ENDEAVOR GAS 2001

OWNER'S MANUAL QUESTIONNAIRE

Your suggestions are very important to us and we are continually striving to improve the quality of our manuals. After becoming familiar with your new recreational vehicle and the accompanying manual, please take the time to answer the following questions. When you are finished please return it, postage paid, to our Technical Publications Department. Feel free to attach an additional page if you desire.

1. Is this your first recreational vehicle? YES / NO

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

_____
_____
_____
_____
_____

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

_____
_____
_____
_____
_____

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

_____
_____
_____
_____
_____

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

_____
_____
_____
_____
_____

NAME: _____ **PHONE: (____)**_____

ADDRESS: _____

Cut along the dotted line.

FOLD

FOLD

Cut along the dotted line.

SECTIONS

SIGNS

This sign indicates a NOTE.

This sign indicates a WARNING or a CAUTION with additional information attached.

This sign indicates INSPECTION is required.

This sign indicates ASSEMBLY/INSTALLATION or DISASSEMBLY/REMOVAL is necessary.

This sign indicates the specified part requires OIL/LUBRICATION.

This sign indicates a reference to the Warranty INFORMATION FILE located within the gray box inside your motorhome.

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

Endeavor
GAS

SECTION 1
WARRANTY & INFORMATION

1

INTRODUCTION

This section contains warranty information and knowledge for the operation and care of the motorhome. Not all information may be applicable to your model of motorhome. More detailed information with CAUTION or WARNING instructions, other than what is found in this section, can be found in the manufacturer manuals located in the owner information box.

In time, spotting wonderful little roadside locations by exploring off the main highway will become a regular event. There are many modern recreational vehicle parks (including state, county and federal parks) with nice facilities where you can obtain hook-ups for electrical, water and sewage connections. Directories are published which describe these parks and the availability of services and hook-ups. On overnight or weekend trips, chances are you will not fill up the sewage holding tanks, deplete the water or LP-Gas supply or run down the batteries which supply the living area with 12 Volt DC current. On longer trips, when you have stayed where sewer connections and utility hook-ups were not available, it will be necessary to stop occasionally and empty the holding tanks and replenish the water and LP-Gas supply.

Many gas stations have installed sanitary dumping stations. Publications are available which list these dumping stations. When stopped for the night the Holiday Rambler motorhome is built to be safely parked in any spot that is relatively level and where the ground is firm. Try to pick as level a parking spot as possible. The motorhome is fully self-contained, all facilities are present.

The safety alert symbols mean **CAUTION** or **WARNING** for "Personal Safety Instructions." Read and understand the instructions where these symbols are displayed in this manual. Failure to comply with specific instructions may result in personal injury or death. Many instructions are required by National Safety Associations.

CUSTOMER RELATIONS

Only by ensuring your confidence and satisfaction with our products and services can we have continued success as a manufacturer of motorhomes. We believe a good relationship with our customers is just as important as improving the technical excellence of our products. Your authorized dealer is pleased to help you with instructions about your motorhome and to offer service when you need it. If problems remain after you have consulted your dealer you are invited to contact our Consumer Affairs Department. Please have all pertinent information (serial numbers, model number, etc.) when calling. We will work with the dealer and see that every attempt to resolve the matter is made.

Holiday Rambler Consumers Affairs Department
606 Nelson's Parkway
Wakarusa, Indiana 46573
800-522-7519 or 877-466-6226

TAKING DELIVERY

Holiday Rambler Responsibilities

Your motorhome has been manufactured to the highest quality and standards by factory trained personnel. Quality inspections are performed throughout the manufacturing process of your motorhome. Your motorhome has been carefully and almost completely hand assembled in our factory. Prior to the motorhome arriving at the dealership all systems have been carefully tested and inspected to ensure optimum performance. The necessary forms and required manuals have been placed in the motorhome at the time of shipment to the dealership.

Dealer Responsibilities

The dealer must perform additional pre-delivery inspections and system checks, assist in the customer's understanding of the Limited Warranty and assist in completing any necessary forms. They must do a customer orientation to the motorhome, its systems, components and their operation.

The dealer should also ensure the customer receives a complete Owner's Packet with warranty cards and registrations for the motorhome and for separately warranted products, including detailed operating and maintenance instructions. The dealer is responsible for performing a review of the Limited Warranty provisions with the customer while stressing the importance of mailing warranty cards and registrations to the manufacturers within the prescribed time limit to avoid loss of warranty coverage. They must assist the customer in completing these forms and locating serial numbers. They should request that the customer reads all warranty information when possible and explain any provision not clearly understood.

The dealer should instruct the customer on how to obtain local and out-of-town service on the motorhome and its various individual warranted components, whether the service is warrantable or out of warranty.

Customers Responsibilities

As a new motorhome owner you are responsible for regular and proper maintenance. This will help you prevent conditions arising from neglect that are not covered by your Holiday Rambler Limited Warranty. Maintenance services should be performed in accordance with this Owner's Manual and any other applicable manuals. As the owner it is your responsibility and obligation to return the motorhome to an authorized dealer for repairs and service (See Limited Warranty). Since the authorized dealer where you purchased your new motorhome is responsible for its proper servicing before delivery, and has an interest in your continued satisfaction, we recommend that Inspection, Warranty and Maintenance Services be performed by the dealership. We suggest that you take your new motorhome on a weekend shakedown before leaving on an extended trip.

WARRANTY INFORMATION FILE

In addition to this Owner's Manual there is a Warranty Information File in the unit. This file contains valuable documents about the motorhome's systems and equipment. Many of the components have manufacturer's warranty registration cards, which can be found in the Information File. Fill these cards out and mail them. Carefully read all the information in this file to safely operate, maintain and troubleshoot those items.

HOLIDAY RAMBLER FINISH

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

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

Holiday Rambler

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

SERVICE SUGGESTIONS

Know when to take your motorhome in for service. Give some thought to the appointment time. There are several things to consider when selecting a time for service. Location of the service center and the time of year can be a major issue. Monday and Friday are busy days for most dealers. Therefore, it makes sense to make a mid-week appointment whenever possible. Ask your dealer if additional time is needed for check in and completion of paperwork.

Prepare for the Appointment

If you're having warranty work done be sure to have your warranty registration papers with you. All work to be performed may not be covered by the warranty; be sure to discuss additional charges with the service manager. Keep a maintenance log of your motorhome service history. This can often provide a clue to the current problem.

Prepare a List

Make a written list of specific repairs needed. It is important the service manager be aware of all previous work which has been done on your motorhome. For example: if the motorhome has been repaired due to an accident. While this may not seem important it could have a significant effect on the dealer's diagnosis of a problem.

Be Reasonable With Your Requests

Don't leave a list of 20 items to be serviced and expect to have your motorhome back by five o'clock. If you list a number of items, and you must have your motorhome back by the end of the day, discuss the situation with the service manager and list your items in order of priority. Some items may not be able to be repaired due to work loads or parts availability. Expect to make a second appointment for work not completed or for the long drawn out repair item.

No Looking Over the Technicians Shoulder

Please don't be offended when you are told you can not watch the work being done. Many service area insurance requirements forbid the admission of customers into the service work area.

Inspect the Work Properly

Check out the service or repair job when you pick up your motorhome and notify the service manager of any dissatisfaction. If circumstances prevent returning for immediate corrective work make an appointment as soon as possible.

REPORTING SAFETY DEFECTS

If you believe that your motorhome has a defect which could cause a crash, or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Holiday Rambler. If NHTSA receives similar complaints it may open an investigation. If it finds that a safety defect exists in a group of motorhomes it may order a recall or remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer or Holiday Rambler. To contact NHTSA you may either call the Auto Safety Hot line toll-free at 1-800-424-9393 (or 1-202-366-0123 in Washington DC area) or write to:

NHTSA
400 Seventh Street
US Department of Transportation
Washington, DC 20590

FOR YOUR OWN REFERENCE

OWNER'S RECORD - PERSONAL PROPERTY

Item	Serial Number	Value

OWNER'S RECORD - INSURANCE

Company _____

Policy Number _____

Agent's Name & Address _____

Business Phone _____

Emergency Phone _____

Renewal Date(s) _____

FOR YOUR OWN REFERENCE

OWNER'S RECORD - SERIAL NUMBERS

Refer to the Manufacturer's individual manuals for serial number locations that are not listed below.

Motorhome Serial Number _____

Motorhome Federal Vehicle Identification Number (VIN) _____

Door Key Number _____

Range Model & Serial Number _____
(Located under top burner plate)

Microwave Model & Serial Number _____
(Located behind door on case)

Refrigerator Model & Serial Number _____
(Located inside refrigerator compartment)

Generator Model & Serial Number _____
(Located in outside compartment on generator)

Roof Air Conditioner Model & Serial Number _____
(Located under top cover on air conditioner)

LIMITED WARRANTY - *ENDEAVOR GAS* *Model Year 2001*

HOLIDAY RAMBLER MOTORHOME LIMITED WARRANTY

What the Period of Coverage Is:

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

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

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

Limitations of Implied Warranties

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

What the Warranty Covers

Warrantor's Limited Warranty covers defects in the manufacture of your motorhome and defects in materials used to manufacture your motorhome. Also see the section "What the Warranty Does Not Cover" set out below.

What We Will Do to Correct Problems

Warrantor will repair and/or replace, at its option, any covered defect if; (1) you notify Warrantor or one of its authorized servicing dealers of the defect within the warranty coverage period and within five (5) days of discovering the defect; and (2) you deliver your Motorhome to Warrantor or Warrantor's authorized servicing dealer at your cost and expense.

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

Defects and/or damage to interior and exterior surfaces, trim, upholstery and other appearance items may occur at the factory during manufacture. Normally, any factory defect or damage is detected and corrected at the factory during the inspection process performed by the Warrantor. If, however, you discover any such defect or damage when you take delivery of the motorhome, you must notify your dealer or Warrantor within five days of the date of purchase to have repairs performed to the defect at no cost to you as provided by this Limited Warranty.

If two or more unsuccessful repair attempts have been made to correct any covered defect that you believe substantially impairs the value, use or safety of your motorhome, you must, to the extent permitted by law, notify Warrantor directly in writing of the failure to successfully repair the defect so that Warrantor can become directly involved in performing a successful repair to the identified defect.

How to Get Service

The Warranty Registration form must be returned to Warrantor promptly upon purchase to assure proper part replacement or repair and to activate your Limited Warranty. For warranty service simply contact one of Warrantor's authorized service centers for an appointment, then deliver your motorhome (at your expense) to the service center. If you need assistance in locating an authorized warranty service facility, contact Warrantor's Warranty Department (877-466-6226). The mailing address is:

Holiday Rambler Warranty Department
P.O. Box 465
Wakarusa, Indiana 46573
877-466-6226

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

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

What the Warranty Does Not Cover

This Limited Warranty does not cover: any motorhome sold or registered outside of the United States or Canada; items which are added or changed after the motorhome leaves Warrantor's possession; items that are working as designed but which you are unhappy with because of the design; normal wear and usage, such as fading or discoloration of fabrics, or the effects of condensation inside the motorhome; defacing, scratching, dents and chips on any surface or fabric of the motorhome, not caused by Warrantor; routine maintenance, including by way of example wheel alignments; the automotive chassis and power train, including, by way of example the engine, drivetrain, steering and handling, braking, wheel balance, muffler, tires, tubes, batteries and gauges; appliances and components covered by their own manufacturer's warranty including, by way of example the microwave, refrigerator, ice maker, stove, oven, generator, VCR, television(s), water heater, furnace, stereo, radio, compact disc player, washer, dryer, inverter and cellular phone; or flaking, peeling and chips or other defects or damage in or to the exterior or finish caused by rocks or other road hazards, the environment including airborne pollutants, salt, tree sap and hail.

Events Discharging Warrantor from Obligation Under Warranty

Misuse or neglect, accidents, unauthorized alteration, failure to provide reasonable and necessary maintenance (See Owner's Manual), damage caused by off road use, collision, fire, theft, vandalism, explosions, overloading, and odometer tampering shall discharge Warrantor from any express or implied warranty obligation to repair any resulting defect.

Disclaimer of Consequential & Incidental Damages

THE ORIGINAL PURCHASER OF THE MOTORHOME AND ANY PERSON TO WHOM THE MOTORHOME IS TRANSFERRED, AND ANY PERSON WHO IS AN INTENDED OR UNINTENDED USER OR BENEFICIARY OF THE MOTORHOME , SHALL NOT BE ENTITLED TO RECOVER FROM WARRANTOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE MOTORHOME. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above exclusions may not apply to you.

Legal Remedies

ANY ACTION TO ENFORCE THIS EXPRESS OR ANY IMPLIED WARRANTY SHALL NOT BE COMMENCED MORE THAN ONE (1) YEAR AFTER THE EXPIRATION OF THIS WARRANTY. Some states do not allow the reduction in the statute of limitations, so the above reduction may not apply to you.

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

HOLIDAY RAMBLER CORPORATION
ATTENTION: WARRANTY DEPARTMENT
P.O. BOX 465
WAKARUSA, INDIANA 46573
877-466-6226

VENDOR LIST

Air Conditioner
Dometic Corp.
219-463-4858

Air Conditioner- Dash
SCS/Frigette
800-433-1740

Attic Fan
Fan-Tastic Vent
800-521-0298

Awnings
Carefree
800-621-2617

Bathroom Exhaust Fan
Fan-Tastic Vent
800-395-4045

Batteries
Interstate
800-272-6548

Carbon Monoxide &
Liquefied Petroleum Protectors
MTI Industries, Inc.
800-383-0269

Cooktop
Atwood
800-873-4238

Engine
Ford Roadside Assistance*
800-392-3673
*Have VIN # available for service.

Entry Step
Kwikee
800-736-9961

Fire Extinguisher
The Fire Extinguisher Co.
919-563-4911

Generator
Onan
800-888-6626

GFI Outlet
Kevco
219-522-8820

Heat - Furnace
Atwood Mobile Products
801-972-4621

Hitch Receiver
Reese Products
219-164-7564

Inverter (Optional)
Trace Engineering
360-435-8826

Leveling Jacks
HWH Corp.
800-321-3494

LP Gas Detector
MTI Industries, Inc.
800-383-0269

LP Tank
Brunner
800-753-8625

Microwave
Sharp Electronics Corp.
800-237-4277

Monitor Panel
KIB Enterprises
219-294-1504

Power Convertor
Progressive Dynamics
616-781-7802

Power Heated Mirrors
Velvac, Inc.
800-783-8871

Range
Atwood Mobile Products
219-262-2655

Rear Vision System
Sony
800-222-7669

Refrigerator
Norcold
800-543-1219

Seating
Flexsteel Industries
219-831-4050

Slide-0ut Motor
Power Gear
800-334-4712

Smoke Detector
Bob Gun Associates
616-467-8705

Television/VCR
RCA
800-545-2672

Television Antenna
Wingard
319-754-0600

Tires
Goodyear Tire & Rubber
800-399-2772

Toilet
Sealand
800-321-9886

Water Heater
Atwood Mobile Products
219-262-2655

Water Pump
Shurflo
800-762-8094

Windshield Wipers
Diesel Equipment
336-373-8331

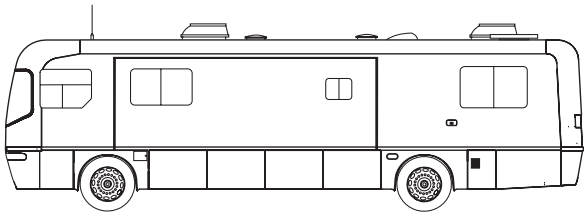
Water Filter
Everpure, Inc.
800-323-7873

NOTES

Endeavor
GAS

SECTION 2
Driving & Safety

DRIVING SAFETY - *Inspections*



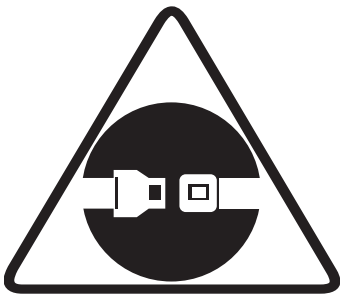
This section contains information on driving tips, emergency situations, towing, safety devices, weighing the motorhome and tires.

There are significant differences between a passenger automobile and your new motorhome. You should always be aware of these differences when traveling. The key for safely operating the motorhome is inspection. Any defect found could result in problems on the road that can result in lost time and money. There are several states that require the motorhome be inspected prior to registration. Know and observe the laws where you will be traveling as they may vary from state to state. A systematic inspection conducted prior to moving the motorhome will ensure nothing is overlooked. An inspection process assists you in becoming familiar with the motorhome. Prior to moving the motorhome begin a general inspection by examining the condition and area around the motorhome for hazards. Look high and low when walking around the motorhome.

Familiarize Yourself

The location of the driver's seat in the motorhome is higher and further to the left giving a different perspective of the roadway. Rely on the outside mirrors to line up with the center of the road and to check the conditions behind you. The dashboard may contain more gauges and controls than are normally found in passenger automobiles. Become familiar with these gauges and what they are indicating before starting out.

Safety Seat Belts



All occupants must be furnished with and use seat belts while the motorhome is moving. The driver's seat and all other seats designed to carry passengers while motorhome is in motion are equipped with safety seat belts. While traveling, do not occupy beds or any seats that do not have a safety belt. Seat belts must only be used on permanently mounted seats. The driver's seat must be locked in the forward facing position while motorhome is in motion. Do not use a seat belt on more than one person. To fasten the seat belt, pull the belt out of the retractors and insert the tab into the buckle; you will hear a click when the tab locks into the buckle. Seat belt lengths automatically adjust to your size and sitting position. Do not route belts over armrest.

WARNING: Seats must be pointed in a forward position and seat belts fastened while the motorhome is in motion. Avoid seat rotation while in transit. Children must not be transported unrestrained. Infants must be placed in approved safety seats. Small children must be restrained in child safety seats. Failure to comply with these rules can cause injury or death.

Tips for Driving

The motorhome is a complex vehicle and requires an increased level of driving awareness and attention because of its size and various components. Due to the motorhomes length the turning radius will be much wider than that of a standard automobile. Always pay close attention to all perimeters of the motorhome: front, sides, rear, roof and undercarriage, being sure the surrounding area is clear of any obstacles. Utilize the driving mirrors to observe traffic and parts of the motorhome: tires, bay doors, blind spots, etc. Use a push-pull method of steering, with both hands parallel on the steering wheel. The motorhome is also heavier than an automobile, with a higher center of gravity. These factors affect the reaction time of the motorhome. Swerves and sharp turns, especially performed at high speeds, could result in the loss of control of the motorhome. Keep the size of the motorhome in mind and drive with extra caution to avoid situations which might require quick momentum changes. Increase your reaction time by paying attention to traffic and road conditions 12-15 seconds ahead.

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

When backing up, have the co-pilot stand at the driver's side rear corner so the co-pilot remains visible in the driver's rear view mirror. The co-pilot can watch for any obstacles and give hand signals during the backing up process. When traveling, make sure bridges being crossed can support the weight of the motorhome. Check the tonnage limit of the bridges before crossing them. Signs should be posted at bridge entrances. Check the posted height of any overpasses or situations where overhead clearances are limited. Keep in mind, road surfaces may have been repaved or become packed with snow and therefore, the actual posted clearance height would not apply in such conditions.

Driving Cautions:

- Avoid getting too close to the edge of the road. A soft shoulder may not support the weight of the motorhome.
- Side spacing is best maintained by keeping the motorhome centered in the driving lane.
- Driving lanes in work zones can be uneven, congested and narrower than usual.
- Be cautious of road debris, it can damage the undercarriage of the motorhome or become lodged in the dual tires, causing damage to the tires, wheel rims, or tow car.
- Keep in consideration that posted speed signs are passenger automobile rated. Pay close attention to driving conditions and appropriate speeds for a motorhomes, especially on corners and mountainous roads.

- Downgrade speed should be at least 5 mph less than the upgrade speed, or the downgrade speed should be attainable within three seconds of a brake application.
- Use a four second rule when following other vehicles at speeds under 40 mph. Use a five second rule when following at speeds over 40 mph.

Right Turns:

The right hand turn can be an intimidating turn which requires negotiation. Many drivers fear they can not make the turn without turning into the other lane, or jumping the curb. Here are a few tips:

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

Left Turns:

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

Night Driving:

- As always be well rested and alert when driving. If necessary, find a safe stopping place to rest until ready to continue.
- Avoid using any interior lights while driving. They can create a glare on the windshield, decreasing visibility.
- Dim the dash lights to a comfortable level to reduce the level of glare.

Extreme Heat and Hot Weather Conditions:

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

Winter and Cold Climate Conditions:

- The motorhome should be prepared for Cold Weather Use.
- Keep speeds slow and steady, make moves gradually and increase your visual distance for a gain in reaction time.
- If the road or weather conditions are treacherous, find a safe stopping place and wait for conditions to improve.
- Wipers should be in good condition and the washer reservoir should have sufficient window wash fluid that has an antifreeze included within it.
- Use the mirror heat to keep the mirrors clear.
- Remove any ice build-up from the entry step to avoid any accidental slipping.

Wet Conditions:

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

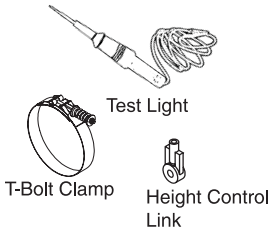
Refueling:

- Truck stops are good refueling points for motorhomes.
- Be aware of which side the fuel port is on. There may not be adequate space to move around the parking lot in order to reposition for the pump.
- Check overhead clearance before pulling through the fuel island.
- Be aware of the concrete/steel posts installed around the fuel island.
- Avoid running over the fuel hose, it can get hung up on the motorhome and cause body damage.

WARNING: Avoid the risk of fire or explosion. Turn off all pilot lights and appliances before refueling.

PRE-TRIP PREPARATION

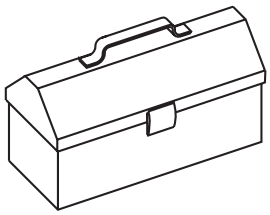
Before departure several items will need to be prepared. Items to pack. Preparing the motorhome for travel. Making facility arrangements or just dry camping along the way. Listed below is a general checklist which may be used as a guide when preparing to depart



Items To Carry:

- Local, State and National Maps. Available are truck atlases showing maps, refueling stations and truck repairing facilities.
- Flashlight.
- Emergency Road Kit.
- 12 Volt DC test light, this may be helpful when on the phone with a technician.
- Battery hydrometer, to check battery electrolyte.

- An assortment of spare fuses.
- A spare alternator belt.
- A variety of assorted handtools.



Driving Preparations:

- Check operation of all exterior lights, headlamp, taillight, brake and clearance lights.
- Inspect fluid level and check tire pressure.
- Check house battery condition.
- Secure all awning locks.
- Check items in storage bays to prevent shifting or damage to items.
- Outside compartment doors should be closed and locked.
- Look around, above and under the motorhome for obstructions.
- Check fuel level gauge. Check all other dash gauges for operation and correct level indications.

Engine Checklist:

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

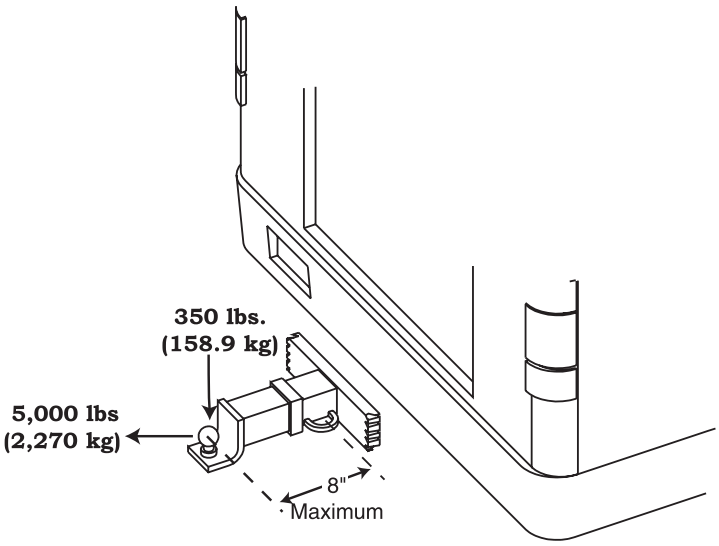
Interior:

- If possible, start refrigerator operation the night before departure to get a head start on the cooling process. Pre-cool items prior to loading the refrigerator.

NOTE: While traveling, use the inverter to supply power to the refrigerator. Upon arrival, be sure to turn the inverter OFF and switch refrigerator operation to LP-Gas or hook the motorhome to shore power.

- Fill the fresh water tank. Disconnect and store the fresh water hose.
- If necessary, load pots, pans, utensils, soap, linens, etc.
- Secure and fasten the bi-fold and pocket doors. Lock the shower door.
- Close roof vents and windows.
- Secure any loose, heavy or sharp objects in case of a sudden stop.
- Close all cabinet doors and drawers.
- Walk the interior and check for items not secured.
- Turn interior lighting off.
- Secure and lock the entry door for travel.

HITCH - *Using the Rear Receiver*



When using the rear hitch remember that the motorhome is intended for towing light loads. The motorhome is designed to be used primarily as a recreational vehicle, towing will affect durability and economy. Your safety and satisfaction require proper use. Avoid excessive loads or any other abuse. Do not use the motorhome to tow anything until it has been driven 500 miles (800 kilometers). Weight pushing down on the rear hitch must not exceed ***350 pounds***. We recommend weighing the motorhome as it will be operated to be certain that there is proper weight distribution. When weighing the motorhome be sure to take the passenger locations into consideration. Total weight of the motorhome and any vehicle towed by it must not exceed the GCWR.

WARNING: Any trailer being towed by a motorhome must have adequate brakes. Failure to follow these instructions will create a safety hazard and may result in an accident.

Tow Plug Connection

The motorhome is prewired with a trailer wire harness. The harness is located on or near the hitch receiver. Convoluted tubing protects the tow harness wires until they are ready for use. Current draw should not exceed ten amps for each designated circuit.

The tow harness wires are color coded:

1. Brown, 12 gauge - tail lights.
2. White, 12 gauge - ground.
3. Black, 14 gauge - right turn signal.
4. Yellow, 14 gauge - left turn signal.
5. Black w/white stripe, 14 gauge - brake light.

When hooking up a tow plug connection you should strip the wires 3/8". Twist the wire and place under the clip and secure the screw. Make sure there are no loose strands of wire which could short against the case or other terminals.

REAR VIEW SYSTEM

The motorhome can be equipped with a rear vision and voice system. The factory will provide the wiring behind the dash and at the rear cap for future installation. The rear vision system consists of a camera with a microphone and a monitor.

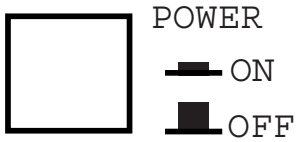
The driver can see what is behind the motorhome with the ability to listen to a guidance assistant. This is useful during backing procedures. The rear vision system will automatically turn ON when the gear selector is placed in reverse. Turning the main power switch to ON will allow continuous operation of the rear vision system when the ignition key is turned ON.

For more detailed instructions see the manufacturer's manual.

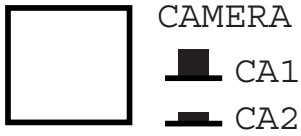
System Features Overview (Optional):

The system is designed to provide the driver with a view of the rear of the motorhome. The field of view is 140° in the diagonal plane, 121° in the horizontal plane and 90° in the vertical plane. Power will be supplied to the system when the ignition key is turned to the **Accessory** or **ON** position. The green LED will illuminate. The display on the monitor is controlled by the position of the power switch. When in the **ON** position the display is present. When placed in the **S/B** (Standby) position the display is off until the gear shift lever is set to Reverse.

Monitor Controls:

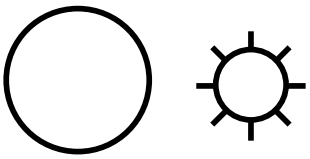


- **Power Switch -** The switch in the **ON** (in) position turns on the monitor for viewing. The green LED indicator will illuminate. When the switch is **OFF** (out) the monitor is in a standby mode of operation. The green LED will remain illuminated when the ignition is ON. The monitor will display rear viewing when the transmission is shifted to Reverse.

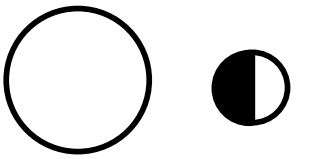


- **Camera Selector -** This switch should be left in the **CA1** (out) position. **CA2** (in) position is not used in the motorhome.

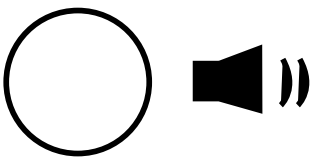
- **Day/Night -** This switch should be left in the **DAY** (out) position for normal viewing. When set to the **NIGHT** (in) picture brightness is reduced. **NIGHT** should be used for night viewing and driving through tunnels.



- **Bright Control -** Clockwise rotation will increase the picture brightness. Counterclockwise rotation will decrease the picture brightness.



- **Contrast Control** - Clockwise rotation will increase the picture contrast. Counterclockwise rotation will decrease the picture contrast.



- **Audio Control -** Clockwise rotation will increase the volume level. Counterclockwise rotation will decrease the volume level.

The camera angle may be adjusted to display a suitable rear view. The camera housing cover will need to be removed to gain access to the hexagon mounting bolts. The mounting bolts can be repositioned to the desired angle. Refasten the camera housing cover and seal using an appropriate sealant.

BACKING UP A MOTORHOME

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

The backing up process should begin while the motorhome is in forward motion. Maneuver the motorhome to align it with the chosen site. This allows straight alignment with the site. Aligning the motorhome with the site after the backing process begins will require considerably more room than an automobile, and may require more than one attempt. When the motorhome is properly aligned with the site the parking area will be visible in both mirrors. Use straight lines, such as road markings, as reference points when possible.

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

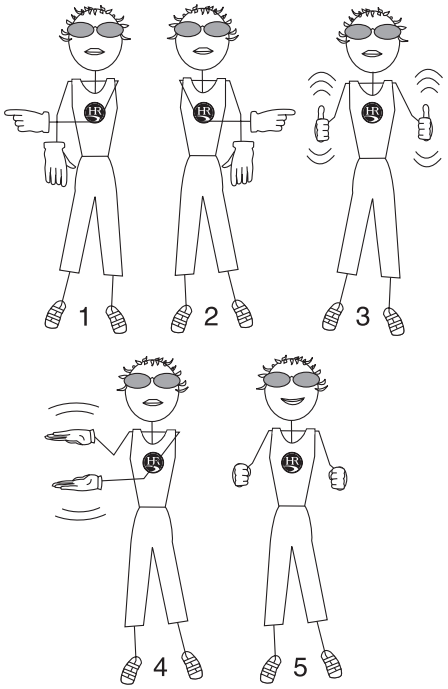
The co-pilot will perform just as important a job as the driver. When guiding the driver the co-pilot should be located safely at the left rear corner of the motorhome, facing forward, while remaining visible in the driver side mirror at all times. The co-pilot should make a conscious effort to maintain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

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

If desired direction is left, the co-pilot points left. For example: The co-pilot will use his/her right arm and forefinger pointing distinctly left with arm and finger held on a horizontal plane, indicating desired direction of travel of the rear of the motorhome. This type of directional signal is easily discerned in the mirror by the driver. The directional signal given will remain steady until desired movement is completed.

The five directional signals are:

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



Backing Up Trailers:

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

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

Brake - Parking

The motorhome parking brake is a foot pedal brake which operates in the same manner as an automobile parking brake. When at a complete stop, select “P” on the shift lever, then engage the foot pedal brake. The brake is released by the “brake release” handle, located below the lower left area of the dash.

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

LEVELING SYSTEM *(Optional)*

The leveling system is designed as a leveling system only. The leveling system should not be used to support the motorhome while under coach or for changing tires. A tire change should be performed by trained personnel with the proper tools and equipment. Attempts to change tires using the leveling jack to support the motorhome could result in damage to the motorhome and risk causing serious personal injury.

Before Operations of the Leveling Jacks

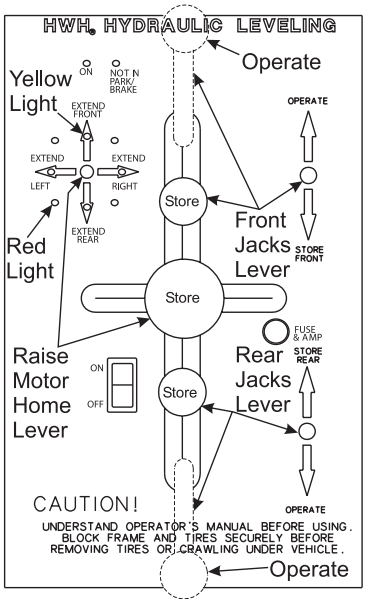
The leveling system shall only be operated under the following conditions:

- The motorhome is parked on a reasonable level surface.
- The **PARKING BRAKE** must be engaged.
- The transmission must be in the **NEUTRAL** or **PARK** position.
- The ignition switch is placed in the **IGN** position.

Ensure the potential jack contact points are clear of obstructions or depressions before operation.

Keep all people clear of the motorhome during the leveling system operations. Never expose hands or other parts of the body near hydraulic leaks. Hydraulic lines are under high pressure. Oil leaks may cut and penetrate the skin causing serious injury.

Leveling the Motorhome



- To level motorhome turn ignition switch to ACC or ON position.
- Transmission shift lever must be in park position and parking brake must be set. If "NOT IN PARK/BRAKE" indicator light is lit check that shift lever and parking brake are in their proper positions.
- Push ON button, ON indicator light should be lit.
- Move FRONT and REAR JACKS LEVERS to OPERATE positions.
- Move RAISE MOTORHOME LEVER to raise rear of motorhome slightly so that both rear jacks contact the ground; do not extend jacks all the way.
- Move RAISE MOTORHOME LEVER to raise front of motorhome slightly so that both front jacks contact the ground; do not extend jacks all the way. If yellow indicator light on any arrow is lit, move RAISE MOTORHOME

LEVER in direction of arrow until light goes out.
- If ground is too uneven jacks may not have enough stroke to level motorhome, therefore motorhome may have to be moved to another location.
- After motorhome is level push OFF button and turn ignition switch to OFF position.

Retract the Leveling Jacks

- To store leveling jacks turn ignition switch to ACC or ON position.
- Move FRONT and REAR JACKS LEVERS to STORE positions; all jacks should raise all the way up. All four red indicator lights should not be lit and warning buzzer should not be sounding.
- After jacks have been retracted push OFF button and turn ignition switch to OFF position.
- If the jacks are down for extended periods, it is recommended to spray exposed chrome with a automatic transmission fluid (A.T.F.) every seven days for protection.

In most applications, the Type A automatic transmission fluid is adequate. If operating in cold temperature (less than 10-F°) the jacks may extend and retract at a slower rate.

WARNING: Never rely solely upon warning lights or warning buzzer to determine position of leveling jacks. Make a visual to check to ensure all jacks are fully retracted prior to moving the motorhome.

CHECKLIST - SET-UP PROCEDURES

If the site for the motorhome has full hook-ups, use this quick reference hook-up checklist. This hook-up list is only a guide. For detailed information look in the section pertaining to the item of interest.

- Prepare the shore cord to be plugged in. Uncoil and inspect the cord. Perform any necessary cord maintenance. Install proper electrical adapters if anything other than 50 amp service is provided. Turn power supply circuit breaker **off** before plugging in the shore cord.
- If cable service is provided, hook a 75 Ohm or RG6 cable to the cable connection in the service center. If the motorhome has a video selector box, press the **CABLE VIEW** button for item desired.
- A phone jack hook-up is provided in the service center. Phone outlets are placed throughout the motorhome, including a phone line to the satellite receiver.

- Hook a potable water hose to the city water connection in the service center. A water pressure regulator is built in. Turn the hand valve so the pointer indicates **CITY WATER**.
- Sewer drain pipe diameters are generally either three or four inches. Proper sewer hose adapters will ensure against leaks or spillage. With the sewer hose properly connected, open the grey water valve (small valve). The black water valve (large valve) remains closed until the tank is full or until time of departure.

NOTE: When dumping the black tank, first close the grey water valve and fill the tank 50%. Open black tank valve until the drain cycle is complete. Use a non-potable water hose when using the black tank flush system. Close the black tank valve, then open the grey water valve. Solids will be flushed from the drain hose.

DRY CAMPING TIPS

For extended dry camping, management of all resources is essential. The motorhome has large batteries, plenty of water and large holding tank capacities. With a little care and forethought it is possible to go a long way with only the wonderful amenities you bring with you.

Conserve water! The motorhome holds a lot but it goes down the drain fast. Use a manual valve on the shower head. Turn the water off and on as needed while showering. By doing this the amount of water needed for a shower can be reduced by as much as two-thirds. Don't let water run in sink while doing other things such as wiping up the kitchen counters or brushing your teeth.

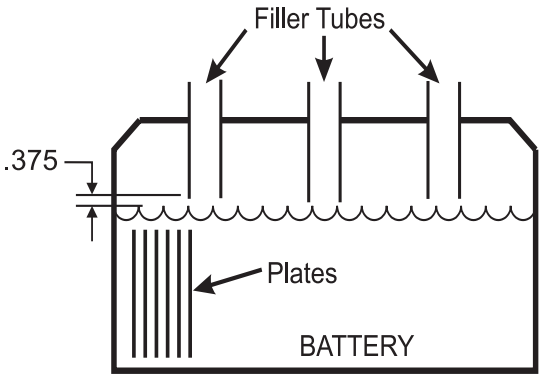
Conserve battery power. Use electricity sparingly. Turn off the inverter when it is not in use. Only turn it on when you need it. However, remember that when the generator is running the inverter will come on automatically.

Charge the batteries when they are half down. At half charge the battery voltage will be 12.2 Volts. You can use a hydrometer for testing. A good rule of thumb is to run the generator for three to four hours daily, which should supply enough power. Never try to use batteries until they are completely dead, or when the lights "dim out." Each time the batteries are used at half charge the ability to recharge up to full capacity is diminished. The damage that occurs is cumulative and will eventually render a battery useless.

If you are in a habit of starting the engine regularly, remember that the alternator output is lower at an idle, and that even at a fast idle it may take as much as an hour to replace what it took to start up the engine. Also, realize that running the engine for a short time may increase moisture contamination in the fuel and oil. It is better to run the engine less often and run it longer, for perhaps an hour. The good news is this can be included in the battery recharge schedule. Solar panels can greatly increase the time you can operate between battery charges.

Remember that different motorhomes have different equipment and that everyone has different habits and expectations. The above general guidelines should provide a useful starting point for building your own schedule and regimen for extended stays where power and water are not available. You too can become less dependent on hook-ups.

- Make sure to turn all appliances on propane.
- The battery cut off switch will need to be left on.
- Purchase extra solar panels, if desired.
- Understand the inverter operations.
- One continuous duty solenoid is a .7 Amp draw, two solenoids will be a 1.4 Amp draw.
- A 13" TV has a 1.7 Amp draw.
- Rope lights (10 ft) are a 1.3 Amp draw.
- The porch light is a 2.0 Amp draw.
- One fluorescent dual bulb light is a 0.9 Amp draw.



Battery State of Charge	Spec. Gravity	Voltage
100%	1.265	12.7
75%	1.225	12.4
50%	1.190	12.2
25%	1.155	12.0
Discharged	1.120	11.9 or Less

NOTE: The distilled water level in battery should be 3/8" below the filler tube.

BREAKING CAMP

Listed below is a checklist guide to reference when preparing to break camp. Preparing the motorhome for travel will require several small tasks. Items properly secured and stowed will help prevent items from getting lost or being damaged during travel.

Outside Checklist:

- Disconnect the cable TV, lower the television antenna and (if applicable) the satellite dish.
- Retract the awnings and secure them for travel.
- Close LP-Gas tank valve. Check the level of the LP-Gas in the tank making sure there will be a sufficient amount.
- Drain and flush the holding tanks. First close the grey water valve, run enough cold water down the sink and shower drains until the grey tank is at least 50% full. Be careful not to overfill or flood the grey tank. Next, open the black tank valve and allow the drain cycle to complete. If applicable, connect a non-potable water hose to the No-Fuss hose bib and flush the black tank system. Close the black tank valve, then open the grey water valve. The water from the grey tank will help flush the solids from the drain hose.
- Disconnect the sewer hose. Flush hose with clean water from non-potable hose. Store the hose. Install the sewer cap.
- Fill the fresh water tank. Disconnect and store the fresh water hose. Remove any hose protected water pressure regulator from the city water faucet.
- Turn shore power breaker off and disconnect the shore line. Wind up and store the shore cord.
- Disconnect and stow the phone line.
- Check tire pressure.

Engine Checklist:

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

Interior Checklist:

- If applicable, retract leveling jacks.
- If applicable, clear slide room path, clean floor, move the driver seat forward and make sure bay doors are shut. When the slide room is fully retracted secure slide room awning locks for travel.

NOTE: To operate the kitchen slide the ignition must be OFF, the park brake must be set and the bay doors under the slide room must be closed.

- Secure and fasten the bi-fold and pocket doors. Lock the shower door.
- Close roof vents and windows.
- Secure any loose, heavy or sharp objects in case of a sudden stop.
- Close all cabinet doors and drawers.
- Start engine, turn off water heater, water pump and furnace. If applicable, turn inverter ON. Switch refrigerator operation to electric. Be sure to turn inverter OFF and switch refrigerator operation back to LP-Gas or hook the motorhome to shore power upon arrival.

Departure Checklist:

- Check items in storage bays to make sure shifting or damage of items won't occur.
- Look around, above and under the motorhome for any obstructions.
- Walk around the motorhome and camp area checking for forgotten items.
- Outside compartment doors should be closed and locked.
- Check operation of all exterior lights - headlamp, tail lamp, brake and clearance lights.
- Walk the interior and check for any items not secured.
- Turn interior lighting off.
- Check fuel level gauge. Check all other dash gauges for operation and correct level indications.
- Carefully pull forward out of campsite. If necessary, clean site and check for any forgotten items.
- Secure and lock the entry door for travel.

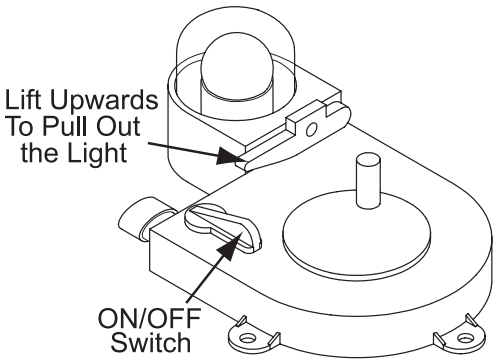
EMERGENCY PROCEDURES

Emergency stops may be required for any number of reasons. Proper braking techniques should be used during an emergency stop. An emergency road kit should include three reflective warning signs, road flares, a flashlight, spare automotive fuses and an assortment of hand tools. For added safety an extra fire extinguisher should also be included. The motorhome is equipped with a fire extinguisher located inside next to the co-pilot seat. Road flares or a reflective warning sign should be displayed if you are along the side of the road for any length of time. Pull off the roadway as far as possible for an emergency stop. Always turn ON the motorhome's hazard warning flasher when parked along the side of traffic lanes. Set the parking brake. In the event of an emergency stop, for a mechanical or motorhome related problems, contact **Holiday Rambler Customer Service Support (1-877-466-6226)**.

Guidelines for placing the warning triangles depends on the road. On a divided highway or one way road the placement is 10 feet, 100 feet and 200 feet from the rear of the motorhome. On a two lane road the placement should

be 10 feet either front or rear of the motorhome and 100 feet in both directions of the motorhome. Curves and hills can be tricky as you may have to go up to 500 feet behind the motorhome to warn approaching traffic after placing one triangle 10 feet from the rear.

Light - Retractable



1. To activate the light move the switch to the ON position.
2. The light has an 18 foot retractable reel cord. To operate the reel lift the lever and pull the light out.
3. The base of the light is magnetic, allowing for hands-free operation.
4. To replace the bulb push down on the clear plastic cover and twist.
5. To rewind the light crank the handle in the retract direction. When fully retracted push down on the lock handle to secure the light into place.

Transmission - Rocking Out

It may be possible to rock the motorhome out if you are stuck in snow, mud or deep sand. Shift the selector to **D** (Drive) and apply steady light throttle. Never apply full throttle as you may spin the wheels and bury the motorhome deeper. When the motorhome has moved forward as far it will go apply and hold the service brakes. Allow the engine to return to idle before selecting the **R** (Reverse). Release the brake and apply light throttle until the motorhome has rocked as far it will go. Again, apply the service brake and allow the engine to return to idle. Repeat this process if the motorhome has moved a greater distance. If the process does not free the motorhome call for towing assistance.

NOTE: Sudden movements or lurching the motorhome with an open throttle can result in damage to the transmission. Avoid this condition by making shifts only when the throttle is closed and engine is at normal idle.

TOWING PROCEDURES

If a towing company is called for service it is recommended that they use a lowboy/landall type of trailer and if a tow truck is used it needs to have a stinger (an arm that goes under motorhome and hooks to front cross member). Inform the tow company of the weight and length of the motorhome, number of passengers and milepost location. If the motorhome ever needs to be towed, use the following directions:

- Secure any loose or protruding parts if the motorhome is damaged.
- Inspect points of attachment on a disabled motorhome. If attachment points are damaged, select other attachment points at a substantial frame structural member.

- Never allow anyone to go under a motorhome while it is being lifted by towing equipment unless the disabled motorhome is adequately supported by safety stands.
- Do not tow the motorhome from the rear. Towing from the rear will cause the front tires and suspension to be seriously overloaded, possibly resulting in a tire or front suspension failure. Rear frame extensions are not designed to withstand weight loads imposed by lifting the rear of the motorhome.
- If rear wheels are disabled place the motorhome on a flat bed trailer or use a heavy duty dolly under the rear wheels and tow from the front of the motorhome.
- The drive shaft must be removed to prevent damage to the transmission.

WARNING: In the event the motorhome requires towing ensure all precautions are followed. The driveline must be disconnected and the mudflap may need to be removed. Damage to the motorhome from a towing company will not be covered by Holiday Rambler.

Towing Without A Stinger

Make sure the tow truck can safely pull the weight of the motorhome. Give the towing company the weight of the motorhome when you call them. If the motorhome is going to be towed without a stinger do the following:

- Wrap chains around both A-arms or the front axle on each side.
- Pass the chains beneath the tow bar below the bumper.
- Position a 6" x 6" piece of lumber between the ends of main frame rails and the tow vehicle transfer plate to maintain clearance to body parts.
- Attach safety chains, which are completely independent of the primary lifting device, to the main frame rails.
- When the motorhome is under tow, allow enough room between the front of the motorhome and the rear of the tow vehicle while turning corners.

TIRES

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

The Importance of Air Pressure

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

A tire that is underinflated will build up excessive heat that may go beyond the design limits of the rubber and radial cords. This could result in sudden failure. A tire that is underinflated will also cause poor motorhome handling, rapid and/or irregular tire wear and an increase in rolling resistance which results in a decrease of fuel economy.

Over-inflation will reduce the tire's "footprint" or contact patch with the road, thus reducing traction, braking capacity and handling of the motorhome. A tire that is over-inflated for the load will have a harsh ride, uneven tire wear and becomes susceptible to impact damage.

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

How Much Air Pressure?

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 loading rating, and the minimum cold air inflation pressure needed to carry that stated maximum load. Utilizing less air pressure means a lesser load can be carried by the tire. The chart at the end of the sections shows weights that can be supported by various air pressures.
The amount of air pressure you need to use is dependent on the weight of your fully loaded motorhome.

Weight Terms

The GVWR (Gross Vehicle Weight Rating) and GAWR (Gross Axle Weight Rating) stickers on the motorhome (normally located on the support pillar next to the driver's seat) will show the chassis manufacturer's and/or the RV manufacturer's total vehicle maximum weight ratings and per axle weight rating.

The GVWR is the maximum total weight for which the motorhome is rated-including passengers, fluids, and cargo.

The GAWR is the maximum for which a single axle is designed. These per axle and total maximum weight ratings could be limited by the tires, wheels, axle and axle bearings, the motorhome frame or other components of the motorhome.

The GAWR sticker is only a guide in knowing the maximum loaded axle weights, and subsequently the correct tire inflation pressure. Every RV, even of the same make and model, will vary in actual loaded axle weights because of different options and personal loads.

While the actual loaded axle weight should be below the GAWR, you must weigh your motorhome in a loaded condition to know its actual weight. Weigh the front axle, the total unit and the rear axle. It is possible for a motorhome to be within the GVWR yet overloaded on an axle. It is even possible for one wheel position to be overloaded, even though the GAWR has not been exceeded. For this reason (if

there is room to the sides of the scales) weigh each wheel position of the motorhome. This will give a clear indication of exactly how the weight of the motorhome is distributed. These instructions and diagrams are presented on the following pages. When the total weight and the weight on each axle is known, the tire load data chart in this manual will show you the correct cold inflation pressure per tire for each axle.

There are two important factors to consider when loading the motorhome: total weight and balance. When loading heavy objects keep them as low as possible, preferably on the floor. Load weight must be distributed as evenly as possible. Listed below are the commonly used weight abbreviations and terms.

- **Gross Vehicle Weight Rating (GVWR):**
  GVWR means maximum permissible weight of this motorhome. GVWR is equal to or greater than the sum of UVW plus NCC.

- **Unloaded Vehicle Weight (UVW):**
  UVW means weight of this motorhome as built at factory with full fuel, engine oil and coolants. UVW does not include cargo, fresh water, LP-Gas, occupants or dealer installed accessories.

- **Net Carrying Capacity (NCC):**
  NCC means maximum weight of all occupants including driver, personal belongings, food, fresh water, LP-Gas, tools, tongue weight of towed vehicle, dealer installed accessories, etc., that can be carried by this motorhome. (NCC is equal to or less than GVWR minus UVW.)

- **Gross Combination Weight Rating (GCWR):**
  GCWR means value specified by motorhome manufacturer as maximum allowable loaded weight of this motorhome with its towed trailer or towed vehicle.

- **Gross Axle Weight Rating (GAWR):**
  GAWR means load-carrying capacity specified by manufacturer of a single axle system as measured at tire ground interfaces.

- **Sleeping Capacity Weight Rating:**
  SCWR means manufacturers designated number of sleeping positions multiplied by 154 pounds (70 kilograms).

- **Cargo Carrying Capacity (CCC):**
  CCC means the GVWR minus each of the following: UVW, full fresh (potable) water weight (including water heater), full LP-Gas weight and SCWR.

MODEL YEAR: 2001 **MAKE:** HOLIDAY RAMBLER **MODEL:** ENDEAVOR GAS

UNIT NO. _____ **CHASSIS VIN: _____**

		LBS.	KGS.
GVWR	(Gross Vehicle Weight Rating) is the maximum permissible weight of this fully loaded motorhome		
UVW	(Unloaded Vehicle Weight) is the weight of an exemplar Motorhome as manufactured at the factory with full fuel, engine oil and coolants (*1)		
SCWR	(Sleeping Capacity Weight Rating) is the manufacturer's designated number of sleeping positions multiplied by 154 pounds (70 kilograms)		
CCC	(Cargo Carrying Capacity) is the GVWR minus each of the following: UVW, full fresh (potable) water weight (including water heater), full LP-Gas weight and SCWR.....		
GCWR	(Gross Combination Weight Rating) is the maximum allowable combined weight of this motorhome and any towed vehicle (*2).		

CARGO CARRYING CAPACITY (CCC) COMPUTATION

GVWR	_____	_____
minus UVW	_____	_____
minus fresh water (*3) weight of gallons @ 8.3 lbs./gal	_____	_____
minus LP-Gas weight of gallons@ 4.5 lbs./gal	_____	_____
CCC for this motorhome (*4)	_____	_____

CONSULT OWNER MANUAL(S) FOR SPECIFIC WEIGHING INSTRUCTIONS AND TOWING GUIDELINES.

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

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

(*1) The UVW has been determined by weighing an exemplar motorhome with some but not all optional equipment available for each model year, make and model of motorhome. The result of the weighing of the exemplar motorhome is then used in calculating the UVW of other motorhomes of same model year, make and model. Your actual UVW may vary based upon options ordered. Please contact the manufacturer of the actual weight of each option.
(*2) Consult your Owner's Manual for towing limitations, restrictions and other guidelines.
(*3) Your motorhome's fresh water tank and water heater taken together determine the gross fresh water capacity. Your usable fresh water capacity, however, may be less.
(*4) Dealer installed equipment and towed vehicle tongue weight will reduce CCC.

Improperly inflated tires or suspension that is incorrectly loaded can result in poor fuel economy, poor handling and over stressed chassis components. Vehicle loading affects tire inflation pressure and the loads carried by each axle. Motorhome axle configuration and floor plan styles will require different weighing procedures.

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

CAUTION: If actual weight carried by any tire is below the tire chart weight specification, a minimum tire pressure of at least 75 psi. must be maintained. Tire pressure below 75 psi. can overheat and damage the tire casing leading to premature tire failure or blowout.

Slide-Out Tire Pressure:

A motorhome equipped with slide-out room(s) will weigh slightly heavier on the driver side. Tire inflation pressures between the driver side and passenger side will differ. More air pressure will be required in the driver side tires due to the added weight on that side.

NOTE: When weighing a slide out motorhome, each tire must be weighed independently to obtain the correct weight carried by each tire.

Scales:

Certified public scales are located in a variety of places such as moving and storage 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 the local area telephone book yellow pages under “scales-public” section or “weighers.” A nominal fee will be charged, but this is money wisely spent.

Weight scale types and weighing methods will affect the procedure used to determine proper tire inflation pressure and axle loading. The size of some scales will allow the entire motorhome to fit on the scale, which will read the GVW with only one scale recording required. Other scales are designed to weigh only one axle at a time, which may require two or three scale readings to determine the GAW or GVW total. Some scales will read only one wheel position at a time due their physical size. Several scale readings may be required to determine the GAW or GVW total.

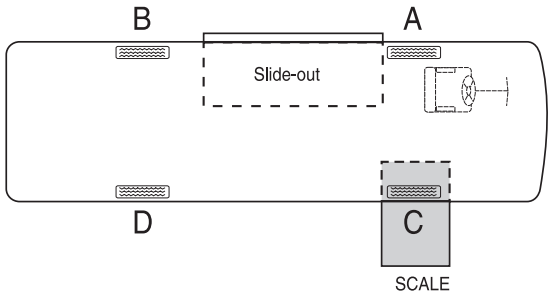
Slide-out equipped motorhomes will require each wheel position to be weighed. This is referred to as a four corner weigh. This type of weighing procedure will accurately determine what the correct tire inflation pressure should be. Depending on the type of scale being used, several different scale readings may be required.

NOTE: The most accurate method to determine proper tire pressure is a four corner weigh. A slide-out motorhome will require each tire to be weighed independently. Weighing an axle will net the total weight carried by that axle. When calculating the drive axle dual tire pressure using a independent corner weigh method, divide the total weight by two to determine the weight carried by each tire. When weighing the entire drive axle, divide the total weight by four to determine the approximate weight carried by each tire.

Example:

The motorhome must be weighed fully loaded to obtain accurate scale readings and to determine the proper tire pressure.

- Take the rear axle gross axle weight rating (GAWR) and divide it by two. Record the figure next to scale B GAWR ÷ 2. Example: If rear axle GAWR is 13,000 lbs. GAWR ÷ 2 would be 6,500 lbs.
- Weigh the driver's side rear corner (scale B) and record the scale reading next to gross axle weight (GAW) for scale B. Example: Scale B reading is 5100 lbs.
- Repeat procedure for the rest of the scale readings.
- Add the GAWR from scales B and D and enter the sum next to the final GAWR. Example 13,000.
- Add the GAW from scales B and D and enter this sum next to the final GCAW. Example: 10,000.
- Compare scale readings GCAW against GAWR readings. All figures on line 2 are not to exceed figures on line 1.
- Use tire chart with scale reading to determine correct tire pressure.



NOTE: Scale readings and gross axle weight ratings are fictitious. Actual scale readings and gross axle weight ratings will vary with model and options.

Rear

Scale B *1.GAWR ÷ 2 (6,500)*
2.GAW (5100)

+

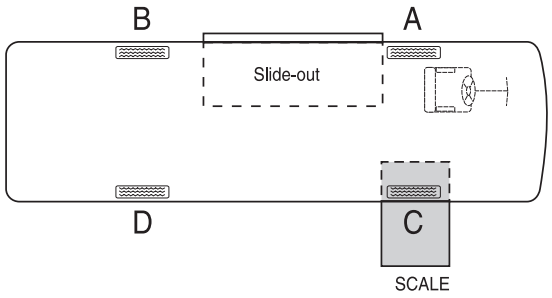
Scale D *1. GAWR ÷ 2 (6,500)*
2. GAW (4,900)

=

1.GAWR (13,000)
2. GCAW (10,000)

Weighing a two axle non slide motorhome:

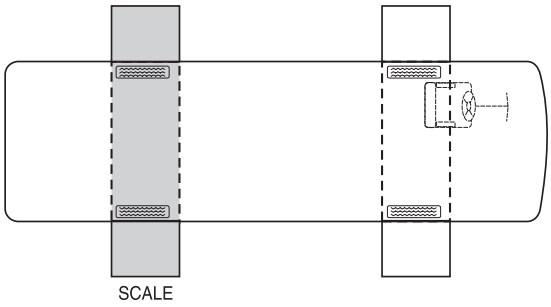
- Record the gross axle weight ratings (GAWR) and the gross vehicle weight rating (GVWR).
- Weigh and record each wheel position or total axle weight.
- If necessary, adjust the payload so the GAWR is not exceeded. Total combined weights must not exceed the GVWR.
- Using the tire chart, locate the recommended air pressure for the weight carried by each tire. Adjust the tire pressure accordingly.



GAWR (Rear)		GAWR (Front)		GCVW
GAW (Rear)	+	GAW (Front)	=	GCAW

Weighing a two axle slide out motorhome:

- Slide rooms must be in the retracted position.
- Record the gross axle weight ratings (GAWR) and the gross vehicle weight rating (GVWR).
- Weigh and record the weight placed on each tire.
- If necessary, adjust the payload so the GAWR is not exceeded. Total combined weights must not exceed the GVWR.
- Using the tire chart, locate the recommended air pressure for the weight carried by each tire. Adjust the tire pressure accordingly.



Rear

Scale B	GAWR ÷ 2			
	GAW			
	+	=	GAWR	
			GCAW	
Scale D	GAWR ÷ 2			
	GAW			

Front

Scale A	GAWR ÷ 2			
	GAW			
	+	=	GAWR	
			GCAW	
Scale C	GAWR ÷ 2			
	GAW			

Chart - Tire Inflation

Use the tire chart to locate the recommended air pressure for the weight carried by each tire. A quality truck tire gauge with an angle dual head is recommended. Adjust the tire pressure accordingly.

TIRE SIZE	MAX Speed Rating (MPH)	Dual (D) Single (S)	INFLATION PRESSURE PSI												
			65	70	75	80	85	90	95	100	105	110	115	120	125
8R19.5	75	D	2350	2460	2570	2680	2780	2880	2980	3070	3160	**3375(F)**			
		S	2410	2540	2680	2800	2930	3060	3170	3280	3400	**3500(F)**			
225/70R19.5	75	D		2720	2860	3000	3115	3245	**3415(F)**						
		S		2895	3040	3195	3315	3450	**3640(F)**						
245/70R19.5	75	D		3415	3515	3655	**3875(F)**	3940	4075	**4375(G)**					
		S		3640	3740	3890	**4080(F)**	4190	4335	**4545(G)**					
265/70R19.5	75	D				3750	3930	4095	4300	4405	4560	4805	4860	**5070(G)**	
		S				3970	4180	4355	4540	4685	4850	5070	5170	**5355(G)**	
9R22.5	65	D	3120	3270	3410	3550	3690	3820	**3950(F)**						
		S	3190	3370	3560	3730	3890	4050	4210	4350	**4500(F)**				
10R22.5	65	D	3690	3870	4040	4200	4375	4520	4670	**4875(F)**	4970	5110	**5250(G)**		
		S	3770	4000	4210	4410	4610	4790	4970	**5150(F)**	5320	5490	**5680(G)**		
11R22.5	75	D				4760	4950	5120	5300	5470	**5750(G)**	**5800(H)**			
		S				4990	5220	5430	5640	5840	**6175(G)**	6240	6430	**6610(H)**	
12R22.5	65	D				5190	5390	5590	5780	5960	6150	6320	6500	**6750(H)**	
		S				5450	5690	5920	6140	6370	6590	6790	7010	**7390(H)**	
245/75R22.5	75	D		3260	3425	3640	3740	3890	4080	4190	4335	**4410(G)**			
		S		3470	3645	3860	3980	4140	4300	4455	4610	**4675(G)**			
255/70R22.5	75	D		3585	3765	3970	4110	4275	4410	4455	4610	4675	**5070(H)**		
		S		3815	4005	4190	4370	4550	4675	4895	5065	5205	**5510(H)**		
265/75R22.5	75	D			4040	4205	4370	4525	4685	**4805(G)**					
		S			4070	4255	4440	4620	4800	4975	5150	**5205(G)**			
275/80R22.5	75	D					4855	5080	5305	5525	5745	5965	6180	**6395(H)**	
		S					5265	5515	5755	6000	6235	6475	6710	**6940(H)**	
295/75R22.5	75	D			4690	4885	5070	5260	5440	**5675(G)**	5800	**6005(H)**			
		S			4725	4945	5155	5370	5510	5780	5980	**6175(G)**	6370	**6610(H)**	
295/80R22.5	75	D				4855	5100	5335	5570	5805	6035	6265	6490	6720	**6940(H)**
		S				5480	5750	6020	6285	6550	6810	7070	7320	7580	**7830(H)**
315/80R22.5	75	D					5840	6070	6395	6540	6770	6940	7210	**7610(J)**	
		S					6415	6670	6940	7190	7440	7610	7920	**8270(J)**	
285/75R24.5	75	D			4740	4930	5205	5310	5495	**5675(G)**					
		S			4770	4990	5210	5420	5675	5835	6040	**6175(G)**			

Holiday Rambler is not the author of this chart and makes no representation or warranty concerning the accuracy of the information disclosed by the chart. Holiday Rambler is not responsible for the accuracy of the information disclosed or for any errors within the Tire Inflation Chart.

Inspecting the Tire Pressure

Check the tire pressure regularly. If a tire is punctured by a nail or screw, creating a slow leak, it may eventually be spotted if it is a front tire or an outside rear dual. However, if there is a leak on an inside dual the chances of spotting it without an air pressure check are very slim. If you begin driving unaware that an inside dual tire has a low air pressure or is flat, very quickly (in most cases a few miles) the outside rear tire (next to the low air pressure tire) will heat up from carrying double the load, leading to failure of the outside dual tire. The motorhome will end up with two tires flat on the same side on the same axle.

The air pressure should be checked every two weeks or at least once a month and before any major trip. The RV tire air pressure should be checked every "drive" morning on both long and short trips (driving a day or less). The tires should be checked before leaving on a trip and again before you start your trip home. If the motorhome is stored for any length of time the air pressure should be checked prior to storage. More importantly, check the tire pressure when it is pulled out of storage.

Check the tire pressure when the tires are "cold" and have not been driven for more than one mile. The stated load capacity for a given cold inflation pressure is based on ambient outside temperature. If you must check the tires when they are warm or hot, allow for a slight increase in air pressure and make sure they are within a couple of pounds of each other on the same axle (does not apply to slide-out equipped motorhomes). Never let air out of a hot tire.

To check or maintain the inflation pressure in the tires use a quality truck tire air gauge which has an angle dual head. This type of gauge will allow you to check inflation of the inner dual wheel which has the valve stem pointing outward; the outer wheel which has the valve stem pointing inward. Nothing should restrict the ability to check the tire's air pressure daily when traveling in the motorhome. Pressure sealing valve caps should always be used to prevent air from escaping from the valve stem. If there are valve stem extension hoses make sure they are good quality stainless steel braid reinforced and are securely anchored to the outer wheel.

Optimum tire performance is achieved with proper inflation pressures for the loads being carried. The air pressure of all tires should be checked and corrected prior to travel, or daily if in full time use.

Tires of different patterns should not be mixed on the same axle. The difference in tractive force could cause rear end gear fight and mechanical damage to the drive train. Tires of different size or construction must never be mixed on the same axle.

Higher than recommended pressure can cause:

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

Lower than recommended pressure can cause:
- Tire squeal on turns.
- Rapid and uneven wear on the edges of the tread.
- Tire rim bruises and rupture.
- Tire cord breakage.
- High tire temperatures.
- Reduced handling.
- High fuel consumption.

Unequal tire pressures on same axle can cause:
- Uneven braking, swerve of acceleration.
- Steering lead, torque steer.
- Reduced handling.

Tire Rotation

The useful tire life of your tire is achieved by the uniform wear for all tires. This can be increased with tire rotation. The first tire rotation is the most important. The tire rotation pattern used for the motorhome should be evaluated by the tire manufacturer. Any unusual or unique wear pattern which may have developed should be evaluated before rotation. Misalignment, imbalance or other mechanical problems may exist and will need corrected prior to rotation.

The tire rotation should be performed every 5,000 miles, or at any sign of uneven wear. After a tire rotation, the inflation pressures should be checked and adjusted for the actual loads of the wheel position accordingly. Tires are covered by the tire manufacturer. Holiday Rambler is not responsible for tire wear.

Blocking When Leveling

Extreme caution must be taken to ensure that the tires are fully supported when placing blocks under the tires. The load on the tire should be evenly distributed on the block. In the case of dual tires, distribute the load evenly on blocks for both tires. If not properly blocked the steel cables in the sidewall of the tires may be damaged and could lead to premature fatigue of the sidewall. **Refer to the "Specifications - Chart" under Specifications & Diagrams in Section (9).**

Tire Care

Cleaning:

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

When cleaning any rubber product, proper care and methods in cleaning must be used to obtain the maximum service years out of the tires. Use a soft brush and a mild detergent to clean the tires. If a dressing product is used to "protect" the tires from aging, use extra care and caution. Tire dressings that contain petroleum products or alcohol may cause deterioration or cracking.

In many cases it is not the dressing that causes a problem, but the chemical reaction that subsequently occurs. When these same dressing products are used on a passenger car tire that is replaced every three to four years, it is rare to see a major problem. However, in most cases, RV tires may last longer due to limited annual mileage, and exposure.

Storage of Tires -Long Term

The RV is designed for recreation, not long-term storage. However, unless the motorhome is used for full-time living it will need to be stored. Rubber tires age faster when not being used. A cool, dry, sealed garage is the preferred method of storage. Many RV's are stored outside in the elements. Some storage surfaces may cause tires to age prematurely. Placing a barrier (i.e. cardboard, plastic or plywood) between the tire and the storage floor/ground surface will help to protect the tires.

There are a few steps that can be taken to reduce the aging effects from long-term storage or a non-use period. Thoroughly clean the tires. Cover the tires to block direct sunlight and ultraviolet rays. Store the RV out of a high ozone area. Failure to take these steps can cause early deterioration and shorten the life of the tires.

NOTE: When the motorhome is stored the tires should be inflated to maximum inflation pressure as indicated on the sidewall of the tire.

Before removing the motorhome from long-term storage thoroughly inspect each of the tires. This means a close examination of each tire's tread area and air pressure. If the pressure check indicates the tires have lost air during storage, inflate them to the correct pressure for the current load before putting the motorhome into service.

In Case of Flat Tire

If you have a flat tire it is recommended to call for roadside service. Proper equipment is necessary to change a tire on the motorhome due to the size and weight of the tires and the vehicle. A professional service technician will have the proper equipment and training to repair or replace the tire. In the case of sudden tire failure, avoid heavy braking. Hold the steering wheel firmly and gradually decrease speed. Slowly pull off the road to a safe, firm and level spot. Turn the ignition off and turn the hazard flasher system ON. Goodyear Tire Company has an emergency number which offers 24 hours assistance. To contact Goodyear call (877) 484-7376. The old tire should be **saved** for warranty purposes.

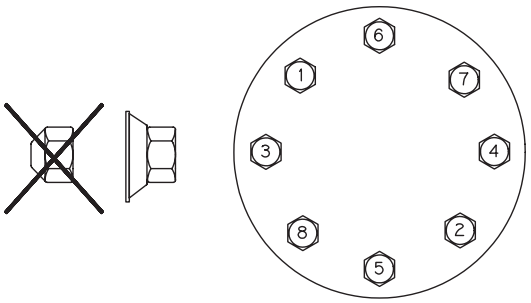
Hub Piloted Mounting:

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

NOTE: Loosen and tighten lug nuts in a star pattern sequence. Sequence tighten to 50 ft. lbs. first, then sequence tighten to 150 lbs. (over tightening can cause distortion).

Front Wheels:

Slide the front wheel over the studs being careful not to damage stud threads. Snug the nuts in sequence. Do not tighten them fully until all have been seated. Tighten the nuts to 150 ft. lbs. in sequence (as shown in the illustration).



Lug Nut and Sequence

Dual Rear Wheels:

Slide the inner dual wheel over the studs being careful not to damage the stud threads. Align the handholds for valve access and slide the outer dual wheel over the studs, again being careful not to damage the stud threads.

Snug the nuts in sequence. Do not tighten them fully until all have been seated. Tighten the nuts to 150 ft. lbs. using the sequence as shown in the illustration. The hub mount wheels use two piece flange cap nuts for both front and rear applications. No inner cap nuts are required.

Torque the Nuts Properly:

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

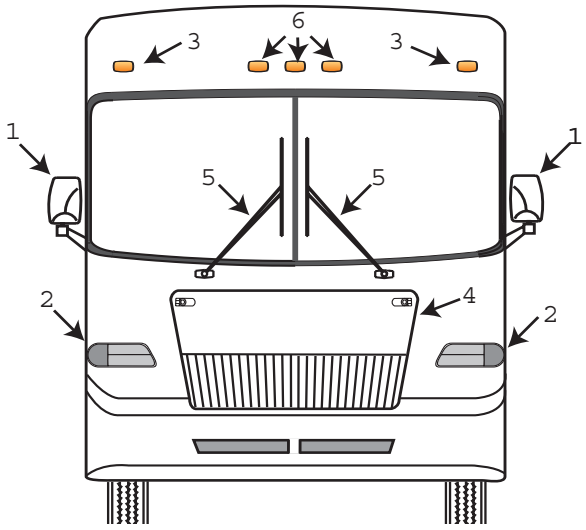
Care & Maintenance of Wheel Covers

Clean the wheel covers frequently with high pressure water from a hose using a mild detergent. Do not use harsh alkalis, alcohol or acidic cleansers. A secondary hand washing with a soft cloth may be required to remove stubborn road grime. To remove the wheel covers from the wheel for a thorough cleaning use the special tool that was included with the motorhome. Each wheel cover is secured by four lug covers identified by indent or notch markings. When the wheel covers are removed tires and rims can be cleaned and inspected.

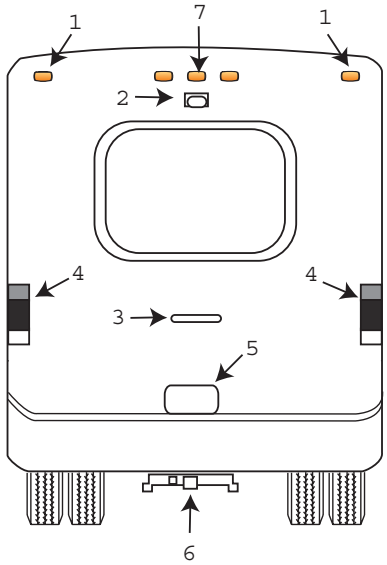
Remove dirt, corrosion or any foreign materials from the tire side of the rim using a wire brush. Do not use a wire brush or other abrasive substances to remove dirt and corrosion from the wheel covers. To maintain the original appearance of the wheel covers the following procedures are recommended:

1. After installing new wheels (prior to operating your motorhome) use a sponge, cloth or soft fiber brush to wash the exposed wheel surfaces with a mild detergent/warm water solution.
2. Rinse thoroughly with clean water.
3. Wipe dry to avoid water spots.
4. Use a high quality, non-abrasive polish to remove stubborn road tars, insects or hard to remove deposits.
5. To protect the appearance surface on wheels covers, wax the cleaned surface with a high quality car wax.
6. Clean the wheel covers frequently to maintain their appearance.

VIEWS - FRONT & REAR

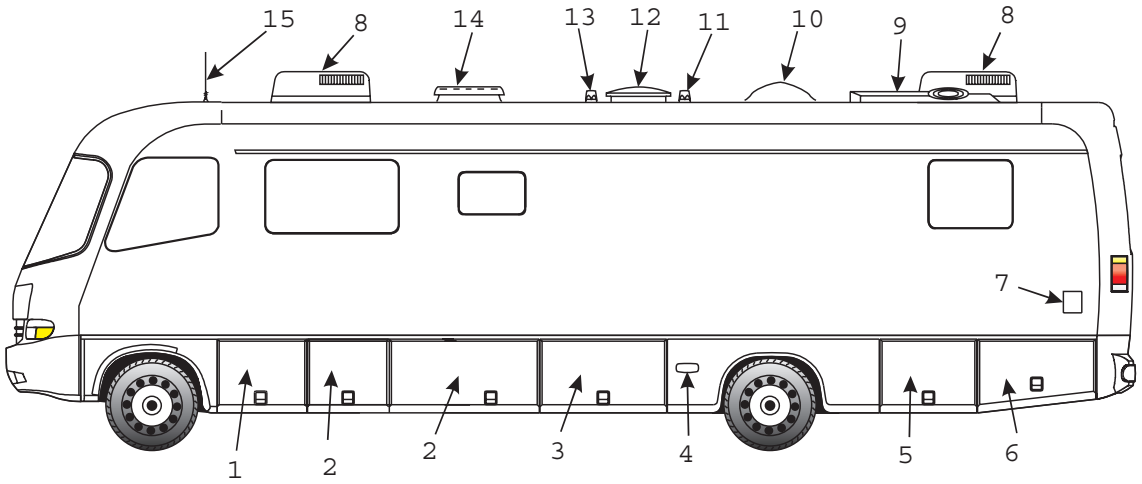


1. Mirrors
2. Headlights
3. Clearance Lights
4. Engine Access Door
5. Windshield Wipers
6. Identification Lamps

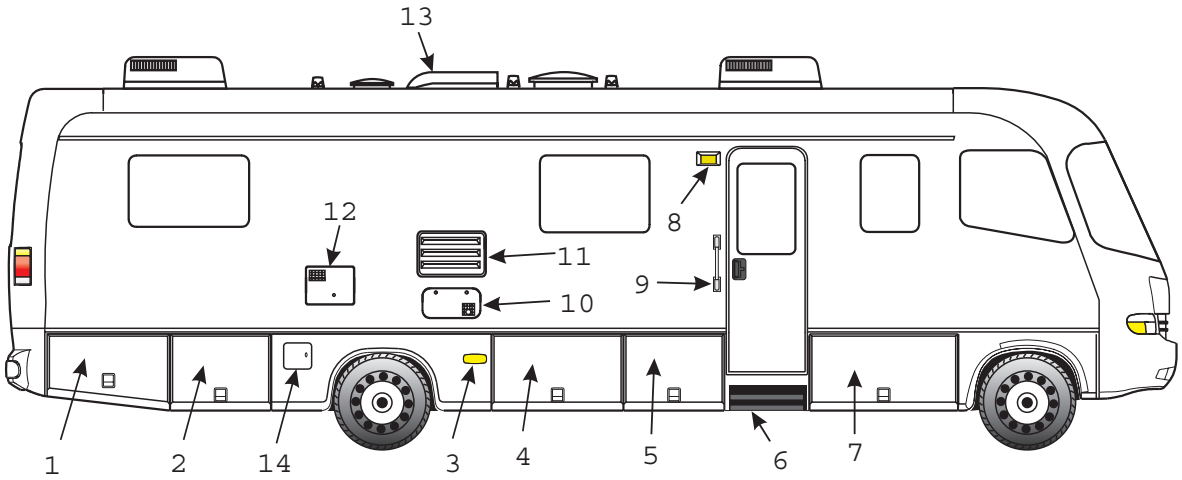


1. Clearance Lights
2. Camera
3. Third Brake Light
4. Tail Lights
5. License Plate
6. Rear Tow Hitch
7. Identification Lamps

VIEWS - CURBSIDE & ROADSIDE



1. Storage & Electrical Panel
2. Storage Compartment
3. Generator
4. Marker Light
5. Water Control Service Center
6. Shore Cord - Electrical Center
7. Roof Air Conditioner
8. TV Antenna
9. Skylight Dome
10. Toilet Vent
11. Exhaust Vent - Bath
12. Holding Tank Vent
13. Exhaust Vent - Galley
14. Radio Antenna



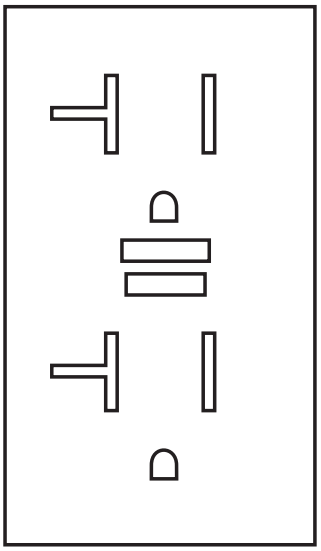
1. Storage Compartment
2. House Batteries & Disconnect
3. Marker Light
4. LP Tank Access & Controls/Spare Tire
5. Storage Compartment
6. Entry Steps
7. Chassis Disconnect/Storage Compartment
8. Porch Light
9. Grab Handle
10. Furnace/Heater Compartment Access
11. Refrigerator Compartment Access
12. Water Heater
13. Refrigerator Vent
14. Fuel Fill

NOTE: Differences in models and floor plans may vary locations of items.

SPECIFICATIONS - DIMENSIONS CHART

CHASSIS SPECIFICATIONS						
MODEL	35SBD	35PBD	35WGS	36SGS	36PBD	36WGS
GVWR	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.
GCWR	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.
GAWR (Front)	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs
GAWR (Rear)	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs
Wheel Base		228"	228"	228"	228"	228"
Overall Length		35' 11"	35'	36'	36'	36'
Overall Height	11'9"	11'9"	11'9"	11'9"	11'9"	11'9"
Interior Height	6'6"	6'6"	6'6"	6'6"	6'6"	6'6"
Interior Width	94.5"	94.5"	94.5"	94.5"	94.5"	94.5"
Exterior Width	100"	100"	100"	100"	100"	100"

GFCI BREAKERS & OUTLETS



GFCI INTERRUPTER OUTLET

A ground fault circuit interrupter "GFCI" can be found in two different types of applications. One type is incorporated in a breaker used in 120 Volt AC breaker panels, the other is incorporated in an outlet. The GFCI, whether it is a breaker or an outlet, offer two types of protection. One type of protection is from over-current or shorts. It also provides protection for persons against hazardous ground fault currents which can result in injury or death. Ground fault currents are currents that flow from the "HOT" or power terminal through a person to the ground. For example, touching a faulty appliance while standing on or making contact with an electrical ground such as a water fixture, bathtub or the earth. If the device has been properly installed it will offer protection against the type of shock that can result from faulty insulation, wet wiring from inside an appliance, or any device or equipment plugged in or wired to that circuit. The "ground fault" portion of the outlet or breaker uses sensitive electronics inside the outlet or breaker to detect a ground fault problem. The electronics monitor the normal current of power, flowing to the "hot" or black wire through the load (eg. a light bulb or appliance) and coming back on the "neutral" or white wire. If just a small amount of the current comes back on the safety ground wire the electronics will "trip" the breaker or outlet, stopping the flow of electricity. The amount of current it takes to trip the device from a ground fault varies slightly from the different outlet or breaker manufacturers (approximately 30 mils or less). Electrical shocks resulting from ground faults can be felt, but such a shock is considerably less than one without ground fault protection. People with heart conditions or other conditions that make them susceptible to shocks can still be seriously injured. A GFCI outlet or breaker will not protect against shock from a normal current flow. For example, a shock from touching both metal prongs of an electrical cord or appliance while plugging it in.

WARNING: If a breaker or outlet trips continually DO NOT continue to reset breaker or outlet until the problem has been identified and corrected.

NOTE: The ground fault outlet or breaker should be tested once a month to insure it is working properly. Use the "TEST" button on the outlet or breaker. It should trip with an audible "click." The breaker or outlet will not trip if no AC power is present to the device. If power is present and the device will not "trip," replace it before using that circuit.

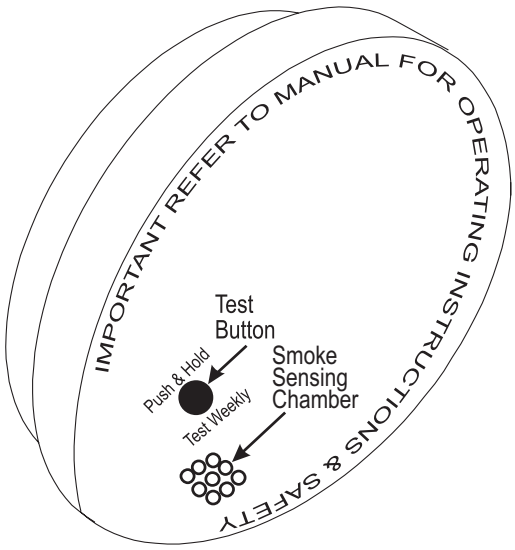
NOTE: One mil is 1/1000 of one amp.

SMOKE DETECTOR

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

The smoke detector responds to both visible and invisible products of combustion. The smoke detector will automatically return from alarm to normal state when the reason for activation, the presence of smoke, is completely removed.

Common causes of fires are smoking in bed, leaving children unattended and cleaning with flammable fluids. Please be safety conscious and avoid unnecessary risk.



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

How to Test

To test the electronics of the alarm press the test button on the cover of the smoke alarm for a few seconds. The smoke alarm will sound by making a continuous loud beep. To complete the test sequence release the button and the alarm should stop.

NOTE: Test the smoke alarm operation after the motorhome has been in storage, before each trip and at least once a week during use.

Maintenance

Vacuum the slots in the cover and sides with a soft brush attachment every month. The smoke alarm should be cleaned every six months to help keep the unit working efficiently.

The battery should power the smoke alarm for at least one year under normal use. When the battery reaches the end of its normal life a low battery warning (intermittent beeping) will indicate the need for battery replacement. Some owners may find it practical to replace the battery during the time changes in the spring and fall.

Troubleshooting

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

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

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

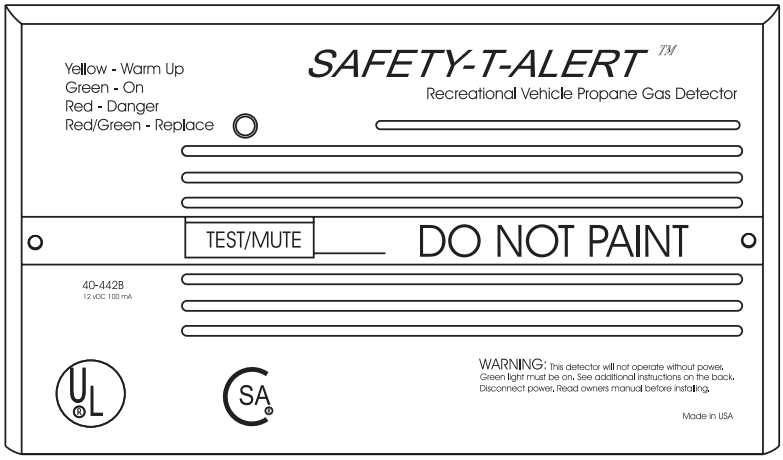
Abnormal air conditions may cause the highly sensitive smoke alarm to give a false alarm. If no fire is apparent ventilate the room and/or blow fresh air into the motorhome until the alarm stops. Once cleared the smoke alarm will automatically reset. Dust can lead to excessive sensitivity. Vacuum as needed.

LP-GAS DETECTOR

Provided for safety is a gas detector. This gas detector will detect both LP-Gas and Methane Gas. Liquefied Petroleum (LP) Gas is heavier than air, Methane Gas is lighter than air. LP-Gas will settle to the lowest point, generally the floor of the motorhome. Methane Gas will rise. The gas detector is also sensitive to other fumes such as hair spray, of which most contain butane as the propellant. Butane, like propane is heavier than air and will settle to the floor level where it will be detected. When this occurs, press reset button to stop alert sound for 60 seconds.

The other combustibles which will be detected include alcohol, liquor, deodorants, colognes, perfumes, wine, adhesives, lacquer, kerosene, gasoline, glues, most of all cleaning agents and propellant of aerosol cans. Most are lighter than air in their vapor state and will only be detected when the motorhome is closed up.

Operation



Upon first application of power the LED will flash yellow for three minutes while the detector is stabilizing. At the end of the start cycle the LED will turn Green indicating full operation. If the detector senses unsafe levels of gas it will immediately sound an alarm.

The gas detector operates on 12 Volts, with a current draw less than 1/10th of one amp.

CAUTION: This detector will not alarm during the three minute warm up cycle.

Testing

Depress the **TEST** switch any time during the warm up cycle or while in normal operation. The LED should flash **red** and the alarm should sound. Release the switch. This is the only way you should test the detector. The test feature checks full operation of the detector.

WARNING: Test the operation of this detector after the motorhome has been in storage, before each trip and at least once per week during use.

Alarm

The **red** LED will flash and the alarm will sound whenever a dangerous level of propane or methane gas is detected. The detector will continue to alarm until the gas clears or the Mute switch is pressed.

Procedures To Take During An Alarm:

1. Turn off all gas appliances (i.e. stove, heaters, furnace). Extinguish all flames and smoking material. Evacuate, leave doors and windows open.
2. Turn off the propane tank valve.
3. Determine and repair the source of the leak. Seek professional help if necessary.

CAUTION: Do Not re-enter until the problem is corrected.

Alarm Mute:

Press the **Test-Mute** button when the detector is in alarm.

1. The **red** LED will continue flash and the alarm will beep every 30 seconds until the gas level has dropped to a safe level.
2. The LED will flash **green** until the end of the Mute cycle.
3. If dangerous gas levels return before the end of the mute cycle the alarm will beep four times and return to phase 1.
4. After two minutes the detector will return to normal operation (**solid green**) or resound the alarm if dangerous levels of gas remain in the area.

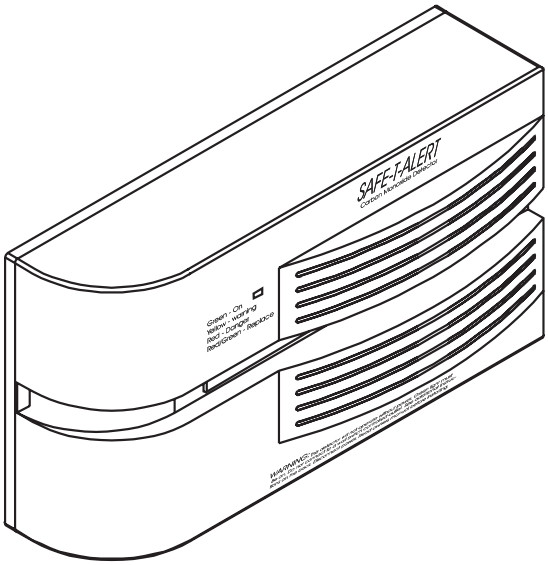
Fault Alarm:

Should the microprocessor sense a fault in the gas detector a fault alarm will sound twice every 15 seconds. The LED will alternately flash **red** to **green** and the **MUTE** switch will not respond to any command. The gas detector must be repaired or replaced.

Care

1. Vacuum the dust off the detector cover weekly (more frequently in dusty locations) using the soft brush attachment of the vacuum.
2. Do not spray cleaning agents or waxes directly onto the front panel. This action may damage the sensor, cause an alarm or cause a detector malfunction.

CARBON MONOXIDE DETECTOR



The motorhome is equipped with a carbon monoxide detector. Carbon monoxide (CO) is a colorless, odorless and tasteless gas. Even low levels of CO have been known to cause brain and other vital organ damage in unborn infants, with no effect on the mother. In cases of mild exposure the symptoms may include: a slight headache, nausea, vomiting and fatigue. Symptoms for medium exposure may include a severe throbbing headache, drowsiness, confusion and fast heart rate. Extreme exposure can result in unconsciousness, convulsions, cardio-respiratory failure and death. Young children and household pets may be the first effected. The CO detector is designed to detect the toxic CO fumes that result from vehicle exhaust and incomplete combustion sources like a furnace, gas stove or water heater. Consequently, it is uncommon for household smoke from cigarettes or normal cooking to cause the alarm to sound.

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

Operating Instructions

The detector is equipped with a self-cleaning CO sensor and requires a ten minute initial warm-up period to clean the sensor element and achieve stabilization. The green power light should be lit when the power is on. If the light is not lit, turn off the power and check all wire connections. If the power is on and the connections are correct but the indicator still does not light, the detector should be returned for service. Do not attempt to fix the detector yourself. The indicator light displays a specific color to monitor the conditions as follows:

- **Green -** Indicates an **"ON"** or normal condition. The CO detector has power and is sensing air for the presence of CO gas. The alarm horn will not sound.

- **Yellow -** Indicates a **"trouble"** or malfunction condition. The alarm horn will sound and cannot be reset by the **TEST/RESET** button. The CO detector is not working properly and must be immediately replaced or repaired.

- **Red** - Indicates an "**alarm condition**." The detector has sensed the presence of a hazardous level of carbon monoxide. The alarm horn will sound continuously until reset by the **RESET** switch.

Alarm

When the alarm sounds you should have the detector and the motorhome checked by an authorized service technician as soon as possible. Never disconnect a CO detector to silence an annoying alarm. Evacuate the motorhome immediately when the **red** light is lit and the alarm sounds. Do a head count to check that all persons are accounted for. Call the nearest fire department and ask them to determine the source of the carbon monoxide. Do not re-enter the motorhome until it has been aired out and the problem corrected.

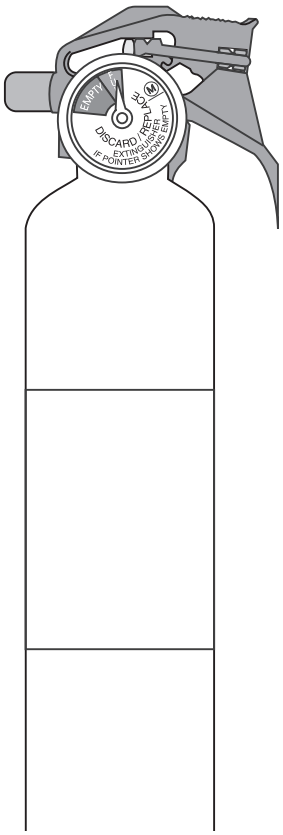
Testing

Test the carbon monoxide detector operation after the motorhome has been in storage, before each trip and at least once a week during use. You can test the alarm by holding the test button in until the alarm sounds. The alarm will stop beeping in about 30 seconds.

Cleaning

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

FIRE EXTINGUISHER



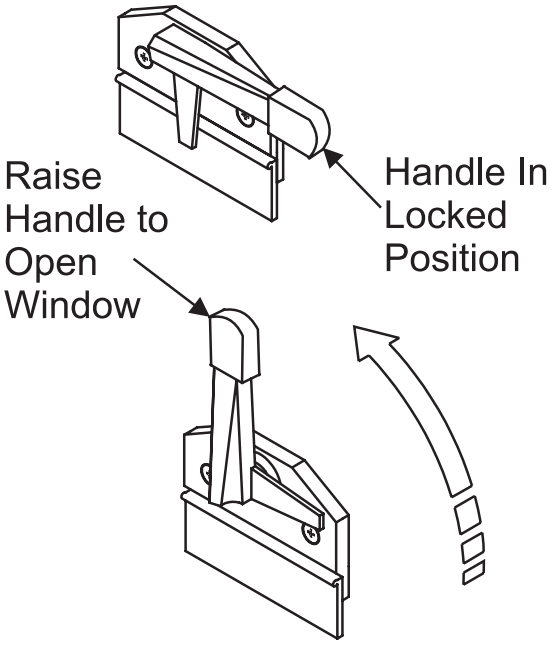
The fire extinguisher in the motorhome is located near the main entrance door. Please read the operating instructions that are printed on the fire extinguisher. If there is any doubt on how to operate the fire extinguisher, you and the family should practice using it. Be sure to replace or recharge the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

Inspect the fire extinguisher at least once a month. Do so more frequently if the extinguisher is exposed to weather or possible tampering. Do not test the extinguisher by partially discharging, this will cause a loss of pressure.

Use the <u>PASS</u> word!

<u>P</u>ull the pin to unlock the extinguisher.
<u>A</u>im at the base (bottom) of the fire and stand 6-10 feet away.
<u>S</u>queeze the lever to discharge the agent.
<u>S</u>weep the spray from left to right until totally extinguished.

EGRESS EXIT WINDOW



Egress Window Handle

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

The glass slider in the egress window operates similar to other windows. To open the egress window, lift the red handle and push outward on the window. Pull the window closed and lower the handles to lock the egress window.

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

NOTES

Endeavor
GAS

SECTION 3
CARE & MAINTENANCE

EXTERIOR CARE

Corrosion

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

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

Washing

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

Drying

Drying chamois cloths come in natural and synthetic materials. Either type is acceptable as long as the surface is clean. Soak the chamois in clean water until all chamois material has absorbed water. Wring excess water from chamois. Start at the top and work towards the bottom. Use a downward "S" pattern to remove water from the surface and wring out the chamois as needed. Using a chamois cloth to remove the rinse water is not necessary, but the effort can be worthwhile.

Waxing

To wax or not to wax? This is a good question. There are many schools of thought on this issue. The two most common thoughts are:

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

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

NOTE: When selecting a product for use follow the product manufacturer's recommended application instructions.

Types of Products:

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

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

Polishes: Polishes usually contain a combination of wax based substances with an abrasive, getting the two for one idea. These products can be too abrasive for clear coats and are not recommended for use.

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

When selecting a product the container should be marked "safe for clear coats" or "clear coat safe." Carefully follow all manufacturer's application instructions when using a product. Upon first use of a product try it on a "small test spot" in an

inconspicuous area in case an undesired reaction occurs. Observe the test area from different angles checking for hazing or swirl marks. If an abnormal reaction to the finish results, discontinue product use and consult the product's manufacturer. If the product is a paste do not allow dried paste to be baked on by the sun. Remove paste shortly after drying. Clean, dry, 100% cotton cloths or cotton baby diapers are best suited for the removal of dried paste. Turn the cloth often. Use a separate clean cloth to buff. The surface should feel "slick" when rubbing the cloth lightly over it. Avoid repeated wax applications which can cause wax to build up. Some very fine scratches or swirl marks may be removed by application of a glaze. These types of glazes fill the scratches or swirl marks.

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

Bright Metal

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

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

Maintenance - Exterior

The motorhome is subjected to a great deal of outside conditions. While the coach is parked it is exposed to extreme temperatures, humidity, ultraviolet rays, acid rain and other organic environmental conditions. While the coach is in operation it is subjected to twisting and flexing caused by entering and exiting driveways, bouncing through potholes and traveling over winding roads.

Periodic inspections of the fiberglass exterior may reveal minute cracks in the surface commonly called "spider cracks" or "hairline cracks," which are caused by the flexing of the fiberglass exterior. These are quite normal. If a crack represents a threat to the integrity of the fiberglass it will open up and the weave of the cloth would be visible. If the exterior has been damaged, prevent moisture penetration, especially in freezing climates. Cover the area as quickly as possible. Use plastic sheeting and tape, if necessary, so that moisture will not get into the motorhome and damage the interior.

Seal Inspections

Periodic resealing of the joints and seams is necessary to prevent the entrance of moisture into the motorhome. Enough emphasis cannot be placed on this issue. Extreme damage from a water leak can occur rapidly. Never leave the vehicle unattended with the slide room extended. If the vehicle is to be stored outside throughout the winter months a full interior inspection for water leaks should be made bi-monthly. Extensive sealing has been done at the factory; however, the twisting and flexing that normally occurs while traveling may have compromised a seal or seam. All joints and seams should be inspected at least twice a year and recalked as necessary. Special attention should be directed toward the roof air conditioning seals, ceiling and plumbing vents, skylights, roof mounted antennas, windows, door molding, clearance lights and the beltline molding. Specific sealant products should be used in the areas for which they were designed. These items can be obtained from recreational vehicle parts suppliers. Listed below are some of the more common sealants and the areas in which they are used. Approved sealants are available at service centers and authorized dealers.

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

Sealant Types

Acryl-R:
This product is used on all roof openings such as vents, skylights, roof mounted antennas and ladder roof mounts, with exception to the roof air conditioners. The sealant should be applied only where the equipment base meets the roof. Clean old sealant that is lifting before applying the new sealant. Make sure the roof is dry and free of dirt. Acryl-R is usually available in a caulking tube. Using masking tape, mask around edges of the area to avoid mishaps as the product spreads out after application.

The roof air conditioners have closed cell foam base gaskets. No sealants are required. The roof air conditioners should be checked for tightness by the four mounting bolts located in each corner of the air conditioner roof opening. Torque specification is 40-50 in./lbs. The base gasket should be compressed to approximately ½ inch.

Clear Silicone Sealant:
Primarily this product is used on the sidewalls where a hole has been made and an item installed. This includes Windows, Doors, Handles, Beltline Molding, Latches and around bases of items surface mounted such as clearance lights. Old peeling sealant should be removed. Avoid using metal utensils as these will scratch the painted surface. Use nylon sticks or equivalent. Avoid using lacquer thinners or ketone based solvents as these chemicals can damage the painted sur faces. Be sure the surface is clean and dry before application. Cut tube at an angle with smallest usable opening. Avoid a heavy bead as a little goes a long way.

Wear a disposable latex glove and use a dry finger at a 45° angle to smooth out the silicon beads. Keep rags or paper towels handy for clean up. Use care when applying silicone. Plan ahead before starting a bead, looking for obstacles that may impede application.

Black Urethane:
This product is used for sealing the windshields. It was not designed to fill holes or other imperfections. Black urethane comes in a tube and it applies much in the same way as silicone does. Clean up involves using solvents such as paint thinner. Gloves are required as this material is hazardous.

Acrylic Sealants (geocel 2300):
This product is used where items are sealed under a painted surface such as the metal corners of the slide-out room. The material is specially formulated to allow paint adhesion.

Spray Foam:
This product is used to seal where a hole has been made for items such as water lines or wires are coming through a floor opening.

Black Seam Tape (Use may vary with models):
This is a sticky tape which comes on a roll. Black seam tape is used on the front and rear roof seams, as well as on the roof to the sidewall corners of the slide out room. Cut away old lifting tape. Surface should be clean and dry before a new application is made. This may be done in sections as needed.

INTERIOR CARE
- *Fabrics*

The fabrics have been manufactured with the same quality you would expect to find in a furniture store. If the fabric is abused it can be damaged. Special care needs to be taken when your motorhome is exposed to a very humid climate for an extended period of time. Cover all upholstery and make sure window coverings are down to protect from sun damage.

Protect the fabric from any unnecessary exposure to moisture. The sofa, pillows, dinette cushions, living area chair, driver/passenger seating and window treatments have been treated with *Scotch Guard* to prevent overall water spots and soiling. Frequently used items will wear accordingly and may require more attention than those items not regularly used.

Use the following guidelines for cleaning your upholstery fabrics:

- Water-based cleaners are not recommended.
- If a spill does occur, blot the soiled area. Do not rub it.
- Some solvents are not recommended since they may have an adverse reaction on specific backings of your upholstery fabric.
- To prevent overall soiling, frequent vacuuming or light brushing are recommended to remove dust and grime.
- Clean spots using a mild water-free solvent or dry cleaning product.
- Clean only in a well ventilated area and **avoid any product containing carbon tetrachloride** or other toxic materials.
- Use a professional furniture cleaning service for an overall cleaning.

Fabric Cleaning Codes:

The codes listed below refer to cleaning instructions recommended by the fabric manufacturer for specific fabrics. The "Fabric Specification Charts" (located on the following pages) list specific fabric codes under "Cleaning Code."

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

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

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

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

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

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

***Machine Washing for 100% Polyester:**
"Wash Cycle" - Use synthetic setting and high water level with mild agitation. A mild soap or detergent in water not to exceed 160º F.
No bleach or fabric softener.

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

"Finishing" - If necessary, press as following:

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

Fabric Specification Chart:

Fabric	Where Used
	Rosewood
Andante Prism	Sofa, Din Cushion, LR Pillow, LR Lam
Origin 1553 MO12353-009	Chair, FSD, LR Pillow, LR Lam
Reiss Denim	Bedspread, BR Pillow, Headboard, BR Lam
Diamon AV Kir	Bedspread, BR Pillow, BR Lam
RVAA Pearl	Leather
Brunswick Pearl	Vinyl
Pearl 009 Natural	Windshield
	Toffee
Piram Martini	Sofa, Din Cushion, LR Pillow, LR Lam
Metropolis Amber	Chair, FSD, LR Pillow, LR Lam
Harlow - SH Twilight	Bedspread, BR Pillow, Headboard, BR Lam
Shantung - SH Truffle	Bedspread, BR Pillow, BR Lam
RVAA New Oyster	Leather
Brunswick New Oyster	Vinyl
Pearl 009 Natural	Windshield
	Nordic Blue
P4174 Opal	Sofa, Din Cushion, LR Pillow, LR Lam
Norwich Wedgewood	Chair, FSD, LR Pillow, LR Lam
Ashbrook Multi	Bedspread, BR Pillow, Headboard, BR Lam
Jester - TR Sapphire	Bedspread, BR Pillow, BR Lam
RVAA Pearl	Leather
Brunswick Pearl	Vinyl
Pearl 009 Natural	Windshield
	Silver Pine
Cayman Jungle	Sofa, Din Cushion, LR Pillow, LR Lam
Dazzle 010	Chair, FSD, LR Pillow, LR Lam
Monarch Moss	Bedspread, BR Pillow, Headboard, BR Lam
Diamond AV Pine	Bedspread, BR Pillow, BR Lam
RVAA New Oyster	Leather
Brunswick New Oyster	Vinyl
Pearl 009 Natural	Windshield

LR = Living Room
BR = Bedroom
FSD = Free Standing Dinette

Fabric Specification Chart:

Fabric	Where Used
	Martha Stewart
Shehere Zade Champagne	Sofa, LR Pillow, Din Cushion, LR Lam
Boheme Champagne	FSD, LR Pillow
Atherton Cinnamon	Chair, LR Lam, BR Lam
Garden Stripe 10013 Antique	Bedspread, BR Pillow, BR Lam
Chrysanthemum 10003 Camel	Bedroom Accent, BR Pillow
Twill Stripe 005 Rye	Bedroom Accent, BR Pillow, Hdbrd
Fancy Taffeta 001 Ecru	Bedroom Accent, BR Pillow
Pansy Taffeta 006 Redwood	Bedroom Accent, LR Pillow
	Bedroom, BR Pillow, BR Lam
Pearl 242 Silk	Windshield
ALZ Gold	Leather - J-Lounge, Rec, Chair, Sofa
New Oyster	Pilot Seat - Dash
La Boheme Amaretto	Trim - Braid 3/8" Cord w/Tab, LR Pillow
La Boheme Amaretto	Trim - Brush Fringe, LR Pillow
La Boheme Amaretto	Trim - Tassle Fringe, LR Pillow
La Boheme Cherry	Trim - Braid 3/8" Cord w/Tab, BR Pillow
La Boheme Cherry	Trim - Tassle Fringe, BR Pillow
La Boheme Cherry	Trim - Dec. Border, BR Pillow
Neffertiti Khaki	Throw for Sofa

LR = Living Room
BR = Bedroom
FSD = Free Standing Dinette

Vinyl

Several areas of the motorhome can be covered in vinyl. These areas include the dash, items of furniture and the ceiling. The care and cleaning of these areas are outlined in the Morbern Vinyl section below.

Morbern Vinyl:

Vinyl requires periodic cleaning to maintain its neat appearance and to prevent the buildup of dirt and contaminants that may permanently stain and/or reduce the life of the vinyl if they are not removed. The frequency of cleaning depends upon the amount of use and the environmental conditions in which the vinyl is subjected. The procedures used for cleaning are dependent upon the end-use circumstances.

Normal Cleaning:

Most common stains can be cleaned using warm soapy water and clear water rinses. Moderate scrubbing with a medium bristle brush will help to loosen soil from the depressions of embossed surfaces. For stubborn stains, use the following commercially available mild detergents in accordance with the manufacturer's instructions: *Mr. Clean* or *Fantastik*. Full strength rubbing alcohol or mineral spirits may be tried cautiously as a last resort on very stubborn stains if the above suggestions do not work. Indiscriminate use of any solvent, or solvent containing cleaner, can severely damage or discolor the vinyl. Stains may become permanent if they are not removed immediately. The procedure for removal of the more severe staining agents are outlined below.

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

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

Bird Excreta & Vomit Stains:

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

Urine Stains:

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

Surface Mildew:

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

CAUTION: Any lacquer solvent will cause immediate irreparable damage to the vinyl. Wax should never be used on any vinyl upholstery as it will cause premature embrittlement and cracking. Dilute chlorine bleach before using. Never use full strength bleach. If flammable solvents such as alcohol, turpentine or varsol are used for cleaning, use only small quantities while in a well-ventilated area. Exercise proper caution by notifying any persons in the area. Keep away from any ignition source. Always wear protective gloves.

Ballpoint Ink:
Permanent Marker Ink spots will stain the vinyl permanently. Wipe the stain immediately with rubbing alcohol in a well ventilated area to remove much of the stain.

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

NOTE: Paint strippers will remove the print pattern and damage the vinyl if it comes in direct contact.

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

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

Crayon, Mustard or Ketchup:
Sponge with mild soap and water. For stubborn stains that may have set use a cloth soaked in diluted mild detergent with gentle rubbing. Any remaining stain should be washed with diluted bleach. Rinse repeatedly with cold water.

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

Lipstick, Grease, Oil, Make-Up or Shoe Polish:
Apply a small amount of mineral spirits with a cloth. Rub gently. Be careful not to spread the stain by smearing it beyond its original source. Remove shoe polish immediately as it contains a dye which causes permanent staining. Rinse thoroughly with clean water.

Candy, Ice Cream, Coffee, Tea, Fruit Stains, Liquor, Wine, Tanning Lotion or Soft Drinks:
Use lukewarm water and sponge repeatedly. Any loose material should be gently scraped with a dull knife. Any soiled area that remains after drying should be gently rubbed with a cloth, dampened with a mild detergent solution. Rinse thoroughly with clean water.

Blood or Plant Residue:
Use a clean cloth soaked in cold water and gently rub the stain. If stubborn spots remain use household ammonia and rinse repeatedly with a clean, wet cloth. Do not use hot water or soap suds as this will set the stain.

NOTE: Vinyl requires periodic cleaning to maintain its appearance and to prevent the buildup of dirt and contaminants that may permanently stain or reduce the life of the vinyl if left untreated. The frequency of cleaning and procedures used depend upon the amount of use and the environmental conditions in which the vinyl is subjected to. Vinyl tears or holes can be temporarily covered with clear "office" tape to prevent further damage. Repairs should be made by a professional upholstery shop. Commercial repair products may contain lacquers and cause the vinyl to become brittle and more difficult to repair.

Naugahyde

Naugahyde Leather is a vinyl coated fabric. The following care and cleaning methods should be used to ensure the long lasting beauty of the fabric. For best results staining should be removed immediately. The longer a stain is allowed to set, the more difficult it becomes to remove it. Always use a clean, soft, damp cloth when cleaning the fabric.

Light soiling:
- A solution of 10% liquid dish soap and warm water applied with the soft damp cloth will remove most soiling.
- Use a solution of liquid cleanser and warm water applied with a soft bristle brush, if needed. Wipe away the residue with the soft cloth.

Difficult stains:

- Mix a solution of 1 part bleach to 4 parts water.
- Dampen the soft cloth and rub gently.
- Rinse with a water dampened cloth to remove the residue.
- It may be necessary to allow the solution to puddle on the affected area for 30 minutes. Rinse using a water dampened cloth to remove the residue.

CAUTION: This method should be attempted on an inconspicuous spot prior to using on the stained area. Never use harsh solvents or cleanser intended for industrial use.

Stains such as lipstick, crayon, felt tip pen, ball point pen, mustard and certain dyed suntan lotions must be cleaned immediately. The longer these and other harsh or permanent stains are exposed to the fabric the more difficult they will be to clean. Other cleaning methods and cleaning agents may be attempted in an inconspicuous area to determine possible damage to the fabric.

Floors - Carpet Cleaning

Spot Removal Procedures

- Act quickly when anything is dropped or spilled. Remove spots before they dry.
- Blot liquids with a clean, white absorbent cloth or paper towel.
- For semi-solids, scoop up with a rounded spoon.
- For solids, break up and vacuum out as much as possible.
- Pretest the spot removal agent in an inconspicuous area to make certain it will not damage the carpet or its dyes.
- Apply a small amount of the cleaning solution recommended for the particular spot. Do not scrub. Work from the edges of the spot to the center. Blot thoroughly. Repeat until spot is removed.
- Follow steps on the Carpet Spot Removal Guide.
- After each application absorb as much as possible before proceeding to the next step.
- Absorb remaining moisture with layers of white paper towels, weighted down with a non-staining glass or ceramic object.
- When completely dry, vacuum or brush the pile to restore texture.
- If the spot is not completely removed contact a professional carpet cleaner.

Cleaning Solutions:

(A) Dry Cleaning Fluid: Nonflammable spot removal liquid, available in grocery and hardware stores.

(B) Nail Polish Remover: Any acetate, which often has a banana fragrance. Do not use if it contains acetone.

(C) Detergent Solution: Mix two cups of cold water and 1/8 teaspoon mild liquid detergent (no lanolin, non-bleach).

(D) Warm Water: Lukewarm tap water.

(E) Vinegar Solution: One cup white vinegar to one cup water.

(F) Ammonia Solution: One tablespoon household ammonia to one cup water.

(G) Spot Removal Kit: Available from retail carpet stores or professional cleaners.

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

(I) Permanent Change: Due to the nature of the stain there may be color loss. The carpet has been permanently dyed or the carpet yarns have been permanently damaged.

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

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

Floor - Vinyl

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

NOTE: Some dishwashing liquids, oil-based cleaners and one step "polishes" may not be suitable cleaners for the flooring. They can leave an oily residue which attracts soil and reduces gloss.

CAUTION: Flooring may become extremely slippery when wet. Avoid personal injury by wiping up spills and keeping flooring dry.

Stains, Spills and Scuffs - Vinyl Floor

STAINS AND SPILLS		REMEDY
Acids, Alkalis Blood Catsup, Mustard Cleaners, Strong Soaps Dye, Dye Markings Food, Candy	Fruit, Fruit Juices Grass Iodine, Mercurochrome Urine, Excrement Rust	Apply Congoleum Bright 'N Easy No-Rinse Cleaner, full strength, on a wet sponge. Treat stubborn stains by rubbing the area with a 10 to 1 dilution of water to liquid bleach. If rust stain does not respond, use lemon juice or a cream of tartar solution.

PAINT AND SOLVENT SPILLS		REMEDY
Dry Cleaning Fluids Lacquer Latex Paints Nail Polish Solvents	Oil Based Paints Wood Stains Varnish	Blot up excess at once. Rub lightly with a cloth dipped in mineral sprits or paint thinner*. If paint is dry, gently peel it from the floor. Clean area with Congoleum Bright 'N Easy No-Rinse Cleaner.

STAINS THAT WON'T WIPE UP		REMEDY
Adhesives Asphalt Chewing Gum Oil	Grease Candle Wax Tar	Remove excess with a dull kitchen knife. (Avoid sharp instruments that could scratch the floor.) Rub lightly with lighter fluid* on a clean cloth. Clean area with Congoleum Bright 'N Easy No-Rinse Cleaner. If floor appears dulled, apply Congoleum Bright 'N Easy Floor Polish.

SCUFFS AND SMUDGES	REMEDY
Rubber Heel Marks Shoe Polish Scuffs	Methods 1-5 are given in descending order depending on severity of scuff. **1.** Spray Fantastik® Cleaner on the scuff. Let stand for 10-15 seconds, then rinse with a sponge or cloth. **2.** Using a damp sponge, rub scuffed area with a polishing cleaner such as Soft Scrub®. Rinse with a sponge or cloth. **3.** Wipe scuff with lighter fluid* applied with a clean cloth. **4.** With a rubbing motion, apply a car polish/cleaner such as Meguirs No.7® or similar product on the area. Rinse thoroughly. **5.** Remove stubborn scuffs with a mechanical buffer equipped with a lamb's wool pad.

***CAUTION:** Lighter fluid, mineral spirits and paint thinner are flammable solvents. Carefully read and follow cautionary information on label. Keep traffic off treated area for 30 minutes.

REPAIR

If the stained area appears to be permanent, a patch may be possible on the sheet vinyl flooring. Contact a vinyl flooring retailer or installer about the possibility of repair. You can receive a copy of the "How To Repair" brochure by contacting Congoleum at 800-934-3567 Monday through Friday 8:30 a.m. to 5:00 p.m. EST.

Floor - Laminated

The laminate flooring used in the motorhome provides style, durability and easy maintenance. The laminate flooring is a high pressure laminated flooring designed to be incorporated as a floating floor. The flooring material is constructed of three main components. The surface, similar to many countertops, contains aluminum oxide particles to form an extremely hard, durable surface. The carrier or core layer is constructed from high density fiberboard. A tongue and groove design will allow for a tighter bond. The backer or bottom layer is also made of laminate for balance and strength.

Care and Cleaning:

Everyday cleaning is as simple as vacuuming the floor to remove dirt and debris. A cotton string mop is recommended for occasional mopping with a minimal amount of water. Use a mixture of soap-free household cleaner and water (vinegar and ammonia both work well) for a more thorough cleaning.

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

CAUTION: Abrasive cleaners and scouring pads can scratch and damage the flooring. Never wax, sand or apply lacquer to laminate flooring.

NOTE: Any unusual or unique problems can be addressed by contacting Wilsonart at (800) 433-3222.

Floor - Tile

Regular maintenance is all it takes to keep the tile in the motorhome looking showroom new. When using your slide-out, be sure to clean the tile floor when the slide-out is extended to prevent dirt from scratching your tiles when the slide out is retracted.

Cleaning Tile:

Clean tiles with a damp sponge mop or cloth to maintain their luster. If moderate staining occurs, cleaning with a window cleaner such as *Windex* should do the job. If you prefer, use a mild solution of hot water and all purpose cleaner for tile floors, walls and countertops. Rinse with clear water and be sure to dry with a soft cloth to prevent streaking. Avoid cleaning tile with soap. Soap forms a film to dull the luster. Soap also promotes the growth of mildew and bacteria.

If the grout requires cleaning, scrub with a plastic brush. Do not use steel wool as small particles may remain and produce unsightly stains. Powdered cleaners

should not be used on unglazed tile floors. Undissolved powder will dull the surface. In addition, sealers are not recommended on unglazed tiles. With the exception of terra cotta, which may be oiled or waxed, you won't need to polish or buff the tiles to maintain their finish.

NOTE: Before using any solution to clean your tile check the manufacturer's warning label to insure the product's safety. If you have any doubt test the solution in an inconspicuous place.

Cleaning Shower

Showers are susceptible to hot water and soap build up. Showers should be cleaned weekly to prevent burdensome clean-up. Using the same solution used to clean tile floors will be sufficient for the shower. However, to control mildew growth you should spray the shower with household chlorine bleach and allow it to stand for five minutes. Weekly cleaning of glass shower doors with window cleaner should maintain the shine. If you have water build up and cannot remove spots from the glass, rubbing lightly with a razor blade will remove the deposits.

To prevent excessive moisture and a continual growth of mildew, use the shower only with adequate ventilation. The sealant in a regularly used shower should be replaced once a year. Use a sharp instrument to remove the old sealant. Apply the new sealant, which can be found at an RV supply store.

Ceiling - Ozite

To clean the ozite ceiling, mix a solution of 8oz. warm water, 4oz. white vinegar, 1oz. bleach, and 4oz. club soda. Spritz on and blot dry. Do not rub or scrub as this may damage the surface.

Wall Coverings

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

Care for the Satinesque Wall Covering:

Any stain should be removed as quickly as possible to minimize any reaction between the staining agent and the wall covering. Time is very important when removing substances that are solvent based or contain color. Examples: nail polish, oil, shampoo, lacquer, enamel, paint, ink and lipstick.

Always begin cleaning with a mild detergent such as soap. If necessary, move to a stronger cleaner such as household bleach, liquid household cleaners or rubbing alcohol. Before using one of the stronger cleaners test the cleaning agent on a small, inconspicuous portion of the wallcovering first to make sure that the cleaner does not affect the color or gloss of the wall covering.

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

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

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

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

Pencil:
Erase as much of the pencil mark as possible. Wipe any remaining marks with rubbing alcohol.

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

Care for the Tower Wall Covering: Remove ordinary stains with mild soap and warm water. Sponge it on. Rinse well and dry with a soft cloth.

Special cleaning problems: To remove ball point pen, blood, lipstick, etc., use a sponge or soft bristle brush and *Formula 409*, *Fantastik* or a similar product. Rinse well and dry. Finish cleaning by applying full strength isopropyl alcohol with a sponge or soft brush. Rinse well and dry.

Countertops - Solid Surface

The Solid Surface was created for a lifetime of easy care. Just follow the simple guidelines listed here to keep your surfaces looking good.

Routine Care:
The motorhome countertops are finished with one type of finish: matte/satin. All solid surface sinks and bowls have the matte/satin finish. Soapy water or ammonia-based cleaners will remove most dirt and stains from all tops and bowls. However, slightly different techniques must be used to remove different stains. The following are recommendations for stain removal.

Cleaning Countertops:

- Most dirt and stains: Use soapy water or ammonia-based cleaner.
- Water marks: Wipe with damp cloth and towel dry.
- Difficult stains: Use soft scrub and a Grey *Scotch-Brite* Pad.
- Disinfecting: Occasionally wipe surface with diluted household bleach (one part water and one part bleach).

Cleaning Solid Surfaces Sink:

Occasionally clean by using *Soft Scrub Liquid Cleanser* and a Grey *Scotch-Brite* Pad. Scrub the sink, rinse and towel dry. Do this as often as you feel necessary.

Removing Cuts and Scratches:

Because the beauty of the surface goes all the way through the Solid Surface, the countertops are completely renewable. Use the following instructions to remove minor cuts and scratches.

- Sand with 180 grit and then 320 grit sandpaper until the scratch is gone.
- Restore the finish using a Grey *Scotch-Brite* Pad. Never sand hard in one small area. Feather out lightly to blend restoration.

Preventing Heat Damage:

The Solid Surface withstands heat better than ordinary surface materials; however, hot pans and some heat-generating appliances, such as frying pans or crockpots, can damage the surface. To prevent heat damage always use a hot pad or a trivet with rubber feet to protect the surface. In most cases the surface can be repaired if it is accidentally damaged.

Other Important Tips:

Avoid using strong chemicals on the Solid Surface such as paint removers or oven cleaners. If these come in contact with the Solid Surface quickly wash with water. Avoid contact with nail polish or nail polish remover. If contact is made quickly wash with water.

NOTE: Do not cut directly on the solid surface. Always run cold water into the Solid Surface sink when pouring boiling water into the sink.

Countertops - Granicoat

The countertop and vanity is a Granicoat product. Granicoat is designed for high moisture and heavy wear. It is stain resistant and requires no special cleaning products to ensure the beautiful appearance day in and day out. Coffee, ink and other stains will not harm the surface. Kitchen sinks and vanities made of Granicoat require special care in usage. To preserve the finish avoid throwing items into the bowl or sharply striking the surface. Heavy use may require additional buffing to maintain the finish. Before pouring boiling water into the sink warm the bowl first by running warm water into it.

A few other simple precautions to consider with the Granicoat surface. Do not place hot pans directly on the surface. Use a trivet under heated appliances such as crock pots, electric fry pans, etc. Strong acids such as oven cleaners, drain cleaners, paint strippers and toilet bowl cleaners should be used cautiously around the Granicoat surfaces. When left on the surface whiting and other problems may be difficult to remove.

DO NOT USE THE SURFACE AS A CUTTING BOARD. Minor cuts and scratches can be repaired whereas deep cuts will require the service of a professional. Superficial scratches may be removed using a wet Scotch Brite buffing pad. Deeper scratches may require use of sandpaper.

NOTE: Deep scratches may be removed by carefully sanding with 180 grit sandpaper first, followed by 220 grit sandpaper. Finish the process with a wet Scotch-Brite buffing pad. Rub in a circular motion until the scratch has been removed. Clean thoroughly with soap and water and allow the surface to air dry.

Normal Cleaning:

Use a cloth or sponge with a mild detergent such as *Fantastik* or *409* to wipe the surface. A mild abrasive cleaner such as *Nom Ami* or *Soft Scrub* can be used on a matte finish. Rub over the entire surface with an abrasive cleaner or a wet *Scotch-Brite* buffing pad to maintain a uniform finish.

Spills and Stains:

Some spills such as tea, food dyes and fruit drinks may require a more aggressive cleaning. Stubborn stains can be removed using full strength bleach followed by a general cleaner. Rinse with water. Most other stains and spills can be removed using normal cleaning techniques.

NOTE: Bleach should not be left on the surface for more than five minutes. An abrasive cleaner can be used on a matte surface to maintain the finish.

Cigars and Cigarettes:

If a lighted cigar or cigarette comes in contact with the Granicoat surface the surface will not burn; however, a nicotine stain or scorch mark may be left. Cleaning with an abrasive cleaner or a wet *Scotch-Brite* buffing pad rubbed in a circular motion will remove either the stain or mark.

Countertops - Laminate

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

Windows

Water Spots:

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

Condensation:

Condensation is a natural phenomenon. The amount of condensation will vary with climate conditions, particularly in relative humidity. Condensation occurs from water vapor present in the air. Each of us add more vapors by breathing, bathing, cooking, etc. Water vapor collects wherever there is available air space. When the temperature reaches the dew point the water vapor in the air condenses and changes to liquid form.

Controlling Moisture Condensation:

Reduce or eliminate interior moisture condensation during cold weather by taking the following steps:

- Partially open the roof vents and windows so that outside air can circulate into the interior. Increase the ventilation when larger numbers of people are in the motorhome. Even in raining or snowing conditions the air outside will be far drier than the interior air.
- Install a dehumidifier. Continuous use of a dehumidifier is effective in removing excess moisture from the interior air. Using a dehumidifier is not a cure-all; however, it will reduce the amount of outside air needed for ventilation.
- Run the range vent fan when cooking, and the bath vent fan (or open the bath vent) when bathing, to reduce water vapor. Avoid excessive boiling or use of hot water as it produces steam.
- Do not heat the motorhome interior with the range or oven. Heating with the range or oven increases the risk of toxic fumes and allows oxygen depletion. Also, open flames add moisture to the interior air increasing condensation.
- In very cold weather leave the cabinet and closet doors partially open. The air flow will warm and ventilate the interior of the storage compartments and the exterior wall surface, reducing or eliminating condensation and prevent the possibility of ice formations.

Miniblinds

- To maintain them, vacuum frequently with the brush attachment.
- Dusting tools are available on the market which are designed specifically for mini-blinds.
- Wash the miniblinds with a mild soap and water in a tub, or hang the blinds on a fence or wall and gently rinse with a hose.

Day/Night Shades

The day/night shades are made of a polyester blended material. Use the following guidelines to care and maintain the day/night shades:

- Vacuum with a brush attachment, or use a dusting tool on a regular basis.
- Use a weak solution of dish soap and water to spot clean the blinds with a slightly damp cloth. Avoid soaking or saturating the shades with water. This will break down the finish of the shade.
- When not in use, leave the shades folded up. This helps to hold the shape of the pleats.
- String tension for the shades should be equal. The tension can be adjusted if the shades will not remain folded up.

STORAGE
- Short Term

To Store the Motorhome:

- Drain the holding tanks.
- Shut off all appliances and water heater.
- Close the LP-Gas valve.
- Close all the roof vents.
- Remove articles from the refrigerator/freezer and clean thoroughly. Leave the door ajar to prevent mildew.
- Retract awnings and secure them for transport.
- Turn the battery disconnects to OFF.
- Secure and lock the entrance door.

STORAGE - Long Term

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

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

NOTE: The natural process of moisture in the air condensing will occur with temperature changes of 30º Fahrenheit or more in one day. Humidity readings of 60% or greater will allow the accumulated moisture to remain for extended periods of time.

If the motorhome is stored in a location where AC power is not available:

- Turn off all the appliances.
- Turn the battery cut-off switch to the OFF position.
- If possible, situate the motorhome so the batteries remain accessible. This allows a battery to be charged or replaced without moving the motorhome.
- Charge the batteries to a full state of charge.
- Turn the main battery disconnects to OFF.
- When stored outside, use the available DC Volt meters to make a quick reference check of the batteries while the motorhome is in storage. If the motorhome is stored outside solar panels may offset the parasitic loads.

- Preventative measures should be used if the voltage readings are low. By using preventative measures, bringing the motorhome out of storage or moving the motorhome in case of an emergency is a much easier process.

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

If AC power is available:

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

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

Type of surface to park and store the motorhome on:

- The type of surface the motorhome is parked upon will have an affect on how much moisture accumulation occurs on the chassis and flooring. Moisture can eventually seep into the interior.
- Parking the motorhome on a grass surface, with the tires supported by blocks, is a perfect situation for moisture to accumulate.
- A gravel covered parking area still allows moisture to evaporate from the ground, through the gravel and to the underside of the motorhome.
- Concrete pads seal the surface allowing better ventilation under the motorhome.
- Storage buildings with concrete floors or heated storage facilities greatly reduce the amount of moisture accumulation and protects the motorhome from moisture damage.

If the motorhome is stored outdoors:

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

Inspect the motorhome:

- Perform a full interior inspection for water leaks every two weeks while the motorhome is in storage. Open all cabinet doors looking for signs of dampness or leaks. Inspect the ceiling areas around roof vents or other roof openings.
- The roof and sidewall seams should be inspected and cleaned at least twice a year. Inspect for exterior sealant gaps of all roof seams, vents, skylights, roof air conditioners and windows. If necessary, use the proper sealants and recommended application procedures.

Fuel:

A full tank of fuel will help moisture from condensing at the top of the tank.

Brakes:

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

Engine:

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

Electric Motors:

Electric motors in the motorhome should be operated occasionally to help lubricate and keep surfaces rotating freely. These items include the roof air conditioners, dash fans, dash blower motor, furnace or Aqua Hot motors, heat exchangers and powered roof vents.

- **Plumbing Lines -** Drain and protect by filling with approved RV antifreeze.
- **Fresh Water Tank -** Drain.
- **Body -** Clean and wax. Oil locks and hinges. Repair roof seams as needed.
- **Countertop and Cabinets -** Wash with mild soap and water.
- **Curtains -** Remove and clean according to care specifications.
- **Windows -** To protect the interior fabric from fading, cover windows by pulling blinds, closing shades or using a separate cover such as a sheet.
- **Holding Tank -** Drain and rinse. Close valves.

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

- **Drain Traps -** Pour RV antifreeze down all drains.
- **Batteries -** Add distilled water and recharge if needed. Disconnect the cables. Remove the batteries and store them in a cool dry place. Check and recharge as needed. Never park the coach where the battery door cannot be opened.
- **Refrigerator -** Clean and leave both doors propped open. Cover the exterior panels and roof vents.
- **Air Conditioner -** Remove the air filters. Clean or replace.
- **Roof -** Keep clear of snow accumulation or damage may occur.

Storage - Removal

If the motorhome was properly and carefully prepared for storage, taking it out of storage will not be difficult. The following procedure checklist assumes that you stored your motorhome properly. If you did not, and extensive freeze damage or other serious deterioration has occurred, consult a dealer or an authorized service center for advice.

- Thoroughly inspect the outside of motorhome. Look for animal nests in the wheel wells or in other out of the way places.

- Remove all appliance vents, ceiling vents and air conditioning covers. Be sure all refrigerator openings are free of debris, insect nests, webs, etc.
- Open all doors and compartments. Check for animal or insect intrusion, water damage or other deterioration.
- Check all chassis fluids levels: engine oil, engine coolant, hydraulic fluid reservoir, transmission oil and rear axle oil.
- Check the charge levels in the batteries. Refill with distilled water only and recharge as necessary. Reinstall the batteries if necessary.
- Be sure the cable ends and terminals are clean and free of corrosion.
- Be sure the engine instruments indicate proper readings. Start the engine, allowing it to reach operating temperature.
- Shut the engine down. Check all fluids and fill as necessary.
- While the engine is running check the operation of headlights, taillights, turn signals, back-up lights, license plate light and emergency flasher. Operate the dash air conditioner. If the air conditioner does not work, or unusual sounds occur, have the system checked by a qualified air conditioner technician.
- Drain, flush and sanitize the fresh water system as outlined in the **Water Section.** Inspect the drain hose for leaks. Replace if necessary.
- Operate all faucets and fixtures in the fresh water system.
- Check for water leaks at all joints and fittings. Repair if necessary.
- Check the 12 Volt circuit breaker and inspect fuses.
- Operate all 12 Volt lights and accessories.
- Install the new batteries in battery operated devices.
- Test the carbon monoxide, LP-Gas and smoke detectors.
- Check the monitor panel operation.
- Inspect the 120 Volt electrical system which includes the power cord, converter, all outlets and exposed wiring. If defects are found, refer to your dealer or an authorized service center.
- Start and run the generator.
- Operate the 120 Volt appliances and air conditioners.
- Inspect the LP-Gas system and check for leaks. If the LP tank shows signs of rust or corrosion have it inspected by a qualified LP technician.
- Operate each LP-Gas appliance. Observe all burner/pilot flames for proper color and size. Have the LP-Gas regulator adjusted for proper pressure by a qualified technician.
- Inspect and clean the interior.
- Check the sealant around all roof and body seams and windows. Reseal if necessary.
- Lubricate all exterior locks, hinges and latches.
- Check the windshield wiper blade condition. Check the wiper/washer operation.
- Wash and wax the exterior. Inspect the body for scratches or other damage; touch up or repair as necessary. Flush the underside thoroughly.

- Run through the operational checks for steering, brakes, engine and transmission. Operate the motorhome slowly during these checks to allow sufficient circulation of fluids and resetting of the components.
- If you choose, your dealer can double check your preparation and correct any defects or make any necessary adjustments.

Prepare the generator for operation following the instructions in the Generator Manual.

NOTES

Endeavor

GAS

SECTION 4
APPLIANCES

INTRODUCTION

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

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

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

REFRIGERATOR

The refrigerator in the motorhome operates on a different principle than a standard household refrigerator. Knowing these differences should answer questions or solve problems that may arise. A standard household refrigerator uses a different type of refrigerant. In a household refrigerator the compressor pumps refrigerant vapor into a condenser where the heat from the refrigerant dissipates and the vapor changes to a liquid. The liquid refrigerant is pumped through a metered orifice or capillary tube at the evaporator. At this time the refrigerant changes from liquid to a vapor. This change cools the evaporator. Air is then blown across the evaporator and into the interior of the refrigerator. This system is efficient as long as 120 Volts AC is available; however, this does not allow the freedom a recreational vehicle is designed to give.

The recreational vehicle refrigerator uses a combination of fluids and gas for refrigeration: ammonia, water, sodium chromate and hydrogen gas. This combination is put into a pressurized cooling unit at approximately 350 psi. It is heated to a gaseous state, which then rises to the top of the cooling unit into a condenser where it forms droplets as it cools. As the vapor condenses it "extracts or absorbs" heat out from the inside of the refrigerator. Using gravity the droplets return through the absorber coils to the absorber vessel to start the process again. To insure longevity and proper operation of the cooling unit follow the specific instructions for use and care. With the proper care and maintenance the refrigerator should provide years of trouble-free service.

Operation Specifics

The refrigerator operates from either LP-Gas or 120 Volts AC electric. Controls are electronic which require the DC Voltage to be no higher than 15.4 Volts DC or lower than 10.5 Volts DC. The AC voltage limits are 132 Volts AC (Volts Alternating Current) maximum and 108 Volts AC minimum. The refrigerator (from front view) needs to be leveled within 3º side to side and 6º front to back. Using a torpedo or bulls eye (fence post) level, place the level onto the freezer plate. The level should be within the circle by a half of a bubble. Generally, this is within comfortable living conditions. The heat source for the cooling unit is supplied by an electric heating element or an LP-Gas flame. The heat source, which is calibrated in BTU's (British Thermal Units), is concentrated to a specific area of the cooling unit. Refrigerator operation in an "off level" condition separates the sodium chromate and crystallize from the heat source, which blocks the recirculation action of the cooling unit and causes accumulative, irreparable damage. The LP side of the refrigerator and the LP-Gas pressure need to be serviced yearly, depending on use. Over time the BTU rating can change, which will affecting the refrigerator's performance. Ambient air temperature and humidity can also affect its performance and function. The BTU rating lowers when operating LP-Gas at an altitude higher than 5,500 feet. This affects the refrigerator's performance. If possible, switch mode operation to 120 Volts AC electric while at a higher altitude.

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

Tips

- If possible, cool items first before putting them into the refrigerator.
- Keep the doors shut. Think about what you want before opening the doors.
- Allow the refrigerator 24 hours of operation before actual use to help it get a "head start" with the refrigeration process.
- A box of open baking soda will help absorb food odors. Wipe up any spilled soda.

The refrigerator can be operated by an optional inverter. This feature keeps the refrigerator contents cool while traveling by suppling the 120 Volt AC.

To enable this feature:
1. Turn the inverter ON
2. Turn the refrigerator ON. Select AC power operation.

NOTE: Use this feature only when the engine is running. Failure to disable this feature with the engine off will result in dead house batteries. Hook to shore power or turn the inverter off and switch the refrigerator to LP-Gas operation.

Refrigerator Controls

The refrigerator controls are DC (direct current) operated through an electronic circuit board. The refrigerator, which operates from heat as described above, gets its heat source two different ways: an electric heating element or a flame from LP-Gas. Mode operation and temperature selection is made by controls on the face of the refrigerator. In order for the refrigerator to operate the house batteries must be charged, the LP-Gas valve on, the water valve on (ice maker option only), and the refrigerator AC cord plugged in (located in outside refrigerator access door). If the controls do not light up, check the house batteries' charge status or see if the 12 Volt wires are plugged into the refrigerator's circuit board (located outside in the refrigerator access door).

Alarm

The refrigerator uses an audible alarm that will sound for the following reasons:

1. DC or AC voltage is higher or lower than allowed specifications.
2. Refrigerator is set to auto mode and the 120 Volts AC is discontinued.
3. Liquid Petroleum Gas mode fails to light initially or fails to light after a period of operation.
4. Door has been left open longer than two minutes.
5. The circuit board detects a failure resulting in a code being displayed.

NOTE: If the alarm sounds, note the code in the LED display and turn the refrigerator off to silence the alarm. Refer to the manufacturer's manual for the list of codes and their meanings.

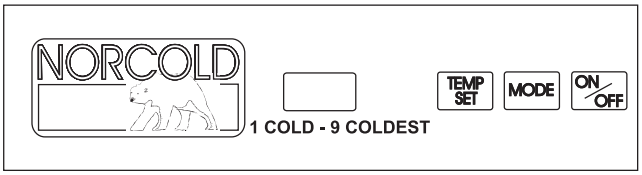
NOTE: Keep the interior box temperature at or below 54º F to reduce the possibility of food spoilage. The refrigerator works harder to keep a low box temperature, especially in hot, humid climates. Low box temperature may also add quicker frost build-up.

WARNING: Make sure all flames are extinguished and the LP-Gas valve is off before refueling. LP-Gas and gasoline are highly flammable which can ignite, resulting in an explosion, fire or death. Many states have passed laws regarding having the LP-Gas valve open while traveling. Know the laws for the particular state in which you are traveling.

Doors

The refrigerator doors are positive lock style doors that close with a "click" to prevent accidental door opening while traveling. When storing the motorhome the refrigerator doors have a storage position that locks the doors partially open. This will help reduce odor from mold and bacteria build-up. A completely closed up refrigerator in storage is a perfect habitat for molds and bacteria to grow. To use the storage feature open doors approximately a half inch and slide the latch into the cut-out of the strike plate.

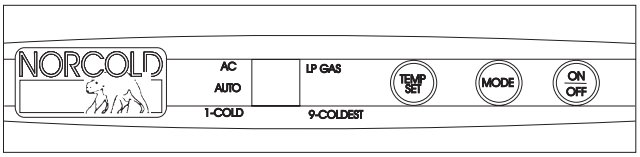
Control Panel-1200 Series



The Refrigerator Control Panel requires 12 Volt DC to operate.

- **ON/OFF Button -** Press this button to turn the refrigerator ON. Press and hold this button to turn the refrigerator OFF.
- **LED Display -** This screen is used for fault code display.
- **MODE Button -** Press and hold this button to cycle the refrigerator through the different modes available: **AUTO**, **AC** and **LP** modes. Release the button when the desired mode is displayed.
- **TEMP SET Button -** Press and hold the button to select the desired temperature setting. Five settings are available from COLD to COLDEST.

Control Panel-900 Series



The Refrigerator Control Panel requires 12 Volt DC to operate.

- **LCD Display** - Window has a light which illuminates when any button is pressed and remains on for 10 seconds after button is released.
- **ON/OFF Button -** Press this button to turn the refrigerator ON. Press and hold this button to turn the refrigerator OFF.
- **MODE Button -** Press and hold this button to cycle the refrigerator through the different modes available: **AUTO**, **AC** and **LP** modes. Release the button when the desired mode is displayed.
- **TEMP SET Button -** Press and hold the button to select the desired temperature setting. Five settings are available from COLD to COLDEST.

Manual Mode Operation

This mode will lock the refrigerator into either LP-Gas or electric AC operation. Press and hold the **MODE** button until LP or AC is displayed. Release when the desired function is lit. The Alarm will sound and a code will be displayed if the function selected is interrupted or a failure occurs. Note the code and turn the refrigerator off to silence the alarm. Refer to the manufacturer's manual for a list of codes and their meanings.

Automatic Mode Operation

This feature will automatically select 120 Volts AC over LP-Gas operation. If 120 Volts AC is available it will use this source for operation until AC service has been discontinued. When AC is discontinued the alarm will sound and the refrigerator will automatically switch to LP-Gas operation. If the refrigerator fails to light the alarm will sound and a code will be displayed.

Press and hold the **MODE** button until **AUTO** is displayed, release the button. Press and hold the **TEMP SET** button until desired temperature is displayed, release button. In **AUTO** mode, AC or LP will remain lit for 10 seconds upon initial start or when mode has changed.

Ice Maker Operation (Optional)

The ice maker works from 120 Volts AC only. The ice maker will start to function only after the freezer temperature is low enough. City water or the water pump must be on and the valve (located under the refrigerator) for the water supply line to the ice maker must be on. Pulling the metal arm (bail) down will turn the ice maker on. Pushing the arm up will turn the ice maker off.

If the ice maker is in operation while the motorhome is in motion water may spill out of the ice tray. **Raise the ice maker arm to stop ice production while the motorhome is in transit.**

NOTE: Do not use the first one or two trays of ice if the refrigerator has been in storage. Ice cubes may have contaminates. Do not operate the ice maker without water pressure supplied to the refrigerator. This can cause damage to the ice maker assembly.

High Humidity Operation

The refrigerator is equipped with a heating element located in the flapper on the left door (four door model), or in the door (two door model). The heating element is activated when the refrigerator is turned on to any mode to help prevent moisture build-up in high humidity conditions.

Cooling Unit Fans (Four Door Models)

The cooling unit is equipped with a pair of cooling fans to help pass air across the cooling unit. These fans start automatically and will be audible when in operation.

Defrosting the Refrigerator

Turn the refrigerator off and remove all items. Leave the drip tray under the cooling fins. **Do not** use heating guns, hair dryer or sharp objects to remove frost build-up as these can damage the interior. Leave all doors open. Defrost time can be shortened using trays of warm water. Wipe off excess water using paper towels or cotton cloth.

Wipe using only cotton or paper towels. Products such as *Formula 409*, *Dawn* and *Fantastik* are acceptable cleaners. Do not use scouring pads or abrasive cleanser as these can damage the interior finish.

MICROWAVE OVEN

The microwave oven is operated from 120 Volt AC supplied by either shore power, the generator or the inverter. Microwaves heat food using sound waves generated at a very high frequency (2,450 MHZ) to agitate the water molecules inside the item being heated. The higher the water content is to solids, the faster the response or the shorter the cooking time. Inside the microwave is a turntable that rotates when the microwave is operating. This will help heat the food evenly. The turntable can be turned off if a baking dish or other large item is used. The microwave is designed to sit over a range or cooktop. When cooking from the cooktop use the microwave's two speed ventilation fan. The fan draws air in from the bottom of the microwave through a pair of grease filters then discharges the filtered air out through a charcoal filter at the top. The ventilation fan is controlled by a thermostat and activates automatically from heat produced by the cooktop.

The microwave offers many different features. Some include varied cooking times with different power settings: automatic sensor cooking, a kitchen timer, metric to American conversion chart (which includes temperature and weight), on screen programming help, childproof lockout and auto defrost cycles. The screen can display one of three different languages.

After placing the food in a suitable container open the oven door and put it on the glass tray. The glass tray and roller guide must always be in place during cooking. Ensure the door is firmly closed before use.

- The oven light is only on when the microwave oven is operating.
- The oven door can be opened at any time during operation by touching the door release button on the control panel. The oven will automatically shut off.
- Each time a pad is touched a "beep" will sound to acknowledge the touch.
- The oven automatically cooks on full power unless set to a lower power level.
- The display will show ":0" when the oven is plugged in.
- The time clock returns to the present time when the cooking time ends. When the STOP/CLEAR pad is touched during the oven operation the oven stops cooking and all information is retained. To erase all information (except the present time) touch the STOP/CLEAR pad once more. If the oven door is opened during the oven operation all information is retained.
- If the START pad is touched and the oven does not operate, check the area between the door and door seal for obstructions and make sure the door is closed securely. The oven will not start cooking until the door is completely closed or the program has been reset.

1. Touch the **CLOCK/A.START** pad. This is a 12-hour clock system.
2. Touch the **CLOCK/A.START** pad once more.
3. Enter the correct time of day by touching the numbers in sequence.
4. Touch the **CLOCK/A.START** pad.

When the microwave is first plugged in the display will flash "**:0**" and a tone will sound. If the AC power goes off the display shows "**:0**" when the power comes back on.

Microwave Tips:

- Turn the oven off before cleaning.
- Keep the inside of the oven clean. When food spatters, or spilled liquids adhere to oven walls, wipe with a damp cloth. Mild detergent may be used if the oven gets dirty. The use of a harsh detergent or abrasive cleaner is not recommended.
- Clean the outside oven surface with soap and water. Wipe away any residue using a damp cloth. Dry with a soft cloth. To prevent damage to the operating parts inside the oven do not allow water to seep into the ventilation openings.
- If the control panel becomes wet, clean with a soft, dry cloth. Do not use harsh detergents or abrasives on the control panel.
- If steam accumulates inside or around the outside of the oven door wipe it away with a soft cloth. This may occur when the microwave oven is operated under high humidity conditions and in no way indicates a malfunction of the unit.
- It is occasionally necessary to remove the glass tray for cleaning. Wash the tray in warm sudsy water or in a dishwasher.
- The roller guide and oven cavity floor should be cleaned regularly to avoid excessive noise. Simply wipe the bottom surface of the oven with mild detergent water or window cleaner and then dry. The roller guide may be washed in mild sudsy water.

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

Microwave Facts:

One of the most useful documents for the microwave is the operations manual, located in the owner's information file box. Read it carefully and keep it for reference. Another useful item is a microwave cookbook. Many will contain information about cooking principles, techniques, hints and recipes. Ensure food is in the microwave during operation to absorb the microwave energy. The magnetron, cycling on and off, may be heard for power levels less than 100%.

Condensation is a normal occurrence in microwave cooking. The moisture within foods and the room humidity will influence how much moisture condenses in the microwave. Covered foods will not usually produce as much condensation as foods that are not covered.

About Cooking:

- Food should be arranged with the thickest areas towards the outside of the dish.
- Monitor cooking times. Use the shortest amount of time required for cooking and add time as needed. For popcorn, follow product instructions and carefully monitor for the duration of popping time.
- Cover the food while cooking to prevent splatter and reduce condensation.
- Stir the food from the outside of the dish to the center, once or twice, between cooking.
- Turn food over during cooking to speed cooking times. Large food items should be turned at least once during cooking time.
- Use standing times to prevent overcooking. Covered food will continue to cook after it is removed from the microwave oven.
- Check for indications that the food is thoroughly cooked.
  - Food is steaming throughout, not just around the edges.
  - Poultry thigh joints come apart and move easily.
  - Meat or poultry is not pink in color.
  - Fish is opaque and flakes easily with a fork.
  - Center bottom of the dish is very hot to touch.

A meat thermometer is the best way to ensure that the food is cooked. The meat thermometer should be inserted into the thickest part of the meat, away from bone or fat. Most food should range between 160º F to 180º F. Never leave the thermometer in during cooking as it can shatter.

FOOD	DO	DO NOT
Eggs, Sausages, Fruits & Vegetables	• Puncture egg yolks before cooking to prevent bursting. • Pierce skins of potatoes, apples, squash, hot dogs & sausages to allow steam to escape.	• Cook eggs in shells. • Reheat whole eggs.
Popcorn	• Use specially bagged popcorn for use in the microwave. • Remove popcorn when popping slows to 1 or 2 seconds in between pops. Use the POPCORN setting.	• Pop popcorn in regular brown bags or glass bowls. • Exceed maximum time on popcorn package.
Baby Food	• Transfer baby food to small dish & heat carefully. Stir often. Check temperature before serving.	• Heat disposable bottles. • Heat rubber nipple. • Heat baby food in original jar.
General	• Cut filled baked goods after heating to release steam. • Stir liquids before and after heating to avoid boiling over. • Use deep bowls for cooking liquids or cereals to avoid boiling out of the container.	• Heat or cook in closed jars or air-tight containers. • Use for Canning. Cooking and heating may not destroy bacteria. • Deep fat fry. • Dry wood, gourds, herbs or wet paper.

Microwave Cooking Safety:

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

MICROWAVE/CONVECTION OVEN - (OPTIONAL)

The microwave/convection oven operates from 120 Volt AC supplied by either shore power, the generator or the optional inverter. The microwave/convection oven has the ability to cook food with heat like an electric oven, or preheat the oven with heat and cook with microwaves. Other features include the ability to cook with microwaves and convection at the same time, sensor cooking and a built-in broiler.

WARNING: If a fire flares up when using the cooktop turn off the ventilation fan. The fan may spread the flame. If the ventilation fan has started automatically from a heated cooktop it can not be manually turned off. Turn off the microwave AC circuit breaker to prevent the flame from getting up into the microwave and spreading the fire.

NOTE: When cooking in convection mode try to avoid using the inverter as the AC power source due to the high rate of battery consumption.

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

Safety Lock:

The microwave comes with a safety lock feature. This feature prevents the oven from operating accidentally. To use this feature:

- Press the **CUSTOM HELP** pad.
- Press the **1** pad.
- Press the **START/TOUCH-ON** pad.

The oven is now locked. If any button is pressed the word **LOCK** appears on the screen. The fan and hood light is still operational with the Safety Lock feature on. To return the oven to normal operation:

- Press the **CUSTOM HELP** pad.
- Press the **1** pad.
- Press the **START/TOUCH-ON** pad. The oven will resume normal operation.

Setting The Clock:

- Press the **STOP/CLEAR** pad.
- Press the **CLOCK** pad.
- Enter correct time in sequence using the number pads.
- Press the **CLOCK** pad to begin time.

NOTE: The clock is a 12 hour clock only.

Kitchen Timer:

- Press the **KITCHEN TIMER** pad.
- Using the number pads enter minutes and seconds, or 00 if no seconds.
- Press the **START/TOUCH-ON** pad to begin timer. Timer end will be signaled by one long beep.

Press the STOP/CLEAR pad to:

- Erase, if you make a mistake during programming.
- Cancel the kitchen timer.
- Stop the oven temporarily during cooking. (Press the **START/TOUCH-ON** pad to resume.)
- Return the time of day to the display.
- Cancel a program during cooking (touch the pad twice).

Turntable On/Off:

- Press **TURNTABLE ON/OFF** pad to stop or start the turntable.
- Enter the cook time desired minutes and seconds.
- Enter power level desired.
- Press the **START/TOUCH-ON** pad.

Hood Light:

To turn the hood light on or off, touch the **LIGHT** button.

Ventilation Fan:

Press the **FAN HI/LO** button once for high, twice for low and three times for off.

Microwave - Timed Cooking:

The maximum amount of cooking time is 99 minutes and 99 seconds. Be sure to enter minutes and seconds. If seconds are not desired, enter 00.

Microwave Cooking

Press and hold the **START/TOUCH-ON**. The microwave pad operates at 100% power until the pad is released. This mode can be used for up to three minutes and up to three consecutive cycles.

One Minute Cook Times:

Press the **MINUTE PLUS** pad if one minute at full power is desired or to add one minute intervals to cooking time. The **MINUTE PLUS** pad must be pressed within one minute of closing the door, or during selected cooking time. For safety, the **MINUTE PLUS** feature will lockout if there is no microwave activity within one minute of closing the door. Use the **START/TOUCH-ON** pad to reset the one minute safety period.

Microwave Cooking:

To use 100% power, enter cook time by pressing the number pads. Press the **START/TOUCH-ON** pad to begin cook time. To use settings lower than 100% power, use the number pads to enter desired cooking time. Press the **POWER LEVEL** pad. Use the number pad to select desired power level. Press the **START/TOUCH-ON** pad to begin cook time.

Multiple Sequence Cooking:

If sequential cooking times with varied power levels are desired press the **POWER LEVEL** pad and select desired power level. Use the number pad to enter cook time for the first interval. Press **POWER LEVEL** pad again, select desired power level, then enter cook time for the next time period. Press the START/TOUCH-ON pad to begin sequential cooking. The microwave can hold up to four sequential cook time periods. If full power is desired in any of the time periods skip the power level step and 100% power is automatically selected.

Keep Warm:

Press the **KEEP WARM** pad during cooking time to automatically keep food warm for up to 30 minutes after cooking time has expired. To use this feature after cooking time has expired, or after the food has been removed, place the food back into oven and press the **KEEP WARM** pad.

Defrosting:

Defrosting can be done on manual time selection or use the microwave's CompuDefrost.

Manual Defrost:

Press the **POWER LEVEL** pad. Select number 3 for defrost power. Enter desired defrost time. Be sure to stir or break food apart at regular intervals.

CompuDefrost:

The microwave has automated defrost programs for different foods and weights. Press the **CompuDefrost** pad to enter this mode. Press **CompuDefrost** again to select between ground meat, steak or chicken. Use number pads to enter weight of food being defrosted. Press **START/TOUCH-ON** to begin defrost cycle

Sensor Cooking:

The microwave has electronic sensors that sense moisture or humidity given off by the food during the cooking process. Electronic sensors will be affected if room temperature exceeds 95° F. To adjust the sensor cooking mode to allow for more or less cooking time, press the **SENSOR COOK** pad. Press the **POWER LEVEL** pad once to increase cooking time or twice to decrease cook time.

To use the sensor cooking mode press the **SENSOR COOK** pad. Select the number or food desired from the library listed adjacent to the **SENSOR COOK** pad. Press the **START/TOUCH-ON** pad to begin sensor cooking.

Convection Cooking (Optional)

The interior of the microwave produces heat just as it does in a regular oven. The convection cooking mode has special options such as a broil mode, the ability to preheat oven by convection and use of microwaves to complete cooking or to preheat.

NOTE: When using the convection oven feature leave the turntable in place and do not restrict the rotation. This can damage the microwave.

Cooking with Convection:

Press the **CONVEC** pad. Press the numbered pad with the desired cooking temperature. Press the numbered pads for desired cooking time. Press the **START/TOUCH-ON** pad to begin convection cooking.

Manual Broiling:

The Manual Broiling temperature is automatically preset to 450° F. Only the cooking time can be adjusted.

To use the broiler press the **BROIL** pad. Enter amount of cooking time. Press the **START/TOUCH-ON** pad to begin preheating the oven. Four beeps will signal the end of the preheat cycle. Food can now be placed into the oven.

CompuBroil:

The CompuBroil cooking method has programs preset for common foods like hamburgers, steaks, chicken and fish. Temperature and time are preset depending on the food quantity. The amount of cooking time can be adjusted to fit particular needs. The **POWER LEVEL** pad will vary the preset cooking time. **Press once for more time and twice for less time.**

To use the CompuBroil feature press the **CompuBroil** pad. Select the food number from the food library next to the CompuBroil pad. Enter the number of pieces being broiled. Press the **START/TOUCH-ON** pad to begin the preheat cycle. A series of four beeps signal the end of preheat cycle.

Automatic Mix Cooking:

This method combines both the convection oven and microwave at the same time. While in this mode the microwave uses 30% power on **HIGH/MIX** and 10% power on **LO/MIX**. The convection temperature can be changed from 100° F to 450° F. The default convection temperature is 325° F for both **HIGH/ MIX** and **LO/MIX**.

To use this feature select either **HIGH/MIX** or **LOW/MIX**. Use the number pads to enter cooking time. Press the **START/TOUCH-ON** pad to begin the mixed cooking cycle.

CompuRoast or CompuBake:

CompuRoast and **CompuBake** can be used for food items ranging from pastries and cakes to roasts, chicken and pork. The temperature is preset for both functions. Only the cook times can be tailored for individual preference by entering into either the **CompuRoast** or the **CompuBake** mode. Press the **POWER LEVEL** pad once for more cooking time and twice for less cooking time. To use either function press the desired pad and enter the food type from list next to the mode used. Enter the food type being cooked by using the number pad. To use **CompuBake** press the **START/TOUCH-ON** pad to begin preheat cycle. To use **CompuRoast** enter the weight of item using the number pads. Press the **START/TOUCH-ON** pad to begin the preheat cycle. Four beeps will signal the end of the preheat cycle and the oven is now ready.

Tips

- Check the type of cookware being used to see if it is microwave or oven safe depending on the type of cooking being done.
- Gold paint or glaze may contain a trace amount of gold which is electrically conductive and not compatible for microwave. Hand-painted china commonly contains traces of metal.
- To test utensil for microwave compatibility place it in the microwave with an 8 oz. plastic cup of water. Set the microwave at full power for one minute. Carefully feel the utensil. The entire utensil should be cool to the touch.
- Cover food with a paper towel or upside-down plate to help keep food spattering to a minimum. Place a paper towel on the turntable to keep clean-up at a minimum. Use paper towels with microwave use only.
- Clean all spills or spatters before they dry.
- Food odors may linger inside oven. To help eliminate odors combine the juice and the peel from one lemon, several whole cloves and 8 oz. of water into a two cup bowl. Place in oven on high power, bring to a boil for several minutes. Let cool in the oven for several minutes.

- Some food wrappers may be foil lined. Check the wrapping carefully before cooking or heating. A small amounts of foil is acceptable if it is not wrinkled or near the sides of the microwave.
- If the microwave screen is not lit plug another electrical appliance into the same outlet the microwave was plugged in to verify AC power is present. If the test item works contact an appliance repair facility to have the microwave checked.

Care & Cleaning

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

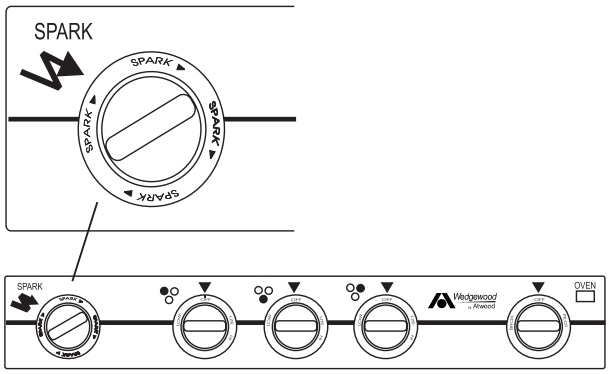
Grease Filters:

Do not operate the oven without the grease filters in place. This can damage the microwave. Grease filters should be cleaned at least once a month. To remove the filters use the pull tab to slide the filter to the end of the opening and tip down. Soak the filters in the sink or in a dishpan filled with hot water and detergent.

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

COOKTOP RANGE

Before cooking on the range top the cover must be in full upright and folded position. Push the cover toward the outside wall to prevent it from falling onto the range top during cooking.



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

WARNING: Do not heat motorhome interior with range or oven. Gas combustion consumes oxygen inside the motorhome.

Lighting Top Burners

- Turn the appropriate burner knob counter-clockwise to **ON** or **LITE**. Do not attempt to light more than one burner at a time.
- Turn the **SPARK** knob clockwise one click. If the burner fails to light continue turning the **SPARK** knob clockwise until the burner lights.
- To extinguish the top burner flame turn the appropriate burner knob clockwise to OFF.

WARNING: Top cover must be open when the cooking surface is in operation.

Lighting Oven Pilot

- Push in the oven control knob and rotate counter-clockwise to **PILOT ON**.
- Light the oven pilot located near the back of the oven, under the broiler shelf and to the left of the oven burner.
- Set the oven control knob to Pilot ON to maintain pilot flame. The oven and broiler are now ready for operation. The oven pilot has been factory set and requires no further adjustment.
- To extinguish the oven pilot push in the oven control knob and rotate clockwise to OFF.

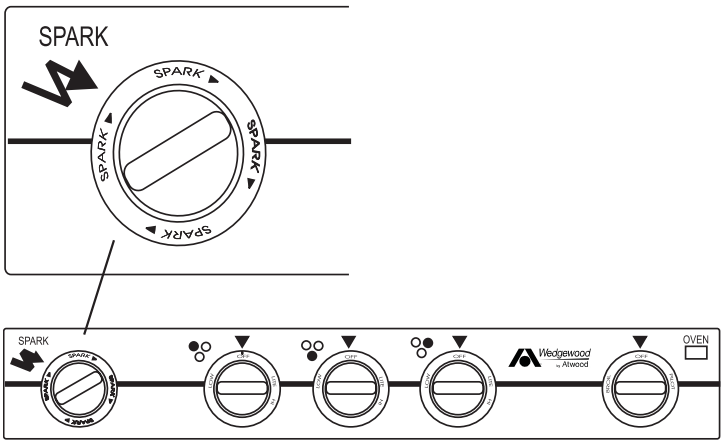
WARNING: Extinguish all pilots when refueling or traveling.

Maintenance

- Clean all surfaces as soon as possible after boil overs or spillovers.
- Use only warm soapy water to clean the burner grates, cooktops, painted surfaces, porcelain surfaces, stainless steel surfaces and plastic items on your range or cooktop. Do not use grit or acid-type cleaners.
- Do not use steel wool or abrasive cleaners. They will damage your range or cooktop. Use only non-abrasive plastic scrubbing pads.

- Do not allow foods containing acids (such as lemon or tomato juice, or vinegar) to remain on porcelain or painted surfaces. Acids may remove the glossy finish. Wipe up egg spills when cooktop is cool.
- Do not wash warm porcelain surfaces. Allow these areas to cool before cleaning. You could burn yourself or the porcelain could crack.

COOKTOP (OPTIONAL)



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

Operation

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

1. The LP-Gas valve on the LP tank is open.
2. The house battery cut-off switch at the entry door is ON.
3. To use the cooktop open the desired burner valve and rotate the igniter knob, clockwise, at the left hand side of the stove.

Burner Grate

The burner grate is attached to the cooktop cover by two spring clips located on the underside of the cooktop cover. The burner grate can be separated from the cooktop cover for cleaning purposes. Place a towel down onto the countertop next to the cooktop. Lift the cooktop cover up by the front corners, just high enough to clear the top of the burners. Pull the cooktop cover toward the front of the cooktop and lift it away. Place the cooktop cover upside down onto the towel. Squeeze both of the grate spring clips to remove the grate from cooktop cover.

WARNING: If you smell gas, extinguish all open flames and turn off the main gas supply. Liquid propane is highly volatile, highly explosive and extremely dangerous. Explosion, fire, property damage, injury or death can result.

Propane is a "heavy" gas and will lay on the floor and "hide" in corners. Open all windows and doors. **DO NOT touch any electrical switches. They may cause a spark which can ignite.** Contact a qualified service center to have the problem correctly diagnosed and repaired before resuming operation.

Tips

1. A yellow flame is an indication of incorrect fuel/air ratio. Lowered BTU output and carbon build up can occur.
2. When cooking at an altitude above 5,000 feet the flame may change appearance and the flame BTU output will be lowered. Allow extra cooking time.
3. Do not allow the tips of the flame to extend beyond pan or pot edge. When this occurs heat is wasted and possibility of injury increases.
4. To help keep the underside of the cooktop clean, remove the cooktop cover. Carefully place strips of aluminum foil on the cooktop floor pan and under burners. Do not restrict air flow of mixture tubes.

Care & Cleaning

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

Porcelain Enamel:

Porcelain enamel is a type of glass fused on steel at a very high temperature. It is not extremely delicate but must be treated as glass. Sharp blows, radical surface temperature changes, etc., will cause enamel to chip or crack. Some foods such as vinegar, lemon juice, tomatoes and milk contain acids which can dull the finish of the enamel. To avoid dulling the finish wipe up the spill before it is baked on. Remember, the surface is glass and must be given consideration when cleaning. Steel wool and course, gritty cleanser will scratch or mar the surface. Any gentle kitchen cleanser powder or grease cleaner will be suitable. For further information on care and maintenance of the porcelain call "Hopes Cultured Marble Polish" at 800-325-4026.

AIR CONDITIONER - ROOF

The motorhome is equipped with two 13,500 BTU roof air conditioners. The roof air conditioners operate from 120 Volts AC only, either by shore power or the generator. Operations are controlled by the 12 Volt DC comfort control. The electronics in the comfort control use a type of telephone patch cord to send a low voltage signal to the roof air conditioner's circuit board. The circuit board controls the desired roof air functions and LP-Gas furnace operation. The refrigeration process in the roof air, primarily the same as the dash air conditioner or a household type refrigerator, functions as an enclosed system. The refrigeration process repeats in a cycle. The refrigerant is drawn into the compressor. The high pressure vapor is sent to a condenser where the heat is expelled into the atmosphere. The vapor leaves the condenser as a high pressure liquid. This liquid is forced into a metered capillary tube and then into the evaporator or low side pressure. The refrigerant changes from liquid form to vapor as the heat is extracted. The vapor is drawn back into the compressor to start the cycle again. When operating the roof air in the heat pump mode the refrigerant flow is reversed blowing the heated air into the interior of the motorhome.

NOTE: Air conditioning systems will freeze the moisture in the air depending on the humidity content. Under high humidity conditions it is recommended to set the blower fan to High speed.

Heat Pump

The heat pump mode offers heat by using the air conditioner as a heat source. The air conditioning principal is reversed, supplying heated air to the ceiling registers instead of refrigerated air. There are ambient temperature limitations of the heat pump mode.

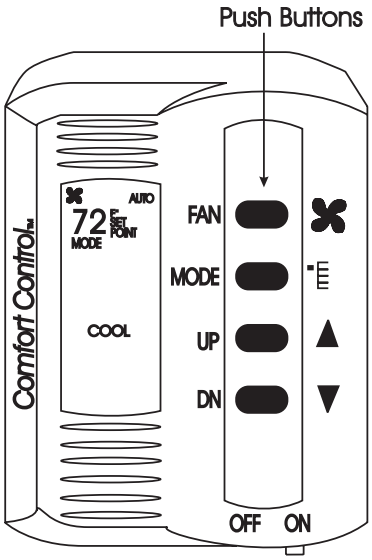
NOTE: The roof air conditioner will not operate in Heat Pump mode with ambient temperatures at or below 24º Fahrenheit.

If the heat pump mode is selected at or below 24° Fahrenheit, or if operating in Heat Pump mode and temperature drops to 24º Fahrenheit, the air conditioner will stop Heat Pump operation and **Aux Heat** will be displayed. The furnace will be selected as the auxiliary heat source and will begin operation. The furnace will remain the primary heat source until ambient temperature rises above 42º Fahrenheit. When ambient temperature is between 24-42º Fahrenheit a defrost cycle is initiated approximately every 40 minutes of compressor operation. The blower motor will stop for five minutes and Defrost will be displayed. After the defrost cycle the Heat Pump operation will resume.

Operation

The roof air conditioner will operate only when the following needs have been met:

- 120 Volts AC from either shore power or the generator is supplied.
- House batteries are charged.



Thermostat Operation In Air Conditioner Mode:

- Slide ON/OFF switch to ON position.
- Press the **MODE** button repeatedly until Cool is displayed.
- Set desired fan speed by pressing the **FAN** button.
- Set desired cooling temperature by pressing the **UP** or **DOWN** buttons.

NOTE: Compressor will engage two minutes after blower motor activation. This prevents accidental compressor activation against high pressure.

Heat Pump Operation:

- Slide ON/OFF switch to ON position.
- Press the MODE button repeatedly until Heat Pump is displayed.
- Set desired fan speed by pressing the FAN button.
- Set desired heating temperature by pressing the UP or DOWN buttons.

Return Air Filters

The return air filters should be cleaned frequently. They are located on the motorhome ceiling inside the air intake vent covers. Never run the air conditioner without the return air filters in place as this may plug the evaporator core with dirt and substantially affect the performance of the air conditioner.

To Clean:

- Remove the vent covers and filters.
- Wash the filters and covers in warm soapy water. Do not use solvents.
- Rinse the filters and cover thoroughly with fresh water and allow them to dry.
- Reinstall the filters and covers.

FURNACE

The furnace and its related components are 12 Volt DC operated, using LP-Gas as the fuel source. Electronic circuitry (automatic ignition) is used to ignite the burner. The furnace uses outside air for the burner combustion and exhaust is expelled through the outside vent. Inside air is drawn into the furnace and blown across the internal heat exchanger. Heated air is then discharged through ducted hoses which can be run throughout the motorhome. A warm air discharge is incorporated to heat the motorhome's holding tanks.

Operation

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

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

1. The LP-Gas valve on the LP tank is open and the LP-Gas valve at the furnace is on.
2. The house batteries in the motorhome are charged.

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

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

NOTE: The automatic ignition circuit board will attempt to light the burner three times before the ignition board will go into "lock-out." If the burner does not light, the furnace blower motor will continue to run and the wall thermostat will have to be cycled off.

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

Using the Furnace

- Slide **ON/OFF** switch to **ON** position.
- Select the furnace mode on the Comfort Control using the **MODE** button.
- Select the **AUTO** speed with the Fan button.
- Select the desired temperature with the arrow **UP** and **DOWN** buttons.

Tips

- After storage the furnace may produce a musty smell during the first couple of cycles.
- Operating the furnace at an altitude above 5,000 feet reduces the BTU output due to air/fuel ratio.
- The furnace will periodically need to be serviced by a qualified technician. If the furnace exhibits unusual symptoms or noises, or has an unusual odor when operating, have the furnace checked or serviced.
- It is advisable to use the furnace to heat the inside of the motorhome during transit. Outside temperature can vary to extreme cold. The dash heater may not provide adequate heat to the interior.

If Furnace Fails to Light

If the furnace fails to light make sure the LP-Gas supply valves are open and the LP-Gas switch is turned on. The furnace will not light if the blower motor is not spinning to its specified speed. This may be due to a low house battery charge condition. Hook-up to shore power and start the generator or main engine to charge the batteries.

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

WATER HEATER

The motorhome is equipped with a six gallon water heater as a standard feature. A larger 10 gallon unit can be optionally installed instead of the six gallon. The water heater in the motorhome will heat water using two different methods. The first method is 120 Volts AC, supplied either by shore power or the on board generator. The second method is LP-Gas. The 120 Volt AC uses a heating element like those found in a house style water heater. The 120 Volt AC method is efficient if shore power is available. The LP-Gas incorporates the use of an automatic ignition circuit board operated by 12 Volt DC. The water temperature is controlled by two thermostats. One is for the 120 Volt and the other is for the LP-Gas. The temperature is preset by the water heater manufacturer. Water is pumped into the bottom of the water heater tank where it is heated and discharged out of the top of the tank upon usage. For easy winterization the water heater is equipped with a by-pass valve. Safety features include a temperature pressure relief valve. The water heater has an aluminum clad tank. An anode is not necessary.

NOTE: The automatic ignition circuit board will make three attempts to light the burner. If the burner does not light by the third attempt the ignition circuit board will go into "lock-out." Cycling the on/off switch will reset the ignition board.

NOTE: Do not operate the water heater by either function without water in the water heater tank. This can damage the thermostats and the electric heating element.

Before Using the Water Heater

Before using the water heater purge all trapped air from the water system. To purge the air and pressurize the system fill the fresh water tank by using the on board water pump or hooking up to city water. Check the tank for any obvious water leaks. Once the system is pressurized turn the hot and cold valves on for each water faucet, one at a time, inside and outside of the motorhome. Run each faucet until a steady stream of water with no air bubbles or air pockets is present. The water heater does not need to be operating while this is being done.

The water heater may discharge at the Pressure-Temperature Relief Valve during the heating cycle due to thermal expansion of water. This can be related to the fact the motorhome utilizes a closed system. When there is a discharge, which is a normal occurrence, it should not be taken as a faulty valve. The water heater by design has an internal air pocket to reduce the possibilities of dripping or weeping. The expanding of water in time will absorb the air and pocket. The air will have to be replaced utilizing a simple procedure when this occurs.

CAUTION: Ensure the water heater storage tank is cool prior to making any check of the valve.

Step 1: Turn OFF the water heater.
Step 2: Shut off the incoming water supply.
Step 3: Open the closet hot water line of the motorhome.
Step 4: Pull the handle of the relief valve until the flow of water stops.
Step 5: Allow the relief valve to snap shut, close the hot faucet and turn on the water supply.

The air pocket will have to been re-established and will not need to repeat until the next discharge of water. If the discharge does not stop contact a qualified service center to evaluate the valve and make any required repairs.

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

Operation

The water heater will operate when the following conditions have been met:
- 120 Volt AC has been supplied either from shore power or the generator.
- The LP tank valve is open.
- The battery cut-off switch at the entry door is ON.
- The house batteries are charged.

LP-Gas Operations:
- Make sure the LP-Gas is turned on.
- Turn the water heater switch to the the ON position. The water heater will make an audible "roar" from the burner when ignited. The indicator light will illuminate briefly then go out when the water heater is lit. The indicator light will glow steady when the ignition cycle has gone into "lock-out."

NOTE: It is not recommended to operate the water heater on LP-Gas while the motorhome is in transit.

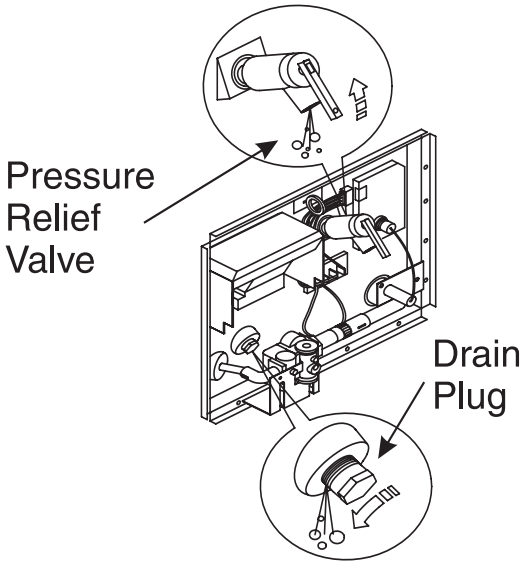
120 Volt AC Operations:
- Have either shore power or the generator supply AC voltage.
- Turn on the RED piloted switch located above the vanity sink.
- The heating process occurs at a quicker rate with both LP-Gas and 120 Volt AC operations activated.

Pressure - Temperature Relief Valve

The water heater is equipped with a **Pressure-Temperature Relief Valve**. The water heater may discharge at the Pressure-Temperature Relief Valve during the heating cycle, due to thermal expansion of water. The Pressure-Temperature Relief Valve is designed to open if the water temperature within the heater reaches 210° F (98.8° C), or if the water heater pressure reaches 150 psi. This can be related to the fact the motorhome utilizes a closed system. When there is a discharge, which is a normal occurrence, it should not be taken as a faulty valve. The water heater by design has an internal air pocket to reduce the possibilities of dripping or weeping. The expanding of water, in time, will absorb the air and pocket. The air will have to be replaced utilizing a simple procedure when this occurs.

Water Heater Bypass System

CAUTION: Ensure the water heater storage tank is cool prior to making any check of the valve.



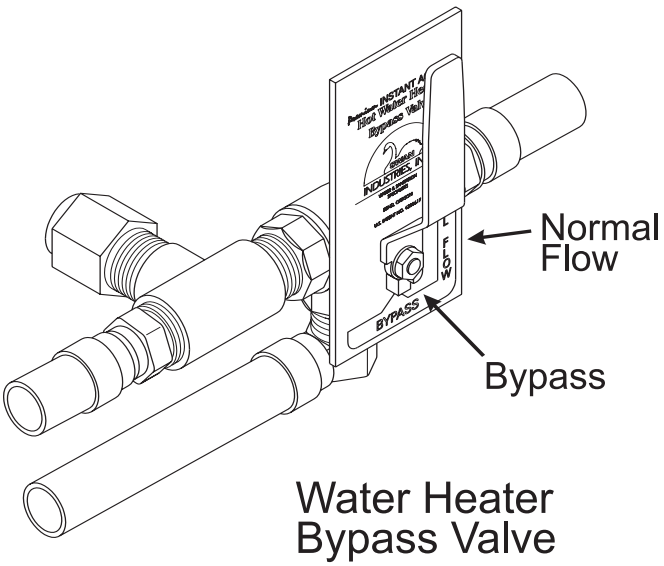
Step 1: Turn **OFF** the water heater.
Step 2: Shut **OFF** the incoming water supply.
Step 3: Open the closest hot water line of the motorhome.
Step 4: Pull the handle of the relief valve until the flow of water stops.
Step 5: Allow the relief valve to snap shut, close the hot faucet and turn **ON** the water supply.
Step 6: Turn **ON** the water heater.

The air pocket will have been re-established and will not need to be repeated until the next discharge of water. If the discharge does not stop contact a qualified service center to evaluate the valve and make any required repairs.

Burner Compartment

Periodically check the service compartment and screen in door on the outside of the motorhome to ensure no foreign material has accumulated which will prevent flow of combustion and ventilating air.

Draining & Storage



The water heater bypass is a valve located on the back of the water heater. By turning the handle on valve to **BYPASS** position you can divert water away from the water heater. The water heater should be in the **BYPASS** position when winterizing. Bypassing the water heater will keep antifreeze out of the water heater, if antifreeze is used for winterization.

For water heater operation turn valve so that handle points to **NORMAL FLOW**.

If your motorhome is to be stored for a long period of time or during winter months the water heater must be drained to prevent damage from freezing. Refer to "Winterizing" for instructions. Be sure to refill water heater with water before resuming operation.

Tips

- Turn off water heater when not in use to conserve LP-Gas.
- The water heater tank capacity is six or ten gallons. When running the shower conserve the heated water by shutting the shower water off when not in immediate use.
- Use caution when adapted to 30 amp shore service. When the water heater element is in operation it will use approximately 12 amps. Appliances may need to be operated in sequence to avoid tripping a breaker.
- The temperature and pressure (T & P) safety relief valve on the outside of the water heater is set to open at 210° F or 150 psi. When water temperature and pressure reach these settings the valve may drip until the pressure has dropped. Avoid opening the T & P valve manually as it may continue to leak. The valves can be purchased from most hardware stores.

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

Troubleshooting

- If water heater fails to light check the outside burner tube for obstructions. Spiders may make nests in the burner tube.
- If the indicator light on the monitor panel does not light and the water heater does not light verify the battery cut-off switch at the entry door is on or check for a blown fuse in the house distribution panel.
- If the switch at the galley is on but there is no hot water check the **ON/OFF** switch located outside behind the water heater inspection panel.
- If the 120 Volt piloted switch does not light check the AC source, breaker, shore cord connection or transfer switch.

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

- Color coded water supply lines: red line for hot, blue line for cold.
- An 1-1/2" waste water drain line with a threaded cap, a P-trap and an automatic vent cap. This will drain the waste water into the grey water holding tank.
- A designated 120 Volt AC receptacle for a washer-dryer is provided.

NOTE: Sidewall dryer vents are not part of the prep package. If a sidewall vent is to be installed be sure it is properly sealed to the sidewall.

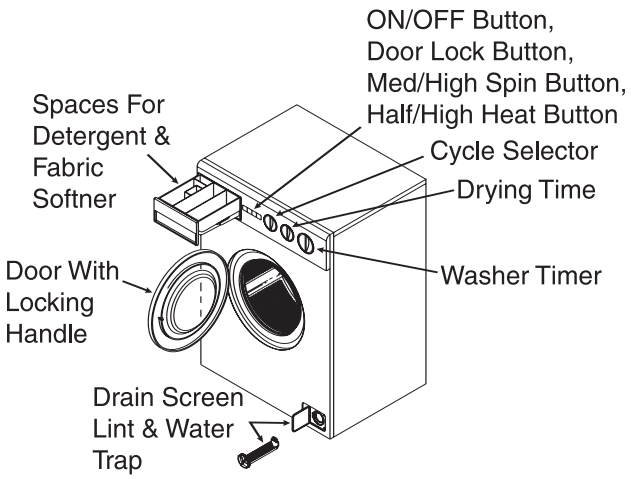
If a washer-dryer is to be installed at a later date, follow all the manufacturer's installation instructions.

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

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

WASHER-DRYER *(Optional)*

This appliance is an automatic washer with a capacity of up to 10 lbs. (4.5Kg) of dry clothing. It is front loading with an extra large door opening for easier access. It has five wash cycles in addition to extra rinse and extra spin cycles.



- The Washer-Dryer operates on 120 Volt AC.
- To operate the Washer-Dryer you will need to be plugged into shore power or have the generator running.
- The Washer-Dryer can be operated while driving down the road. The generator will need to be running and the water pump will need to be on. Make sure the grey tank will have enough room for the rinse cycle.
- The Washer-Dryer water use will be approximately 16 gallons of water per load.

Before using the washer for the first time wipe the inside and outside with a damp cloth to remove any travel dust that has accumulated. Operating a rinse cycle to rinse out the washer is recommended. Front load, horizontal axis washing machines require less detergent. Soap suds line should not exceed the halfway point of the glass door.

To begin wash load:

- Sort and pre-treat clothes.
- Add the measured amount of detergent suggested by the package directions (maximum two tablespoons).
- Load the clothes loosely into the washer. Close the washer door.
- Turn the cycle selector knob to the desired temperature setting.
- Decide which washing cycle you wish to use. Turn the timer knob clockwise to the desired wash setting.
- Select High or Medium spin (only for regular washing).
- Press the pushbutton **ON.**
- After the cycle is complete, wait two minutes for the door lock to release before attempting to open the door.

WARNING: Do not wash or dry articles that have previously been cleaned, washed, soaked or spotted with gasoline, dry cleaning solvents or other flammable or explosive substances. Do not add these substances to the wash water as they produce vapors that could ignite or explode. Do not use dryer to dry articles containing foam rubber or similar textured, rub-

ber-like materials. Clean the lint screen after each use (if applicable), located in the top left corner on the back of the washer. Keep the are around the exhaust opening and adjacent areas free from lint, dust and dirt accumulation.

The removable drain screen, which protects the pump from lint and foreign matter, needs to be cleaned periodically. The frequency in which it is cleaned depends upon the type of clothes that are washed. Cotton articles produce more lint than nylon articles. Under no circumstance should the drain screen be removed while the machine is full of water. To clean the drain screen, on an empty machine, open the service door by pressing on the left hand side. Place a cloth or shallow tray under the drain screen housing to catch any remaining water that may drip out. It may be helpful to first set the machine to spin, then remove the drain screen. This procedure reduces the amount of water released. Turn the drain screen counterclockwise and pull the drain screen out. Clean the screen to remove any dirt and lint. To replace the screen slide it back into the housing and turn it clockwise to secure. Close the service door.

NOTE: Check for water leaks before using the washer after removing and replacing the drain screen.

To winterize your Washer-Dryer follow the instructions below to avoid damage to your unit due to freezing:

1. With the unit off remove the wash filter to allow the water remaining (in the pump and drain hose) to be evacuated. Replace the filter.
2. Close the inlet shut-off valve located at the manabloc water system.
3. Open the low point drains to drain all the water.
4. In cold climates air should be used to blow out the system.
5. Install the water pressure regulator on a short water hose. Connect it to the water system. Use an air hose connector on the female end as this reduces pressure. Make sure one or more faucets are open.

If antifreeze is being used in the system follow these instructions:

1. When putting antifreeze into the water system of your motorhome set the washer to a warm/warm fill setting and allow water to flow into the unit until the antifreeze is detected.
2. Slowly advance the timer to a rinse cycle and allow the water to flow for 10 seconds. Advance the unit to a spin cycle to remove the majority of the water from the unit.
3. With the unit off remove the wash filter from the unit. This will allow the water remaining in the pump and drain hose to be evacuated. Replace the filter.
4. Any water remaining in the unit should contain antifreeze and be protected from freezing.

NOTE: When placing the unit back into service allow the unit to operate for one complete cycle before doing laundry to ensure all antifreeze has been purged from the unit.

As you use the Washer-Dryer, occasionally wipe the exterior of the cabinet with a damp cloth or sponge. Wipe dry with a soft cloth. Do not use polish on plastic trim. Clean the interior with one cup of chlorine bleach mixed with two cups of granular detergent. Run the washer through a complete cycle using the hot water. Repeat the process if necessary. Remove hard water deposits using only cleaners labeled as washer safe. Wipe the inside of the Washer-Dryer door with a soft cloth to remove any moisture. Periodically apply a thin coat of paste wax to the inner door, especially to the area which is immediately next to the door window. This will protect the door finish from laundry spills and discoloration.

NOTE: Should the Washer-Dryer need removal for service, care should be taken as the Washer-Dryer weighs approximately 185 lbs. Proper accommodations should be made to avoid risk of injury.

Endeavor GAS

SECTION 5
EQUIPMENT

5

INTRODUCTION

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

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

ENTRY STEP - *Operation*

The entry step features amber lighting under the step, automatic retraction with the ignition key in the RUN position and a last out feature. Located to the left, just inside the entry door, is the step switch.

Operating the Entry Step:

1. With the entrance door open, turn the step switch on.
2. Close the door. The step should retract and lock in the UP position. The step light will remain on.
3. Open the door. The step should extend and lock in the "down" position with the under step light on. The step will retract when the door is closed.
4. The step is equipped with a power switch. When the switch is turned off, the step should remain in the extended position with the door closed and the under step light off. Close the door and turn on the ignition switch. The step will retract for travel. To hold the entry step in the retracted position proceed with the following:
   - Turn the engine ignition switch off.
   - Wait 15 seconds and then turn the power step switch from off to on, then back off again. The step will stay retracted until the step switch is turned ON, or the ignition switch is turned on. The retracted position is useful for high curbs or on boat ferries.
5. With the power switch off, the step extended, the entrance door closed and the ignition turned on the ignition override system will go into effect and the step will automatically retract.
6. Turn the ignition off and open the door. The step will extend and lock in the "down" position. This is the "last out" feature. When the ignition is on the step will always activate with the door movement, regardless of the power switch position.

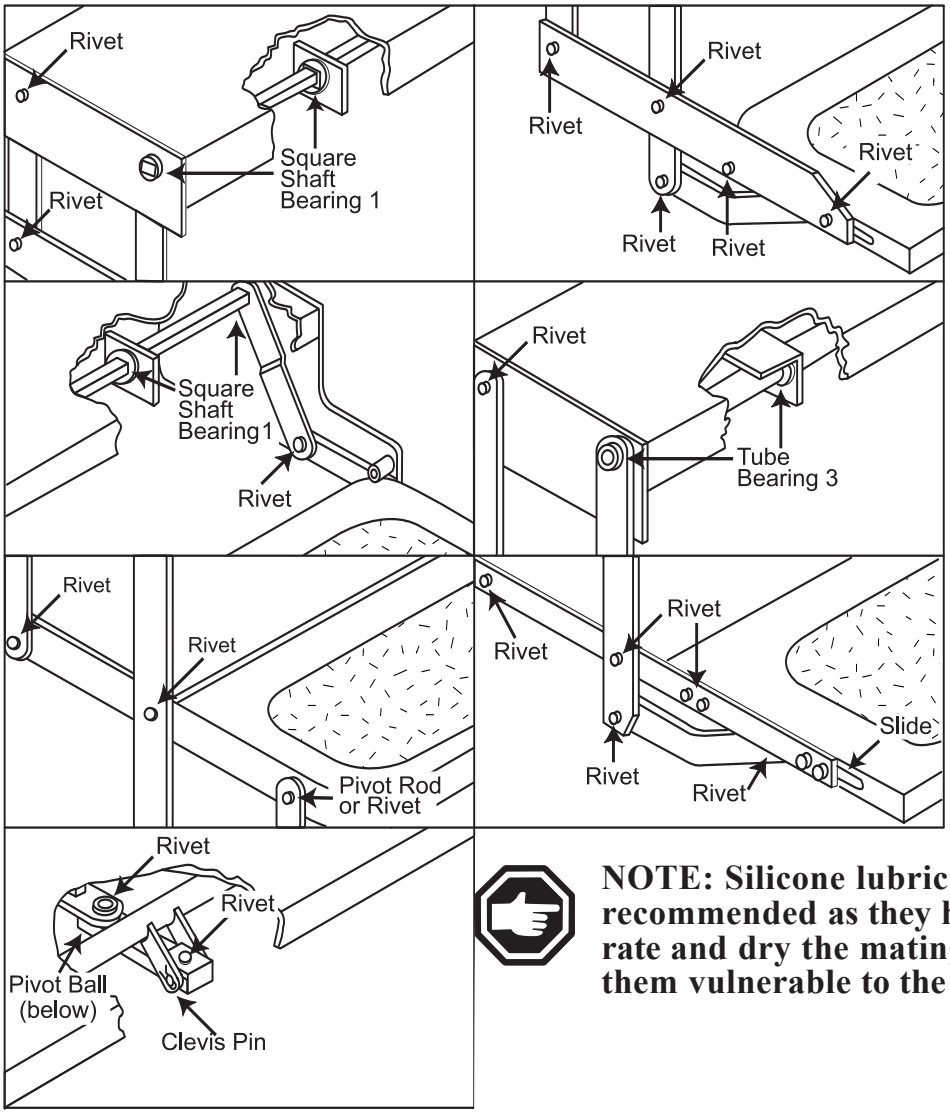
Tips

If the step fails to operate:

- Verify that the step switch is **ON**.
- Check the main power supply for the step. A 20 amp auto reset 12 Volt DC circuit breaker is located on the rear run plate.
- A magnetic door jam switch is used to control step operation. Use a separate magnet to apply a "trigger" to the door jam switch. Rotate test magnet to align polarity field.
- A five amp ATO blade fuse is used to illuminate the **STEP OUT** dash warning light. The fuse is located on the front run plate.

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

Maintenance & Lubrication



Clean all mud, salt and road grime from the step before lubricating. Lubricate all moving parts (bearings, pivot points, slides, clevis pin and the drive linkage ball) every 30 days with a good quality heat and moisture resistant penetrating grease. ***Kwik Lube Spray Grease*** is specially formulated to lubricate ***Kwikee Electric Steps*** and it is also recommended for lubricating all moving parts. (Refer to the illustration.)

NOTE: Silicone lubricates and WD-40 are not recommended as they have a tendency to evaporate and dry the mating surfaces which leaves them vulnerable to the elements.

ENTRY DOOR

To keep the entry door in good condition and operating in the manner in which it was designed to operate, some routine maintenance items should be attended to on a regular basis. These items are as follows:

1. Strike Plate Adjustment:

The door in the motorhome was installed and adjusted to a factory setting. The position of the striker plate or bolt may change over the course of time and settlement of the motorhome. The setting may need to be adjusted to insure that your door operates smoothly and efficiently. To adjust the strike plate, loosen the two Phillips head screws holding the strike to the jamb system. Move the plate in or out as needed to obtain a proper seal and closing force. Retighten the screws.

CAUTION: If you loosen the screws too far on the out-swing doors, the backer plate will release and drop down into the door jamb. Should this happen, replace the short screws with a screw that is long enough to go through the jamb system and into the framework of the sidewall.

2. Locks:

The key cylinder in your locks need to be lubricated on an annual basis or as needed. Use a powdered graphite, not a petroleum product. Petroleum products gum up the cylinder and inhibits smooth operation. Apply a light coating of white lithium grease to the face of the lock bolt to obtain a smooth closing.

3. Hinges:

The hinges on your door should be lubricated annually, or as needed, with any high-quality, dry spray lubricant.

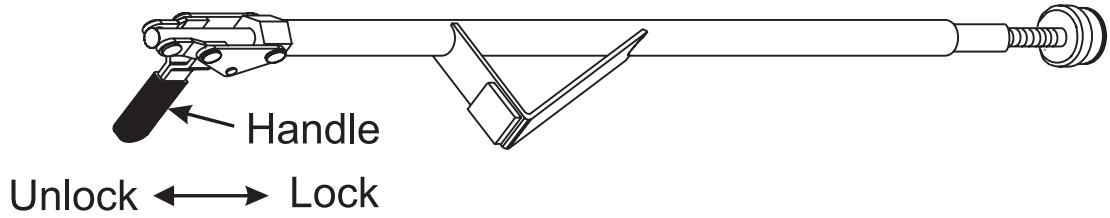
4. Fiberglass Skin:

To maintain their appearance and a long service life the door skin panels should be washed and cleaned periodically. Cleaning removes the accumulation of dust and dirt which can combine with sunlight and wind to attack exposed surfaces, both chemically and abrasively.

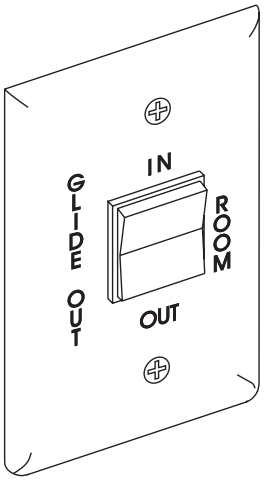
SLIDE-OUT OPERATION - *Extending Room*

To Extend the Slide-Out Room:

- Move the driver seat forward before activating the slide-out room.
- Confirm that there is at least five feet of clearance outside the motorhome for the slide-out room to extend.
- Ensure the ignition key is in the OFF position.
- The park brake must be applied.
- The storage bay doors under the slide-out must be closed.
- Locate the two locking bar mechanisms on the top of the slide-out room inside the motorhome.
- Move the handles to the unlock position.



The Lock'R bar is used to secure the slide-out room.



- Release the bar mechanisms and remove the bars from between the wall and the top of the slide-out room. Store the bars for reuse before the motorhome is in motion.
- Locate the slide-out room control switch in the passenger side overhead compartment above the entry door.
- Press and hold the slide-out room switch in the OUT position. The slide-out room will slowly move to the OUT position. To continue the room movement push and hold the switch in.
- Release the slide-out switch when the room is fully extended (a change in motor sound indicates extension). The slide-out drive motor will not stop automatically, the switch must be released.
- Level the motorhome with the leveling system.

WARNING: Move the drivers seat forward before activating the slide-out room. Ensure there is five or more feet of clear space outside the slide box prior to extending the slide room. The outside area must be clear of any obstructions which may hinder the movement of the slide room. Ensure there is sufficient clearance inside the motorhome. Never move the motorhome with the slide-out extended.

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

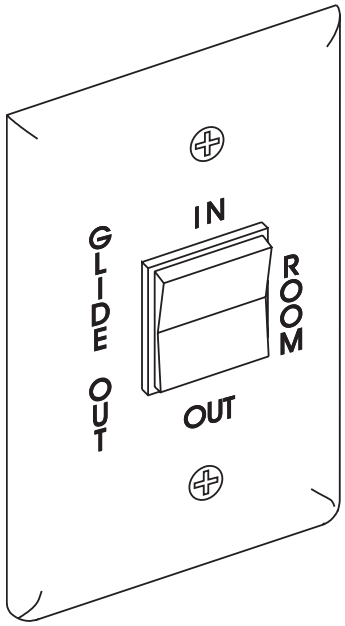
CAUTION: Remove the LOCK'R bar before moving the slide-out room. Damage can result if it is left in position. Holiday Rambler is not responsible for damage resulting from operating the slide-out room with the LOCK'R left in position.

NOTE: Slide-out room operation should be performed with a full air suspension system. It is not recommended to extend the slide room in snow, sleet, ice or freezing rain. There may be extensive damage resulting from the awning freezing up.

Retracting Room

To Retract the Slide-Out Room:

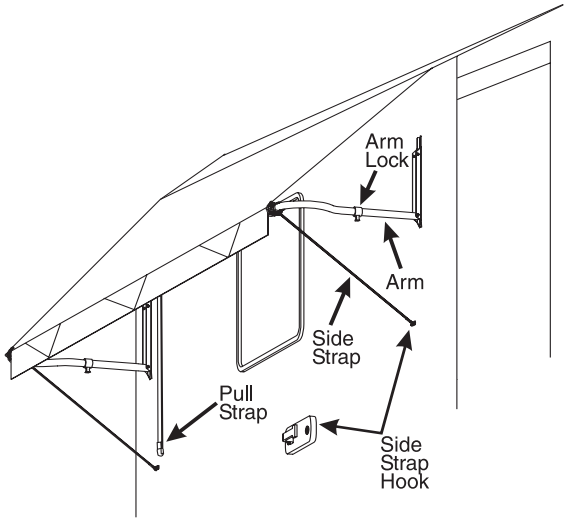
- Check for sufficient clearance inside the motorhome before retracting the slide-out room.
- Clean the floor, if applicable, to ensure there is no dirt or grit that could result in floor damage during slide-out retraction.
- Press and hold the switch in the **IN** position. The slide-out room will move slowly in. To stop the slide-out room before the room reaches the IN position, release the switch. To continue the room movement, push and hold the switch in. The motor will change tone when the slide-out room is fully extended.
- Release the switch.
- After the slide-out room is completely retracted, locate the two removable locking bar mechanisms. Place the bar mechanisms between the wall and the top edge of the slide-out room. The Lock'R has a built in spring to preset the tension. Move the handle to lock the position.

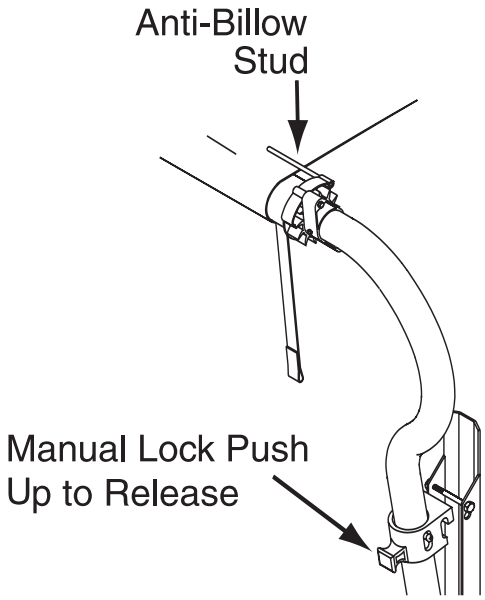


NOTE: Be sure you have sufficient clearance on the inside of the motorhome (drivers seat, etc.) before you retract the slide-out room. If your motorhome has ceramic tile floor ensure the the floor is clean before you retract the slide-out room. Dirt or grit that is trapped under the slide-out room can scratch the floor surface. Never move the motorhome without having the slide-out room retracted.

Awning - Slide-Out

The motorhome is equipped with a slide-out awning that will automatically roll out with the slide room when it is extended. When the slide room is extended the awning can then be rolled out completely as a window awning. The slide-out awning has two devices to help prevent the awning from "billowing" while traveling. The first device is a pair of anti-billow studs, which are located above each end of the awning roller tube. If the awning catches wind and begins to billow the awning metal wrap will contact the anti-billow stud levering downward and engaging with a plastic gear preventing further unraveling of the awning material.





The second device uses two metal wind deflectors which are positioned just below the awning. This helps prevent side winds from scooping under the awning and unwinding the awning material.

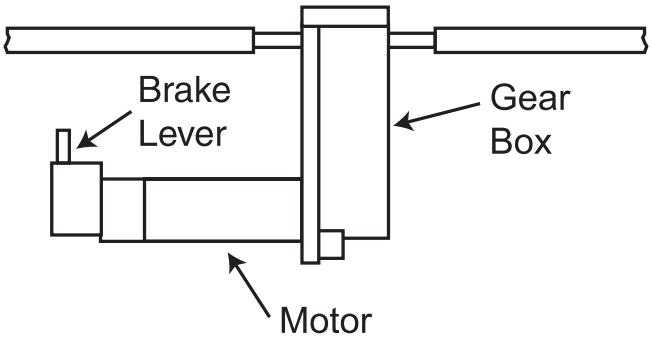
CAUTION: The slide room and slide-out awning should be retracted during heavy winds or rain. Rain can be driven up under the slide-out awning and into the motorhome. The slide-out awning should be retracted in high wind conditions as damage can occur to the awning or motorhome.

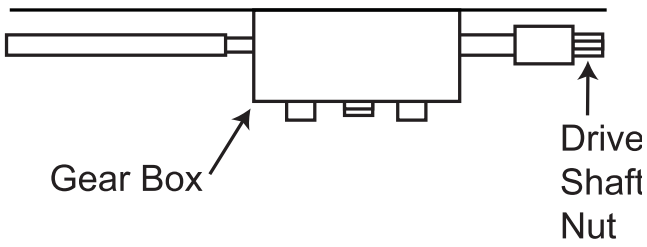
NOTE: At least five feet of clearance is needed between the side of the motorhome and any objects, such as trees or fences, to allow the slide room and slide-out awning to be fully extended.

Manual Override

The slide-out room can be operated manually in the event of electrical problems. The slide-out room motor and gear assembly is located roadside in the large pass-through storage compartment. The lever on the motor must be moved to the freewheel position.

The drive shaft can be moved using a 7/8 inch wrench. Once the slide-out room has been placed in the desired position place the motor lever in the service position.





NOTE: The slide-out room is heavy and may require several persons to push it into the retracted position.

Troubleshooting:

The following can be used as a guide to assist you in the event of a slide room malfunction.

The slide room will not move:

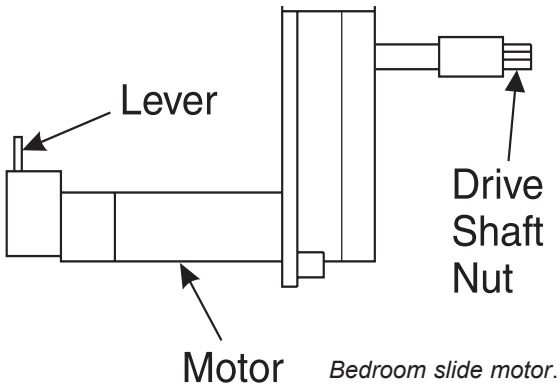
- The house batteries should be fully charged prior to operating the slide-out.
- The ignition switch should be in the OFF position.
- The fuse for the slide-out room is located in the bedroom panel. This is a 15 amp fuse.
- The fuse for ignition lock-out is located in the front run panel. This is a 7.5 amp fuse.
- The slide-out room motor input voltage requirements are 12 VAC.

The slide room movement is rough:

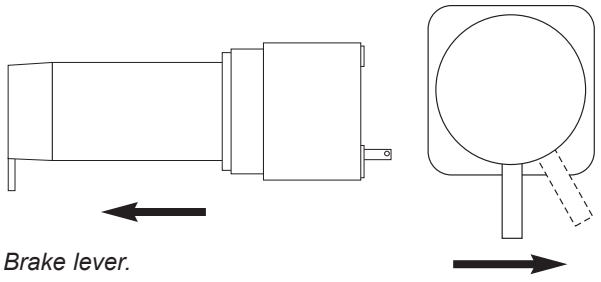
- The rollers will need adjustment.
- The gear is worn or damaged.
- The slide room is binding in the opening.
- The wipe seal is rubbing the slide room too hard.
- The voltage is low.

Manual Override - Bedroom Slide-Out

1. Disconnect the battery cables from the battery.
2. Lift up the mattress and base board to gain access to the slide-out mechanism.
3. If the bedroom slide-out motor has a lever on the back side, rotate the lever counterclockwise about 1/8th of a turn (looking from the rear of the motor) to release the brake that locks the room in place. If the motor does not have a lever, use a ½" wrench to remove the four motor mounting bolts. Remove the motor.
4. Use an appropriate wrench (a ¾" wrench/ratchet or an adjustable wrench) on the override to move the room in or out. The override is located on the opposite side of the slide-out rail from the motor.
5. Once the room is in apply pressure to the wrench so that the room is sealed. Return the brake lever to its normal downward position to lock the room in place. Install the transit bar (if so equipped). If the motor does not have a brake lever, apply pressure to the wrench so that the room is sealed and install the transit bar (if so equipped). If there is no motor lever and no transit bar the motor must be mounted back onto the slide-out system to hold the room for transport. Because of this the room may not be sealed from the environment.
6. Take the motorhome to an authorized dealer for service.



Bedroom slide motor.



Brake lever.

Rotate approx. 30° counterclockwise to release the motor brake.

Preventative Maintenance

The slide-out system has been designed to require very little maintenance. To ensure the long life of the slide-out system read and follow these simple procedures:

- The roof of the slide-out should be checked for debris such as pine needles, dirt, leaves, sticks, etc. If the slide-out has been out for a period of time, any debris left on the top may cause damage to the seals when being retracted. If debris is present wash with soap and water, then rinse.
- When the room is out visually inspect the inner slide rail assemblies. Check for excess build-up of dirt or other foreign material. Remove any debris that may be present.
- If the system squeaks or makes noise apply a coat of light weight oil to the drive shaft and roller areas. Remove any excess oil so dirt and debris do not build-up. Do not use grease.

CAUTION: Do not work on the slide-out system unless the battery is disconnected.

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

NOTE: It is not recommended to extend the slide room in snow, sleet, ice or freezing rain. There may be extensive damage resulting from the awning freezing. In the event the slide-out room is extended in snow, sleet, ice or freezing rain conditions, it is recommended you clear the awning and ensure free movement prior to retracting the slide room.

ENTERTAINMENT CENTER - HOME

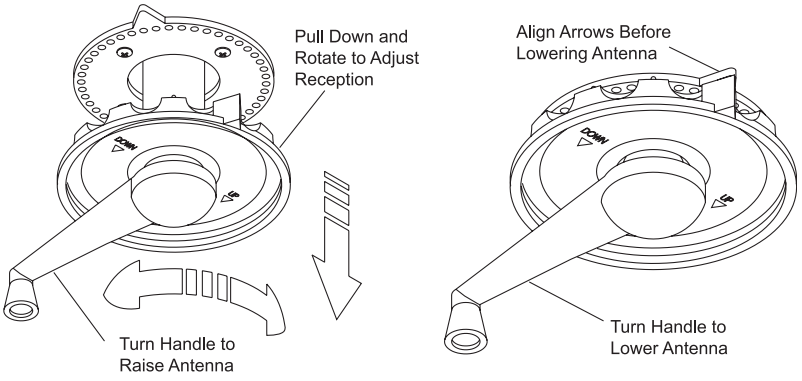
Front Television Lock-Out

The motorhome is equipped with a remote control color television located above the pilot seat. The outlet for front TV is controlled by the ignition switch so that the front TV can only be viewed while the vehicle is at rest. The TV operates from 120 Volt AC power only, which can be provided by shore power, the generator or the inverter. Viewing time of the front TV from the inverter depends on the state of charge of the house batteries and any additional 12 Volt DC lighting being used.

Television Antenna

The television antenna is a manual crank up style antenna with built in electronics which use 12 Volts DC to “boost” signal strength. Signals that are weak or fuzzy can be amplified by turning on the boost switch in the passenger front overhead cabinet. The antenna and booster work together to provide the best possible picture for most situations. Certain conditions occur when no amplification is needed and in fact may make the picture worse. The television

station will send a signal that resembles the waves or rings of water from a rock thrown into a still pond. The radiating television signal can hit an object such as a mountain and come back. The result one sees in the television picture is a double image. The antenna will receive a signal from the initial pass, then receive an additional signal from the rebound resulting in a split or double image. In this case the picture may be improved by no amplification or even lowering the antenna.



NOTE: Do not move the motorhome with antenna in the raised position, it can be damaged by tree limbs or wires.

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

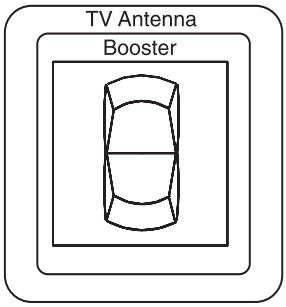
To Raise The Antenna:

- Rotate the crank handle clockwise to raise the antenna (it is approximately 14 ½ turns).
- Pull down on the outside directional wheel and rotate the antenna until the best picture is obtained. The directional wheel is spring loaded.

WARNING: Do not raise a TV antenna near overhead electrical wires as contact may cause serious injury or death. The motorhome must not be driven with the antenna in a raised or partially raised position. Worm gear or worm breakage may result.

To Lower The Antenna:

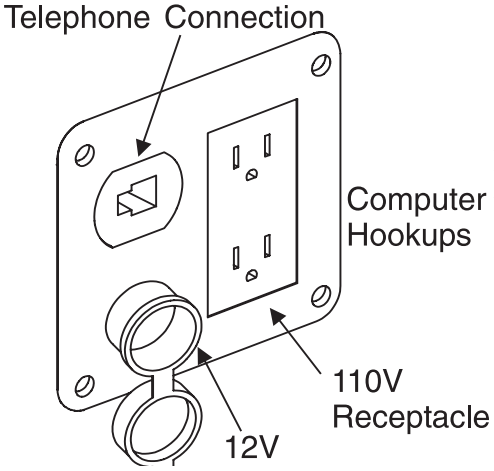
- Pull down on the directional wheel and align arrows together.
- Rotate crank handle counter clockwise lowering antenna fully into the cradle. Make an outside visual inspection to ensure the antenna is properly stowed.



Boost Operation:

To boost the antenna signal to the TV or VCR use the boost switch. Turn this switch to the ON position. Turn the boost switch off when not in use.

Hook-Ups - TV Cable, Computer & Telephone



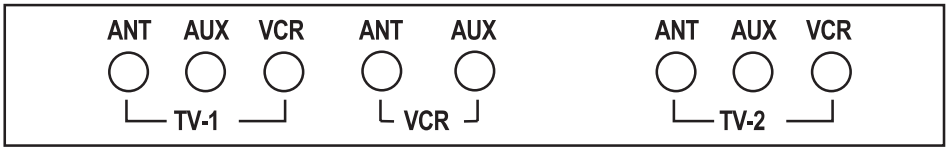
The motorhome is equipped with cable TV and telephone hook-ups, located in the electrical service center. For convenience there are auxiliary outlets located at the co-pilot seat and on the optional computer desk. This connection is set up for a phone or laptop computer to be used.

VCR & Bedroom Television (Optional)

The VCR and bedroom television operate from only 120 Volts AC, which can be provided by shore power, the generator or the inverter. Use the instructions given in the video selector box section to use these components.

Video Selector Box (Optional)

The motorhome is equipped with a video selector box located in the overhead cabinet. The selector box receives video and audio signals from three different sources: the roof mounted antenna, shore cable (auxiliary) or the optional VCR. The video selector box directs the signals to either the front or rear TV, and directs the signal from shore cable or the roof mounted antenna to the VCR. The selector box switches are divided into three groups: **TV1** (front TV), **TV2** (rear TV) and the **VCR**. Both the **TV1** and **TV2** button groups perform the same functions. For example: To watch the front TV (**TV1**) from the antenna, depress the **ANT** button in the **TV1** group. This will direct the signal from the antenna to the front TV.



To Watch the front TV:

- Using the antenna, depress the **ANT** button in the the **TV1** group.
- Using the shore cable, depress the **AUXILIARY** button in the **TV1** group.
- Using the VCR, turn the TV to channel 3 and depress the **VCR** button in the **TV1** group.

To Watch the REAR TV (Optional):

- Using the antenna, depress the **ANT** button in the **TV2** group.
- Using the shore cable, depress the **AUXILIARY** button in the **TV2** group.
- Using the VCR, turn the TV to channel 3 and depress the **VCR** button in the **TV2** group.

NOTE: When watching TV by using the VCR (such as playing a tape) make sure the TV is tuned to channel 3.

Using the VCR (Optional):

- With the antenna, depress the **ANT** button in the **VCR** group.
- With the shore cable, depress the **AUXILIARY** button in the **VCR** group.

Tips:

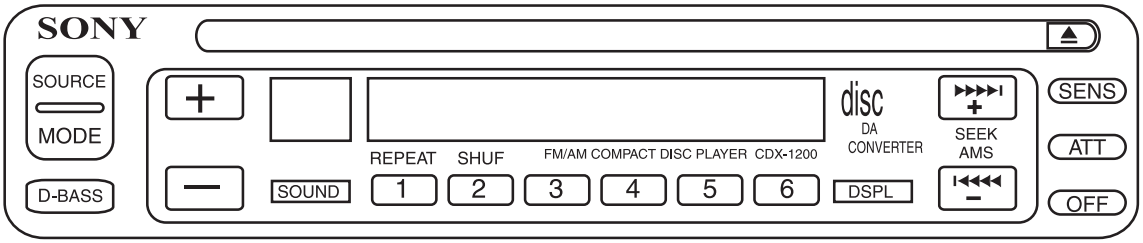
1. If the picture is weak and the antenna boost is working try moving the motorhome a few feet forward or backwards.
2. If it is weak or has no picture check the video selector box to make sure the proper mode button has been selected.
3. If the signal is still weak it may be a shorted or open coax. The coax cable is made up of two conductors. A center conductor, which is usually copper; and the ground, which is woven or braided aluminum. There is insulating material that separates the two conductors known as the die-electric. The ground and center conductor are to remain separate from one another. When installing a metal end onto the coax cable use care so that none of the woven ground strands come in contact with the center conductor. A continuity tester is used to test for a suspected bad coax wire run. Unscrew both ends of the suspected bad coax run and use the continuity tester to check between the center conductor and outside threaded ring. If continuity is present the coax is shorted. To test for an open connection of a particular coax run touch each end of the coax's ground or center conductor using the tester leads. Continuity should be present. For proper operation there should be continuity from one end to the other of both the ground and center conductor. No continuity should be between the ground and center conductor. Though damage does not usually occur from a shorted or open coax cable picture quality is compromised.

Satellite System Prewire - DSS (Optional)

The motorhome may have been prewired for a roof mount DSS system. The prewire will consist of a ¾" flexible conduit which will run from the front overhead to a spot marked on the roof. A telephone hook-up will also be provided for Pay Per View accessibility.

RADIO - DASH

The dash radio is a tuner and a compact disc player. It holds up to eighteen preset FM stations and six AM stations. Other features are an attenuate mode, loudness control, a clock and autoseek tuning. The compact disc player features are fast forward and reverse, random track play, repeat and pause. The radio power can be turned off from two different locations.



Tips:

1. If the radio does not function check the house battery cut-off switch to make sure it is on. Check either of the radio power switches located at the dash panel and in the bedroom.
2. The LCD display may become difficult to read at temperatures at or below 41° F.

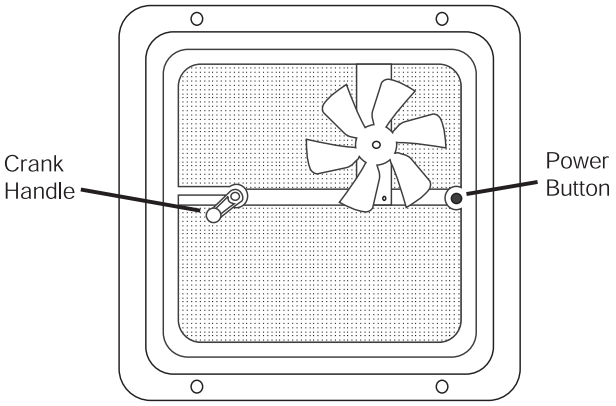
For detailed information and operating instructions on the stereo and CD player system refer to the manufacturer's manual.

CITIZEN BAND (CB) RADIO PREWIRE (OPTIONAL)

The motorhome may have been pre-wired for a Citizen Band (CB) Radio. A two pin connector is labeled Citizen Band Radio for future installation. The red wire is fused at a two amp connection in the front distribution panel. The ground wire, white in color, is connected to the chassis frame.

FAN - *Bathroom Fan*

The motorhome is equipped with roof air vents which are manually operated. The vent is opened or closed by simply turning the crank handle in the desired direction. The fan, which is for ventilation only, will not help cool the motorhome, and is operated by pushing the small power button. The vent must be opened before using the power fan. To close the power air vent push in the power button to stop the fan and close the vent.



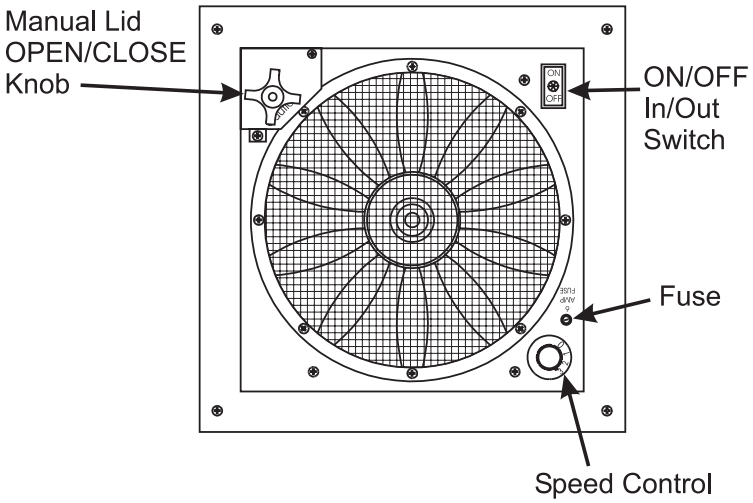
Exhaust Fan

The fan is a three speed fan with a **0** or **OFF** position. The fan will either pull in air or extract air from the motorhome. There are three controls located on the ceiling vent fan. The knurled knob is used to open the vent cover. The rotary knob will select the operating speed of the fan.

The **IN/OUT** switch controls the direction of the fan rotation. When the vent cover is opened approximately two inches the fan motor will operate.The vent cover lid must be manually controlled during normal operations by the knurled knob.

To Operate The Fan:

- Open the vent cover using the **OPEN/CLOSE** knob.
- Select the desired fan direction to **IN/OUT**.
- Select the desired fan speed on the Speed Control dial:
  - **0 = OFF.**
  - **1 = LOW.**
  - **2 = MEDIUM.**
  - **3 = HIGH.**



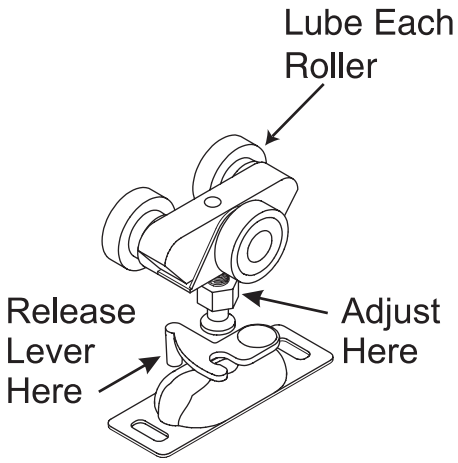
NOTE: If the speed switch is in the "0" position the fan operates only as a vent.

Tips

- To keep condensation from accumulating open the vent fan lids slightly to help the air circulate. Condensation occurs naturally from fluctuations in interior and exterior temperatures, humidity and dew point changes, steam from cooking or boiling large amounts of water on the cooktop. Shower usage also produces condensation.
- If the fan fails to operate check for a blown fuse either in the domestic fuse panel or the 6 amp fuse on the fan.
- To clean the screen remove the eight screws holding it in place. Wash the screen using a non-abrasive soap and water. Re-install the screen and tighten the screws.
- Keep all the vents closed when using the Fantastic Fan Vent. Direct the airflow by slightly opening the window(s) on the shaded side of the motorhome to obtain the maximum air flow, especially on hot, sunny days. Close all the roof vents. The area between the open window(s) and the Fantastic Vent supplies the maximum air flow and providing the most comfort.

NOTE: Do not leave the vent cover open while the motorhome is stored or unattended for extended periods of time. High winds other unusual conditions or obstructions may prevent closing. The resulting leakage could cause serious damage.

DOOR - SLIDING



The sliding pocket door uses two rollers at the top of each door. During the life of the motorhome the sliding door may need adjusting. The sliding pocket door can be adjusted to close tight against the wall. Locate the small wrench and turn the adjusting screw upward or downward.

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

The pocket door rollers should be lubed with just a drip of oil once a year to help increase the life of the rollers and improve the sliding of the door.

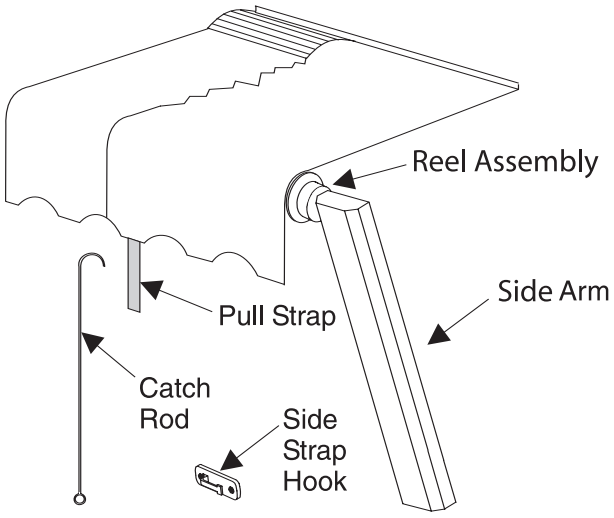
AWNINGS
- Window Awning (Optional)

To Extend Awning:

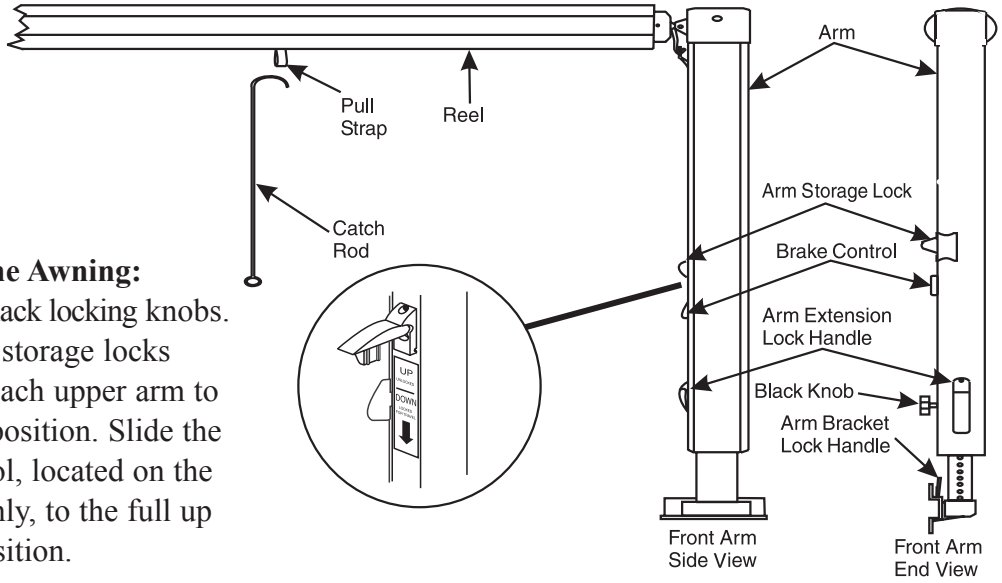
1. Catch the loop of the pull strap with the awning rod.
2. Pull the awning to fully extend the reel assembly and the side arms away from the motorhome.
3. Hook the pull strap on to the side strap hook.
4. Remove the awning rod from the pull strap and store it.

To Retract Awning:

1. Hook the awning rod on to the pull strap.
2. Remove the pull strap from the side strap hook and slowly allow the awning to retract.
3. Remove the awning rod from the pull strap loop and store it.



Patio Awning



To Unlock The Awning:

1. Loosen the black locking knobs.
2. Lift the arm storage locks located on each upper arm to the unlock position. Slide the brake control, located on the front arm only, to the full up (unlock) position.

To Extend The Patio Awning:

1. Hook the loop of the center pull strap with the pull wand and draw the awning away from the motorhome to the desired extension. Slide the center pull strap to one end of the awning and store it.
2. Slide the inner rafters to the top of each arm and push outward to the tension canopy. Tighten the black locking knobs.
3. Raise the arm extension lock handles and slide the awning upward. Lower the lock handles and move the awning arm upward or downward to lock the detent into the hole. First, raise the lock handles on the main side. Next, raise the lock handles to the entry door. Go to the other awning arm and do the same. Make sure the awning is straight.

To Retract The Patio Awning:

Retract the arms and lower the awning until the arms rest on the lower stop bolts and lock into position. Loosen the two black locking knobs. Release the locking tab on the end of the awning leg. Slide the pull strap to the center of the awning while holding on to the strap. Allow the awning to roll up to the stored position.

- Snap the arm storage locks into the down position and tighten the black locking knobs.
- Verify that the brake control is in the locked or closed position.

CAUTION: When the awning is at full extension do not allow the awning to snap back into the retracted position. Personal injury or damage to the awning or motorhome may occur.

Rain Release Setting:

After the awning has been extended choose the rain release position to prevent water build up on the awning. To position the awning in the rain release setting lower one arm of the awning and leave the other arm in the normal position. This will create enough of a slope for adequate water run off.

Using The Carport Feature:

To safely use the carport feature:

1. Extend the braces and lock them into the end of the side arms. Tighten the black knobs.
2. Extend the awning as described under "To Extend Awning."
3. Unlatch the bottom of the rear arm by pushing in on the lock handle on the arm bracket. Swing the arm away from the motorhome to an upright position.
4. Raise the rear arm extension lock handle all the way up to the unlocked position. Extend the arm to position the awning at the desired height and lower the lock handle to lock the arms in place.
5. Drive the stakes through the bottom holes in the arm.
6. Repeat instructions 1 through 5 for the front arm extension lock handle.

NOTE: To move the awning out of the carport position reverse the above steps.

Securing The Awning For Travel:

Before traveling check the following:

1. The awning is fully retracted against the sides of the motorhome.
2. The black locking knobs are tightened.
3. The storage locks are down and in the locked position.
4. The brake control is in the full down (locked) position and no red warning is showing.
5. The bottom of the front and rear arms are latched properly into the bottom brackets.
6. The catch rod is stored away.

Care and Maintenance:

Washing:

On a monthly basis, loosen hardened dirt and remove dust from the awning with a dry, medium bristle brush. Thoroughly rinse both the top and bottom with a hose. Wash both sides of the awning using a quality vinyl cleaner solution and an awning brush. (Washing the awning can be made easier with use of awning maintenance products.) Saturate the fabric with the cleaning solution and leave it on for 15-20 minutes. If necessary, reapply the solution to keep the fabric saturated. Rinse the awning thoroughly. Repeat, if necessary, until most of the stains disappear.

Water Leaks:

If leaking occurs after washing it generally results from insufficient rinsing. If water drips through the needle holes in the stitching use a commercial seam sealer which is available in canvas and trailer supply stores. Paraffin wax may also be applied to the top of the seams. As the awning "weathers" these holes will normally seal themselves.

It is normal for slight leakage to occur through the fabric where water is allowed to accumulate or pocket on the fabric. See "Storm Precautions" for information on the awning settings for proper water drainage. Sometimes soap or chemical residue, such as from active agents in insect fog or sprays, can "wet" the fabric so that it appears unable to repel water. Rinse the fabric thoroughly and test to see if it is water repellent after it dries. If leakage continues after repeating the washing and thoroughly rinsing please contact Carefree Awning Magic concerning further maintenance.

Storm Precautions:

The warranty does not cover damage caused by acts of God; therefore, steps should be taken to prevent damage from occurring due to wind, rain or storms. If you are leaving or retiring for

the night close the awning. This takes only a few minutes and it gives the best protection for the awning. If closing the awning is not possible at the time, lower both ends of it as far as possible to create a sufficient slope for water run-off. One end may be lowered to sufficiently divert the water if the awning is being monitored.

Water weighs 8.33 pounds per gallon. The awning was not made to withstand the 500 to 700 pounds that could accumulate. It is best not to subject the awning and the motorhome to the needless strain.

NOTE: Allow the awning material to thoroughly dry before rolling the awning up. Metal surfaces should be cleaned with soapy water and thoroughly rinsed.

Awning - Automatic (Optional)

The Carefree One Touch automatic awning requires only "finger tip" operation. A key lock on the One Touch switch pad is provided to prevent accidental deployment of the awning while the motorhome is in motion. The key is removable in the lock or unlock position.

Gas filled struts keep the awning fabric tight at any extended position. The 12 Volt DC motor for the One Touch awning uses approximately 15 amps while in operation.

To Extend the Awning:

- Verify all persons and objects are clear from the extend path of the awning and related hardware.
- Turn the One Touch key to the **ON** position.
- Depress and hold the momentary switch to **EXTEND**. Motor will automatically stop at full extension.
- Allow 14 seconds for awning to reach full extension.
- Extension distance or fabric tension is adjusted by toggling between **RETRACT** and **EXTEND**.
- Turn the One Touch key to the **OFF** position.

CAUTION: The patio awning requires nine feet of lateral clearance from the side of the motorhome. This distance will allow the awning to reach full extension. The One Touch patio awning was not designed with a carport feature or a rain release setting. The awning should be retracted if the motorhome is left unattended or high wind conditions exist. Otherwise, wind damage to the awning may occur.

NOTE: It is not required to have the awning at full extension. Awning may be stopped at any time of extension or retraction by releasing the momentary switch.

NOTE: Some models may require that the ignition key be turned to accessory or the ignition run position.

To Retract the Awning:

- Verify all persons and objects are clear from the retract path of the awning and related hardware.
- Turn the One Touch key to the **ON** position.
- Depress and hold the momentary switch to **RETRACT**. The motor will automatically stop at full retraction.
- It takes approximately 14 seconds for the awning to travel from the fully extended position to the fully retracted position.
- Turn the One Touch key to the **OFF** position to avoid accidental deployment of the awning while the vehicle is in motion.

Tips:

If the awning fails to retract or extend:

- Verify the One Touch key is in the **ON** position.
- The house battery cut off switch is in the **ON** position.
- The house battery voltage is at 12 Volts or above.
- Verify proper electrical connection from the awning motor to the side of the motorhome.

Emergency Retract Procedure:

If the One Touch awning fails to retract and proper DC voltages have been verified the One Touch awning has two emergency methods of alternately retracting the awning:

1. Two exposed electrical studs are mounted externally at the forward end of the awning at the motor assembly. An alternate 12 Volt DC positive and negative supply may be applied to these connections. If awning fails to move reverse the polarity of the alternate supply leads.

2. On the motor assembly, mounted externally at the forward end of the awning, is an opening. Insert a 9/64” Allen hex wrench. Using an electric drill wind the awning to the retract position.

CAUTION: When using an alternate method to operate the awning use extreme care to keep appendages, hair or loose clothing away from exposed rotating hardware.

SOFA BED CONVERSION

The sofa will convert easily into a bed. The sofa comes equipped with safety belts and these should be used if occupied during travel.

Sofa to Sleeper

- Raise the sofa seat base until seat base and backrest form a V shape by lifting up from the center of sofa just below the seat cushions.
- Push down on seat base until the seat base and backrest are flat.
- Fold seat belts out of the way.

Sleeper to Sofa

- Lift the seat base up until seat and back rest are in a V shape.
- Push down on seat base.

DINETTE BED CONVERSION *(Optional)*

- The booth dinette easily converts into a bed.
- Lift seat cushions to an angled vertical position.
- With a firm grip, lift front edge of the table approximately six inches and push table leg lock to side.
- Swing the table leg up and lock into a horizontal position.
- Continue lifting table until table stays are clear of retainers. Pull outward and lower table down.
- Use both seat cushions and one back cushion for a mattress. Leave one back cushion in a vertical position.

WARNING: Do not occupy the booth dinette, if NOT equipped with safety belts, or the dining chairs while the motorhome is in motion. To avoid personal injury to occupants in case of a crash or sudden stop, chairs must be stored in an enclosed area or secured with tie down straps while the motorhome is in motion.

STORAGE - UNDER BED

To use the storage compartment located under the bed, locate and unlock the bed deck latches. Lift up the bed by the front edge of the mattress platform. Gas struts hold the mattress and platform open.

NOTE: Do not over stress gas struts by rapidly opening or closing the bed access cover. This action can damage the struts or mounts. In extreme cold gas struts may not hold the mattress platform in the open position.

NOTES

Endeavor
GAS

SECTION 6
WATER SYSTEMS

6

INTRODUCTION

This section contains information and knowledge for the operation and care of the various water system equipment found in the motorhome. The motorhome is equipped with two separate water systems. Optional water equipment will also be discussed, so not all information may be applicable to the motorhome. More detailed information with CAUTION or WARNING instructions for the various equipment, other than what is found in this section, can be found in the manufacturer's manual in the owner information box.

It is hard to imagine how much water you use everyday when you are at home. Newcomers to self-contained motorhomes soon discover that water does not last very long unless consumption is drastically reduced. For instance, you can use less water for showering if you wet down, turn off water while soaping then turn on water to rinse. This way a good shower uses a gallon or less of water. There is plenty of water to meet personal needs once you modify some habits.

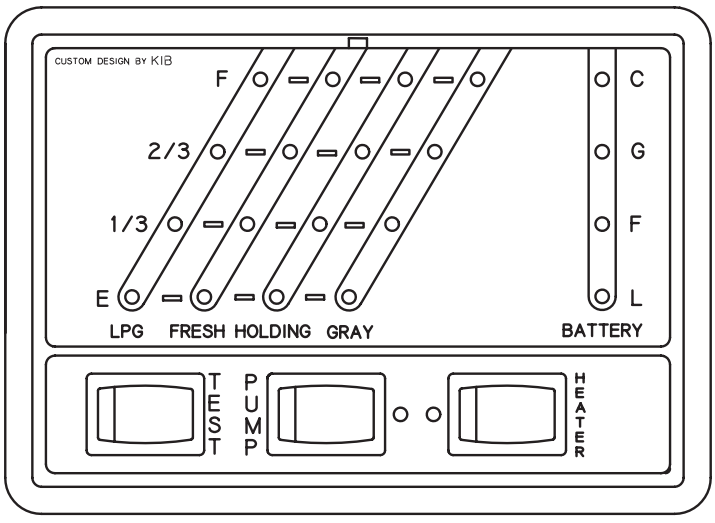
Fresh Water System:
The fresh water system consists of fresh water tank, water pump, gravity fill connection, water filter and a city/fresh water connection.

Waste Water System:
The waste water system consists of a waste holding tank (grey water), a sewage holding tank (black water), flush system, toilet and drains.

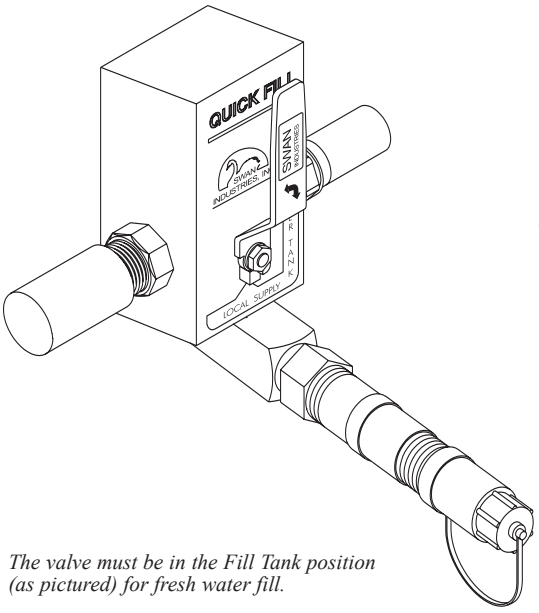
MONITOR PANEL
Measurement & Calibration

The motorhome is equipped with a monitor panel to aide in managing the storage tanks. The monitor panel will be located above the entry door or in the bathroom area. The switch marked **test** is a momentary switch which requires being held down while testing the level of the storage tanks. Read the scale for the desired storage tank which is to be monitored. Each scale uses colored lights along with a corresponding scale reading. The lights and scales indications are as follows:

- Green lamps indicate good or normal ranges.
- Amber lamps indicate fair or partial ranges.
- Red lamps indicate full or empty ranges (depending on the scale) which are in the critical range.



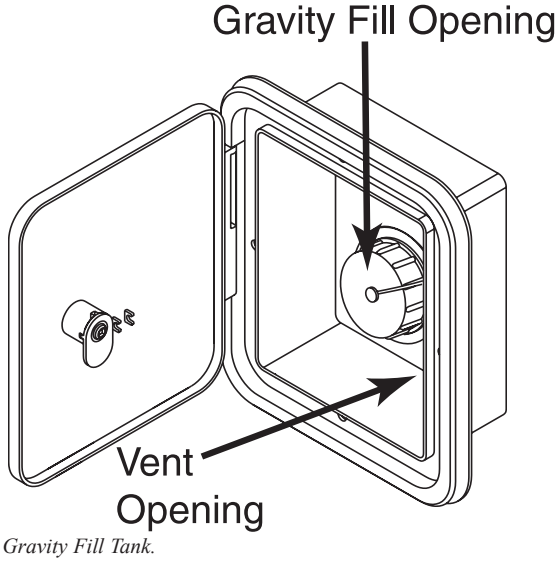
WATER TANK - FRESH WATER FILL



The valve must be in the Fill Tank position (as pictured) for fresh water fill.

1. Check to make sure the fresh water tank drain valve located on roadside in the service center is in the closed position.
2. Connect the hose labeled for potable water to the water source. The water hose from the source to the motorhome sometimes will not have a pressure regulator inline. On a hot day the hose may expand and burst from water pressure within the water hose.
3. Remove white plug in the end of the pressure regulator.
4. Connect the water hose to the City water inlet.
5. The knife valve should be in the Fresh Water position.
6. Turn on the water at the water source. The water should be audible as the fresh water tank fills.
7. Locate the monitor panel. Lift the cabinet door and locate the switch marked test. The switch is a momentary switch that requires the switch to be held in position while testing the level in the fresh water tank. Read the scale as the fresh water tank is filling. When the 2/3 tank light illuminates it should not take much longer to finish filling the tank. Do not leave coach unattended while filling the fresh water tank. The light marked "F" should start to blink as a warning that the fresh water tank is almost full. Return to the service center. When the fresh water tank is full water will come out an overflow tube under the coach on the driver's side.
8. Turn off water supply as quick as possible.

WATER TANK - FRESH GRAVITY FILL



Gravity Fill Tank.

The gravity fill inlet allows fluids to be introduced directly into the fresh water tank. When dry camping water can be poured directly from a container into the fresh water tank. The gravity fill inlet can be used to pour disinfecting solution into the fresh water tank or when using potable RV antifreeze to winterize the fresh water system. Use only potable water sources, solutions and delivery systems when using the gravity fill inlet.

Filling the Tank:

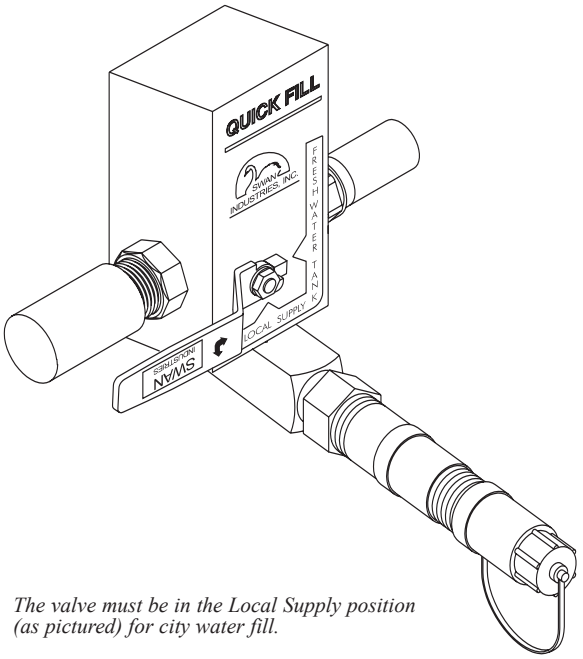
1. Unscrew fill cap taking care to keep cap and inlet clean.
2. Insert potable water hose into inlet.
3. Fill tank until water overflows from inlet.

NOTE: When filling tank do not leave hose unattended.

WATER - CITY HOOK-UP

When connecting the motorhome to fresh water use a hose manufactured and labeled for potable water to insure that the hose will not flavor the water.

1. Remove white plug in the end of the water inlet.
2. Connect water hose to the city water inlet.
3. Knife valve handle should be in the position shown in the picture.
4. Turn on water at water source.
5. The water pump can either be in the OFF position or in the ON position. It will not affect the water pump to leave it on.
6. The fresh water connection has a built in pressure regulator and a one way check valve that protects the motorhome to 45 lbs.
7. You may need to open each faucet one at a time to rid any trapped air inside the pipes.

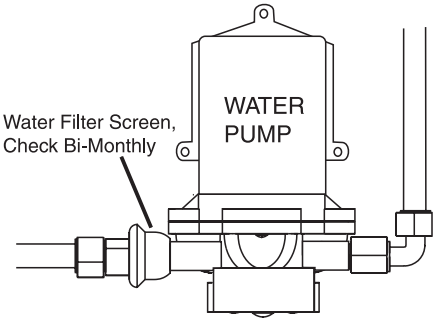


The valve must be in the Local Supply position (as pictured) for city water fill.

CAUTION: Some water sources develop high water pressure, particularly in mountainous regions. High water pressure is anything over 55 psi (pounds per square inch). Excessive water pressure may cause leaks in water lines and/or damage the water heater. The coach does come with a pressure regulator.

WATER PUMP

The water pump is used to pressurize the fresh water system when it is not connected to city water. The water pump is totally automatic and self- priming, operating on demand as water is used. The pressure equalizer tank relieves the water pump from cycling when a small amount of water is used. The water pump is located in a storage compartment of the motorhome.



WARNING: Before leaving the coach for extended periods of time (i.e. overnight or longer) be sure that the city water and all water pumps have been turned off. Damage from neglect will be responsibility of the owner and not Holiday Rambler.

To operate the water pump push on switch and watch for the green light to stay on. The remote switches are located in the bathroom on the control panel next to the entrance door and on the outside water control panel.

Do not allow the pump to run when the fresh water supply tank is empty. Continued operation with a dry tank may open an electrical circuit and/or damage the water pump.

To start pump after unhooking city water supply or first time use proceed as follows:

- Fill the fresh water tank.
- Open all valves and faucets except the drain valves. This includes hot and cold water valves, all faucets and shower.
- Turn the water pump on and wait for the water lines and the hot water tank to fill.
- Close each faucet when it delivers a steady stream of water (cold water faucets first).

Water Pump - Troubleshooting

Vibration induced by road conditions can cause the plumbing or pump hardware to loosen. Check for system components that are loose. Many symptoms can be resolved by simply tightening the hardware. Check the following items along with other particulars of the system.

The water pump will not start/blows the circuit:

- Check the electrical connections, fuse, breaker, main switch and ground connection.
- Is the motor hot? The thermal breaker may have triggered. It will reset when cool.
- Is the voltage present at the switch? Bypass the pressure switch.
- Does the pump operate?
- Check the charging system for correct voltage and check the pump for the proper ground connection.
- Look for an open or grounded circuit or motor.
- Check for seized or locked diaphragm assembly (water frozen).

The water pump will not prime/sputters (No discharge/motor runs):

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

The water pump will not shut-off/runs when the faucet is closed:

- Check to see if the fresh water tank fill valve is completely closed.
- Check output side (pressure) plumbing for leaks and inspect for a leaky toilet or valves.
- Look for loose drive assembly or pump head screws.
- Are the valves or the internal check valve held open by debris or is the rubber swollen?

The water pump is noisy or rough in operation:

- Check for plumbing which may have vibrated loose.
- Does the mounting surface multiply noise (flexible)?
- Check for mounting feet that are loose or compressed too tight.
- Look for loose pump head to motor screws (three long screws).
- Is the motor with the pump head removed? Is noise coming from the motor or pump head?

The water pump is rapid cycling:

- Look for restrictive plumbing/flow restrictors in the faucets or shower heads.

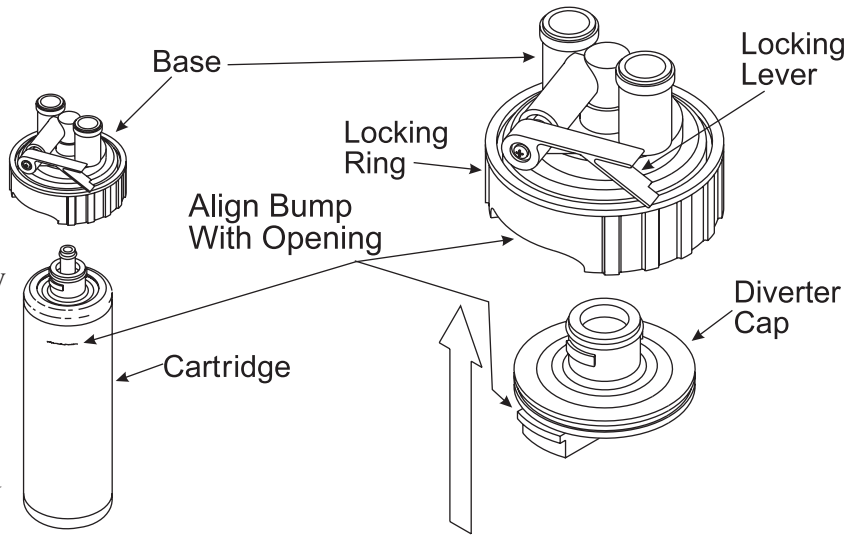
WATER FILTER *(Optional)*

Servicing the Filter:

The water filter is located under the galley sink, and may have been installed in the motorhome without its cartridge.

The units ADC Cartridge is easily installed by following the simple instructions on the cartridge wrapper. A fresh replacement cartridge is needed when the flow of water from the faucet becomes too slow for convenience. How often will this occur? That depends on how cloudy the unfiltered water is and how much water is used.

Each time water passes through the water filter dirt particles are trapped and held in the tiny pores of the micro-pure coating on the filtering element inside the cartridge. As the cartridge actively



removes the impurities from the water its microscopically small pores slowly fill up and the amount of water flowing from the cartridge gradually lessens.

When the flow of water from the water filter becomes too slow for convenience it should be serviced. If the cartridge is not changed, eventually the flow will stop entirely. Even when a decreasing flow does not demand it, at least one cartridge change a year is recommended for reliable performance from the Water Filtration System.

WATER SYSTEM - *Troubleshooting*

Water system problems and leaks usually fall into two categories: system problems and problems caused by improper use or lack of attention. These problems usually stem from improper winterizing, poor maintenance, road vibration and campsite water pressure variations. Check all plumbing connections for leaks at least once a year. If the water pump runs when a faucet is not open, check for a water leak. Be sure the tank drain valves are closed. If the system continues to leak take the motorhome to an authorized dealer for service.

WATER SYSTEM - *Disinfecting Fresh Water*

Disinfecting the water system with chlorine bleach (superchlorination) protects you and your family from bacteriological or viral contamination from any common water source.

You should disinfect the water system:

- If the motorhome is new.
- If the motorhome has not been used in a long time.
- Every **three** months.

NOTE: An independently operated water pump with garden hose connections and a container to hold prepared solution may be desired to perform this task. The gravity fill may also be used to perform the task. Remove cap off the gravity fill. Add the solution to the fresh water tank. When finished secure the gravity feed cap.

Use following procedure to disinfect water system:

- Remove the filter element from the filter and reassemble the filter without the elements (see "Filter").

- Prepare a chlorine bleach solution using 1 gallon water and 1/4 cup of chlorine bleach. Use 1 gallon of solution for every 15 gallons of tank capacity. Example: Add 2-2/3 gallons solution to a 40 gallon tank. Add 4-2/3 gallons solution to a 70 gallon tank. Add 6-2/3 gallons to 100 gallon tank. This mixture puts a 50 ppm (parts per million) residual in the water system. This concentration will act as a quick-kill dosage for harmful

bacteria, viruses and slime-forming organisms. Concentrations higher than 50 ppm may damage the water lines and/or tanks.

- Drain the fresh water tank. Close the drain and pump the solution (if desired) into the fresh water tank using an independently operated pump and a garden hose connected to City Water Hook-Up on the water control panel. It can be poured into the fresh tank using the gravity fill and a funnel. Open each faucet, in turn, and run the water until you smell a distinct chlorine bleach odor. Do not forget the hot water, tub and shower faucets.

- Allow the system to stand for four hours.

- Drain the system and flush with fresh water. The drain is located in the outside water control compartment. Install new water filters. Flush with fresh water repeatedly, if necessary, until no chlorine bleach taste or smell is left in the water system.

TANK CAPACITIES - CHART

TANK CAPACITIES (Approximate Gallons)						
MODELS	**35SBD**	**35PBD**	**35WGS**	**36SGS**	**36PBD**	**36WGS**
Water Heater	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**
Grey Tank	**45 Gal.**	**45 Gal.**	**43 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**
Black Tank	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**
Fresh Tank	**67 Gal.**	**67 Gal.**	**67 Gal.**	**70 Gal.**	**55 Gal.**	**70 Gal.**
LP Tank	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**

WASTE WATER SYSTEM - *Waste Drains & Sewage Tanks*

The waste drainage system is designed to provide adequate and safe storage and/or discharge of waste materials. All materials used in the fabrication and installation of the system are tested by a nationally recognized testing laboratory. The entire fabricated waste system is factory tested in accordance with American National Standards Code A119.2. The drainage system uses ABS plastic piping and fittings for its connection to the sinks, shower, toilet and holding tanks which provide for the proper drainage to an outside termination. The motorhome should be reasonably level for optimum operation of the systems. Two separate waste water systems are in the motorhome: one for waste water (grey water) and one for sewage waste (black water). Each has its own storage tank and control valve. Both systems empty through a sewer drain hose. When the motorhome is traveling both holding tanks should be empty or less than half full.

What Not to Put in Waste Holding Tanks

- Do not use strong or full strength detergents to deodorize and disinfect. Use odor control chemicals made especially for holding tanks.
- Do not put automotive antifreeze, ammonia, alcohol or acetone in holding tanks. Some chemicals will dissolve plastic.
- Do not put large table scraps in the tanks. They could get stuck in or damage the valve seals.
- Do not flush facial tissues. They are treated chemically to strengthen them and will not dissolve like toilet paper. Special holding tank tissues are available at most RV supply stores. White toilet paper dissolves faster than colored papers.

Proper Waste Disposal

Most State Parks have strict regulations about discharging wastes except into authorized disposal systems. Dumping raw sewage from toilet holding tanks, except at authorized dumping stations, is universally prohibited.

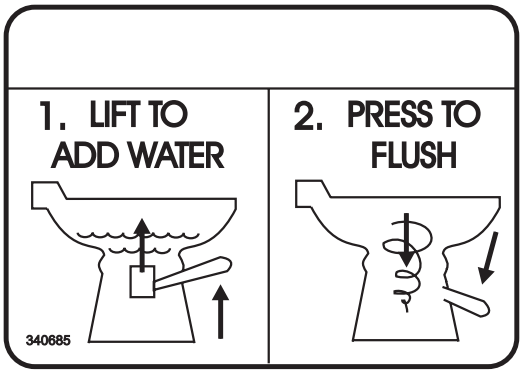
Most National, State and private parks have either a central dump facility or campsite hook-up for sewage. Many of the modern rest areas along the interstate now have dump stations available. You will find a list of dumping stations from coast to coast in Woodall's Campground Directory, Trailer Life's RV Campgrounds and Services Directory, Rand McNally's Campground and Trailer Park Guide, Good Sam Park Director (Good Sam Club) and other publications. Some major oil companies offer dump facilities at selected stations. Plan ahead and you will find few inconveniences in proper and legal disposal of holding tank wastes.

Connecting to Available Sewer Hook-Up

When you park in an area with sewer hook up available the waste holding grey tank gate valve can remain open once you have connected to the sewer hook-up. The sewage holding black tank valve must be closed at all times except when dumping. One thing you may want to consider prior to dumping the holding tanks is to allow enough fluid to accumulate in the grey tank before dumping. Then you dump the black tank first so the grey tank fluid may be used to flush the sewer hose.

TOILET
Operating Instructions

The toilet operates from either fresh water tank or city water supply. The water pump must be turned on or the city water connected. The toilet flushes directly into a sewage holding tank (black water).



- To add water to the toilet before using lift 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 until the sewage leaves the toilet. The water flow pressures vary at different locations; therefore, holding the flush lever down for five to eight seconds may be required. We recommend 2-gpm flow for proper rim and bowl wash.

- To operate the remote mounted hose sprayer push down the lever and hold it. Release the flush lever by allowing it to snap back, which permits positive sealing around the flush ball. A small amount of water should remain in bowl.

NOTE: Holding flush lever down longer than necessary results in excessive water usage.

Cleaning

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

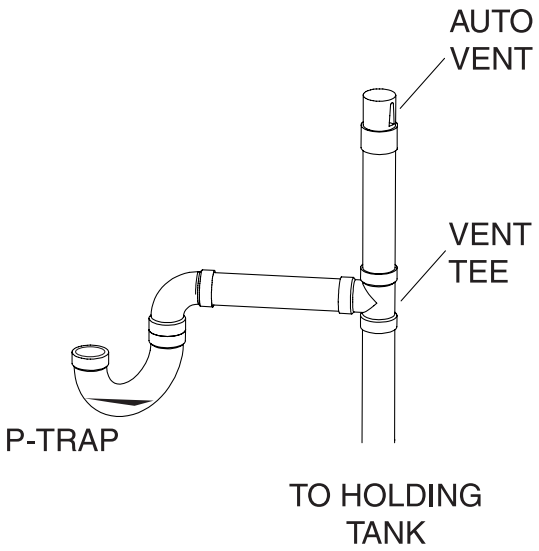
Clean out the system by flushing several gallons of fresh water through with one cup of dry laundry detergent. Add odor control deodorant, in the amount specified for the holding tank capacity, after cleaning and every few days during use.

Maintenance

To find leaks, check behind or under toilet. Take four or five sheets of toilet tissue and wipe all the seams and waterline connections. Start at the top of the unit and work downward. When the tissue comes in contact with leaking water it will immediately change texture.

If the motorhome is in storage for six months it is a good idea to spray silicone on the toilet valve and work it back and forth. Silicone will evaporate in about 30 days.

Drain Traps & Auto Vents



Sinks, shower and clothes washer drains incorporate a water trap or “P-trap” and auto vents to prevent waste water holding tank odor from entering the motorhome. These P-traps are usually within 54” of a vent tee. These traps must have water in them to block odors. During storage water can evaporate and allow odor into motorhome. If odor is detected run water into sinks, shower and clothes washer to fill drain traps. During cold weather antifreeze must be added to the drain traps. The auto vent by design is to assist in the flow of water in the drain lines. They enable a smooth flow water in the drain without creating vacuum pressure in the lines.

The auto vent, if stuck in the open position, can allow grey odors to enter the motorhome. These auto vents also double as “clean outs” in the event you have to snake out a line.

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

Draining the Waste Holding Tanks

Before you start to dump the waste tanks take a few minutes to exercise the drain pipe. Grasp both sides of the drain pipe firmly and swivel the pipe up and down. This will exercise the O-rings. When the drain pipe is pointed up turn the drain end cap counterclockwise and remove it from the drain pipe. This will prevent any residual spill from running out.

To dump the waste holding tanks:

- Unscrew the bottom access hole plug from the service compartment. Feed the adapter end of the drain hose up through the hole and install the hose adapter on the drain pipe.
- Attach the other end of the drain hose to the sewer connection at the dump station.
- Rotate the drain pipe downward to maximize flow.
- Drain the sewage tank first by pulling the large T-handle gate valve out on

the water connection panel. Water can be heard rushing through the hose.

- Flush the sewage tank. Connect the water supply hose to the SEWAGE TANK FLUSH connection on the water connection panel. This water supply hose should not be the same hose used to connect the city/fresh water hook-up. Ensure the T-handle gate valve remains open when flushing the sewage tank. Turn the water on and flush the system for approximately two minutes. Again, water running through the drain hose should be audible.
- Turn the water off and disconnect the water supply hose when finished flushing the system.
- After you have drained and flushed the sewage tank drain the waste water tank by pulling the T-handle out on the water connection panel.
- Flush the waste holding tanks with fresh water before closing the gate valves. The waste water tank is flushed by pouring two gallons of water down a sink drain.
- Run the toilet water to flush the sewage tank.
- Push both T-handles in and install the end cap (required in some states) when in transit to prevent leakage.
- Flush the drain hose with either the water supply hose or the exterior faucet sprayer and secure in travel location.

WARNING: When using the black tank flush do not leave the motorhome unattended or flooding may occur. Turn off the water supply to the black tank flush when finished.

What to Put into the Holding Tanks - Black Tank

The sewage tank stores toilet drain waste only. Before using the toilet you need to treat the sewage holding tank with water that is mixed with an odor controlling chemical. These chemicals are readily available at any RV supply store. The chemicals are poured into the holding tank through the toilet. Mix the chemicals with approximately one gallon of water. Be careful not to spill the chemical on hands, clothing or carpet as it can cause permanent stain. Extremely hot weather areas may require adjusted amounts of chemical to help with odor control. Each time the holding tank is dumped repeat the chemical mixing.

CAUTION: Do not use any products that contain petroleum or ammonia in place of an RV odor controlling chemical. Petroleum and ammonia will damage the ABS plastic holding tanks and seals.

What to Put into the Holding Tanks - Grey Tank

The waste tank stores sinks, shower and clothes washer drain water. No chemical is required in this holding tank; however, keep in mind this is a waste holding tank and can produce odors. A reduced mixture of chemicals may be used for odor control.

Prior to dumping the waste holding tanks be sure there is enough liquid in the holding tanks to provide a smooth flow through the valve drain pipe and drain hose. When sufficient liquid is in the tank a swirling action will result that should take accumulated solid wastes along with the waste liquid when the tank is dumped. The tanks should be emptied when they reach ½ full, or weekly, to prevent stagnation and overfilling.

COLD WEATHER USE

A motorhome is not designed for extended use in below freezing (32° F/0° C) weather; however, problems may not occur as long as the temperature does not drop too low.

Interior water lines, fixtures, water storage tanks and pumps are normally protected from moderate freezing temperatures as long as the furnace is operating.

Exposed drains may freeze quickly. If in doubt about what temperatures the motorhome will tolerate winterize with a potable antifreeze.

The exterior water control bay has a 12 Volt electric heater to warm the bay during cold weather. The heater should be turned on when the ambient temperature approaches 44° F.

Storage:

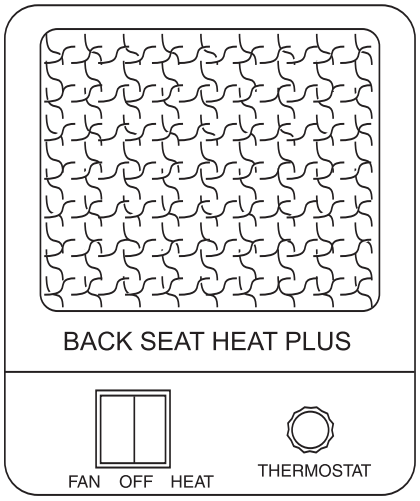
If you are storing the motorhome where freezing temperatures may occur you will need to drain the domestic fresh water loop completely of water. When draining the domestic fresh water system start off by draining the fresh water tank. This is accomplished by simply opening the point drain lever for the fresh tank and allowing the water to drain.

NOTE: Ice makers, water filters, water purifiers and water heaters all use domestic water and should be drained and stored in accordance with the manufacturer's recommendation for winterization.

How to store the motorhome and protect the water lines is up to the motorhome owner. The lines can be air blown to remove standing water or the lines can be filled with an approved FDA RV antifreeze. Either way, all interior and exterior faucets need to be opened and closed, one at a time, to be checked. All low point drains should be opened and the holding tanks emptied.

Bay Heater (Optional)

The heater is controlled using two switches. One switch is located on the heater itself and one, a remote "SYSTEMS HEAT" switch, is located inside motorhome next to the entrance door. Both switches must be in **ON** position for the heater to operate. Either switch turned in the **OFF** position will turn the heater off.



Heater Controls:

1. Function Select Switch:
   - Left Position - Fan only on.
   - Middle Position - Heater off.
   - Right Position - Both fan and heater on.
2. Thermostat:
   - Rotate right or clockwise to increase temperature setting.
   - Rotate left or counter clockwise to reduce temperature setting.

Cold Weather Package (Optional)

The cold weather package consists of one 12 Volt electric heating pad attached to each holding tank. Heating pads are turned on and off using the same "SYSTEMS HEAT" switch (located inside motorhome next to the entrance door) that turns on the bay heater. Pad operation is controlled by a thermostat designed to turn on at 44° F and off at 64°F. Power to pads should be turned ON when ambient temperatures approach 44° F. There must be liquid in the holding tanks when the pads are turned on.

CAUTION: Turn OFF power to pads when dumping the holding tanks, plugging motorhome into shore power and when starting the electric generator to prevent damage to the pad thermostat.

WINTERIZING *- Using Air Pressure*

To use air pressure to winterize the motorhome you will need access to an air compressor and an adapter to connect the air line to the water system. Adapters can be found at any RV supply store. When hooked to the water lines the pressure should not exceed 40 psi. Higher pressure can damage the lines.

1. Remove the water filter elements from the filters and reassemble the filters without the elements (see "Water Filter").
2. Drain the fresh water tank by opening the valve located in the outside water control service compartment of the motorhome.
3. Open the water heater and the low-point drains. Turn knobs to open the drains. Open the low point drains to clear the water out of the hot and cold water lines. Leave the low-point valves open until the motorhome is used again.

4. Let all the water drain. Turn the pump on and allow it to run so that all the water is cleared out of the pump and lines. Turn the pump off.
5. After the water lines are drained hook an air hose to the city water connection located on the water control panel in the outside service compartment. Blow out the water lines until no further water can be seen coming out of the drain lines. Do not exceed 40 psi in the water lines and faucets.
6. Open all faucets (including the outside spigot), one at a time while the air is on, to clear water from the faucet supply lines. Do not forget to drain the shower.
7. While the air is on hold the spray nozzle (located right next to the toilet) open until the water has quit running. Hold the toilet flush pedal or handle down until the water has stopped running.
8. Unhook the air hose and close the city water connection.
9. You will need 1 gallon of RV antifreeze to protect various water drain lines in the motorhome. Pour 1 pint into both the kitchen and bath shower drains. Pour 2 pints into the bath sink drain, with some of the antifreeze going into grey tank to protect the drain valve. While holding down the flush pedal, pour another 3-1/2 pints into the toilet, letting the antifreeze run into the black tank to protect the valve located there. Pour the last pint of antifreeze into the toilet after you have released the flush pedal. Use a soft cloth to wipe out the sinks and shower after you pour in the antifreeze to protect the surfaces from stains.
10. Leave the low-point drains open until the motorhome will be used again.

WARNING: When draining the low water drain lines and the water heater be sure the water is not hot. Hot water from the lines can burn you.

WINTERIZING - *Fresh Water System Using Nontoxic Antifreeze*

Ten gallons of FDA RV winterizing antifreeze is needed if the water lines are to be filled with antifreeze.

1. Open all low point drains and drain valves to drain the fresh water tank, water heater tank, holding tanks and fresh water lines.
2. Close all faucets, drain valves and low point drains.
3. Pour the antifreeze into the fresh water tank using the gravity feed opening.
4. Turn ON the system water pump and operate each faucet individually until a small amount of antifreeze is present.
5. Close off the faucets.

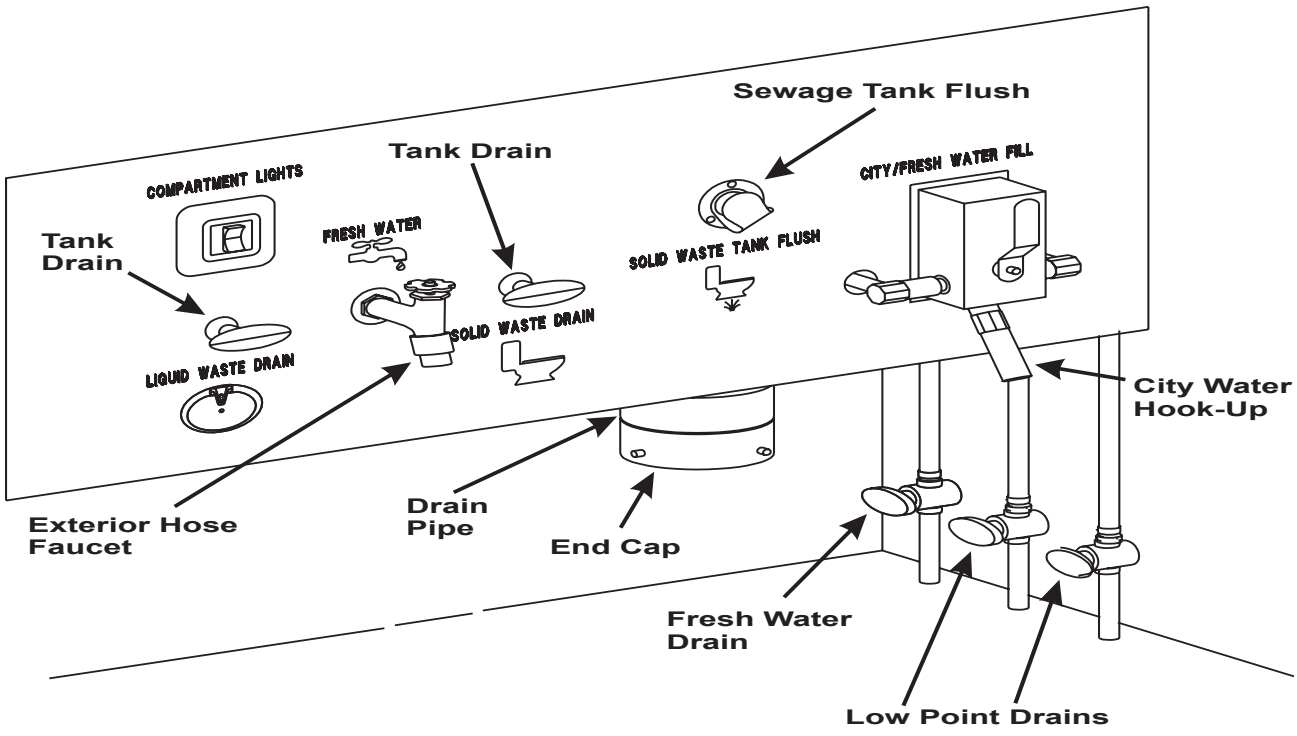
6. Open the shower faucets and toilet valves to allow a small amount of antifreeze to run into the holding tanks.
7. Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
8. Exterior faucet should be opened and closed using the same procedures as the interior faucets.
9. If the motorhome is equipped with an ice maker, remove the 3/4 inch fitting and flush antifreeze through the water line.
10. Disconnect the power supply line affecting water pump operation.
11. Drain the water heater by removing the anode

De-winterization:

For de-winterization, drain off the fresh tank and fill the fresh tank with water. Reconnect the power supply line for the water pump. Operate all faucets, one at a time, until clear water is present.

WARNING: You should use only non-toxic RV antifreeze that is specifically made for potable water systems. Automotive antifreeze, if ingested, can cause blindness, deafness or death.

WARNING: It is recommended that this procedure be done by a qualified RV service technician familiar with motorhomes, such as the authorized selling dealer.

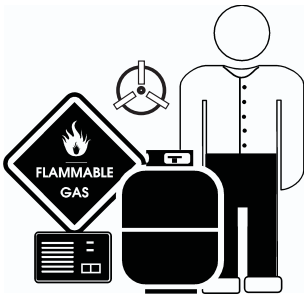


Service Center view.

Endeavor
GAS

SECTION 7
LP-GAS SYSTEMS

LP-GAS SYSTEM



This section contains information and knowledge for the operation and care of the various Liquefied Petroleum (LP-Gas) system equipment found in the motorhome. The motorhome is equipped with several appliances and various equipment which are capable to operate on LP-Gas. Some items discussed may not be applicable to all motorhomes. More detailed information with CAUTION or WARNING instructions for the various equipment, other than what is found in this section, can be found in the manufacturer's manual in the owner's information box.

All components for the motorhome LP-Gas systems are approved for use in camping vehicles by a nationally recognized testing laboratory. When properly handled LP-Gas is a clean-burning dependable fuel for heat producing components. The LP-Gas tank mounted in the motorhome contains liquid petroleum gas which is under high pressure. As the fuel is used liquid gas vaporizes and passes through the tank valve to a regulator that automatically reduces pressure. Low-pressure gas is then distributed to components through a pipe manifold system.

Component lighting problems are commonly caused by an improperly adjusted gas regulator. Do not attempt to reset the regulator. Adjustments need to be made by a dealer or an authorized service person.

In higher elevations or extreme cold weather (10° F/-21° C or lower) a shortage of LP-Gas may be experienced. Usage can be modified by running only one component at a time. For example, turn off the furnace while using the range. If LP-Gas is going to be used in higher elevations or cold climates for a long period of time have an authorized service person adjust the LP-Gas regulator for these conditions.

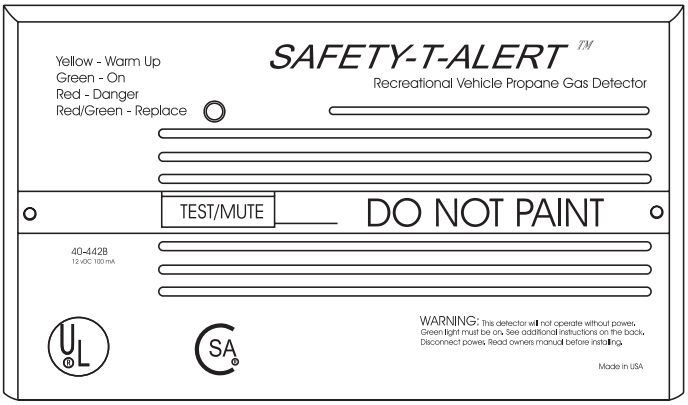
It is recommended that the LP-Gas system be checked by an authorized dealer at least once a year, and thereafter before every extended trip. Although the manufacturer and the dealer test the system carefully for leakage, travel vibrations can loosen fittings.

Leaks can be easily found by applying a leak detector solution on all connections. If a leak detector solution is not available, a soapy water solution made with dish soap can be used. Rinse fittings thoroughly with clean water after use of soap solution.

Leaks can usually be repaired by tightening the fittings. If not, shut off the main gas valve at the tank. Immediately see a authorized dealer for repairs. Hand tighten the tank valves only. Do not use a wrench or pliers as over tightening may damage valve seats and cause leaks. If you suspect a leak (which can be easily identified by the odor of rotten eggs or sulfur) never light a match, have an open flame or use any spark producing equipment or appliance.

WARNING: LP-Gas is highly volatile and extremely explosive. Do not use matches or a flame to test for leaks. Use only approved LP-Gas leak testing solution for leak detection. Unapproved solutions can damage copper tubing and brass fittings. Never attempt to adjust LP-Gas regulators. Only qualified personnel should perform any maintenance or repair to the LP-Gas system.

LP-GAS DETECTOR



LP-Gas Detector

Provided for safety is a LP-Gas detector. This gas detector will detect both LP-Gas and Methane Gas. Liquefied Petroleum Gas (LP-Gas) is heavier than air, Methane Gas is lighter than air. LP-Gas will settle to the lowest point, generally the floor of the motorhome. Methane Gas will rise. The LP-Gas detector is also sensitive to fumes such as hairspray, most of which contain butane as a propellant. Butane, like propane, is heavier than air and will settle to the floor level where it will be detected. When a detection occurs, press the reset button to stop alert sound for 60 seconds in order to clear the air.

The other combustibles which will be detected include alcohol, liquor, deodorants, colognes, perfumes, wine, adhesives, lacquer, kerosene, gasoline, glues, most of all cleaning agents and propellant of aerosol cans. Most are lighter than air in their vapor state and will only be detected when the motorhome is closed up.

Operation

Upon first application of power the LED will flash **yellow** for three minutes while the detector is stabilizing. At the end of the start cycle the LED will turn **green** indicating full operation. If detector senses unsafe levels of gas it will immediately sound an alarm. The gas detector operates on 12 Volts, with a current draw less than 1/10th of one amp.

CAUTION: This detector will not alarm during the three minute warm up cycle.

Testing

Depress the **TEST** switch any time during the warm up cycle or while in normal operation. The LED should flash **red** and the alarm should sound. Release the switch. This is the only way you should test the detector. The test feature checks full operation of the detector.

WARNING: Test the operation of this detector after the motorhome has been in storage, before each trip and at least once per week during use.

Alarm

The **red** LED will flash and the alarm will sound whenever a dangerous level of propane or methane gas is detected. The detector will continue to alarm until the gas clears or the **MUTE** switch is pressed.

Procedures To Take During An Alarm:

1. Turn off all gas appliances (stove, heaters, furnace). Extinguish all flames and smoking material. Evacuate the motorhome, leaving all doors and windows open.
2. Turn off the propane tank valve.
3. Determine and repair the source of the leak. Contact a qualified service professional if additional repairs are necessary or if the source of the leak cannot be determined.

WARNING: If the alarm sounds and there is no immediate danger open all doors and windows to air out the motorhome. Exit the motorhome and turn off the gas at the LP tank. Do Not re-enter the motorhome until the alarm stops sounding. If the alarm sounds again after the gas is turned back on turn the gas off. Leave the gas off and contact a qualified service technician to find and repair the leak. Do not re-enter the motorhome until the problem is corrected.

Alarm Mute:

Press the **TEST-MUTE** button when the detector is in alarm.

1. The **red** LED will continue flash and the alarm will beep every 30 seconds until the concentration of LP-Gas has dispersed to a safe level.
2. The LED will flash **green** until the end of the MUTE cycle.
3. If dangerous gas levels return before the end of the MUTE cycle the alarm will beep four times and return to phase 1.
4. After two minutes the detector will return to normal operation (**solid green**) or resound the alarm if dangerous levels of gas remain.

Fault Alarm:

Should the microprocessor sense a fault in the gas detector, a fault alarm will sound twice every 15 seconds. The LED will alternately flash **red** to **green** and the **MUTE** switch will not respond to any command. The gas detector must be repaired or replaced.

Care of the Detector

1. Vacuum the dust off the detector cover weekly (more frequently in dusty locations) using the soft brush attachment of the vacuum.
2. Do not spray cleaning agents or waxes directly onto the front panel. This action may damage the sensor, cause an alarm or cause a detector malfunction.

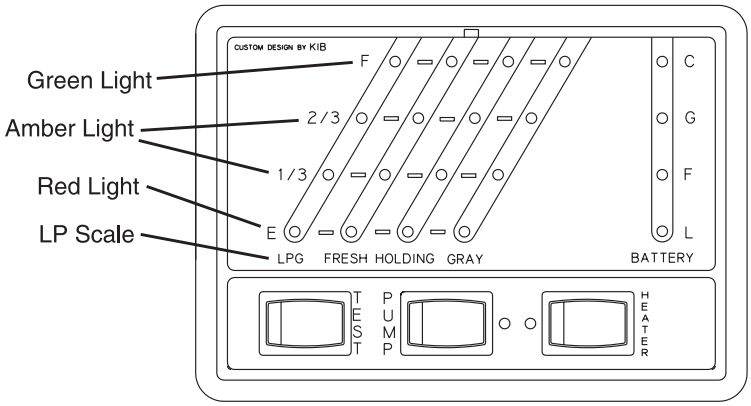
MONITOR PANEL
Measurement & Calibration

Tank Measurement:

To measure level of a tank simply push button on display panel corresponding to tank you wish to measure. Lights on panel will turn on in sequence indicating level of tank.

Calibration:

The monitoring panel comes factory calibrated for accuracy and should not need to be adjusted.



KIB Monitor Panel

CHECKLIST - LP-GAS EMERGENCY PROCEDURES

If you smell gas (a rotten egg or sulfur smell) at any time perform the following steps immediately:

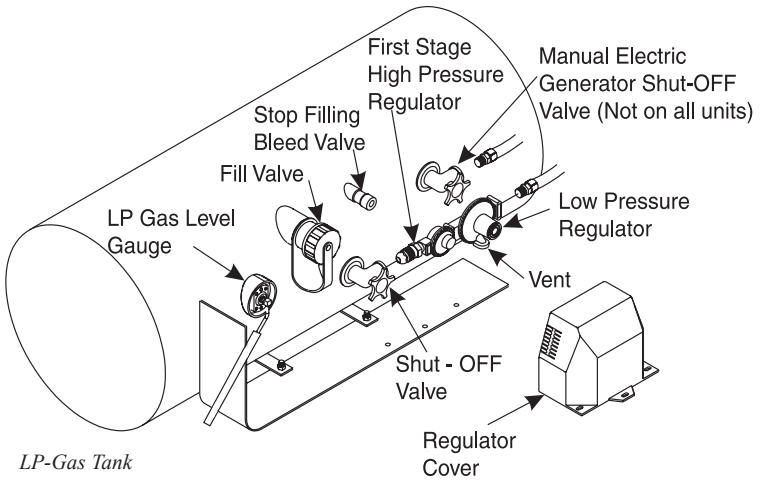
- Shut off gas appliances.
- Manually turn off the main gas supply at the tank.
- Do not attempt to operate any electric switch.
- Open windows and doors.
- Evacuate the motorhome.
- Keep open flames, spark producing devices and smoking material out of the area.
- Contact a qualified service technician to find the source and repair the gas leak.

WARNING: A fire or explosion from ignited gas or gas fumes can seriously injure you or cause death.

LP-GAS TANK
- Filling

Woodall's Campground and Trailer Guide and other publications list refueling stations. Many travel parks sell LP-Gas. Shut off the pilot lights, appliances and igniters before filling the LP-Gas tank to prevent a fire or explosion. Have a trained service person fill the LP-Gas tank.

The LP-Gas tank fill and bleed valves are located in the LP-Gas tank access outside compartment. Caution the service technician, if the tank is new and being filled for the first time, to purge any air from the tank before filling. When the tank is filled to the proper level there is space available for the conversion of liquid into gas. If a tank is over-filled it may vent pressure. When this happens you may detect a strong rotten egg odor near the tank and/or hear a hissing noise.



LP-Gas Tank

WARNING: Turn off all pilot lights and appliances during the refueling of the motorhome and filling the LP-Gas tank to prevent a fire or explosion.

LP-Gas exists in both the liquid and vapor state with the LP-Gas tank. A "Full" tank is approximately 80% liquid. The pressure inside the tank varies with the temperature of the liquid. All tanks are required to be equipped with a pressure relief device. The purpose of the relief valve is to release gas or liquid caused by overpressurization. The gauge on the LP-Gas tank will only read 3/4 full when the tank is actually full. The monitor panel is adjusted to indicate FULL at this point.

Install an approved plug in the LP tank outlet holes to prevent leaks. **Do not store or transport empty LP-Gas tanks, portable tanks, gasoline or other flammable liquids inside the motorhome. Keep open flame and spark producing materials away from the LP-Gas area. Shut off all appliances and LP-Gas tank valves (located on side of LP-Gas tank underneath the motorhome) when the motorhome is in storage.** If this warning is ignored a fire or explosion could result.

CAUTION: Pressure inside LP-Gas tanks can reach over 300 psi when exposed to direct sunlight. A high pressure safety relief valve will purge excess high pressure if necessary. LP-Gas will stop vaporizing as the LP-Gas tank temperature approaches -40° F. Appliances which consume large amounts of LP-Gas, such as the water heater or furnace, will need to be operated in sequence in extremely cold environments.

LP-Gas Fundamentals

# Capacity	Gallon Capacity	BTU Capacity
5	1.18	107,903
10	2.36	215,807
11	2.59	237,387
20	4.72	431,613
30	7.08	647,420
40	9.43	863,226

CONVERSIONS

Gallons to Liters (1 Gallon = 3.785 Liters)
Fahrenheit to Celsius (F° = 9/5 C° + 32°)
11" Water Column = 6 1/4 ozs. per sq. in. pressure.
27.7" Water Column = 1 pound per sq. in. pressure.

The above capacities allow for 20% vapor space on each cylinder.
**Data taken from the National Fire Prevention Association (NFPA). Pamphlet #58-1998.*

Basic Facts About LP-Gas:

Pounds Per Gallon	4.24
Specific Gravity of Gas	1.50
Specific Gravity of Liquid	.504
Cubic Feet Gas Per Gallon of Liquid	36.38
Cubic Feet Gas Per Pound	8.66
BTU Per Gallon	91,502
BTU Per Pound	21,548
Dew Point in Degrees Fahrenheit	-44F°
Vapor Pressure at 0° F	31
Vapor Pressure at 70° F	127
Vapor Pressure at 100° F	196
Vapor Pressure at 110° F	230
Flash Point	842º F

NOTE: The above information is not a complete guide for the use of LP-Gas tanks or appliances. In cold climates keep fuel levels above 50% in order to keep vaporization of LP-Gas at the highest level.

Operation

Operating and Monitoring LP Tank:

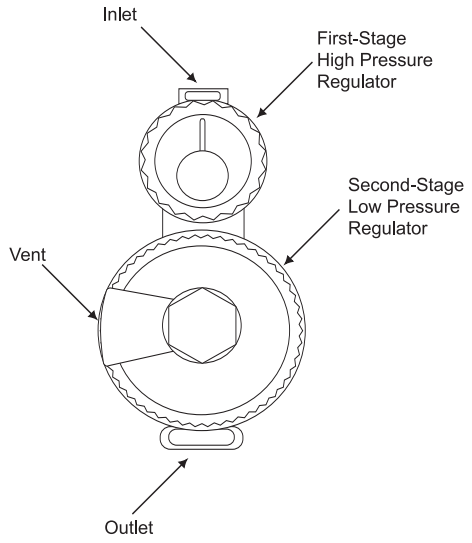
- The battery cut-off switch, located inside the entry door, must be in the OFF position.
- Manually open the main shut-off valve located on the curbside of the LP-Gas tank.
- Turn off the manual valve on the LP-Gas tank when the motorhome is between trips.
- Hand tighten the manual valve. Do not use a wrench or pliers to close the valve.
- The manual valve is designed to be closed by hand, over-tightening may permanently damage the valve seat.

Tank Capacity - Chart

TANK CAPACITIES (Approximate Gallons)						
MODELS	35SBD	35PBD	35WGS	36SGS	36PBD	36WGS
Water Heater	6 Gal.	6 Gal.	6 Gal.	6 Gal.	6 Gal.	6 Gal.
Grey Tank	45 Gal.	45 Gal.	43 Gal.	45 Gal.	45 Gal.	45 Gal.
Black Tank	45 Gal.	45 Gal.	45 Gal.	45 Gal.	45 Gal.	45 Gal.
Fresh Tank	67 Gal.	67 Gal.	67 Gal.	70 Gal.	55 Gal.	70 Gal.
LP Tank	32.9 Gal.	32.9 Gal.	32.9 Gal.	32.9 Gal.	32.9 Gal.	32.9 Gal.

LP-GAS REGULATOR

The regulator is the heart of an LP-Gas system. The LP-Gas in the tank is under high pressure. The regulator reduces the pressure of gas so that it is safe to use with various appliances. The regulator on the motorhome is a two-stage regulator. Simply put, the first stage regulator reduces the full tank pressure down to a range of 10-13 psi. The second stage further reduces the pressure down to an outlet pressure of 0.4 psi (11 inches of column water). The regulator is equipped with a vent so that it can breathe. This means that if pressure in the LP tank is too high the regulator will allow gas to escape through the vent until pressure returns to a normal range. It is important to keep the vent clean and clear of obstructions or corrosion. If the vent becomes clogged pressure from LP tank could cause a failure of the components. If there is any corrosion contact a qualified LP-Gas service technician. The regulator is mounted so that the vent faces



LP-Gas Regulator

downward. If the vent becomes clogged clean it with a toothbrush.

Under normal atmospheric conditions a LP regulator will not freeze, nor will the LP-Gas. The gas passing through the regulator will expand and cool creating moisture in the gas. This moisture will turn to ice which can build up and partially or totally block the orifice. The possibility of freeze up is greatly reduced with the two stage regulator.

To prevent freeze up:

1. Ensure the LP tank is totally free of moisture prior to filling.
2. Ensure the tank is not overfilled.
3. Keep the valve closed when the tank is empty.
4. If a freeze up occurs, have an LP-Gas distributor purge the tank.
5. Have the LP-Gas distributor inject methyl alcohol in the tank.

WARNING: Do not attempt to adjust the regulator, it is preset at the factory. If adjustments need to be made it requires special equipment. Failure to follow these instructions may result in a fire or explosion and cause severe personal injury or death. Do not attempt to enter the motorhome until the problem has been corrected!

LP-GAS CONSUMPTION

Each gallon of LP-Gas produces 91,502 BTU's of heat. One 27 gallon tank produces two million BTU's. Total consumption depends on the rate of usage by each appliance and the operating time. The stove and heating systems typically use the most gas. With sub-freezing temperatures and high winds consumption by the furnace can be very high. Check the tank level often in cold weather.

WARNING: LP-Gas is highly volatile and extremely explosive. Never use matches or open flame to test for leaks. Use only approved LP-Gas leak testing solution to test for leaks. Unapproved solutions can damage copper tubing and brass fittings. Never attempt to adjust LP-Gas regulators without the use of proper equipment. Improper LP-Gas regulator adjustment will affect the performance of LP-Gas operated appliances. Incorrect flame or explosion can occur. Only qualified personnel should preform any maintenance or repair to the LP-Gas system.

LP-GAS DISTRIBUTION LINES

A primary manifold black steel pipe running throughout the motorhome distributes LP-Gas to secondary lines. All secondary lines leading to gas appliances are made of copper tubing with flared fittings. If any lines rupture do not attempt to splice them. Always run a new line. We recommend gas distribution work be performed by an authorized dealer or an authorized service technician. When removing or servicing any gas appliance manually close the main valve located on the side of the LP-Gas tank. This will prevent dangerous gas leakage that could result in an explosion and possible serious injury. If you suspect a gas leak get the system inspected and repaired by a qualified service technician as soon as possible.

Endeavor
GAS

SECTION 8
ELECTRICAL SYSTEMS

8

INTRODUCTION

The standard electrical system of the motorhome consist of 120 Volt AC and 12 Volts DC (direct current) systems. The motorhome 120 Volt AC system can be operated from three different power sources. Shore power is the most efficient and should be used whenever possible. The on-board generator has a limited amount of 120 Volts AC output power. This can be used when shore power is unavailable.

The motorhome 120 Volt AC is equipped with a UL listed power cord, a UL listed circuit breaker panel transfer switch, convertor and generator package. Additionally an inverter package, 50 Amp upgrade, generator upgrade package and energy management package can be installed.

Input power to the motorhome is supplied from two different sources: 30 Amp shore power cord or the on board generator. The selection of the power source being used is done automatically by the use of an automatic electrical switching device known as a transfer switch.

AC SYSTEM - 120/240 VOLT

The motorhome 120/240 Volt AC system can be operated from three different power sources. Shore power is the most efficient and should be used whenever possible. The on-board generator has a limited amount of 120 Volts AC output power. This can be used when shore power is unavailable. The inverter/converter supplies silent AC power by the use of the motorhome's house batteries. This source has limited AC power output and should be used sparingly.

The motorhome 120 Volt AC circuit breaker panel is supplied with power from two different sources: the shore power cord or the on-board generator.

Shore Power

The AC system power requirement for the motorhome is 120/240 Volt AC single phase. This can be either 20 Amp, 30 Amp or 50 Amp service. Ensure the power distribution panel is configured to handle the load. If shore power service is available connect the motorhome to the shore power source using the supplied shore power cord. The shore power cord plugs into the shore power source and can be *"dog boned"* to the smaller receptacles. The motorhome shore power cord is located on the road side of the motorhome and is permanently attached.

NOTE: In many instances 50 Amp shore service is not available and care will have to be used when operating the appliances and using the outlets so as not to overload the shore power service being used.

Generator

The generator can be selected for use when AC shore power is not available. The motorhome's on-board generator has limited 120 Volt AC power output capabilities. The generator's maximum amount of output power is specified in watts, which is calculated at an elevation of 500 feet above sea level. The figure will decrease with a higher altitude. Temperature also affects total maximum output. Fuel consumption is based upon a percentage of AC electrical load applied to the generator. While using the generator care will have to be taken when operating appliances and outlets so as not to overload the generator. The generator is fueled from the main fuel tank.

12 VOLT DC SYSTEM

A majority of the lighting and appliances are designed to operate from 12 Volt DC (direct current) power. This is why the batteries play such an important role in the function of the motorhome. There are exceptions with appliances such as the microwave or television; however, indirectly they still operate from 12 Volt DC power, as they can be operated from the inverter. The chassis functions (engine, transmission, dash air, etc.) are also 12 Volt DC.

With the all technological advancements taking place in the past several years manufacturers have now incorporated electronics into these systems. It is important to keep the 12 Volt system(s) in good working order. These systems, with their incorporated electronics, are voltage sensitive. Some items can be damaged if the DC voltage is not maintained within the designed specifications.

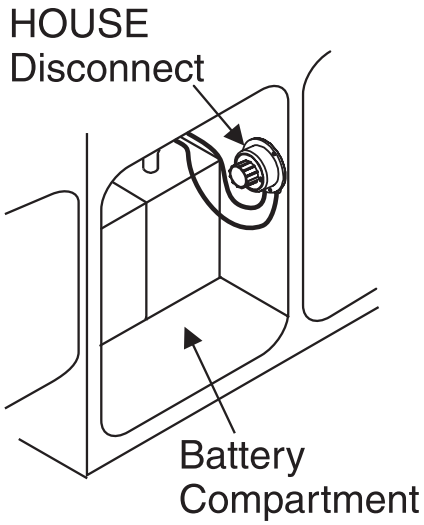
There are two separate 12 Volt systems: the chassis system and the house system. These two systems, for the most part, are separate from one another. The house system does not operate engine functions, the engine system does not operate house functions; however, within the two systems there are some innerconnections. For example: While the motorhome is driven the alternator on the engine will charge the house batteries. Likewise, while the motorhome is plugged into shore power or the generator is running the engine battery(s) are being charged. Each system will supply 12 Volt DC power to the 12 Volt distribution panels. The 12 Volt panel that services a majority of the chassis system functions is located outside on the front firewall. Another panel is located inside under the dash in the driver's area. The 12 Volt panel for the house is located in the roadside storage compartment. The panel located in the bedroom services the house interior functions, such as the interior lighting and appliances. You should become familiar with these panels and the items they operate.

The two different systems, engine and house, have their own set(s) of battery(s). The engine battery supplies 12 Volt DC power to the chassis distribution panels. The panels contains mostly engine system fuses and wiring such as headlights, taillights, dashboard functions, gauges, etc. The house battery(s) supplies 12 Volt DC power to the house distribution panels. The panels contains fuses for the house, interior lighting and appliances such as the furnace and the water heater.

Each panels electrical circuits may be protected by fuses, fusible link cartridges, circuit breakers or a combination of these devices.

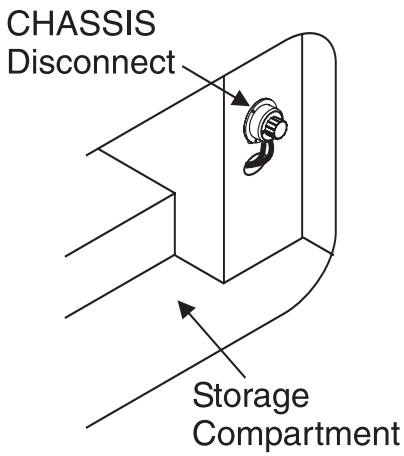
BATTERY DISCONNECT
- House

The main house battery disconnect switch turns the battery power supply on or off. The domestic battery disconnect switch shuts off the 12 Volt DC power to the following items: the inverter, the domestic fuse panel in the bedroom, the domestic fuse panel in the front run box and the domestic power supply in the rear run box(s). Turn the main battery disconnect switch off when the motorhome is going to be stored or before performing electrical maintenance on the motorhome. If possible, leave the motorhome plugged into an AC source with the battery disconnect switch on. This will help prevent the possibility of dead batteries. Use of the battery cut-off switch at the entry door will not turn off all DC electrical items or other parasitic loads. Small (parasitic) loads are present on the house battery. Some are federal mandated items such as the LP-Gas detector.



Battery Disconnect - Chassis

The main battery disconnect for the chassis battery turns the DC power on or off to the chassis fuse boxes. Most chassis and engine functions are interrupted when the battery disconnect is turned off. Some electronic items require a constant power source for memory retention such as the dash and CB radios. A security system requires a constant power source to remain operational when the disconnect switch is off. Some electronic components of the engine and transmission require a constant power source. Turn the main battery disconnect switch off when the motorhome is going to be stored or performing electrical maintenance. If possible, leave the motorhome plugged into an AC source with the battery disconnect switch on to help prevent the possibility of dead batteries.

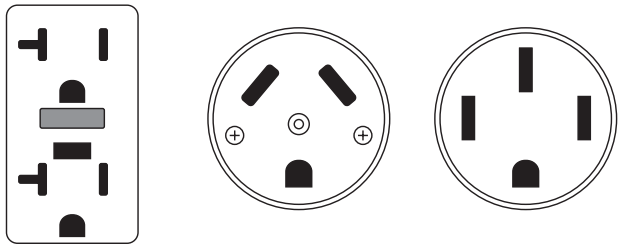


NOTE: If an AC source is not available and the motorhome is not going to be used or is stored more than 48 hours it is recommended to turn the battery disconnect switch off.

SHORE POWER HOOK-UP

If shore power service is available all that is necessary is to connect the motorhome to the shore power service using the supplied shore power cord. The cord is located in the compartment on the driver's side of the motorhome. After connecting the unit to shore power wait approximately one minute for the inverter to "stabilize" charging of the batteries before starting air conditioners or other large AC loads. In many instances 50 Amp shore service is not available. Proper electrical adapters must be used to connect the supplied shore power cord to the shore service available. When connecting to anything other than 50 Amp shore service use caution not to overload the supplied shore service breaker. Appliances and outlet loads will have to be operated in sequence rather than all at the same time.

NOTE: Below are the three types of shore power outlets most commonly used.



20 AMP Outlet 30 AMP Outlet 50 AMP Outlet

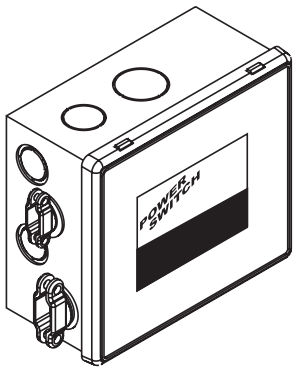
Depending on the motorhome AC Distribution panel configuration there may be 20 Amps, 30 Amps or 50 Amps with the energy management system.

CAUTION: Avoid the risk of electrical shock or component damage by disconnecting from shore power during electrical storm activity. Use the inverter or start the generator if AC power is needed.

Transfer Switch

The transfer switch automatically transfers power from the shore cord through the transfer switch and to the 110 Volt AC breaker panel. When the generator is used the transfer switch has a time delay built into it. This allows the generator time to warm up before an AC load is applied to it. The transfer switch will automatically select the generator over shore power even though shore power is hooked up.

NOTE: To prevent damage to the transfer switch do not have appliances on or AC loads plugged into outlets when hooking up to shore power or starting generator. The transfer switch will begin to disengage between 85-90 Volts AC. Operation at this voltage may damage transfer switch, appliances or other items plugged into outlets.



WARNING: Keep fingers away from metal contacts of shore plug end. Avoid standing water. Serious electrical shock and personal injury can occur. To avoid the risk of an electrical shock turn the circuit breaker off for the shore power outlet before making shore power connection.

GENERATOR - 120 AC

The 120 Volt AC gasoline generator is located in a service compartment on the roadside of the motorhome. The generator may stop running before the chassis fuel tank is completely empty. This is a safety feature to prevent the motorhome from running completely out of fuel.

A preheater control lever on the generator needs to be set for the appropriate temperature to prevent the engine from erratic operation and over-speeding. At temperatures below 40° F (4° C), move the lever to the **WINTER** position. Between 40° F (4° C) and 70° F (21° C) the lever can be in either the **SUMMER** or **WINTER** position. Above 70° F (21° C) move the lever to the **SUMMER** position.

Starting the Generator:

The generator is controlled by either a remote switch on the dash or a switch located on the generator. To start the generator shut off all 120 Volts AC appliances and equipment. Push the start switch and hold until the generator is running, then release the switch. The dash switch is lit when the generator is running. Normally the generator will start running within five seconds. If it fails to start after cranking for 10 seconds release the switch and wait 30 seconds before cranking again. If the generator fails to start after five attempts allow the starter motor to cool down for five minutes before cranking again.

Stopping the Generator:

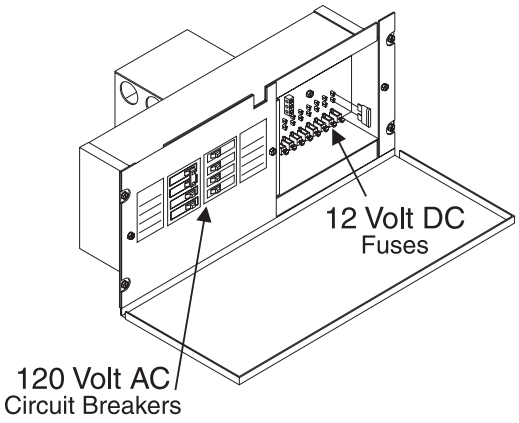
Turn off all 120 Volt AC appliances and equipment and run the generator for at least three minutes before turning it off. This allows lubricating oil to carry heat away from the combustion chamber and the bearings. To stop the generator push the switch to the stop position for approximately one second and then release it.

For in-depth information regarding low oil shut-down protection, circuit breaker locations and maintenance procedures refer to the manufacturer's brochure in the Owner's information file.

30 AMPS FUSES & CIRCUITS

Distribution Panel -Inside

The 12 Volt house contains fuses (located in the bedroom cabinet) that protect the electrical circuits. These fuses are the standard automotive type. When a fuse is "blown," the wire in middle of the plastic case will be burnt. A broken, bad or "blown" fuse must be replaced with a fuse of the same rating and type. Use of a fuse with a different rating or type will defeat the circuit protection provided by that fuse and could result in damage o the motorhome's electrical system.



Fuse assignments are as followed:

1. Bath Lights/Vents - 15 Amp Fuse
2. Dinette/Porch/Rt. Overhead - 15 Amp Fuse
3. Bedroom/ODS Lights - 15 Amp Fuse
4. Kitchen/Left Overhead, Stove Vent (Opt Vent - 15 Amp Fuse)
5. Ceiling Lights - 15 Amp Fuse
6. Furnace - 15 Amp Fuse
7. Monitor Panel - 15 Amp Fuse
8. Slide-out - 15 Amp Fuse
9. Radio - 5 Amp Fuse

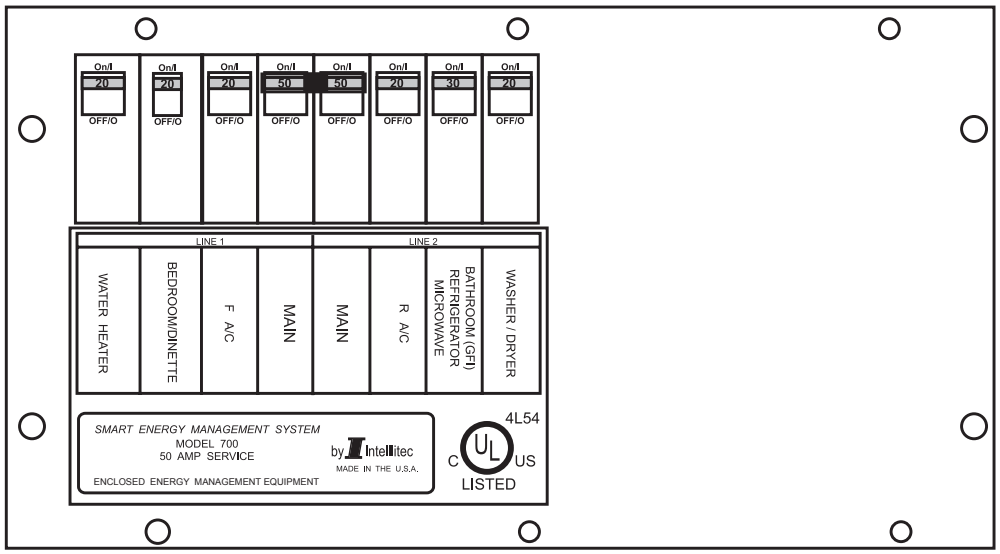
Circuit Breaker assignments are as follows:

Left Side
- 50 AMP MAIN
- Front Air Conditioner
- Rear Air Conditioner

Right Side
- Converter, Bedroom TV, Dining Room
- Bathroom, Kitchen, Refrigerator, TV, VCR
- Water Heater
- Microwave

50 AMP DISTRIBUTION PANEL (OPTIONAL)
House 110 AC Panel

The AC distribution panel is located in the bedroom. The main AC panel 120 Volt circuit breakers receive power from the transfer switch, which is powered by either shore power or the on board generator. Power is introduced into the panel to the 50 Amp MAIN breaker first, followed by power being fed into the individual branch circuit breakers. The panel label describes the breaker layout and the item, outlet or appliance to which they pertain.



WARNING: This panel contains high voltage which can cause serious injury or death. Before beginning any work or testing procedures involving the electric panels, or any of the branch circuits, be sure the motorhome is unplugged from shore power, the generator is not running and the inverter is in the OFF position.
Certain testing procedures can require the AC power to be on. Only qualified personnel or personnel with electrical backgrounds should attempt any testing procedures.

Branch circuit breakers supply AC power to the different items or “loads.” An electrical load is any item or device that will use current when supplied with an electromotive force. Should a breaker “trip” from over current use, or a short circuit condition, the load to which the breaker is supplying the electromotive force should be reviewed or disconnected to determine the cause of the trip. If no cause is found, or not readily apparent, reset the breaker by toggling the breaker to the OFF position, then back to ON. Should the breaker trip again after the load is reapplied it may indicate a fault with that particular load. Do not continue to reset breaker until the problem has been diagnosed and corrected.

Breaker current ratings are current set points in which the breaker is designed to operate. The internal configuration of the circuit breaker is designed to trip when excess current is drawn through the breaker.The trip action of the circuit breaker can occur within milliseconds due to the speed at

which electricity can travel. Breaker ratings are set to operate on a continuous load at 80% of the breaker's rated capacity. For example: A breaker with a 20 Amp rating will handle a continuous load of 16 Amps. This designed set point is when an inductive load is applied, such as when an electric motor turns on. As the motor starts to spin, current consumption may momentarily exceed the rated capacity of the breaker. As the electric motor comes up to operating speed the electric motor's current consumption will fall. The AC current load then falls back into the breaker's rated 80% set point. This electric principle should be kept in mind when using anything other than 50 Amp shore service and using appliances with electric motors. When using outlets care should be considered when applying loads such as electric motors, heaters, coffee makers, toasters, hair dryer or other large current consuming loads. If the current rating of a load is not known it is usually stated on most electrical items. The rating will either be in amps or watts. Current ratings stated on electrical items will change slightly with voltage fluctuations. As voltage increases current consumption decreases. As voltage decreases current consumption increases. This may explain why in some instances items operated at borderline voltage to current tolerances may seem fine in one location but problematic in another.

NOTE: To calculate watts to amps simply divide the watt figure by the voltage of which the item operates from. For example: The electrical item is rated at 1,370 watts. Divide that by the operating voltage of 115 volts which equals 11.913 amps. Use this formula to calculate load to current supply ratio.

50 AMP ENERGY MANAGEMENT SYSTEM - (OPTIONAL)

The Energy Management System is easily identified by the remote display panel located inside motorhome above the entrance door.

The 50 Amp Smart EMS consists of two elements: the display panel and the bedroom distribution panel. The display panel is mounted in the inside overhead compartment next to the entrance door. The distribution panel located in the bedroom is a completely self-contained 120/240 Volt power distribution and energy management system intended to be used in recreational vehicles. It is housed in a sheet metal enclosure with removable front panel. It provides circuit protection for all the 120 Volt AC loads in the motorhome and a system of energy management to minimize the over-loading and tripping of circuit breakers.

Circuit Breakers: The distribution panel offers slots for eight single or dual standard 120 Volt circuit breakers. Two of these breakers, located in the two center stab positions, must be a 50 Amp unit that act as a main input protection for each of the lines supplying the remainder of the branch breakers (up to 12).

Energy Management: The 50 Amp Smart EMS automatically senses the available power to the motorhome. It determines whether it is connected to a 120 Volt AC - 30 Amp shore power source, 50 Amp shore power source or generator source. Depending upon available power, it controls the operation of 6 possible loads as indicated on distribution panel. These may be any type load, but are typically heavier loads; those whose use can be "postponed until a time when current is available for their use. If the available power source is 120 Volt AC - 30 Amp shore power it attempts to keep the total 120 Volt current draw to less than 30 Amps.

Operation: If 120 Volt AC is not available at the distribution panel, L1 or L2 outputs, the system shuts itself off. This feature is intended to prevent the system from drawing current from the +12 VDC battery supply when not in operation.

When 120 Volt AC power is applied the system automatically powers up and determines the nature of the power source.

If the generator is running, 120 Volt AC will be present at the distribution panel L1 and L2 inputs. In this mode the energy management feature is disabled and all control relay contacts are closed, energizing all of the controlled loads. The control Module sends a signal to the display panel causing the load meter to display actual load current, the GEN SET service indicator to light and all power status indicators to light.

If 120 Volt AC is present at the distribution panel L1 and L2 inputs the system will assume that 120 Volt AC, 30 Amp shore power is available and the energy management feature will be enabled. **If only 20 Amp service is available the user must select the 20 AMP service mode by momentarily pressing the 20/30 Amp select switch on the Control Panel.** Initially all relay contacts are closed and the total current is monitored. If the total current should exceed the service limit the system will turn off the first load in the shedding table. As it turns the loads off it calculates the amount of current that was removed, which is the value for that load. This value is placed in memory. If the current remains above the service limit the system will turn off the next load in shedding table. Again it calculates the amount of current that was removed and places this value, which is the value of that load, in memory. The system continues to turn off loads until the total current falls below the service limit or all of the six controlled loads have been shed. Through this process the system has "learned" the amount of current that each particular load draws. This feature compensates for the differences in current draw over a range of line voltage and ambient temperature by re-learning the load each time it is turned off or "shed."

The 50 Amp Smart EMS will now wait until the total current is lower than the service limit and enough current is available (as compared with the amount in memory for the last load shed) before it will turn that load back on. This assures that there is sufficient current to operate the load.

NOTE: There is a two minute minimum delay period after a load is shed before the load will be turned on again to prevent air conditioners from turning on with a head pressure.

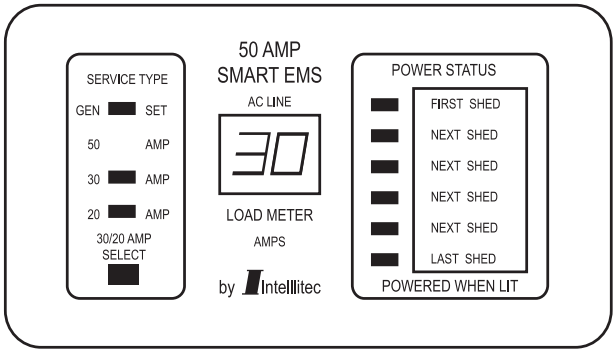
Three Hour Averaging: The RVIA (Recreational Vehicle Industry Association) in conjunction with the NEC (National Electrical Council) have established rules regarding the rating of electrical systems and the use of energy management systems. One of these rules requires that if any energy management system is used the average total load current for the system over a 3 hour period be limited to 80% of the service rating. For that reason the 50 Amp EMS calculates the average running current for the system and, if it exceeds 80% of the service rating, the EMS sheds loads to reduce the average current below that limit.

For example, if a system operating under 120 Volt AC, 30 Amp service has been running at the 30 Amp limit for three hours the EMS will change its shedding threshold to 24 Amps and turn off loads until the 24 Amp limit is attained. If the user selects the 20 Amp service mode this limit will translate to 16 Amps. Because the EMS calculates a running 3 hour average, if the average load current drops below the limit the system will restore power to loads based on their impact on the limit. If the system is in the averaging mode the decimal point at the lower right corner of the load meter display on the display panel will illuminate.

Display Panel: The display panel is located in the inside overhead compartment next to the entrance door and connects to the distribution panel located in the bedroom. Six power status LED's indicate power is applied to those loads. These LED's are on when the power is applied. The load meter has a two digit display to indicate the amount of current actually being drawn by all the appliances in the motorhome.

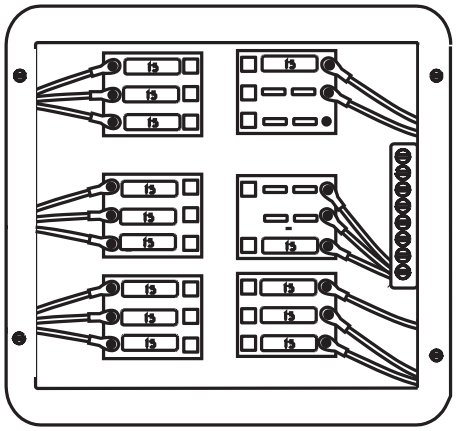
Four service type LED's indicate the source for 120/240 Volt AC power. Three of these sources are automatically detected and indicated by the EMS, namely: Gen Set Service, 50 Amp Service and 30 Amp Service.

The 20 Amp service mode is not automatically detected and the operator must manually select the 20 Amp mode when 20 Amp service is available. The service select button allows the current threshold to be set to either 30 Amps or 20 Amps to match the incoming service.



50 AMP DISTRIBUTION PANEL (OPTIONAL) HOUSE 12 VOLT

The 12 Volt house contain fuses (located in the bedroom overhead cabinet) that protect the electrical circuits. These fuses are the standard automotive type. When a fuse is "blown," the wire in middle of the plastic case will be burnt. A broken, bad or "blown" fuse must be replaced with a fuse of the same rating and type. Use of a fuse with a different rating or type will defeat the circuit protection provided by that fuse and could result in damage to the motorhome's electrical system.



#-COLOR-AMP	CIRCUIT
1 - BLUE - 15	BATH LTS/VENT
2 - YELLOW - 15	DIN,PRCH,R O/H
3 - GREEN - 15	BEDROOM LTS
4 - VIOLET - 15	VENTS, L O/H
5 - RED - 15	CEILING LTS
6 - GRAY - 15	FURNACE,A/C 12V
7 - RED/T - 15	MONITOR PANEL
8 - BLACK - 15	SLIDE-OUT
9 - GRAY - 5	RADIO
10 - RED - 15	ELECTRIC AWNING
11 - RED - 15	COMPUTER TABLE

12 Volt Distribution Panel - Outside

The distribution panel (12 Volt DC) is located inside the front roadside compartment. Fuse assignments are listed on a fuse label attached to the inside cover of the front distribution panel. When replacing fuses always replace with the same size as listed for a particular location. Fuse sizes shown are maximum fuse size allowable. Installing fuse sizes other than those listed can cause electrical wiring to become overloaded and create hazardous situations.

Fuse assignment are as followed:

1. Slide-out Room - 15 Amp circuit breaker
2. LP Detector/CO Detector - 3 Amp Fuse
3. Power Seat (Opt) - 15 Amp circuit breaker
4. Power Seat (opt) - 15 Amp circuit breaker
5. Storage Lights - 15 Amp Fuse
6. Bedroom Slide-out - 15 Amp circuit breaker
7. Auxiliary Start/TV Amp - 7.5 Amp Fuse
8. Cigarette Lighter - 15 Amp Fuse
9. Map Lights - 7.5 Amp Fuse
10. C.B. Radio - 2 Amp Fuse
11. Service Light - 7.5 Amp Fuse
12. 12V Receptacle - 15 Amp Fuse
13. Step Switch - 7.5 Amp Fuse
14. Step Motor - 25 Amp Fuse

20. Rear Vision (Opt) - 5 Amp Fuse
21. Leveling Jacks (Opt) - 5 Amp Fuse
22. Accessory Switch - 15 Amp Fuse
25. Air Conditioner - 20 Amp Fuse
26. Jack/Antenna Warning Lamp - 5 Amp Fuse
27. TV Cutout Relay - 7.5 Amp Fuse
28. Galley Slide-Out Room Ign. Relay - 7.5 Amp Fuse
29. Mirror Heaters - 15 Amp Fuse
30. Mirror Motors - 1 Amp Fuse
33. Step/Isolator Relay - 7.5 Amp Fuse
34. Marker Lights - 7.5 Amp Fuse

NOTE: Number's 15, 16, 17, 18, 19, 23, 24, 31, 32 are reserved for future use.

Chassis 12 Volt Distribution Panel - Front

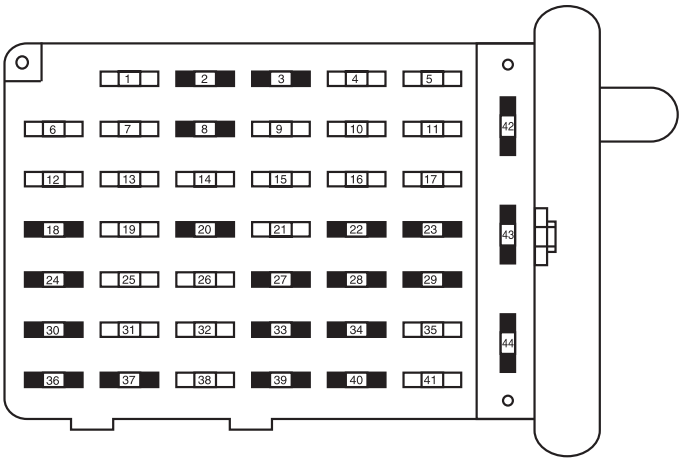
The chassis fuse boxes are placed in two locations. One panel is located inside the motorhome under the dash panel. The box located under the dash is referred to as the **Central Junction Box.**

The other panel is located outside, mounted on the front firewall. This box is referred to as the **Power Distribution** or the **Battery Junction Box.**

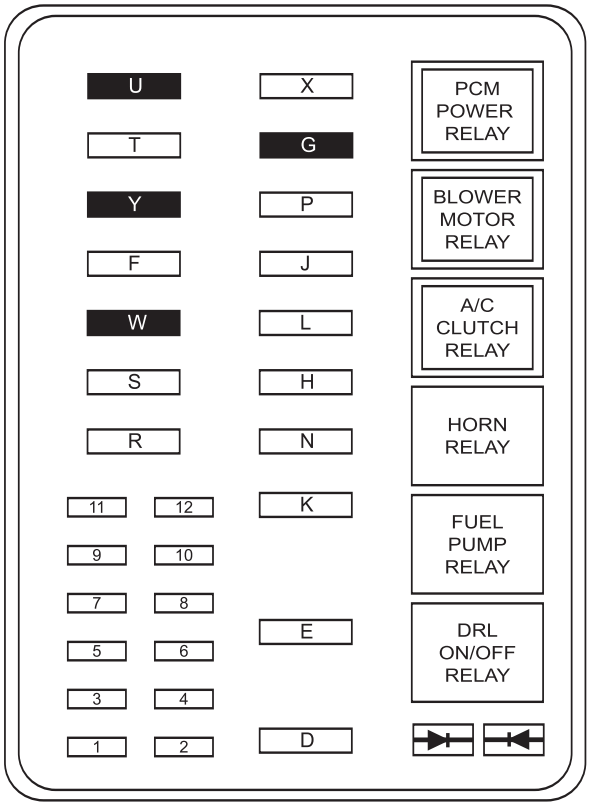
Central Junction Box:

Fuse Position	AMPS	Circuits Protected
1	20	Right Turn Signal Relay Coil, Left Turn Signal Relay Coil, Right Turn Indicator, Body Builder Right Rear Turn/Stop Feed, Body Builder Turn/Stop Feed.
2	-	NOT USED
3	-	NOT USED
4	15	Interior Lamp Relay
5	10	Accessory Feed #1
6	10	Trailer LH Turn/Stop Lamp
7	15	Blower Motor Relay
8	-	NOT USED
9	20	Trailer Tow Electrical Brake Controller Feed, Body Builder Right Rear Turn/Stop Feed, Body Builder Left Rear Turn/Steop Feed, Body Builder Stoplamp Feed
10	5	Instrument Cluster, Hydromax Lamp
11	30	Windshield Wiper/Washer Module, Wiper Feed
12	10	Trailer Tow Right Stop/Turn Feed
13	10	4 WABS Module
14	10	Instrument Cluster, Hydro-Max Monitor, Warning Chime Module, Transmission Control Switch
15	15	LH Turn Relay
16	20	Body Builder Battery Feed
17	5	Body Builder Radio Feed
18	-	NOT USED
19	5	DRL On/Off Relay
20	-	NOT USED
21	15	RH Turn Relay

Fuse Position	AMPS	Circuits Protected
22	-	NOT USED
23	-	NOT USED
24	-	NOT USED
25	10	Body Builder Right Headlamp (Low Beam)
26	10	Shift Lock Acutator, Speed Control Servo
27	-	NOT USED
28	-	NOT USED
29	-	NOT USED
30	-	NOT USED
31	10	Body Builder Left Hadlamp (Low Beam)
32	10	Digital Transmission Range (DTR) Sensor (Reversing Lamp Feed)
33	-	NOT USED
34	-	NOT USED
35	20	Headlamp High Beam, High Beam Indicator
36	-	NOT USED
37	-	NOT USED
38	10	Body Builder Accessory Feed #2 (Run)
39	-	NOT USED
40	-	NOT USED
41	10	Headlamp switch, Dimmable Light, Body Builder Feed, Instrument Cluster Illumination
42	-	NOT USED
43	-	NOT USED
44	-	NOT USED



Battery Junction Box



HIGH CURRENT FUSE VALUE AMPS	COLOR CODE
20A PLUG-IN	YELLOW
30A PLUG-IN	GREEN
40A PLUG-IN	ORANGE
50A PLUG-IN	RED
60A PLUG-IN	BLUE

Fuse Position	AMPS	Circuits Protected
1	5 (Mini)	Hydro-Max Module
2	10 (Mini)	A/C Clutch Relay
3	20 (Mini)	PCM OBD2 Functions
4	5 (Mini)	Powertrain Control Module (PCM)
5	15 (Mini)	PCM Power, MAF Sensor, Fuel Injectors, Fuel Pump Relay Coil, A/C Clutch Relay Coil
6	20 (Mini)	Park Lamp Feeds, Warning Chime
7	15 (Mini)	Digital Transmission Range Sensor (DTRS), Starter Relay Coil
8	10 (Mini)	Brake Pressure Switch, Hydro-max Module, Speed Control Servo, Powertrain Control Module (PCM), ABS Module, Brake Shift Interlock Actuator
9	5 (Mini)	Charge Warning Indicator
10	20 (Mini)	Daytime Running Lamps
11	30 (Mini)	Ignition Coils, Radio Noise Capacitors #1 & #2, Powertrain Control Module Relay
12	20 (Mini)	Trailer Running Lamps, Trailer Reversing Lamps
D	40 (Maxi)	PCM Power Relay
E	20 (Maxi)	Fuel Pump Relay, Fuel Pump Motor
F	60 (Maxi)	4 WABS Module
G	-	NOT USED
H	40 (Maxi)	Interior Lamp Relay
J	60 (Maxi)	Ignition Switch
K	20 (Maxi)	Cigar Lighter, Data Link
L	50 (Maxi)	Ignition Switch
N	40 (Maxi)	Blower Motor Relay, Blower Motor Feed

Fuse Position	AMPS	Circuits Protected
P	30 (Maxi)	Multifunction Switch, Main Light Switch
R	30 (Maxi)	Electronic Brake Controller Feed
S	60 (Maxi)	Central Junction Box Feed
T	20 (Maxi)	Horn Relay
U	-	NOT USED
W	-	NOT USED
X	60 (Maxi)	Hydro-Max Relay
Y	-	NOT USED

Circuit Breakers

Breaker current ratings are current set points in which the breaker is designed to operate. The internal configuration of the circuit breaker is designed to trip when excess current is drawn through the breaker. The breaker will heat up from the excess current causing the breaker to trip. The trip action of the circuit breaker can occur within milliseconds due to the speed at which electricity can travel. Breaker ratings are set to operate on a continuous load at 80% of the breaker's rated capacity. For example: A breaker with a 20 Amp rating will handle a continuous load of 16 Amps. This designed set point is when an inductive load is applied, such as when an electric motor turns on. As the motor starts to spin current consumption may momentarily exceed the rated capacity of the breaker. As the electric motor comes up to operating speed the electric motor's current consumption will fall. The AC current load then falls back into the breaker's rated 80% set point. This electric principle should be kept in mind when using anything other than 50 Amp shore service and using appliances with electric motors. When using outlets care should be considered when applying loads such as electric motors, heaters, coffee makers, toasters, hair dryer or other large current consuming loads. If the current rating of a load is not known it is usually stated on most electrical items. The rating will either be in Amps or watts. Current ratings stated on electrical items will change slightly with voltage fluctuations. As voltage increases current consumption decreases. As voltage decreases current consumption increases. This may explain why in some instances items operated at borderline voltage to current tolerances may seem fine in one location but problematic in another.

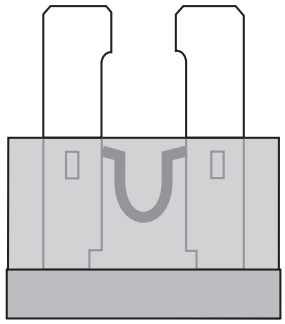
NOTE: To calculate watts to amps simply divide the watt figure by the voltage of which the item operates from. For example: The electrical item is rated at 1,370 watts. Divide that by the operating voltage of 115 volts which equals 11.913 amps. Use this formula to calculate load to current supply ratio.

Fuses

The 12 Volt fuses, located in this distribution panel, service the interior house lighting, ventilation fans, monitor panel, furnace and water heater. Should a fuse blow it will be evident by the broken metal strip located in the center of the fuse. Replacement fuses should be of the same amperage. If a higher rated fuse is installed it can damage the wiring. Fuse current set points follow much of the same electrical principle as the 120 Volt AC breakers. Using 12 Volt DC as the electromotive force can make it more susceptible to outside influences, such as corrosion from weathering or oxidation.

AMPERAGE	COLOR
1	BLACK
2	GRAY
3	VIOLET
4	PINK
5	GOLD
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	CLEAR
30	GREEN

The large variety of applications this voltage can be used in makes it a diet staple for most of the recreational vehicle and automotive industries. The danger from shocks with this voltage is minimized but can still occur. A good example is when a magnetic field is generated, then collapses when the power supply is cut. The result is a discharge that can reach tens of thousands of volts for a short time period. Care should be used when working with this voltage as current values can be quite high, like in the case of a battery cables.



Shorting a battery cable to ground with a battery at a reasonable state of charge can result in a fire or serious personal injury from a burn.

Tools of the Trade

One of the most widely used tools used for testing a 12 Volt problem is the test light. Test lights come in a host of varieties such as a light bulb with a probe and ground clip to the more elaborate electronic ones that measure a wide scale of voltages and perform a variety of functions. A VOM or Volt Ohm Meter is used to perform a multitude of tests. It is generally used when exact values are needed for evaluation. These meters come in an analog or digital format. Either of these two testing tools may be used, depending upon personal preference. If a 12 Volt light is not working the test light may be better suited for this. In the case of a charging system problem the meter may be the tool of choice. In any situation the testing tool is an invaluable piece of equipment when it comes to determining an electrical problem.

Knowing When to Say No

Should it become necessary to use testing tools take certain precautions and consider three things. First, recognize when the problem is beyond your skill level. Nothing will create more mayhem than being armed with tools and going in an unknown direction. Good intentions have led to major problems. The second item to keep in mind is if something will cause more grief by being dealt with now than if it were left alone and repaired by a professional at a more convenient time. How many times have you said to yourself, “This will

only take a few minutes," only to find it is taking an entire day and you wished you had not touched it? The third item to consider is whether or not the current situation may be potentially dangerous if left to be repaired at a more convenient time?

NOTE: Check all related fuses before assuming you have encountered an electrical problem or situation. Spare fuses should be kept on hand and can be purchased from an auto parts stores. A fuse description label is on the distribution panel cover.

WARNING: If a fuse blows replace the fuse with same amperage rating and type. Installing higher amperage fuses can damage the wiring or the item the fuse is protecting, or may cause a fire. If the fuse repeatedly blows after replacing it do not continue to replace it. Have the problem diagnosed and corrected by a qualified technician.

BATTERY - HOW IT WORKS

The operation of the battery is based on a chemical reaction. The battery is comprised of lead plates and a solution of distilled water and sulfuric acid. The solution, when mixed together, is known as "electrolyte." The 12 Volt battery is actually six batteries in one case. When charged, each cell has a voltage of 2.1 Volts. When six cells are hooked together this makes a 12.6 Volt battery (fully charged).

Electrons are stored on the negative plates. When a load (eg. a light bulb) is put between the positive and negative terminals the electrons move from the negative plate to the positive plate through the "load" and then back to the ground terminal. At this time the sulfuric acid leaves the water and adheres onto the plates of the battery. The electrolyte solution keeps the electrons from flowing while the battery is in the "at rest" position.

Charging the battery moves the sulfuric acid back into solution with the distilled water. A battery left in a low or discharged state will cause the acid to "sulfate." In attempting to recharge the battery the acid has become hardened and no longer will leave the plates and enter into the liquid solution with the distilled water. The lowered acid to water ratio has a direct affect on the battery's ability to release the stored electrons (power output) and the length of time it can perform (reserve capacity). Batteries left in a discharged condition will readily freeze. This can crack the case allowing the solution to spill, it can also warp the plates.The acid acts like an "antifreeze" for the battery. This is why batteries should not be left or stored in a "discharged" condition.

Battery Types

Batteries come in different sizes, types, amp hours, voltages and chemistries. There are nearly as many descriptions of battery types and how they should be used as there are people willing to offer advice on them. Although it is not possi-

ble to cover batteries in their entirety there are guidelines that can be followed to ensure that the batteries are well maintained.

Starting Battery

The starting battery is designed for high output cranking power, but not for deep cycling like the house batteries are designed to do. The starting battery will not last long in a deep cycle application. The way it is rated should give a good indication of its intended use. “Cold Cranking Ampere” is a measurement of amperage output that can be sustained for 30 seconds. The starting battery uses thin plates to maximize the surface area of the battery. This allows a very high starting current, but lets the plates warp when the battery is deep cycled (discharged).

Deep Cycle Battery

This is the type of battery that is best suited for use with 12 Volt operated lights, appliances and inverters. Deep cycle batteries are designed to have the majority of their capacity used before being recharged. Available in many sizes and types, the most common is a non-sealed, liquid electrolyte battery. The non-sealed types have battery caps. The caps should be removed periodically to check the level of electrolyte. When a cell is low only distilled water should be added. Water consumption will vary depending on many factors: how far the batteries are depleted, how much voltage, how long the voltage is being applied to charge the batteries and how often this occurs.

NOTE: Tap water contains minerals which can alter battery chemistry and ruin the battery. Use only distilled water when refilling the battery.

Battery Maintenance

At a minimum, the battery electrolyte level should be checked at least once a month. Check the level sooner if the battery is frequently used. The level should be above the top of the plates, but not overfull. Most batteries have a plastic cup or well. The electrolyte level should be approximately 1/8” below the well to allow room for expansion while the battery is being charged. Overfilling the battery will allow the electrolyte solution to boil or gas out of the battery cap. Remember to use only distilled water to refill the battery. A battery with a low electrolyte level will boil the water out rapidly once the plates have been exposed to air. This process may take only a matter of hours. If this has happened the battery is more than likely damaged.

After checking the battery’s electrolyte levels it is also a good idea to check the battery connections for tightness and corrosion. If any corrosion is found disconnect the cables (make sure to mark their locations) and carefully clean them with a mild solution of baking soda and water. There are also aerosol products available that will work. This will neutralize any acid that may be present. Do not allow the solution to enter the battery as this will damage the

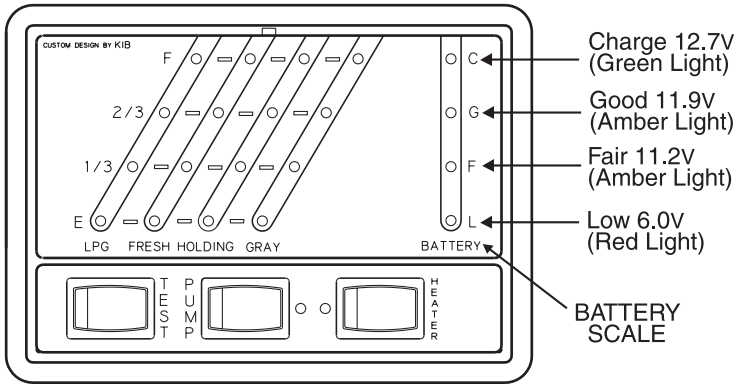
electrolyte balance. Use water to rinse the top of the battery area when done. Hook the cables back to the battery. Coat the terminals with petroleum jelly or an anti-corrosive grease.

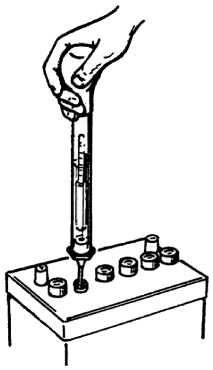
The battery cable to battery terminal connections should be metal to metal. Periodically check the batteries for corrosion. Look for cracks and check the vent plugs. Replace them if they are cracked or missing. Keep the top of the batteries clean. The accumulation of electrolyte and dirt may permit small amounts of current to flow between the terminals which can drain the battery.

WARNING: Liquid lead acid batteries produce hydrogen gas while being charged. This is highly explosive. Do not smoke around batteries. Extinguish all flames in the area. Batteries may explode resulting in fire, personal injury, property damage or death.

Testing the Batteries

There are several ways in which a battery can be tested and monitored. The motorhome uses a monitor panel which shows the status of the house batteries at a quick glance. Pressing and holding the test button, the power level will be displayed on the battery scale. The illustration shown explains in more detail the scale and indications.





A more efficient way of testing the batteries is to check the electrolyte solution. The only way to test a battery's electrolyte solution is with a hydrometer. Many styles are available, from types with cylinder graduation (shown here) to types with floating balls. Hydrometers can be purchased from most auto parts stores. The hydrometer tests the battery's electrolyte solution which is measured in specific gravity (sulfuric acid to water ratio). Distilled water has a specific assigned gravity of 1,000. The hydrometer is calibrated to this mark. Pure sulfuric acid has a specific gravity reading of 1,840. The acid is 1.84 times heavier than water. The electrolyte solution is about 64% water to 36% acid (fully charged battery). Hydrometers with cylinder graduation are graphed and the exact state

of specific gravity can be determined.

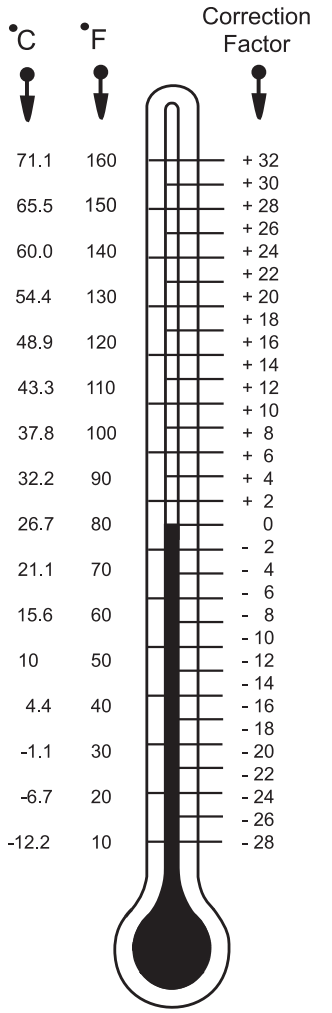
Temperature and recent battery activity (charging or discharging) affect the hydrometer readings. It is best to check the battery when it has been "at rest" for at least three hours, although readings taken at other times will give a "ball park" figure. Using the hydrometer, draw the electrolyte solution up into the tube. Allow the hydrometer to attain the same temperature as the electrolyte solution. Note the reading for that cell. Complete the same test for the rest of the cells on that battery bank.

Chart readings are taken at 80° Fahrenheit. Temperature affects the hydrometer readings. The higher the electrolyte temperature, the higher the specific gravity reading. The lower the temperature, the lower the specific gravity reading will be. Add or subtract four points for each 10° variance from the 80° Fahrenheit chart. Readings between cells should not vary more than 50 points.

If one cell in a particular battery bank being tested is at a 50% state of charge while the others are fully charged, charge that battery to see if the low cell will come up. At the same time, do not over charge the "healthy" cells.

If the low cell does not come up after charging, this battery can damage the rest of the battery bank and should be replaced. An accurate digital volt meter + - .5% will also give an indicator of the battery's state of charge.

Another test that can be performed is to put the battery(s) under a specified load for a predetermined length of time for that particular battery's rating. This machine is usually an adjustable carbon pile that can vary the load applied to the battery(s) while monitoring voltage to see if they will perform to the specific rated capacities.



NOTE: See chart for temperature compensation. Liquid levels should be even between the cells of the battery being tested as it will affect the accuracy of the test.

WARNING: Sulfuric acid in the batteries can cause severe injury or death. Sulfuric acid can cause permanent damage to eyes, burn skin and eat holes in clothing. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in eyes or on skin immediately flush the affected area for 15 minutes with large quantities of clean water. In case of eye contact seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous splattering of electrolyte.

Seven Reasons Why Batteries Fail

1. Physical Condition:

Active material flakes off the plates and fall to the bottom of the cell. This is normal, but sediment accumulates under the plates and can short out a cell. The plate separators fail to insulate positive and negative plates in a cell and the cell becomes shorted, ruining the battery.

2. Insufficient Electrolyte:

This allows exposed portions of the plates to sulfate rapidly. This reduces the battery's ability to accept a charge and the battery capacity is reduced. Accelerated erosion of the lower portions of the plates occur from higher than normal acid content due to water loss. Only the water evaporates, not the acid. The battery also has a higher internal resistance when low on water. Add only distilled water. Fill each cell to the bottom of the vent well when the battery is warm. Filling a very cold battery with water to the bottom of the vent well will cause overspill when the battery warms up and the plates expand. A Battery Formula For Failure: The battery has a higher internal resistance when low on water, therefore: *high resistance = more heat = shorter battery life!*

3. Sulfation:

When a battery is allowed to remain discharged too long the accumulated lead sulfate in the plate material solidifies and cannot reenter the electrolyte. Sulfate in plates is not able to reconstitute the electrolyte to a higher specific gravity, or to restore the plate material to a more active composition.

4. Overheating:

A battery operated, when the electrolyte temperature reaches 125º F, increases the chemical reaction. This increases the corrosion of the plates and reduces the battery life. When overheated the battery plates tend to buckle and destroy the structural integrity of the battery.

5. Freezing:

When the electrolyte freezes, ice formed dislodges the active material from the plates. The battery case may crack and the electrolyte will leak out when thawed. It is especially important to keep a battery at full charge in cold weather to prevent freezing. The high specific gravity of a fully charged battery does not freeze as easily. Never attempt to recharge a frozen battery. Warm it up first.

6. Corrosion:

Corrosion from spilled or splashed electrolyte form deposits that can conduct electricity and cause battery drain. Clean off all corrosion, especially around the battery terminals and on the top cover of the battery. Prevent accumulation by coating the terminals and the exposed metal cable connectors with high temperature grease.

7. Overcharging:

Overcharging rapidly converts water to gas and decreases the electrolyte's water content as the water evaporates. The electrolyte level drops and becomes more acid in content. This subjects the plates to a higher concentration of sulfuric acid and results in early battery failure.

NOTE: Any time you add more than one or two ounces per-cell per-thousand miles driven, check the motorhome charging system for overcharging. Prolonged overcharging generates excessive heat inside the battery, which buckles the plates and destroys the battery. It is a fact that over 50% of battery failures are caused by overcharging.

Battery Voltage & Current

Why does the voltage on a discharged battery measure the same as a fully charged battery until the loads are applied? The simple answer to this might go as follows: A battery creates electrical power by converting energy from a chemical reaction into electrical energy. As this reaction slows down the battery voltage will drop. In a lead acid battery the electrolyte conductivity (how well electrical current can flow through it) changes. The same current may be available but the rate of the reaction decreases, causing a voltage drop.

Another way of looking at this is to use the analogy of a water pump (a battery is an electric pump). The pressure in psi (pounds per square inch) that a pump delivers is like a battery's voltage. The volume of water in GPM (gallons per minute) is like the electrical current. Let's look at a 12 psi pump with no loads (the pump is running but the outflow valve is turned off). The pump will run and the internal pressure of the pump will build up to some point higher than 12 psi. Once the valve is opened and the water is free to flow into the loads the pressure will drop to the rated output pressure of 12 psi, but only if the load is not too big. If the pump is designed to maintain 12 psi at 15 GPM, and a load demanding 20 GPM is connected, the pump will not be able to keep up and the pressure will get sucked down to a lower psi.

If the load is then reduced or removed the pump will catch up and return to its rated 12 psi pressure. If the pump has an infinite source of water, such as a lake or the water utility (this is like the grid, no battery), the pump will never run out of pressure. If the pump never runs out of pressure and is operated at or below it's 15 GPM level, it will hold 12 psi. However, a pump that is connected to a water tank with a finite capacity will start to lose the ability to hold pressure as the level of water in the tank drops. Think of siphoning water from a bucket. As the level of the water drops the volume of water exiting the siphon slows down.

When the tank is full it is capable of feeding more "pressure" to the pump inlet due to gravity, and the pump always has enough water available to maintain its rated pressure and volume. However, if the water tank gets low the pump will not have enough water volume coming in to maintain 12 psi at

15 GPM. If the loads are taken away from the pump by closing the valve on the outflow, even with low pressure in the tank the pump will eventually pump up to 12 psi. It will just take it longer to get there. When the valve is opened the pump will sustain 12 psi for a brief period, but since the tank is no longer feeding the pump as fast as needed the pressure will eventually drop. This analogy can be restated by replacing the pump with a battery, pressure with voltage, volume with amps, outflow valve with a switch, water with electricity and the water tank with the battery electrolyte.

The level of the tank could be thought of as the rate of the reaction taking place in the electrolyte. When the battery is fully charged the electrolyte has an excess of reactions taking place to feed the battery terminals. This tapers off with time as the electrolyte is spent so maintaining voltage becomes possible. With no loads the spent electrolyte will be capable of producing close to the rated voltage, but only after a period of time has elapsed for enough reactions to take place to bring the voltage back up. Hopefully this scenario will help make clear why a battery measured at rest can show close to its rated voltage but will not run a load.

Calculating Run Times:

Calculating run time figures when operating 120 Volt AC electrical items with an inverter can be expediential. This is due to battery characteristics. Flow characteristics of electrons vary with different battery types and chemical compositions. Deep cycle batteries are generally designed to slowly release a majority of their charge capacity. Deep cycle batteries are rated in amp hours (Ahr) with the discharge occurring over an extended period of time before the battery is charged. Engine starting batteries are designed to quickly release large amounts of current for short durations without depleting battery reserves. Commercial type batteries bridge the gap of deep cycle and engine batteries. Commercial batteries release medium amounts of current over a longer period of time, but they are not designed to cycle their charge capacity.

The working range of a deep cycle battery is between 50 and 100% state of charge (SOC). Deep cycle batteries should not be cycled below 50% state of charge. Discharging a deep cycle battery below 50% state of charge shortens the life of the battery. Deep cycle batteries use an amp hour rating which is usually calculated over a 20 hour discharge interval. Example: A deep cycle battery with a rated capacity of 100 Ahr is designed to release current at the rate of five amps per hour. Multiply a 5 amp load over a 20 hour discharge period equals the rated 100 Ahr capacity. These discharge figures are calculated with the battery starting at 100% state of charge with the battery at 80º F when the discharge cycle begins. Increasing the discharge load applied to the battery from five amps to ten amps on a 100 Ahr battery does not yield 10 hours of discharge time. This is due to the internal reactions which occur when a battery is discharging. Actual discharge time for a 10 amp load may be closer to eight hours of discharge time. Increasing the load applied to the battery to 20 amps will not

yield five hours discharge time but may be less than three hours. It might be understood as a point of diminishing return.

Calculating applied loads to an inverter to approximate run time from the battery amp hours available is not an equal trade up when voltage is inverted and amperage is calculated. When the inverter is used to operate an AC load, it uses approximately ten times the DC current needed from the battery when inverting 12 Volts to operate the 120 Volt item. Also, a small inverter loses approximately 10% of its efficiency when inverting. For example: When using the inverter to operate an AC electrical item, which has a current draw rating of 2 amps, the inverter will use over 20 amps DC power from the batteries.

Determining Current Consumption:

First determine the amount of current used by an AC item. For example: The television is rated at 200 watts at 120 Volts. Calculate watts to amps. Divide 200 watts by the operating voltage of 120. This equals 1.6 amps. Multiply 1.6 amps AC current by a factor of ten the inverter will use, this equals 16 amps DC battery current. Add the revised 10% efficiency loss figure. This calculates to a total of 17.6 amps DC. If the battery bank capacity is rated at 500 Ahrs, actual elapsed time to the suggested 50% state of charge would net viewing time for the television at approximately 13 hours in ideal conditions.

The run time figure will vary greatly with the actual state of charge of the battery bank when the discharge process begins. Ambient temperature, combined with other working loads such as lights and parasitic loads applied to batteries affect run times. Calculating the exact run time is not precise due to all the variables and equations involved; however, an approximate time figure can be obtained. Proper battery maintenance and charge cycles affect battery performance. Observe the battery condition with hydrometer and voltage readings. Use only distilled water when filling batteries. To achieve the highest quality of battery performance and longevity keep batteries in their proper operating range.

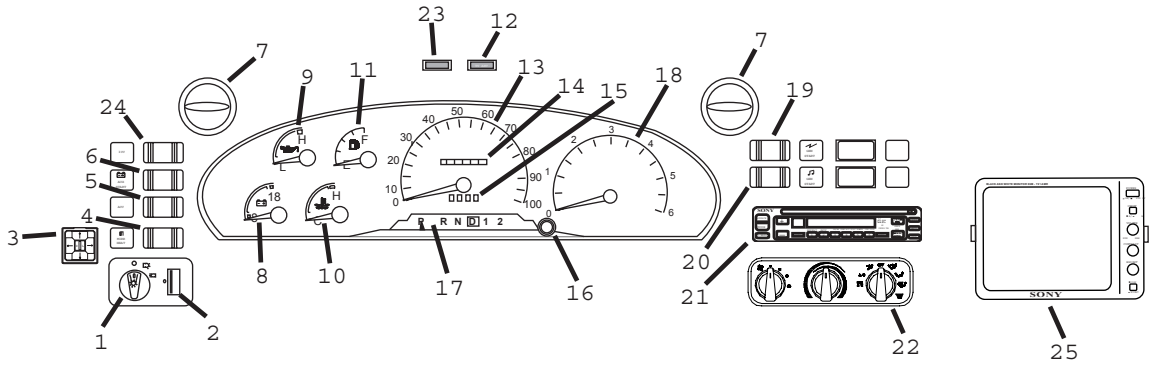
Chassis	AH (20 hr)	CCA	RC (25A) minutes
12 Volt Chassis			
BXT-65-750	**N/A**	**750**	**N/A**
6 Volt Domestic			
U2200 (2 each)	**225**	**	**447**

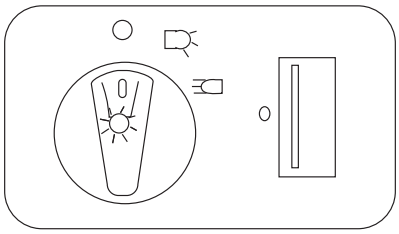
**Battery connections are made in a Series/Parallel connection.
Domestic batteries not rated in Cold Cranking Amps (CCA).

STATE OF CHARGE	VS.	OPEN CIRCUIT VOLTAGE
100%		12.66V
75%		12.45V
50%		12.24V
25%		12.06V
Discharged		11.89V

STATE OF CHARGE	VS.	SPECIFIC GRAVITY
100%		1.265
75%		1.225
50%		1.19
25%		1.155
Discharged		1.12

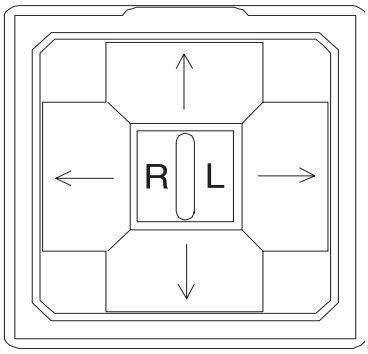
DASH PANEL





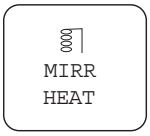
1. **Headlight Switch:** Turns the headlights on and off.
2. **Panel Light Switch:** Dims the dash panel backlighting.

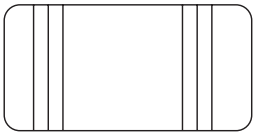
3. **Mirror Control:** This switch adjusts the bottom mirror of the rear view mirror. The small selector in the middle of the switch must be placed in the desired side. The middle position is to prevent accidental bumping of the switch and changing the mirror position.



Mirror Care and Cleaning:
When washing your motorhome with hot water and soap you will be also washing the outside chrome mirrors. When you have completed washing the motorhome you will need to clean the outside mirrors with a good quality glass cleaner. DO NOT use anything abrasive on the mirror and the outside chrome of the mirror.

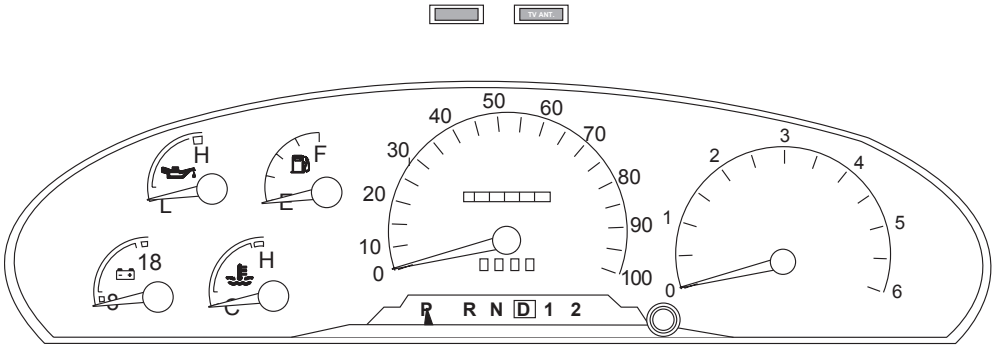
4. **Mirr Heat:**
This switch turns on the heaters in outside rear view mirrors. The mirror heaters should be used when defogging or deicing is needed. Mirror heat should not be left in the ON position unless continuous fogging conditions occur.
The outside mirrors have been placed so they can be easily adjusted with an Allen wrench. After taking delivery of the new motorhome it will be necessary to sit in the drivers seat and have the mirrors adjusted for accurate visibility. Make sure you can see out of both the driver and the passenger side mirrors before heading out on the road.





5. **Accessory Switch:**
The Accessory Switch is prewired with a hot wire and ground wire for additional accessories which may be added in the future.

6. **Auxiliary Start:**
The Auxiliary Start switch is used in the event the motorhome chassis battery has been drained or is at a low charge level where the engine cannot start. This switch momentarily "jumps" the house battery to the motorhome domestic battery to assist in starting the engine. The boost switch used in conjunction with engine starting procedures should not be held for more than 30 seconds. This time period is long enough to prevent the boost solenoid from overheating.



7. Air Conditioner Vent:
The vent will direct air flow either right, left, up or down.

8. Voltmeter:
Shows voltage of chassis electrical system.

9. Oil Pressure Gauge:
Registers oil pressure of engine. A engine temperature reading in midrange area is considered average.

10. Engine Temperature Gauge:
Normal operating temperatures should be a midrange indication.

11. Fuel:
Fuel gauge will register approximate fuel level in tank when ignition switch is in run position.

NOTE: Fuel mileage varies with driving style and road conditions. Always average more than one tankful to obtain a more accurate figure. The Generator will use fuel from main tank and will affect fuel mileage figures. The Generator will not operate below 1/4 tank to insure there is enough fuel to run main engine.

12. Antenna Up Warning Light:
This light illuminates when TV antenna is in raised position with ignition switch ON. Do not move motorhome until the antenna is lowered.

13. Speedometer:
Indicates the speed of the motorhome. The gauge indicates MPH and KPH. Located on center of the instrument cluster.

14. Odometer:
The odometer indicates the actual mileage of the motorhome.

15. Trip meter:
The trip meter will display the current mileage of the trip since the last reset.

16. Reset Button:
Used to reset the trip meter counter to zero.

17. Shift Selector:
The indicator shows the position on the transmission.

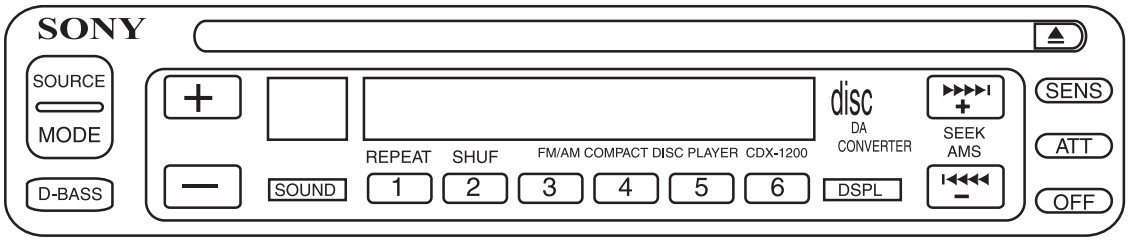
P - Indicates Park.
R - Indicates Reverse.
N - Indicates Neutral.
D - Indicates Drive.
1 - Indicates Lower Drive.
2 - Indicates Lower Drive.

18. Tachometer:
Displays engine speed in revolutions per minute (RPM).
Tachometer reads output pulse of alternator. If tachometer quits or indicates improperly, have alternator checked immediately.

19. Gen ON/OFF:
Starts and stops generator from the dash area.

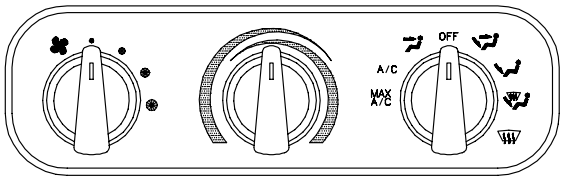
20. Radio power switch:
Turns radio on and off independent of main switch on radio.

21. Radio :
Complete instructions for operation of radio are in your Owner's Information Packet.



22. Dash AC and Heater Control:

The system is designed to only provide heating, cooling and defrost capabilities for the pilot/co-pilot area. The system is not capable of heating or cooling the entire motorhome.



Blower Operation:

The blower is selected automatically when the desired feature is selected with the "**SELECT SWITCH**." The system is shut off by placing the mode control switch in the "**OFF**" position.

A/C Operation:

The A/C dash system will operate in all modes except **VENT**, **FLOOR** and **OFF**. The **A/C** and **MAX** positions engage the A/C compressor. When the switch is positioned in the **A/C** mode, fresh air is drawn through the front air intake of the unit through the A/C coil. In the **MAX** position a damper door closes off the fresh air, while another door opens to permit only air from inside the coach to be used. When maximum cold air is desired this position should be selected. Also use this position when you do not wish to introduce outside air into the coach.

23. Jacks Down Warning Light:

This light illuminates when leveling jacks are in the down position. You should not move motorhome unless jacks are in stored position.

24. ICC Flasher:

This switch will flash lights. This is normally used as a courtesy to acknowledge another driver.

Air Distribution Switch (Mode Control):
This switch is used to direct air where it is needed to maximize the comfort of the motorhome.

MAX A/C - Recirculated air is drawn from the passenger area and discharged through the dash louvers.

A/C - Fresh Air is drawn from outside into the system and discharged through the dash louvers.

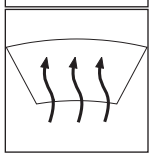
VENT - Fresh air is drawn in and discharged throughout the dash and defrost louvers.

OFF - The blower motor does not operate. The fresh air inlet door will close minimizing outside air infiltration into the motorhome.

BI-LEVEL - Fresh air is drawn in and discharged through the dash, floor and defrost louvers.

FLOOR - Fresh air is drawn in and discharged through the floor louvers. A small amount of air is used to defrost the windshield.

MIX - Fresh air is drawn in and discharged through the floor and defrost louvers. The A/C system operates to dehumidify the discharged air.



DEFROST - Fresh air is drawn in and discharged through the defrost louvers. The A/C system operates to dehumidify the discharged air.

Temperature Control Switch:
This switch controls an electric water valve regulating the amount of engine coolant passing through the heating and cooling coils in the system. Rotating to the red area provides warmer air; rotating to the blue area provides cooler air.

Blower Control Switch:
The switch controls the speed of the blower motor, which is one of the best and most effective ways of controlling the temperature. The switch provides four speeds in all modes except **OFF**.

Operating tips and hints:

Air intake and discharge temperatures are greatly affected by ambient temperature and relative humidity. A large amount of cooling capacity is used to dehumidify air as well as cool it. After three to five minutes of A/C operations the discharged air temperature should be approximately 30º F cooler than the fresh or recirculated air entering the A/C system.

Winter Use:

- De-ice the windshield using the **DEFROST** mode.
- Air will heat up faster with a slower blower speed until normal operating temperature ranges are reached.

Summer Use:

- Close all windows and vents to hot, humid outside air.
- **MAX A/C** and **HI** blower will provide quick cool down.
- Use a lower blower speed to produce cooler air.

Troubleshooting:

The dash A/C/Heat system uses a combination of compressed air (developed by the chassis system), vacuum air (developed by the vacuum generator) and electric relays and vacuum switches. Therefore, any repair can be classified in one of five categories:

• Electrical • Vacuum • Air Conditioner • Heater • Defroster

The motorhome compressed air tank must have adequate pressure to operate the vacuum generator or damper doors will not function. Also, the dash **A/C/Heat** unit must be switched **ON** to provide electric current to the relays, vacuum switches, etc. The dash A/C and heater system should be used monthly to keep the compressor lubricated.

The following information is provided to assist in troubleshooting common operational problems which may occur.

No Heating:

- A/C switch is turned off.
- Blower switch is turned off.
- Verify the proper engine coolant level.
- Verify that the engine is reaching operating temperature.
- Verify engine coolant is reaching water valve attached to unit.
- Verify operation of water valve to permit engine coolant to pass through valve to heater core.
- Check unit fuses.
- Check power supply to water valve and grounding.
- Check wiring.
- Engine thermostat faulty.

No Cooling:
- Check blower is operating, A/C switch is in A/C or Max position, temperature control is turned to max cooling (blue area).
- System fuses are not blown.
- Condenser fan is operating.
- Check power supply to unit and grounding of system.
- Check wiring.
- Coolant valve leaking.
- Drive belt loose or broken.
- Compressor Clutch inoperative, will not engage.
- Expansion Valve faulty or frozen.
- Thermostat control faulty.
- Mode control switch faulty.
- Compressor faulty.
- Loss of refrigerant.

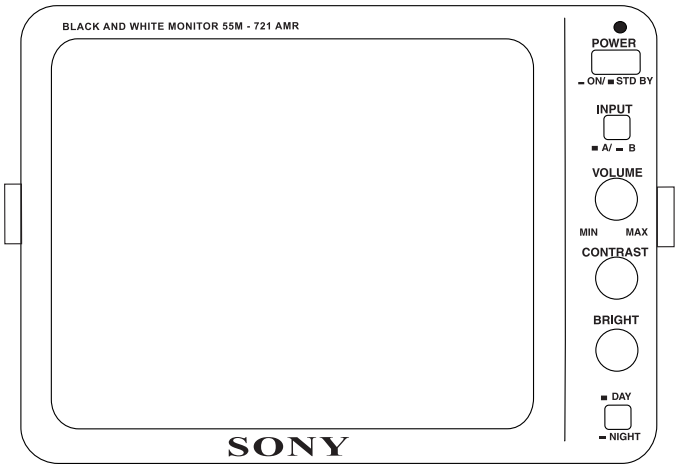
Reduced cooling:
- Coolant valve not operating correctly.
- Air passages obstructed.
- Loose or worn drive belt.
- Check blower and select switch.
- Thermostat control valve faulty.
- Expansion valve faulty.
- Compressor faulty.
- Low refrigerant charge.

Blower Does Not Operate or Runs Slow:
- Check fuses.
- Check for loose or corroded connection.
- Check wiring.
- Check ignition switch is “ON.”
- Check blower and select switch.
- Motor shaft seized.
- Blower wheel out of alignment.

Damper Doors Do Not Operate:
- Does motorhome air tank have pressure?
- Check vacuum generator is being powered and producing vacuum.
- Check vacuum line entering unit for vacuum.
- Check that the vacuum solenoid mounted on unit are receiving power from the mode switch. If operating properly, the vacuum solenoid will feel hot if current is engaging the solenoid.
- Check mode switch.
- Check wiring.
- Check for pinched vacuum line leading to the vacuum motor operating the damper door in question.

25. Back up Monitor:

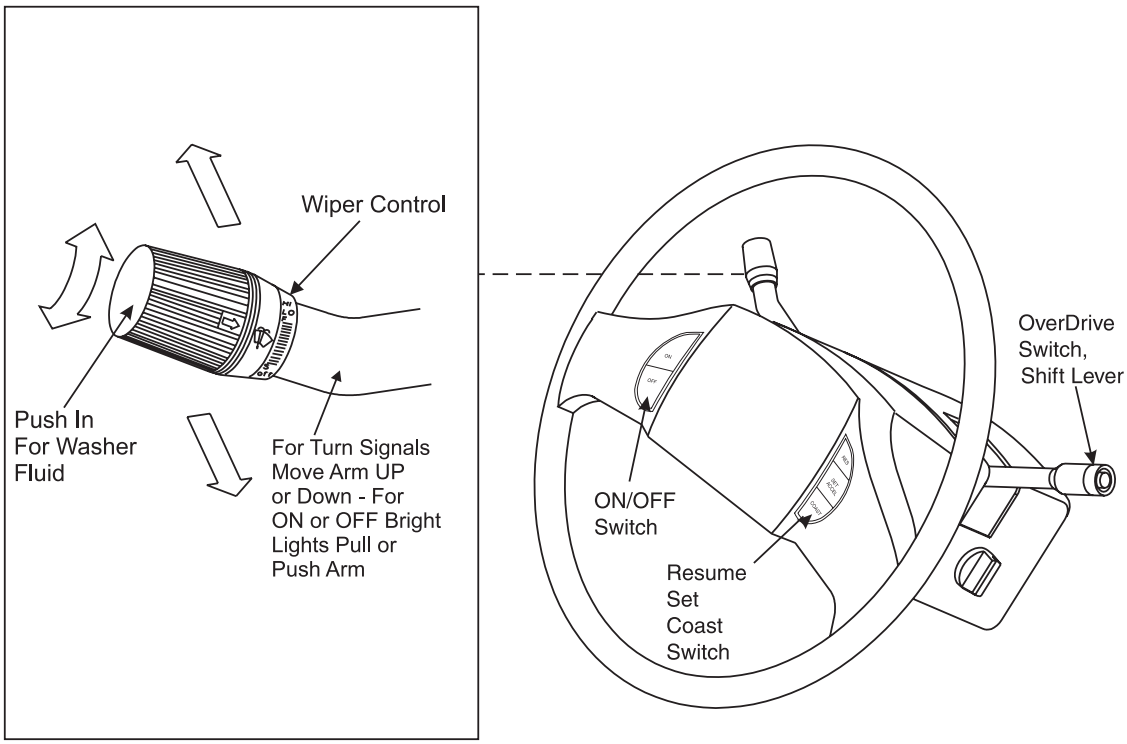
Used with the back up camera and will display the rear view of the motorhome.



STEERING WHEEL - *Operator Controls*

The left lever arm contains the controls to operate the wipers, turn signals and head light dimmer (turns brights on and off). This lever will also function as the ICC Flash. Cruise control switches are located on the steering wheel and the Overdrive Lock-Out is located on the end of shift lever.

The cruise control has a built in safety switch which will not allow the system to operate until the speed of the motorhome is greater than 30 mph.



Cruise Control

To Set Speed:

Push and release the **ON/OFF** switch on the steering wheel. Accelerate to the desired speed which exceeds 30 mph. When obtained, hold the desired speed with the foot pedal while the **SET** switch is pressed and released. One second after the switch is released the foot can be removed from the accelerator pedal. Speed can be increased at any time with pressure on the accelerator pedal. When the accelerator pedal is released the set speed will be resumed.

To Accelerate:

When the cruise is engaged there are two ways to accelerate the motorhome. Push and hold the **SET** switch on steering wheel to accelerate the motorhome. In using the **SET** switch, once the **SET** switch is released that speed will then automatically become the new default speed setting. The other option for acceleration is simply press to the accelerator pedal. When the accelerator pedal is released the original programmed speed will be resumed.

To Coast:

The **COAST** switch on steering wheel will allow the motorhome to coast or slow in speed. When the **COAST** switch is pressed and held the motorhome will slow in speed. When released the motorhome programmed set speed will automatically set to the adjusted coast speed.

To Disengage:

The cruise can be disengaged by two methods, simply press the brake pedal and the current programmed speed is canceled. Pressing and releasing the **ON/OFF** switch on steering wheel will erase the programmed speed and turn OFF the cruise function.

To Resume:

When you disengage system with the brake you do not erase the set speed from memory even if a complete stop is reached. To return to the chosen speed drive to a speed above 30 mph then push the **RESUME** switch on steering wheel. The speed control program will take you back to that original set speed. If the rate of acceleration is faster or slower than you like, use the accelerator to obtain a speed close to pre-set speed then push the **RESUME** switch. The cruise control will automatically be turned off when ignition switch is turned off.

Tilt Steering Wheel

The control for the steering wheel tilt is a lever located on the steering column near the dash. Pulling the lever will allow changes to be made in the tilt of the steering wheel. Adjust the wheel to the desired position then release the lever.

Wiper/Washer Operation

When the end of the arm is pressed in washer fluid will be dispensed from the system and the wipers will turn on momentarily. Holding the tip pushed in fluid will continue to be dispensed until the tip is released.

Headlight Beam Change & Turn Signals

Wiper operations are controlled when rotating the end of arm. When the end of the arm is rotated from **OFF** to **DELAY** the wipers will turn on and a time delay between wipes (ranging from 45 seconds to 2 seconds) will occur. The amount of delay time changes as arm end is rotated. A continuous low or high speed can be obtained by rotating the arm end to appropriate position. The wipers will be turned OFF with the switch in the **OFF** position.

Overdrive Lock-Out Switch

Moving the arm upward will activate the right hand turn signal circuitry. A downward movement will activate the left hand turn signal circuitry. When the headlights are ON pushing the arm away from steering wheel will switch the headlights from low to high beam. This position will require a slight pull towards the steering wheel to change from high to low beam. There is blue headlight indicator in the dash cluster which indicates when high beams are selected. The headlight ICC circuitry can be operated by momentarily pulling the arm all the way up towards the steering wheel and releasing. This procedure when repeated several times in succession will flash the headlights.

Hazard Flasher

The lock out overdrive is for towing or direct drive transmission operation. Push in on the button located on end of shift lever and the indicator light on the lever dash cluster will illuminate. This should be engaged for mountain driving. Return to overdrive operation by pushing the button in and release it. The indicator light on the lever will go out. This is the normal indication.

The flasher button is located on the top of the steering column.

- To turn four way flasher on, push in on flasher button. This will release the switch and activate the flashers circuitry.
- To shut off the flasher again push in on the push button, locking the button inward.

BULB USAGE

Interior Lights:

- Sidewall - 1076
- Dinette Light - 1141
- Double Pancake - Bulb 1141
- Single Pancake - Bulb 1141
- Cosmetic Light - 9-019C
- Map Light - Bulb 1003
- Fluorescent Light - Phillips F8T5/CW

Exterior Lights:

- Engine Light - GE 232
- Porch/Off Door Service Light - Bulb 1003
- Red Clearance - Bulb 194
- Amber Clearance - Bulb 194
- Storage Lights - 168
- Systems Compartment - 1141
- Tail Light Turn Signal (Top) - 3156
- Tail Light Brake/Tail (Center) - 3457
- Tail Light Back Up (Bottom) - 3156
- Third Brake Light - 562
- License Plate - Order Complete Assembly
- Front Amber Park (Outside Top) - 194
- Front Amber Turn/Park (Outside Bottom) - 1157
- Front Amber Turn (Inside Top) - 1156
- Front Headlight (Inside Bottom) HB519007

Endeavor

GAS

SECTION 9
SPECIFICATIONS & DIAGRAMS

TIRE - CHART

TIRE SIZE	MAX Speed Rating (MPH)	Dual (D) Single (S)	INFLATION PRESSURE PSI												
			65	70	75	80	85	90	95	100	105	110	115	120	125
8R19.5	75	D S	2350 2410	2460 2540	2570 2680	2680 2800	2780 2930	2880 3060	2980 3170	3070 3280	3160 3400	**3375(F)** **3500(F)**			
225/70R19.5	75	D S		2720 2895	2860 3040	3000 3195	3115 3315	3245 3450	**3415(F)** **3640(F)**						
245/70R19.5	75	D S		3415 3640	3515 3740	3655 3890	**3875(F)** **4080(F)**	3940 4190	4075 4335	**4375(G)** **4545(G)**					
265/70R19.5	75	D S				3750 3970	3930 4180	4095 4355	4300 4540	4405 4685	4560 4850	4805 5070	4860 5170	**5070(G)** **5355(G)**	
9R22.5	65	D S	3120 3190	3270 3370	3410 3560	3550 3730	3690 3890	3820 4050	**3950(F)** 4210	4350	**4500(F)**				
10R22.5	65	D S	3690 3770	3870 4000	4040 4210	4200 4410	4375 4610	4520 4790	4670 4970	**4875(F)** **5150(F)**	4970 5320	5110 5490	**5250(G)** **5680(G)**		
11R22.5	75	D S				4760 4990	4950 5220	5120 5430	5300 5640	5470 5840	**5750(G)** **6175(G)**	**5800(H)** 6240	6430	**6610(H)**	
12R22.5	65	D S				5190 5450	5390 5690	5590 5920	5780 6140	5960 6370	6150 6590	6320 6790	6500 7010	**6750(H)** **7390(H)**	
245/75R22.5	75	D S		3260 3470	3425 3645	3640 3860	3740 3980	3890 4140	4080 4300	4190 4455	4335 4610	**4410(G)** **4675(G)**			
255/70R22.5	75	D S		3585 3815	3765 4005	3970 4190	4110 4370	4275 4550	4410 4675	4455 4895	4610 5065	4675 5205	**5070(H)** **5510(H)**		
265/75R22.5	75	D S			4040 4070	4205 4255	4370 4440	4525 4620	4685 4800	**4805(G)** 4975	5150	**5205(G)**			
275/80R22.5	75	D S					4855 5265	5080 5515	5305 5755	5525 6000	5745 6235	5965 6475	6180 6710	**6395(H)** **6940(H)**	
295/75R22.5	75	D S			4690 4725	4885 4945	5070 5155	5260 5370	5440 5510	**5675(G)** 5780	5800 5980	**6005(H)** **6175(G)**	6370	**6610(H)**	
295/80R22.5	75	D S				4855 5480	5100 5750	5335 6020	5570 6285	5805 6550	6035 6810	6265 7070	6490 7320	6720 7580	**6940(H)** **7830(H)**
315/80R22.5	75	D S					5840 6415	6070 6670	6395 6940	6540 7190	6770 7440	6940 7610	7210 7920	**7610(J)** **8270(J)**	
285/75R24.5	75	D S			4740 4770	4930 4990	5205 5210	5310 5420	5495 5675	**5675(G)** 5835	6040	**6175(G)**			

Holiday Rambler is not the author of this chart and makes no representation or warranty concerning the accuracy of the information disclosed by the chart. Holiday Rambler is not responsible for the accuracy of the information disclosed or for any errors within the Tire Inflation Chart.

COMMON PARTS - CHART

COMPONENT	6.8 L V10 ENGINE
Air filter	FA-1634
Battery	BXT-65 -750
Fuel filter	FG872
Oil Filter	FL-820-S
PCV Valve	EV-233
Spark Plugs	AWSF 22E

SPECIFICATIONS - CHART

CHASSIS SPECIFICATIONS						
MODEL	35SBD	35PBD	35WGS	36SGS	36PBD	36WGS
GVWR	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.	20,500 lbs.
GCWR	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.	25,500 lbs.
GAWR (Front)	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs	7,000 lbs
GAWR (Rear)	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs	13,500 lbs
Wheel Base		228"	228"	228"	228"	228"
Overall Length		35' 11"	35'	36'	36'	36'
Overall Height	11'9"	11'9"	11'9"	11'9"	11'9"	11'9"
Interior Height	6'6"	6'6"	6'6"	6'6"	6'6"	6'6"
Interior Width	94.5"	94.5"	94.5"	94.5"	94.5"	94.5"
Exterior Width	100"	100"	100"	100"	100"	100"

TANK CAPACITIES (Approximate Gallons)						
MODELS	**35SBD**	**35PBD**	**35WGS**	**36SGS**	**36PBD**	**36WGS**
Water Heater	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**	**6 Gal.**
Grey Tank	**45 Gal.**	**45 Gal.**	**43 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**
Black Tank	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**	**45 Gal.**
Fresh Tank	**67 Gal.**	**67 Gal.**	**67 Gal.**	**70 Gal.**	**55 Gal.**	**70 Gal.**
LP Tank	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**	**32.9 Gal.**

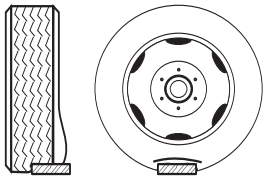
Engine Specs	
Engine Type	Ford V10 Gas Fuel Injection
Engine Size	6.8L V10
Cubic Inch Displacement	415
Tire Size	245/70RX19.5F
Fuel Tank (Approx. Gal)	75
Alternator (Amp)	130
Rear Axle Ratio	5.38:1
Overdrive	Standard

Tire "Support" Methods

INCORRECT

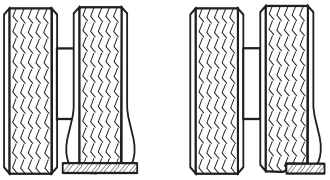
Singles

Only a portion of the tire is supporting the full load.

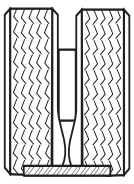


Duals

One tire or a portion of one tire is supporting the full load.

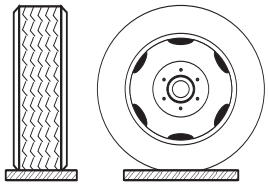


One tire or a portion of the two tires supporting the full load.



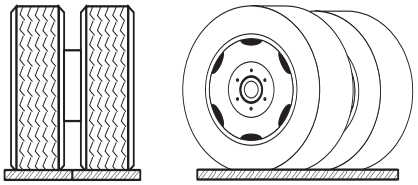
CORRECT

Singles

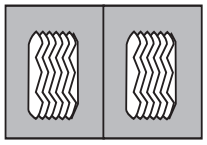


Tire Footprints

Duals



Dual Tire Footprints



CHASSIS LOG

Date	Mileage	Dealer Address	Service/Remarks

CHASSIS LOG

Date	Mileage	Dealer Address	Service/Remarks

CHASSIS LOG

Date	Mileage	Dealer Address	Service/Remarks

CHASSIS LOG

Date	Mileage	Dealer Address	Service/Remarks

GLOSSARY OF TERMS

AC Electricity - Alternating current also known as household power.

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

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

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

British Thermal Unit (BTU) - The amount of heat required to raise or lower the temperature of one pound of water by 1° F.

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

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

City Water - A term associated with the water supply that you hook-up to when you are at campgrounds. It is called city water because you pull water from a central source (like in a city) and not the fresh water tank.

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

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

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

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

DC Electricity - Direct current also known as battery power.

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

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

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

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

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

Egress Window - The formal name for the emergency window located in the rear of the motorhome. Egress windows can be easily identified by their red handles.

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

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

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

LED - (Light Emitting Diode) Indicator light.

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

OHM - A unit for measuring electrical resistances.

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

Road Side - This refers to the side of the motorhome which faces the road when it is parked. Often called the off-door side.

Shore Line - This is the electrical cord which runs from the motorhome to the camp ground 120 volt electrical supply.

Shore Line Plug - This is the 120 volt outlet that you can plug your motorhome into a campground.

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

Volt - The unit of measure for electric potential.

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

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

O

P, Q, R

S

T, U

V

W, X, Y, Z

NOTES