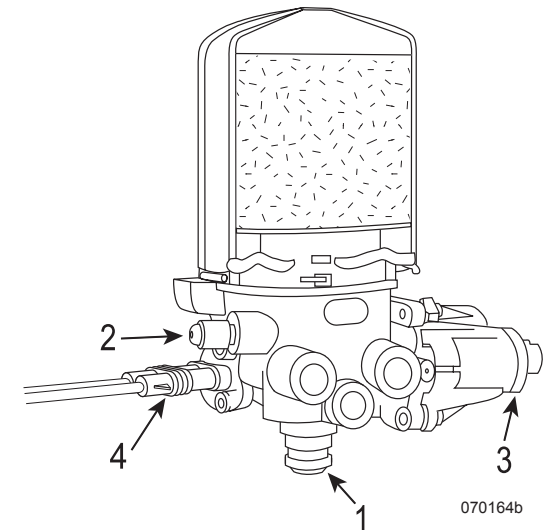
The air dryer, located curbside in engine compartment removes moisture from the compressed air system to prevent freezing of brakes or other pneumatically operated items. The three functions of the air dryer are cooling, filtering and drying the system air. This prevents valve and seal damage or wash away of lubricants as well as freeze damage to the system components.

Air Dryer Cycle:

The governor turns the compressor on when the supply tank pressure drops below cut-in pressure. Compressed air then passes into the air dryer at the inlet port. Moisture-laden air and contaminants pass through the desiccant. Moisture is retained by the desiccant and collects in the base of the dryer. When the compressor reaches cut-out pressure (approximately 145 psi) the purge valve opens and the dryer purges and expels water collected in the dryer base. The regeneration valve opens sending a small charge of dry system air from the front air tank back through the dryer. The backflow dries the desiccant, preparing it for the next cycle.

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 to allow collected moisture, condensation and contamination to expel 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 by allowing air from the supply and secondary tanks to bypass the outlet check valve.
- 4. Heater Power Connection:** Provides 12 Volt DC power to the heating element.



In extreme cold, verify that the air dryer heater is in good working order. The 100-watt heater in the air dryer is controlled by ignition power. The heater turns on below 45° F and off when the air dryer temperature is above 86° F. The circuit breaker for the heater is located in the rear electric bay.

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

Warm, humid air from the compressor condenses into either water or water vapor. A desiccant-type air dryer protects the air brake system by drying moisture-laden air before it passes through the air reservoirs and into the brake system. The replacement kit contains one cartridge and one O-ring.



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Located curbside in rear engine compartment

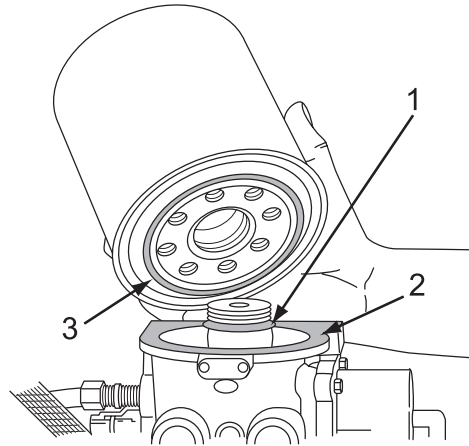
To Replace the Cartridge:

1. Loosen and remove the old cartridge. Use a strap wrench, if necessary.
2. Remove and discard the O-ring from the dryer base.
3. **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.

4. Install a new O-ring.
5. Lubricate the O-Ring on the stem with a thin layer of grease.
6. Lubricate the cartridge seal with a thin layer of grease.
7. Thread the replacement cartridge onto the base until the seal touches the base. Tighten the cartridge **ONE** additional turn. **DO NOT OVERTIGHTEN.**



080223
1. O-Ring
2. Seal Seat
3. Cartridge Seal

NOTE:

If an excess amount of water is present when performing the monthly air tank drain service, the filter for the air dryer may need to be changed.

Desiccant-Type Air Dryer

1. Warm, humid air from the compressor condenses into either 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.

REPLACEMENT REQUIREMENTS		
Components	When to replace?	Why?
Desiccant Cartridge	<ul style="list-style-type: none"> • Every two to three years. • When compressor is replaced. • Water in supply tank. 	<ul style="list-style-type: none"> • Preventive maintenance. • Contaminated cartridge. • Saturated or contaminated cartridge, high duty cycle (wrong application of air dryer).

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. The governor turns the compressor off when the system reaches cutout pressure (approximately 145 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 air tank backflows through the filter. The backflow dries the desiccant, preparing it for the next cycle.

AIR SPRING INSPECTIONS

Listed items should be checked when the motorhome is in for periodic maintenance.

NOTE:

Never attempt to service the air suspension on a motorhome with the air spring inflated.

- ◆ **Inspect the Outer Diameter (OD)** of the air springs. Check for irregular wear or heat cracking.
- ◆ **Inspect** air lines to ensure contact does not exist between air line and air springs. Air lines can rub a hole in an air spring very quickly.
- ◆ Ensure there is sufficient clearance around the complete 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. This height should be maintained within $\frac{1}{4}$ inch. This dimension can be checked with the motorhome loaded or empty.
- ◆ The leveling valves (or height control valves) assist in ensuring the total air spring system works as required. Clean, **inspect** and replace if necessary.
- ◆ Make sure to check shock absorbers for leaking hydraulic oil and worn or broken end connectors. If a broken shock is found, replace it immediately. The shock absorber will normally limit 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 to use soap and water, methyl alcohol, ethyl alcohol or isopropyl alcohol. Unapproved cleaning methods include all organic solvents, open flames, abrasive and direct pressurized steam cleaning.

HEIGHT CONTROL VALVES

Height Control Valves (HCV) inflate or deflate air springs to maintain proper suspension height throughout the load range. Two Height Control Valves are installed at the rear drive axle to control rear suspension height and left or right tilt of the motorhome. A separate HCV is installed to control front suspension height. The three HCVs mount to the main frame of the motorhome, above the axles, with a linkage rod connecting the valve to the axle.

Actuating components inside of the valves are oil dampened to reduce valve reaction to 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 by adding or purging air from the air springs as needed.

The air springs mount between the axle H-frame assembly and the two main frame rails. Air spring support plates mount to the main frame and the H-frame. There is a specified distance the air spring must maintain between the mounting plates. Other than specified distance between the plates will compromise ride quality and handling, and affect shock absorber travel, drive shaft angle, as well as various other running gear components.

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 will automatically apply (this occurs at approximately 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 will remain lit until air system pressure is above 65 psi.

WARNING:

When parked with the air tank not depleted, there is 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, clamped at the base of the shaft, will work.

Automatic Slack Adjusters

The braking system 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 will keep the brake lining at proper adjustment. Automatic slack adjusters and the connecting S-cam shaft require periodic lubrication and inspection.

WARNING:

Automatic slack adjusters are not designed to be manually adjusted. DO NOT manually adjust the slack adjusters. 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.

NOTE:

Replacement parts should be of the same original equipment size and type. Mixing brake components may result in unequal braking action. Brake maintenance is not covered by the manufacturer.

WARNING:

Brake lining may contain asbestos material and should only be serviced by qualified service technicians who are trained in the appropriate precautionary procedures.

Brake Systems - Backup

The motorhome air braking system is equipped with backup safety systems and warning alarms in the event of air system failure. For example: should the air compressor fail to charge the air system and low air gauge readings go undetected, a low air pressure warning buzzer will sound and a low air pressure dash warning indicator light will flash. These warning indicators occur at approximately 65 psi. This will alert the operator of an impending situation. If the motorhome is allowed continued operation, the pneumatic emergency spring brake relay valve, installed in the air system, senses the low air pressure condition and will release the air charge from the spring brake air chambers on the rear drive axle. In this case, the park brakes will automatically apply at approximately 30 psi. This safety backup system acts as an automatic emergency brake system.

Another backup 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 and tag 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.

Accessory air items are other pneumatically operated items such as the air horn, vacuum generator, etc. The accessory air items operate only when air tank pressures exceed 65 psi. This is done with pressure protection valves. Should an accessory air item fail, the pressure protection valve (PPV) reserves the remaining air pressure of 65 psi for braking. This will leave the motorhome with one air tank fully charged for safety backup.

The rear air tank also has a safety backup - the safety inversion valve. The inversion valve senses the absence of rear air tank pressure. In this case the inversion valve will allow 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 backup system implements use of all the brakes, allowing the operator to bring the motorhome a safe stop. In case of all compressed air charge escaping from the front air tank, the operator will still have full use of the rear brakes.

BRAKE - AUXILIARY

Auxiliary braking systems are designed to supplement the standard wheel braking system.

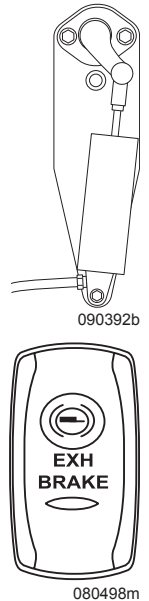
These devices are not designed to bring the motorhome to a complete stop; however, they can assist in controlling the speed of the motorhome. Use of the auxiliary braking system can extend service life of brake linings .

Exhaust Brake

The exhaust brake system is an auxiliary braking device that is attached directly to the engine turbocharger. A switch on the driver's console operates the exhaust brake. The exhaust brake will engage when the switch is on and the 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 pressure slows the engine speed. The amount of engine braking power developed is related to engine speed (RPM), so the engine braking effect increases with higher engine RPM.

The exhaust brake is wired to the electronically controlled transmission. When the exhaust brake is activated going down a hill, it will help 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 through second gear. Certain road conditions and engine speeds may require manually shifting the transmission in order to generate adequate engine RPM and increase the engine brake effect.



NOTE:

The brake lights will illuminate while the Exhaust Brake is applied.

NOTE:

Activating the Exhaust Brake switch will cancel the cruise control.

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 to monitor magnetic pulses. The pulses are monitored by the ABS electronic control unit (ECU).

The ECU monitors all 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 traction. It is possible, under certain conditions, to have

the wheel(s) skid with a normal functioning ABS system.

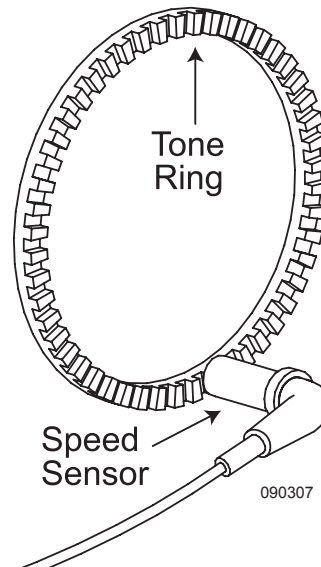
The ABS itself does not apply additional braking power. The purpose of the ABS is to limit wheel lock and decrease stopping distance. Cautious driving practices and maintaining adequate safe distance when following vehicles is the key to safe vehicle operation.

WARNING:

The ABS/ATC system is designed to increase tire to road surface traction but cannot overcome naturally occurring laws of physics. The ABS/ATC system, combined with safe driving practices, will 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.



- ◆ The ECU receives the speed sensor signal pulses to calculate 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 are operated in the Air, Release or Hold modes to regulate air pressure to the brake chambers.
- ◆ Braking force is applied at a level which minimizes the stopping distance while maintaining as much lateral stability as possible.

ABS Warning Light:

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 (3 seconds) verifying the self-diagnostic test. If the ABS indicator light remains on, or illuminates while the motorhome is being operated, this indicates a fault in the anti-lock brake system. This fault will not affect normal service braking. The motorhome will need to go to a service center to repair the problem.

INFORMATION:

If a fault code occurs, call a Bendix service locator at 1-800-247-2725 and take the motorhome to the nearest repair facility.

ATC System:

The ATC system improves traction on slippery or unstable road surfaces by limiting excessive drive wheel slip. This is accomplished two ways, limiting engine torque to the drive wheel or engaging a brake to the spinning drive wheel. During normal operation engine torque is unaffected. 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:

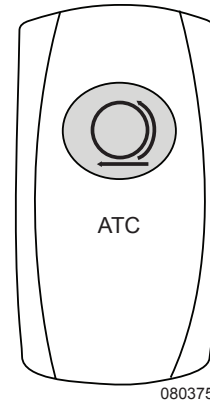
The ATC system is always active.

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.

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 will vary 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.

ATC Indicator Light:

During normal operation, the ATC indicator light on the dash will illuminate steady when the ignition key is turned ON. If an ATC event occurs, the indicator light will flash quickly. The indicator light will flash slowly if the ATC switch is activated.

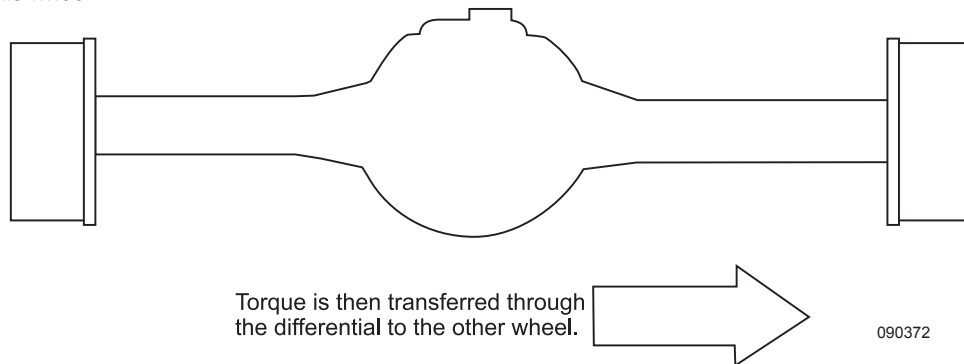
CAUTION:

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.

How Automatic Traction Control (ATC) Works

If this wheel is spinning due to slippery surface or wheel off the ground, the ABS system with ATC applies the brake to this wheel.

This wheel then delivers torque to the ground.



Torque is then transferred through the differential to the other wheel.

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FRONT AXLE

While driving the motorhome, be aware of any changes in the feel of steering and have the system checked when noting 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 is parked. Investigate any unusual or loud noises that occur. Begin by checking the level of the hydraulic fluid. 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 sharply turning back and forth, the noise should be inspected and repaired as necessary.

Shimmy and looseness should be checked and corrected as soon as possible. If 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 evident play or uneven interaction between components to help pinpoint a problem. Wheel bearings should be cleaned and repacked with high temperature disc brake grease every 30,000 miles. 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; a change in the alignment may indicate damage to the steering components or suspension.

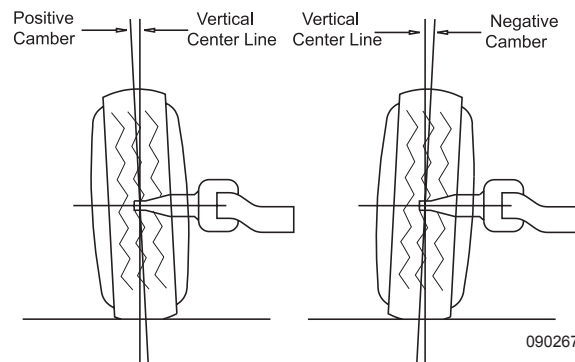
Maintenance for the system entails adequate lubrication. Use only a hand operated grease gun on the fittings. Grease fittings for the steering system are found on the both ends of the drag link (the bar connecting the steering gear to the axle), and on the intermediate steering shaft located between 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

Camber:

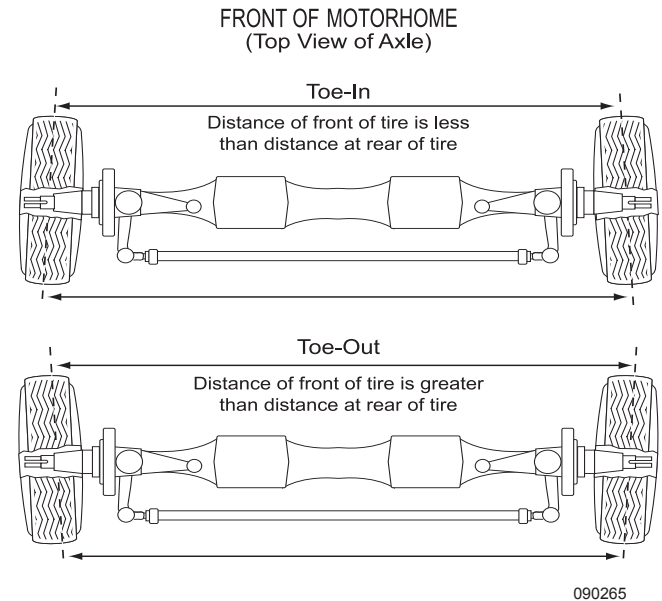
Camber, as shown, is vertical tilt of wheel as viewed from the front of the motorhome. This is machined into the axle when manufactured and is not adjustable.

- ◆ “Positive” camber is an outward tilt of the wheel at the top.
- ◆ “Negative” camber is an inward tilt of the wheel at the top.



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 motorhome 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 motorhome 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.

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.

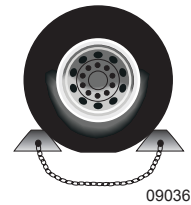
“**Positive**” caster is the tilt of the top end of the kingpin toward the rear of the motorhome.

“**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 the motorhome wandering or poor steering return to center. The caster angle is determined by the installed position of the steer axle.

Lubrication Maintenance Safety

The front axle components require periodic lubrication maintenance. Chock wheels for safety prior to accessing components underneath the motorhome.



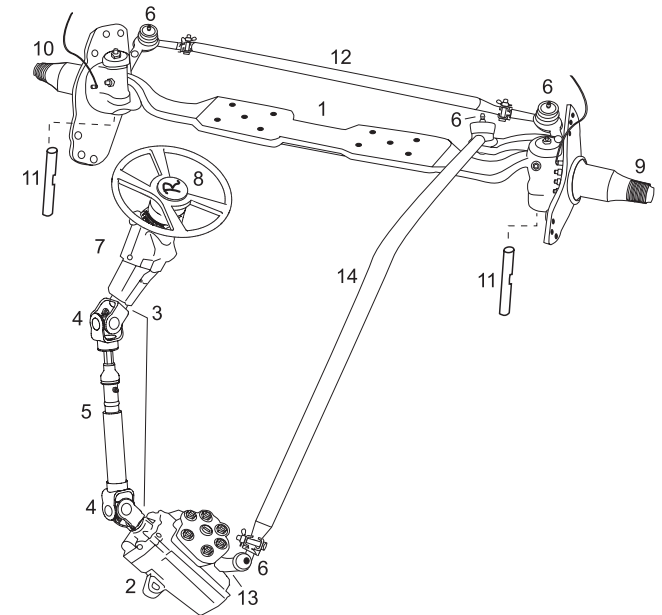
WARNING:

Never place yourself under motorhome without first properly blocking frame (jackstands) from coming down in case of rapid deflation of air system.

NOTE:

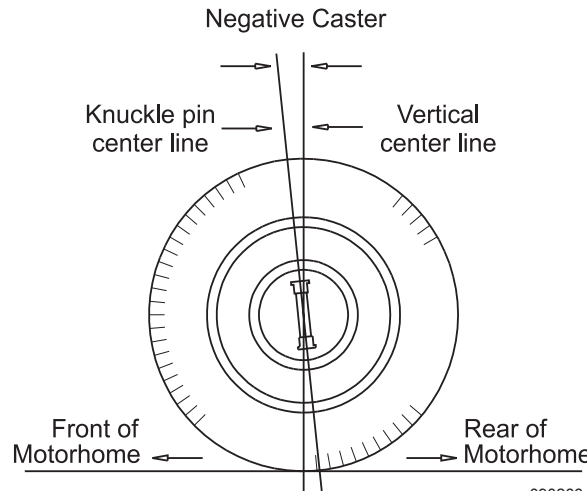
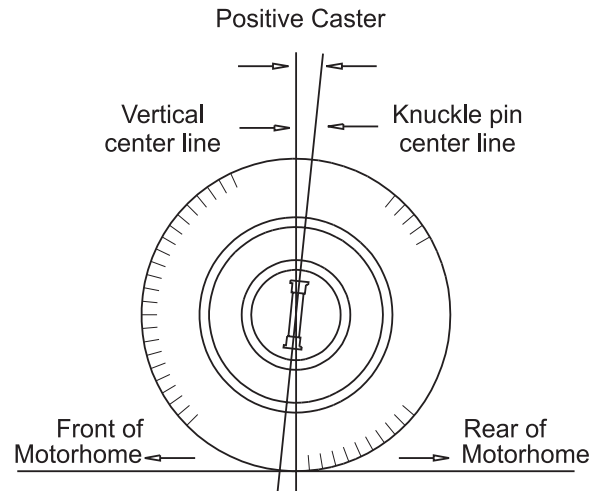
Suspension and steering components are lubricated at factory using Texaco Starplex NLGI 2 Lithium soap-based grease.

Steering Components



Typical Steering Components

- 1. Axle Beam
- 2. Steering Box
- 3. Intermediate Steering Shaft
- 4. Universal Joints
- 5. Slip Yoke
- 6. Ball Joint
- 7. Steering Column
- 8. Steering Wheel
- 9. Right Knuckle Assembly
- 10. Spindle
- 11. Kingpin
- 12. Centerlink
- 13. Pitman Arm
- 14. Drag Link



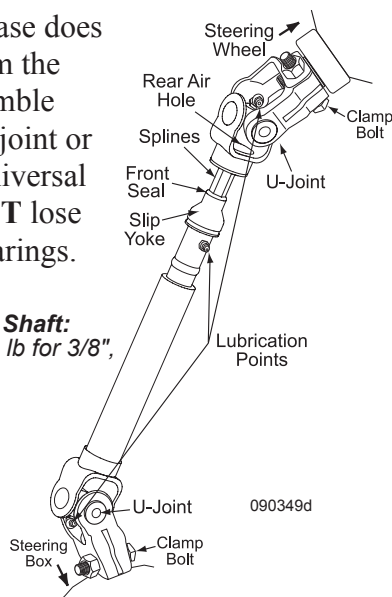
Steering Column

The intermediate steering shaft connects the steering wheel to the steering box. Service the intermediate steering shaft universal joints and slip yoke every 30,000 miles or annually. Check torque on clamp bolt every 5 years or 50,000 miles. Remove the steering column cover to access the upper universal joint and slip yoke lubrication points. 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 shaft for looseness. Repair if loose or worn. Check clamp bolt and torque as specified.
2. Apply the specified grease at the grease fitting on the universal joint. Apply 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 the needle bearings.

Intermediate Steering Shaft:
Torque clamp bolt 48 ft. lb for 3/8",
75 ft. lb for 7/16"



Greasing the Intermediate Steering Shaft Slip Yoke and Splines:

1. Check the shaft for looseness. Repair if loose or worn.
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 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.

NOTE:

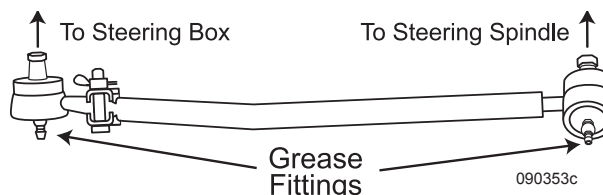
Depending upon application universal joints may have two grease fittings each. It is necessary to apply grease to each fitting to properly lube the universal joint.

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.

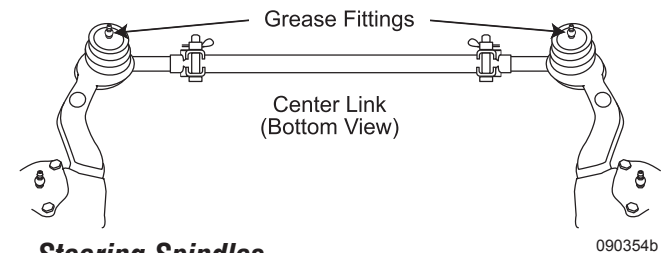
NOTE:

It will be necessary to start the motorhome and turn the steering wheel to access fitting(s).



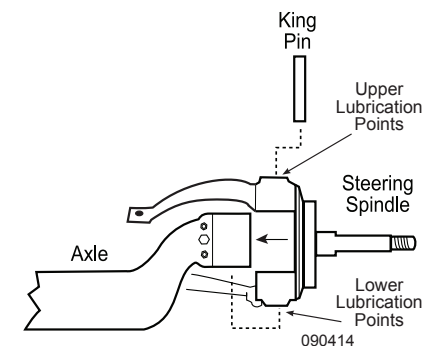
Center Link

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.

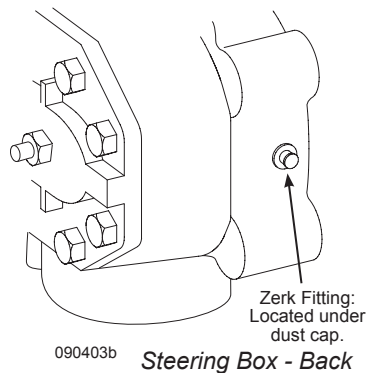


Control Arm Bushings

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.

STEERING GEAR

Maintain the grease pack behind the output shaft dirt and water seal as a general maintenance procedure at least twice a year. The grease fitting is provided in the housing trunnion.



Use NLGI grade 2 multipurpose chassis lube and use only a hand operated grease gun on the fitting. Add grease until it begins to extrude past the sector shaft dirt and water seal.

Power steering is provided by using hydraulic pressure to assist rotating the output shaft of the steering gear. Located at the end of the input shaft of the steering gear is poppet valve and worm drive. The poppet valve directs the hydraulic fluid pressure to a type of spool. The worm drive threads in the center of the spool. When in the center position, pressurized hydraulic fluid bypasses the spool.

When a turn is made, the poppet valve shifts to one direction or the other, directing the hydraulic pressure to one side of the spool depending on

turning direction. The hydraulic fluid is then cooled before returning to the reservoir.

NOTE:
Inspect for signs of leakage when performing fluid level checks.

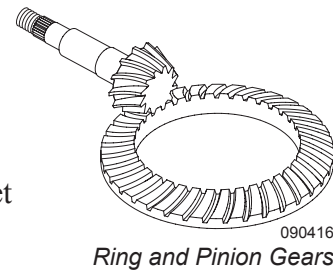
Changing the hydraulic filter in the engine compartment at regular intervals will help ensure trouble-free operation.

DRIVE AXLE & DRIVE SHAFT

Drive Axle:

The chassis drive axle is a single reduction axle. 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 80w-90 gear oil meeting SAE J 2360 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. 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.

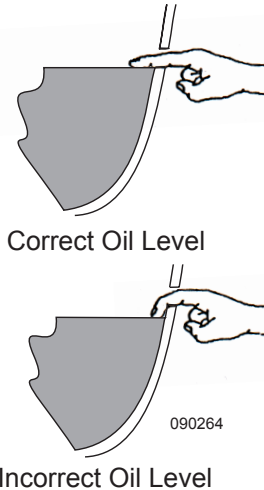
The level of lubricant in the rear axle should be checked every 30,000 miles or annually, whichever occurs first. This will ensure adequate lubricant in the axle for proper operation. Regular inspection of the drive axle lube levels is an essential maintenance procedure.

WARNING:

Never place yourself under motorhome without first properly blocking frame (jack stands) from coming down in case of rapid deflation of air system.

Proper Drive Axle Lubricant Level:

- ◆ With the motorhome parked on a level surface and rear axle warm, place a large container under axle.
- ◆ Clean the area around the fill plug, which is located approximately 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 to 50 ft. lbs.



6. Clean the area around the fill plug from the axle-housing bowl.
7. 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° F or hotter can easily cause severe burns.

NOTE:

When checking the lube level also check the housing breathers on top of axle housing. Clean the breathers if dirty or replace them if damaged.

Drive Shaft:

The drive shaft transfers the power produced by the engine to the drive axle. A worn or out of balance drive shaft causes chassis vibration that generally increases in intensity with road speed.

Lubrication Maintenance:

The drive shaft requires periodic lubrication maintenance. Lubricate the slip joint and universal joints every 5,000 miles or six months, whichever occurs first. Use NLGI #2 chassis lubricant.

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. Repair if loose or worn.

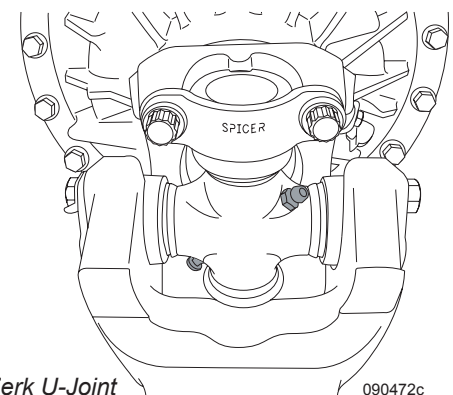
2. Apply the specified grease at the grease fitting on the universal joint. Apply until new grease purges from all the seals.
3. If new grease does not purge at the seals, loosen the bearing cap bolts and re-grease until all four caps purge. If new grease still does not purge, disassemble and clean or replace the universal joint.

NOTE:

Depending upon application universal joints may have two grease fittings each. It is necessary to apply grease to each fitting to properly lube the universal joint.

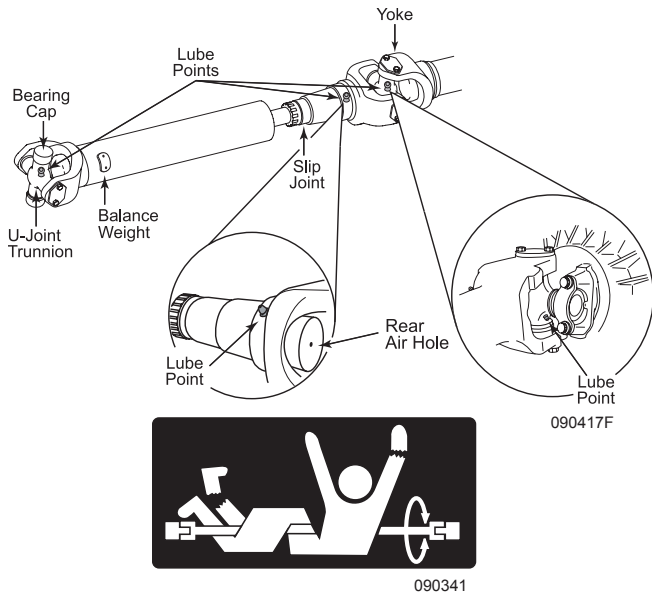
Greasing the Drive Shaft Slip Yoke and Splines:

1. Check the drive shaft for looseness. Repair if loose or worn.
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 until new grease purges and forces finger away from the air hole in the end of the slip yoke.



Dual Zerk U-Joint

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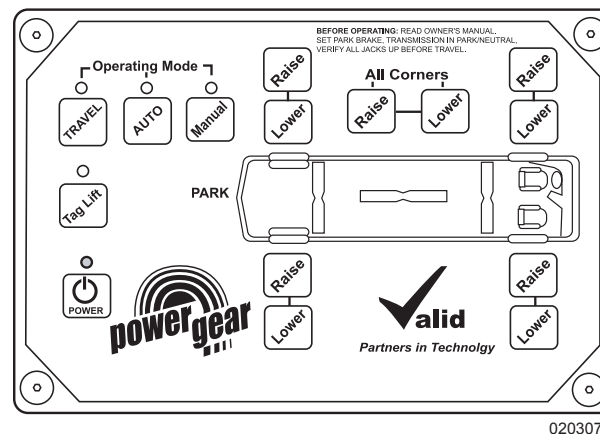


WARNING:
Rotating shafts can be dangerous. Rotating shafts can snag clothes, skin, hair, hands, etc. causing serious injury or death. DO NOT work on or near a shaft with or without a guard when the engine is running.

TAG AXLE (42' MODELS ONLY)

Hydraulic Leveling:

A stand alone switch is used to raise or lower the tag axle. The tag axle switch is located on the driver's console. Two lights are located on the switch: the tag axle icon will illuminate with the park lights and the lower bar light will illuminate 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, the tag axle is automatically lowered and the light will be off. A beeping alarm sounds when the switch is on. Raise the tag axle when performing tight maneuvers less than 5 MPH to reduce turn radius and prevent the tag axle tires from scuffing.

Air Leveling (Optional):

Raising or lowering the tag axle is integrated into the Air leveling pad located on the driver's console. Pushing the "Tag Lift" button will illuminate the corresponding LED and raise the tag axle. The tag lift feature uses a two minute delay at each ignition cycle to ensure enough air system pressure is available to raise or lower the tag axle. After starting the engine, press the Travel button to begin the time delay. After approximately two minutes, the tag axle LED will stop flashing, indicating the time delay is over and the tag axle can be raised.

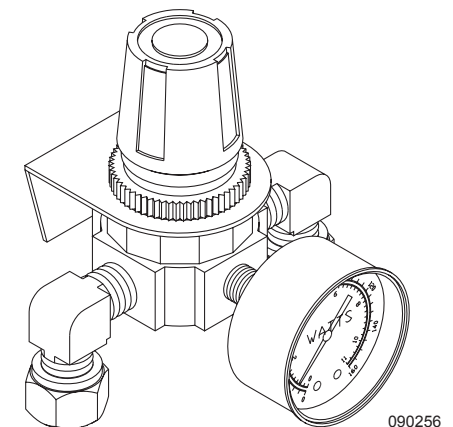
Raise the tag axle when performing tight maneuvers, at less than 5 MPH, to reduce turn radius and prevent the tag axle tires from scuffing. The tag axle will automatically lower when the motorhome exceeds 10 mph.

NOTE:
With the tag axle in the up position, there is not a specific height requirement other than the tire should be off the ground.

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 is preset at the factory and may require adjustment to obtain the proper weight distribution on all axles. To determine the correct setting of the pressure regulator, weigh the motorhome after it has been loaded for travel.

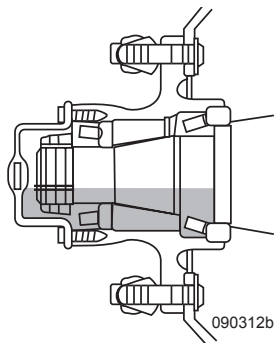
NOTE:
The tag axle pressure regulator valve is located in the engine compartment on the roadside.



Tag Axle Pressure Regulator located in engine compartment.

Tag Axle Lubrication:

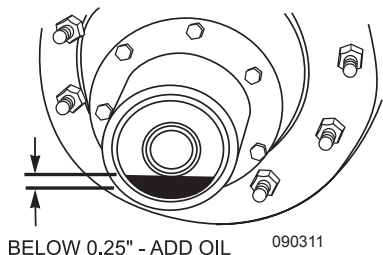
All tag axes use oil to lubricate the wheel bearings. The oil is drained and refilled without removing the wheel end assembly. Remove the hubcap to access the bearing cover and drain plug.



Shading Indicates Correct Amount of Oil

INSPECTION:

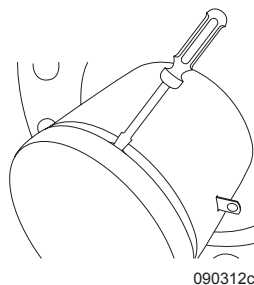
Inspect the oil level before every trip or every 5,000 miles. The motorhome should remain motionless for at least 30 minutes in order to stabilize the oil level before inspecting.



BELOW 0.25" - ADD OIL 090311

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.



Oil Change Intervals

The recommended oil change interval is based on operating conditions, speeds and loads. Limited service applications may allow the recommended interval to be increased. Severe applications may require the recommended interval to be reduced. For more information, contact a Dana/Eaton service representative.

Recommended Interval Change:

- ◆ Change the fluid whenever the seals are replaced, the brakes are relined or at 30,000 miles (48,000 km). However, check the lubricant twice a year (spring and fall) for contamination. Change as needed.
- ◆ If yearly mileage is less than 30,000 miles, change the fluid twice a year (spring and fall).

Lubricant Type:

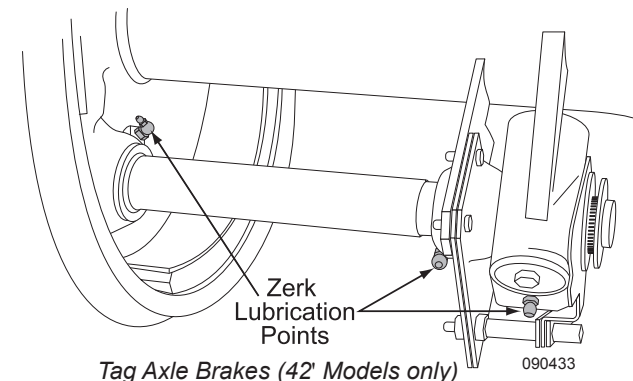
- ◆ Texaco Star Gear Lubricant SAE 80w/90. Specifications, minimum ambient temperature - 15° F (-26.1° C). There is no maximum ambient temperature. Lubricant temperature must never exceed 250° F (+121° C).

To Drain:

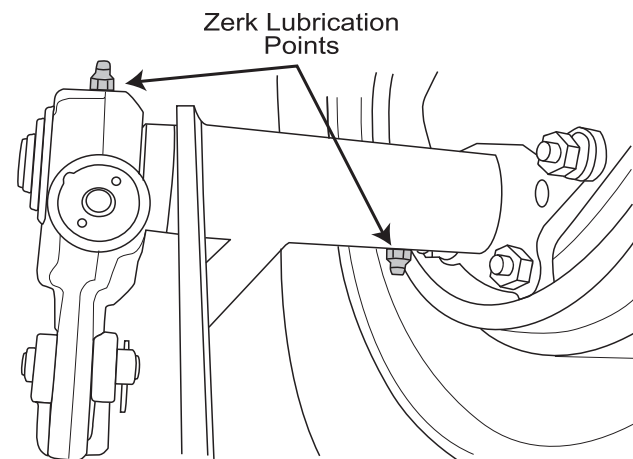
- ◆ Place a suitable container below the bearing cover and remove the drain plug. If the cover does not have a drain plug, remove the screws retaining the cover plate to drain the lubricant.
- ◆ Replace plug or cover plate and fill bearing assembly with the recommended lubricant.

DRUM BRAKE LUBRICATION

The drive and tag axle slack adjuster and "S" cam shaft need to be periodically lubed to ensure proper brake operation. Lubricate every 10,000 miles or three months using a NLGI #2 Lithium soap-base lubricant.



Tag Axle Brakes (42' Models only)



Rear Brakes (All Models)

SHOCK ABSORBER

The shock absorber is a hydraulic device used to dampen suspension/ body movement. Road surface irregularities are compensated for by the shock absorber. 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 approximately 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 will be 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.



LEVELING - HYDRAULIC

The leveling system is designed to reduce sight selection problems and stabilize the motorhome when parked. The leveling system features a remote control panel (located near the pilot seat). The multiple warning system that consists of a Jacks Down LED and warning alarm if a jack is down and the transmission is placed in gear or the park brake is released.

The leveling system can be operated in manual or automatic modes.

Safety Features:

The leveling system has safety features to prevent a jack from extending during travel. The control panel will not activate until the following safety features are in place.

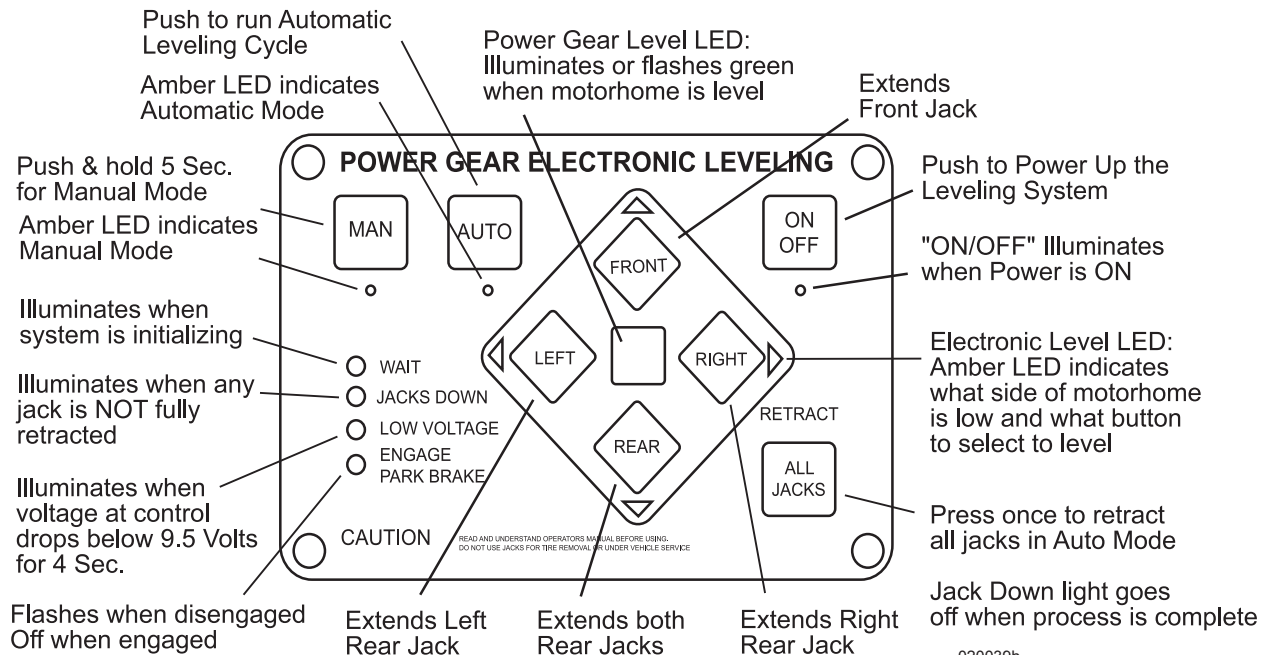
- ◆ Transmission is in Neutral.
- ◆ Parking brake is applied.
- ◆ Ignition switch is in the ACC or On position.

Remote:

The remote control panel includes four jack extend switches, an Auto switch, a MAN (manual) switch, a retract All Jacks switch and a power **ON/OFF** switch. A LED light next to a directional button indicates that position is low.

Indicator Lamps:

- ◆ **MAN** – Indicates system is in manual level mode.
- ◆ **AUTO** – Initiates Automatic level mode.
- ◆ **ON/OFF** – Turns the leveling system on or off.
- ◆ **JACKS DOWN** – Indicates one or more jack is extended.



- ◆ **LOW VOLTAGE** – Indicates chassis voltage is low.
- ◆ **ENGAGE PARK BRAKE** – Indicates the Park Brake is disengaged.
- ◆ The LED adjacent to any extend switch indicates that position is low.

CAUTION:

The leveling jacks are not designed for changing tires. This can cause problems with the suspension system, frame alignment and damage to the windshield(s). Never use the jacks to elevate any wheel position off the ground.

CAUTION:

DO NOT move the motorhome while the jacks are still in contact with the ground or extended. Damage to the jacks can occur.

Prior to Leveling

- ◆ Chassis battery voltage must be at least 12 Volts DC.
- ◆ Select a level site if possible, or park the motorhome with the front facing downhill.
- ◆ Apply the parking brake. Place the transmission in Neutral.

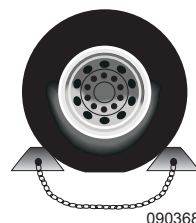
- ◆ (Optional) Lower the air suspension (if applicable) by stepping on the brake several times until system air pressure is below 60 psi. With the ignition on, push and hold the Air Dump switch to lower the suspension. This reduces the amount the jack will need to extend before making contact with the surface.

CAUTION:

Ensure potential jack contact points are clear of obstructions or depressions before operation. Keep all people clear of the motorhome during leveling system operations. Never expose hands or other parts of the body near hydraulic leaks. Hydraulic lines are under high pressure. Oil leaks may cut and penetrate the skin causing serious injury.

CAUTION:

Hot asphalt, gravel or dirt may not support the weight that is 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.



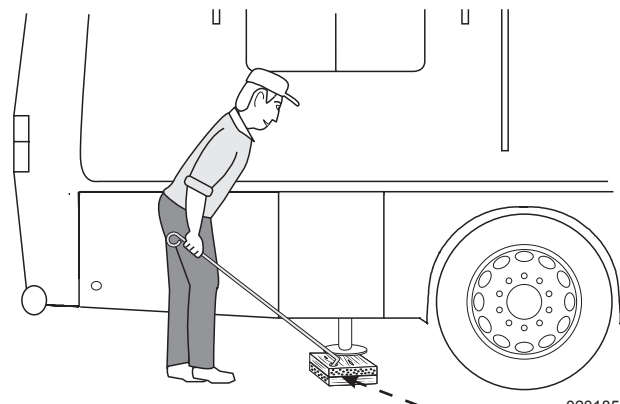
Properly chock the wheels to prevent the motorhome from rolling.

CAUTION:

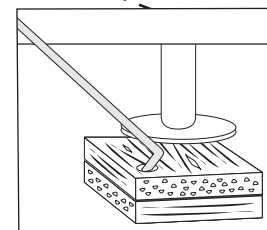
Survey the area around and under the motorhome for obstructions that can damage the motorhome or undercarriage components before lowering the air suspension. Damage to the mud flap may occur if it is located over a raised area.

NOTE:

If additional height or surface support is needed, construct a 1' x 1' wooden block made from two pieces of ¾" plywood for a total thickness of 1½". Drill hole in corner and use awning wand to slide wooden block under jack pad.



Wood Support Block



020185b

Manual Leveling

The manual leveling mode can be used for leveling or stabilization preference. An indicator lamp adjacent to an extend switch indicates that jack position(s) is low.

Manual Leveling Operation:

- ◆ Follow the instructions in *Prior to Leveling*.
- ◆ Turn the ignition switch to On or ACC position.
- ◆ Press the **ON/OFF** button to turn the system on.
- ◆ Press and hold the **MAN** (manual) button for five seconds. Once the indicator lamp below the **MAN** button illuminates, the system is ready.

CAUTION:

Prior to leveling the motorhome it is important that all jacks be in contact with the ground to stabilize and support the frame. No single jack should be solely used to level the motorhome. Applying an improper leveling process can cause excess torsion stress and/or twisting of the chassis, frame and body, resulting in damage to the windshield or an entry door malfunction.

- ◆ Extend the front jack(s) until contact with the surface is made. Extend an additional 1/2". This allows the front jack(s) to act as a pivot point.

- ◆ Extend the jack position according to the indicator lamp. Example: If the indicator lamp is lit under **Jack Extend Switch - Rear**, the rear of the motorhome is low. Press and hold the Rear button. Both rear jacks will extend. Once level, the system will automatically stop. The Power Gear Level Light will illuminate. Release the switch. Pressing Right or Left will extend a single rear jack accordingly.
- ◆ Turn off the remote panel.
- ◆ Turn off the Ignition switch.

Automatic Leveling

The automatic function of the leveling system should only engage when the site is relatively level and solid to prevent excessive twist/stress to the frame. It is essential that there is no movement in the motorhome prior to and during the automatic leveling process.

Automatic Leveling Operation:

- ◆ Follow the instructions in *Prior to Leveling*.
- ◆ Turn the ignition switch to On or ACC position.
- ◆ Press the **ON/OFF** button to turn the system on.
- ◆ Press the Auto switch. The pump motor activates and the appropriate jacks automatically extend and level the motorhome.

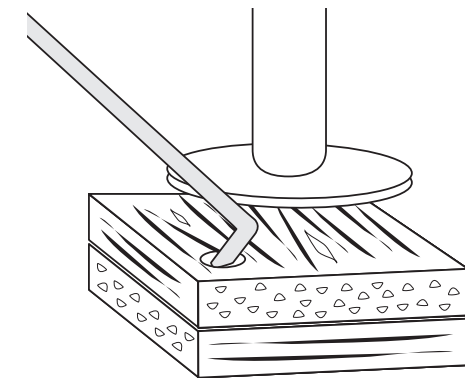
NOTE:

A Jacks Down warning light will illuminate when the jacks are extended. The alarm will sound if the jacks are down and the park brake is released or transmission placed in gear.

- ◆ The motorhome is level when the LED's next to Jack Extend switches are off and the green Power Gear Level light is illuminated.
- ◆ Turn off the remote panel.
- ◆ Turn off the ignition switch.

NOTE:

If additional height or surface support is needed, construct a 1' x 1' wooden block made from two pieces of 3/4" plywood for a total thickness of 1 1/2". Drill a hole in one corner and use the awning wand to slide the wooden block under the jack pad.



Wood Support Block

020185b

Retracting Leveling Jacks

- ◆ Turn the ignition switch to On or ACC.
- ◆ Confirm that parking brake is applied.
- ◆ Turn On the remote panel.
- ◆ Momentarily press the All Jacks Retract button. If retracting in manual mode, the All Jacks button must be held until the Jacks Down LED goes out.
- ◆ Once the Jacks Down LED goes out, jacks should be fully retracted. Make a visual inspection to ensure that all jacks have fully retracted before moving the motorhome.

INSPECTION:

Perform a visual inspection to ensure that all jacks have fully retracted before moving the motorhome. Remove any debris that may be on the jack pad.

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 do not 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:

With the jacks extended and the park brake released, or transmission placed in gear, a warning alarm will sound and all LEDs will illuminate. The jacks will automatically retract. A full visual inspection is required to confirm full retraction of jacks before moving motorhome.

Maintenance:

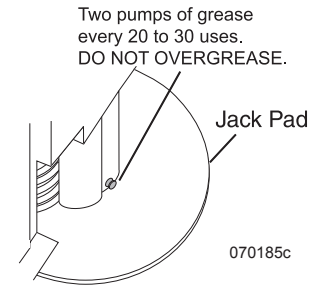
At weekly intervals, use silicone spray on the jack rod. This will help prevent moisture damage to surface of the jack rod. If parked near coastal areas, apply more often. Occasional oil or grease on the extended jack rod is normal.

- ◆ Remove dirt and road debris from the jacks as needed.
- ◆ Check the fluid level every month. The fluid level should be within ¼" 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 will occur.

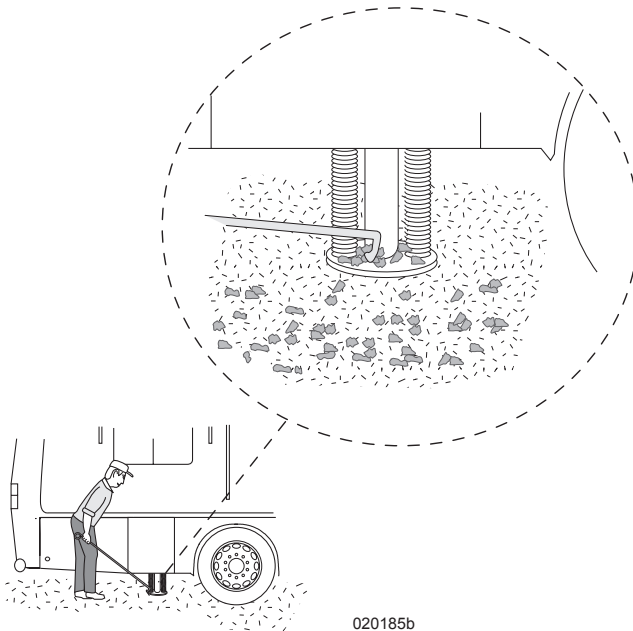
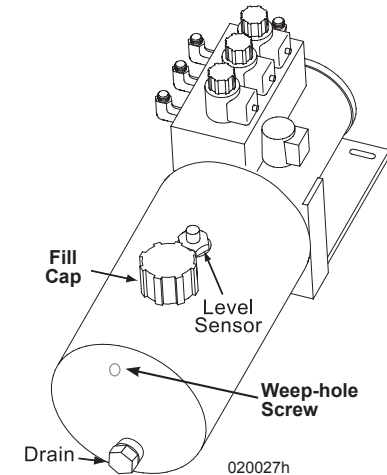
- ◆ Fluid change interval is 36 months.



Adding Fluid:

If the leveling system makes unusual noise or the alarm sounds when driving around corners or over bumpy roads, this indicates a low fluid level.

1. Ensure all jacks are retracted.
2. Chock a wheel fore and aft for safety.
3. Remove the weep-hole screw.
4. Unscrew the fill cap from the top of the pump. Slowly fill the reservoir with fluid until fluid seeps from the weep-hole.
5. Replace the weep-hole screw and fill cap.



AIR LEVELING (OPTIONAL)

Located on the roadside drivers console is the air leveling control touchpad. The computer controlled system can operate automatically or manually to adjust the air springs when leveling the motorhome.

NOTE:

The motorhome engine must be ON for the air suspension to operate.

NOTE:

The automatic leveling system will perform best if there is no movement in the motorhome while the system is attempting to level.

CAUTION:

Several inches of unobstructed downward travel is required when using the leveling system. Look underneath the motorhome for any obstacles that could damage the undercarriage components before using the leveling system.

WARNING:

Never engage the leveling system when anybody is near or underneath the motorhome. Serious injury or death can occur.

Automatic Air Leveling

Prior to leveling:

- ◆ Set park brake.
- ◆ Place transmission in neutral.
- ◆ Ensure front wheels are pointing straight ahead.

- ◆ Have motorhome at ride height with air tanks full.
- ◆ Turn off ignition and extend slide-outs.

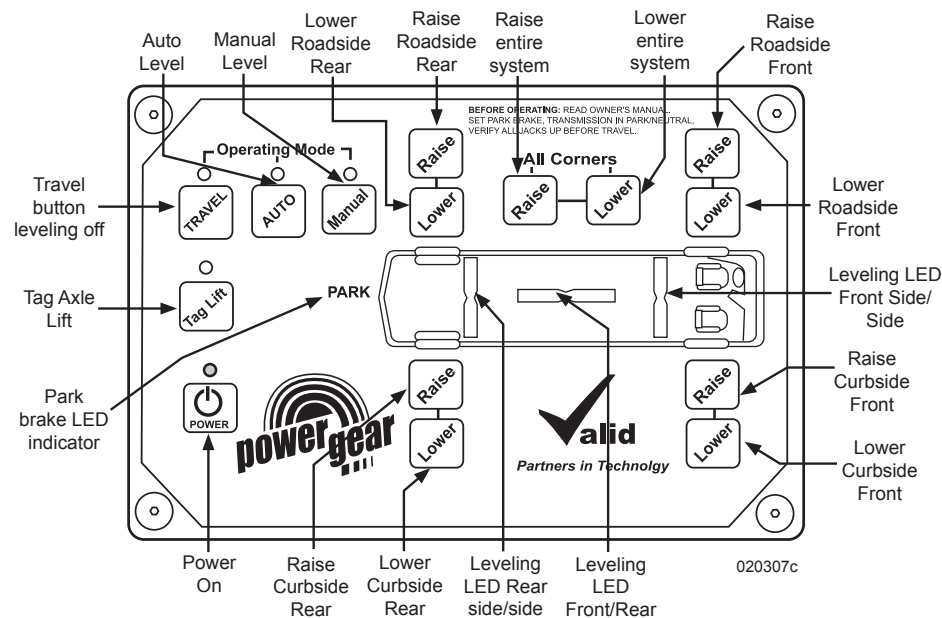
Leveling Procedure:

- ◆ Start engine.
- ◆ Press the **POWER** button on the leveling control panel to turn the system **ON**. The Power indicator light will glow solid green.
- ◆ Press the **AUTO** button to initiate the leveling process. The indicator light above Auto will blink and the motorhome will automatically level itself. Red lights in the motorhome icon indicate the motorhome is leveling. The system measures along three different axes (rear axle, front axle and longitudinal axis) of the chassis to check for both level and flex in the motorhome.

- ◆ Wait until all lights in the motorhome icon turn solid green. The motorhome is level.
- ◆ When leveling is achieved, leave the control panel on and turn ignition switch off.

After leveling:

- ◆ After 15 seconds, the leveling system goes into “Sleep” mode to minimize parasitic current draw on the chassis batteries.
- ◆ After 20 seconds, the system goes into “Low Power” mode indicated by the occasional flashing of the Auto and Power indicator lights.
- ◆ After a period of time in “Low Power” mode the system automatically “wakes” and checks to see if re-leveling is required.
- ◆ If leveling is required the system will automatically level the motorhome.



NOTE:

Turning off the control panel after leveling will disable the system and not allow automatic re-leveling if necessary.

NOTE:

Only 42' models with a Tag Axle have a Tag lift switch.

System Air Compressor:

Should air pressure in the leveling system need adjustment while in Automatic Leveling mode, a small air compressor provides the leveling system with air pressure. This compressor requires no maintenance.

Manual Air Leveling

The Manual Leveling Mode gives the operator control over the leveling process.

NOTE:

Manual control of the air system can be used while traveling at low speed when an uneven surface must be negotiated.

Prior to leveling:

- ◆ Set park brake.
- ◆ Place transmission in neutral.
- ◆ Ensure front wheels are pointing straight ahead.
- ◆ Have motorhome at ride height with air tanks full.
- ◆ Turn off ignition and extend slide-outs.

Leveling Procedure:

- ◆ Start Engine.
- ◆ Press the **POWER** button on the leveling control panel to turn the system on. The Power indicator light will glow solid green.
- ◆ Press the **MANUAL** Mode button. The indicator light above Manual will blink.

- ◆ Press **RAISE** or **LOWER** for each of the four corners to manually adjust. During the leveling process a red light will blink on the motorhome icon. Once that corner is level the light turns to solid green. Proceed to the next corner until the motorhome is level.
- ◆ To control all four corners simultaneously use the **ALL CORNERS RAISE** and **ALL CORNERS LOWER** buttons.
- ◆ When leveling is achieved, turn ignition switch off.

Travel Mode

Travel Mode is the operational mode used when the motorhome is in motion. This mode gives control of the motorhome air suspension system to the ride height valves.

WARNING:

The time required to achieve full ride height varies. Make sure that the motorhome is at ride height before driving. If the motorhome is too low, severe damage can result.

To Use Travel Mode:

- ◆ Start engine and press **TRAVEL** button.
- ◆ If the Air Leveling System is turned off, or in any other mode other than Travel, it automatically turns on and switches to Travel Mode when the motorhome speed exceeds its designated Travel Mode speed limit (set in the initial configuration of the system).
- ◆ Enter Travel Mode before the motorhome begins moving.

NOTE:

The tag lift feature uses a two minute delay at each ignition cycle to ensure enough air system pressure is available to lift/lower the tag axle. After starting the engine, press the Travel button to begin the time delay. After approximately two minutes, the tag axle LED will stop flashing indicating the time delay has completed and the tag axle can now be raised.

INFORMATION:

For detailed information and operating instructions on the Air Leveling System, refer to the manufacturer's manual.

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.

STARTING PROCEDURE

NOTE:

To avoid starter motor damage, do not crank the engine for more than 15 seconds at one time. If the engine fails to start, wait two minutes before attempting to start the engine again.

WARNING:

Never attempt to start the engine by “jumping” relays or any means other than using the ignition start switch. DO NOT attempt to start the engine unless all persons are clear of the engine before starting.

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 on the engine. The manifold grid heater will activate if intake manifold temperature is below specified level (approximately 40° F.). 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.

To Start the Engine:

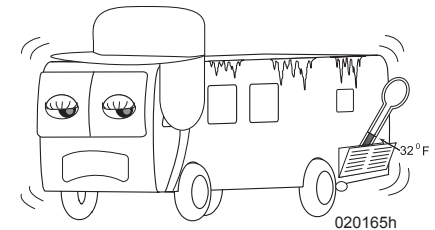
With the throttle in idle position, turn ignition to ON. Allow the “Wait To Start” lamp to extinguish. Turn key to the start position. When the engine starts the grid heater will again energize for a time period determined by the Electronic Control Module. Allow the engine to idle with no load for three 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.

NOTE:

DO NOT idle the engine for long periods of time. Consistent periods of long idle wastes fuel and may cause engine damage.

Cold Weather

In sub-freezing or extreme cold, engine oil becomes



thick and battery output is reduced. Thick oil, combined with less amperage available from the battery, increases difficulty in starting the engine.

Depending on ambient temperature it may be necessary to pre-heat the engine. Located in the coolant passage in the engine is a heating unit that operates from 120 Volt AC. If it is necessary to pre-heat the engine due to ambient temperature, it is recommended to activate the block heater the night before, allowing several hours for the block heater to warm the engine.

It is possible to operate diesel engines in extremely cold environments when the engine is properly equipped with the correct lubricants, fuels and coolant. 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 multi-viscosity oil meeting manufacturers 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 manufacturers specifications and fuel to have maximum cloud pour points 10° F (6° C) lower than the ambient temperature in which the motorhome operates.

INFORMATION:

Refer to the engine manufacturer's Owner's Manual for more detailed information.

NOTE:

The engine is filled with Texaco URSA Super Plus SAE 15-40w multi-viscosity oil from the factory. Generally this will start the engine in temperature down to 15° F. If the engine has normalized to a temperature below 15° F it will be necessary to pre-heat the engine before starting.

CAUTION:

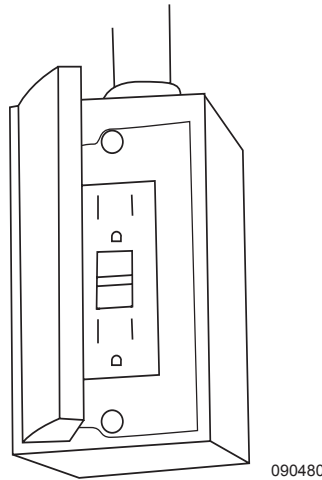
Upon cranking an engine in cold temperature, the starter may rapidly engage and disengage. If this occurs STOP attempting to crank the engine to prevent starter damage. Pre-heat the engine before making further attempts to start.

Block Heat:

The block heater is rated between 850 and 1500 watts, depending on engine size. Hook to shore power, or plug the block heater cord into a separate power cord rated for 15 Amps and a GFCI protected outlet rated at 20 Amps. The engine may require several hours of pre-heating before starting. It is recommended to start preheating the engine the night before departure.

To Use the Block Heater:

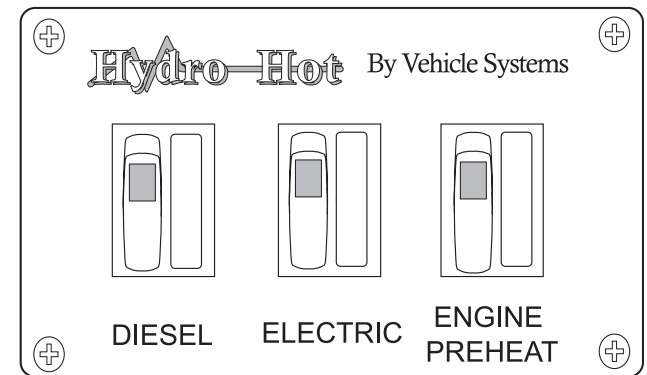
- ◆ Hook to shore power and plug the block heater cord into the block heater receptacle (both are located in the engine compartment).



Outlet located in engine compartment.

Hydro-Hot (Optional) Engine Preheat:

The diesel burner inside the Hydro-Hot heats an internal engine coolant loop. When the Hydro-Hot Engine Preheat 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 preheat the engine depends on ambient temperature. Allow at least three hours of preheating before attempting to start the engine.



Located on galley cabinet.

040484h

To Use the Engine Preheat System:

- ◆ Press the Hydro-Hot switch at the kitchen to turn the system on.
- ◆ Turn the Hydro-Hot Engine Preheat switch at the kitchen to the ON position. This activates the engine pump inside the Hydro-Hot.

Tips:

1. When operating below 32° F, the Hydro-Hot and/or block heater preheat can enhance engine starting by easing cranking and helping to prevent engine misfire 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 sufficiently warm for operation. Utilize the fast idle feature to quicken the process. Wait to operate the motorhome for at least three minutes or until the coolant temperature begins to rise.
4. Check air inlet and filter daily, or as necessary, when driving in snow conditions.
5. The demand on batteries increase 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 additives to start the engine as damage may occur.

Cummins Engine Requirements:

The maintenance guidelines in the Cummins Operation & Maintenance Manual are the recommendations for the engine to extend the 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 multi-viscosity 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. 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, will aid in 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:

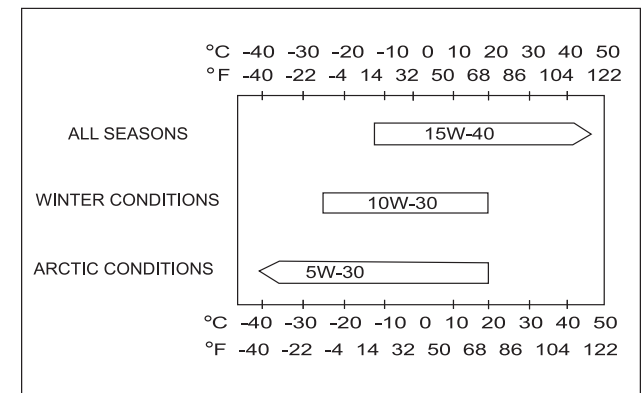
The engine does not require a “break-in” procedure.

INFORMATION:

Refer to the Engine Manufacturers Owners Manual for details on the oil maintenance schedule.

NOTE:

The Engine is filled with Texaco URSA Super Plus SAE 15W-40 multi-viscosity oil from the factory.



Lubricating oil recommendations and specifications. 070201

ENGINE SHUTDOWN

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.

Extended Engine Shutdown

When the motorhome has been sitting for 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 engine manufacturer's owner's manual for guidelines on troubleshooting low oil pressure, or contact a qualified service technician. Allow the engine to idle for five minutes before operating under a load.

COOLANT SYSTEM

A fully formulated antifreeze or coolant containing a pre-charge of Supplemental Coolant Additives (SCA) is recommended to significantly simplify coolant system maintenance. The difference between fully formatted antifreeze and fully formatted coolant is the percentage of water. Both contain balanced 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.

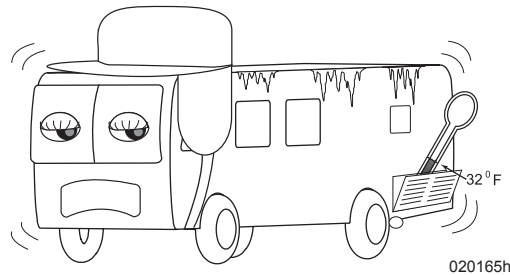
Clean, quality water in a 50/50 ratio (40 to 60% working range) mixed with fully formatted antifreeze will provide protection from -34° F to 228° F. The 50/50 mix ratio must be premixed prior to being put in the system. Placing antifreeze and water in the cooling system is not recommended. Consult the manufacturer's OEM for more details.

Coolant System Overheated:

If the engine is overheated do not pour cold coolant into the hot engine. 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 System Frozen:

If the coolant system freezes, the motorhome must be towed to a warm area until completely thawed. If the engine is operated when the cooling system is frozen it can 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.



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 warning light illuminates and the engine begins to de-rate in power output. Continued operation will result in engine damage.

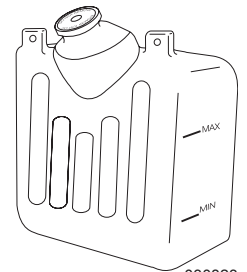
NOTE:

Consult the engine manufacturer owners guide for more detailed information.

Engine Coolant Reservoir:

The engine coolant reservoir is connected to the radiator by a hose. When the motorhome is driven, coolant heats and expands. A portion of fluid, displaced by expansion, flows from the radiator into the reservoir.

When the engine is stopped the coolant cools and contracts. 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.



Coolant Reservoir

CAUTION:

To avoid scalding hot steam or coolant from being released from the engine cooling system, never remove the reservoir cap while the engine is running or hot. Failure to follow this warning may result in damage to the engine cooling system and possibly cause severe personal injury.

Coolant Levels:

- ◆ Check the coolant level daily or when refueling.
- ◆ If the coolant is below the minimum level, the low coolant alarm will sound and the low coolant light will appear on the dash.

INSPECTION:

Stop the motorhome and inspect the coolant level before continued operation.

INFORMATION:

Refer to the Engine Manufacturer Owner's Manual for details on engine coolant maintenance.

NOTE:

Have an inspection performed of the surge tank cap seal and have the cap pressure tested at each oil change.

INFORMATION:

Refer to OEM manual for detailed antifreeze information.

Radiator/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.

This process works well, however, the intake air charge is heated two different ways: through convection by the exhaust gases driving the turbocharger and when air is compressed. This negative effect inside the combustion chamber results in lost power potential. Therefore, a Charge Air Cooler (CAC) is installed to cool the intake air before it enters the engine. The CAC performs the same function as a radiator, cooling air instead of liquid. Ambient air passing through the CAC will cool the engine intake air charge.

After leaving the turbocharger, intake air is compressed and heated to approximately 300° to 375° F., depending on the engine load and throttle position. Before air enters the intake manifold, the CAC cools the intake air temperature to the engine manufacturer specifications. Lowered intake air temperatures reduce exhaust emissions, improve fuel economy and increase horsepower. The CAC will continually expand and contract up to ¼" as throttle increases and decreases.

Cleaning and Maintenance:

- ◆ Regular maintenance includes draining the engine coolant, flushing/cleaning the cooling system, **inspecting** the water pump standpipe, replacing the thermostat, gasket and seal, and replacing the coolant and SCA element.
- ◆ **Inspect** the charge air cooler every six months and remove dirt and debris that may block 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, clog the fins and reduce cooling efficiency. When the oil leak is repaired, the CAC must be thoroughly cleaned.
- ◆ During each oil change **inspect** the engine side of the radiator/CAC assembly for foreign objects that may cause restriction.
- ◆ 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.
- ◆ When performing maintenance, it is also necessary to **inspect** other components of the cooling system. The charge air cooler and radiator also requires an **inspection** for cracks, broken welds, secure mounting, and general cleanliness.

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 any hose 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 any deficiencies found.

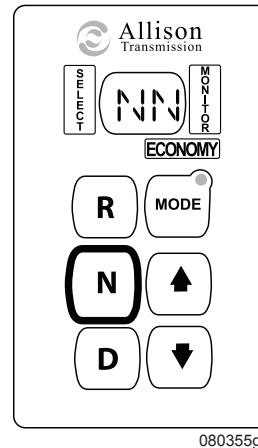
TRANSMISSION

The Allison World transmission incorporates the **World Transmission Electronic Control (WTEC)** system. The system consists of five major components connected by a wiring harness: the Electronic Control Unit (ECU), engine throttle position sensor, three-speed sensors, remote shift selector (keypad) and the control module. The ECU processes information received from the throttle position sensor, speed sensor, pressure switch and shift selector to provide optimum shift quality. This is accomplished by matching transmission and engine RPM during a shift to establish a desired shift profile within the ECU. Another feature of the transmission is the ability to “learn” or “adapt.” The electronic control system optimizes shift quality by using “Adaptive Shifting.”

A wide variety of varied shift conditions is required before optimizing shift quality. Generally, five typical shifts of a consistent shift type are needed to optimize shift quality.

Shift Selector

The keypads on the shift control are **R** (Reverse), **N** (Neutral), **D** (Drive), Arrow up, Arrow down, Mode button. A digital display window shows gear selection, various transmission modes, oil level and transmission fault codes. Generation 4 keypads have a split screen displaying two number sets while in drive. The left number displays the highest forward range available. The right number is the range that the transmission is currently in. NN (Neutral) will appear in the display window when the ignition is turned On. This indicates the transmission is in neutral and it is safe to start the crank. If the NN does not display when the ignition is turned on, there is no power to the shift selector and the transmission will not allow the engine to start. No display is an indicator of electrical problems with the engine batteries, ECU or the shift selector.

**Keypad Functions:**

- ◆ Select the Reverse gear by pressing **R**. RR will display.
- ◆ Select Neutral by pressing **N**. The area around the N button has a raised ridge so the driver can orient his hand to the push buttons by touch without looking at the display.
- ◆ Select Drive range by pressing **D**. The highest forward gear (6th gear) appears in the display and the transmission will shift to first gear indicated as 6 1.
- ◆ The Up and Down arrow buttons are used to select a higher (if not in “6”) or lower (if not in “1”) forward range. These buttons are not functional in Neutral or Reverse.
- ◆ When in Drive, one press changes the gear range selected by one. If the button is held continuously, the selected range will continue to change up or down until the button is released or until the highest/lowest possible range of gears is selected.
- ◆ The Mode button enables a secondary shift point to be selected. This is commonly referred to as 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 the cruise control set between 55 and 65 m.p.h., setting the transmission to economy mode will eliminate about 99% of transmission downshifts from sixth to fifth when incurring a slight incline or overpass.

CAUTION:

DO NOT use Economy Mode in heavy stop and go traffic or mountainous terrains. Frequent shifting while using heavy throttle occurs in Economy Mode and increases transmission fluid temperature. Exit Economy Mode until road conditions improve.

NOTE:

The Mode button is used by the service technician to access diagnostic codes when troubleshooting. The diagnostic circuitry must be enabled to display.

CAUTION:

Engine temperature may rise when ascending long grades using full throttle. Towing a load will increase the demand on the engine. If this occurs, manually shift the transmission to the next lower gear and use less throttle. The engine will use less fuel and RPM should increase.

NOTE:

The transmission will not accept a manually selected gear change to occur if the gear selected is out of the specified operating range.

NOTE:

The transmission will not shift into gear from Neutral if the engine RPM is at or above 900. The display will flash “66” indicating the engine RPM is excessive. Select “N” and lower engine RPM.

Check Trans Indicator

The electronic control system of the transmission is programmed to alert operator of a problem with the transmission system, and reacts automatically to protect the motorhome and transmission from damage. Normally, the Check Trans indicator on the speedometer LCD will display when there is an error condition. The indicator will go out after the engine has started. The transmission system should be checked immediately if the Check Trans indicator displays. The Check Trans warning indicates the ECU has detected a fault and recorded a diagnostic code. The Check Trans warning is accompanied by a flashing display from the shift selector.

The shift selector display shows the actual range attained and the transmission does not respond to shift selector requests when the ECU detects a Do Not Shift (DNS) condition. Indications from the shift selector inform the operator that the transmission is operating at reduced capabilities. 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. This allows time to find a safe place to park the motorhome to prevent transmission damage. If the engine is shut off, then started after a Check Trans indication, the transmission remains in Neutral until the fault has been corrected. Service should be performed immediately in order to minimize potential damage to the transmission.

NOTE:

Contact an authorized Allison Transmission service center whenever a transmission related concern arises. For some problems, fault codes may be registered without the ECU activating the Check Trans indicator. An authorized Allison Transmission Service center will have the equipment to check diagnostic codes and correct problems that may arise.

Diagnostic Codes:

The shift selector can be used to display transmission malfunctions as numerical codes. Each code is a two-digit main code and a two-digit sub code. These codes will fall in two classes: active and inactive. Active codes are codes currently affecting the ECU process and transmission operation. Inactive codes are retained in memory but may not affect the ECU process or transmission operation. A service technician will activate Diagnostic mode or hook an electronic display (Pro-Link) to the data plug to retrieve diagnostic codes. A maximum of five codes, D1 to D5, may be listed at one time. The highest priority code will be listed in D1. The Mode button will enable selection of sequential codes. Allison 4th Generation controls list each code consisting of five characters. The first being a letter followed by a four digit number string. The most severe or recent code is listed in the ECU memory first with a maximum of five codes being d1 to d5 possibly listed at the same time. When new codes are added, the oldest inactive codes will be dropped.

To Display Diagnostic Codes:

- ◆ Stop the motorhome at a safe location.
- ◆ Apply the parking brake.
- ◆ Simultaneously press the up and down arrows once to enter oil level display mode. Then press the up and down arrows again to enter diagnostic mode.
- ◆ The codes will display one digit at a time or two characters at a time on 4th Generation controls.
- ◆ Press the mode button to scroll through the codes.
- ◆ Record all diagnostic codes that are displayed. The codes then can be used by an Allison Service Center for evaluation and repair.
- ◆ Hold the Mode button for ten seconds to clear both inactive and active codes.

Some codes are self-clearing while others will require service or ignition on/off cycles to clear.

Periodic Inspections

The Allison MH Series requires very little maintenance. Careful attention to the fluid level, electrical connections and hydraulic hoses is very important.

The transmission should be kept clean for easy inspection. Make periodic checks for loose bolts and leaking fluid. Check the condition of the electrical harnesses regularly. Check the engine cooling system occasionally for evidence of transmission fluid that would indicate a faulty oil cooler. Report any abnormal condition to an Allison Service Center.

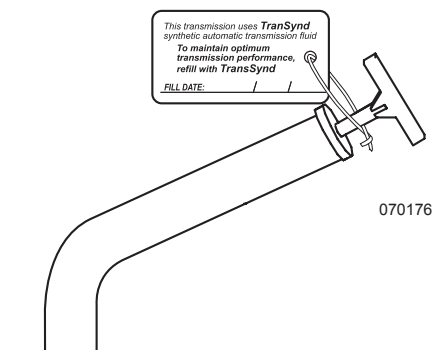
Prevent Major Problems:

Help the control system oversee operation of the transmission. Minor problems can be kept from becoming major problems if an Allison Transmission Service center is notified when one of these conditions occur:

1. Shifting feels odd.
2. Transmission leaks fluid.
3. Unusual transmission-related sounds (sound made by normal engine thermostatic fan cycling when climbing a long grade with a heavy load are often mistaken for transmission-related sounds).
4. The Check Trans indicator comes on frequently.

TRANSMISSION FLUID & FILTERS

The transmission is filled with TranSynd™ synthetic transmission fluid at the factory. TranSynd™ synthetic transmission fluid extends service intervals. A small tag has been attached to the dipstick identifying that the transmission is filled with TranSynd™ synthetic transmission fluid.



Located inside rear engine access

Fluid and Filter Change Interval:

The transmission has two filters: a main filter and a lube filter. Change the main filter at the first 5,000 miles. Thereafter follow the service intervals listed in the transmission **OEM (Original Equipment Manufacturers)** manual. Fluid and filters may require changing earlier than recommended in the transmission OEM manual, 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 will dictate more or less frequent service intervals.

CAUTION:

DO NOT mix Dexron III® transmission fluid with TranSynd™ Synthetic transmission fluid.

NOTE:

Be sure to retain the receipt for proof of the initial Main filter change. Refer to the Allison transmission owner's manual or contact an authorized Allison service center for service intervals.

Proper Fluid Levels:

Transmission fluid cools, lubricates and transmits hydraulic power. Proper fluid levels must be maintained at all times. If the level is low, the converter and clutches do not receive an adequate supply of fluid. If the level is high, the fluid can aerate and cause the transmission to erratically shift or overheat.

An **Oil Level Sensor (OLS)** is built into the transmission. The fluid level can be checked easily and cleanly using the shift selector. Check the transmission fluid level before each trip and after removing the motorhome from storage.

Fluid Level Check from the Shift Selector:

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 at operating temperature or an error code will appear.
- ◆ The motorhome must be stationary and in Neutral for approximately two minutes to allow the fluid to settle in the 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 will indicate one character at a time. An “o” followed by “L” represents oil level check mode. One of the following will be indicated:

Common Oil Level Fault Codes

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

- ◆ “o K” represents the level is okay.
- ◆ “Lo” represents a low fluid level followed by a numeric indication of the number of quarts needed 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 indicates the fluid is still settling. When the fluid has stabilized in the sump, the true level will indicate.
- ◆ 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 “Common Oil Level Fault Codes” chart.
- ◆ Exit by pressing “N.”

Cold Check - Manual Check Procedures:

The concept of a cold check is to determine adequate fluid level for safe operating, such as after a fluid and filter change. A cold check should be performed after transmission maintenance or service until a hot fluid level check or fluid level check from the shift selector can be performed.

To Check the Fluid When Cold:

- ◆ Park the motorhome on a level surface. Set the parking brake.
- ◆ Chock the wheels to prevent the motorhome from moving.
- ◆ Start the engine.
- ◆ Allow the engine to run at idle (500 to 800 RPM) for one minute.

- ◆ Apply the service brakes and shift to **D (Drive)**, then to **N (Neutral)** and next to **R (Reverse)** to fill the system. Shift the transmission to **N (Neutral)** and release the service brakes. Allow the engine to idle at 500 to 800 RPM.
- ◆ Remove the dipstick and wipe clean. Reinsert the dipstick fully into the tube, then remove to check fluid level. Repeat to verify reading, if needed.
- ◆ Safe operating level is anywhere within the Cold Check band on the dipstick. This allows safe operation of the transmission until a Hot Check or fluid level check from the shift selector 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 a fluid level check from the shift selector or a Hot Check at the first opportunity when normal operating temperatures are reached.

CAUTION:

Low or high fluid level can cause overheating and irregular shift patterns. These conditions can damage the transmission if not corrected.

Fluid Levels - Hot Check

Fluid level rises as temperature increases. Fluid must be hot to ensure an accurate check. Be sure fluid has reached normal operating temperature. If a transmission temperature gauge is not present, check the fluid level when the engine water temperature gauge has stabilized and the motorhome has been driven 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.
- ◆ Ensure that fluid level checks are consistent. Check the level more than once. If readings are not consistent, ensure the transmission breather is clean and not clogged. If readings are still not consistent, contact the nearest Allison Service Center.

FUEL SYSTEM
Fuel Requirements

Low sulfur #2 diesel fuel or #1 and #2 commercial winter 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. Obtain fuel from sources that are replenished often, such as large truck service facilities where fuel supplies are fresh and the possibility of contaminants is reduced. It is important to not empty the engine of fuel. The fuel system on the engine is sensitive to air. If the engine is allowed to run out of fuel, the fuel system will need to be thoroughly primed before the engine will start.

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 injectors. 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 gelling during cold weather. Before adding any type of fuel additive or extender, consult the Manufacturer's Owner's Manual.

Fuel Tank

Pick-up and return lines are placed at opposite ends of the tank to inhibit fuel aeration. The engine pickup tube is cut at a 45° angle to allow optimum flow to the engine. The generator and Hydro-Hot (Optional) intake tubes are set to approximately ¼ of a tank. This will prevent depleting the fuel supply while dry camping.

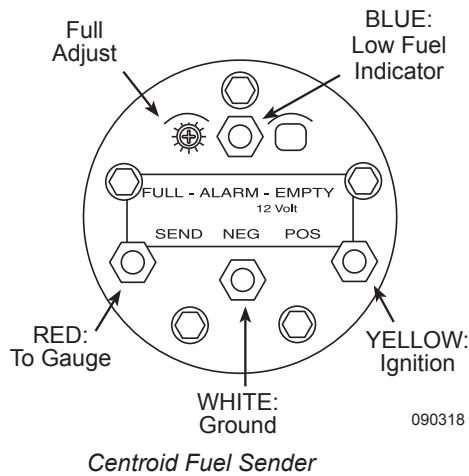
Internal baffles slow fuel slosh. A check valve placed at the bottom of the baffle, at the end of the tank with the pick-up tube, prevents fuel starvation through long corners when fuel supply is low.

NOTE:

Fill the fuel tank if the motorhome is going to be stored for any length of time to reduce the amount of potential condensation. After storage, check the vent tube for blockage. It is not uncommon for insects to plug the vent tube. If pressure or vacuum exists when the fuel cap is removed, the vent tube may be blocked. The end of the vent tube is located on the curbside of the fuel tank, near the bottom.

Fuel Sender

The Centroid fuel sender has no moving parts and works by measuring between inner and outer tubes in the tank. The more fuel between the tubes the higher the reading. Electronics in the head of the sender convert the capacitance to current to drive the fuel gauge.



Centroid Fuel Sender

Connections:

The Centroid sender has four connections:

1 and 2 - Positive (POS) and Negative (NEG): Battery voltage to run the electronics in the sender head.

3 - SEND: Connects to the SEND terminal of the gauge on the dash.

4 - 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 fuel indicator on the liquid crystal display on the speedometer and is not adjustable.

Adjustments:

The Centroid sender has two adjustments:

1 - EMPTY: Adjusts for length of sender. It is set at the factory, covered with a sealant and should not be changed.

2 - FULL (Full Adjustment): The full adjustment can be used to correct for slight differences between fuel meters. During installation it was factory calibrated and does not need re-adjustment.

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.

NOTE:

The adjustment must be made within 30 seconds of turning on power. If the adjustment is not finished in time, turn the power off and back on to get another 30 seconds of adjustment time. The sensor responds too slowly after 30 seconds (damped output) to allow adjustment.

Troubleshooting:

A. Electronic Output: The sender has a transistorized output to prevent an ohmmeter from getting a correct reading of output resistance.

B. Fuel Only: The sender will not work correctly in conducting fluids such as water (it will read empty all the time in water). One possibility is that when there is a constant empty reading there may be water in the bottom of the fuel tank.

C. Contact Centroid: Probably 90% of the return 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 Lines & Hoses

Make a visual check for fuel leaks at all engine-mounted fuel lines, 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. Maintenance of hoses is an important step in ensuring efficient, economical and safe operation of the engine and related equipment.

INSPECTION:

Check hoses for leaks daily as part of the pre-start inspection. Check all fittings, clamps and ties. Ensure the hoses are not touching shafts, couplings or heated surfaces, including exhaust manifolds, sharp edges or other obvious hazardous areas. Vibration from the engine and road can move or fatigue clamps and ties. To ensure continued proper support, inspect fasteners frequently and tighten or replace them as necessary.

Fuel Filters

Two filters are used for the engine: a primary and secondary filter. Both filters are located in the engine compartment.

NOTE:

Wear gloves and old clothing when working with diesel fuel. Avoid getting fuel in the interior of the motorhome.

Filter Maintenance Intervals:

- ◆ Drain the primary fuel filter daily before travel.
- ◆ Change the primary fuel filter every six months, every 15,000 miles or at the first indication of power loss.
- ◆ Refer to the engine OEM manual for service intervals of the secondary fuel filter.

Warning Light:

If the **Warning** light illuminates on the dash, the primary filter may have detected water in the fuel. **DO NOT** continue engine operation. Fuel contaminated with water can damage fuel injectors. Water is heavier than fuel and will collect in the primary filter. Drain the primary filter by opening the valve on the bottom of the filter bowl.

To Drain the Filter:

- ◆ Shut off the engine.
- ◆ Open the drain valve, by hand, counterclockwise approximately 1½ to 2 turns until draining occurs. Drain water/fuel into a container and dispose of in accordance with local environmental regulations.

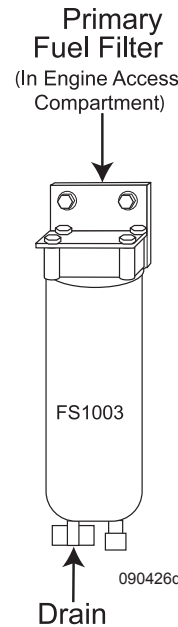
- ◆ Close the drain valve by turning clockwise when clear fuel is visible.

NOTE:

The water and sediment can contain petroleum products. Consult the local environmental agency for recommended disposal guidelines.

HYDRAULIC SYSTEM

The motorhome uses an engine driven hydraulic pump to operate both the power steering and engine hydraulic cooling fan systems, sharing one common reservoir. The hydraulic fluid used is Texaco Rando 46.



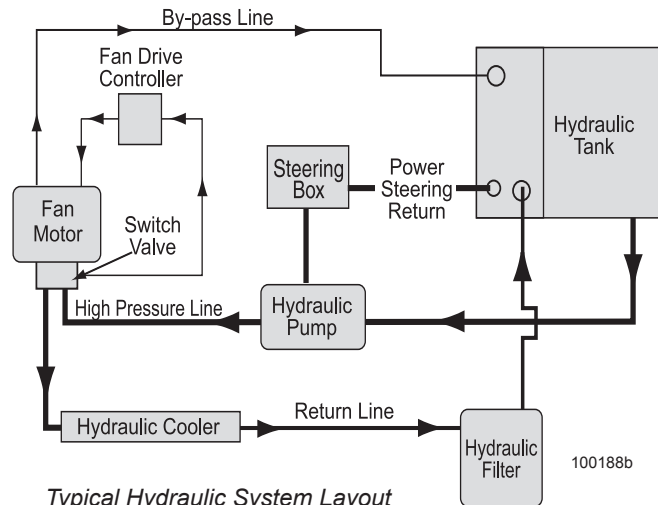
Fuel Filter:
Turn valve counterclockwise to drain.

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 temperatures will raise the hydraulic system operating pressure and may damage the hydraulic cooler.

Hydraulic Pump

The hydraulic pump creates pressure by meshing sets of gears together inside closed 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 by-pass pressure relief spring. If the hydraulic pressure should exceed the specified pressure limit, the internal by-pass relief valve will force 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.



Typical Hydraulic System Layout

This may be understood as a faucet with a garden hose attached. Crimping the hose with the faucet on will create pressure from the restriction. 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 operates to prevent hydraulic fluid from overheating. When a load is placed on the hydraulic system, heat is created in the fluid. Heat must be dissipated to prevent 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 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, hydraulic fan motor, hydraulic switching valve and fan drive controller.

Cooling fan speed is proportional to engine speed and coolant temperature. When coolant temperature rises above 185° F, the fan drive controller slowly closes off the bypassing hydraulic fluid from the switching valve. As coolant temperature rises, a spool valve begins to move in the switching valve.

The spool valve directs the pressurized hydraulic fluid to the fan motor. The higher the coolant temperature, the further the spool valve is moved in the switching valve, providing a higher volume of pressurized hydraulic fluid to the fan motor. Fan motor speed is increased to meet the demand for cooling. The action of the fan drive controller 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 motor will increase in speed when the motorhome is ascending long hills or operating in high ambient temperatures. It is normal for the fan to “roar” when it is operating. Fan motor speed and engine RPM are approximately the same with the switching valve in the full open position.

Fan Drive Controller

The fan drive controller is mounted in the engine compartment on the roadside chassis rail. The fan drive controller 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 valve and return to the hydraulic reservoir. As the coolant temperature inside the radiator rises to approximately 195° F, the fan drive controller begins to restrict fluid flow. The restricted hydraulic fluid pressure then begins to move the internal spool valve of the switching valve. This process will continue until coolant temperature inside the radiator reaches approximately 210° F. At this temperature hydraulic fluid flow through the fan drive controller is stopped, moving the spool valve to the full open position.

Switching Valve

The switching valve is mounted to the fan motor and 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. Either the thermo valve or the electric override valve directs the fluid to the spool in the switching valve. When the radiator is cool, pressurized hydraulic fluid will bypass the fan motor and return to the fluid reservoir. As radiator temperature rises, the thermo valve signal is slowed or stopped to the switching valve. High pressure fluid is then directed to the fan motor, cooling the radiator.

Fan Motor

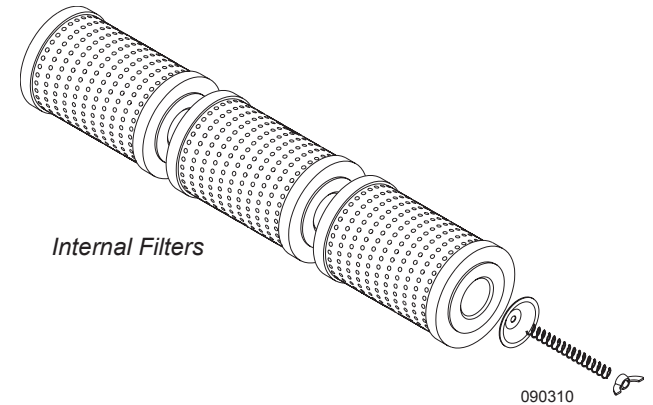
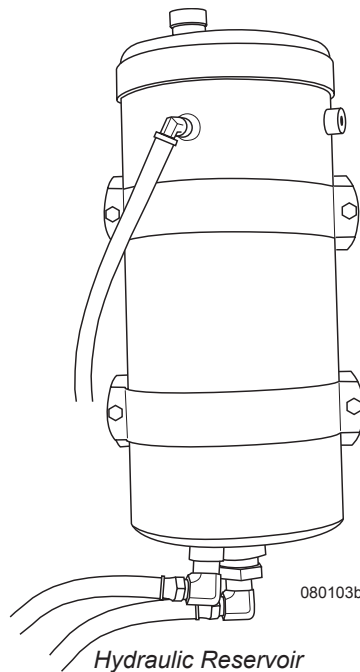
The fan motor is driven by hydraulic fluid pressure from the switching valve. The fan motor works on the same mechanical principle as a hydraulic pump, only in reverse. Instead of creating hydraulic pressure by meshing gears together in a closed tolerance housing, the fan motor receives hydraulic pressure. The hydraulic fluid drives the fan motor's internal gear assembly, spinning the fan motor and attached fan blades.

The switching valve is mounted to the fan motor. The hydraulic fluid is then cooled and filtered before returning to the reservoir.

Hydraulic Reservoir/Filter

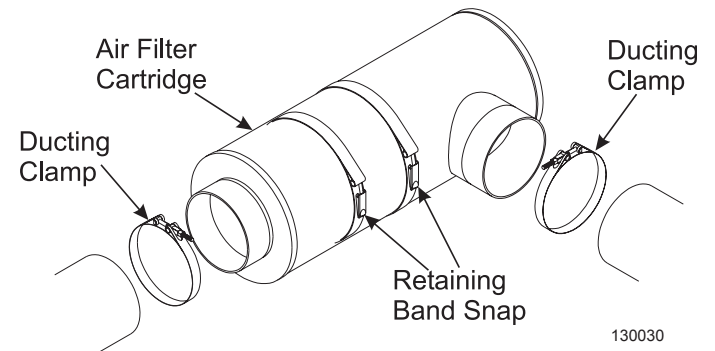
The hydraulic reservoir internal filter system located in the engine compartment is the reservoir for both the hydraulic fan drive system and power steering system. The hydraulic filter assembly is located inside the reservoir. Check the oil level in the reservoir when the oil is at operating temperature every 6000 miles or three months. The oil dipstick/oil fill is located on top of the reservoir. When performing fluid level checks, inspect fittings and hoses for signs of leakage. Avoid untimely and costly failures by having leaks repaired. The oil level should be kept between the full and add marks on the dipstick.

Replace the internal filters every 15,000 miles or once a year. Loosen the band clamp at the top of the reservoir and remove the lid. Place a 5-gallon drain bucket under the reservoir. Loosen one of the bottom fittings to drain the reservoir. Drain only enough fluid from the reservoir to expose bottom filter. Tighten fitting. Remove the wing nut, filter spring and filter washer. Remove and replace the three drop in filters. 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 to the full mark and install top and band clamp. Run engine to purge trapped air. Check fluid level after fifteen minutes of operation to confirm proper level.



AIR FILTER Changing the Filter

The entire air filter cartridge is discarded and replaced by loosening the inlet and outlet ducting clamps and releasing the retaining band snaps. The air filter is located in the engine compartment. The Air Filter Minder indicates when the filter will need to be changed.

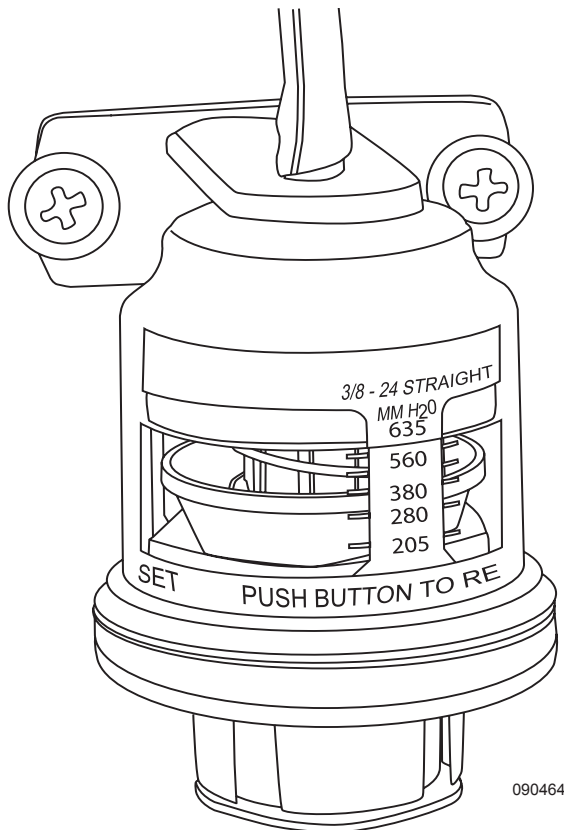


Air Filter Minder

The air filter minder, located in the roadside of the engine compartment, is a precision overflow restriction gauge designed to take the guesswork out of air cleaner replacement.

As dirt captured by filter cartridge slowly builds up, vacuum between the filter and charge air cooler increases. The indicator locks at the point of maximum restriction so readings can be taken with or without the engine running.

When the desired change-out point is reached, the air filter should be replaced and the service indicator reset by pushing the **Reset** button on the bottom of the minder.



LUBRICATION MAINTENANCE

Performing regular scheduled maintenance ensures reliable operation and optimum service life of the various chassis components. Completed maintenance brings peace of mind knowing the various components have received proper service. Failure to follow maintenance guidelines, or perform scheduled maintenance, results in inefficient operation, premature component wear or component failure resulting in breakdown.

Maintenance schedules are usually performed at certain mile or time intervals. When performing high level procedures, lower level service should also be performed.

NOTE:

Maintenance schedules are based on normal operating conditions and use. Operating under unusual or adverse condition shortens service intervals.

NOTE:

Engine and transmission service intervals are listed in their respective manuals.

Proper Lubricant Waste Disposal:

When performing service maintenance on the engine, transmission or rear axle, waste fluids and filters should be properly disposed of or recycled. Package used oils, antifreeze and other fluids in sealed containers. In many cases used oil is accepted free of charge at county disposal sites. Waste fluids are toxic to pets and other animals. Waste fluids should not be left in open containers. The sweet odor of antifreeze is attractive to pets, but highly toxic.

CAUTION:

Properly dispose of used antifreeze and waste oil. Animals like the sweet odor of antifreeze and may ingest it if left in open containers. Wipe up any fluid spills. Pets may lie in puddles of fluid, many of which are irritants and can cause severe chemical burns if not properly washed.

Lubricant Classification:

Lubricants come in many different oil and grease consistencies, each with a designed application. To properly select lubricant for a specific application, the component must be evaluated. Component stress loads, ambient temperature, working temperature and environmental exposure are just a few of the variables to consider. As an example: selecting high viscosity grease to lubricate a lock cylinder results in sluggish lock cylinder operation especially in a cool environment. Conversely, using graphite to lubricate a component that is under extreme temperature and load will result in component failure.

Grease ratings and their base compounds are especially important when selecting a lubricant type for an intended application. Some grease compounds are manufactured for multi-use application. These are acceptable if the grease rating is in accordance with the manufacturer's recommended lubricant type and rating.

Lubricants:

Many chassis components require lubrication. The types of lubricants used will vary with the application of the component. A component may fail prematurely due to lack of lubrication or from using an incorrect lubricant type. The component manufacturer usually recommends a particular type of lubricant with a minimum approval rating. Most lubricants are tested under strict guidelines set by the **ASTM (American Society for Testing and Materials)**. The **NLGI (National Lubricating Grease Institute)** helps disperse information to the grease production industry. Grease containers usually have an approval rating by the **SAE (Society of Automotive Engineers)**, **Mil Spec (Military Specification)**, **API (American Petroleum Institute)** or by other recognized and accepted organizations. The correct lubricant type with an approved specific rating must be used whenever applying, changing or adding any lubricant. When purchasing lubricants for a specific application be sure the label affirms the type of lubricant required with the tested rating by the term "meets or exceeds" in accordance with the manufacturer specifications.

Lubricating greases are made from different base compounds giving the grease different lubricating consistencies, properties and maximum operating temperatures. Most containers list the base compound and maximum operating temperature usually listed as melting point or drip point. Lubricating components, such as brake component for example, require a high temperature special base compound grease. Lubricating this type of component with other than specified grease type will result in inadequate lubricating qualities and component malfunction or failure.

INSPECTION:

When performing any scheduled maintenance, inspect the area around where you are working. For example, changing the oil, look at the rear differential. Inspect for visual signs of fluid leaks.

Most fluids and lubricants have a distinct odor, which can be used to detect early signs of trouble. Generally, odors are most detectable soon after stopping. Unusual sounds are another way to detect a problem early. There are many types of sounds that are normal, such as the cyclic purging of the air dryer. Become familiar with the different sounds. If something sounds odd, smells peculiar or looks unusual, investigate the situation.

Greasing:

Thoroughly clean all Zerk grease fittings before applying new lubricant. Keep paper towels or disposable rags handy when greasing. When lubricating items such as drive shafts and steer axle components, continued grease application is generally required until new grease appears at exit points.

Some items use sealed boots around the component to prevent moisture intrusion. When greasing these types of components, care must be given to prevent excess lubricant pressure from rupturing the seal.

WARNING:

Always chock wheels before going underneath the motorhome.

WARNING:

Never place yourself under motorhome without first properly blocking frame (jack stands) from coming down in case of rapid deflation of air system.

Brake actuating components require lubrication to keep the actuating components freely operating. Avoid contaminating brake linings with lubricant. Particular care and attention to details should be taken when lubricating brake actuating components.

NOTE:

Suspension, steering, brake and drivetrain components are lubricated at factory using Texaco Starplex NLGI 2 Lithium Soap based grease.

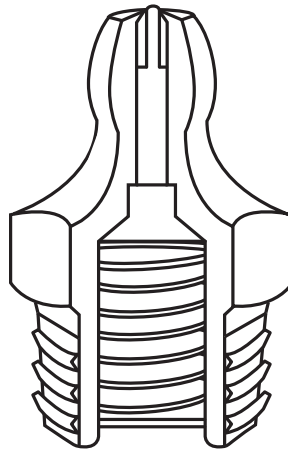
To apply grease:

- ◆ Clean the grease fitting. Initially operate grease gun until new lubricant discharges from nozzle, then wipe nozzle clean to avoid introducing contaminants into the component.
- ◆ Snap nozzle onto grease fitting. Nozzle must remain in line with the grease fitting during the application process. If the nozzle is not in line, lubricant will collect around nozzle and grease fitting, failing to lubricate the component.
- ◆ Wrap the nozzle with a paper towel or rag to prevent contamination and accidental soiling of other areas.

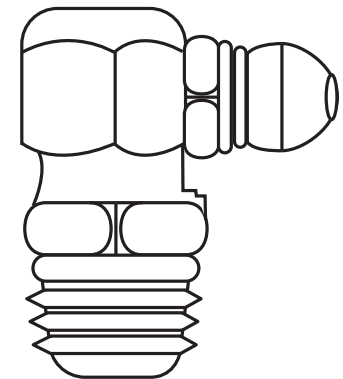
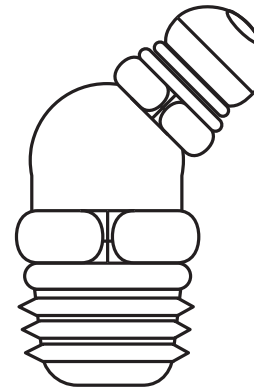
If the component does not accept grease the Zerk fitting may be plugged or damaged. Zerk fittings are replaceable and generally available at most auto supply stores. Zerk fittings come in a variety of angles depending on the application. Every effort should be made to lubricate the component, as neglect will only result in premature component failure.

NOTE:

Some grease fittings may not be accessible until the steering wheel is turned or the motorhome is moved slightly.

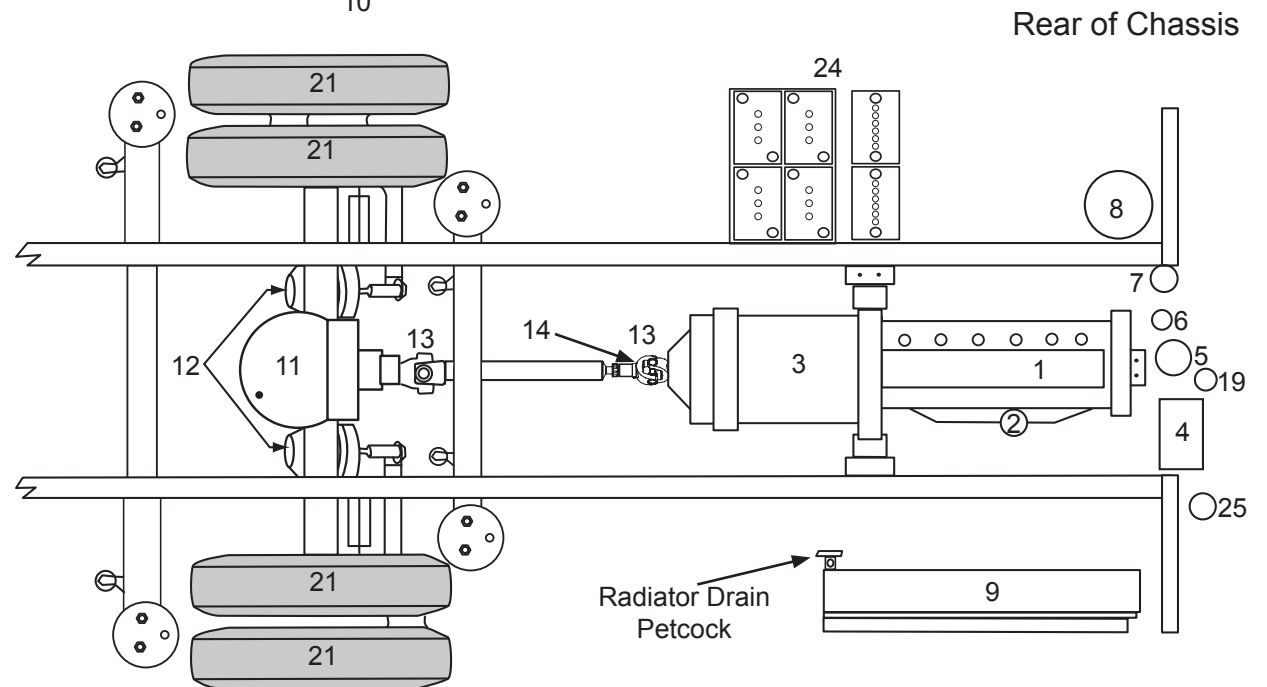
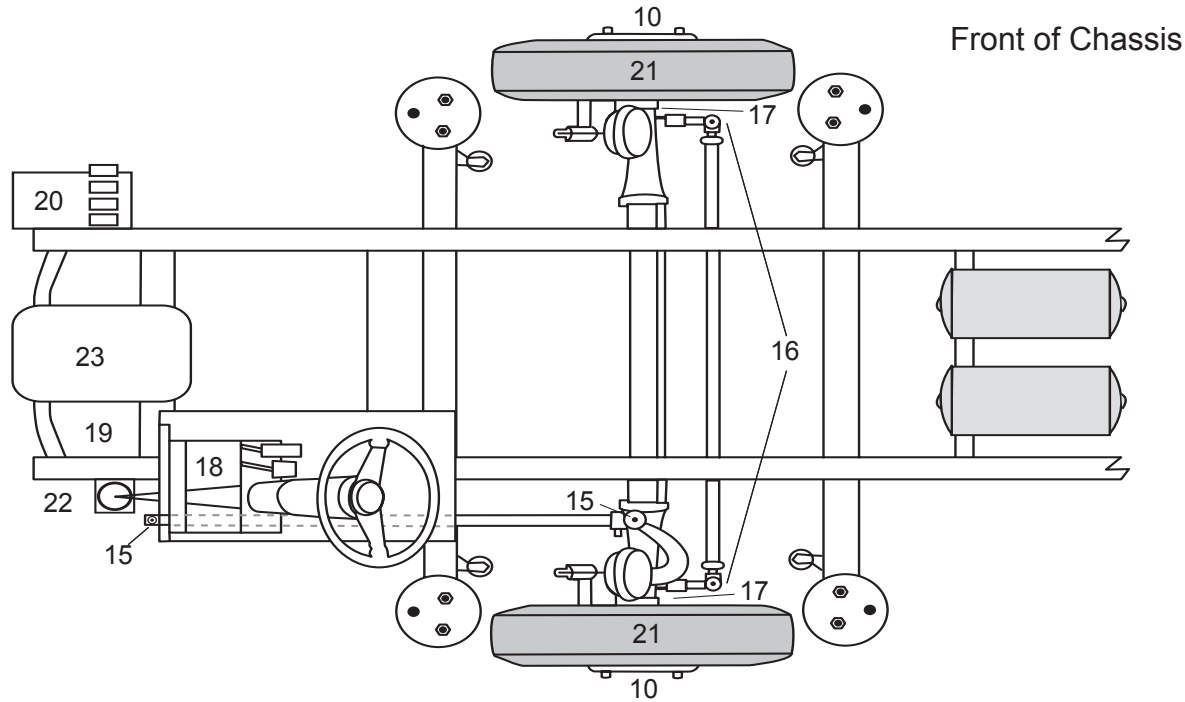


Typical Zerk Fitting (Not Actual Size)



090368

LUBRICATION CHARTS
36'-40' Models



COMPONENT:	ACTION:	WHEN:	CODE:	
1	Engine Oil Fill	Keep to full mark	Before each trip/daily en route	EO
2	Engine Oil Filter	Replace	At Oil Change	OEM
3	Transmission	Keep to full mark	Refer to OEM Manual	TS
4	Engine Coolant Reservoir	Maintain level	Before each trip	OEM
5	Hydraulic Reservoir	Maintain level	Before each trip	HF
6	Primary Fuel Filter	Replace	15,000 miles or 6 months	FF
7	Secondary Fuel Filter	Replace	Refer to OEM manual	OEM
8	Air Dryer Filter	Replace	2-3 Years	-
9	Radiator/Charge Air Cooler	Inspect	Weekly	-
10	Wheel Bearings	Re-pack	30,000 miles or annually	HT
11	Rear Differential	Replace	250,000 miles or 3 years	MP
12	Slack Adjuster/S-cams	Grease 3 fittings each	10,000 or 3 months	CL
13	Drive Shaft Universal Joints	Grease 2 fittings	5,000 or 6 months	CL
14	Drive Shaft Slip Yoke	Grease 1 fitting	5,000 or 6 months	CL
15	Drag Link	Grease 2 fittings	5,000 or 6 months	CL
16	Center Link	Grease 2 fittings	5,000 or 6 months	CL
17	Spindles/Kingpins	Grease 2 fittings	5,000 or 6 months	CL
18	Intermediate Steering Shaft	Grease 3 fittings	30,000 or annually	CL
19	Air Tank Drains	Drain	Monthly	-
20	Hydraulic Jacks Reservoir	Keep to full mark	6,000 or 3 months	HF
21	Tire Pressure	Check	Before each trip	-
22	Steering Box	Grease 1 fitting	Every 6 months	CL
23	Generator	Refer to OEM Manual	Refer to OEM Manual	OEM
24	Batteries	Inspect Apply Coating	Every Two Weeks 10,000 miles or quarterly	DW P
25	Air Filter Minder	Inspect	--	-

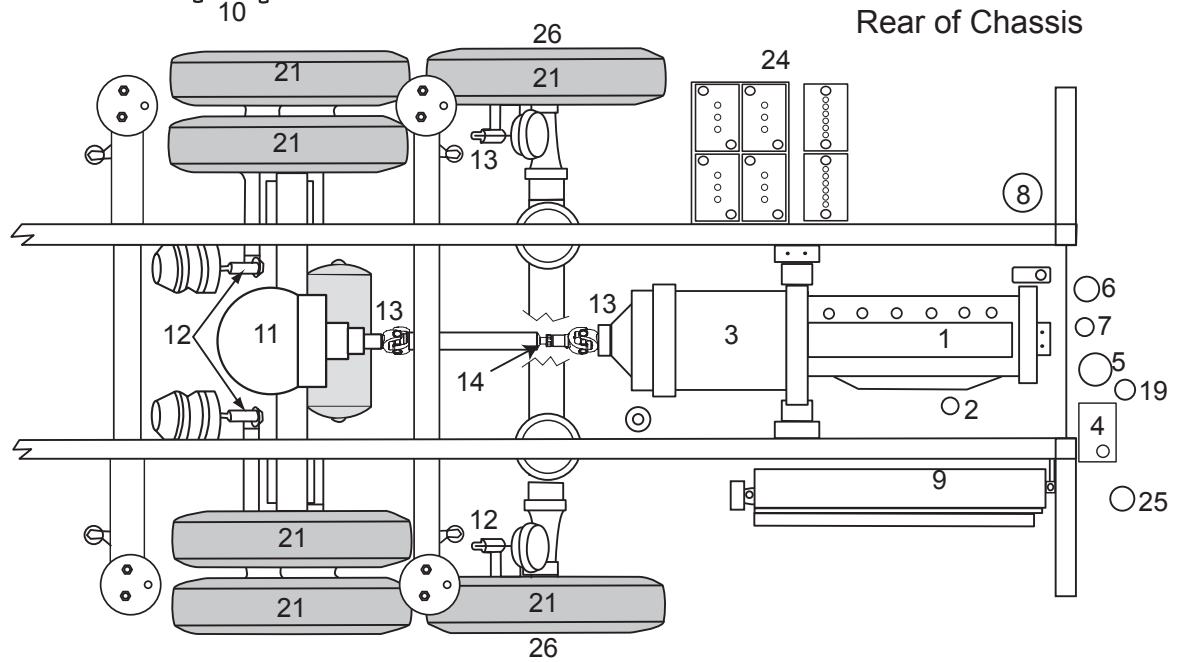
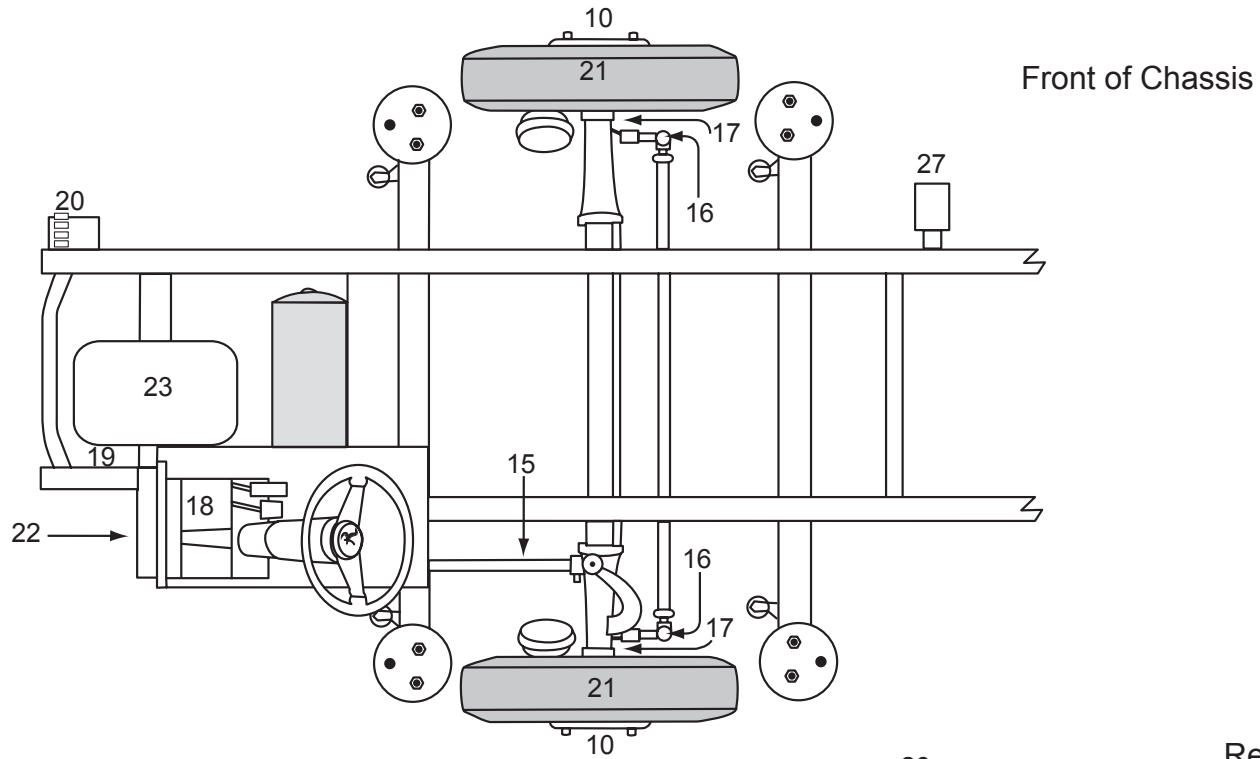
Lubrication Code Chart:	
*EO	Engine oil as recommended by engine manufacturer. Texaco URSA Super Plus SAE 15W-40.
*OEM	Refer to the Original Equipment Manufacturer's manual.
*MP	API GL-5 or MT-1 type gear lubricant - Texaco Star Gear SAE 80W-90 Non-Synthetic.
*CL	Chassis lubricant should be a high quality non corrosive multi-purpose lithium soap base lubricant that is water resistant and designed to withstand extremely high operating temperatures. Texaco Starplex NLGI 2.
*AF	Antifreeze as recommended by engine manufacturer. Texaco 50/50 with bitterant and SCA.
*BF	Dot-3 Brake Fluid
FF	Fuel Filter
HT	High Temperature Bearing Grease
*TS	TranSynd™
DW	Distilled Water
*HF	Texaco Rando HD46 Hydraulic Fluid
P	Petroleum Jelly

* Fluids initially filled at factory.

NOTE:

Service must be performed every twelve (12) months, regardless of actual mileage, to protect seals, bearings and gaskets from drying out and failing. The motorhome must be started and driven for at least 20 miles every two weeks. It is important to remember the generator maintenance interval is based on hours of usage. Consult the OEM Owner's Manual for the generator service interval.

42' Models

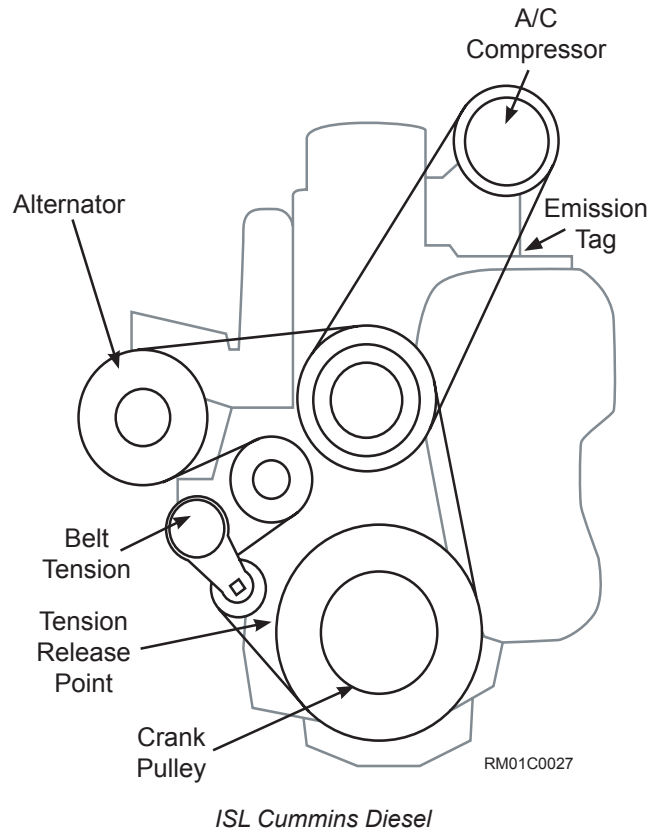


COMPONENT:		ACTION:	WHEN:	CODE:	Lubrication Code Chart:	
1	Engine Oil Fill	Keep to full mark	Before each trip/daily en route	EO	*EO	Engine oil as recommended by engine manufacturer. Texaco URSA Super Plus SAE 15W-40.
2	Engine Oil Filter	Replace	At Oil Change	OEM	*OEM	Refer to the Original Equipment Manufacturer's manual.
3	Transmission	Keep to full mark	Refer to OEM Manual	TS	*MP	API GL-5 or MT-1 type gear lubricant - Texaco Star Gear SAE 80W-90 Non-Synthetic.
4	Engine Coolant Reservoir	Maintain level	Before each trip	OEM	*CL	Chassis lubricant should be a high quality non corrosive multi-purpose lithium soap base lubricant that is water resistant and designed to withstand extremely high operating temperatures. Texaco Starplex NLGI 2.
5	Hydraulic Reservoir	Maintain level	Before each trip	HF		
6	Primary Fuel Filter	Replace	15,000 miles or 6 months	FF	*AF	Antifreeze as recommended by engine manufacturer. Texaco 50/50 with bitterant and SCA.
7	Secondary Fuel Filter	Replace	Refer to OEM manual	FF		
8	Air Dryer Filter	Replace	2-3 Years	-	*BF	Dot-3 Brake Fluid
9	Radiator/Charge Air Cooler	Inspect	Weekly	-	FF	Fuel Filter
10	Wheel Bearings	Re-pack	30,000 miles or annually	HT	HT	High Temperature Bearing Grease
11	Rear Differential	Replace	250,000 miles or 3 years	MP	*TS	TranSynd™
12	Slack Adjuster/S-cams	Grease 3 fittings each	10,000 or 3 months	CL	DW	Distilled Water
13	Drive Shaft Universal Joints	Grease 2 fittings	5,000 or 6 months	CL	*HF	Texaco Rando HD46 Hydraulic Fluid
14	Drive Shaft Slip Yoke	Grease 1 fitting	5,000 or 6 months	CL	P	Petroleum Jelly
15	Drag Link	Grease 2 fittings	5,000 or 6 months	CL	* Fluids initially filled at factory.	
16	Center Link	Grease 2 fittings	5,000 or 6 months	CL		
17	Spindles/Kingpins	Grease 2 fittings	5,000 or 6 months	CL		
18	Intermediate Steering Shaft	Grease 3 fittings	30,000 or annually	CL		
19	Air Tank Drains	Drain	Monthly	-		
20	Hydraulic Jack Reservoir	Keep to full mark	6,000 or 3 months	HF		
21	Tire Pressure	Check	Before each trip	-		
22	Steering Box	Grease 1 fitting	Every 6 months	CL		
23	Generator	Refer to OEM Manual	Refer to OEM Manual	OEM		
24	Batteries	Inspect Apply Coating	Every Two Weeks 10,000 miles or quarterly	DW P		
25	Air Filter Minder	Inspect	--	-		
26	Tag Axle – Oil Bath Hubs	Keep to full mark Change	Before each trip/daily en route Annually	MP		
27	Slide-Room Reservoir (Full-slide models only)	Keep to full mark	6,000 or 3 Months	HF		

NOTE:

Service must be performed every twelve (12) months, regardless of actual mileage, to protect seals, bearings and gaskets from drying out and failing. The motorhome must be started and driven for at least 20 miles every two weeks. It is important to remember the generator maintenance interval is based on hours of usage. Consult the OEM Owner's Manual for the generator service interval.

ENGINE DRIVE BELT DIAGRAM



SPECIFICATIONS CHARTS
Engine Specifications

ENGINE SPECIFICATIONS ISL 400 HP	
Cubic Inch Displacement	8.8 L/538 CI
Engine HP	400 HP @ 2000 RPM
Engine Torque	1200 lbs./ft. @ 1300 RPM
Governed Speed	2200 RPM
Firing Order	153624
Rear Axle Ratio	4:30:1
Alternator Amp Size	160 Amp

Chassis Fluid Capacities

CHASSIS LIQUID CAPACITIES ISL 400 HP	
Engine Oil	26 Qts.
Transmission Oil (initial amount)	26 Qts.
Transmission Oil (with service)	19 Qts. w/filter
Radiator Coolant (initial amount)	50-55 Qts.
A/C Refrigerant (initial amount)	4 lbs. 134 A
Hydraulic Oil	35 Qts.
Rear End	15 Qts. Approx.

Generator Specifications

8.0 Kw

SERVICE INFORMATION
Refer to operator's manual for maintenance specifications and adjustments.

Air Cleaner	-	140-2897
Oil Filter	-	185-5409
Fuel Filter	-	149-2513
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 Fuzz & Radiator Cap Under Cover.

36'-40' Models

020159c

10 Kw

SERVICE INFORMATION
Refer to operator's manual for maintenance specifications and adjustments.

Air Cleaner	-	140-3071
Oil Filter	-	122-0897
Fuel Filter	-	149-2513
Oil Capacity	- 6	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.

42' Models

060144p

Tank Capacities

Tank Capacities (Approx. Gallons) All Models	
Water Heater	10 gallons
Grey Water	78 gallons
Black Water	44 gallons
Fresh Water	100 gallons
Diesel Fuel	130 gallons
LP-Gas*	31 gallons

*Actual filled LP-Gas Tank Capacity is 80% of listing due to safety shutoff required on tank.

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 than the estimated capacities based upon fabrication and installation of the tanks.

NOTE:

This chart reflects product specifications available at the time of printing. Therefore any floor plans introduced thereafter may not be reflected in the chart. All other information contained throughout the manual will still apply.

Belts & Filters

CUMMINS ISL ENGINE		
Filter & Belt	Manufacturer	Part #
Oil Filter	Fleetguard	LF 9009
Fuel Filter (Primary)	Fleetguard	FS 1003
Fuel Filter (Secondary)	Fleetguard	FF 5488
Aqua-Hot Fuel Filter	Garber	Model # R
Hydraulic Filter	Nelson	84101B
Alternator Belt	Cummins	3289930
A/C Belt	Drive Rite	17475 HD
Air Filter	Donaldson	P53744802
Air Dryer Filter	Meritor Wabco	R950011
Transmission Filter	Allison	2952688

*MP= Manufacturer Part #.

NOTE:

Filter and belt numbers were correct at the time of printing. Verify the numbers at time of removal. The manufacturer will not be responsible for incorrect filter or belt usage. Please refer to the engine manufacturer’s operating instructions for specific maintenance information.

BATTERY SPECIFICATION CHARTS

Application		AH (20 HR)	CCA†	RC (25A @ 80° F) Minutes
12 Volt Chassis* - MHD (2 each)	Group 31p		950	195
6 Volt Domestic** each)	U2200 (4	450		75 Amp @ 80° F = 230 Min.

**Batteries connected in parallel. **Four batteries connected in a Series/Parallel configuration. †CCA Ratings are 0° F. These are the minimum requirements.*

Approximate Hours of Ampere Load					
**U2200	5 AMPS	10 AMPS	15 AMPS	20 AMPS	25 AMPS
	110	44	25	18	14

***Four batteries connected in a Series/Parallel configuration.*

Battery State of Charge vs Voltage/Specific Gravity			
Voltage	Specific Gravity	State of Charge	Depth of Charge
12.65	1.265	100%	0%
12.45	1.225	75%	25%
12.25	1.190	60%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%

Voltage Reading: Battery fully charged at rest for one hour.

Engine Cold Cranking Amp Requirements			
ISL	1500	CCA	12 VOLTS

CCA Ratings are at 0° F. These are the minimum requirements.

MAINTENANCE RECORDS

LUBRICATION SERVICE RECORD

After scheduled services are performed, record the date, odometer reading and who performed the service in the boxes provided after the maintenance interval. Any 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 portfolio is a convenient place to store them.

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												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
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19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

BATTERY RECORD						
MAKE	TYPE	DATE INSTALLED	REPAIRS	DATE REPLACED	SERVICE	
					MONTHS	MILES

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2007 SCEPTER | INDEX

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