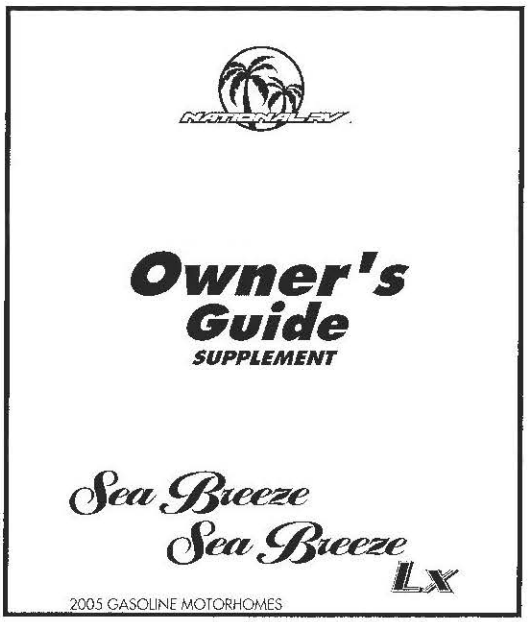
GASOLINE MOTORHOMES

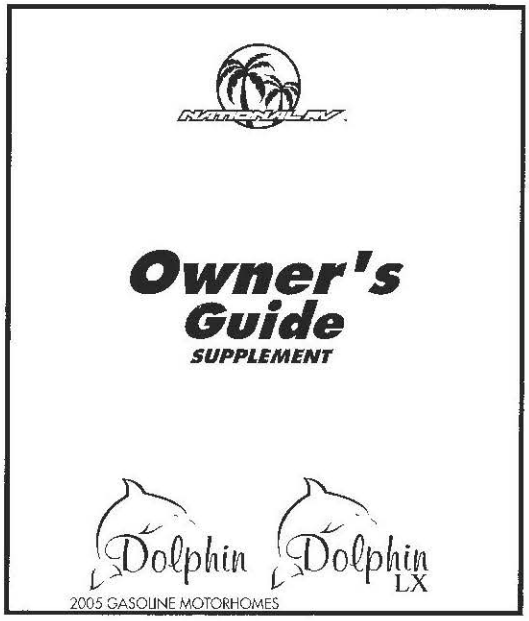
OWNER'S GUIDE

NATIONAL RV™

www.nationalrv.com

National RV Owner's Guide Supplement





We proudly present this National RV Owner's Guide with information covering your RV and its contents and functions. As a complement to this information, we also include a Model Supplement detailing specific aspects of your model RV. Included in the Supplement is cockpit, plumbing and electrical information, as well as diagrams and drawings specific to your model RV. For the most complete information, consult this Owner's Guide, your Model Supplement and other information in guides and manuals provided in your "Important Papers" packet included with your RV.

TABLE OF CONTENTS

4: DRIVER'S CONTROLS

5: ELECTRICAL SYSTEMS

6: PLUMBING SYSTEMS

7: LPG SYSTEM

8: INTERIOR COMPONENTS

9: EXTERIOR COMPONENTS

10: STORAGE & COLD WEATHER OPORATIONS

11: MAINTENANCE

CHAPTER ONE:
INTRODUCTION

THANK YOU!

The employees of National R.V., Inc. sincerely thank you for your purchase. We understand that this purchase is the culmination of careful, extensive comparison among many different brands. We are proud and grateful that you chose ours from among the many fine products on the market.

USING THIS OWNER'S GUIDE

Scope of This Publication

Your new unit was shipped with a complete "Important Papers" packet. This Owner's Guide was included in that package. Also furnished in the manufacturer documentation package are the manuals and other publications supplied by manufacturers of components built into your unit such as the chassis, engine, each of the kitchen appliances, etc.

This Owner's Guide does not attempt to replicate the information already provided in the component manufacturers' literature. Rather, it is a general overview of your specific unit, with guidelines, instructions and information that pertain to your coach. Complete information is given for the operation, care and maintenance of National RV-manufactured and/or -assembled components. Certain information from manufacturers' literature may be presented herein wherever appropriate. Likewise, throughout this publication the reader will be referred to the manufacturers' literature for more detailed information.

Finding Information

We recommend that you completely read this entire Owner's Guide prior to operation of your new unit. Likewise, many manufacturers of components included with your unit recommend thoroughly reading their literature prior to operating the corresponding equipment.

It is our goal that this manual be easy to use and that specific information be easy to find. The *Table of Contents* will be most useful in finding specific information. In general terms, information is grouped by subject (i.e. *Plumbing* or *Electrical*). In some cases, information pertaining to a particular component will be located in more than one place.

RECREATIONAL VEHICLE USE

Your unit is designed and intended for recreational use. Full-time use of your unit will accelerate the wear of all components in your motorhome. To extend the life of your unit and to minimize the signs of wear, the use of floor mats, furniture covers and the like is highly recommended.

DURAFRAME® CONSTRUCTION

Vehicles currently manufactured by National RV offer the new and improved DURAFRAME® Subflooring Construction technique.

The DURAFRAME® structure is a National RV exclusive! This type of construction offers a durable, open and accessible subfloor that is placed between the chassis and the RV floor to improve the rigidity, accessibility, modularity and storage area of the vehicle. The subfloor is fabricated using rigid, high-strength and low-weight materials that offer a better structural framework or platform upon which to support the shell of the motorhome. It is truly innovative and a unique feature that not only enhances the stability of the vehicle, but also increases the pass-through storage capability.

STANDARDS COMPLIANCE

Your new unit has been designed and engineered to conform to American National Standards Institute (ANSI) A119.2 Standards on Recreational Vehicles or Z-240 Standards for Canadian Vehicles and it complies with applicable Federal Motor Vehicle Safety Standards (FMVSS). These standards govern the installation of Plumbing, Electrical, LP-Gas and Safety components designed into your unit. The Compliance Seal - either Recreation Vehicle Industry Association (RVIA) or Canadian Standards Association (CSA) - is located to the left of the main entry door (outside wall) as you enter the unit (see Fig. 01-01).

REPORTING SAFETY DEFECTS

National Highway Traffic Safety Administration Reporting Procedure:

If you believe that your vehicle has a defect that 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 National RV.

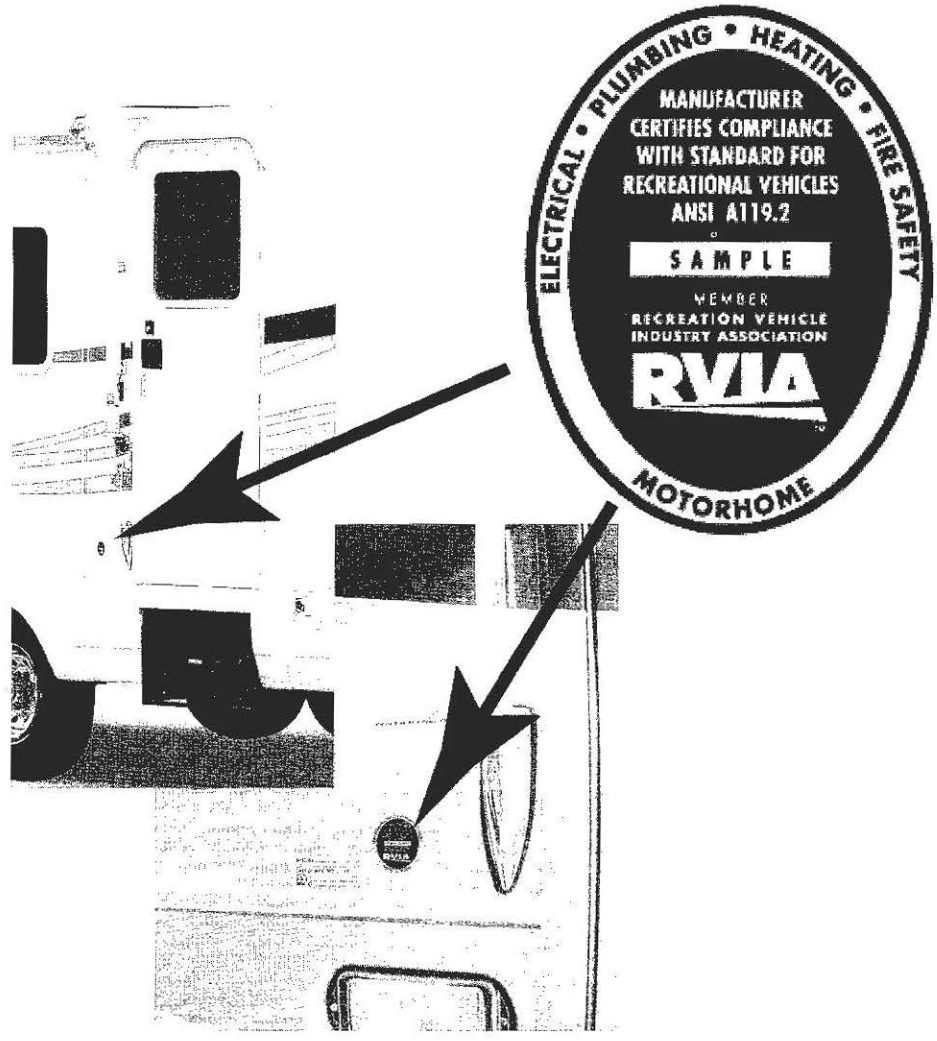


Fig. 01-01 - RVIA Insignia located next to entry door

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

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-888-327-4236 or write to:

NHTSA
U.S. Department of Transportation
Washington, D.C. 20590

Note: You can also obtain other information about RV safety from the Hotline.

CUSTOMER SERVICE

National RV is committed to providing you with the finest Recreational Vehicle we possibly can. If questions arise, or a situation that the dealer cannot resolve, we encourage you to write or telephone our customer service personnel. Please see Chapter 2 for more information on customer service. National RV will do everything possible within the warranty guidelines to assist you. If you are having difficulties with a product that the National RV warranty does not cover, you should contact the manufacturer of the product. However, we would also encourage you to inform us also so we may assist you. National R.V., Inc. strives to make your ownership of this recreational vehicle a very pleasurable experience.

National R.V., Inc.
3411 North Perris Boulevard
Perris, California 92571
Email: owners@nationalrv.com
(800) 999-7260 - FAX (951) 943-6938

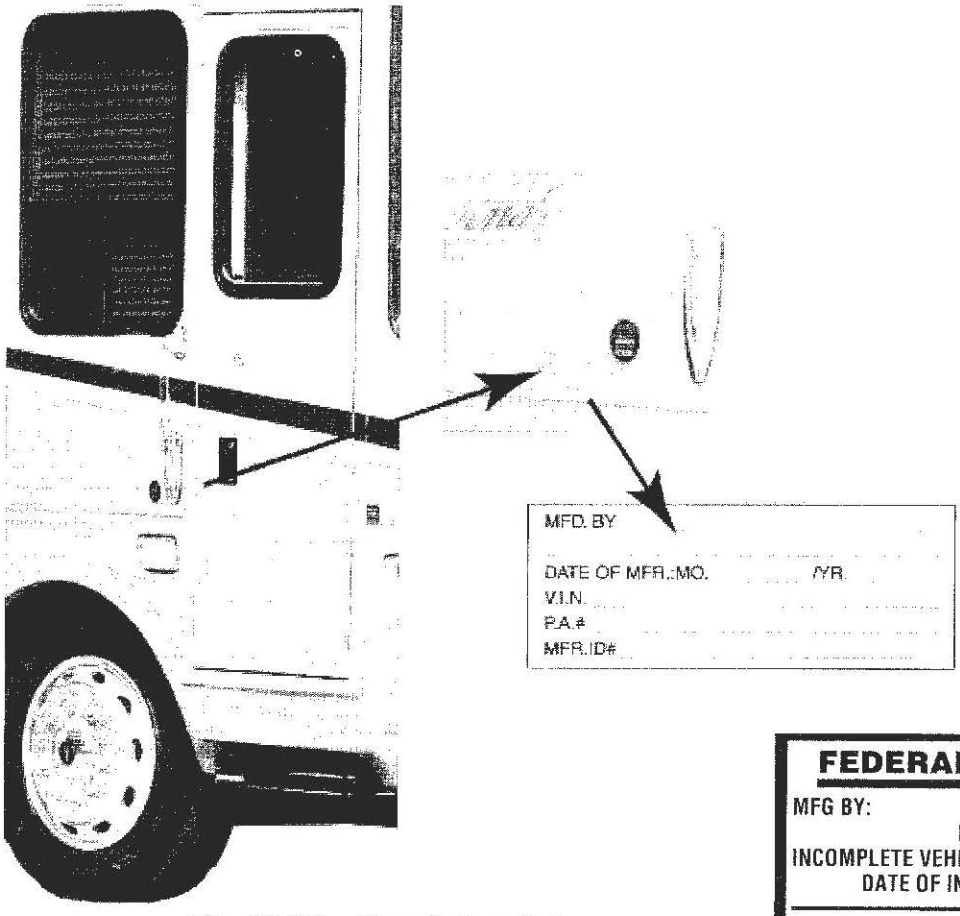


Fig. 01-02 - Manufacturer's Tag

VEHICLE/CHASSIS IDENTIFICATION

Vehicle Serial Number

The *Manufacturer's Tag* (Fig. 01-02) is located on the outside wall, to the left of the main entry door as you enter the vehicle. It provides the date the unit was built and the serial number.

Chassis Identification Number

Whenever you contact the factory, always refer to your RV model number, year and vehicle identification number (VIN). This information can be found on the *Federal Certification Tag* (Fig. 01-03) located on the sidewall adjacent to the driver's seat. Use this National RV identification number in all your correspondence and whenever you order parts. This label is reproduced here and fully discussed in the *Safety Considerations* chapter under "Safe RV Loading".

FEDERAL CERTIFICATION TAG

MFG BY:
DATE OF MFG:
INCOMPLETE VEHICLE MFG. BY:
DATE OF INC. VEH. MFR:

GVWR:	KGS (	LBS)
GAWR FRONT:	KGS (	LBS)
	WITH:	RIMS
	TIRES AT:	KPA COLD SINGLE
	(	PSI)
GAWR INTERMEDIATE:	KGS(	LBS)
	WITH:	RIMS
	TIRES AT:	KPA COLD DUAL
	(	PSI)
GAWR REAR:	KGS (	LBS)
	WITH:	RIMS
	TIRES AT:	KPA COLD SINGLE
	(	PSI)

This vehicle conforms to all applicable U.S. Federal Motor Vehicle Safety Standards in effect on:

V.I.N.

TYPE VEHICLE: MULTI-PURPOSE PASSENGER VEHICLE

The tires on this unit may be different from those shown above. Check tire sidewalls for maximum inflation pressures.

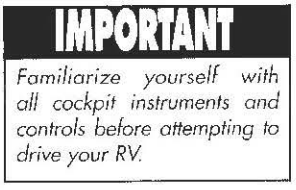
Replacement tires must be rated not less than the axle capacity (GAWR). NR1011

Fig. 01-03 - Federal Certification Tag

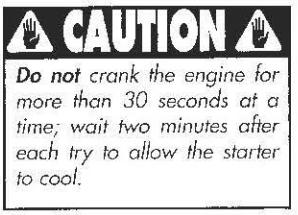
ALERT SYMBOLS

In order to highlight pertinent information, this manual makes liberal use of *Alert Symbols* located throughout the text which are intended to call your attention to certain important information. These alert symbols, taken together, also function as an easy-to-use quick reference of important information. The different alert symbols are as follows:

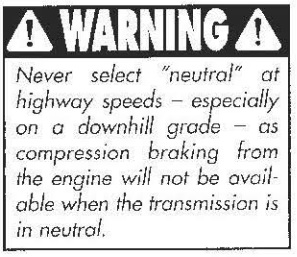
The "MFG INFO" Symbol: As mentioned above, most information regarding separately manufactured components may be found in the component manufacturers' literature. All component owner's manuals, operating manuals, warranty information and other publications are included in the "Important Papers" packet you received with your new unit. In these instances, this alert symbol is used to alert you that pertinent information may be found in other documentation included in the package.



The "IMPORTANT" Alert Symbol: Items that provide instruction on the proper operation, care and maintenance of your coach are highlighted using this symbol. The "Important" alert items should be memorized and adhered to while operating, maintaining, using or storing your unit. Please become familiar with them.



The "CAUTION" Alert Symbol: Not adhering to a "Caution" alert may result in minor damage and/or inconvenience. To prevent damage, read each "CAUTION" alert symbol carefully.



The "WARNING" Alert Symbol: "WARNING" symbols must be heeded at all times. The "WARNING" alert symbol is used where failure to adhere to the information provided may cause major equipment damage, personal injury or even death. Read and familiarize yourself with the information provided in the "WARNING" alerts prior to operating the specified equipment.

Notes:

CHAPTER TWO:
WARRANTY & SERVICE

WELCOME TO NATIONAL RV

The National RV organization welcomes you to the National RV family and thanks you for purchasing your new recreation vehicle. From Design, Engineering and Manufacturing to support activities in Parts, Service and Sales, high standards have been set to help ensure your satisfaction and pride as an owner of a National RV product. National RV takes pride in producing a quality product, and a strong dealer network supports our efforts. Your satisfaction is of prime importance, and we will work hard to win and retain your loyalty.

Understanding Your RV

Your recreation vehicle is a complex machine - literally a well-appointed, amenity-filled house on wheels. The final product represents the collaborative efforts of many different designers and manufacturers - each of whom take warranty responsibility for the portion of the RV built by them. *Given the complexity of your RV, it is extremely important that you take the time to learn how to correctly operate your unit along with its many systems and components.* You also should expect that some systems and components may fail or malfunction during your ownership, and that some problems could be difficult to diagnose or repair completely on the first attempt. Despite our best efforts, this is the nature of recreation vehicles and we thank you in advance for your patience and understanding.

Inspecting Your RV

Please carefully inspect your RV before taking delivery. If you discover any defects during this inspection, please bring them to the attention of your dealer right away so they can be resolved before you take your RV home. Your prompt inspection is especially important with items subject to wear and tear (e.g. carpeting, countertops, trim, etc.), as any delay in reporting a defective condition could cause confusion as to whether the condition is a defect covered by warranty or normal wear and tear which is not covered by warranty.

IMPORTANT

Inspect your new RV before taking delivery.

It is your dealer's responsibility to ensure you receive various loose items at the time of purchase. When conducting your pre-delivery inspection, please look for the following items:

- All warranties, warranty-related documents, and an "Important Papers" packet including owner's manuals, product literature, a list of separately warranted products, and the like.
- Two complete sets of keys
- Six-pin male hitch connector plug
- Awning pull-down rod and leg (arm) pegs
- Remote Controls

ADDITIONAL DEALER RESPONSIBILITIES

Your dealer is responsible for the following:

- Provide a thorough explanation and demonstrations (where necessary) of all RV operations, functions, systems, warranties, loading characteristics, and safety issues
- Ensure you receive all owner's manuals and warranties, including those documents in the Important Papers packet, and explain warranty service procedures
- Perform a Pre-Delivery Inspection (PDI)
- Register your motorhome with National RV by completing the Customer Acceptance form and the Product Registration Form and returning it to us.

THINGS YOU SHOULD KNOW ABOUT NATIONAL'S WARRANTY

General Description

National RV provides a limited warranty (see the warranty booklet) covering those portions of the vehicle manufactured by National RV. The warranty described in the warranty booklet is the only warranty that National provides to you.

As to those portions of the RV manufactured by National, parts and labor required as a result of defects in material or workmanship and brought to the attention of National or an authorized warranty repair facility will be provided and/or performed by an authorized National service provider at no charge during the warranty period.

Repairs required because of damage, misuse, abuse, collision, normal wear and tear, incomplete or improper maintenance are not covered by the National warranty. For more information about what is covered and excluded by the National warranty, please see the warranty booklet.

How to Obtain Warranty Service Under the National Warranty

To obtain repairs under the National warranty, contact an authorized National warranty service provider and explain the condition. We recommend that you first contact your selling dealer as the dealer will be the one most familiar with your unit, its service history, your use of the unit, and your driving habits. If you are traveling or have moved from the area of purchase, call National RV at 800-999-7260 and we will direct you to the nearest authorized warranty repair facility.

For after hours or emergency road service call CoachNet® at 800-759-6999. CoachNet®'s Customer Care and Emergency Road Service is a benefit provided at no charge to you during the first year of ownership. After the first year, you may purchase extended coverage directly from CoachNet® at your option. You will find a helpful brochure describing CoachNet®'s benefits and services in your Important Papers packet.

Fig. 02-01 - Coach Net® Cards

When you register your unit you will receive a customer ID card directly from CoachNet®.

When you arrive for your service appointment have your maintenance records and service records available. **Please inform the service writer if the defective condition you are experiencing is a repeat problem.**

IF A *SAFETY-RELATED* DEFECT PERSISTS DESPITE A REPAIR ATTEMPT, PLEASE NOTIFY NATIONAL RV DIRECTLY SO WE CAN BECOME INVOLVED TO RESOLVE THE PROBLEM.

IF A NON SAFETY-RELATED DEFECT PERSISTS AFTER TWO REPAIR ATTEMPTS WE WOULD ALSO LIKE TO BE NOTIFIED DIRECTLY SO WE CAN BECOME INVOLVED TO RESOLVE THE PROBLEM.

WE WOULD ALSO LIKE TO BE NOTIFIED IF YOU BELIEVE YOUR UNIT HAS BEEN IN THE SHOP FOR AN EXCESSIVE NUMBER OF DAYS.

WE CAN BE REACHED AT 800-999-7260 OR BY EMAIL AT owners@nationalrv.com. You may also mail correspondence to:

Owner Relations Manager
National RV, Inc.
3411 North Perris Boulevard
Perris, CA 92571

Separately Warranted Items

Many products and components installed on your RV are not covered by National's warranty. National is not responsible or liable for defects or malfunctions of these items as they typically have warranties from their respective manufacturers. These items may include such products as: the chassis, engine, transmission, generator, batteries, tires, furnace, hot water heater, inverter, leveling systems, audio systems, televisions, DVD/VCRs, roof and dash air conditioners, refrigerators, kitchen appliances, and others. The warranty documents for these items should be included in your Important Papers packet.

We strongly recommend that you review all literature for your separately warranted products and promptly submit all product registration materials to the manufacturer. This literature will explain how you go about obtaining warranty service for these items.

OWNER RESPONSIBILITIES

You are responsible for the following maintenance requirements:

- The operation, maintenance and care of your RV according to the instructions and requirements listed in the Owner's Manuals and other documentation provided to you.
- The parts and service necessary for maintenance at recommended intervals such as tune ups, lubrication, seals, wheel alignments and replacement of consumable and wear items.
- YOU MUST CHECK AND DOUBLE CHECK ALL ROOF AND WINDOW SEALS ON A REGULAR BASIS. DO SO MORE FREQUENTLY IN EXTREME WEATHER CONDITIONS. THIS IS CONSIDERED NORMAL MAINTENANCE.
- Front-end alignment is a maintenance issue. Your unit was aligned at the factory at the time of manufacture. The factory settings are indicated on a document enclosed in your Important Papers packet. PLEASE BE ADVISED: After you load the unit with your possessions, water and fuel, it may become necessary to have your unit realigned. This is an owner maintenance responsibility.
- Keep a copy of all service and maintenance records. These records may be required for substantiation of proper maintenance.

PRODUCTION CHANGES

National RV reserves the right to make changes in or additions to its products at any time without incurring any obligation to make the same or similar changes to RVs previously manufactured or sold by us.

DEALING WITH SERVICE PROBLEMS

Customer Satisfaction Procedure

Your satisfaction and goodwill are important to National RV and your dealer. Normally, any concerns with the sales transaction or the operation of your motorhome will be resolved by your dealer's Sales or Service Departments. Sometimes, however, despite the best intentions of all concerned, misunderstandings can occur. If your concern has not been resolved to your satisfaction, the following steps should be taken:

STEP ONE - Discuss your concern with a member of dealer management. Normally, concerns can be quickly resolved at that level. If the matter has already been reviewed with the Sales, Service, or Parts Manager, contact the general manager or owner of the dealer facility.

STEP TWO - If you feel your concern did not get resolved, please contact the National RV Owner Services Department at 800-999-7260. When you call please have the Vehicle Identification Number available. This will allow the Customer Assistance Representative to quickly locate information about your motorhome.

STEP THREE - If your concern has still not been resolved, we invite you to contact the National RV Customer Relations Manager, by email at manager@nationalrv.com or by regular mail to the address below. Please do not ask for or contact the Customer Relations Manager until after you have given the Owner Services Department a full opportunity to find a resolution.

Contact address:

Customer Relations Manager
National RV, Inc.
3411 N. Perris Blvd.
Perris, CA 92571

CUSTOMER SERVICE
NATIONAL RV, INC.
100 W. SINCLAIR
PERRIS, CALIFORNIA 92571

800-999-7260
Or
951-943-6938 (fax)
Or
owners@nationalrv.com

NATIONAL RV
CUSTOMER SERVICE REQUEST

Owner(s): _____
Address: _____
_____
Phone: _____ Fax: _____
Email: _____

Unit Information: Year _____
Make _____
Model _____
VIN _____ (last eight characters)

Unit Purchased (please circle) NEW USED

Selling Dealer: _____

Date of Purchase: _____ Current Mileage_____

CUSTOMER SERVICE REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Signed: _____ Date: _____

Mail To:
Customer Service, National RV, Inc., 100 W. Sinclair, Perris, California, 92571
or
Fax To: 951-943-6938

Notes:

CHAPTER THREE:
SAFETY CONSIDERATIONS

SAFETY NOTICES

The particleboard, hardwood plywood or paneling used in the manufacture of your unit is made with urea-formaldehyde. Proper ventilation should reduce the risk of potential problems. The following required information is provided:

This product is manufactured with urea-formaldehyde resin and will release formaldehyde gas. Formalde-hyde levels in the indoor air can cause various problems including eye and respiratory irritation and may aggravate respiratory conditions or allergies. Ventilation will reduce indoor formaldehyde levels and it will dissapate over time.

This vehicle, like many other vehicles, may contain small amounts of one or more substances that are known to the state of California to cause cancer, birth defects or other reproductive harm.

SAFETY EQUIPMENT

Carbon Monoxide Detector

A carbon monoxide detector (Fig. 03-01) has been installed for your safety. Carbon monoxide is a colorless, odorless and deadly gas. The presence of carbon monoxide could be fatal. Always take the appropriate action when the detector sounds an alarm. If anyone has a headache or an upset stomach, move immediately to a location that has fresh air then seek medical attention immediately. If no one exhibits symptoms of discomfort associated with CO poisoning, simply proceed with this check list:

- Immediately get fresh air into the unit.
- Operate the reset (TEST) button.
- Turn off all LP-Gas appliances, vehicle and other sources of combustion immediately.
- Call a qualified technician and have the problem corrected before restarting any appliances, generator, the vehicle or any other potential ignition and combustion source.

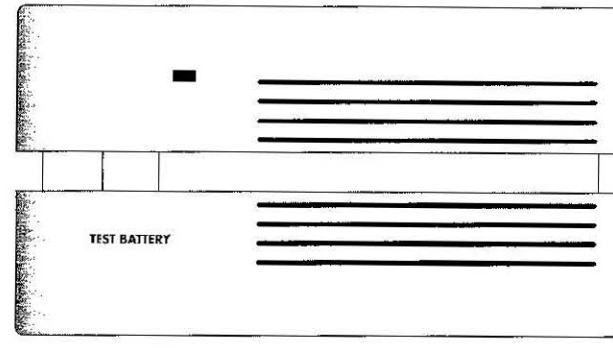


Fig. 03-01 - CO Detector

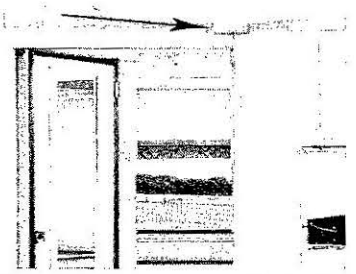


Fig. 03-02 - Smoke Detector

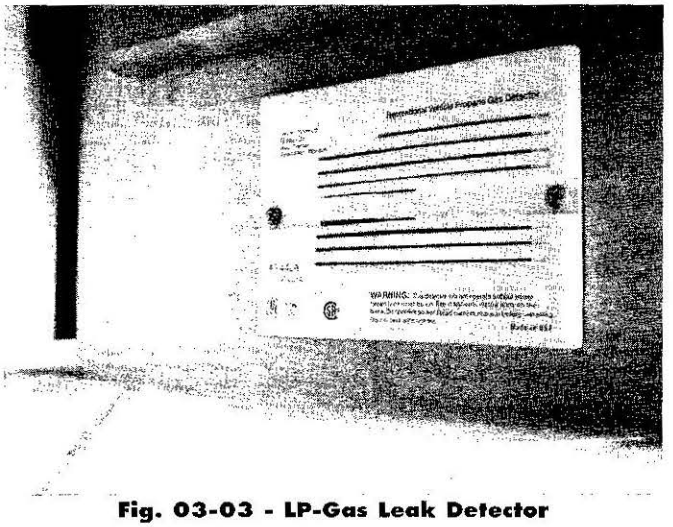


Fig. 03-03 - LP-Gas Leak Detector

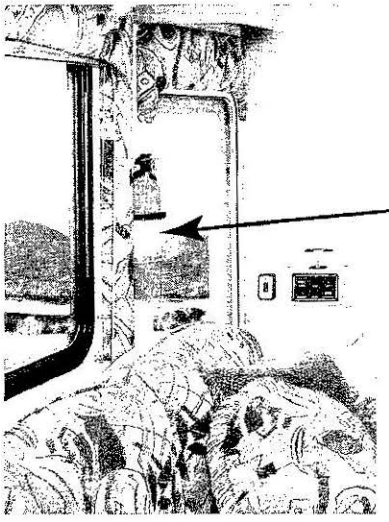


Fig. 03-04 - Fire Extinguisher

Smoke Detector

A smoke detector has been placed in the living area of your RV (see Fig. 03-02). It is battery operated and depends upon you for proper performance. *Note. Please install, check and maintain the 9-Volt battery. A label is in place adjacent to the smoke alarm to remind the owner of the required service.*

LP-Gas Leak Detector

⚠ WARNING ⚠

Test the smoke detector operation after the vehicle has been in storage, before each trip and at least once per week during use.

Your unit is equipped with an LP-Gas leak detector (see Fig. 03-03). The detector will sound an alarm if it detects the presence of LP-Gas inside the coach living space. For further information on the LP-Gas detector, refer to the chapter titled *LP-Gas System* later in this manual.

⚠ WARNING ⚠

The LP-Gas detector is disabled when the main battery disconnect is switched to "Off." Only use the main disconnect when the coach is in storage and not occupied.

Fire Extinguisher

Your unit is equipped with a portable dry chemical fire extinguisher with a minimum UL rating 10-B: C (see Fig. 03-04). It is mounted on the wall close to the entry door or behind the passenger's seat. This unit can be used to extinguish various categories of fires including oil, diesel, grease, flammable liquid and electrical. Please read the Service/Inspection tag that is attached to your fire extinguisher and follow the instructions contained therein. If the dial indicator is not in the green area, the extinguisher will not work properly and must be replaced.

Emergency Exit Facilities

RVs are required to have a minimum of two emergency exits (see Fig. 03-05). Please take the time to familiarize yourself with the alternate emergency exit located in the rear bedroom on the window. *Note: It is clearly identified as EXIT.* It is equipped with either one or two handles that are colored red. To gain egress, you must either pull or twist the handle(s), then push out the window.

⚠ WARNING ⚠

For your safety, everyone who travels in the RV should know where the exits are located and how to use them.

SAFETY WHEN TRAVELING

Your unit was designed to be open and spacious. While this provides delightful aspects to traveling, it also requires additional safety awareness. All loose objects can become potentially dangerous projectiles in the event of sudden stops and maneuvers. To eliminate this hazard, be sure all loose objects are properly secured. Closets, drawers and cabinet doors are provided with latches for this purpose. Free standing dinette chairs are equipped with restraining belts; please use them.

Prior to each trip, check all open areas to verify that gear has been properly stowed. Check all appliances, doors and drawers for proper locking or latching. All passengers should sit in designated areas only. Fasten the seat belt by engaging the buckle and adjusting the belt by the pulling the excess through the clamping mechanism at the buckle so that the belt is snug and the buckle is located for your comfort and easy access.

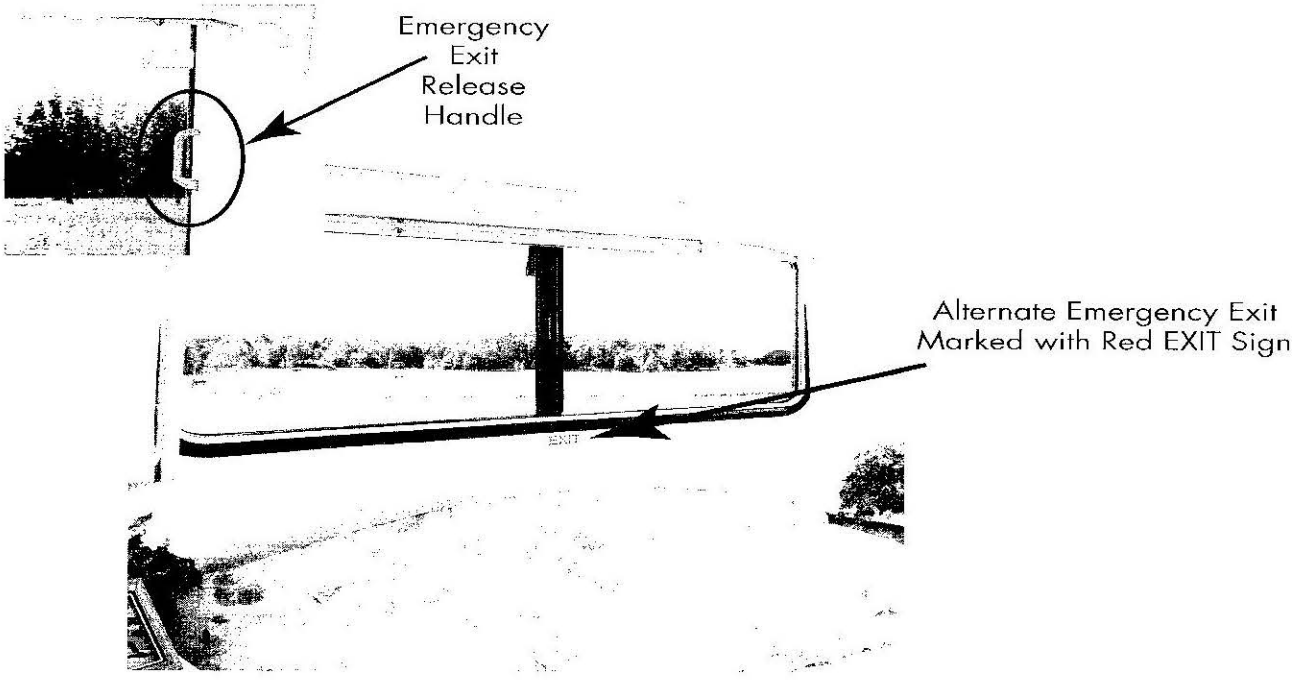
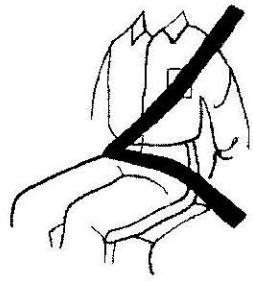


Fig. 03-05 - Familiarize yourself with the alternate emergency exits and how to use them. It is clearly marked EXIT.



Correct seat belt placement.
Lap belt worn low across hips and shoulder belt placed properly on shoulder.
Always wear seat belt properly, and buckle-up every trip.

Incorrect seat belt placement:
Belt should never be worn with shoulder belt behind back.
Never wear the belt improperly, serious injuries can result.

Incorrect seat belt placement:
Shoulder belt should never be worn across chest and under arm.
Never wear the belt improperly, serious injuries can result.

SEAT BELTS

Not all seating positions are equipped with safety belts due to the unique configuration of RVs. Those seats not equipped with safety belts should not be occupied while the vehicle is in motion. A warning label adjacent to the seat identifies these seats. Since these seats are not equipped with safety belts, they provide no protection in the event of an accident.

While in transit, all occupants must sit in seats equipped with safety belts. For your own safety, do not get up and move around the unit while it is in motion.

The following instructions will describe how to wear safety belts properly.

Using the Lap/Shoulder Belt

- Close and lock the entry door.
- Adjust the seat so you can sit up straight.
- Pick up the latch plate and pull the belt across you. Don't let it get twisted.
- Push the latch plate into the buckle until it clicks. If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it. If the belt is not long enough, see "Safety Belt Retrofit" at the end of this section.
- Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if necessary.
- To tighten the belt, pull down on the loose end of the belt.

⚠ WARNING ⚠

A twisted belt can seriously injure you. In a car crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly or ask your dealer to fix it. To unlatch the belt, push the button on the buckle. The belt should retract out of the way.

- The belt should be worn low and snug on the hips, just touching the thighs. In a crash, this technique applies force to the strong pelvic bones and you will be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries.

- To unlatch the belt, push the red colored button on the buckle.

IMPORTANT

It's very important for rear seat passengers to buckle up!

Children

Everyone in the RV needs protection! That includes infants and all children smaller than adult size. In fact, the law in every U.S. state and Canadian province specifies that children up to a specific age and weight must be restrained while in a vehicle.

⚠ CAUTION ⚠

There are special things to know about safety belts and children. And there are different rules for babies and smaller children. If a child will be riding in your unit refer to the section for Children. Follow the instructions there for everyone's protection.

Smaller Children and Babies

Smaller children and babies should always be restrained in a child or infant restraint. The instructions for the restraint will note whether it is the correct type and size for your child. A very young child's hip bones are so small that a regular belt will not properly stay low on the hip. Instead, the belt will likely end up over the child's abdomen. In a crash, the belt would apply force over the child's abdomen which could cause serious or fatal injuries. Be sure that any child small enough for one is always properly restrained in a child or infant restraint.

Child restraint systems are designed to be secured in the vehicle by lap belts and should be secured in accordance with the restraint system manufacturer's instructions.

⚠ WARNING ⚠

Never hold a baby in your arms while riding in a vehicle. During a crash a baby will become so heavy you can't hold it. For example, in a crash at only 25 mph (40 km/h), a 12 pound (5.5 kg) baby will suddenly become the equivalent of 250 pounds (110 kg) on your arms. Result: the baby would be almost impossible to hold. Always secure the baby in an infant restraint.

Larger Children

The vehicle's safety belts should be worn by children who have outgrown child restraints. Wherever the child sits, the belt should be worn low and snug on the hips, just touching the child's thighs. This applies belt force to the child's pelvic bones in a crash.

IMPORTANT

Never allow two children to wear the same belt. The belt can't properly spread the impact forces. In a crash, the two children can be crushed together and seriously injured. Only one person must use a seat belt at one time.

Safety Belt Use During Pregnancy

Safety belts work for everyone - including pregnant women. Like all occupants, they are more likely to be seriously injured if they do not wear safety belts. A pregnant woman should wear the lap belt as low as possible throughout the pregnancy. The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it is more likely that the fetus won't be injured in a crash. For pregnant women - as for anyone - the key to making safety belts effective is wearing them properly.

Safety Belt Retrofit for Front Facing Seats

If the vehicle's seat belt will fasten around you, use it. But if a seat belt is not long enough to fasten, your RV can be retrofitted with an extended-length seat belt. Your dealer or other authorized National RV service center will order an extended length safety belt that will work properly and comfortably for you. Be sure to get extended safety belts for each seat you may occupy while traveling.

Checking Your Restraint System

Now and then, make sure all your belts, buckles, latch plates, retractors and anchorage are working properly. Look for any loose parts or damage. If you see anything that might keep a restraint system from doing its job, have it repaired.

Replacing Safety Belts After a Collision

After a very minor collision, you may not need to replace the belts. But if the belts were stretched, as they would be if worn during a more severe accident, then new belts may be required. If belts are cut or damaged, replace them. Collision damage also may mean you will have to have safety belt parts, like the retractor replaced or anchorage locations repaired-even if the belt wasn't being used at the time of the collision.

Contact your selling dealer or authorized National RV service center for assistance in replacing the safety belt.

⚠ WARNING ⚠

Torn or frayed belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, replace it immediately. The model number on the replacement belt must be listed on the safety belt you want to replace.

RVs equipped with free standing dinette option: DO NOT occupy these chairs during operation of your RV. **Note: Seat belts are not provided with these chairs and they do not meet FMVSS requirements.**

Traveling with Pets

Traveling with the family pet may be enjoyable but RVs are not equipped to properly secure them. In an accident, unrestrained pets in the unit can be thrown around and become injured as well as injure other occupants. Specialty pet supply stores carry safety belts for some varieties of pets; however, traveling with pets is not recommended.

TIRE SAFETY

The tire designed for your RV is a very technical and precisely engineered product. To obtain the maximum safe use and best service out of your tires, it is helpful to understand the function of the tire. A tire is a container that holds air. It is the combination of air and tire that supports the vehicle and its contents. In addition, since the tire is the only contact that the vehicle has with the road surface, it must provide other functions such as traction for moving, stopping and steering as well as providing a cushion for the vehicle.

The Importance of Air Pressure

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

A tire that is underinflated will build up excessive heat that may exceed the prescribed limits of endurance of the rubber and the radial cords. Under-inflation could result in sudden tire failure. A tire that is underinflated can also cause poor vehicle handling, rapid tire wear and a decrease in fuel economy.

Overinflation will reduce the tire's footprint, or contact patch with the road, thus reducing the traction, braking capacity and handling of the vehicle. A tire that is overinflated for the load that it is carrying will also contribute to a harsh ride and uneven tire wear and will be more susceptible to impact damage. Maintaining the correct tire inflation pressure for your vehicle's loaded axle weight is of the utmost importance and must be a part of regular vehicle maintenance.

Federal law requires that the tire's maximum load rating be molded into the sidewall of the tire. If you look on your tire's sidewall, you will see the maximum load allowed for the size tire and load rating and the cold air inflation pressure required to carry that stated maximum load. Utilizing less air pressure means the tire can carry a lesser load. For more information, contact your tire manufacturer and request a *weight/inflation chart* that shows weights that ca[illegible] be supported by various air pressures. The amount of air pressure you need to use is dependent upon the weight of your fully loaded vehicle.

When to Check Air Pressure

1. *Every two (2) weeks.*
2. *Before starting a trip.*
3. *Every travel day.*
4. *Before putting your RV in storage.*
5. *When you remove your RV from storage.*

⚠ WARNING ⚠

Maintaining the correct tire inflation pressure for your vehicle's loaded axle weight is of the utmost importance. Checking your tire's air pressure MUST be a part of regular vehicle maintenance.

You should check your air pressure every two weeks and before any major trip. Your RV tires' air pressure should be checked every drive morning on long trips. On short trips of a day or less driving each way, your tires should be checked before you leave on your trip and again before you start your trip home. If your vehicle is stored for any length of time, air pressure should be checked prior to storage; more importantly, check pressure when the vehicle is removed from storage.

Check your tires when they are cool and have not been driven on for more than a few miles. The stated cold inflation pressure is based on an approximate outside temperature of 68°F. If you must check your tires when they are warm or hot, allow for a slight increase in air pressure and make sure that they are within a couple of pounds of each other on the same axle. *Never let air out of a hot tire.*

We recommended you purchase a quality *truck-style* air pressure gauge. Some RV wheels are such that a normal truck tire gauge needs to have a bend in it to reach the valve on the inside tire of the outside dual. Purchase one with a built-in offset or use a good quality stainless steel valve extension. These can be used on any dual tire setup for ease in checking your pressure. Nothing should restrict you from checking your air pressure daily when you are driving your RV daily.

What if you don't check your air pressure? If you pick up a nail or screw while driving that creates a slow leak and causes some pressure loss, you might eventually spot it with a quick look if it's a front tire. If it's an outside rear dual, you might spot it with a long look. However, if it is an inside rear dual, the chances of spotting it without an air pressure check are very slim. If you begin driving without finding it, your outside rear tire next to the low air pressure tire is going to heat up very quickly from carrying double its load (in most cases, within a few miles) resulting in tire failure. Then you'll have two tires down on the same side and on the same axle - and an eight-ton or more vehicle at any speed is difficult to bring under control. As you "preflight" check your vehicle every "drive morning," include an air pressure check of your tires. *Your life is worth the extra few minutes!*

Changing a Flat Tire

Even the best drivers can drive over a nail and the best tires can pick up that nail or screw and go flat. Whenever this occurs, *do not* attempt to jack up the unit and change it yourself. RV wheels and tires are extremely heavy and lug nut torque requirements make it advisable to summon professional help. We suggest calling Coach Net® or your auto club for assistance.

IMPORTANT

Do not use leveling jacks as a lift for changing tires or for working under the unit. Doing so is extremely dangerous!

Tire Repair

If you pick up an object that causes a flat with your RV tire, the repair must be made to the inside of the tire to be repaired properly. To do this, the tire needs to be dismounted and inspected on the inside of the casing for any other damage that the object may have caused. The tire should always be removed from the wheel to inspect for internal damage by a service professional.

⚠ CAUTION ⚠

Wheel lug nuts must be retightened to proper torque specifications (consult your chassis owner's manual) at 50 miles and then at 500 miles of new vehicle operation (or after a wheel change) and at the intervals specified in the maintenance schedule. Failure to retighten wheel lug nuts as required could allow wheels to come off while the vehicle is in motion, causing loss of control and possible collision.

Tire Inspection

Your RV tires should be inspected thoroughly at least once a year and at any time you drive in rough or rocky terrain. We also reccomend that you have your tires inspected each time that you have your RV serviced. This inspection should include the outside and inside sidewalls, tread area, valves, caps and any valve extensions. Inspect for nails, cuts, bulges, aging, fatigue cracks, weathering and ozone cracking. Also check between the duals for objects lodged between them. See a tire dealer at once if there is anything found to be in question.

To check for bad toe alignment problems, on a regular basis, rub the palm of your hand across the face of the tread on your front tires to feel for any feathered wear from toe alignment problems. Be careful since severe wear can expose steel belt edges that are very sharp. A toe misalignment problem can be caused by impact with a chuck hole in the road. Bad toe wear can be hard to find visually, but can be felt very quickly with the hand. This type of alignment can wear the rubber off the tread of your tires in just a few hundred miles.

Tire Rotation

If the correct air pressure and proper alignment are continually maintained, tire rotation may never be needed. In other cases, however, tire rotation may be needed to help correct alignment or underinflation problems. There are no restrictions regarding the method of rotation with your RV tires. They can be rotated front-to-rear and side-to-side.

Proper Cleaning

Like the rest of your RV, it pays to keep your tires clean. Road oil will cause deterioration of the rubber. Dirt build-up will help hold the chemicals in the air next to the tire and will deteriorate the tire. As with the cleaning of any rubber product, proper care and cleaning methods must be used to obtain the maximum service years out of your tires. A soft brush and normal mild soap that you would use to clean your RV may be used. If you use a dressing product to protect your 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 itself that is a problem, but the chemical reaction that the product has with the anti-oxidant compound in the tire. Heat can add to the negative reaction. 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. In most cases, however, RV tires will last much longer due to limited annual mileage. The chemical reactions have much longer to take effect.

Long-Term Storage of RV Tires

Rubber tires age faster when not being used; however, there are steps that you can take to reduce the aging effects from long-term RV storage. Before putting your RV into storage, thoroughly clean your tires and fill the air pressure to the recommended maximum. Then cover the tires to prevent direct sunlight and ultraviolet rays. Failure to take these steps can lead to early deterioration and shorten the life of your tires.

The Life-Span of an RV Tire

Miles alone cannot measure the life of a tire used on an RV. Your RV tire life depends on driving habits, driving conditions, geography and the age of your tires. You can determine the age of the tire by looking at the Department of Transportation number (DOT, see illustration Fig. 03-06) molded on the side wall of the tire. The last two digits on the right are the last two digits of the year in which it was manufactured.

With the average (non-full timer) RV driving 5,000 miles per year, it could take years to wear out the tires. In this case, the age of the tire is more important than the amount of tread depth remaining. Just like your fan belt and radiator hose, the rubber in your tire ages as well. In cooler, clean air locations, the expected tire life will be longer than in high-temperature, high-smog areas. As your tires age, of course, you should inspect them more frequently.

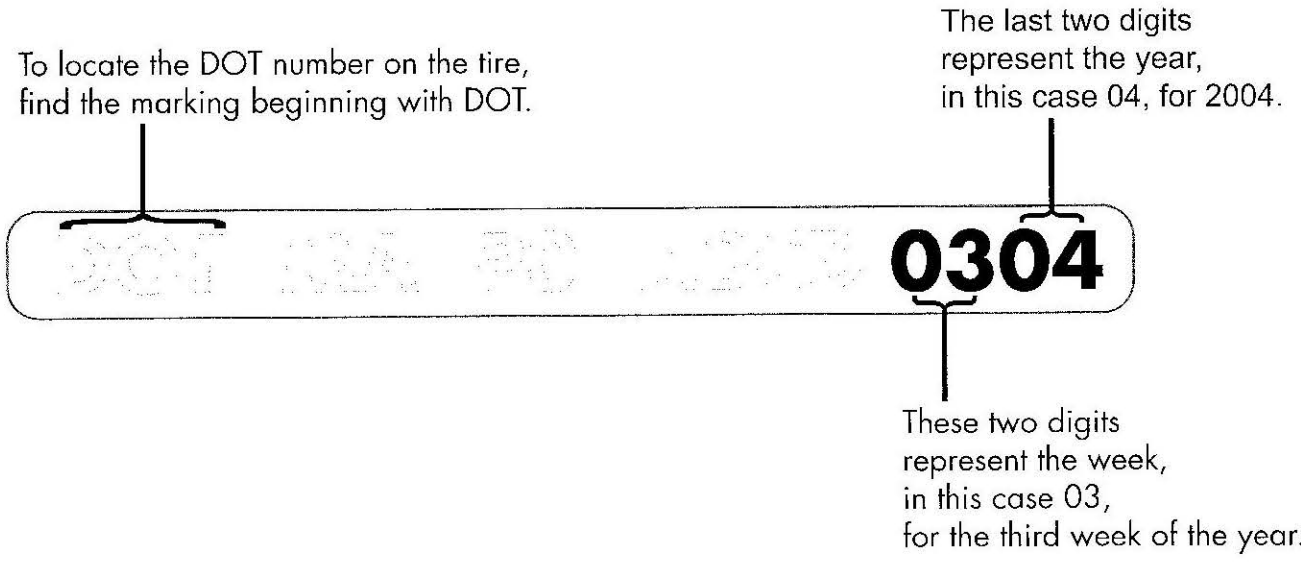


Fig. 03-06 - Department of Transportation (DOT) Number on tire sidewall.

DOT Number Explanation: Tires produced after January 1, 2000 have a 4-digit date code at the end of the DOT number. The first 2 digits represent the week of production and the last 2 digits represent the last 2 digits of the year of production.

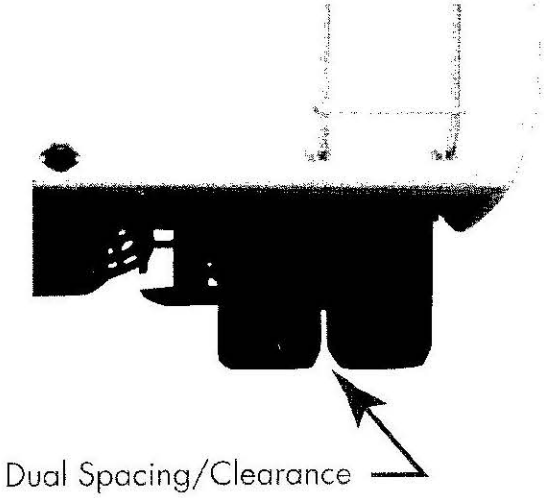


Fig. 03-07 - Replacement Tires Should Not Change the Dual Spacing/Clearance

Selecting Replacement Tires

One of the most important equipment purchases that you will make is the replacement tires for your RV. If you obtain good service with your first set of tires, chances are that they were matched well for your RV's weight needs and your type and area of driving.

If there is reason to replace your tires with another size, be very careful. There are some basic areas of concern such as the load rating of the new tire and the overall diameter of the new tire for vehicle clearance and speedometer reading. See a tire professional for the best information.

It is important that replacement tires for the rear duals do not change the designed clearance space between the tires or the load rating of the duals (see Fig 03-07). Be sure that the wheel width is compatible with the new size. For example, buying a new tire with a higher load rating that might require 105 PSI would be of no advantage if your wheel is limited to 80 PSI. Consult a tire professional for more information.

IMPORTANT

There are some critical areas to consider when selecting replacement tires for your RV. For the best information, see a tire dealer.

SAFE RV LOADING

Dangers of Overloading

What are the risks of driving an overloaded vehicle? In addition to possible problems with tires, wheels and suspension, there can be problems of brake failure, drive train failure and wheel bearing failure. Plus, an overloaded RV uses more fuel, is harder to handle, slower to stop and can lead to driver fatigue. If any one component should fail, it could result in vehicle damage and/or loss of vehicle control. In addition to the above dangers, there are some states that require RVs to utilize the Highway Patrols' weight scales to check for overloaded axle weights. Citations can be issued.

Load Definitions

Proper loading and weight distribution of your unit is of critical importance since it will affect drive handling and braking. Your RV chassis was designed to carry and/or tow a specific weight. Overloading or exceeding these limitations might place you in danger by reducing your braking capacity. It also places undue stress on components and can lead to shortened service life or premature failure. Before discussing loading and weighing, however, it is necessary to define some weight-related terminology as follows:

- **GVWR** (*Gross Vehicle Weight Rating*) is the maximum permissible weight of this RV. The GVWR must be equal to or greater than the sum of the Unloaded Vehicle Weight (UVW) plus all vehicle loads including cargo.

- **GAWR** (*Gross Axle Weight Rating*) is the maximum weight that a specific axle is designed to carry. The sum of ratings may be more than GVWR to allow for load variations.

⚠ CAUTION ⚠

DO NOT exceed the GVWR or the GAWR of your RV. Exceeding these ratings of your RV

- *WILL reduce your warranty protection.*
- *CAUSES undesirable handling characteristics.*
- *WILL create a safety hazard.*

- **GCWR** (*Gross Combined Weight Rating*) is the maximum allowable loaded weight of this motor home and any towed trailer or towed vehicle.

- **GTW** (*Gross Towed Weight*) is the maximum allowable loaded weight that this RV has been designed to tow.

- **MTW** (*Maximum Tongue Weight*) is the maximum vertical load that the towed vehicle applies to the hitch on the RV.

- **UVW** (*Unloaded Vehicle Weight*) is the weight of this RV as built at the factory with full fuel, engine oil and coolants. The UVW does not include cargo, fresh water, LP gas, occupants or dealer installed accessories. *Note: This weight is representative of a typical production example of this model vehicle. Some variations from one vehicle to another occur.*

- **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 equal to GVWR minus each of the following: UVW, full fresh (potable) water weight (including water heater), full LP-Gas weight and SCWR. *Note: Dealer installed equipment and towed vehicle tongue weight will reduce CCC.*

- **GVW** (*Gross Vehicle Weight*) is the actual weight of your RV when fully loaded and driven onto the scales and is not a limit or specification. It is the total gross weight of the RV with accessories, full fresh (potable) water weight (including water heater), fuel, cargo plus driver and occupants. *Note: The GVW must never exceed the GVWR.*

The *Weight Information Sticker* (Fig. 03-08) on your RV is normally located in the driver's overhead cabinet. This label will supply you with important weight information regarding the approximate Cargo Carrying Capacity (CCC) of your vehicle.

In addition, your unit is labeled in accordance with Federal Motor Vehicle Safety Standards (FMVSS) to indicate safe limits which each axle and the total vehicle itself can be loaded to at a specific tire inflation pressure. The *Federal Certification Tag* (Fig. 01-02) can be found on the sidewall, to the left of the driver's seat.

The tires, wheels, axles, axle bearings, suspension, vehicle frame or other components of the vehicle limit these maximum axle and load weight ratings. Every RV - even of the same make and model - will vary in actual loaded axle weights because of different options, personal loads and other variations.

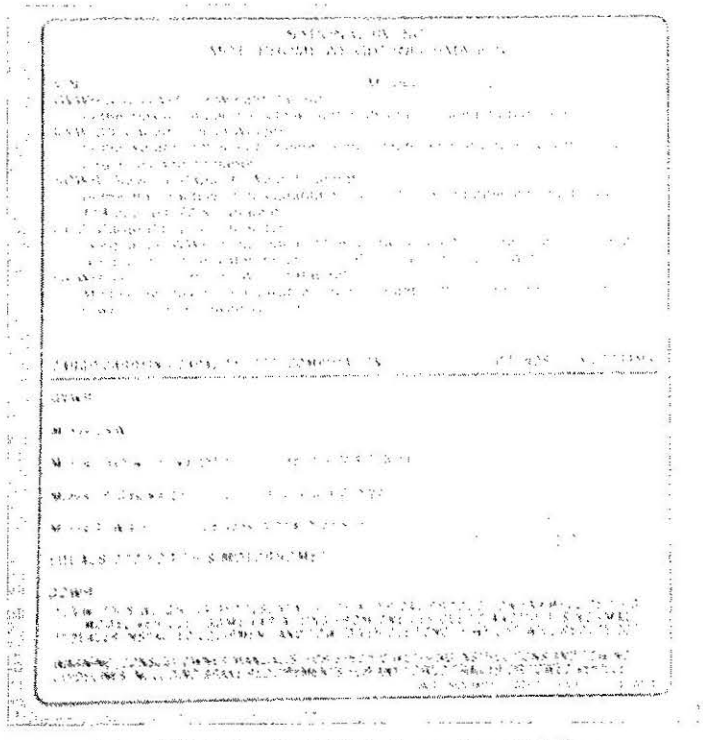


Fig. 03-08 - Weight Information Sticker

While your Gross Vehicle Weight (GVW) should be below the GVWR, you must weigh your RV in a loaded condition to identify its actual weight. Weigh the front axle, the total unit and then the rear axle. If possible, also weigh the left and right sides. Once you know the total weight and the weight on each axle, the tire weight/inflation chart obtained from your tire manufacturer (see the section on "The Importance of Air Pressure") will show you the correct cold inflation pressure per tire for each axle.

If you are towing a vehicle (automobile or trailer), then you must also weigh the towed vehicle. *This is important as you must not exceed the tongue load capacity of the trailer hitch, the towing capacity of the hitch or the GCWR of the motorhome.* Please refer to the manufacturer of the towed vehicle for information on how to obtain the tongue weight of the towed vehicle.

How Much Cargo Can I Carry?

You must decide what cargo you wish to carry based on how many people you are carrying and the actual weight of the liquids on board. It is recommended that the holding tanks be emptied before leaving the campground. The weight of optional equipment and owner add-ons must also be added to the unloaded weight of your vehicle. Most campgrounds have fresh water; unless you are going to camp in primitive areas, it is seldom necessary to travel with a full water tank. Normally, 10-20 gallons will suffice for convenience while traveling.

Where to Weigh Your Vehicle

There are probably several certified public scales in your area. You will find public-access scales in a variety of places, such as moving and storage company lots, farm suppliers with grain elevators, gravel pits, recycling companies and large commercial truck stops. If you are not aware of a nearby public scale, check your telephone book yellow pages under "scales-public" or "weights". A nominal fee will be charged, but it is money well spent.

How to Weigh Your Vehicle

Most of the scales will be a large platform design type that is long enough to handle a large truck and trailer. A few will be the single axle type.

If the scales are the single axle design type:

- Drive your front axle onto the scale and stop long enough for the weight to be obtained. This is the front axle weight.
- Then, pull forward until the rear axle is on the scale. Weigh the rear axle. This is the rear axle weight.
- To identify the total weight of your unit, add the weights together. This is the GVW, or gross vehicle weight.

If the scales are the platform design type:

- Drive your front axle onto the platform scale and stop just before the rear tires reach the platform. Obtain the weight. This is the front axle weight.
- Drive the unit fully onto the center of the scale, stop and obtain the weight for your total unit. This is the GVW, or gross vehicle weight.
- Then drive forward until the front tires are just off the scale and stop. Obtain the weight. This is the rear axle weight.

Note: For the best results, the axle that is off the scale should be level with the scale.

If there is sufficient room on the sides of the scale, it would be helpful to obtain the right and left side weights of your RV. Again, the RV should be as level as possible. When comparing the weights of your axles and/or sides, the total of the front and rear axles and the totals of the right and the left sides should match up closely with your total RV weight.

Compare the weight measurements with the Weight Information Sticker and the Federal Certification tag, use the forms found at the end of this chapter to help you.

The weights of your RV should never exceed any of the specifications. If your measurements exceed any of the Weight Ratings of your RV, you must reduce the weight of the RV by removing cargo.

- Check your measurement of the front and rear axle weights against the GAWR for those axles. If your measurement exceeds the Ratings, you must remove cargo until the measurement is less than the GAWR.
- Check your measurement of the GVW (gross vehicle weight) against the GVWR (gross vehicle weight rating). If your measurement exceeds the Rating, you must remove cargo until the measurement is less than the GVWR.
- Don't forget to include the passenger weight.

Wet Load Weight

It is also recommended that you weigh your vehicle to obtain a full wet load weight.

- For this measurement, the vehicle should not have personal belongings, food products, kitchenware, passengers or driver included.
- The vehicle should have a full tank of engine fuel, a full tank of liquefied petroleum gas (LPG) and a full tank of fresh water.
- Normally, the holding tanks will be empty if the water tank is full.
- Subtract your indicated wet weight from the GVWR printed on the certification label to find the maximum cargo and passenger load that can be safely carried.

Weigh Your RV Before Your First Adventure

Before leaving on your first adventure it is recommended that you weigh your vehicle again to check your total GVW along with your total personal cargo load and passenger load. Your vehicle should be fully loaded the way you intend to use it.

- Weigh your RV as it will be loaded when traveling.
- Be sure all passengers are sitting in their favorite seat.
- If passengers choose different seating arrangements while the vehicle is traveling, the weight change will affect the front and rear Gross Axle Weight (GAW).
- Be sure the family pet is part of the load if you plan to take the pet with you.

Loading List

Prepare a loading list to help as a checkoff list before departures:

- Categorize the load so that stored items not often used can be easily located at a later date.
- This list may also be used to prioritize the weight of belongings to ensure that your vehicle is not traveling in an overweight condition. After weighing your vehicle a second time, you may find it necessary to redistribute your load or it may become necessary to remove some load.
- The expendable loads should be a separate category on your list. All food products, pantry-stored food, refrigerator food, beverages, ice, extra freezer or ice chest with ice should be included on this list. Also include campfire wood, bags of charcoal briquettes and all expendable items that may leave with you on your journey but may be consumed as you reach your journey's end.

Important Loading Tips to Remember

- It is not recommended that the vehicle travel with both water tank and holding tanks full at the same time. This condition will significantly reduce your vehicle's carrying capacity and may cause the vehicle to be overweight.
- Always empty the holding tanks before leaving the campground. If a dump station is not available, it is not recommended that the vehicle travel with a full fresh water tank when the holding tanks have stored wastewater in them.
- The storage compartments on your vehicle have been made as large as possible to accommodate bulky items such as lawn chairs and barbecues, etc. It is very easy to overload these areas. Often, many items are not needed and will decrease your vehicle's carrying capacity to safely transport additional people and cargo. When loading your vehicle, always place heavy items in the lower compartments and lighter items in the overhead cabinets.

TOWING A VEHICLE OR TRAILER

The hitch load is the additional weight applied to the hitch of your RV. A towed vehicle, boat trailer or carrier rack is a hitch load that effects the GAWR, GVWR and GCWR. Probably the single most critical factor in trailer towing is the combined weight (GCWR) of your RV and tow vehicle. The total actual weight (GVW) of the RV and towed vehicle should not exceed this rating. While this figure has more to do with the drive train design limits (engine, transmission, axle, and bearings), this additional weight can also affect the tires and how your RV handles. Finally, don't forget to consider the actual tongue weight. This should not exceed the Maximum Tongue Weight (MTW) rating of the hitch.

⚠ CAUTION ⚠

Attach the safety chains to the rounded slots on both sides of the hitch mounting plate. Do not secure them to any other part of the coach.

Important Facts About Towing

- Your unit is equipped with a hitch that can be used for towing vehicles. The towing capacity and the tongue load capacity of this hitch are indicated above the hitch on a label. You must never exceed these limits.

- Every hitch is equipped with an electric connection for signal lights.

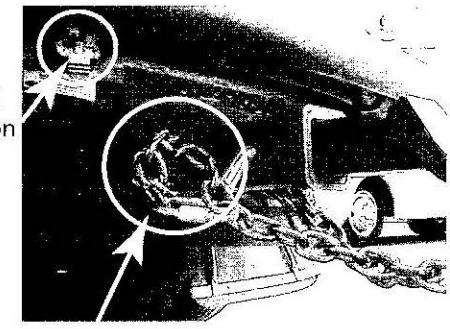
⚠ CAUTION ⚠

CAUTION: The factory installed trailer hitch on the unit will safely tow a trailer or another vehicle whose weight does not exceed the GTW (Gross Towing Weight) of the hitch or the Tongue Load Capacity. **You will find this information on the label above the trailer hitch.** *See your chassis manufacturer's owners guide for the GCWR.*

- If you use a ball mount, it must be compatible with the capacity of the hitch.

- You must use safety chains. For this purpose, there are rounded slots on both sides of the hitch mounting plate. These are the only allowed points of attachment for the safety chains. Make sure you leave enough space for turns when you attach the safety chains. *Do not secure safety chains to any other part of the coach.*

- The brake system of the motorhome is rated for operation at the weight capacity of the motorhome only. In other words, if the total weight of the motorhome plus the towed vehicle exceed the GVWR, the towed vehicle must have its own independent brake system. Otherwise, the brake capacity may be inadequate and could result in personal injury or death. Separate functioning brake systems are required for safe control of the towed vehicle. *Do not* connect the towed vehicle's hydraulic brake system directly to the coach's brake system. The motorhome may not have sufficient brake power and your chance of collision greatly increases. We recommend an electric, manual, automatic or surge-type brake system that does not connect in any way to the motorhome's brake or electric system. When installed properly and adjusted to the manufacturer's specification, they will be safe. The towed vehicle's brakes must meet local and Federal regulations. Please familiarize yourself with the proper use of the towed vehicle's independent brake system before driving.



Safety Chains attached through rounded slots. Do not attach the Safety Chains to any other part of the coach.

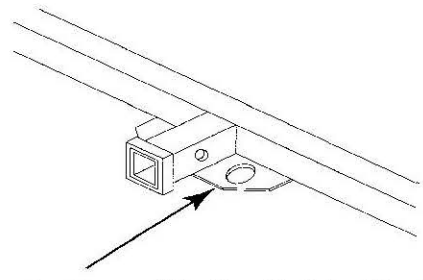


Illustration of Trailer Safety Chain attachement location. Do not attach the Safety Chains to any other part of the coach.

⚠ WARNING

BEFORE TOWING ANY VEHICLE WITH THIS MOTOR HOME, REFER TO YOUR OWNER'S MANUALS FOR TOWING GUIDELINES. THE TOTAL WEIGHT OF THE TOW VEHICLE AND THE MOTOR HOME SHOULD NEVER EXCEED THE GROSS COMBINED WEIGHT RATING ("GCWR"). THE USER IS RESPONSIBLE FOR SELECTING THE PROPER COMBINATION OF LOADS, TO ENSURE THAT THE GCWR, AND ALL OTHER VEHICLE CAPACITIES, ARE NOT EXCEEDED.

- You must never exceed the Gross Combined Weight Rating (GCWR).
- When descending a steep grade, shift the transmission into the next lower gear.
- In high-altitude operating environments, your engine will lose power at the rate of one percent per 1,000 feet (305 meters) of elevation. For these high-altitude operating conditions, a reduction in gross vehicle weights and gross combination weights is recommended and will result in improved vehicle performance.
- Please read and follow the specifications of the towed vehicle. There may be important instructions therein regarding towing.
- Please refer to the section "How to Weigh Your Vehicle" for instructions on how to properly weigh your coach. The information obtained from weighting your coach is critical when towing a vehicle.

Towing Tips

- Practice turning, stopping and backing up before starting on a trip to get the feel of the motorhome-trailer combination. When turning, make wider turns so the trailer wheels will clear curbs and other obstacles.
- Allow more distance for stopping with a trailer attached.
- After you have traveled 80 Km (50 miles), thoroughly check your hitch, electrical connections and trailer wheel lug nuts.
- When stopped in traffic for long periods of time in hot whether, place the gearshift in P (Park) and increase idle speed. This aids engine cooling and air conditioner efficiency.
- Consult the towed vehicle's owner's manual. You may need to follow important procedures that will improve safety and performance.
- Vehicles with trailers should not be parked on a grade. If you must park on a grade, place wheel chocks under the trailer's wheels. In order to do this, set the transmission in (N) neutral, while depressing the brake pedal; continue depressing the brake pedal and have another person place wheel chocks under the trailer and motorhome wheels; once the wheel chocks are in place, set the transmission in P (Park) and engage the parking brake, making sure that the chocks are holding the vehicle and trailer.

EMERGENCY TOWING OF YOUR RV

In the event of a breakdown or accident, it is strongly recommended that your RV be trucked with a flat bed towing service when necessary for any distance. In an extreme emergency, your RV may be towed from the front end by a knowledgeable and experienced towing service. Special care must be taken to prevent any damage to the fiberglass front-end. *Do not* tow your RV from the rear, since it will cause serious overloading of the front-end components. *Do not* allow your RV to be towed without having the drive shaft disconnected from the transmission. *Note: Follow the chassis manufacturer's recommendations to avoid damage.*

IMPORTANT

For any distance, it is strongly recommended that your unit be trucked with a flat bed towing service when necessary.

PRECAUTIONARY CHECKLISTS

The following is a recommended precautionary checklist that should be adhered to when operating your RV. *Note: Consult your "Important Papers" packet for other warnings from various manufacturers.*

IMPORTANT

- The starter should not be operated longer than 15 seconds at a time. If the engine fails to start, always wait at least two minutes before trying again to protect the starter from overheating.
- Avoid extended or unnecessary idling of the engine (10 minutes or more). Idling could produce excessive system temperatures that can damage your vehicle.
- It is recommended that the windows, door seams and joints sealants be checked every six (6) months and resealed if necessary.

⚠ CAUTION ⚠

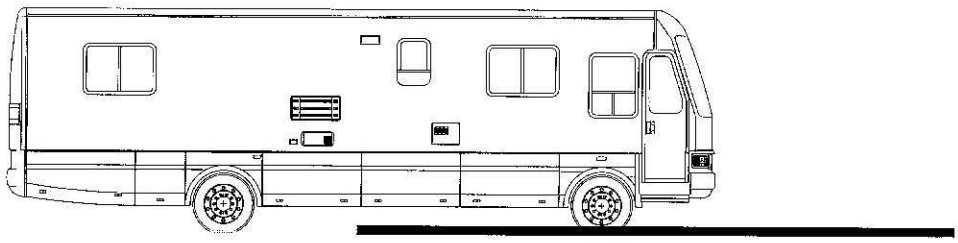
- Driving through water deep enough to wet the brakes can affect braking performance and cause the vehicle to pull to either side when the brakes are applied.
- If brake failure is indicated, immediate repair service is necessary. Continued operation of the vehicle in this condition is dangerous.
- *Do not* use parking lights when the vehicle is in motion. Parking lights denote a parked vehicle.
- The law prohibits operating the hazard warning flasher system while moving on a highway. The hazard warning flasher system is used only to warn other drivers when your unit is disabled.
- Inspection and service should be performed any time a malfunction is observed or suspected.
- All passengers should be properly restrained in approved restraint systems whenever the vehicle is in motion.
- *Do not* adjust the driver's seat belt while the vehicle is in motion.
- Before beginning an extended vacation or trip in your RV, it is recommended that the fire extinguisher be checked for proper charge and inspected to assure proper operating condition.

⚠ WARNING ⚠

- When performing maintenance on any gas fired appliance, shut off gas at the tank. Perform a gas leak test on tank valves and check connections before relighting.
- Always check for sufficient overhead clearance before entering an area with low overhead clearance such as garages, drive-ins, car washes, etc.
- Selected doors and windows have been designated as exits in case of emergency. They are marked with an exit label and the latches on the windows are red. Learn where the exits are and how to use them.
- Avoid inhaling exhaust gases as they contain carbon monoxide gas that is colorless, odorless and poisonous.
- The radiator cap should be removed only when checking coolant freeze point or for complete replacement with antifreeze coolant. *Do not* remove the radiator cap until the radiator has cooled completely. *Note: Use caution with a hot coolant system.*

Single Axle Scale

1. Drive the front axle onto the scale: stop and obtain the weight for the front axle.



scale

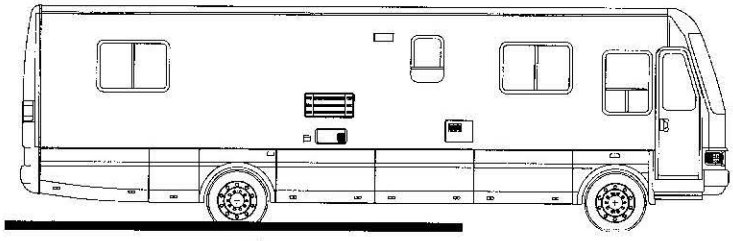
Front Axle Weight:

_____

Front GAWR:_____ minus Front Axle Weight: _____ = _____

The Front Axle Weight should not exceed the Gross Axle Weight Rating for that axle.

2. Pull forward until the rear axle is on the scale: stop and obtain the weight for the rear axle.



scale

Rear Axle Weight:

_____

Rear GAWR:_____ minus Rear Axle Weight: _____ = _____

The Rear Axle Weight should not exceed the Gross Axle Weight Rating for that axle.

3. To identify the total weight of your RV, add the Front and Rear Axle weight together.

Total Weight:

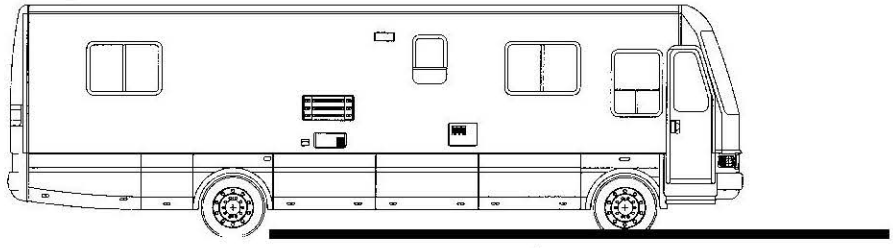
_____

The Total Weight represents your Gross Vehicle Weight.
The Gross Vehicle Weight should not exceed the Gross Vehicle Weight Rating.

GVWR:_____ minus GVW:_____ = _____ Maximum Carrying Capacity

Platform Scale

1. Drive the front axle onto the scale: stop just before the rear axle is on the scale.
Obtain the weight for the front axle.



scale

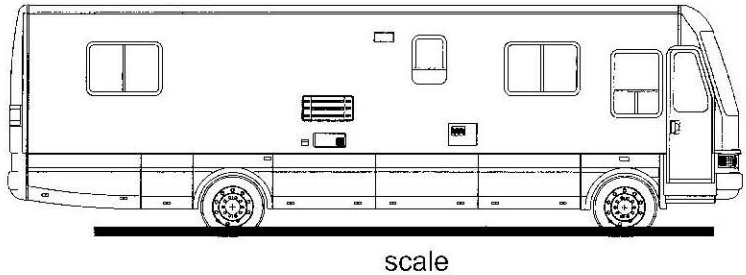
Front Axle Weight:

_____

Front Axle Weight: _____ minus Front GAWR:_____ = _____

The Front Axle Weight should not exceed the Gross Axle Weight Rating for that axle.

2. Pull forward until the rear axle is on the scale: stop and obtain the weight for the entire vehicle.



scale

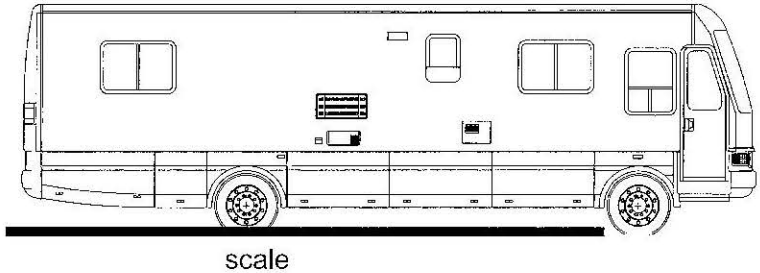
Total RV Weight:

_____

GVW:_____ minus GVWR:_____ = _____ CCC

The Total Weight represents your Gross Vehicle Weight.
The Gross Vehicle Weight should not exceed the Gross Vehicle Weight Rating.

3. Pull forward until the front axle is just off the scale: stop and obtain the weight for the rear axle.



scale

Rear Axle Weight:

_____

Rear Axle Weight: _____ minus Rear GAWR:_____ = _____

The Rear Axle Weight should not exceed the Gross Axle Weight Rating for that axle.

FIRE SAFETY

It is vitally important that everyone traveling in your RV understand the fire extinguisher and how to safely operate it as well as what to do if the fire alarm ever activates. Discuss the emergency exits and how to use them with everyone traveling or staying in your RV (see the *Emergency Exits* section of this chapter).

Smoke alarms should be tested monthly or per the manufacturer's instructions. The batteries should be replaced twice a year, or sooner if the low battery indicator chirps. A good rule-of-thumb is to replace the batteries at the same time you change your clocks for daylight savings time.

Clean the alarm by removing from the mounting bracket, and vacuum using the soft brush attachment, or wipe with a clean, dry cloth. After cleaning, reinstall and test, using the test button.

Smoke and fire alarms need to be replaced every 10 years minimum. Check the manufacturer's documentation for your specific alarm.

For fire extinguishers, check the pressure gauge and inspect the extinguisher once a month, or more frequently, if exposed to weather, or possible tampering. The pointer on the gauge must be in the green area to work properly.

Fire extinguishers can limit property damage if used properly. Using the PASS method of fire extinguisher operation helps effectively extinguish a fire before it spreads. When using the following procedure make sure your back is to an exit, and stand six to eight feet away from the fire.

P Pull the pin

A Aim at the base of the fire, staying at least 6 feet away.

S Squeeze the handle

S Sweep the base of the fire from side-to-side

Fire extinguishers may have one or more letters on the label-A, B, C, D, or K-and a number from 1 to 120. The letters A, B, C, D and K represent the types of fire the extinguisher can extinguish.

Class A

For common combustibles like paper, fiberglass, wood, 12-volt wiring and many other items commonly found in a home, RV or boat.

Class B

For flammable and combustible liquids and gases like gasoline, diesel fuel, and propane.

Class C

For energized 120-volt electrical equipment, including wiring, fuse boxes, circuit breakers, machinery and appliances.

Class D

For combustible metals like magnesium, sodium, potassium, sodium-potassium alloy uranium and powdered aluminum.

Class K

For restaurant grease.

If any of these symbols are missing on a portable fire extinguisher, it has not been rated for this class of fire.

The numbers on the label represent the area the extinguisher will cover. Class A is measured in cubic feet (1A equals 8 cubic feet.) Class B fires are measured in square feet (10B equals 10 square feet). There is no area measurement for Class C.

CHAPTER FOUR:
DRIVER'S CONTROLS

MANUFACTURER DOCUMENTATION

All driver's controls, instruments and warning lamps are products that are covered in the documentation provided by their respective manufacturers and can be found in the "Important Papers" packet that came with your RV. Most of the items covered in this chapter are components of either the chassis, engine or transmission. For these items, complete information may be found in their respective manufacturer's documentation.

MFG INFO

Consult your owner's and operation manuals for complete chassis, engine and transmission information.

For your convenience, summarized information regarding operation procedures and the purpose of various instruments are provided here. However, National RV does not warrant the accuracy of the information provided here. It is important that the owner or operator completely read and become familiar with the original manufacturer operation and maintenance documentation of each component or system in the vehicle prior to operation.

IMPORTANT

Familiarize yourself with all cockpit instruments and controls before attempting to drive your RV.

For general information on your engine, chassis and dashboard controls, consult your model supplement. For complete information consult your manufacturer's documentation provided in your "Important Papers" packet.

DASH HEAT & AIR CONDITIONING

A. *Blower Fan Control* - Provides three fan speeds in any Air Conditioning or Heating mode.

B. *Air Temperature Control* - Controls the temperature of the discharged air. Turn the knob to the red area for warmer air and to the blue area for cooler air.

C. *Air Distribution Mode Switch* - Provides the driver the ability to direct airflow:

- *Max A/C* - Air is drawn from the passenger compartment, through the A/C evaporator and discharged through the dash louvers.
- *A/C* - Outside air is drawn through the A/C evaporator and discharged through the dash louvers.
- *Vent* - Outside air is drawn into the system.
- *Off* - Closes the outside air inlet door.
- *Bi-Level Mode* - Outside air is drawn into the system and is discharged through the dash louvers, floor and defrost outlets.
- *Floor Mode* - Outside air is drawn into the system, through the heater core and is discharged through the floor outlets.
- *Mix Mode* - Outside air is drawn into the heater core and discharged through the floor and defrost outlets.
- *Defrost Mode* - The A/C system operates and directs air to the windshield for defogging.

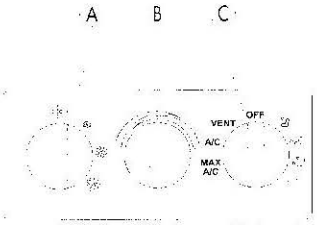


Fig. 04-01 - Dash Air Conditioning Control

REAR VIEW MONITOR (SOME MODELS)

See Fig. 04-02.

A. *Power* - Two-position push-button.

ON: Camera/monitor is continuously operational when the ignition keyswitch is on.

STBY: Camera/monitor switches on when the vehicle transmission is shifted into reverse and remains off otherwise.

B. *Camera Position* -Two-position push-button.

UP: Panoramic view, raises viewing level.

DOWN: Lowers viewing level.

C. *Input* - Two-position push-button. UP: Rear-mounted camera. DOWN: Unused.

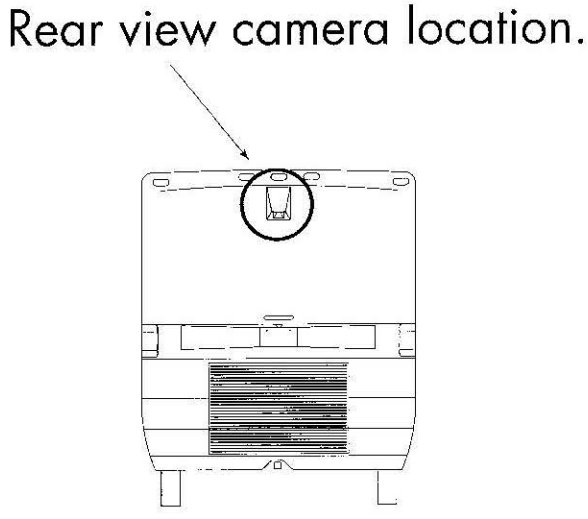
D. *Contrast* - Radial dial. Adjusts contrast of moni tor.

E. *Brightness* - Radial dial. Adjusts brightness of monitor.

F. *Volume* - Radial dial. Adjusts the volume.

G. *Day/Night* - Two-position push-button. Toggles between modes of preset levels optimized for day or night operation.

Fig. 04-02 - Rear View Monitor



POWER LEVELERS - HYDRAULIC JACKS (OPTION)

The optional hydraulic leveling system on your coach is designed and built to give you years of trouble-free leveling and stabilizing operation. Please read and study the operator's manual for complete details of operation.

Important Precautions

- Check potential jack contact locations before operating your system.
- *Do not* use the leveling jacks as a lift for changing tires or to support the vehicle while under the coach.
- When extending the rear stabilizers, *do not* lift the wheels beyond the ground contact. This overrides the braking effect of the chassis parking brake.
- Never expose your hands or other parts of your body near hydraulic leaks. High-pressure oil leaks may cut and penetrate the skin causing serious injury.
- Park your coach on reasonably solid surfaces or jacks may sink into the ground or blacktop. When on extremely soft surfaces, use some wood planking as load distribution pads under each jack.

Deploying the Leveling Jacks

- Park your vehicle on reasonably level ground.
- Apply the parking brake.
- Securely block the wheels using wheel chocks.
- Follow the leveling system manufacturer's instructions for leveling the coach using the control pad on the side console.

Leveler Control Panel Operation

Consult Fig. 04-03 for illustration.

- To operate the levelers, turn the system on. *Note: Level the vehicle front-to-rear first, then level it side-to-side.*
  - On/Off - Push button to illuminate panel and activate system.
  - Front, Rear, Left and Right - Push button until contact with ground is felt.
  - Jacks Down - Illuminates when any jack is not fully retracted.
  - Retract All Jacks - Automatically retracts jacks when the Jacks Down light is not lit.

Retracting the Leveling Jacks

- Retract your jacks following the manufacturer's procedures (see the manufacturer's owner's and operator's guides).

⚠ CAUTION ⚠

Always level the vehicle front-to-rear first, then side-to-side.

- Ensure that the red LED indicator light and hydraulic pump have shut off. If the indicator glows (flashes red) and there is an audible warning beep, the jacks are not retracted. *Do not move the vehicle!*
- When the Jacks Down light extinguishes, push the On/Off button to de-energize the system.
- After a visual inspection around your coach to verify that all jacks are fully retracted, you may proceed to move the vehicle.

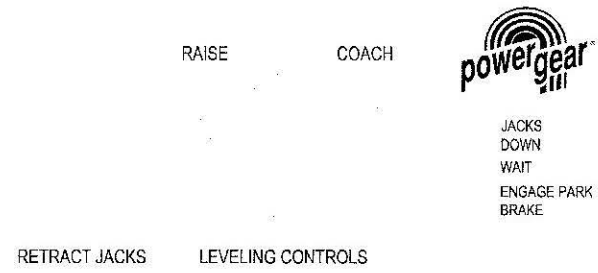
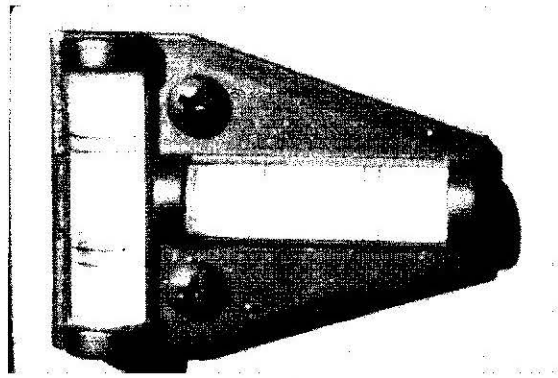


Fig. 04-03 - Leveling Jack Control Pad (Manual)



Leveling Bubble

OVERHEAD ACCESSORIES

The overhead area of the cockpit contains some driver-related components and may include items like the sun-visors and optional cockpit fans. The sun visors are fully adjustable in any direction. The cockpit fans are operated via the fan button on the dash instrument console.

Contained within the cockpit overhead cabinets may also be the television, optional DVD/VCR, optional CD changer and theater sound speakers (Fig. 04-05). Consult the documentation from each of the individual manufacturers of this equipment (included in your "Important Papers" packet) for complete operating instructions.

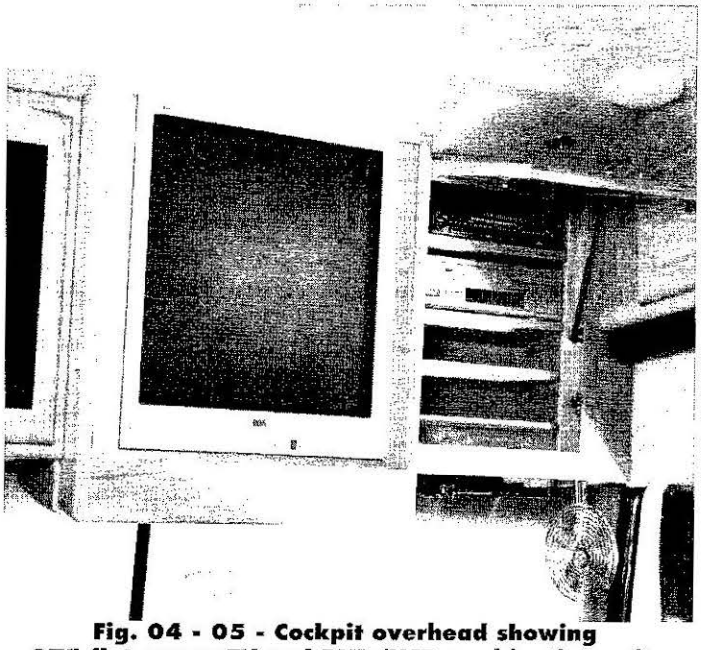
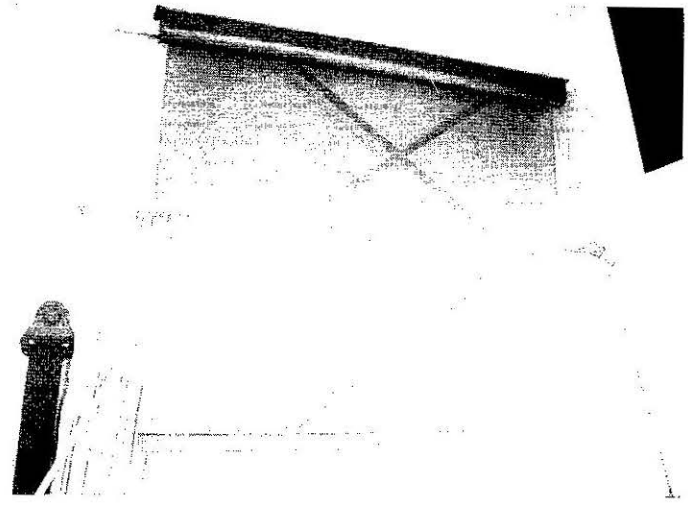


Fig. 04 - 05 - Cockpit overhead showing 27" flat screen TV and DVD/VCR combination unit.



Side sun shades are located on both the driver side and passenger side windows. Sun shades are optional in all models.

CHAPTER FIVE:
ELECTRICAL SYSTEMS

OVERVIEW

The electrical system provides power for lights, appliances, air conditioning and other equipment in your RV. There are three basic electrical power systems built-in to meet your RV electrical requirements under different situations as follows:

1. A 12-Volt Direct Current (DC) automotive electrical system - battery supplied
2. A 12-Volt Direct Current (DC) house system - battery and Inverter/Charger supplied
3. A 120-Volt Alternating Current (AC) system - supplied from Shore Power or Generator Power

IMPORTANT

Familiarize yourself with the three separate power systems, which equipment each powers and when each is appropriate to use.

1. AUTOMOTIVE ELECTRICAL SYSTEM

The chassis or vehicle 12-Volt DC electrical system powers the following:

- Headlights
- Turn indicators and hazard warning lights
- Instrument panel lights
- Windshield wipers and washers
- Engine ignition switch
- Cigarette lighter/12-Volt DC outlet
- Automotive heater and air conditioning fans
- Clearance lamps
- License and back-up lights
- Electrical dash gauges
- Starter motor
- In-dash radio memory
- Remote control mirrors
- Cruise control
- Cab lighting
- Horn
- Windshield fans
- Entry step
- Leveling components

Automotive Fuses

The chassis manufacturer's fuse block is located under the dashboard, on the firewall to the left of the steering column. *Note: See the chassis manual for the location of various fuses within the panel and for a detailed description of each.*

MFG INFO

Consult the chassis manufacturer's manual for additional fuse locations.

2. AUXILIARY RV BATTERIES

The 12-Volt batteries (Fig 05-01) are located under the carpeted step built into the entry stepwell. To gain access, use the nylon pull-loop and lift the front edge of the step. *Note: The stepwell is hinged in the rear.*

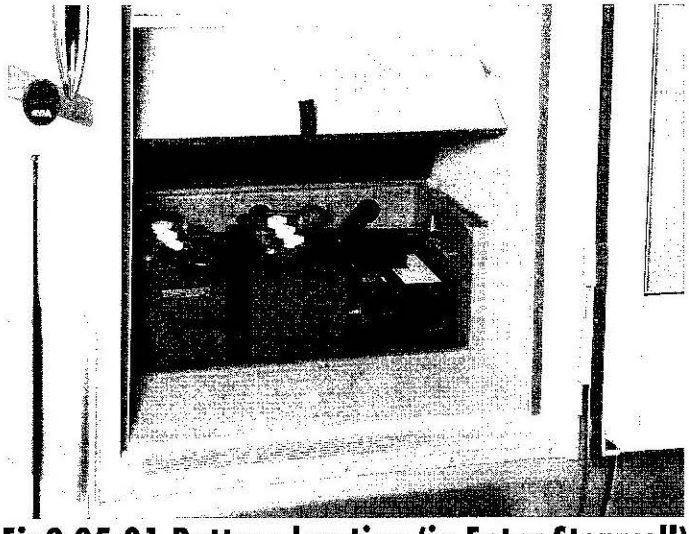


Fig3 05-01 Battery location (in Entry Stepwell)

- All interior lights, furnace motor, exhaust fan, water pump and other interior electrical equipment operate on the 12-Volt DC system provided by two 6-Volt auxiliary storage batteries (connected in series) and the 1000 Watt Converter/Charger (not standard on the Sea Breeze models) when connected to 120-Volt shore power cord or the on-board electrical generator.
- A 2000 watt Inverter/Charger is available as an option on the Dolphin LX and it uses four 6 volt batteries.
- Battery charging is accomplished automatically by the vehicle's alternator when traveling. The auxiliary battery is also charged by the Converter Charger or the Inverter/Charger (if so equipped) when connected to 120-Volt shore power or the on-board generator. In addition, the solar panel provides a trickle charge to help keep the batteries charged when the vehicle is in storage. *Note: The comparitor circuit in the DC power panel has a built-in feature that allows simultaneous charging of the house battery and the automotive battery.*
- When connected to 120-Volt AC shore power (campground or park) receptacle for a long period of time, check the electrolyte level of your RV batteries once a week.

⚠ WARNING ⚠

Charging the battery produces hydrogen gas that is explosive when mixed with air. Do not disconnect the battery cables or produce a spark by any means close to the battery while it is charging. Do not allow electrolyte solution to contact your skin or eyes. The electrolyte is a sulfuric acid that could cause serious personal injury. Wear eye protection whenever you are working with batteries. Be sure to check the liquid level regularly and when adding water use distilled water to promote longer battery life.

Battery Disconnect Switch

The battery disconnect switch (Fig. 05-02) located by the entry door is used to operate the auxiliary battery disconnect relay in the Battery Control Center (BCC). Operate this switch only when you want to disconnect the auxiliary battery during periods of RV storage or service.

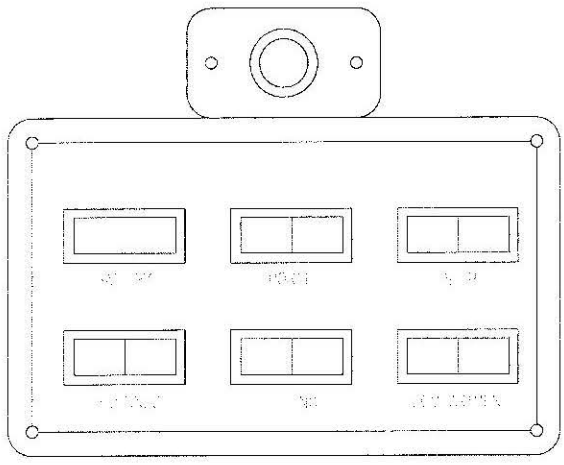


Fig. 05-02 - Auxiliary Battery Disconnect Switch located on the Front Entry Panel.

Emergency Start (Booster) Switch

The 12-Volt emergency start (booster) switch is located in the driver's dash. When activated, it operates a 12-Volt solenoid in the Battery Control Center panel. This operation temporarily connects the auxiliary RV battery to the engine battery to assist in starting either the vehicle's engine or on-board generator. Whenever the vehicle's battery is in a low discharged condition, it may become necessary to perform the boost operation.

To use the Emergency Start (Booster):

1. Depress and hold the switch in the "start" position and turn the key to start the engine.

2. Hold the emergency start switch in this position until the engine is running, then release.

Normally, the engine will start within five seconds; however, if it fails to start after cranking for ten seconds, release the switch and wait for a few seconds before activating the start switch again. This procedure will allow the automatic choke to reset in the full choke position.

12-Volt DC Power Distribution Panel

The 12-Volt DC Power Distribution Panel is also known as the Battery Control Center (BCC). This panel is located in the outside compartment adjacent to the main entry door. The BCC is a centralized power supply system that does switching, fusing and distributing of the 12-Volt DC power. Both the chassis and auxiliary batteries are connected to this panel. If the on-board generator or leveling jacks lose main power, then the 150-Amp circuit breaker in the BCC must be reset using the small trip lever. *Note: See the 12-Volt DC fuse panel drawing for location detail in your Model Supplement. Do not attempt to modify or add options to this panel! Only a qualified service technician should do servicing.*

12-Volt DC Breakers

Your RV is fused to protect all 12-Volt DC circuits.

A 60-Ampere (Amp) circuit breaker protects the main cable between the auxiliary battery and the Converter. (Sea Breeze only.)

The 12-Volt DC breakers in the main distribution panel protect all interior lighting and equipment circuits. If any breaker trips, push it in to reset it. *Note: These breakers are located in the 12-Volt DC Power Distribution Panel. See your Model Supplement for more information.*

The dash AM/FM Stereo/CD Player has one (1) or two (2) fuses, depending on manufacturer, located on the back side of the case.

Optional Rear Observation System (Back-up camera): The in-line fuse is located on the cable going from the back of the monitor into the overhead cabinet. Note: To check or change this fuse, pull the wire cable from the overhead until the fuse holder is visible.

12-Volt DC circuit breakers are Type III and must be reset manually with a push button or lever. Note: Familiarize yourself with the location of these breakers and the method to resetting them.

Interior Lighting

All interior lights operate only on 12-Volt DC. When the bulbs burn out, replace them with the same type bulb. A number on the base identifies each bulb - generally an automotive type bayonet socket bulb. Automotive bulbs may be purchased from either service stations or auto supply stores.

Monitor/Control Panel

Your monitor control panel is designed to give you instant systems information at your fingertips. It indicates the levels of your fresh water supply, both gray and solid waste holding tanks, LP-Gas tank liquid level and the condition of your RV battery. Simply press the indicated rocker switch to obtain a reading level. Also, the on/off switches to your water heater and pump can be found in this panel. *Note: For your convenience an additional water pump switch is located in the bathroom and in the storage compartment on the water service panel. See the Interior Components chapter.*

Solar Panels (Option)

Solar panels are used to help keep the house RV batteries charged during periods of storage. When not in use over a period of time, the house battery will naturally self-discharge. Your solar electric charging system provides a small trickle charge method to help keep your RV battery charged during storage.

They function automatically and will operate whenever the panel is exposed to sufficient sunlight. *Note: This trickle charge is not large enough to operate any appliances and should not be depended upon when your coach is in use.*

The solar panel charges at a rate of 1/4 amp per hour and there is no meter to indicate charge.The LED glows when it is operating. To test that it is operating properly:

> Remove the positive battery cable from the house batteries and utilize a volt-ohm meter (that measures in milliamps) in line. The reading should be around 250 milliamps.

However, remember that the solar panels are not designed to replenish weak batteries on a daily basis, they are designed to help maintain a charge on batteries during storage.

3. 120-VOLT AC ELECTRICAL SYSTEM

120-Volt AC power is available in your RV when you are plugged into an approved 30- or 50-Amp, 120-Volt park receptacle or through the power cord and Motor Base receptacle output from the generator supply.

Your RV is equipped with a four-pronged, 25-foot, 50-Amp power supply cord that is stored in the exterior service compartment. The cord can be used in the exterior wall receptacle located on the driver's side of your unit. Some campgrounds do not offer 50-Amp service. In this instance, a 50-Amp to 30-Amp adapter is needed.

When connected to a 120-Volt AC power source, both the 120-Volt AC outlets and all interior 12-Volt DC lights and equipment circuits will become energized. The auxiliary RV battery is automatically recharged from the 12-Volt Power Converter/Charger without overcharging. *Note: You still must check your battery electrolyte levels to maintain a complete charge and avoid damaging the batteries.*

120-Volt AC Circuit Breakers

Circuit breakers are installed to protect the 120-Volt AC wiring in your RV. The breakers are located in the power distribution panel. This main electrical panel (breaker box) is generally located in the bedroom or hall. Please familiarize yourself with its location. If a circuit breaker should trip and open a circuit, locate and remove the cause for overload and then reset the breaker.

Ground Fault Circuit Interrupters (GFCI) are designed to protect people from shock hazards. They are used in your RV with 120-Volt AC receptacles that are near water sources (wet) areas like the bath compartment, outside patio and the kitchen location by the galley sink. This device is not a substitute for proper grounding of your vehicle. *Note: Test the device regularly as described on the receptacle label. If it does not work properly, have it replaced by a qualified electrician.*

POWER INVERTER/CHARGER

See Fig. 05-04.

1000 Watt Inverter/Charger

The 1000 watt Power Inverter (see Fig. 05-04) provides 120-Volt AC power to operate the front television and DVD/VCR from the 12-Volt DC house batteries whenever shore-power or on-board generator power is not available. You must first turn on the inverter by activating the inverter rocker switch located adjacent to the entry door. Whenever an external 120-Volt AC power is available, the internal transfer switch is automatically activated and the inverter is turned off. *IMPORTANT: When 120-Volt AC power is available, the internal transfer switch is activated and the inverter cannot be turned on. The inverter should always be turned off when it is not in use.*

2000 Watt Inverter (Option on Dolphin LX)

Whenever your RV is connected to a 120-Volt AC power source or to the on-board generator, the optional 2000 watt Inverter/Charger provides energy to all interior lights, fan motors and water pump. It also powers 120-Volt AC convenience receptacles, such as the microwave oven and the front television, that obtain power from this unit to operate from battery power. The galley, patio, bath lavy and dinette GFCI receptacles are also Inverter/Charger powered.

Inverter/Charger Monitor

The Inverter/Charger monitor provides important AC and DC systems and Inverter/Charger information available in the convenient aisle location (see Fig. 05-05). A remote "On/Off" power switch with bright and easy to read indicators provide you with low battery indicator, Inverter/Charger status, DC Volts indicator, overload indicator, AC input indicator and DC Amp indicator. Consult the manufacturer's information for operation instructions.

IMPORTANT

When 120-Volt AC power is available, the internal transfer switch is activated and the inverter cannot be turned on. The 1000 watt inverter should always be turned off when it is not in use.

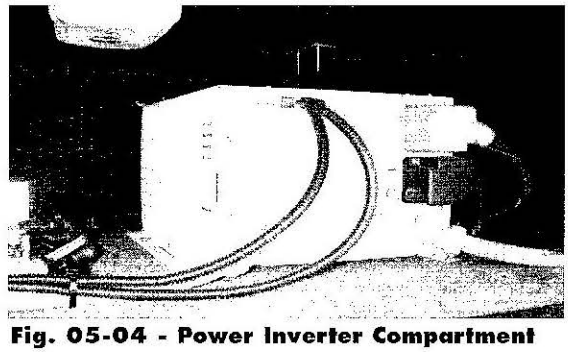


Fig. 05-04 - Power Inverter Compartment

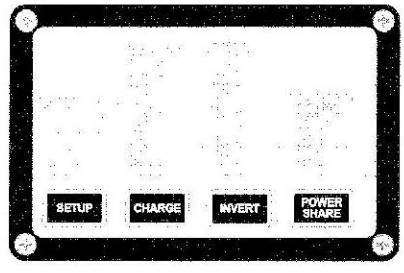


Fig. 05-05 - Inverter/Charger Monitor (Only on 2,000 Watt Inverter/Charger)

POWER CONVERTER/CHARGER

See Fig. 05-06.

A. *Converter/Charger.*

B. *12-Volt Distribution Panel.*

Whenever your RV is connected to a 120-Volt AC power source or to the on-board generator, the Converter/Charger provides power to all interior lights, fan motors and water pump. The Converter/Charger is designed to function as an integral part of the battery system. The output of the unit is directly connected to the BCC through a 60-Amp circuit breaker located adjacent to the BCC. *Note: See the 12-Volt DC Fuse Panel drawing for location detail in your Model Supplement.* The Converter/Charger has a ferroresonant transformer inside that will produce a slight humming noise when operating. Since the transformer characteristically operates very warm, the case may feel hot to the touch. Therefore, avoid storing any materials in this compartment. *Note: If it ever gets too hot, it will turn itself off. Then after cooling down, it will come back on automatically. The Converter/Charger cannot be damaged by overloads and it has no adjustments or user serviceable parts.*

The power feed line is directly connected to the Battery Control Center (BCC). *Note: See the 12-Volt DC Breaker Panel drawing for location detail in your Model Supplement.* The inverter has internal protection against output short circut, overload and high temperature conditions. There is an internal thermally controlled cooling fan that keeps the unit cool. It is necessary to allow free space around the inverter housing for proper air circulation and adequate ventilation; *do not* block the cooling with personal storage. As there are no user serviceable parts inside, *do not* remove the cover. For further information, please refer to the inverter manufacturer's owner's guide.

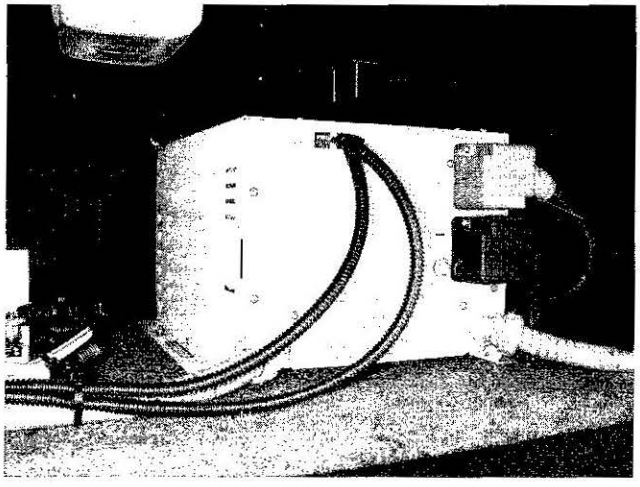


Fig. 05-06 - Converter/Charger

IMPORTANT

It is necessary to allow ample free space around the Converter/Charger housing for sufficient air circulation.

GENERATOR SYSTEM

A comprehensive set of instructions on the operation, care and maintenance of the generator set is supplied with each vehicle. *Note: Please read and understand the instructions completely before attempting to operate or service this equipment.*

⚠ WARNING ⚠

HIGH VOLTAGE!

Remember that the function of a generator set is to produce electricity and that wherever electricity is present, there is the potential danger of ELECTROCUTION.

An hour meter at the generator control switch makes it convenient to log the number of hours that the generator has been running, so that routine servicing can be scheduled.

⚠ WARNING ⚠

LETHAL EXHAUST GAS - An engine discharges deadly carbon monoxide as part of the exhaust when operating. Carbon monoxide (CO) is particularly dangerous in that it is an odorless, tasteless and nonirritating gas. However, it can cause death if inhaled for even a short time.

Have only thoroughly qualified specialists ins tall and replace exhaust system components and have the system inspected frequently. Be careful when parking your RV to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely; otherwise, carbon monoxide may deflect under and into the vehicle or enter through open doors, windows or vents. Also make sure that your exhaust cannot be discharged toward neighboring RV campers or any building. *Note: Be especially watchful for exhaust gas accumulation under calm windless conditions.*

IMPORTANT

A generator set, like any other electromechanical device, can pose dangers to life and limb if improperly maintained or imprudently operated. The best safeguards against accidents are to be mindful of the potential dangers and to always use common sense. In the interest of safety, some general precautions relating to operation of an RV generator are presented.

Warning - High Voltage!

Remember that the function of a generator set is to produce electricity and that wherever electricity is present, there is the potential danger of electrocution. Take the same precautions with electrical appliances in your RV that you would observe in your home. Keep away from electrical circuits and wiring while the generator set is running and have electrical service performed only by a qualified electrician. Make sure unqualified persons - especially children - cannot gain access to your generator set. *Note: Keep the compartment door securely latched at all times.* Never touch electrical leads of appliances with wet hands, when standing in water or on wet ground. The chance of electrocution is especially prevalent under such conditions.

MFG INFO

See your generator owner's manual for complete operation and service information.

General Precautions

Keep the compartment and generator set clean and free of debris to minimize the chance of fire. Also remember that hot exhaust gases and exhaust system parts could start grass fires. Keep away from hot engine and generator parts to avoid burning yourself.

Start-Up Checklist

- Check the engine oil level and, if necessary, fill to dipstick FULL mark.
- Check the vehicle fuel tank. It must be at least 1/4 tank full.
- Check that the tail pipe is clear and piping is tight and in good condition.
- Check that both the air inlet and outlet are free of any obstructions.
- Turn off all electrical loads by switching them to the "off" position or setting main circuit breakers to "off".
- Refer to the generator owner's manual for cranking instructions.
- Let the engine warm up for about 5 minutes to allow internal temperatures to stabilize.
- Carefully inspect the engine-generator for fuel, oil and exhaust leaks.
- Turn on the loads or circuit breakers.

Start-Stop Procedure

Depress the Start/Stop switch in the "start" position, hold in this position until the engine is running and release. Normally, the engine will start within five seconds; however, if it fails to start after cranking for ten seconds, release the switch and wait for a few seconds before activating the start switch again. This procedure will allow the automatic choke to reset in the full choke position. Whenever possible, allow for a brief cooling period by running the set at low or no load for a few minutes just prior to shutdown. To stop, depress the switch in the "stop" position and hold until the set comes to a complete halt.

ELECTRICAL SYSTEM SAFETY

As delivered, your RV electrical system has been engineered and checked for performance and safety. Circuit breakers and fuses are installed to protect electrical system circuits from overloading. *Do not* make unauthorized changes to circuitry or add-on fixed appliances yourself. If alterations are required, consult your dealer and they will assist you in obtaining a safe and approved installation.

An approved removable power supply cord can be attached to the vehicle for hookup to a 120-Volt AC outlet. The power cord has a four-pin 50-Amp plug that provides proper grounding through the rounded pin. Grounding is for your protection from electrical shock; therefore, do not use any adapter or extension cord that will break the continuity of the grounding circuit. Never remove the grounding pin or connect to a non-grounded receptacle.

Never operate your RV's 120-Volt AC system with an inadequate ground. If you can feel a shock (even a small one) from the vehicle while standing on the ground, immediately disconnect the power cord and locate the trouble. Ground continuity should be continuous from any electrical appliance or the vehicle frame to the distribution panel board (breaker box) through the round pin on the power supply cord to the park receptacle and to earth ground.

Sidewall 120 Volt Hook Up

FREQUENTLY ASKED QUESTIONS - BATTERIES

Battery Terminology

Starting or Chassis Battery - Starting batteries (sometimes called SLI, for starting, lighting, ignition) are used to start and run engines. This requires a very large starting current for a very short time. In your motorized RV this battery powers the chassis 12V systems. This battery is designed to be discharged only 2-5% but may last for thousands of cycles.

Deep-Cycle or House Battery - This battery powers all interior lights, furnace motor, exhaust fan, water pump, and such. And with the inverter or converter, it powers 120V appliances as well. Deep cycle batteries are designed to be discharged down as much as 80% time after time.

CCA Rating - The cold cranking ampere (CCA) rating is the number of amperes a battery can support for 30 seconds at a temperature of 0°F until the battery voltage drops to 1.20 volts per cell, or 7.20 volts for a 12V battery.

MCA Rating (or CA Rating) - The marine cranking ampere (MCA or cranking ampere, CA) is the same as the CCA except that the test is conducted at 32°F.

HCA Rating - Hot cranking amperes is the same as the MCA, CA or CCA, except that the temperature at which the test is conducted is 80°F.

Ah Rating - The ampere-hour (Ah) rating is the capacity of a battery. A typical battery that is rated as a 100Ah battery at the 10 hour rate of discharge is capable of delivering 10A for 10 hours before the terminal voltage drops to a standard value such as 1.67 volts per cell, or 10.02 volts for a 12V battery. Similarly, a 50Ah battery would supply a 5A load for 10 hours.

Reserve Capacity Rating - The reserve capacity of a battery is defined as the number of minutes that it can support a 25 ampere load at 80°F until its terminal voltage drops to 1.75 volts per cell or 10.50 volts for a 12V battery. Thus a 12V battery that has a reserve capacity rating of 100 signifies that it can be discharged at 25 amps for 100 minutes at 80°F before its voltage drops to 10.75 volts.

Impedance - Impedance is a measure of how easily the battery can be discharged. The lower the impedance (resistance), the easier it is to discharge the battery.

Battery Size Codes - Batteries come in all different sizes. Many have "group" sizes, which is based upon the physical size and terminal placement. It is not a measure of battery capacity.

What's inside a battery?

The battery case is usually made of polypropylene (plastic or fiber made from propylene). The case is generally divided into six sections, called cells, that look like one row of an ice cube tray.

Grids, or plates, are made of lead or an alloy of lead and other metals. A mixture of lead oxide, powdered lead and other materials, sulfuric acid and water is applied to the grids (this makes positive grids). Expander material made of powdered sulfates is added to the paste to produce the negative plates.

Separators are put between the positive and negative plates to prevent short circuits. Fine pores in the separators allow electrical current to flow between the plates while preventing short circuits.

An element is a positive and negative plate paired with a separator in between them. There is only one element per cell. The elements are connected with a metal that conducts electricity. Lead terminals, or posts, are welded on and the battery is filled with electrolyte.

What effects does temperature have on batteries?

Battery capacity (how many amp-hours it can hold) is reduced as temperature goes down, and increased as temperature goes up. This is why your car battery dies on a cold winter morning, even though it worked fine the previous afternoon.

The standard rating for batteries is at room temperature, 25°C (about 77°F). At approximately -22°F (-27°C), battery Ah capacity drops to 50%. At freezing, capacity is reduced by 20%. Capacity is increased at higher temperatures, at 122°F, battery capacity would be about 12% higher.

Even though battery capacity is higher at high temperatures, battery life is shortened. Battery capacity is reduced by 50% at -22°F, but battery LIFE increases by about 60%. Battery life is reduced at higher temperatures, for every 15°F over 77°F, battery life is cut in half.

What is the difference between a battery cycle and battery life?

A battery "cycle" is one complete discharge and recharge cycle. It is usually considered to be discharging from 100% to 20% and then back to 100%. Battery life, how long it will last, is directly related to how deep the battery is cycled each time. If a battery is discharged to 50% every day, it will last about twice as long as if it is cycled to 80%. If cycled only 10%, it will last about 5 times as long as one cycled to 50%.

How do I charge my battery?

Your RV inverter or converter is designed to charge your batteries without outside intervention from you. However, this information is still interesting to know.

Battery charging takes place in 3 basic stages: Bulk, Absorption, and Float.

Bulk Charge - Current is sent to batteries at the maximum safe rate they will accept until voltage rises to near full charge level (80-90%). Voltages at this stage typically range from 10.5 volts to 15 volts.

There may be limits on the maximum current that the battery and/or wiring can take during bulk charging.

Absorption Charge - Voltage remains constant and current gradually tapers off as internal resistance increases during charging. It is during this stage that the charger puts out maximum voltage. Voltages at this stage are typically around 14.2 to 15.5 volts.

Float Charge - After batteries reach full charge, charging voltage is reduced to reduce gassing and prolong battery life. This is often referred to as a maintenance or trickle charge. This is what the solar panels on your unit are designed to do.

How do I clean my battery?

Warning: Wear safety goggles when you are working with batteries.

1. Remove electrical connection(s) from the battery terminal post(s). Clean only one battery at a time to avoid improper connections when replacing the cables.

2. Spray the top of the batteries with the battery cleaner. The cleaner should react with any acid on the battery surface. Let it foam for 2-3 minutes. Rinse batteries with water until the cleaner is completely removed.

3. Wipe batteries dry with towels. Reinstall electrical cables to the proper terminal posts.

4. Apply an anti-corrosion aerosol spray to all cable connection(s) and terminal posts only. Caution: Protect all surfaces from overspray!

What should I consider when replacing my batteries?

In situations where multiple batteries are connected in series, parallel or series/parallel, replacement batteries should be the same size, type and manufacturer (if possible). Age and usage level should be the same as the companion batteries. Do not put a new battery in a pack that is more than 3 months old or has more than 75 cycles. Either replace with all new or use a good used battery.

Inactivity can be extremely harmful to a battery. It is a bad idea to buy new batteries and "save" them for later. Either buy them when you need them, or keep them on a continual trickle charge. The best thing - if you buy them, use them.

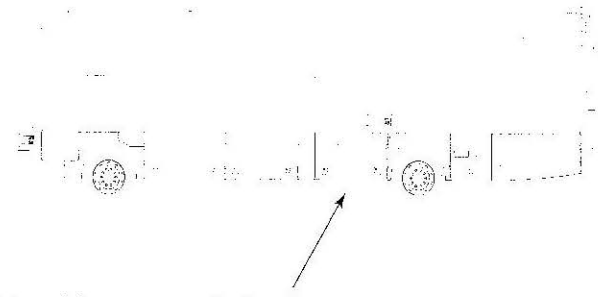
CHAPTER SIX:
PLUMBING SYSTEMS

PLUMBING SERVICE COMPARTMENT

For information on your unit's plumbing service compartment, consult your model supplement.

Protection of Interior Water Lines

Be careful not to store heavy items such as canned foods, tools, etc. in areas where they may contact water piping. They could cause damage due to road conditions and shifting of the load.

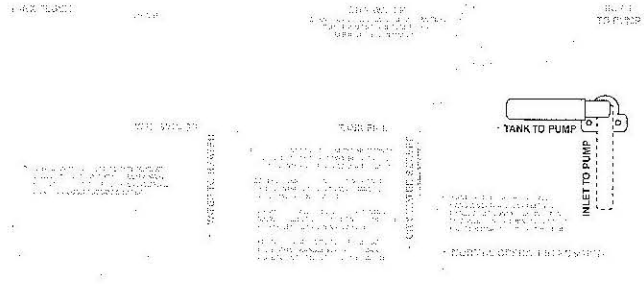


Usual location of plumbing service compartment. The last compartment before the rear wheels on the driver's side of the coach.

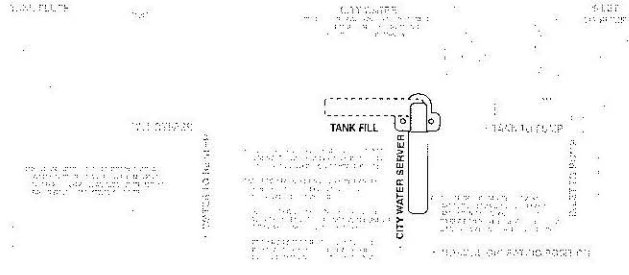
WATER SERVICE OPERATION

The water service entrance manifold (see your specific model supplement and Figs. 06-02 & 06-03) can be found in the plumbing service compartment located on the roadside of your RV. This manifold consists of three selector valves and a water pressure regulator. Various water transfer functions can be performed depending on the position of these valve handles as follows:

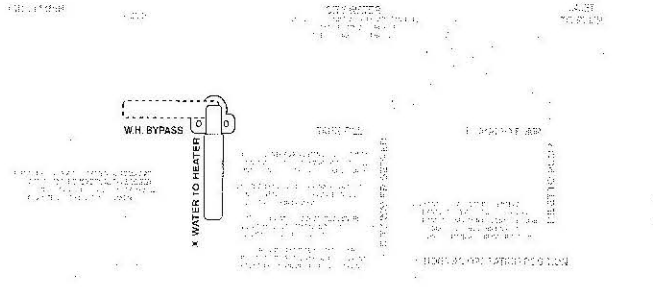
- Tank To Pump/Inlet To Pump selector valve is used when winterizing (normal handle position is *up* for Tank To Pump).
- Tank Fill/City Water Server selector valve is used to fill your water tank (normal handle position is *down* for City Water Service).
- Water Heater Bypass/Water to Heater selector valve is used when winterizing (normal handle position is *down* for Water to Heater).



Tank-to-Pump/Inlet-to-Pump selector valve



Tank Fill/City Water Serve selector valve



Water Heater Bypass/Water-to-Heater selector valve

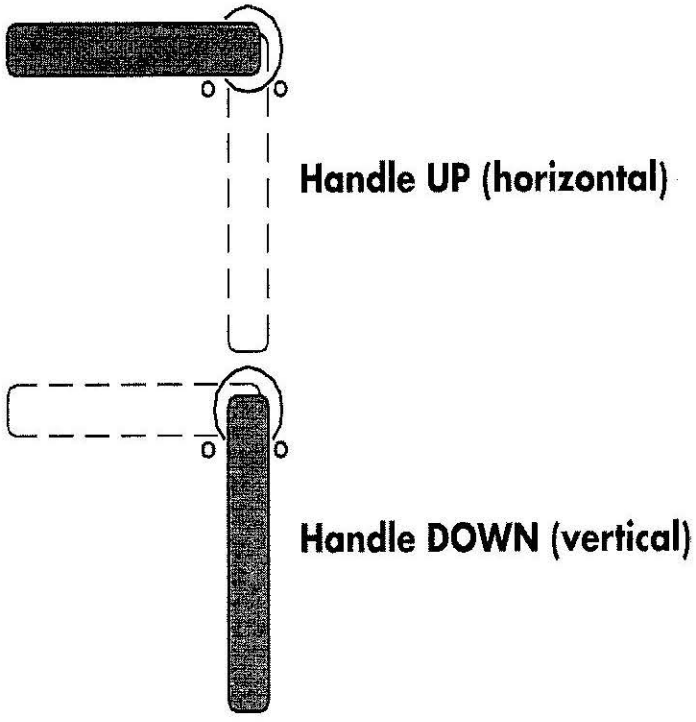


Fig. 06-01 - Selector Valve Positions

Plumbing Service Panel

See Fig. 06-02. Shown with all handles in normal operating position.

1. *Black Tank Flush-Out Inlet* - See the "Flushing the Solid Waste Tank" procedure.
2. *Water Pump Switch* - On and Off.
3. *Outside Shower Faucet.*
4. *Water Heater By-Pass Selector Valve* - Two position, see the "Winterizing Procedures" section.
5. *Tank Fill/City Water Selector Valve* - See the "Water Service Entrance" section.
6. *City Water Inlet* - Fresh water connection port. 3/4" hose swivel.
7. *Tank to Pump/Inlet to Pump Selector Valve* - Used in conjunction with the Antifreeze Inlet (#8 below), see the "Winterizing Procedures" section.
8. *Antifreeze Inlet* - See the "Winterizing Procedures" section.

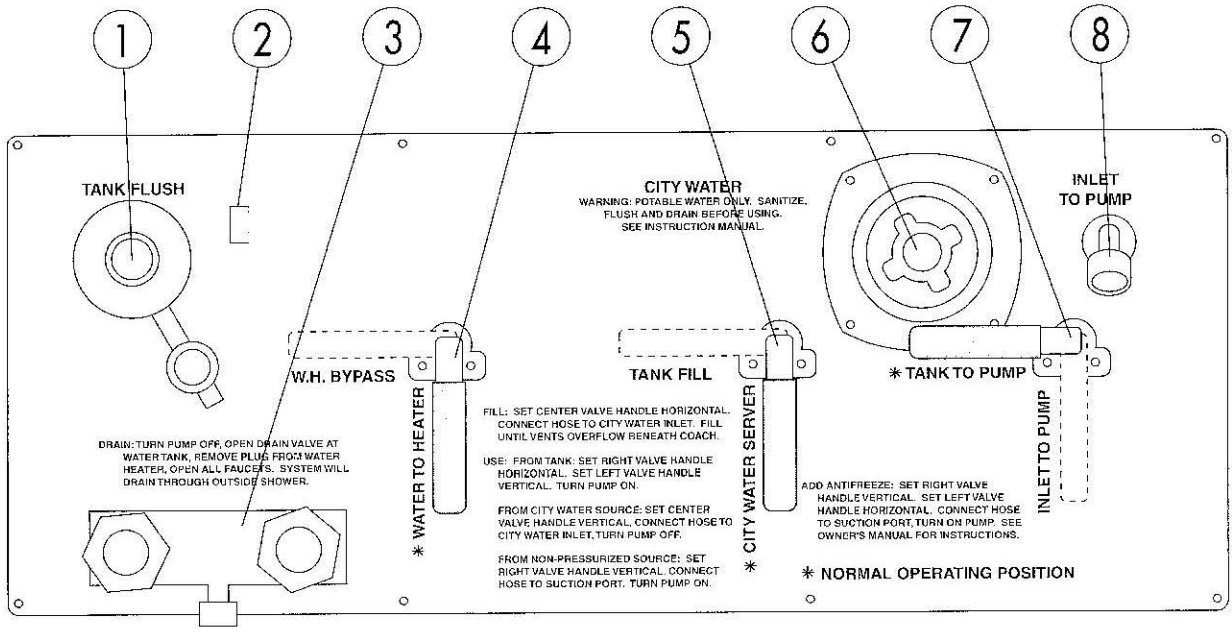


Fig. 06-02 - Typical Plumbing Service Panel

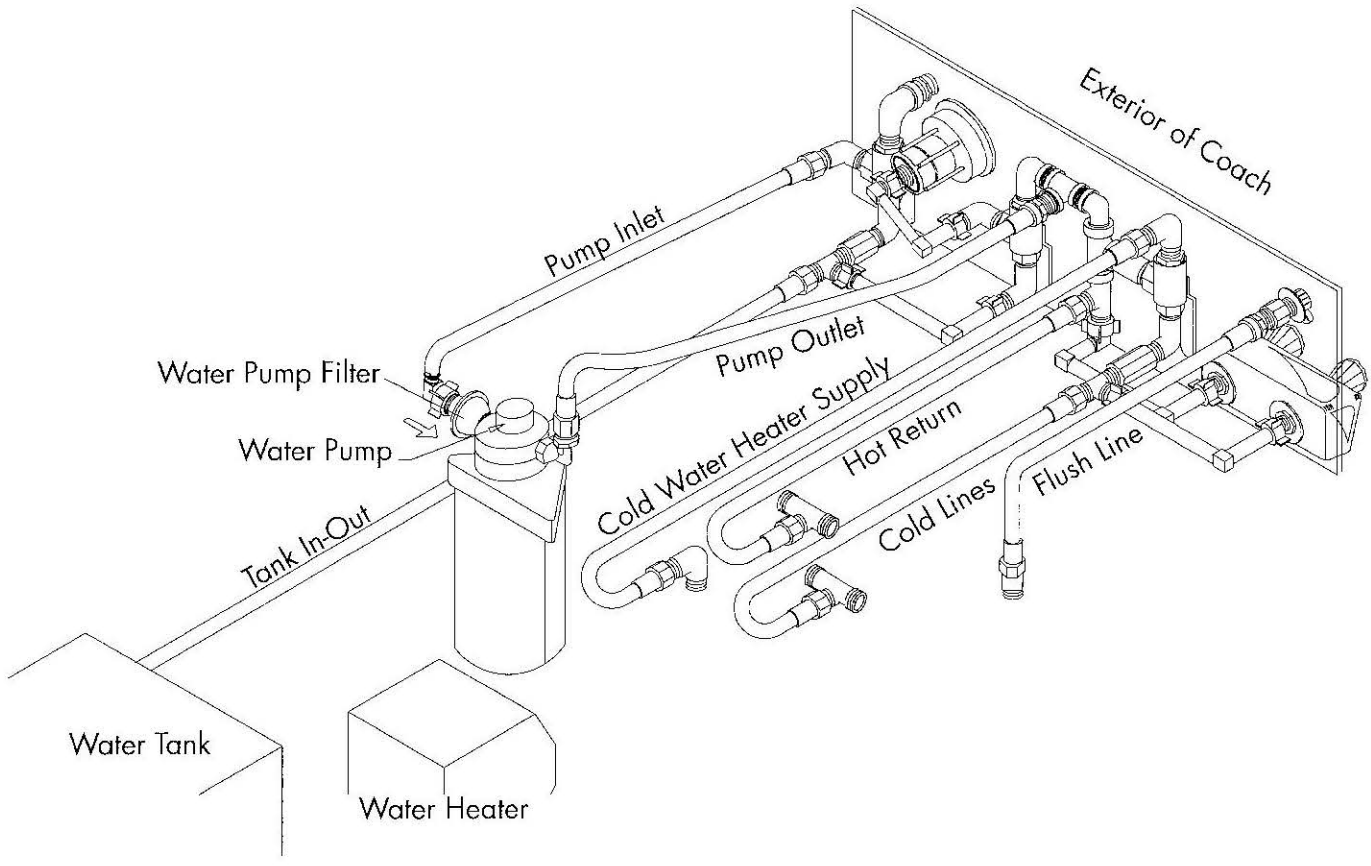


Fig. 06-03 - Water Service Entrance Plumbing Diagram.

FRESH WATER SYSTEM

Fresh water in your RV is supplied either through the on-board water tank system or directly from an outside source. When using the water tank, the 12-Volt pump will supply the required water pressure to operate the system. When using city water, turn your pump off. The water pressure required to operate your fixtures will be supplied by the city water hook-up.

IMPORTANT

Excessive pressure from water supply systems may be encountered in some parks – especially in mountainous regions. Damage to your plumbing system can occur. A water pressure regulator has been installed to provide protection of your system against high pressure. The recommended operating pressure setting is 40-50 PSI.

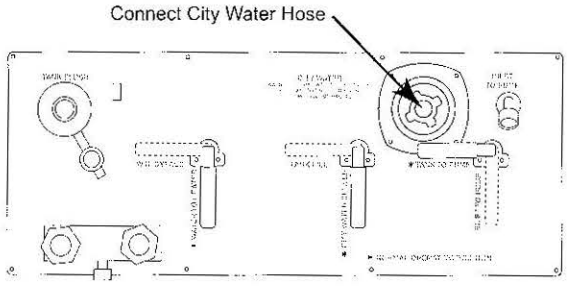
City Water Supply

Connect an approved flexible hose with 3/4" fitting to the City Water service and the RV water inlet fitting. Turn on the city water and you will receive pressure to the vehicle's water system. For detailed directions see the following section on *Using City Water*. The on-board water pump should be turned off when connected to the city water service. The flexible hose used to supply water to your RV water system or to fill your fresh water tank should be drinking water safe and made with Federal Food and Drug Administration (FDA) approved materials.

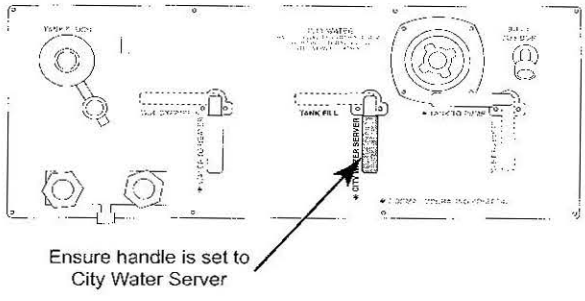
Using City Water

1. Turn off the water pump and the campground water supply valve.

2. Connect the city water hose to the 3/4" swivel hose connection at the fill location found on the Water Service Entrance plate labeled "City Water".



3. Ensure that the Tank Fill/City Water Server selector valve handle is vertical, set to City Water Server.



4. Turn on the campground supply valve; your city water system is ready for use.

5. Remember to shut off the campground supply valve and disconnect the hose before moving your RV.

⚠ WARNING ⚠

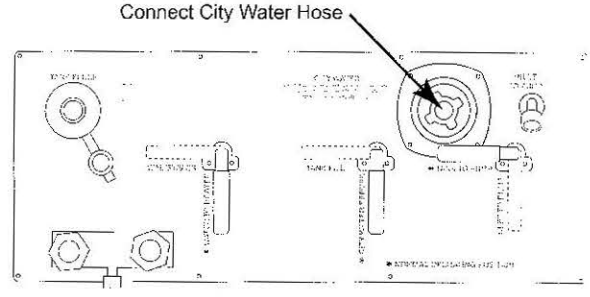
Be sure to use only water hoses that are Drinking Water Safe when filling the fresh water tank.

Filling the Fresh Water Tank

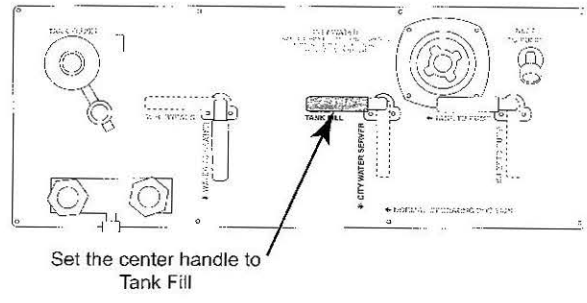
1. Turn off your water pump and the water supply valve (faucet).

2. Wash the area around the connections.

3. Connect the city water hose to the 3/4" swivel hose connection found on the Water Service entrance plate labeled "City Water".

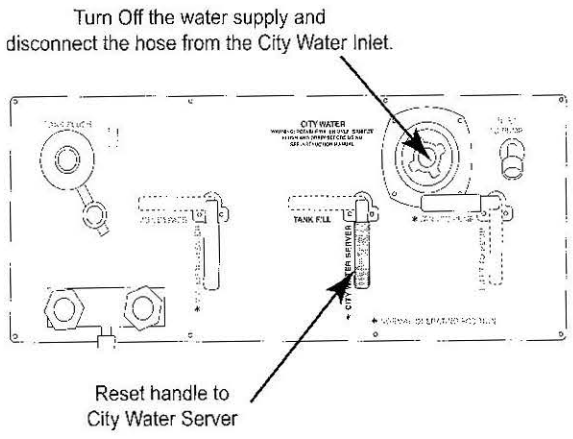


4. Ensure the center Tank Fill selector valve handle is horizontal, set to Tank Fill.



5. Turn on the water supply valve. Monitor the water level in the tank using the gauge on the Monitor Panel inside the coach (see the *Interior Components* chapter for more information).

6. When the tank is full, water will spill from the tank vents. Shut off the water supply, return the center Tank Fill selector valve to the DOWN (vertical) position and disconnect the hose.

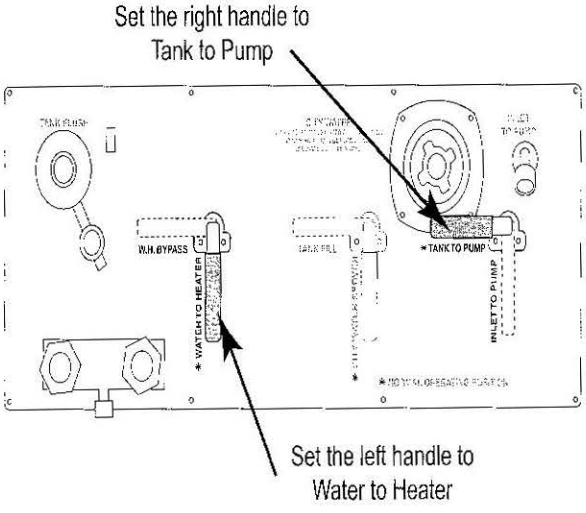


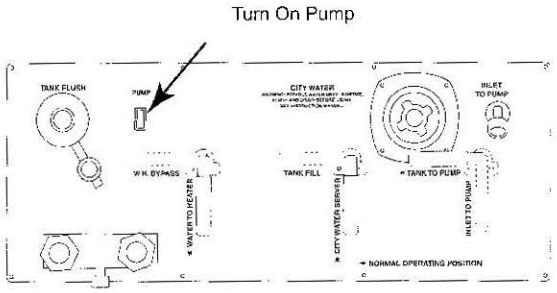
7. Remember to shut off the campground supply valve and disconnect the hose before moving your RV.

Using Tank Water

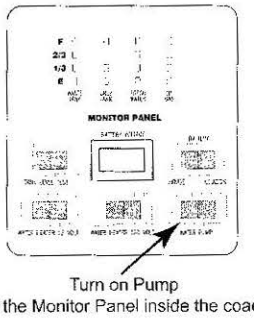
1. Check that the water tank has an adequate supply of fresh, potable water using the Monitor Panel inside the coach (see the *Interior Components* chapter).

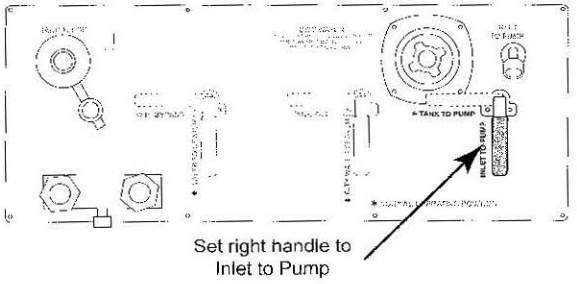
2. Set the right handle to Tank To Pump and the left handle to Water to Heater.





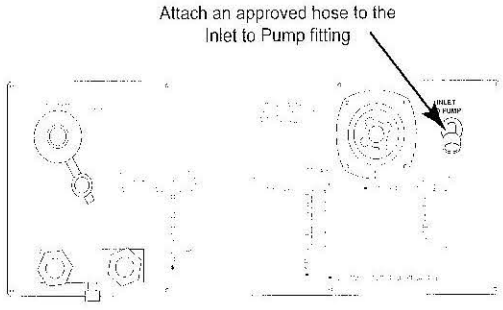
3. Turn on the water pump with the switch located on the panel or using the switch on the Monitor Panel inside the coach (see the *Interior Components* chapter); your fresh water system is ready for use.



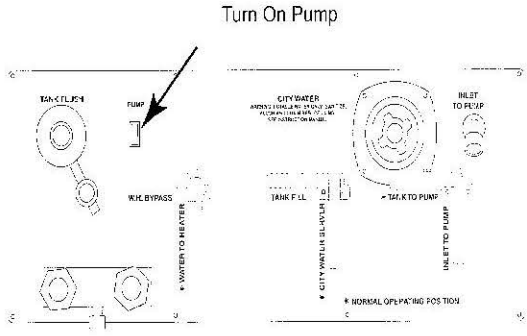


Using Water From a Container

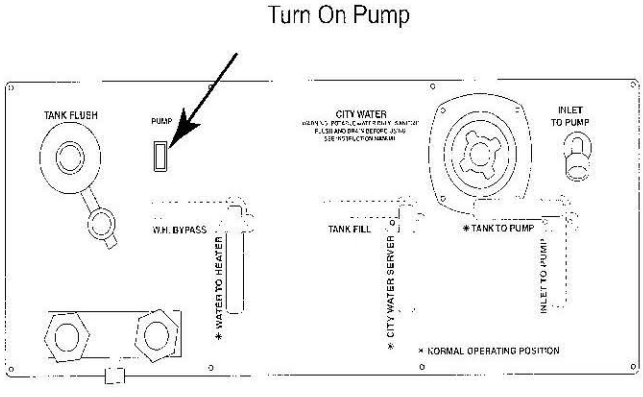
1. Set the right handle to Inlet to Pump.



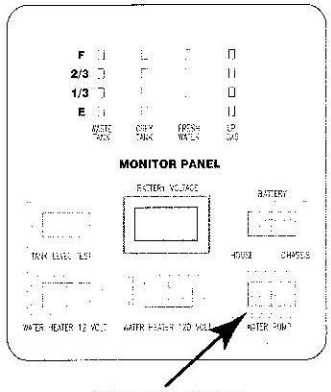
2. Connect an approved water hose to the Inlet to Pump fitting.



3. Place the other end of the water hose into a clean potable water container.



4. Turn on the "on-board" water pump to pump the water into the system, using either the Pump switch on the water panel or the switch on the Monitor Panel located inside the coach.



Turn on Pump
on the Monitor Panel inside the coach

Purging Air from the Water System

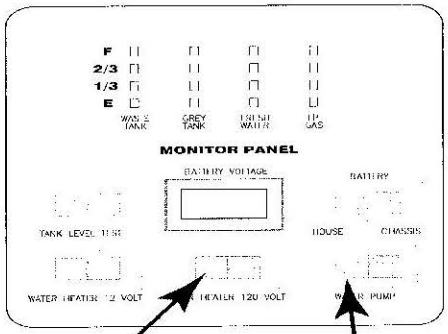
To purge trapped air from the water system, turn on all plumbing fixtures until water flows continuously. In addition, be sure that trapped air is removed from the water heater. Purge the air out of the water heater tank by filling it with water. This is accomplished by turning on the hot water faucet at the galley sink until water flows continuously. If water does not fully cover the heating unit, it may burn out the element, which would void your appliance warranty.

Draining the Fresh Water System

Water system drains are located at or below the floor of the RV so that water lines may be drained of water for sanitizing or winterizing. Some models use the outside shower faucet as the low-point system drain. The water heater has a separate built-in drain plug that can be removed (see the manufacturer's instructions).

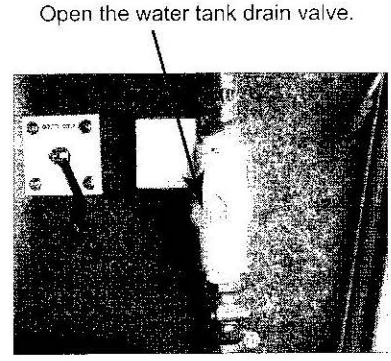
1. Level the RV - front-to-rear and side-to-side (see the *Driver's Controls* chapter for leveling directions).

2. Turn off the water heater and water pump.



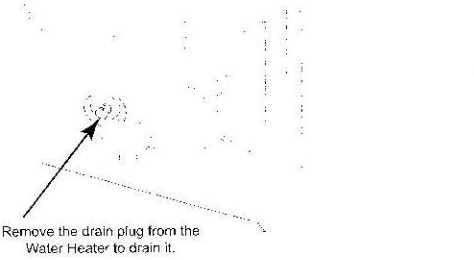
Turn Off the Water Heater and Water Pump

3. Open all fixture valves inside the coach and the outside shower. *Note: The system will drain through the outside shower hose.*



4. Open the water tank drain valve.

5. Remove the drain plug in the water heater.



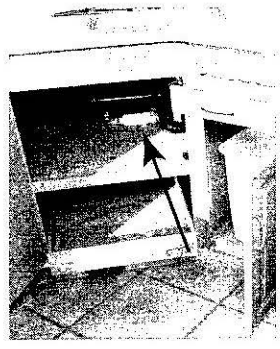
6. Operate the water pump for approximately 30 seconds to remove water between the tank and pump, then shut it off.

7. The (optional) washing machine and refrigerator icemaker must be drained according to manufacturer's instructions.

⚠ WARNING ⚠

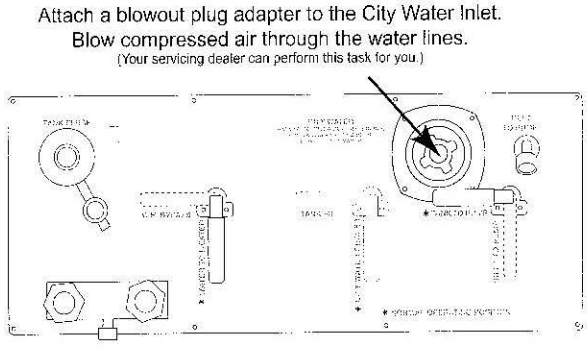
Open the hot water faucet for several minutes before using an electrical appliance connected to the hot water system. This procedure is designed to expel hydrogen gas which may develop in the water line if the water heater hasn't been used for more than two weeks.

8. Remove the water filter under the galley and drain.



9. Check all interior plumbing fixtures including the toilet flush valve for trapped water.

10. Any water remaining in the system may be removed by attaching a blowout plug adapter to the fill connection and blowing compressed air through the water lines.



11. Turn off all drain valves and plumbing fixtures when the system is completely drained. *Note: For cold weather storage, see the section on "Winterizing".*

Reactivating a Previously Drained Fresh Water System

To reactivate a previously drained fresh water system:

1. Sanitize the system following the directions in the "Water System Sanitizing Procedure" section later in this chapter.

2. Reinstall the water filter.

3. Reconnect the icemaker and washer/dryer lines, if applicable.

4. Fill the water tank following the directions outlined in the "Filling the Fresh Water Tank" section.

5. Slowly open each valve (faucet) in the coach until water flows continuously, then turn off. This procedure is designed to remove air from the water lines. See the "Purging Air from the Water System" section.

6. Turn on the water pump; your water system is ready for use.

After the water tank has been filled, a 12-Volt DC electric water pump supplies water to all the plumbing fixtures. Once the water pump switch at the monitor panel is turned on and air purged from the system, the water pump is totally automatic and self-priming, operating on demand when any fixture is turned on. When the pump is first turned on (upon delivery or after the system has been drained) purge all air from the lines and water heater by turning on all plumbing fixtures. *Note: Be sure to purge the system of trapped air before lighting the water heater.*

SANITIZING THE WATER SYSTEM

Sanitize the on-board water storage system upon first delivery, after long periods of non-use and after any suspected contamination. There are various commercial solutions approved for RV use available for sanitizing the system.

Water System Sanitizing Procedure

1. Ensure that the water filter is removed and the bypass installed. This step ensures that chlorine residue will not be left in the filter elements which could result in a chlorine taste in your water.

2. Prepare a chlorine solution using one gallon of water with 1/4 cup of household bleach (5% sodium hydrochloride solution). When the tank is empty, add one gallon of solution into the tank for each 15 gallons of capacity. *Note: This solution may be poured into the water tank through a special fitting located on the tank.* Remove the threaded cap, add the solution and replace the cap. In some models the solution needs to be pumped into the tank through the water inlet fitting using an external water pump.

3. Continue filling the tank with fresh water. Open the faucets to release air. Pressurize the system with the pump until water flows and a distinct odor of chlorine can be detected in the discharged water. Turn off the pump.

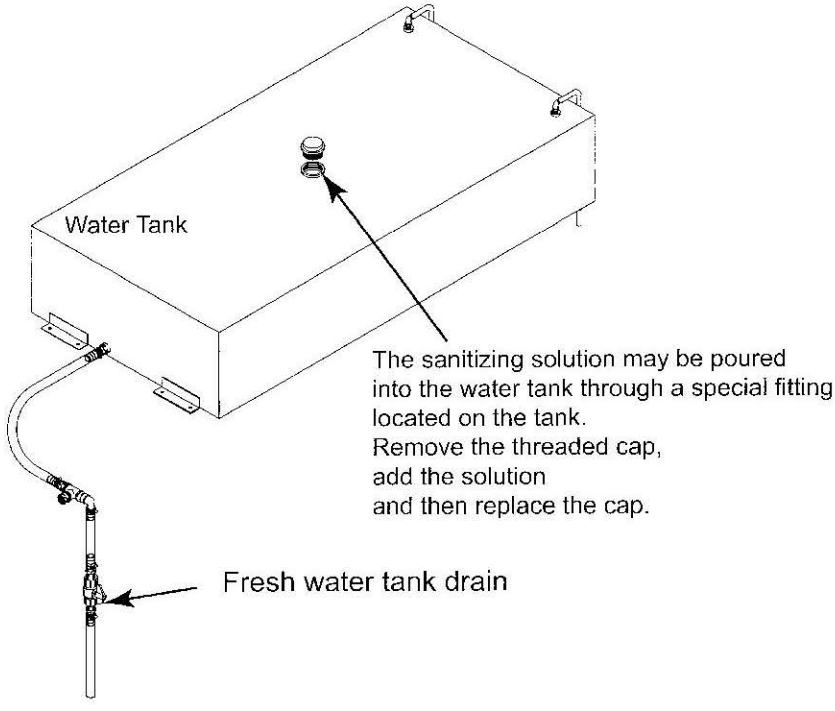
4. Allow water to stand for three to four hours.

5. Drain the entire system including the water heater. See the instructions in the "Water Drains" section.

6. Flush the entire system with fresh water and drain. The water heater and all plumbing lines may be flushed using the outside water connection (see directions in the "Draining the Fresh Water System" section).

7. To remove excessive chlorine taste or odor which may remain, prepare a solution of one quart vinegar to five gallons of water and allow solution to agitate in the tank by vehicle motion (for several days, if possible).

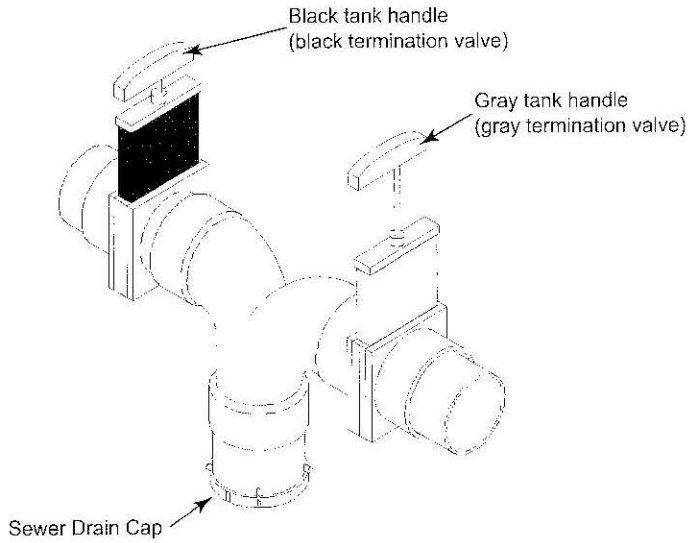
8. Drain the tank and again flush with potable fresh water.



WASTE DRAINAGE SYSTEM

Your waste drainage system is designed to provide adequate safe storage and disposal for liquid waste. Two separate waste tanks are provided. The solid waste tank (black tank), located directly beneath the toilet, holds the toilet waste. The liquid waste tank (gray tank) holds waste from your sink, lavatory and shower.

While staying in an RV park or campground that has on-site sewer connections, keep the dump valve on the solid waste tank closed and add enough water into the holding tank to prevent the solids from building up in the tank. When using the water saver toilet, raise the water in the bowl to the desired level to ensure adequate water supply to move the solids from the toilet to the holding tank and to avoid build-up under the toilet.



This drawing may not represent your exact model.
Black handle shown in the closed position;
gray handle shown in the open position.

Fig. 06-04 - Holding Tank Drain Handles

IMPORTANT

While staying in a park with on-site sewer connections, do not leave the valve on the solid waste holding tank open. (Dump the tank as necessary following the outlined procedures).

While you are on the road and operating in self-contained mode, you will again need to keep a small amount of water in the solid waste holding tank. The amount required will be less; as you travel, vehicle movement will keep the tank water sloshing to help prevent any build-up. When using the water saver toilet, keep the water level in the bowl to a low level so water does not slosh out on the carpet. When ready to use, raise the water level to a desired level. *Note: Waste-holding tanks should only be dumped at a waste disposal station or sanitary sewer connection.*

⚠ CAUTION ⚠

The dumping of toilet waste (raw sewage) into facilities other than regular facilities or sewer systems is strictly prohibited.

Disposal Stations

Most government and privately owned parks have either a central dump facility or offer campsite hook-ups for sewage. By referring to various camping publications you will find lists of many dump facilities throughout the U.S. Some major oil companies offer dump facilities at selected service stations (contact the companies to get their dump station list). Plan ahead and you will have very little inconvenience in proper waste disposal.

Waste Tank Draining Procedures

See Fig. 06-04 for illustration of the drain handles.

1. Be certain that both tank termination valves are closed (handles are pushed in).
2. Carefully remove the sewer drain cap.
3. Securely attach the sewer hose adapter to the drain outlet. Be certain the hose is securely attached to the adapter.
4. Insert the hose outlet into the sewer inlet.

5. Open the solid waste tank (black tank) termination valve in a slow continuous motion. The tank is equipped with a black valve handle. *Note: Sudden opening or closing of the valve may cause waste in the tank and line to surge and inadvertently disconnect the hose from the drain valve.* After draining, connect the fresh water hose to the tank flush inlet (#1 on Fig. 06-02) and run water for a few minutes to clean the tank's interior.

6. Close the solid waste tank termination valve after draining.

7. Open the gray tank termination valve. The tank is equipped with a gray valve handle. After dumping, follow up with a fresh water rinse by turning on the galley sink to add several gallons of fresh water to the tank. Leave the valve open until all water has drained. Close the grey tank valve.

8. Ensure both termination valves are closed.

9. Remove the sewer drain hose, clean and stow.

10. Replace the sewer drain cap. For sanitary reasons be sure to wash your hands when finished.

Cleaning the Holding Tanks

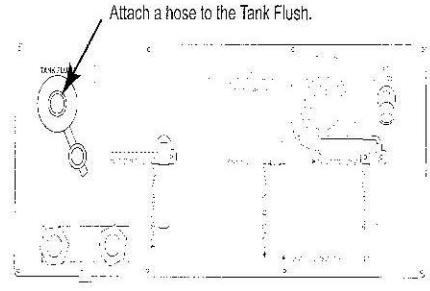
There are numerous waste tank chemicals on the market. These chemicals assist in breaking down the solids and have components that mask waste odors. Unwanted solids can build-up in waste tanks due to using too little water and not flushing the tank out properly after each use. If you wish to dump a partially full tank, it is better to fill the remaining space with water first to provide the volume necessary for complete system evacuation or flushing.

Flushing the Solid Waste Tank

1. Empty the holding tank in the usual manner at an approved dumping station (see the "Waste Tank Draining Procedures" section).

2. After emptying the solid waste tank leave the holding tank valve open.

3. Attach a garden hose to the Tank Flush inlet.



4. To flush, turn on the water hose and let it run for approximately one minute.

5. When finished, turn off water supply, let the tank drain, close the valve and install the cap.

6. Try to keep the water connection fittings from coming in contact with the drain hose to reduce the chances of contamination.

7. Always rinse the sewer drain hose before storing.

8. Wash your hands when completed.

WINTERIZING

"Winterization" constitutes removing water from the water lines and fixtures and then introducing a 100% non-diluted, non-toxic antifreeze solution into the water supply system. *Note: Do not place the antifreeze solution in any appliance such as the water heater, fresh water tank, water filter or icemaker! Doing so could destroy the appliances or render them inoperable.*

Your fresh water tank and holding tanks are automatically warmed whenever the furnace is operational. The heated line to the tank compartment is intended to help keep the tanks from freezing in cold weather. During inoperation, however, cold weather may cause trapped water to freeze and expand, causing severe damage to several areas of the plumbing system. To avoid this costly damage during periods of inoperation in cold weather, winterize your coach by doing the following:

Draining All Plumbing Systems

1. Drain the fresh water system (see the section on "Draining the Fresh Water System"). Open the valve from the fresh water tank, turn on the outside shower and remove the threaded plug from the water heater.
2. The outside shower valves must be opened and the hose and shower head drained.
3. Drain and clean out your holding tanks.
4. Remove the water filter.

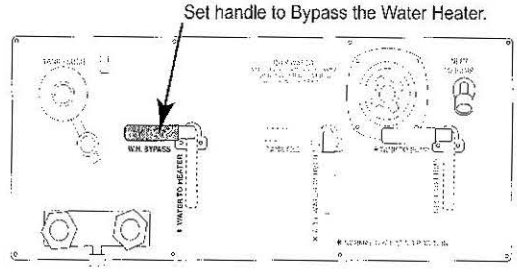
IMPORTANT

If you decide that draining the fresh water system is not satisfactory winterizing and you wish to fill the system with antifreeze, be sure it is of a type approved for potable water systems.

5. Turn the water pump switch on, allow the pump to run for 30 seconds and switch it off.
6. Any water remaining in the system may be removed by attaching a blowout plug adapter to the fill connection and blowing compressed air through the water lines.
7. Leave all faucets and valves closed during storage. Before operating the RV again, be sure to sanitize the water system in accordance with the instructions provided earlier in this chapter.

Adding Antifreeze to the Fresh Water System

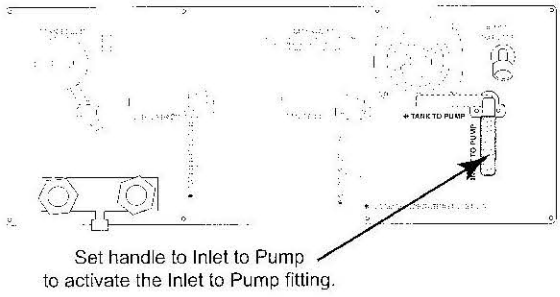
1. Drain the water tank and the fresh water system by using the procedures as outlined.
2. Turn off the water heater and remove the drain plug from the water heater and drain.
3. If your RV is equipped with an icemaker*, turn off the valve and drain the icemaker line.
4. Turn the Water Heater selector valve UP to Bypass the Water Heater.



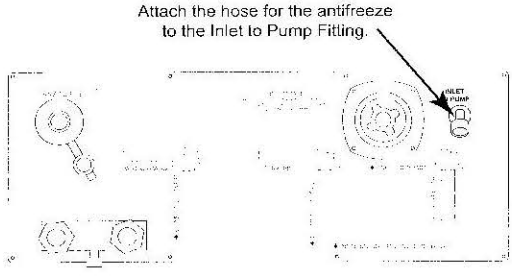
5. Turn the Tank to Pump selector valve DOWN to disconnect the water tank and engage the antifreeze inlet to pump or suction port.

⚠ WARNING ⚠

Do not use ethylene glycol, methanol-based automotive type antifreeze or any other poisonous chemicals. These chemicals are harmful and could be fatal if ingested.



6. Add the polypropylene base RV antifreeze (potable type) to the fresh water system by attaching a hose to the Inlet to Pump (#8 on Fig. 06-02) and introducing the antifreeze solution into the water system following the instructions found on the container.



7. Activate the toilet valve and hold it open until the colored antifreeze appears.

8. Slowly turn on the cold water at the kitchen sink. When the colored fluid appears, turn the faucet off. Repeat this procedure with the hot water.

9. Repeat the steps above for each water outlet including the lavatory, shower and outside shower.

10. Disconnect the hose used to install the antifreeze solution.

11. The residual antifreeze from the running the faucet should be enough to protect the p-traps. You're now ready for a safe winter!

**Note: Not all options may be available on your RV.*

Reactivating the System After Winterization or Adding Antifreeze

To reactivate the system, follow the instructions under the "Sanitizing the Water System" section. *Never* use automotive antifreeze in your water system.

⚠ WARNING ⚠

Hydrogen gas may build up if you have not used the water heater for two weeks or more. Hydrogen gas is extremely flammable. To reduce the risk of injury under these conditions open the hot water faucet for several minutes at the kitchen sink. If hydrogen gas is present you probably will hear an unusual sound like air escaping through the pipe as the water begins to flow. Do not smoke or have any open flame near the open faucet.

WATER SYSTEM APPLIANCES

Water Heater

The water heater is an LP-Gas fired appliance. Some units may be equipped with an optional 120-Volt AC water heater (consult your manufacturer's owner's manual for more information). Before lighting the LP-Gas water heater, purge the air out of the water heater tank by turning on the hot water faucet at the galley sink until water flows continuously. Your water heater has an electronic spark ignition and requires no matches to light. To operate, simply turn on the water heater switch found in the monitor control panel. If it fails to operate properly, it may be in a lockout condition due to high water temperature. Wait until the water cools, reset by placing the switch in the "Off" position for at least 30 seconds and return it to the "On" position.

Water Filter

The water filter has been designed specifically for the extra protection needed in the RV drinking water system. The filter cartridge contains a filter and Granulated Activated Carbon (GAC) that will assist in reducing microorganisms and chlorine while generally improving the overall quality and taste. The filter is located beneath the galley sink along with the shut-off valve that supplies filtered water to the optional icemaker in the refrigerator. RVs equipped from the factory with water filter systems are shipped from the factory in a winterized mode.

There is also a water filter installed on the water pump that should be removed and cleaned at least once a year. The filter is accessible through the water service panel.

Water Pump Operation

Your unit features water pump switches in the kitchen, bath and service bay. After filling the water tank and purging air from the water system as per the directions above, the water pump provides water to the fixtures of your coach. The water pump automatically switches off when fixtures are turned off. If the pump switches on and off voluntarily while you are not using any water, inspect your water system for leaks. Turn the switch off when the system is not in use or the vehicle is unattended. *Note: Do not operate the pump when the water tank is empty or when the RV is not in use. Damage to the water pump can occur!*

⚠ WARNING ⚠

Do not operate the water pump when the water tank is empty or when the RV is not in use. Damage to the water pump can occur!

Once the water pump switch at the monitor panel is turned on and air purged from the system, the water pump is totally automatic and self-priming, operating on demand when any fixture is turned on. When the pump is first turned on (upon delivery or after the system has been drained) purge all air from the lines and water heater by turning on all plumbing fixtures. *Note: Be sure to purge the system of trapped air before lighting the water heater.*

Toilet

Most RVs are equipped with a mechanical seal toilet that has been designed for marine and RV use. It differs from your standard residential toilet. To use the toilet:

- To flush the toilet, step on and then release the operating pedal slowly. The normal bowl water refill is simultaneously activated.

Some RVs are equipped with a handle operated toilet. On some models, to use the toilet:

- To add water to the toilet before using, lift or raise the flush lever until the desired water level is reached. Generally more water is required only when flushing solids.

- To flush the toilet, push the lever all the way down for 4-8 seconds until the sewage leaves the toilet. Release the flush lever by allowing it to return back, which permits positive sealing around the flush ball.

A small amount of water should always remain in the bowl. Clean the toilet bowl with a mild bathroom cleaner. *Do not* use chlorine or caustic chemicals. At the end of the season, the toilet should be winterized for storage by either draining or using potable safe antifreeze in the system. *Note: Refer to the toilet owner's manual for complete instructions.*

Toilet Hand Sprayer

See Fig. 06-07 for illustration.

1. Depress the thumb lever while activating the flush pedal or lever.

2. Direct the spray toward the desired area of the bowl.

IMPORTANT

Use only toilet tissue, cleaner, deodorizer or sanitizer that is specifically designed for RV sanitation systems. These products contain special chemicals to properly break-down the solid waste matter and tissues.

IMPORTANT

Do not dispose of any non-dissolving items in the toilet (including sanitary napkins).

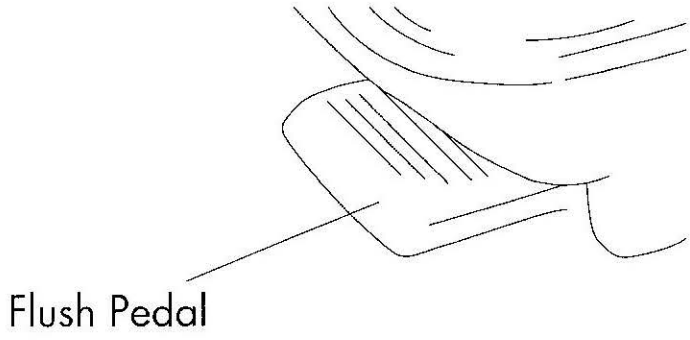


Fig. 06-05 - Toilet Pedal

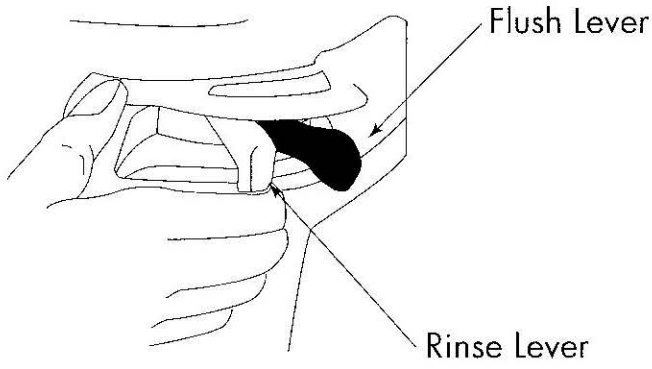


Fig. 06-06 - Hand Lever

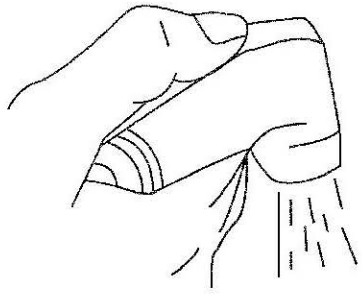


Fig. 06-07 - Toilet Hand Sprayer

Refrigerator with Icemaker

A red tag warning notice is attached on the water supply line to the icemaker. This tag can be accessed via the exterior refrigerator access door. Don't forget to winterize your icemaker if you plan to put the RV into winter storage or continue its use in temperatures below freezing (32° F) without the use of a heat strip/tape (on the water solenoid valve and its outlet tube). The icemaker should be drained to prevent component damage and leaks. *Note: Refer to the detailed instructions provided by the refrigerator manufacturer.*

Washer/Dryer (Option)

The optional washer/dryer is a compact space-saving combination unit (see Fig. 06-08). The removable drain screen which protects the pump from lint and foreign matter needs to be cleaned periodically. When it is not installed, your RV comes prepared with the electrical and plumbing pre-installed for future installation (in models which offer the washer/dryer option). *Note: Please read and follow the instructions provided in the manufacturer's owner's manual supplied for the washer/dryer for correct operating procedures.*

Pre-Plumbed for Washer/Dryer

Pre-plumbing for the optional washer/dryer includes hot and cold water lines with hose bib valves to attach the washer/dryer hoses to. It also includes the drain plumbing stand pipe to attach the washer/dryer drain hose to. Pre-plumbing also includes a separate electrical breaker and wiring circuit to a 120VAC receptacle to plug the washer/dryer cord into.

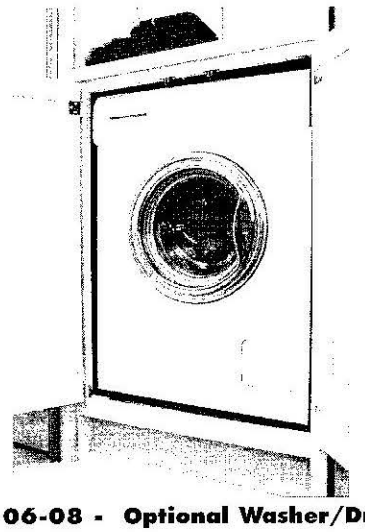


Fig. 06-08 - Optional Washer/Dryer

CHAPTER SEVEN:
LP-GAS SYSTEM

ABOUT LPG

Your RV is equipped with a Liquefied Petroleum Gas (LPG or LP-Gas) system to provide energy for comfort heating, cooking, hot water and refrigeration. LP-Gas is a colorless, highly flammable fuel. Butane and Propane are the two most common types of LP-Gas. Both will work equally well in your unit. Butane can only be used in warmer climates since it will not vaporize in temperature 30°F and below. Propane can be used in colder areas, as it will vaporize down to minus 44°F.

MFG INFO

Consult your owner's and operation manuals for your LP-Gas generator for more information.

Each gallon of LP-Gas contains about 92,000 British Thermal Units (BTUs) of energy. To determine how long a gallon of LP-Gas will last, total up the BTU inputs from all your LP-Gas appliances being used (this information is found on the appliance nameplates). The total inputs divided into 92,000 will tell you approximately how many hours a gallon of LP-Gas will last. Allowances must be made for the actual time various appliances will be used.

ABOUT LPG TANKS

Under-floor mounted LP-Gas tank(s) are built to the American Society of Mechanical Engineers (ASME) standards for pressure vessels. All valves, gauges, hoses and fittings are inspected, tested and listed by a nationally recognized listing agency.

The tank is located outside your unit, below the floor. Fuel level indication is monitored at the tank and in the galley at the monitor panel (consult the *Interior Components* chapter for more information).

LP-Gas Tank Installation

See Fig. 07-01.

1. *Information Plate*
2. *Sight Gauge* - Fuel level indicator.
3. *Wiring Harness* - To monitor panel.
4. *Fuel fill.*
5. *Vapor Outage Valve* - Used for refueling.
6. *Two-Stage Regulator Assembly (Under cover).*
7. *LP-Gas Tank.*
8. *LP-Gas Hose* - To appliances.

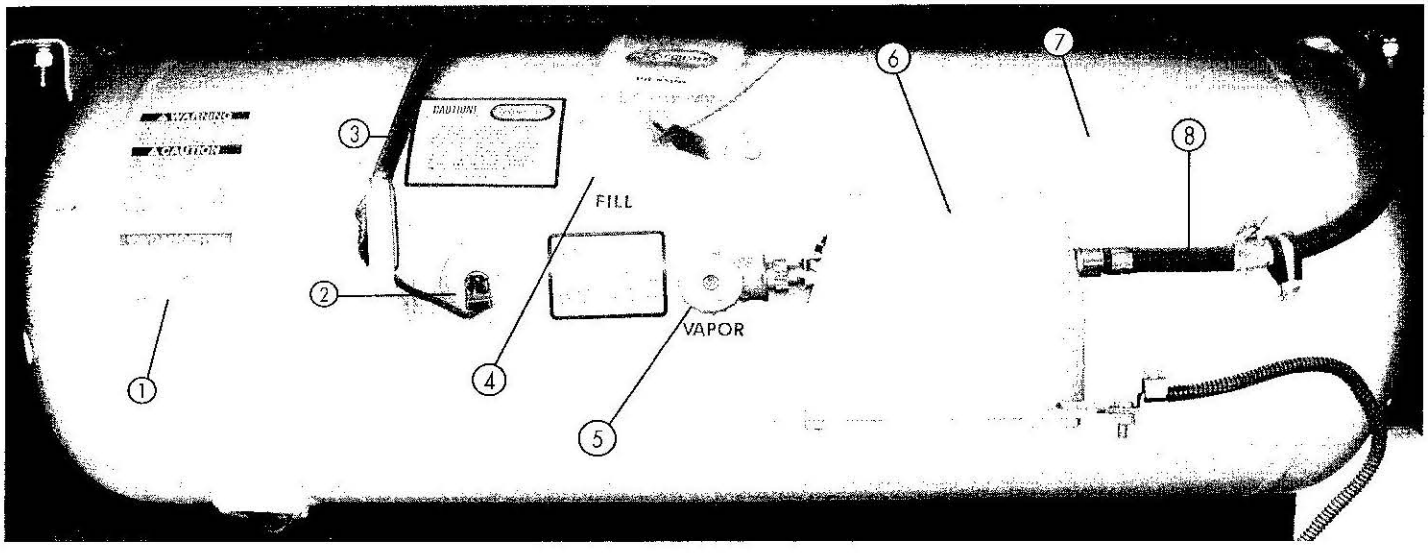


Fig. 07-01 - LP-Gas Tank Installation

IMPORTANT

LP-Gas tanks are typically shipped from the factory filled with compressed gas to eliminate internal moisture. Before filling the tank for the first time, it must be purged, contact your LPG dealer.

Filling the LPG Tank

Before filling your LP-Gas tank, turn off all pilot lights and their igniters, then close the main tank valve(s). *Note: Only an authorized LP-Gas dealer should fill or refuel this tank.* A safety relief valve found on all tanks will discharge liquid LP-Gas if the pressure in the tank exceeds safe limits. Keep all open flames and cigarettes away from this area. As the outside temperature rises, the LP-Gas expands increasing in-tank pressure that could cause it to discharge through the safety relief valve. When the tanks are filled to the proper level, a safe expansion space remains for the gas. This assures that only LP-gas vapor can be withdrawn through the piping system.

⚠ WARNING ⚠

An over-filled tank is unsafe and can cause damage to the LP-Gas regulator(s).

⚠ WARNING ⚠

All pilot lights, appliances and their igniters (see operating instructions included with each appliance) should be turned off during refueling of motor fuel tanks and/or LP-Gas containers to prevent damage.

Re-Fueling

The ASME tank mounted beneath the floor is equipped with an automatic *stop fill* device for your protection. Important instructions on the tank tell the LP-Gas dealer how to fill the tank.

Your LPG piping system is designed for use of liquefied petroleum gas *only*. DO NOT CONNECT NATURAL GAS OR ANY OTHER FUEL TO THIS SYSTEM.

Securely cap inlet(s) when not connected for use. After turning on gas, test gas piping and connections for leakage with a soapy water or bubble solution. *Do not* use products that contain ammonia or chlorine.

Do not fill containers to more than 80% of capacity.

IMPORTANT

When open, some baggage doors may block proper ventilation of an LP-gas appliance such as the furnace or water heater. Moreover, the hot exhaust may damage the door's finish. A warning label is installed to remind you of this fact. Do not leave this door open while the furnace or water heater is in operation.

OPERATION OF LPG APPLIANCES

Make sure all appliance control valves are in the "Off" position. Familiarize yourself with the operation of each gas-fired appliance by reading the instruction manuals provided. When all appliances are turned off (including their pilots) the LP-Gas system is ready to use. Turn the main valve to full open to supply gas to all appliances. Then each appliance can be lit or started. *Note: For initial lighting of the LP-Gas appliances, air in the lines must first be purged before any gas will flow through the burners.* Most appliances are automatically lit with a built-in spark or electronic ignition device and do not need to be lit by hand. The other appliances can be started following the operational instructions found on each appliance.

If your vehicle is equipped with an LP-Gas Oven, the pilot light in the range top valve can be turned to pilot ON. Light the oven pilot with a match or a hand-held spark igniter and rotate the knob to the desired setting. *Note: This valve should be turned off when refueling or traveling.*

SAFETY IN USING LP-GAS

LP-Gas Leak Detector

An LP-Gas detector has been installed in your unit to aid in the detection of leaked LP-Gas. For your safety, please read and follow the operating instructions. The activation of this device indicates the presence of LP-Gas that can cause an explosion and/or fire. Activation of this device normally indicates a leak in the LP-Gas piping or an LP-Gas appliance. If it ever activates, proceed with the following precautions:

- Evacuate the vehicle immediately and open all doors and windows.
- Turn off the main valve at the LP-Gas tank.
- Immediately extinguish all open flames.
- *Do not* activate any electrical switches.
- If you cannot locate the source of LP-Gas, contact your authorized RV Service Center for help.
- *Do not re-enter the vehicle until the problem has been corrected and the unit aired out.*
- *Note: LP-Gas is heavier than air. Like water, leaking gas tends to flow to low places.*

Leaks

Usually you can detect gas leaks by their strong "garlic-like" odor. If you encounter this odor, *turn off all open flames immediately* and commence a systematic search for leaks throughout the gas system.

Leaks can be found easily with a soapy water solution in a spray bottle applied to the outside of the gas piping connections (if bubbles form, a leak exists). Shut off the main gas valve at the LP-Gas tank if a leak is detected. Never light a match or allow any open flame if leaking gas is suspected.

If the leak does not show up in the manifold or copper tubing distribution system, check all the appliances. If at this time the odor still persists, turn off the main valve(s) at the LP-Gas tank and all appliance pilots. Ventilate the unit and check with your LP-Gas dealer or your authorized National RV dealer for professional help.

⚠ CAUTION ⚠

Do not use a detergent containing ammonia or chlorine when testing gas lines for leaks as they may cause a chemical reaction causing corrosion to the gas lines, resulting in dangerous leaks. Use mild soapy water for testing lines. Never use an open flame to test for gas leaks. Be sure to shut off the main LP Gas supply valve(s) when the vehicle is not in use.

Checking for Leaks

You should check for leaks at the connections on the LP-Gas system soon after the initial filling of the LP-Gas tank. Although the entire distribution system and its attached appliances have undergone factory testing for leaks, connections and fittings can develop leaks due to road vibrations. Your vehicle was manufactured to provide you with full access to all gas line connections. Place a soapy water solution in a spray bottle and spray it on the outside of the pipes. If bubbles form in the water on the pipes, a leak exists. *Never use a match!*

We strongly recommend contacting a professional to repair any leaks. However, when repairing any copper fittings, be sure to use two wrenches on connections and fittings with opposing torque to prevent twisting of copper tubing (Fig. 07-02).

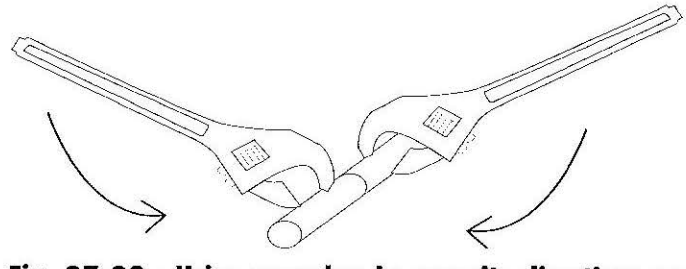


Fig. 07-02 - Using wrenches in opposite directions on fittings with opposing torque

IMPORTANT CONSUMER SAFETY INFORMATION

Do not place or store LPG containers inside the vehicle. LPG containers are equipped with safety devices that relieve excessive pressure by discharging excess gas to the atmosphere.

⚠ WARNING ⚠

The following warning label has been located in the cooking area to remind the user to provide an adequate supply of fresh air for combustion (Fig. 07-03):

WARNING

IT IS NOT SAFE TO USE COOKING APPLIANCES
FOR COMFORT HEATING
COOKING APPLIANCES NEED FRESH AIR FOR SAFE OPERATION.
BEFORE OPERATION:
1. OPEN OVERHEAD VENT OR TURN ON EXHAUST FAN, AND
2. OPEN WINDOW

IF YOU SMELL GAS

1. EXTINGUISH ANY OPEN FLAMES, PILOT LIGHTS, AND ALL SMOKING MATERIALS.
2. DO NOT TOUCH ELECTRICAL SWITCHES.
3. SHUT OFF THE GAS SUPPLY AT THE TANK VALVE(S) OR GAS SUPPLY CONNECTION.
4. OPEN DOORS AND OTHER VENTILATING OPENINGS.
5. LEAVE THE AREA UNTIL ODOR CLEARS.
6. HAVE THE GAS SYSTEM CHECKED AND LEAKAGE SOURCE CORRECTED BEFORE USING AGAIN.

Fig. 07-03 - Cooking Appliance Warning

Unlike homes, the amount of oxygen is limited due to the size of the recreational vehicle and proper ventilation when using the cooking appliance(s) will avoid the dangers of asphyxiation. It is especially important that cooking appliances not be used for comfort heating as the danger of asphyxiation is greater when an appliance is used for an extended period of time.

⚠ WARNING ⚠

Overfilling the LP-Gas container can result in uncontrolled gas flow which can cause fire or explosion. A properly filled container will contain approximately 80 percent of its volume as a liquid LP-Gas.

Note: The remaining 20 percent of the tank area must be empty to allow gas to vaporize.

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

- *Do not* bring or store LP-Gas containers, gasoline or other flammable liquids inside the vehicle because a fire or explosion can result.

- A warning label has been located near the LP-Gas container. This label reads: DO NOT FILL CONTAINER(S) TO MORE THAN 80 PERCENT OF CAPACITY.

LP-Gas regulators must always be installed with the diaphragm vent facing downward. Regulators that are not in compartments have been equipped with a protective cover. Make sure that regulator vents face downward and that all covers are kept in place to minimize vent blockage that could result in excessive gas pressure causing fire or explosion. *Note: The manufacturer has preset the regulator(s) and they require no adjustment.*

FREQUENTLY ASKED QUESTIONS

LPG is:

Colorless

Odorless (it is normal to add an odorant to help in the detection of any leaks)

Flammable

Heavier than air

Approximately half the weight of water

Non toxic but can cause asphyxiation

What is LPG made out of?

Butane and Propane are the two most common types of LPG. Both will work equally well in your unit. Butane and propane are both alkanes ('al-"kAn). This means that they are unreactive. Alkanes are obtained by distillation from petroleum. Alkanes are used extensively as fuels. The alkanes are sometimes referred to as the methane series (after the simplest alkane) or as paraffins.

Butane is a gaseous alkane. The chemical symbol of butane is C4H10. The main advantage of butane is that it can be liquefied easily. This means that butane can be used in both liquid and solid forms.

Propane is also a gaseous alkane. The chemical symbol of propane is CH3CH2CH3. Propane can be liquefied when it is compressed and cooled. The main advantage of propane is that like butane, it can be liquefied easily. This means that propane can also be used in both liquid and solid forms.

So, which alkane should you use? Butane can only be used in warmer climates since it will not vaporize in temperature 30°F and below. Propane can be used in colder areas, as it will vaporize down to minus 44°F.

Where does LPG come from?

LPG comes from two sources. It occurs naturally in oil and gas fields and is separated from the other components during the extraction process. LPG is also one of the by-products of the oil refining process.

Is LPG the best solution for motorhome and trailer fuel needs?

There are three main reasons that LPG makes such a great fuel for your coach's appliances:

LPG is a highly flammable fuel and very efficient; you use less fuel to power your appliances than you would use with gasoline or other fuels.

LPG is clean burning: It is easy to achieve the correct fuel to air mix ratio that allows the complete combustion of the product. This gives LPG its clean burning characteristics and relatively low emissions into the environment.

Both propane and butane are easily liquefied and stored in pressure containers: This makes it easy to store and transport.

How much energy is in LP-gas?

Each gallon of LP-Gas contains about 92,000 British Thermal Units (BTUs) of energy. To determine how long a gallon of LP-Gas will last, total up the BTU inputs from all your LP-Gas appliances being used (this information is found on the appliance nameplates). The total inputs divided into 92,000 will tell you approximately how many hours a gallon of LP-Gas will last.

How should I fill my LPG tanks?

Only an authorized LP-Gas dealer should fill or refuel your LPG tanks.

A safety relief valve found on all tanks will discharge liquid LPG if the pressure in the tank exceeds safe limits. Keep all open flames and cigarettes away from this area. As the outside temperature rises, the LPG expands increasing in-tank pressure that could cause it to discharge through the safety relief valve. When the tanks are filled to the proper level, a safe expansion space remains for the gas. This assures that only LP-gas vapor can be withdrawn through the piping system.

Portable LP-Gas cylinders require special handling and safety instructions as follows:

Do not use or store LP-Gas cylinders in buildings, garages or other enclosed areas.

Do not transport cylinders inside your coach, trailer or tow vehicle.

Contact an LP-Gas supplier for repairs or disposal of cylinders and/or LPG.

Tanks are for outdoor use only.

LP-Gas regulators must always be installed with the diaphragm vent facing downward to minimize vent blockage that could result in excessive gas pressure causing fire or explosion. Note: The manufacturer has preset the regulator and it requires no adjustment.

What are the hazards of LPG?

LPG is a flammable gas that has the potential to create a hazard. Therefore, it's important to follow all the safety rules and guidelines for its use.

An LP-Gas detector has been installed in your unit to aid in the detection of leaked LP-Gas. For your safety, please read and follow the operating instructions. The activation of this device indicates the presence of LPG that can cause an explosion and/or fire. Activation normally indicates a leak in the LPG piping or an LPG appliance.

If this alarm ever activates:

Evacuate the vehicle immediately and open all doors and windows.

Turn off the main valve at the LP-Gas tank. Immediately extinguish all open flames.

Do not activate any electrical switches.

If you cannot locate the source of LP-Gas, contact your authorized RV Service Center for help.

Do not re-enter the vehicle until the problem has been corrected and the unit has been aired out. Note: LP-Gas is heavier than air. Like water, leaking gas tends to flow to low places.

There is also a warning label in your coach to remind you what to do if you smell leaking gas (See Fig. 07-03).

How can I use LPG safely?

You can use LPG safely if you apply a few simple safety rules.

Always close the cylinder or tanks valves after use and especially when storing your unit for any length of time.

Ensure that your LPG supplier provides a supply of LPG that is odorized to allow you to smell any leaking LPG.

Always use LPG appliances and other gas equipment according to the operating instructions included with those appliances

Check for gas leaks on a regular basis.

Never check for gas leaks using a flame. Always use a solution of soapy water and look for bubbles coming from around valves and pipe joints. These bubbles indicate a gas leak.

How can I reduce my consumption of LPG?

To help lower your LPG use, keep your expenses down and help conserve our natural resources:

Cooking:

1. Get all of your ingredients together and prepared before lighting your stove burner.

2. When cooking, cover the pots and pans you are using to keep heat in, not to mention keeping the flavors in. Heat loss will mean more heat you have to apply to warm and cook your food.

3. If there is a break in cooking, turn the LPG off and then re-light the burner to begin cooking again. Over time, this can result in a significant reduction in LPG use.

4. Use cooking vessels that are the same size as the burners. For example, use a small burner for a small pot. This will help to reduce the volume of LPG used. Did you know that the small burner uses about 6 to 10 percent less fuel than the large burner?

5. Avoid wasting LPG by re-heating food in your microwave.

6. The cooking flame should be blue in color. If the outlet holes become blocked it may become yellow. If this happens, have your stove serviced by a qualified professional. Yellow flames means the LPG is burning inefficiently and using more fuel.

7. Keep the cooking flame under the pan (don't set the flame so high that it extends beyond the bottom of the pan). This keeps the heat concentrated under the food you are cooking and keeps you from wasting energy heating the air around the pan instead of just the pan itself.

Heating:

1. Be sure the door and all the windows are closed when operating your furnace. Even a small opening can be a significant waste of energy.

2. Use your blinds and shades to keep windows covered to help keep from losing heat through your windows.

3. Make sure all of the seals on your coach are in good condition (see the *Exterior Components* chapter).

Notes:

CHAPTER EIGHT:
INTERIOR COMPONENTS

OVERVIEW

While your RV was designed to provide you years of service with a minimum of effort, routine care and maintenance will provide extended life and keep your RV looking fresh. Information in this chapter explains the operation of some interior components found within your RV and describes the care and maintenance of your interior furnishings in detail.

MAIN ENTRY

Entry Switch Panel

See Fig. 08-01.

1. *House (Auxiliary) Battery Indicator Light*
2. *Porch and Entry Light* - On-Off-On Switch (Porch On - Both Off - Entry On).
3. *Entry Step* - On/Off Switch (When the step is Out, the step light remains off.)
4. *Auxiliary Battery Disconnect Switch*
5. *Ceiling Lighting* - On/Off Switch
6. *Exterior Storage Compartments Lights* - On/Off Switch

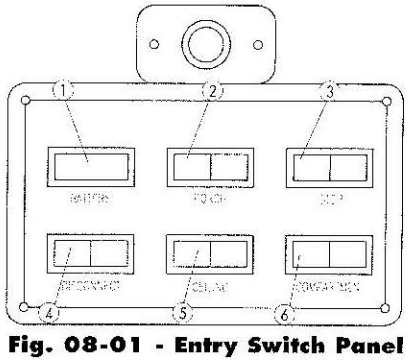
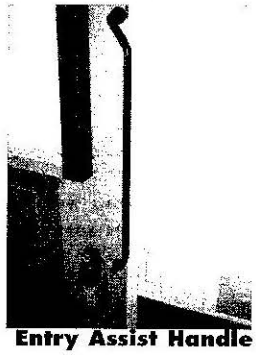


Fig. 08-01 - Entry Switch Panel



Entry Assist Handle

Entry Assist Handle

A full height entry assist handle is provided in each coach for your convenience and safety.

Automatic Electric Entry Step

Your RV is equipped with an automatic electric step at the main entry door.

Switch in ON position:

Step extends when door opens, and

Step retracts when door closes.

Switch in OFF position when parked:

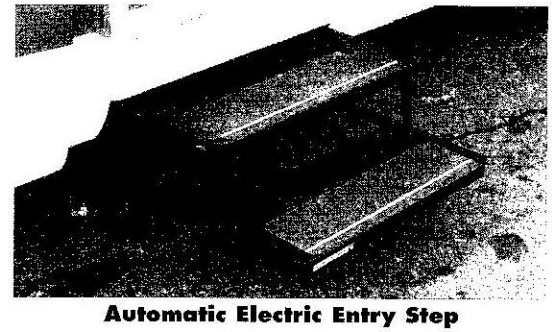
Step remains in the position it was in when the switch was turned to OFF, either open or closed.

Door closed and engine turned ON:

Step retracts to closed position no matter what the switch setting.

When the entry switch is in the ON position, the step will extend and retract each time the door opens and closes. *Note: The entry step is powered from the chassis battery and will operate even when the 12-Volt DC disconnect switch is off.*

While parked, turning the switch to the off position will leave the step extended or retracted. If the engine is started with the step extended and the door closed, the step will retract regardless of the position of the wall switch. If you park too close to obstructions like curbing, proper operation of the step may be impeded. The entry step will automatically shutdown if the tread strikes an object while extending. By closing the door, the step retracts without damage.



Automatic Electric Entry Step

APPLIANCES

Forced Air Furnace

The furnace supplies heat to the interior of your RV, water tank and holding tank compartment simultaneously. This appliance is equipped with an ignition device that automatically lights the burner. *Do not* try to light the burners by hand. *Note: Ensure that the valve power switch (accessed from the outer door) is in the on position by following the manufacturer's operating instructions.* The units are controlled by the central aisleway thermostat.

MFG INFO

Consult the manufacturer's documentation that is provided for your furnace.

Air Conditioner

The roof air conditioner will only operate when the power cord is plugged into shore power or the on-board generator is running. The unit has a return air grille with an enclosed air filter. Periodically remove the filter and wash it with soap and warm water. After it is dry, return and replace it. The ability of the system to maintain the desired inside temperature depends on the heat gain of the RV. For the best performance, we suggest parking in a shaded area and keeping windows and doors shut. Also, keeping window coverings drawn and heat producing appliance use to a minimum will aid in cooling. Like the furnaces, the air conditioners are controlled at the central aisleway thermostat in the Comfort Control Center (CCC).

MFG INFO

Refer to the air conditioner owner's manual and other documentation for complete operating instructions.

Basement Air Conditioner

The basement air conditioner design in the Dolphin and Dolphin LX makes it possible to maintain a smooth, free-flowing roof line for the vehicle. It also has all heat pump noise and condensation drainage off the roof and below the floor of the vehicle.

This heat pump contains a dual compressor system with each compressor connected to a separate refrigeration circuit.

The system operates a two-stage system in cooling, running a single compressor when the air conditioning requirement is low, or with two compressors when maximum cooling is required.

The 1st Stage (the first compressor and refrigeration circuit) will operate when the thermostat is demanding cooling, and the vehicle is being powered by either shore power or the on-board generator.

The 2nd Stage (the second compressor and refrigeration circuit) will operate when the thermostat senses room temperature is 2 degrees higher than setpoint, and the vehicle has enough power.

The basement air conditioner in your unit will be able to work in a 30 Amp park. Each compressor draws approximately 25 Amps at 95 degrees.

For your convenience, a manual switch is installed in your coach to allow you to prevent the stage-two compressor from starting (see Fig. 08-02). This manual switch will help you avoid tripping the 30 Amp campground's breaker switch. When you're parked at a 50 Amp campground you can flip the manual switch back giving both compressors the ability to operate.

Consult the guides and manuals provided with your unit for further information on the Basement Air Conditioning.

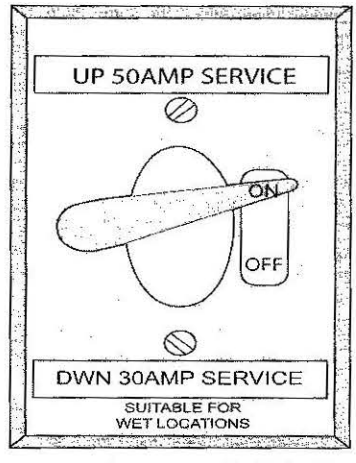


Fig. 08-02 - 30 Amp/50 Amp Switch, located next to the cable inlet. (For basement A/C only).

Water Heater

The water heater is a LP-Gas fired appliance. Before lighting, purge the air out of the water heater tank by turning on the hot water faucet at the galley sink until water flows continuously. Your water heater has an electronic spark ignition and does not require matches to light. To operate, simply turn on the water heater switch found in the monitor control panel. If it fails to operate properly, then it may be in a lockout condition due to high water temperature. Wait until the water cools, reset by placing the switch in the off position for at least 30 seconds and return it to the on position.

MFG INFO

Consult the manufacturer's documentation that is provided for your water heater.

Refrigerator

The refrigerator was specifically designed for RV applications and uses the absorption principle of operation.

Absorption refrigeration uses heat in the form of burning gas or propane to produce cold inside the refrigerator. Typically, a strong solution of ammonia and water is heated in a container called a generator. The ammonia vaporizes and moves into a condenser. In the condenser, the ammonia changes back to a liquid state and the ammonia flows to the evaporator. Cooling of the refrigerator is accomplished as the vaporization and liquification of the ammonia draws heat from the refrigerator.

With absorption cooling it is extremely important that the refrigerator operate only when level, as cooling ammonia and other chemicals can build up inside the unit in unexpected places and cause permanent, irreparable damage.

CAUTION

Always make sure that exhaust vents for the furnace, water heater, refrigerator, etc. are free of obstruction by walls, debris or open luggage compartment doors.

The absorption cooling process makes refrigeration available from the LPG supply even when electricity is not.

IMPORTANT

Your refrigerator will cool more efficiently if there is sufficient room for air to circulate around items inside.

Before operating the refrigerator, make sure the vehicle is level and follow the operating instructions supplied with your refrigerator. Turn on the gas supply to the refrigerator and then select the MODE of operation.

IMPORTANT

When starting the refrigerator for the first time or restarting later, the cooling cycle may require up to four hours of running time before the cooling unit is fully operational.

Refrigerator (2-Way Operation)

This refrigerator is equipped with a control system that can be set to automatically select 120-Volt AC/LP-Gas operation or LP-Gas operation only, as follows:

- (AUTO) MODE - When operating in the AUTO mode, the AUTO indicator lamp will illuminate. The control system will automatically select between 120-Volt AC and LP-Gas operation with the electrical power having priority over gas.
- (GAS) MODE - When operating in the GAS mode, the AUTO mode indicator lamp will be off. This mode provides for LP-Gas operation only.

MFG INFO

Refer to the refrigerator owner's manual and other documentation for complete operating instructions.

Side-by-Side Refrigerator with Icemaker (Option, Some Models)

This refrigerator is equipped with an Automatic Energy Selector (AES) control system, which can automatically select the most suitable energy source which is available - either 120-Volt AC or LP-Gas operation. The user can set the system to fully automatic (Auto) Mode or to the LP-Gas only (Gas) Mode. The thermostat on the refrigerator controls both the gas and electric operation and eliminates having to reset each time a different energy source is employed.

⚠ WARNING ⚠

It is important to provide adequate ventilation when using the gas cooking appliances to prevent the danger of asphyxiation.

Range, Cooktop & Hood

Cooktop Burner Operation

The LP-Gas range or cooktop is operated much like the gas range in your house. Turn the appropriate burner knob counterclockwise to the On or Lite/Hi position. *Do not* attempt to light more than one burner at a time. Then turn the Spark knob clockwise one click to light. If it fails to light, try again. To extinguish the top burner flame, turn the appropriate burner knob clockwise to off. *Note: Please review the LP-Gas System chapter for safety considerations.*

Range Oven Operation

If your vehicle is equipped with an LP-Gas Oven, the pilot light will be a control valve in the range top that can be turned to *"pilot on"*. Light the oven pilot with a match or a hand-held spark igniter and rotate the knob to the desired setting.

Range Hood

The range hood is used to eliminate cooking odors and to exhaust hot cooking vapors. It is built into the Microwave/Convection Oven mounted over the Range Top. It will work when 120-Volt AC power is available from shore-power, the on-board generator or the Inverter/Charger. The filters require periodic cleaning; follow the manufacturer's instructions. Also available is a surface light. Press once for bright light, twice for night-light or three times to turn the light off. *Note: The ceiling 12-Volt DC power roof exhaust fan may be used to eliminate cooking odors and exhaust hot cooking vapors whenever 120-Volt AC power source is not available to power the range hood.*

MFG INFO

Refer to the cooktop/oven owner's manual and other documentation for complete operating instructions.

IMPORTANT

The oven pilot control valve should be turned off when refueling or traveling.

Microwave/Convection Oven

This appliance functions like the one found in your kitchen at home. It is wired to operate whenever a 120-Volt AC source is available. Please read your owner's manual and observe all the safety precautions therein, including the following:

- *Do not* attempt to operate the microwave oven with the door open since it could result in harmful exposure to microwave energy. *Do not* attempt to defeat the safety interlocks.

⚠ CAUTION ⚠

If improperly used, a microwave oven can be very dangerous. Thoroughly read and adhere to all safety procedures.

- *Do not* place any object between the oven front face and the door or allow soil or cleaner residue to accumulate on sealing surfaces.
- *Do not* operate the oven if it is damaged. It is important that the oven door close properly and that there is no damage to the door, hinges, latches, seals or sealing surfaces.

MFG INFO

Consult the manufacturer's documentation that is provided for your microwave oven.

- *Do not use metal, foil or twist ties* in your oven. This will cause "arcing," or sparks, in the oven. If this problem occurs read your manual and correct the problem before proceeding.
- The oven should not be adjusted or repaired by anyone except properly qualified service personnel.

MFG INFO

Both the TV and VCR/DVD came with separate owner's manuals. Full operation and maintenance information is included in the manufacturers' documentation.

Televisions, VCR & DVD Player

The televisions and DVD/VCR operate only when a 120-Volt AC power is available. The source of power could be shore-power, on-board generator power or the Inverter/Charger. When the automotive ignition switch is turned to the "On" position or the engine is running, the front TV is locked-out since it is illegal to drive the vehicle with the television on. The DVD/VCR and Video Selector are located in the front overhead cabinet. The DVD/VCR is comparable to home models and plays or records standard VHS cassette tapes. The Video Selector (Fig. 08-03) is a push-button type that will accept five inputs (Satellite Receiver, TV Antenna, DVD/VCR, Cable TV and Auxiliary) and provide three outputs (Main and secondary TV and DVD/VCR).

You can select various video sources, including outside cable, TV antenna, VCR, satellite or AUX input from your personal equipment. The choice

CAUTION

To prevent damage, ensure that the TV antenna is down before driving away.

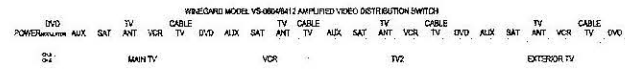


Fig. 08-03 - Video Selector

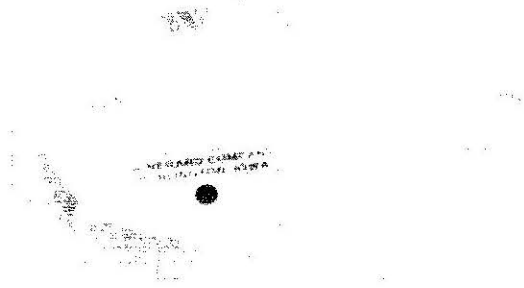


Fig. 08-04 - Antenna Extended and Base Turned for Best Reception

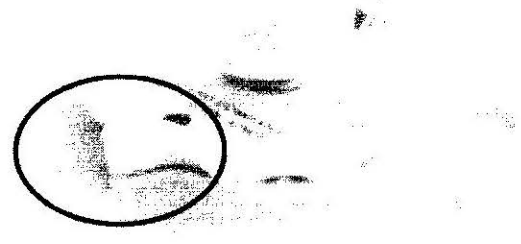


Fig. 08-05 - Arrows Aligned Before Lowering Antenna

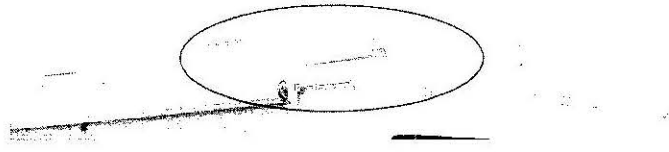
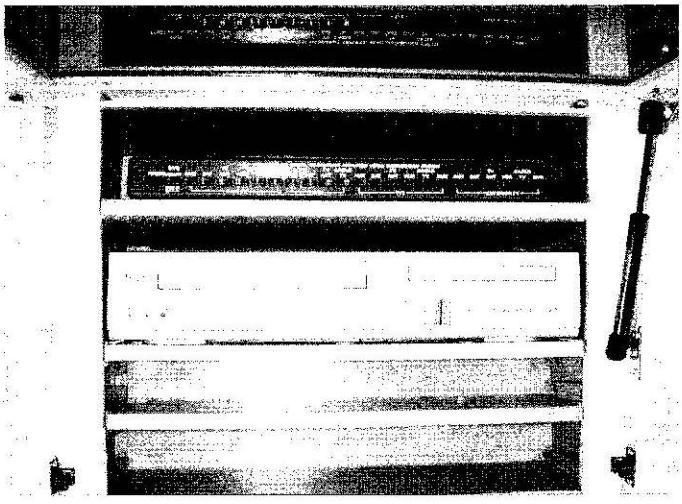


Fig. 08-06 - Visually Ensure Antenna is Down



is yours! You can also watch different programs on each TV set at the same time.

Satellite Dish (Optional on Sea Breeze Models)

Your unit may be equipped with a combination digital satellite system (DSS) dish and television antenna. If you subscribe to a digital satellite service provider, such as DirecTV®, you will receive a variety of crystal clear programming through your DSS dish. The antenna feature also allows you to receive broadcast programming from local UHF and VHF channels.

Included in the information packet that came with your unit is the antenna system's owner's manual. Refer to the owner's manual for complete instructions on correctly adjusting and operating the unit for the best reception.

TV Antenna

Located on the ceiling in the living room, you will find a hand crank and rotating dial adjustment for the TV antenna. Turn the crank handle clockwise to raise the antenna. Then, pull down and rotate the base dial to direct the antenna for the best reception (see Fig. 08-04). The antenna feature also allows you to receive broadcast programming from local UHF and VHF channels.

Before lowering the antenna, rotate the base dial until the two alignment arrows are together (see Fig. 08-05). Now, turn the crank handle counterclockwise to lower the antenna.

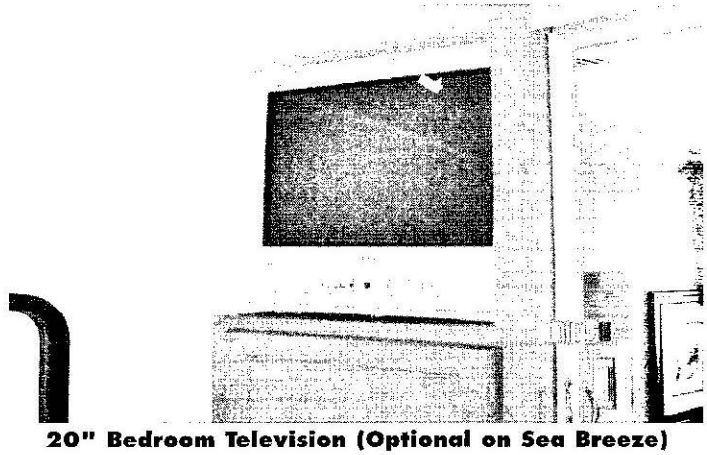
Important: To prevent damage, ensure that the TV antenna is all the way down before driving away (Fig. 08-06). Sometimes, the antenna seems to be down when it is not. To prevent damage, visually inspect the coach from the outside to verify that the antenna is down.

Home Theater Sound System

A home theater sound system may be installed for your listening pleasure. The audio from the front overhead TV will play through the home theater stereo speaker system, while the radio will play through its own speakers.

King Dome Satellite System (Some Models)

The King Dome Automatic Satellite System provides quick and easy access to satellite television broadcasts while away from home. To adjust the dish, press the Fast Find button and the system's electronic controller positions the internal dish for optimal reception. The King Dome system is designed to work with all DSS and DishNetwork receivers and does not



20" Bedroom Television (Optional on Sea Breeze)

IMPORTANT

The stereo/radio/CD player operate only on 120 Volt AC power.

require any connection to the satellite receiver other than through the coaxial cable.

Washer/Dryer (Option, Some Models)

The optional washer/dryer is a compact space-saving combination unit that is located in the wardrobe (see Fig. 08-08). The removable drain screen which protects the pump from lint and foreign matter needs to be cleaned periodically. *Note: Please read and follow the instructions provided in the manufacturer's owner's manual supplied for the washer/dryer for correct operating procedures.*

MFG INFO

Consult the manufacturer's manuals for information about your stereo/radio/CD player.

When the washer/dryer is not installed, your RV comes prepared with the electrical and plumbing pre-

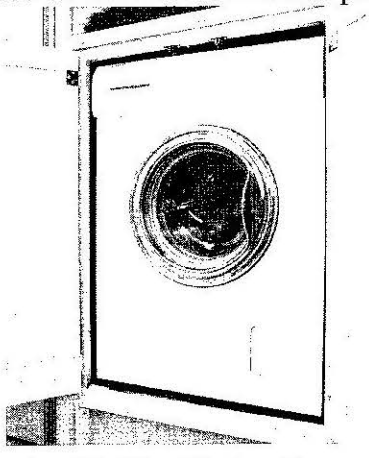
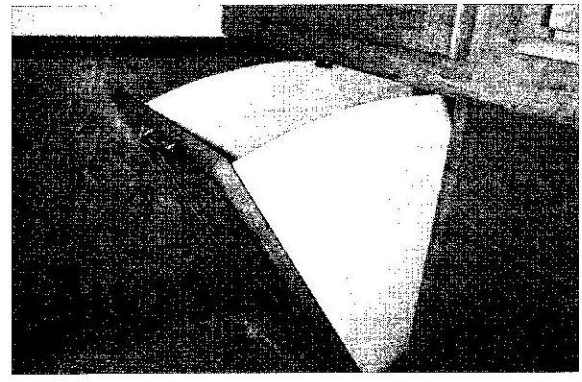


Fig. 08-08 - Washer/Dryer

Laundry Hamper

The laundry hamper is a standard feature on all of our models. It is located in the bedroom cabinetry group and is accessed by pulling the cabinet handle toward you.



installed for future installation (in models which offer the washer/dryer option).

INTERIOR CONTROLS

See Fig. 08-09.

Monitor Panel

Your Monitor Panel (top panel) is designed to give you instant systems information at your fingertips.

Tank Level Test Button - Press the left button on the top row to test the levels in the holding tanks. The levels will display on the lighted area above.

Battery Voltage - Press the House side of the top right button to test the house battery and the Chassis side to test the chassis battery. The voltage will display on the LCD screen to the left of the button.

The Water Heater in most LX models is dual fueled, chose either LP Gas or 120V electric operation when connected to shore power.

Water Heater 120 Volt - Pressing this button will turn on or off the 120 Volt heater coil in the water heater.

Water Heater 12 Volt - Pressing this button will ignite the LPG burner in the water heater.

Note: The Direct Spark Ignition (DSI) Fault indicator light illuminates when there is a fault in the LPG ignition system.

Water Pump - Use this switch to turn off and

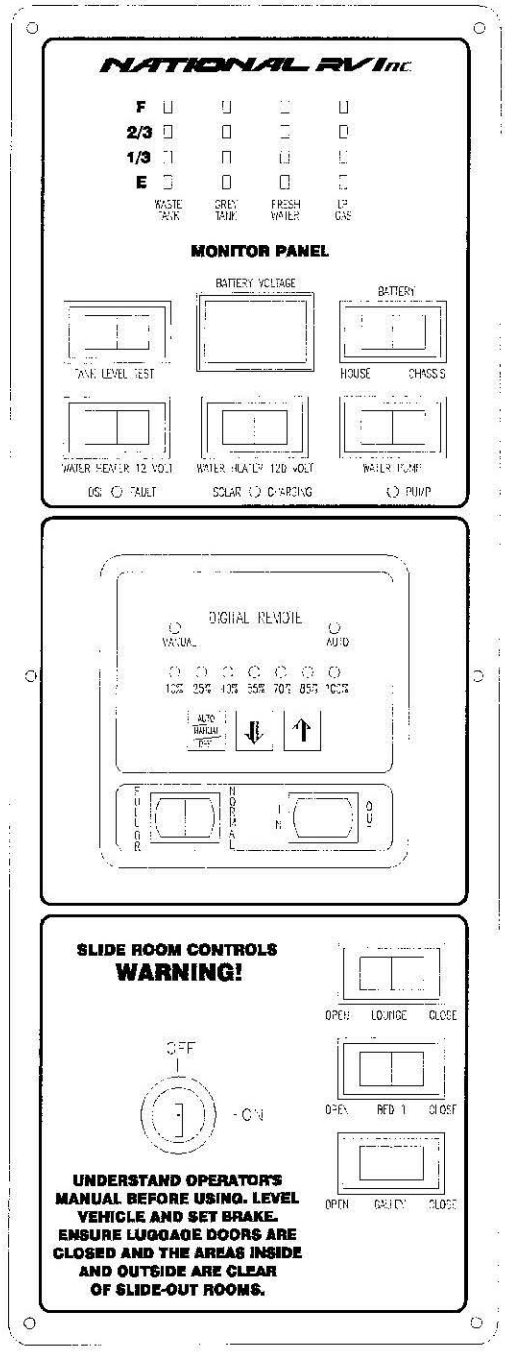


Fig. 08-09 - Control and Monitor Panels (Some models)

on the water pump. The Pump indicator light illuminates when the water pump is turned on.

Roof Vent/Fan Control

Your coach may feature a high-capacity exhaust fan (see the center control panel in Fig. 08-09. It has a built-in safety switch that prohibits operation unless the dome is partially opened. This fan will either draw outside air into the RV or exhaust interior air to the outside. The source of airflow is determined by whatever window(s) or door is open. The fan control/thermostat will allow for both manual and automatic operation. The speed of the fan is controlled by the Up and Down arrows. There is a Rain Sensor built into the fan that will automatically close the dome

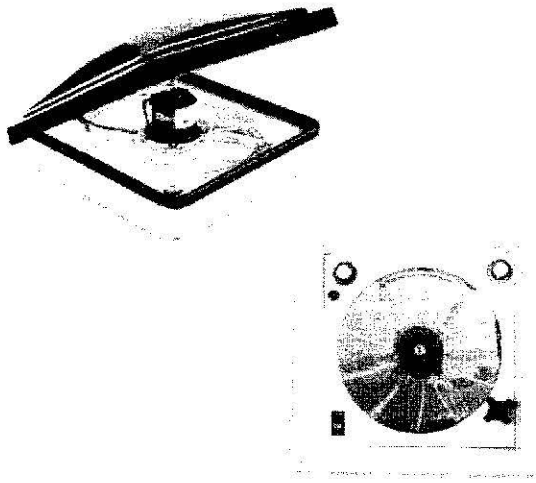


Fig. 08-11 - Roof Vent

Slide Room Controls

A 12-Volt DC motor and driveshaft operates the slide out rooms, powered by the house (auxiliary) battery. A specially designed control gives you full control of room movement in or out (Open or Close).

To extend a room (see the lower control panel in Fig. 08-09):

1. Insert the key and rotate the key lock switch to the On position.
2. Depress and hold the appropriate switch on the right hand side of the panel to the open position.
3. Release the switch when the room is fully extended.
4. In reverse, depress and hold the switch in the close position and release it when the room is fully retracted.
5. For safety, turn the key switch to Off and remove the key when not in use.

WARNING

CLOSE LUGGAGE DOORS BEFORE OPERATING SLIDE OUT.

⚠ CAUTION ⚠

Do not operate your Slide Room or Topper in snowing or freezing-rain conditions. Such use will prevent the awning and room from retracting properly and possibly damage the awning and/or room.

IMPORTANT

When the room seals, immediately realese the switch. Holding down the switch puts an excessive load on the mechanism and may cause the breaker to trip.

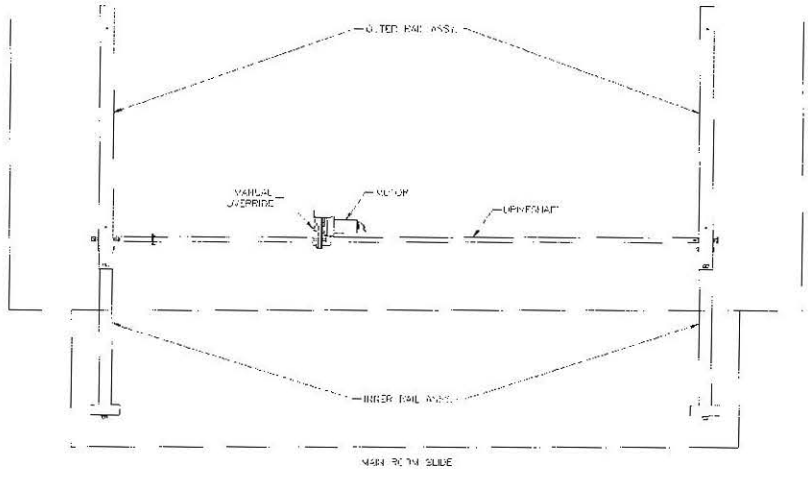


Fig. 08-12 - Typical Locations of Slide-out Room Motors and Overrides

Emergency Room Retraction

In case of loss of power, the slide out rooms in your coach are designed to be retracted manually.

1. Prior to manually cranking the slide-out, unplug the wire harness located at the slide out relay control next to the 12 Volt distribution panel in the forward compartment on the co-pilot side of the coach (see Figs. 08-13).
2. Then, retract the room by turning the hexagonal stop shaft located on the motor gear box. This will take a considerable amount of time. (See Fig. 08-14)

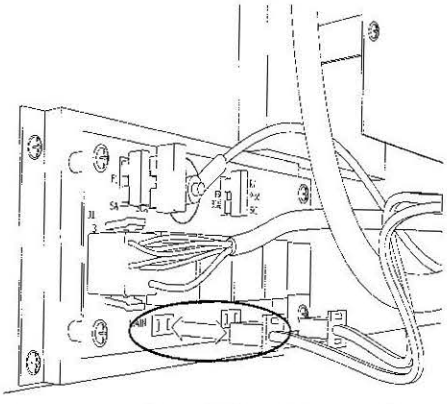


Fig. 08-13 - Unplug the Wiring Harness before manually cranking the slide-out

Slide System Manual Crank-Breaking Oporation

1. Pull back on housing and disengage alignment pin.
2. Rotate counter clockwise 1/8 turn.
3. Manually crank system to desired position.

To Re-engage Brake:

1. Rotate housing and engine alignment pin.
2. Manually crank system until alignment pin is fully engaged.

Warning: During this operation DO NOT power unit or re-engagment of brake may become difficult.

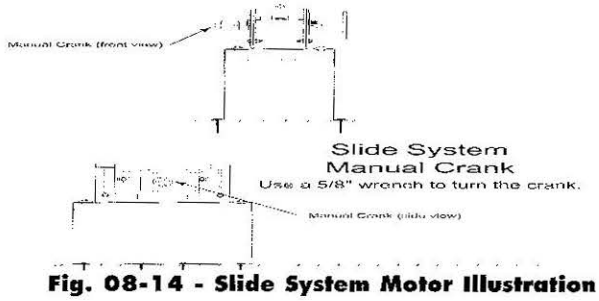


Fig. 08-14 - Slide System Motor Illustration

whenever it is activated. When your RV is not in use, it is suggested the unit be left off. See the manufacturer's information provided with your coach.

CO DETECTOR

This device sounds an alarm to alert you of the presence of carbon monoxide (CO) gas inside your RV (see Fig. 08-15). Carbon monoxide is an extremely dangerous, potentially fatal, tasteless and colorless gas. See the chapter on *Safety Considerations* for further

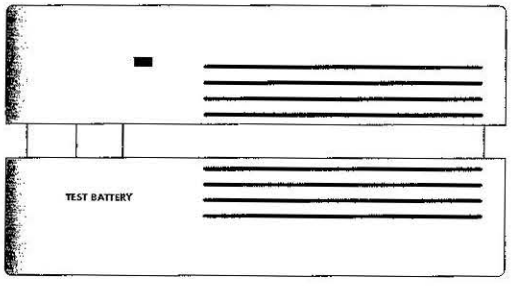


Fig. 08-15 - CO Detector

information on CO gas and what to do in the event it is detected. This detector is powered by batteries which must be checked regularly using the "Test Battery" button and replaced promptly when needed.

THERMOSTATS

Consult the information provided with your Basement Air Conditioner for units so equipped.

Duo-Therm Thermostat (Some Models)

Both the front roof air conditioner and the furnace are controlled at the main thermostat located in the galley hall area (see Fig. 08-09). *Note: Only the rear roof air conditioner is controlled at the wall thermostat located in the bedroom.*

To operate the cooling or heating features:

1. Place the Temperature Set Lever to the desired temperature level (located at the right side of the thermostat).

2. Select the fan speed (Hi or Lo) that best satisfies your needs.

3. Then, select the Fan Auto/On Switch operation.

The air conditioner compressor or heater will come On when cooling or heating is required and cycle Off when the temperature level selected is reached. Consult the thermostat manufacturer's user's guide and operating instructions for more information.

Comfort Control Center Thermostat (Some Models)

The thermostat controls the forced air furnace/s and the two roof air conditioners (see Fig. 08-11). Turn the unit on by switching the on/off switch to the on position.

To operate the furnaces:

1. Push the MODE push-button on the thermostat in the Comfort Control Center (CCC) until the FURNACE indicator on the Liquid Crystal Display (LCD) is illuminated.

2. Adjust or set the desired temperature.

3. To select the second furnace, depress the Zone button (option on 37' and longer models). Then adjust or set the desired temperature as shown above.

See the furnace manufacturer's documentation for further information.

To operate the air conditioners

1. Push the MODE push-button until the COOL indicator on the Liquid Crystal Display (LCD) is illuminated.

2. Depress and release the FAN push button to set your desired fan speed.

3. Adjust or set the desired temperature. After a delay of approximately two (2) minutes the A/C compressor will come on and the cooling process will begin.

INTERIOR ENGINE ACCESS

The engine may be accessed from the compartment inside the unit between the driver's and passenger's seats (see Fig. 08-16). Loosen the two screws located on the rearward vertical flange and the two screws located on the forward vertical flange of the engine cover. Remove the cover for engine access. When servicing is complete, reinstall the cover and replace the screws to ensure the seal.

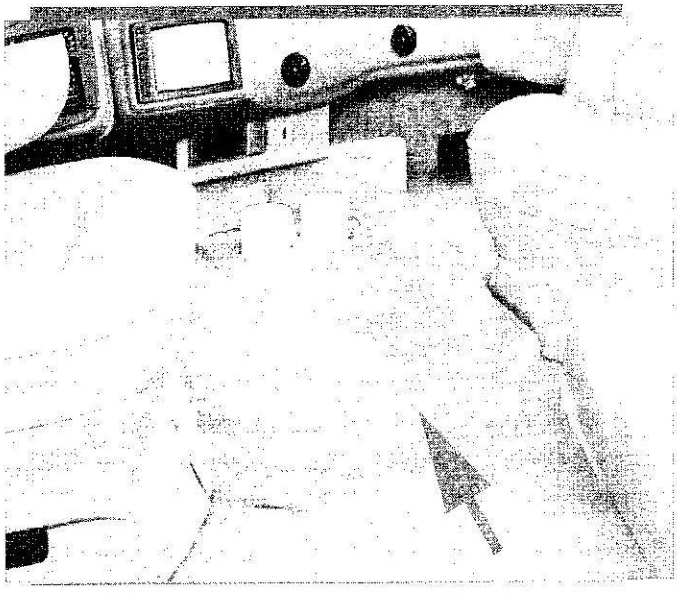
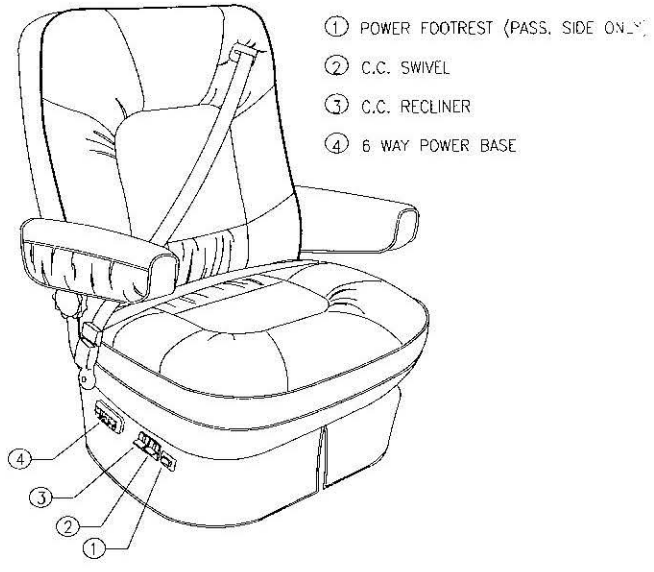


Fig. 08-16 - Interior Engine Access

⚠ WARNING ⚠

When replacing the engine cover, ensure that it is fully seated and the gasket seal is completed. Do not allow carpeting or other matting to interrupt the seal between the engine compartment and the interior. This could allow engine exhaust gases to penetrate into the coach interior creating a safety hazard.

4. To select the second air conditioner, depress the Zone button (option on 37' and longer models). Then adjust or set the temperature as shown above.



MISCELLANEOUS APPLIANCES

Additional appliances may be provided with your RV. This equipment will only work on 120-Volt AC power and they operate like those typically found in your home. *Note: For further information or details of operation, please review the information supplied with these products.*

Telephone Jack

Telephone jacks are typically located in the living room, at the computer workstation hookup and at the bedroom nightstand. These jacks are connected to a shore phone connection jack in the electrical service bay with the outside TV cable hookup. This phone jack can be connected to land telephone lines at home or in various campgrounds.

See the roof air conditioner manufacturer's documentation for further information.

COPILOT CHAIR

To turn the copilot's chair around to face the living area of the motorhome, make sure the seat is all the way forward.

CARE AND MAINTENANCE

Carpet Covering Care

Vacuum carpets after each trip. Clean any spills immediately; the longer they remain on the carpet, the deeper they set and the more difficult they become to remove. Remove stains with a standard household carpet cleaner. *Do not* use ordinary soap or detergent since it tends to leave a residue that attracts dust and hastens soiling. For stubborn stains, see a carpet cleaning specialist for advice.

Ceiling Fabric Care

Frequent vacuuming helps to maintain a soil-free surface. For cleaning and spot removal, we recommend the use of commercially available cleaners such as Woolite Carpet Cleaner®* or Chem-Dry®* (or equivalent). *Note: Follow the instructions as noted on the product label.*

Ceramic Tile Care

Usually cleaning with a solution of vinegar and water is all that is required. Never use abrasive cleaners or steel wool.

Corian® Countertops Care

Most dirt and stains can be cleaned with soapy water or ammonia-based cleaner. Watermarks can be wiped with a damp cloth and towel dried. Difficult stains should be cleaned with Soft Scrub®* or diluted bleach and a white Scotch-Brite®* pad. For further information, see the Corian®** care and maintenance guide included in the "Important Papers" packet.

Day/Night Shades Care

Use a mild detergent such as Ivory® with a white wash rag for spot cleaning only. *Do not* saturate with water or dry clean. Vacuuming can also help to clean the shades. Dry brushing and vacuuming are the best methods to prolong the life of your shades.

Shades should only be opened or closed by pushing the rails with the knobs provided; move only one rail at a time. Shades should remain up when not in use to aid in pleat retention. If tension adjustments become necessary, simply wind cords around venter of the bobbin fastener to tighten, or re-tie to loosen. Adjustments should be made equally on both cords for shade to remain level. Rubbing cords with parafin wax (or candle wax) will help lengthen the life of the cords by reducing friction and fraying.

Doors and Paneling Care

The interior cabinetry may be cleaned with a damp cloth. Periodically apply a coating of furniture polish to preserve the finish. Rub a good quality wood treatment into the solid wood cabinet doors. Clean vinyl-covered decorator paneling with a liquid household cleaner. *Do not* use solvents or abrasive cleaners as these could damage the decorated surfaces.

Draperies and Upholstery Care

Keep your draperies and upholstery looking fresh and clean by treating them like any upholstered furniture in your home. The fabrics used in your RV are not washable and should be dry-cleaned only. *Do not* launder. Seat covers may be spot-cleaned with a foam type spot remover. If overall cleaning becomes necessary, have the seat covers dry-cleaned by professionals.

Fixtures and Appliances Care

Follow the manufacturer's instructions for cleaning and maintaining the microwave, refrigerator and range top. *Note: The exhaust fan over the range has filters installed which must be cleaned periodically*

Table and Counter Tops Care

High quality decorative laminate counter surfaces have been selected for their durability and good looks. Regular cleaning with mild detergent will keep the surface like new. For general purpose cleaning, we recommended using any mild liquid dish washing detergent, diluted 25 to 1 in warm water; *do not* use them full strength. *Do not* use scouring pads to clean. *Do not* use your counter tops as cutting boards. The tops can be scratched. *Do not* place hot pots and pans directly on the surface.

Ultraleather HP™ Cleaning

Spot cleaning and regular care are virtually worry-free. Most stains and spills lift easily from Ultraleather HP™ using soap and warm water, tougher stains can be treated with mild cleaning fluids followed by a quick water rinse - with no worry about rings, water marks or discoloration.

Vinyl Cleaning

Use upholstery cleaner or a mild soapy solution. *Do not* use an abrasive cleaner.

Vinyl Floor Covering Care

Sweep or vacuum regularly to remove dirt and grit that can abrade, dull or scratch your new floor. Wipe up spills promptly with a damp cloth or mop. Wash your floor with Bright'N Easy No-Rinse Cleaner®*. Scuffmarks may be removed with Spray Fantastik®* Cleaner or Soft Scrub®* and a damp sponge.

**The term Bright'N Easy is a registered trademark of Congoleum Corporation. Clorox and Soft Scrub are registered trademarks of the Clorox Company. Fantastik is a registered trademark of Dow Brands, Inc. Scotch Brite is registered trademark of the 3M Company. Woolite is a registered trademark of Platex Products, Inc. ChemDry is a registered trademark of Harris Research, Inc.*

***Corian® surfaces may not be available on all models. Corian® is a registered trademark of Dupont Company.*

Notes:

CHAPTER NINE:
EXTERIOR COMPONENTS

OVERVIEW

Information provided in this chapter discusses some exterior components found on your RV and describes in detail the operation, care and maintenance of those items. Whenever a problem is encountered that is not covered here, it may be necessary to contact your authorized dealer for further assistance.

Vibration occurs through normal use of your unit. Screws may need tightening periodically. Use of a weatherproof sealer around all windows and door frames will prolong the life of the coach. Lubricating locksets, latches and hinges with graphite will help, too. If your unit is located near a beach or is otherwise exposed to continuous wet weather, more frequent lubrication may be required.

CLEANING AND WAXING TERMINOLOGY

Some useful terms related to cleaning and waxing your vehicle:

- *Cleaner:* Cleaning agents are classified into two broad categories, either friction or chemical. Friction cleaners use a silicate or clay particulate to smooth the surface and are usually described as fine, medium or heavy cut (when in doubt, always use the least aggressive product). Chemical cleaners are usually more effective at removing bugs, stains, tree sap and tar. Avoid silicone-based products as they can cause problems in the future.

- *Glaze:* This usually refers to a superfine friction type cleaning agent, usually including emollients and lubricating oils and sometimes even some mild chemical cleaners. Glazes will usually remove mild swirl marks and scratches as well as refresh the paint and smooth out the finish.

- *Polish:* A polish is usually a non-abrasive oil-based product and may or may not have a chemical cleaner included. Most polishes use fillers to help cover swirl marks.

- *Compound:* A compound is equivalent to using coarse sandpaper on your paint. Compounds should only be used if the paint is seriously degraded and all else has failed. Rather than using a compound, we recommend consulting a professional for assistance.

- *Clay:* Like a compound, using clay without professional assistance can cause expensive damage to your paint.

- *Cleaner/Wax:* These products are usually a combination of a chemical cleaner and a wax. Though it may save time, this product is doing two very different functions, cleaning and waxing at the same time, usually doing neither function well.

- *Wax:* There are two categories of wax, organic and polymer based. Organic waxes are derived from plants, such as carnauba, or from animals, such as bee's wax or paraffin. The polymer-based waxes are usually made in chemical factories.

- *Degreasers and Tar/Bug Removers:* These products are normally solvents designed to dissolve surface contaminants such as road tar and bugs. Most of these removers contain harsh chemical that may cause long-term damage to your paint.

IMPORTANT

Proper care of exterior surfaces of your unit not only keeps it looking its best, it also maximizes the longevity of all components.

Fig. 09-01 - Ensure catch is engaged on entry door for side entry models to avoid damaging the door or the sidewall when the door is open.

EXTERIOR FIBERGLASS CARE

Your RV has an exterior that is both rugged and functionally beautiful. Its smooth, aerodynamic finish is resistant to dents and scratches. By keeping the RV cleaned and waxed, the fiberglass exterior will maintain its original luster indefinitely. *Do not* use abrasives on exterior decals. The use of a wax or a polish with an ultraviolet protector aids in preventing deterioration of the exterior fiberglass. *Note: Only professionals should repair damaged surfaces. Your dealer or our factory will often be able to repair the damage. If not, check with your local automotive body shops.*

MOLDED PLASTIC PARTS CARE

Some of the exterior panels on your unit are Thermoformed or molded plastic parts. With proper care and attention, these engineered polymers can retain their brand new look for a long, long time. Centrex® is a weatherable polymer designed to resist color fading from exposure to sunlight. For normal cleaning needs the following commercial products are safe when properly used to clean these molded plastic parts: Fantastik®, Ivory Soap® (liquid or flake), Formula 409® and Simple Green®. For heavy-duty cleaning needs, the following is suggested: Soft Scrub®, household ammonia and/or mineral spirits. *Note: Avoid acetone or products that contain ketones or chlorinated hydrocarbons since these could damage the surface.*

**Centrex is a registered trademark of Bayer Corporation. Fantastik is a registered trademark of Dowbrands, Inc. Formula 409 and Soft Scrub are registered trademarks of the Clorox Company. Ivory Soap is a registered trademark of Proctor & Gamble Company. Simple Green is a registered trademark of Sunshine Makers, Inc.*

ENTRY DOOR & SCREEN CARE

The entry door to your RV is equipped with two locks and a separate screen door. When leaving your vehicle unattended, it is recommended that you engage the dead bolt lock for extra security. Be careful while opening your door until the door safety latch is securely in place. A gust of wind may catch the door and slam it against your vehicle. The entry screen door has its own hinge and can be opened separately by pulling it away from the magnet catch. Lubricate the door hinges and moving parts with light oil periodically. Use powdered graphite to lubricate both door locksets. Clean the screen door as you would at home.

ROOF & ROOF FIXTURES

The roof of your RV is clad in a rugged, flexible gel-coated fiberglass sheeting and long-lasting rubber coating on the slide-out rooms. Coat all seams and around roof vents once a year with a good quality RV roof sealer. Be sure the sealer used is recommended for use with your roof material. *Note: Refer to the Sealant Specification chart at the end of this chapter.* These materials are available from your dealer or RV store.

⚠ WARNING ⚠

Exercise extreme caution when using the rear ladder and when walking on the roof. Both the ladder and roof surface can be extremely slippery when wet. The use of chairs on the roof is not recommended. Do so at your own risk!

⚠ WARNING ⚠

The fiberglass roof top is extremely slippery when wet.

Visually inspect the roof of your RV at least twice a year to check for damage or seals that need replacing. When walked on, the roof of your RV will normally feel soft and have some flex or give. Small rocks or other items wedged into the soles of your shoes can damage the roof. Be sure to brush them off before walking on the roof. Keep your roof clean.

While you're inspecting the roof for water integrity, take the time to check the gasket under the air conditioner. If this seal is damaged, water can leak into the roof structure. Check this seal at least once a year.

IMPORTANT

Do not use cleaners or conditioners containing petroleum solvents, harsh abrasives or citric-based cleaners on your coach's roof.

Fiberglass Roofing

Fiberglass roofs weigh less than rubber roofs and are designed for lasting durability. Durable gelcoat covers the fiberglass, but it can become dull or faded as it weathers. Sunlight, heat and moist air can combine to oxidize the gelcoat surface, fading it and making the surface cloudy.

If the vehicle is kept dry and protected from the elements, then exposure is minimal and the fiberglass can be maintained every 6 months. However, if the vehicle is left in the elements under constant exposure, regular maintenance should be performed every 3 months. Without regular care and maintenance, fiberglass can begin to show signs of oxidizing in 4 to 12 months. There are many fine products on the market to treat and repair fiberglass roofs and oxidation; follow the manufacturer's directions.

Rubber Roofing

Rubber roofing, used on the slide out rooms only, is subject to "chalking" as it weathers and ages. In the roofing manufacturing process, fillers or pigments are used to give the rubber material its white color. As the rubber ages it begins to react to moisture, heat and sunlight, causing the fillers to rise to the surface. These fillers are carried to the surface and appear as white or gray powdery residue. Rain or moisture (morning dew) may mix with the fillers and flow down the vehicle forming white streaks. Chalking is a natural process and is not harmful to the roof material.

Most sidewall streaks can be easily removed with a good cleaner. For tougher stains on fiberglass and aluminum side panels, use a quality polishing compound or oxidation removal product. Of course the best thing is to prevent the chalking and streaking process altogether. A good rubber roof treatment can help prevent this process and minimize maintenance.

Before treating with a protectant, clean the roof with a Borax-type cleaner in water using a medium-bristle brush. Make sure you continually rinse with lots of clean water (from a hose). *Be very careful; rubber roofs are slippery when wet.*

Once the roof is clean, inspect the entire surface for holes, tears or separations. If you use a protectant, be sure it is free of petroleum distillates or citrus-based solvents.

For normal cleaning of the rubber slide-out roof, standard household products such as Formula 409® or mild detergent are sufficient. For stubborn stains, a rag dampened with mineral spirits is recommended. *Do not* soak the rag. An alternative would be using 20 Mule Team Borax® and a soft bristle brush. When cleaning, rinse thoroughly with clean water to avoid residue buildup on the roof or streaks on sidewalls of

the vehicle. Try not to park where fruit or tree sap may stay on the roof for extended periods of time because it may result in unremovable stains. *Note: A special cleaner and conditioner is available through our Parts Department.*

Minor Roof Repairs

Pinholes, cracks or small open areas may develop around roof openings used for vents and accessories as time goes by. Inspect these areas carefully to determine what maintenance may be needed. For holes 1/2"-inch or smaller, a good non-setting type sealer will do the job. *Do not* use silicone on rubber roofs. Clean all the dirt from the area before applying the sealer. Make sure that the sealer adheres to both the roof material and the edges of accessories (including screw heads).

Larger holes and rips can be repaired using a rubber-roof patch kit. These kits usually employ sections of rubber material precoated on one side with an adhesive. To use, follow the manufacturer's directions or consult a professional.

**20 Mule Team Borax is a registered trademark of Rio Tinto Borax Co. Formula 409 is a registered trademark of the Clorox Company.*

AWNINGS & SLIDE TOPPERS CARE

- Whenever an awning is wet while rolled up roll it out and let it dry before rolling it up again as soon as conditions permit. *Note: This will help prevent mildew and rotting.*
- Always ensure that the patio awning is extended completely before opening the entry door to avoid damaging the awning.
- When operating the window awning, grasp the loop on the pull strap and pull down to extend the awning. Hook the loop onto the window strap hanger to support it.

IMPORTANT

When deploying the awning, do not release the strap since the awning is under tension and it may snap back and damage the vehicle or cause bodily harm.

- The slide topper awning will automatically open and close as your slide-out room opens and closes. It was designed to protect the top of your RV slide-out room from weather and debris. *Note: Always check for and remove debris on the awning before retracting the slide-out room.*

CAUTION

Do not operate your Slide Topper in snowing or freezing-rain conditions. Such use will prevent the awning from retracting with the slide room and possibly damage the awning and/or room.

- The slide topper is not intended to be 100 percent waterproof due to drips and condensation. Because the awning canopy is level, water may collect on the top. As the slide-out room is closed and the awning rolls up, these puddles will spill over the sides of the awning.
- Complete operating instructions for your awnings are provided in the "Important Papers" packet supplied with your RV.

EXTERIOR STORAGE COMPARTMENTS

Your unit is equipped with "D"-ring tie downs in the exterior storage compartments. These rings are designed to allow equipment and personal belongings to be secured to the floor of the compartment. The rings are rated at 200lbs.; please plan storage with this in mind.

Exterior Entertainment Center

Your unit may feature the Exterior Entertainment Center. The center is located in a lower compartment. Always remember to securely close and latch the compartment when traveling to avoid damage to the center. For complete operating instructions, consult the manuals and guides for each of the components, included in your "Important Paper" packet.

WASHING THE EXTERIOR

Before washing the exterior, be sure windows are closed and locked. Close all doors and vents and lock storage compartments so water will not get into them. Wash the exterior with a mild soap solution, rinse thoroughly and dry. *Never* use strong alkaline cleaners and abrasives. *Do not* spray water directly into refrigerator grille, furnace vents, window weep holes or similar openings.

Wash the windows with warm soapy water and dry with soft cloths. Commercially available cleaning products like Windex®* (or equivalent) is recommended when used at proper dilution ratios. Avoid using any abrasive cleaning tools or rough pads; these can scratch the glass and the painted aluminum frames.

*Windex is a registered trademark of SC Johnson Company.

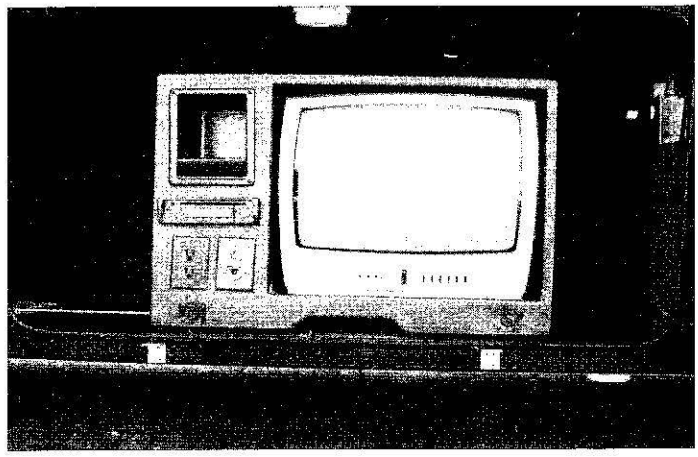


Fig. 09-02 - Exterior Entertainment Center

EXTERIOR GRAPHICS CARE

Today's finest pressure sensitive graphics have been professionally applied to your vehicle. These graphics require little maintenance and should be treated similarly to a painted surface.

- *Wash your graphics* with plain soap and water or any car wash soap. Rinse thoroughly with clean water.
- *Keep high pressure* nozzles at least 1 1/2 feet from the edge of the graphics. High pressure spray may cause the edge of the graphic to peel.
- *Test any* cleaning solution on a small section of the decal before using.
- *Do not* use any aromatic solvents such as acetone, M.E.K., toluene, paint thinner or lacquer thinner on your graphics. Solvents may soften or smear colors.
- *Do not* overcoat the graphics with clear paint or paint over the graphics.
- *Do not* let gasoline or other fuels drip or stay on graphics for any length of time. If a spill occurs, wipe it off and rinse it with water immediately.
- *Do not* apply wax over graphics - especially if

EXTERIOR SEALANTS SPECIFICATIONS CHART

Windshield	Sikaflex 255FC
Roof components (Rubber roof only, slide rooms)	Carlisle 502-LSW
Roof components (Fiberglass)	Colorimetric Silicone Sealant
Exterior components	Colorimetric Silicone Sealant
Holding tanks fittings	Carlisle 502-LSW
LP-Gas, threaded black pipe	Rectorseal No 5
Fresh water fittings	Teflon tape

the wax contains any petroleum distillates. Wax that has dried between stripes can be removed by softening it with rubbing alcohol and cotton swabs. Be sure to rinse the area with water after cleaning.

- *Care and caution* should be taken when storing your vehicle. Vinyl graphics and other items such as dashboards, tires and flexible rubber products will have a shorter life expectancy when exposed to severe heat and sunlight. Protection of graphics from prolonged direct sunlight will ensure an extended life.

EXTERIOR PAINT CARE

Care for the painted exterior of your RV much the same way as you would care for your automotive finish.

- For cleaning, use a natural pH soap designed for automotive finishes.
- *Do not* use household detergents to clean your RV as they are formulated to remove grease and to scour metal and porcelain. Therefore, they will also remove the wax or polish on the painted surface and accelerate the process of oxidation.
- Make sure the paint surface is cool to the touch and wash the vehicle from the top down.
- Follow the automotive soap manufacturer's instructions regarding the amount of soap to use; the tendency is to use too much.
- Dry the vehicle using a chamois or a terry cloth towel. Excess water in grooves and around fittings may be removed by driving the vehicle a short distance.
- Apply a good quality wax at least every six (6) months. Consult the manufacturer's instructions for more information.
- *Do not* use a rotary buffer. They are often used improperly and can damage the surface.
- Consult a professional for more information.

SEALANTS

The sealants used in the fabrication of your RV will require continual maintenance. Inspect around the doors, windows, moldings and roof components on a regular basis. If any defects are discovered they should be repaired immediately. Proper sealants can be obtained through your dealer or the National RV Parts Department. (See the Service Interval Chart in Chapter 11 for more details.)

Inspect Seals

Precipitation and temperature changes have an effect on the seals on your RV. Inspect the seals on your RV at least every six months. The seals will need to be inspected more frequently in extreme weather conditions. To inspect the seals, walk around the outside of your vehicle and on the roof. Take a close look anywhere where there is an opening or seam in your walls and roof. This includes around doors, windows, vents, etc. Check for these signs of bad seals:

1. Missing strips of sealer.
2. Wear spots at joints where multiple body segments come together.
3. Peeling sealer.

One of the most common sealer problems is found if the RV was sealed with putty tape. Look for an oily residue around the putty tape: this is symptomatic of degradation. Dust adheres to the residue, leaving a dirty smear. A common spot to find putty tape issues is around the windows. If you find putty tape creeping from under window gaps, look for further gaps around other windows.

We recommend taking your RV to your service center and having bad seals replaced by a professional.

Minor Repair Tools

For minor sealant repairs and replacement the following tools are needed:

1. Plastic putty stick. Using any scraping tool other than a plastic putty stick may do damage to your RV's finish.
2. Denatured alcohol (for cleaning off any leftover residue).
3. Sealant. For rubber roofs, do not use a silicone sealant. For rubber-to-fiberglass and metal-to-metal applications, we recommend you use a pliable silicone sealer.
4. Good quality sealant gun.

Minor Repair Procedures

When making minor repairs to the sealants on your RV, the following procedures are recommended:

Strip away all the bad sealer. Use your plastic putty stick to gently scrape away the old sealant. Once you have the area cleared, clean it with denatured alcohol.

Run a bead of new sealer. Cut the nozzle of your sealer tube at a 23-degree angle, and be sure it is the same size as the bead you want to run. As you begin to run a bead, keep the silicone even with the front of the tube. Don't let it build up a bead in front of your progress. This will ensure a good seal, and an attractive bead.

As you reach the end of your workspace, anticipate the end of the bead and release pressure from the gun handle early so you don't end up with a lot of extra bead at the end.

Clean-up excess sealant.

If you spill sealer, it can usually be cleaned with soap and water, if you catch it immediately. Always

CHAPTER TEN:
STORAGE & COLD WEATHER OPERATION

GENERAL STORAGE NOTES

Information in this chapter will provide tips for placing your vehicle into storage and how to operate under cold weather conditions. These are just guidelines; we suggest you contact your authorized dealer for further suggestions suitable for your local climate conditions.

Storage Checklist

- Thoroughly clean the interior of your RV including all fixtures and appliances (see the *Interior Components* chapter for recommendations).
  - Clean both the refrigerator and freezer; leave the doors slightly ajar. *Note: An open box of baking soda will help absorb any odors.*
  - Remove all perishable food from the refrigerator and the galley.
  - Close all shades and apply window coverings to reduce the effects of fading on carpets and upholstery. *Note: Don't forget to cover the windshield.*

IMPORTANT

Thoroughly inspect your coach for possible leaks before the winter season or placing the vehicle in storage. National RV cannot be held responsible for any damage when a coach is left unattended for extended periods of time.

- Drain and flush the holding tanks and drain the water system (see the *Plumbing Systems* chapter).
  - Turn off the water pump, water heater and icemaker switches (see the *Plumbing Systems* chapter).
  - Check the vehicle and auxiliary batteries for charge prior to storage. Clean battery terminals if necessary (see the *Maintenance* chapter).
  - Turn off the master battery disconnect switch (see the *Electrical Systems* chapter).
  - Prepare the electrical generator following the manufacturer's instructions.
- Turn off the service valve(s) on the LP-Gas tank (see the *LP-Gas System* chapter).
  - Turn off all LP-Gas appliances including the water heater, refrigerator, stove and furnaces (see the *Interior Components* chapter).
- Check engine oil, transmission fluid and coolant levels prior to storage. Refer to the chassis owner's manual for instructions.
- Wash and wax the exterior of your vehicle (see the *Exterior Components* chapter).
  - Cover or close off all exterior appliance vents to prevent entrance by rodents or insects. *Note: Be sure to remove these coverings before reusing your appliances.*
- Park your unit on flat, level ground in a protected environment.
  - Block front and rear wheels and leave the parking brake in the "ON" position (see the *Driver's Controls* chapter).
- Store your unit in a garage or building, if available.
  - Purchase and use an RV tarpaulin or fabric covering to help protect your investment.
- Close and lock all windows and doors and set your alarm if your unit is so equipped.

Additional Tips for Extended Storage

- Remove the vehicle and auxiliary batteries and place them in storage; unused batteries will discharge themselves if left connected.
- Drain old engine oil and replace with a new filter and oil (see your chassis owner's and maintenance manuals).
- Add an antioxidant additive to the fuel tank to keep the fuel from deteriorating.
- Start and run the engine and air conditioner for about 15 minutes every 30 days.
- Check your tire pressure and install coverings for your tires when not stored inside a garage. *Note: Rubber tires age faster when not used and coverings will eliminate direct ultraviolet sunlight on tires to reduce sidewall cracking.*
- Cover the roof air conditioner shrouds and refrigerator vent cover if your unit is not completely covered.
    - Slight openings of vents will allow air circulation without worry of water entering. Leaving an air freshener agent will minimize odors from plastics and other materials.
- Check for cracked or peeled sealants around doors, windows and moldings. Replace as necessary following the instructions in the *Exterior Components* chapter. Spraying silicone on mechanisms will minimize the effects of corrosion.

Starting Up After Storage

If you prepared your RV for storage properly, start-up again should be easy. Basically, reverse operations from the storage checklists as follows:

- Remove all tarpaulins and coverings. Look for any water damage.
    - Inspect the outside of your RV. Look for any damage or animal nests in the wheel well areas or engine compartment.
- Install the batteries if removed. Refill the electrolyte solution if low and recharge batteries as required.
- Test the CO detector and verify the operation of the LP-Gas detector and smoke detector.
- Check the air pressure in the tires and inspect for damage.
- Check the engine oil, transmission fluid and coolant levels (see your chassis manuals for more information).
    - Start the engine and verify all instruments and gauges are working properly.

> **⚠ WARNING ⚠**
> ***Do not*** *operate the engine or generator while your vehicle is parked inside a garage or other enclosed structure. Injury or death can result from carbon monoxide asphyxiation.*

- Start-up all appliances and verify proper operation.
    - Prepare the generator for operation by following the instructions in the manufacturer's operation manual. Start and run the generator. Check for leaks.

- Sanitize the fresh water system as per the instructions found in the *Plumbing Systems* chapter. Fill the water tank and start-up the system again. Check the monitor panel operation and verify that all levels are proper.

COLD WEATHER OPERATION

Although your RV has been designed for year round recreational use, extreme cold weather conditions may render the RV temporally uninhabitable and may necessitate taking supplemental steps to assure maximum comfort levels are maintained. To prevent potential freezing of water or drain lines, it may become necessary to supplement the RV heating system installed in your RV. Also, it may become necessary to add antifreeze to the holding tanks and blanket insulation materials to any piping susceptible to freezing in storage areas or exposed to the elements. *Note: Keep in mind that your RV is not designed to be a permanent dwelling for long term use in freezing and subfreezing temperatures.*

⚠ WARNING ⚠

NEVER USE THE RANGE OR OVEN FOR SUPPLEMENTAL COMFORT HEATING! The range or oven should only be used for cooking purposes and then adequately ventilated by opening a roof vent or window. All other gas appliances in the RV are vented to the outside and are safe to use continuously. Do not use charcoal grills or any fuel-burning appliance for comfort heating inside the vehicle. They could cause a fire or asphyxiation. Note: All supplemental heating devices must be installed in accordance with the manufacturer's installation instructions and all applicable codes and regulations.

Winter Traveling Tips

- Stay where 120-Volt AC electricity is available since even fully charged batteries last only about 15 hours in freezing weather. If shore power is not available, run your generator to recharge the batteries.
  - Make use of the engine block heater when 120-Volt AC power is available.
  - If 120-Volt AC is not available, use as little electricity as possible.
  - Service and prepare your generator for cold weather operation per the manufacturer's instructions.

IMPORTANT

Operate the furnaces to keep the temperature in your RV above freezing. Note: The furnace supplies heat to both the interior of your RV and the water tank and holding tank compartment simultaneously. This will help keep your water system and the holding tanks from freezing.

- Check your automotive radiator solution to ensure that the anti-freeze mix is at the recommended level for the anticipated temperature.
- Check electrolyte levels and make sure that the batteries are fully charged. Batteries will self-discharge quickly if not used for a period of time. *Note: Remember that battery water (electrolyte) will freeze at low temperatures.*
  - During cold weather, a common cause of furnace failure is insufficient power from the batteries. *Note: Keep your batteries fully charged.*

- Leave cabinet doors slightly open at night to allow air to circulate in and around the interior of the cabinets.

- To receive the full benefits of your heating system, do not block furnace heat registers.

Controlling Condensation

Condensation is caused by excessive humidity inside your RV during wet or winter conditions. Because cold air holds less moisture than warm air, the air immediately adjacent to the cold outside walls and windows cools down and causes water vapor to condense into moisture droplets that fog up your windows while the warmer inside surfaces remain dry. You can control or reduce the effects of condensation during cold weather by taking the following steps:

- Provide adequate ventilation by occasionally opening a roof vent or window slightly.

- Keep the interior air circulating by operating fans to bring in drier outside air and improve overall circulation by cross-flow circulation.

- Operate the range hood fan and the ceiling exhaust fan while cooking. Use the bath vent and fan when bathing to carry out the steaming vapors.

- Use a small dehumidifier to reduce condensation when extremely cold weather makes outside ventilation impractical.

- Positive air ventilation while driving is accomplished by setting the dash heater/air conditioning controls to the VENT position.

Winterizing the Water System

Complete winterizing procedures are found in the *Plumbing Systems* chapter.

Notes:

CHAPTER ELEVEN:
MAINTENANCE

The maintenance information provided here is a supplement to your chassis manufacturer's maintenance schedule and is not intended to be a a replacement. Please follow the required scheduled maintenance because it is deemed essential to the life and performance of your vehicle. Use only the recommended fuels, lubricants, fluids and service parts. The *Service Interval Chart* presented here is provided to assist you in the care and maintenance of your RV. The time spent performing this service on a regular basis should provide your RV with extended service life. Remember when you are encountering difficulties, consult your servicing dealer or call the National RV Service Center for assistance.

CHASSIS CHECK LIST

- Your RV chassis, like all fine vehicles, requires regular maintenance for long and trouble-free service. Study your chassis owner's manual for suggested maintenance intervals and for detailed instructions.
- Check the coolant level at least once a month when the engine is cool. If coolant is necessary, add water and antifreeze mixture as recommended.
- Check oil level frequently. Avoid operating the engine with the oil level below the "add" mark on the dipstick. Use only the chassis manufacturer specified oil.
- Other day-to-day care includes checking and maintaining the chassis and coach batteries. Check the fluid level (when not sealed) in the battery cells monthly. Remove corrosion around terminals by rinsing them with baking soda. After cleaning, coat the terminals with battery grease to dissipate corrosion.
- Keep the windshield washer reservoir filled with water and windshield washer solution.
- Check your brake fluid level. Add only the chassis manufacturer recommended brake fluid.
- Satisfactory operation of your automatic transmission requires the use of automatic transmission fluid meeting the chassis manufacturer specifications.
- Visually inspect the tires daily and have the air pressure checked regularly. Always keep the tires inflated as recommended by the tire manufacturer. Tire pressure lower than recommended will reduce tire life. Higher tire pressure will tend to give a harsher ride.

Interior Engine Access

The engine may be accessed from the compartment inside the unit between the driver's and passenger's seats. Loosen the two screws located on the rearward vertical flange and the two screws located on the forward vertical flange of the engine cover. Remove the cover for engine access. When servicing is complete, reinstall the cover and replace the screws to ensure the seal.

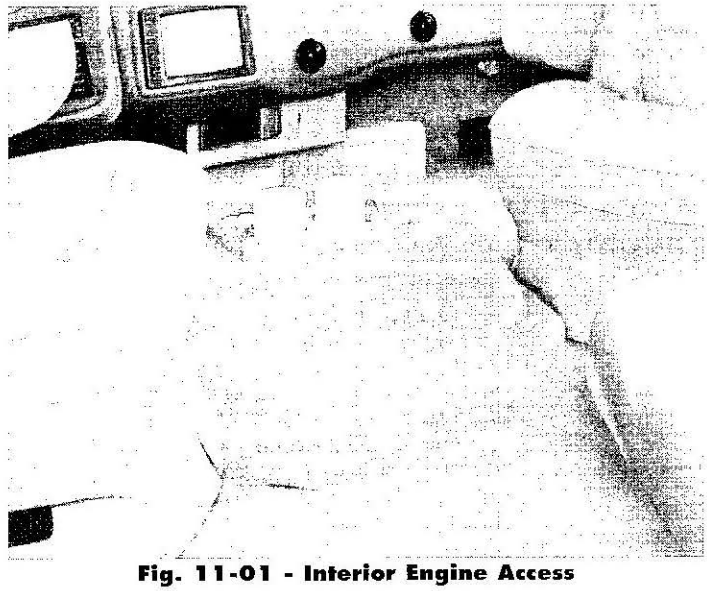


Fig. 11-01 - Interior Engine Access

IMPORTANT

When replacing the engine cover, ensure that it is fully seated and the gasket seal is completed. Do not allow carpeting or other matting to interrupt the seal between the engine compartmen t and the interior. This could allow engine exhaust gases to penetrate into the coach interior creating a safety hazard.

Radiator Coolant

The engine coolant level should be checked daily. To check the coolant level in the radiator, open the rear access and visually check the level of the coolant in the reservoir bottle. To add coolant, remove the top of the reservoir bottle and add coolant to the bottle. *Note: Do not remove the radiator cap. Check the chassis maintenance manual for detailed instructions.*

The coolant system should be flushed and new coolant installed if the engine overheats, if foaming is observed in the radiator or if the cooling system becomes contaminated. Also, coolant should be changed as part of proper maintenance according to the recommended interval stated in your chassis manufacturer's owner's manual.

Engine Oil

The engine oil level should be checked daily and with each fuel fill-up. Additionally, engine oil should be changed according to the recommended intervals found in the chassis manufacturer owner's manual.

To check the oil level in the engine, open the rear access and pull the dipstick and check the level. To add oil to the engine, remove the filler cap next to the dipstick. For detailed information on the location and procedure, consult your chassis owner's manual.

⚠ WARNING ⚠

Do not attempt to remove the radiator cap when the engine is hot. Hot engine coolant will be under pressure, and will spray upon removal of the cap, resulting in serious injury. Check coolant level at the surge tank before the engine is hot.

Transmission Fluid

To check the fluid level in the transmission, open the rear access and pull the dipstick and check the level. Fluid may be added through the dipstick port. Check the chassis maintenance manual for detailed instructions.

Belts & Hoses

Belts and hoses should be given at least a cursory inspection at every refueling and a more thorough inspection every 3,000 miles. Check for cracks, tears, loose clamps and other damage.

Check the serpentine drive belt for intersecting cracks. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect the transverse cracks are not acceptable. Replace the belt if it is frayed or has pieces of material missing.

Fuel Filters

If a problem is encountered with supplying fuel to the engine, check to see if the electrical fuel pump is running when the engine is running. If the pump runs, check the fuel filter in the line between the electric fuel pump and the engine.

Fuel Filter/Water Separator - The remote fuel filter/water separator should be checked on a daily basis and drained if necessary. The separator can be found behind the engine air intake when opening the service bay door. *Note: Follow the drain and replacement procedure found in the chassis manual.*

OTHER SERVICE AREAS

Batteries

Check and maintain the chassis and coach batteries regularly. Check the fluid level (when not sealed) in the battery cells monthly.

To thoroughly clean your batteries and terminals, the following procedure is recommended:

1. Individually remove electrical connection(s) from the battery terminal post(s). We suggest cleaning only one battery at a time to avoid improper connections when replacing the wires.

⚠ WARNING ⚠

Due to the precise tolerances of diesel injection systems, it is extremely important that fuel be kept clean and free of dirt or water, which can cause severe damage to both the fuel pump and the fuel injectors.

2. Spray the top of the batteries with battery cleaner. The cleaner should react with any acid on the battery surface. Let it foam for 2-3 minutes. Rinse batteries with water until the cleaner is completely removed.

3. Wipe batteries dry with towels. Reinstall electrical wires to proper terminal posts. First, install the battery cable connector(s) with a flat plate washer and finally a lock washer with nut. Tighten the connection to ensure good electrical contact, approximately 10-13 ft.-lbs. torque.

4. Apply an anti-corrosion aerosol spray to all cable connection(s) and terminal posts only. *Caution: Protect all surfaces from overspray!*

Tires

Visually inspect the tires daily and have the air pressure checked regularly. Tire pressure lower than recommended will reduce tire life. Higher pressures will tend to give a harsher ride. Always keep tires inflated as recommended by the tire manufacturer.

Windshield Washer

To check the liquid in the windshield washer reservoir, pull out the generator caddy at the front of the unit and observe the liquid level in the washer reservoir located on the co-pilot's side frame rail. Washer fluid may be added to the reservoir by removing its top.

Air System Moisture Ejection

Compressed air from the air compressor is delivered to the air dryer where moisture is removed. Accumulated moisture is regularly expelled from the air dryer onto the ground beneath the coach. This accounts for the occasional air discharge heard.

Assess the effectiveness of air dryer operation every 6,000 miles or six months, whichever comes first, by checking for moisture in the compressed air system. Low-point air system drain valves are located on the pilot's side firewall. Pull out the generator caddy to access the valves. Open the valves and look for the presence of water as air escapes. The desiccant cartridge functions as a drying agent for the system. If moisture is present, the desiccant cartridge may require replacement. Have the desiccant cartridge inspected and/or replaced by an authorized service technician.

Air Cleaner (Indicator)

The purpose of the air restriction indicator (*Filter Minder*, see Fig. 11-01) is to notify you when to change your air cleaner. The indicator can be found in the power cord service bay or the rear engine compartment. Replace the air cleaner element after the first six months, and thereafter, replace it when the yellow indicator line reaches 20" vacuum or every two years regardless of mileage. After the air cleaner is replaced, press the rubber button on the bottom of the restriction indicator to reset it. *Note: The chassis manual will provide instructions on how to change the filter.*

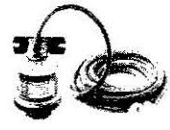


Fig. 11-01 - Filter Minder

Brake Fluid

Check the chassis manufacturer's owner's manual for the location of the brake fluid reservoir and filling information.

Power Steering Fluid

Check the chassis manufacturer's owner's manual for the location of the power steering reservoir and filling procedures.

TROUBLESHOOTING CHART

The following chart will assist you in the safe and proper operation of your RV. Also, look at the various manufacturers' operating manuals for detailed maintenance and troubleshooting instructions for the specific appliance or component.

COMPLAINT/PROBLEM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
12 Volt DC appliance failure	Insufficient voltage	Check the monitor panel for adequate battery voltage; if the voltage is too low, turn the generator or shore power ON and recharge the battery. With 120 Volt AC power ON, try turning the appliance in question on again.
	Tripped Circuit Breaker	Reset manual breaker. See the *Electrical Systems* chapter of this manual for details.
	Defective Appliance	Check the appliance manufacturer's owner's manual for specific troubleshooting suggestions. If needed, take the appliance to your authorized servicing dealer for repair or replacement.
120 Volt AC appliance failure	Insufficient voltage	Low shore power voltage may be due to line loss. Try running appliances from the on-board generator. Check battery voltage readings at the inverter/charger remote panel indicator.
	Tripped Circuit Breaker	Try resetting the breaker at the main distribution panel or press the reset buttons at the inverter/charger.
	Defective Appliance	Check the appliance manufacturer's owner's manual for specific troubleshooting suggestions. If needed, take the appliance to your authorized servicing dealer for repair or replacement.
No Fresh Water	Empty water tank	Verify that the water selector valve in the plumbing service compartment is turned to City Water. Check the tank level at the monitor panel, then fill tank if it is low.
	Water pump not operating	Verify that the pump switch is ON and check battery voltage at the monitor control pannel. Check the12 volt breakers in the Battery Control Center. If the pluger is poped out, push RESET. Take the unit to your authorized servicing dealer.
	Water pump filter clogged	The water filter may need cleaning if it has become clogged with filtered sediment and is restricting flow.
Generator Not Working	No Fuel	Check the fuel tank level at the dash panel. The fuel level may be below the generator's fuel pickup. Fill the fuel tank.
	Blown Fuse	Check fuse on generator and replace if necessary.
Engine, Transmission or Chassis	Any Problem	Check your chassis, engine and/or transmission owner's manuals for operating details and troubleshooting tips. Take the unit to your authorized servicing dealer.

SERVICE INTERVAL CHART

DESCRIPTION	W	M	Q	S	A	ET	SS	ES	SI
Chassis Service									◆
Inspect battery, check electrolyte level	◆					◆			
Inspect tires & check air pressure	◆					◆			
Check exterior lighting for proper operation				◆			◆		
Check & inspect safety equipment: LP-Gas and CO detector, fire extinguisher, smoke alarm		◆				◆	◆		
Inspect generator exhaust system		◆				◆	◆		◆
Inspect all seatbelts for any damage					◆	◆			
Inspect LP-Gas system for leaks		◆					◆	◆	
Sanitize water system			◆				◆		
Flush black tank, add chemicals						◆			◆
Clean stove hood and A/C filters			◆						
Inspect & clean LP-Gas appliances, vents, refrigerator, water heater & furnaces				◆			◆	◆	
Service appliances as required: generator, refrigerator, roof A/C units							◆		◆
Wash exterior of vehicle			◆			◆			
Wax & polish exterior					◆				
Inspect, check & repair all sealants: Doors, windows, moldings & roof				◆			◆	◆	
Inspect & lubricate slide-room drive shaft/roller areas & rubber seals			◆				◆		
Lubricate doors, window tracks & key lock sets				◆			◆	◆	
Vacuum & clean carpets		◆							
Clean drapery, fabrics & upholstery				◆			◆		

W = Weekly
M = Monthly
Q = Quarterly
S = Semi-annually
A = Annually
ET = Every trip
SS = Start of season
ES = End of season
SI = Special interval (at either a specified mileage or hours of operation)

ENGINE OIL

Engine oil does a lot more than just lubricate the engine, it also cools hot engine parts. It also keeps engines free of rust and deposits, seals rings and valves against leakage and, with the oil filter, removes metallic contaminants and other foreign matter.

Picking Motor Oil

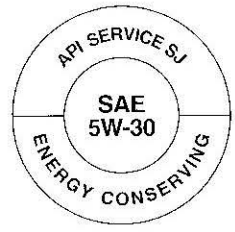
Motor oil standards are based on viscosity and performance. The Society of Automotive Engineers (SAE) sets up oil standards based on viscosity. Viscosity on the bottle of oil at your parts dealer is the SAE 10W-30 numbers. Performance standards are set by the American Petroleum Institute (API) and are based on engine type. Only purchase a motor oil that is SAE and API inspected and labeled. (See the illustrations of the API donut and starburst.)

Viscosity is the most important property for engine oil. It refers to how flowable the oil is and how flowable it stays as the temperature increases. Thicker oils generally have higher viscosity, and thinner oils lower viscosity. An oil with a low viscosity might shear and loose film strength at high temperatures, while one that is too high might not pump oil to all the parts of the engine at low temperatures.

The weights given on oils are numbers assigned by the SAE. These numbers correspond to real viscosity as measured by the SAE. Oils that fall into a certain range are designated 5, 10, 20, 30, 40, 50 by the SAE. The W means the oil meets specifications for viscosity at 0 degrees F and is therefore suitable for Winter use.

API "starburst"

The API Certification Mark "starburst" is designed to identify engine oils recommended for a specific application (such as gasoline service). An oil may be licensed to display the starburst only if the oil satisfies the most current requirements of the International Lubricant Standardization and Approval Committee (ILSAC) minimum performance standard for this application.



API "donut"

The API Service Symbol "donut" is divided into three parts:
The top of the donut shows the oil's performance level for gasoline and/or diesel engines. The letter "S" followed by another letter (for example, SJ) refers to oil suitable for gasoline engines. The letter "C" followed by another letter and/or number (for example, CH-4) refers to oil suitable for diesel engines. These letters officially stand for "Service" and "Commercial."
The center of the donut shows the oil's SAE viscosity grade. Operators should refer to their owners manuals to select the proper viscosity oil for the ambient temperature and operating conditions at which the equipment will be used.
The bottom of the donut tells whether the oil has energy conserving properties when compared with a reference oil in an engine test. Oils labeled as "Energy Conserving" have passed this test. Widespread use of engine oils with this designation should result in an overall saving of fuel in the nation as a whole, but a particular vehicle operator may not experience a fuel savings as a result of using these oils.

Polymers are added to the base oil to create multi-viscosity oil. At cold temperatures the polymers are curled up and allow the oil to flow as their low numbers indicate. As the oil warms up the polymers begin to unwind into long chains that prevent the oil from thinning as much as it normally would. Another way of looking at multi-viscosity oils is to think of a 20W-50 as a 20 weight oil that will not thin more than a 50 weight would when hot. Always use a multi-grade with the narrowest span of viscosity that is appropriate for the temperatures you are going to encounter. In the winter base your decision on the lowest temperature you will encounter, in the summer, the highest temperature you expect.

Almost all petroleum oil manufacturers produce their own brand of synthetic oil. When compared to petroleum-based oils, synthetic oils offer superior high-temperature protection, higher film strength, a very low tendency to form deposits, a stable viscosity base, and better low-temperature flow characteristics. In addition, synthetic oils also offer reduced wear and friction, which can have the side benefit of a slight increase in engine power and fuel economy. Synthetic as well as petroleum oil starts with a base stock of oil and then adds in a viscosity improver and an additive package to achieve the results the oil manufacturer requires. Some synthetic oils are so good that they require no viscosity improvers to achieve a 10W-30-viscosity rating. The fewer additives added to the oil the less there is to deteriorate and leave deposits inside your vehicle's engine.

Motor Oil Myths

Myth: If the oil turned dark or black in the engine, it's no good. You can tell the condition of the oil by the look, smell or color. Dirty or black oil means the oil is breaking down.

Fact: If the oil is doing its job, the oil removed from the engine should be dirty. In fact, the oil should be keeping soot, dirt and other contaminants suspended in it to be carried to the oil filter, and removed when the oil is changed. New oil should start to look dirty very quickly, in fact, in diesel engines, it's not uncommon for the oil to look dirty within a few hours of operation.

Myth: I broke in my engine on Brand X; I can't switch oil brands.

Fact: It's ok to change oil brands any time as long as the new brand meets the requirements of the engine manufacturer.

Myth: You can't mix brands of motor oil.

Fact: Mixing brands isn't the best thing to do as all brands are formulated differently and they might not be as efficient when mixed. However, it is more important to keep the oil filled to the proper level. If your brand is not available when you need a top off, be sure to top off with the equivalent quality oil of another available brand.

Myth: Motor oils can cause sludge.

Fact: Poor quality oil can contribute to sludge which is a combination of dirt, soot, partially burned fuel, oxidized motor oil, leaked coolant and condensed water vapor. All of these things are usually present, but a good quality motor oil keeps them suspended so they can be removed either by the filter or during an oil change.

Myth: My engine will benefit if I use supplemental additives.

Fact: Oil additives should not be used. The oil companies work with engine manufacturers to create oil that meets the vehicle's requirements. If you add anything to the oil you may upset this balance and prevent the oil from performing to specification.

Myth: The "normal" oil change intervals recommended by engine manufacturers are conservative and I can safely extend them.

Fact: The normal change intervals in the owner's manuals are not conservative. Engines have become more demanding of the oil, but recommended intervals have not shortened. We advise against exceeding OEM engine oil drain interval recommendations for your type of service.

Myth: Motor oils made with certain base stocks are better than others.

Fact: Always look for the American Petroleum Institute (API) "donut" and "starburst" on quart containers of motor oils. These symbols mean you are buying quality motor oils that meet the requirements set by the API.

Myth: The "Energy Conserving" label on oil is just a marketing gimmick. I never see fuel savings.

Fact: The American Petroleum Institute has set specific fuel economy standards for engine oils. In order for an oil to be labeled "Energy Conserving," it must show specific improvement in fuel economy over a standard reference oil in the same engine operated under controlled conditions.

CHANGING THE OIL

Important reminders:

Before changing your oil, refer to your engine manufacturer's owner's manual for specific instructions and precautions.

Always dispose of used motor oil properly, either at a local auto parts store or service center.

Most manufacturers recommend changing the motor oil in your engine every 3,000 miles.

Most manufacturers recommend a specific type of motor oil, or motor oil grade be used. In fact, if the wrong oil is used it can void your warranty.

Always wear safety glasses when changing oil and working around your rigs' engine.

Tools needed for changing the oil:

a 3/8-drive socket set (metric is fine)

a combination wrench set (closed- and open-ended, metric)

an oil filter wrench

something to catch the old oil – an oil pan, a used kitchen basin

a couple of empty one gallon milk containers with screw-on lids

a funnel and a one quart Ziploc baggie

a lot of old newspapers and several dirty rags

a new oil filter (see vehicle's owner's manual for requirements)

enough oil to refill the engine (check your owner's manual for grade and number of quarts)

Procedure

1. Find a flat place to change the oil. It's best to be on concrete, but if you have to jack up your rig for any reason, never, never do it on dirt or asphalt as there is more likelihood of sinking and slippage on such surfaces.

2. Take your motorhome for a drive around the neighborhood. Drive until the temperature gauge starts to register, this will make the oil nice and thin so it drains more completely from the engine block.

3. Park in your pre-chosen spot.

4. Turn off the engine, put your motorhome in park (or in gear if it doesn't have park), and set the parking brake firmly. For safety, block the tires with several bricks or large rocks.

6. Locate the oil drain plug. The drain plug should be the closest thing to the ground and is usually a fairly large nut with a washer under it. If you are the least bit unsure if you have the correct drain plug, check your engine owner's manual again. Also, the metal around the oil drain plug will generally be much warmer than the metal around the transmission drain plug.

7. Using a socket, loosen the drain plug. Slide the bucket under the drain plug and remove the plug and set it aside. Try not to drop the plug as it comes out, or you will have to be fishing for it in a bucket full of oil.

8. Remove the oil filter (for the best information on how to remove the filter on your engine, consult your engine owner's manual).

9. Use a clean rag to clean around the metal circle on the engine where the oil filter fits. Fill the new oil filter with oil according to the directions in your engine owner's guide. Before you thread the new oil filter in place, dip a finger into a bottle of the new oil and coat the gasket on the oil filter with oil to help it seat better, then thread the new oil filter on. Tighten it to the specification listed on the oil filter box or according to your engine owner's manual.

9. Replace the drain plug and the washer that goes on it (we recommend you purchase a new washer). Put the washer in place and thread the drain plug back into its hole. Tighten it up with the socket.

10. Pour the dirty oil into the empty milk bottle using a funnel. Clean the outsides of the bottles and the inside and outside of the funnel with a rag.

Viscosity is the most important property for engine oil. It refers to how flowable the oil is and how flowable it stays as the temperature increases. Thicker oils generally have higher viscosity, and thinner oils lower viscosity. An oil with a low viscosity might shear and loose film strength at high temperatures, while one that is too high might not pump oil to all the parts of the engine at low temperatures.

The weights given on oils are numbers assigned by the SAE. These numbers correspond to real viscosity as measured by the SAE. Oils that fall into a certain range are designated 5, 10, 20, 30, 40, 50 by the SAE. The W means the oil meets specifications for viscosity at 0 degrees F and is therefore suitable for Winter use.

Polymers are added to the base oil to create multi-viscosity oil. At cold temperatures the polymers are coiled up and allow the oil to flow as their low numbers indicate. As the oil warms up the polymers begin to unwind into long chains that prevent the oil from thinning as much as it normally would. Another way of looking at multi-viscosity oils is to think of a 20W-50 as a 20 weight oil that will not thin more than a 50 weight would when hot. Always use a multi-grade with the narrowest span of viscosity that is appropriate for the temperatures you are going to encounter. In the winter base your decision on the lowest temperature you will encounter, in the summer, the highest temperature you expect.

Almost all petroleum oil manufacturers produce their own brand of synthetic oil. When compared to petroleum-based oils, synthetic oils offer superior high-temperature protection, higher film strength, a very low tendency to form deposits, a stable viscosity base, and better low-temperature flow characteristics. In addition, synthetic oils also offer reduced wear and friction, which can have the side benefit of a slight increase in engine power and fuel economy. Synthetic as well as petroleum oil starts with a base stock of oil and then adds in a viscosity improver and an additive package to achieve the results the oil manufacturer requires. Some synthetic oils are so good that they require no viscosity improvers to achieve a 10W-

11. Use your clean funnel to help pour the new oil into the oil filler hole. This will help prevent spills on your engine. Continue to add the oil until you have reached the capacity listed in your engine owner's guide. Put the oil cap back on, check the oil level with the dipstick just to make sure.

12. Start the engine and let it idle while watching for leaks. Make sure everything is tight.

13. Don't forget to drop the old oil and filter off at a used oil recycling center.

How Often Should I Change the Oil?

You should check your engine manufacturer's owner's guide and change the oil as often as it recommends, not only to protect your warranty, but to make sure your engine lasts as long as possible.

SERVICE RECORD

SERVICE RECORD

DATE	MILEAGE:	SERVICE PERFORMED:

National RV, Inc.
3411 N. Perris Boulevard
Perris, California 92571

www.nationalrv.com

For more of everything
National RV Inc. related
join us at NRVCLUB.com