
LIMITED WARRANTY • 1
LIMITED WARRANTY - ROADMASTER CHASSIS • 5
WARRANTY INFORMATION FILE • 8

MONACO COACH CORPORATION LIMITED WARRANTY

**LIMITED
WARRANTY
- 2002 Executive**

What the Period of Coverage Is:

If you use your Monaco motorhome only for recreational travel and family camping purposes, the Limited Warranty provided by Monaco Coach Corporation ("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 comes first.

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

The above Limited Warranty coverage applies to all owners, including subsequent owners, of the motorhome. However, a subsequent owner must submit a warranty transfer form by filing the form through an authorized Monaco dealer. A subsequent owner's warranty coverage period is the remaining balance of the warranty coverage period the prior owner was entitled to under this Limited Warranty. Warranty transfer forms can be obtained by contacting the 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. It is reasonable to expect some service items to occur during the warranty period.

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

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

If 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 (1-877-466-6226). The mailing address is:

**Monaco Coach Corporation
91320 Coburg Industrial Way
Coburg, Oregon 97408.**

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

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

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

What the Warranty Does Not Cover

**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 . THE EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES SHALL BE DEEMED INDEPENDENT OF, AND SHALL SURVIVE, ANY FAILURE OF THE ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above exclusions may not apply to you.

Legal Remedies

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.

ROADMASTER CHASSIS LIMITED WARRANTY

**LIMITED
WARRANTY
- ROADMASTER
CHASSIS**

What the Period of Coverage Is:

If you use the Roadmaster Chassis that your motorhome is mounted upon for only recreational travel and family camping purposes, the Limited Warranty provided by Roadmaster ("Warrantor") covers your Roadmaster Chassis for twenty-four (24) months from the original retail purchase date or the first 24,000 miles of use, whichever occurs first.

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

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 ROADMASTER CHASSIS 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. Any dealer selling a motorhome assembled upon a Roadmaster Chassis is not the Warrantor's agent but is an independent entity. Warrantor is not responsible for any undertaking, representation or warranty made by any dealer or other person beyond those expressly set forth in this Limited Warranty. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

***Limitations of
Implied Warranties***

Warrantor's Limited Warranty covers defects in the manufacture of the Roadmaster Chassis (as defined herein) and defects in materials used to manufacture the Roadmaster Chassis. The term "Roadmaster Chassis" as used herein means only the frame; frame cross members; steering axle, including the axle king pins and bushings; hubs and bearings; brake calipers; rotors, brake backing plates and related parts of the axle; tie rods; drag links; drive shafts, including the U-joints; carrier bearings; and, the axle housing and its internal parts. Also see the section "What the Warranty Does Not Cover" set out below.

***What the Warranty
Covers***

What We Will Do to Correct Problems

Warrantor will repair and/or replace, at its option, any covered defect if: (1) you notify Warrantor or one of its authorized servicing dealers of the defect within the warranty coverage period and within five (5) days of discovering any such defect; and (2) you deliver the Roadmaster Chassis to Warrantor or Warrantor's authorized servicing dealer at your cost and expense. It is reasonable to expect some service items to occur during the warranty period.

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

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

If 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

For warranty service simply contact one of Warrantor's authorized service centers for an appointment, then deliver your Roadmaster Chassis (at your expense) to the service center. If you need assistance in locating an authorized warranty service facility, contact Warrantor's Warranty Department (1-877-466-6226). The mailing address is:

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

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

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

This Limited Warranty does not cover: modifications and alterations to the Roadmaster Chassis by others; the motorhome that is mounted upon the Roadmaster Chassis, including by way of example the motorhome manufacturer's design, manufacture, assembly and/or installation of the side walls, roof, windows, flooring, electrical system, plumbing system, LP-Gas system, appliances and slide-outs; items that are working as designed but which you are unhappy with because of the design; normal wear and usage; routine maintenance including by way of example wheel alignments; component parts covered by their own manufacturer's warranty, including by way of example the engine, transmission, tires, tubes, batteries, exhaust system and the emission control systems; and, flaking, peeling rusting and chips or other defects or damage in or to the frame and frame cross members caused by rocks or other road hazards and the environment including airborne pollutants and salt.

What the Warranty Does Not Cover

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.

Events Discharging Warrantor from Obligation Under Warranty

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

Disclaimer of Consequential & Incidental Damages

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.

Legal Remedies

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

**ROADMASTER CHASSIS DIVISION
MONACO COACH CORPORATION
91320 COBURG INDUSTRIAL WAY
COBURG, OREGON 97408**

**WARRANTY
INFORMATION
FILE**

In addition to this Owner's Manual you will find a Warranty Information File in your unit. This file contains valuable documents about your motorhome's systems and equipment. Many of the component manufacturer's warranty registration cards can be found in the box. They will need to be filled out and mailed. Be sure you read and understand all the information in this file to help you safely operate, maintain and troubleshoot those items.

MONACO COACH 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.

Monaco Coach Corporation

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

EXECUTIVE

SECTIONS

1

GENERAL INFORMATION

2

DRIVING & SAFETY

3

CARE & MAINTENANCE

4

APPLIANCES

5

EQUIPMENT

6

WATER SYSTEMS

7

LP-GAS SYSTEMS

8

ELECTRICAL SYSTEMS - HOUSE

9

ELECTRICAL SYSTEMS - CHASSIS

10

CHASSIS INFORMATION

INDEX - PAGE 391

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 grey box inside the motorhome.

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

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

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EXECUTIVE

SECTION 1 GENERAL INFORMATION

INTRODUCTION	• 13
CUSTOMER RELATIONS	• 13
REPORTING SAFETY DEFECTS	• 14
TAKING DELIVERY	• 14
<i>Monaco Coach Responsibilities</i>	<i>• 14</i>
<i>Dealer Responsibilities</i>	<i>• 14</i>
<i>Customer Responsibilities</i>	<i>• 15</i>
SERVICE SUGGESTIONS	• 15
OWNER'S RECORD - SERIAL NUMBERS	• 17
OWNER'S RECORD - PERSONAL PROPERTY	• 18
OWNER'S RECORD - INSURANCE	• 19
VENDOR LIST	• 20



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 chapter, can be found in the manufacturer's owner manuals located in the owner information box.

In time you will develop a knack for spotting wonderful little roadside locations by turning off the main highway and exploring. There are many modern recreational vehicle parks (including state, county and federal parks) with good 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 probably 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 occasionally 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 Monaco Coach 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. Your facilities are with you and the motorhome is fully self-contained.

The safety alert symbols of **CAUTION** or **WARNING** are "Personal Safety Instructions." It is important to thoroughly read and understand these safety instructions where the symbols are displayed throughout the manual. Failure to comply with specific instructions may result in personal injury or death. Many instructions are required by National Safety Associations.

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.

**Customer Service Department
Monaco Coach Corporation
91320 Coburg Industrial Way
Coburg, Oregon 97408
877-466-6226**

**CUSTOMER
RELATIONS**

REPORTING SAFETY DEFECTS

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

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

TAKING DELIVERY *Monaco Coach 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. The 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.

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 Monaco Coach 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 the 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.

**Customer
Responsibilities**

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.

**SERVICE
SUGGESTIONS**

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 for the
Appointment**

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.

Prepare a List

Don't leave a list of 20 items to be serviced and expect to have the motorhome back by 5:00 p.m. If you list a number of items, and must have your motorhome back by the end of the day, discuss the situation with the service manager and list 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.

**Be Reasonable
With Your
Requests**

***No Looking Over
the Technicians
Shoulder***

Please don't be offended when you are told you cannot 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.

FOR YOUR OWN REFERENCE

OWNER'S RECORD - SERIAL NUMBERS



INFORMATION: Many of the serial numbers for various items and components are filed on the Data Card located in the Warranty Information File box. Refer to the Manufacturer's individual Owner's Manuals for serial number locations that are not listed below.

Motorhome Serial Number _____

Motorhome Federal Vehicle Identification Number (VIN) _____

Entry Door Key Number _____

Compartment 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)

Inverter Model & Serial Number _____

FOR YOUR OWN REFERENCE

OWNER'S RECORD - PERSONAL PROPERTY

Item	Serial Number	Value

FOR YOUR OWN REFERENCE

OWNER'S RECORD - INSURANCE

Company: _____

Policy #: _____

Agent's Name & Address: _____

Business Phone #: _____

Emergency Phone #: _____

Renewal Date(s): _____

Notes: _____

VENDOR LIST

Air Bags

Firestone
317-818-8600
www.bridgestone-firestone.com

Air Conditioner

Dometic Corp.
219-463-4858
www.dometic.com

Air Conditioner- Dash

SCS/Frigette
800-433-1740
www.scsfrigette.com

Alternator

Leece-Neville
800-349-2628
www.prestolite.com

Aqua Hot (Optional)

Vehicle System
800-685-4298
www.hydro-hot.com/index.html

Awnings

Carefree
800-621-2617
www.carefreeofcolorado.com

Girard Systems
800-382-8442
www.girardrv.com

Axles

Merritor Corporation
800-535-5560
www.arvinmerritor.com

Eaton Corporation
800-328-6687
www.truck.eaton.com

Battery Isolator

Powerline
800-443-9394
www.hehrpowersystem.com

Battery Maintainer

"Keep It Up"
Lambert Enterprises
800-853-3748
www.lambertenterprises.8k.com

Batteries

Interstate
800-272-6548
www.interstatebatteries.com

Brake-Anti-Lock Brake System

Eaton
800-826-4357
www.eaton.com

Carbon Monoxide Detector

Safe-T-Alert
800-383-0269
www.safe-t-alert.com

Carbon Monoxide & Liquefied Petroleum Protectors

MTI Industries, Inc.
800-383-0269

Citizen Band Radio (C.B.)

Cobra
733-889-3087
www.cobraelec.com

Cooktop

KitchenAid
800-422-1230
www.kitchenaid.com

Cooktop (Optional)

Seaward Products
562-699-7997
www.seawardproducts.com

Drapery Motor

Somfy
800-63-SOMFY
www.somfysystems.com

Engine

Cummins
800-343-7357
www.cummins.com

Entertainment Center - Bedroom

Fisher
800-421-5013
www.sanyoservice.com

Entry Step

Kwikkee
800-736-9961
www.kwikkee.com

Fan - Bathroom Exhaust

Fan-Tastic Vent
800-521-0298
www.fantasticvent.com

Faucet

Moen Faucets
800-289-6636
www.moen.com

Filters

Racor Fluid Filters
800-344-3286
www.parker.com/racor/

Fire Extinguisher

The Fire Extinguisher Co.
919-563-4911

Furnace

Suburban Manufacturing
800-659-2138
www.suburbanmanufacturing.com

Generator

Onan
800-888-6626
www.onan.com

Hydraulic Filter

Parker
1-800-343-4048
www.parker.com

Home Theater (Optional)

Sony
800-222-7669
www.sony.com

Inverter

Trace Engineering
360-435-8826
www.traceengineering.com

Leveling Jacks - Air

HWH Corporation
800-321-3494
www.hwhcorp.com

Leveling Jacks - Hydraulic

RVA
760-746-5732

LP-Gas Tank

Brunner Mfg.
800-753-8625
www.thomasregister.com/olc/brunner/home.htm

Microwave

Sharp Electronics Corp.
800-237-4277
www.sharp-usa.com

Navigation

Mito Corporation
800-433-6486
www.mitocorp.com

Outside Mirrors

Velvac Mirror
800-783-8871
www.velvac.com

Power Blind

Hunter Douglas
800-22-STYLE
www.hunterdouglas.com

Power Cord Reel

Glendinning Marine
843-399-6146
www.glendinningprods.com

Radio - Dash

Panasonic
800-211-7262
www.panasonic.com

Rear Vision System

Mito Corp.
800-433-6486
www.mitocorp.com

Refrigerator

Norcold
800-543-1219
www.norcold.com

Satellite System

Datron DBS 3000
800-287-5052
www.datrondb.com

Security System

Viper
Directed Electronics Inc.
800-274-0200
www.dei.com

Shock Absorbors

Bilstein
800-537-1085
www.bilstein.com

Slide-Out

Kitchen - Generator HWH
800-321-3494
www.hwhcorp.com

Slide-Out Motor (Bedroom)

Power Gear
800-334-4712
www.powergear.com

Slide-Out Motor (Living Room)

HWH Corporation
800-321-3494
www.hwhcorp.com

Steering Gear

Sheppard
717-637-3751
www.rhsheppard.com

Steering Wheel (Smart Wheel)

Vehicle Improvement Products
847-395-7250
www.vipwheels.com

Solar Panels

RV Solar Consultants
541-937-9812
www.amsolar.com

Storage Trays

Kwikkee
800-736-9961
www.kwikkee.com

Television

Sony
800-222-7669
www.sony.com

Television Antenna

Winegard
319-754-0600
www.winegard.com

Tires

Goodyear Tire & Rubber
800-399-2772
www.goodyear.com

Toilet

Thetford
800-521-3032
www.thetford.com

Transfer Switch

ESCO
219-264-4156
www.escousa.net

Transmission

Allison Transmission
800-524-2303
www.allison.com

VCR

Sony
800-222-7669
www.sony.com

Washer/Dryer

Splendide
800-736-4127
www.splendide.com

Water Heater

Suburban Manufacturing
800-659-2138
www.suburbanmanufacturing.com

Water Manablock

Vanguard
800-775-5039
www.vanguardpipe.com

Water Filter

Premier Manufactured Systems
800-752-5582
www.premierh2o.com

Water Pump

Aquatec
800-975-9995
www.aquatec.com

Wheels

Accuride
800-626-7096
www accuridecorp.com

Windshield Wipers

Diesel Equipment
336-373-8331
www.diesequipment.com

NOTES

EXECUTIVE

SECTION 2 DRIVING & SAFETY

- DRIVING & SAFETY • 27**
 - Inspections • 27*
 - Familiarize Yourself • 27*
 - Safety Seat Belts • 27*
 - Tips for Driving • 28*
- CHECKLIST - PRE-TRIP PREPARATIONS • 31**
 - HITCH • 32**
 - Using the Rear Receiver • 32*
 - Tow Plug Connection • 33*
 - Rear View System • 33*
 - BACKING UP A MOTORHOME • 34**
- CHECKLIST - SET-UP PROCEDURES • 36**
 - DRY CAMPING TIPS • 38**
 - BREAKING CAMP • 42**
- EMERGENCY PROCEDURES - ROADSIDE • 44**
 - Light Retractable • 44*
 - Transmission - Rocking Out • 45*
 - Jump Starting • 45*
- TOWING PROCEDURES • 45**
 - Brake - Disabling the Parking Brake • 46*
- TIRES • 47**
 - The Importance of Air Pressure • 47*
 - How Much Air Should I Carry in My Tires? • 47*
 - Tire Pressure Inflation Guideline • 47*
 - Weight Label • 48*
- WEIGHT TERMS • 49**
- WEIGHING THE MOTORHOME • 50**
 - TIRE CHART • 56**
 - Inspecting & Pressure • 57*
 - TIRE SENTRY (Optional) • 58**
 - Tire Rotation • 59*
 - Blocking When Leveling • 59*
 - Storage of Tires - Long Term • 61*
 - In Case of Flat Tire • 61*
- SPECIFICATIONS - DIMENSIONS CHART • 63**
 - VIEWS - Front & Rear • 64**
 - VIEWS - Curbside & Roadside • 65**
 - SECURITY SYSTEM (Optional) • 66**
 - Operation • 66*
 - SMOKE DETECTOR • 72**
 - Operation • 72*
 - How to Test • 72*
 - Maintenance • 72*
 - Troubleshooting • 73*
 - LP-GAS DETECTOR • 73**
 - Operation • 73*
 - Testing • 73*
 - Alarm • 74*
 - Care • 74*
 - CARBON MONOXIDE DETECTOR • 75**
 - Operation Instructions • 75*
 - Alarm • 76*
 - Testing • 76*
 - Cleaning • 76*
 - FIRE EXTINGUISHER • 76**
 - EGRESS EXIT WINDOW • 77**



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 a motorhome. Always be aware of these differences when traveling. The key for safely operating the motorhome is inspection. A defect could create problems on the road that may result in lost time and money. Several states require that the motorhome be inspected prior to registration. Know and observe the laws in the area you are 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 in becoming familiar with the motorhome. Prior to moving the motorhome, perform a general inspection by examining the condition and area around the motorhome for hazards. Look high and low when walking around the motorhome.

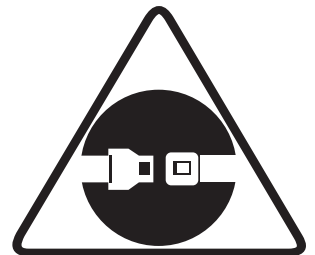
Inspections

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

Familiarize Yourself

All occupants must be furnished with and use seat belts while the motorhome is moving. The driver's seat, and other seats designed to carry passengers while the motorhome is in motion, are equipped with safety seat belts. While the motorhome is 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 one single seat belt to buckle in more than one person. To fasten the seat belt, pull the belt out of the retractors and insert the tab into the buckle. It will click when the tab locks into the buckle. Seat belt lengths automatically adjust to an individual's size and sitting position. Do not route belts over armrest.

Safety Seat Belts



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 motorhome length the turning radius will be much wider than that of a standard automobile. Pay close attention to all perimeters of the motorhome: front, sides, rear, roof and undercarriage. Insure the surrounding area is clear of any obstacles. Utilize the driving mirrors to observe traffic conditions, as well as 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 loss of control of the motorhome. Keep the size of the motorhome in mind and drive with extra caution to avoid situations which might require quick momentum changes. Increase reaction time by paying attention to traffic and road conditions 12-15 seconds ahead of the motorhome's position.

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

When backing up the motorhome, have the co-pilot stand at the roadside rear corner so the co-pilot remains visible in the roadside rear view mirror. The co-pilot can watch for any obstacles and give hand signals during the backing up process. When traveling, make sure the bridge being crossed can support the weight of the motorhome. Check the tonnage limit of the bridges before crossing. Signs should be posted at bridge entrances. Check the posted height of all overpasses or situations where overhead 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 which can damage the undercarriage of the motorhome or become lodged in the dual tires causing damage to the tires, wheel rims or tow car.



- Keep in consideration that posted speed signs are passenger automobile rated. Therefore, an extra awareness of the driving conditions and appropriate speed for a motorhome are necessary, especially on corners and mountain roads.
- Downgrade speed should be at least 5 mph less than upgrade speed, or downgrade speed should be attainable within 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 center line of the road and your hips should be parallel to the roadside curb of the corner being turned. This will aid in avoiding a premature turn.
- Make the turn slowly.
- Check mirrors frequently being aware of 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 interior lights while driving, as they can create a glare on the windshield, decreasing visibility.
- Dim the dash lights to a comfortable level to reduce the level of glare.

Extreme Heat and Hot Weather Conditions:

- Observe all gauges frequently. Any variation from normal conditions should be evaluated promptly.
- Check tire pressure 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 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.
- Avoid using engine retarding device on wet or slippery surfaces, which can cause the wheels to skid.
- Wipers should be in good condition and the washer reservoir should have sufficient window wash fluid that has antifreeze included.
- Use the mirror heat to keep the mirrors clear.
- Remove any ice build-up from the entry step to avoid accidental slipping.

Wet Conditions:

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

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 heights before pulling through the fuel island.
- Be aware of the concrete/steel posts installed around the fuel island.
- Avoid running over the fuel hose as it may get hung up on the motorhome, causing body damage.



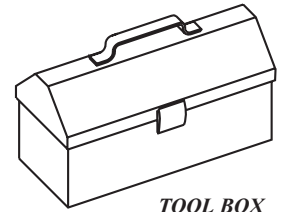
WARNING: Avoid the risk of fire or explosion. Turn off all pilot lights and appliances before refueling.

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.

CHECKLIST - PRE-TRIP PREPARATIONS

Items To Carry:

- Emergency Road Kit (road flares, warning signs, flashlight, fire extinguisher).
- Local, State and National Maps. Truck atlases are available showing maps, refueling stations and truck repair facilities.
- Potable/non-potable water hoses and a water pressure regulator.
- Hand tools.
- 12 Volt DC test light may be helpful when on the phone with a technician.
- A battery hydrometer to check the condition of battery electrolyte.
- A spare 12 Volt continuous duty solenoid (if applicable).
- An assortment of spare fuses.
- One link kit for ride height control assembly (air suspension only).
- A spare alternator belt.
- Charge air cooler hump hose clamp.



TOOL BOX



12 VOLT DC
TEST LIGHT



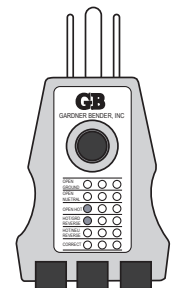
HUMP
HOSE CLAMP



LINK

Interior:

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



POLARITY TESTER.

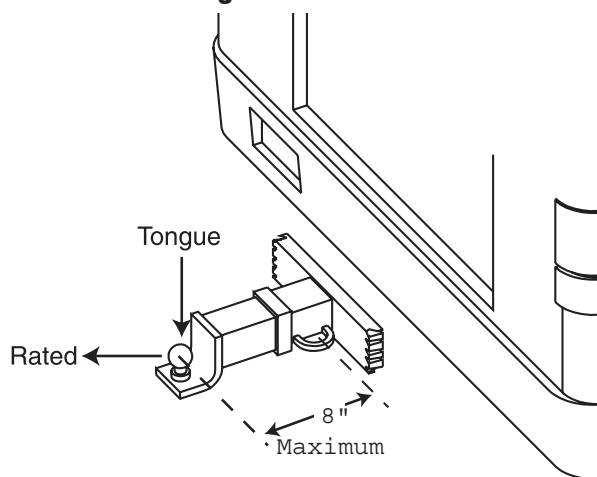
Engine Checklist:

- 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.

Driving Preparations:

- Check operation of all exterior lights, headlamp, taillight, brake and clearance lights.
- Inspect fluid level (if applicable) in oil bath hubs and check tire pressure.
- Check both house and chassis battery condition.
- If applicable, program the navigation system.
- 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.
- 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. Safety and satisfaction require proper receiver use. Avoid excessive loads or other misuse. 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 10% of the hitch capacity. It is recommended to weigh the motorhome when fully loaded to ensure proper weight distribution of the GCVW (Gross Combined Vehicle Weight). When weighing the motorhome add all passenger weight to the GCVW total. The motorhome fully loaded, and any vehicle or trailer towed by it, must not exceed the GCVW.



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 Car or Trailer:

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

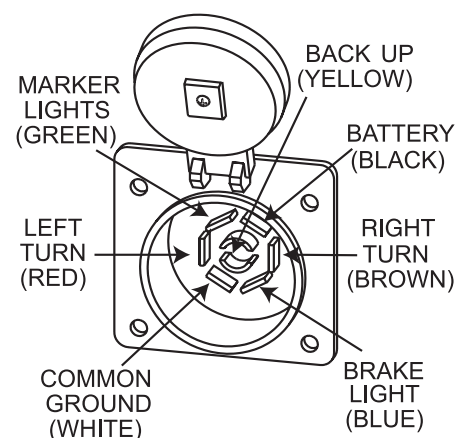
ENGINE TYPE	RATED CAPACITY	TONGUE WEIGHT
ISL 370	10,000 LBS.	1,000 LBS.
ISM 500	10,000 LBS.	1,000 LBS.

A seven-pin electrical connection for towing comes pre-wired from the factory for use in towing a trailer or other vehicle. The connection is located on or near the hitch receiver. The connection design works like an umbilical cord between vehicles. Convoluted tubing protects the tow harness wires. Current draw for each designated light circuit should not exceed ten amps. Within the electrical connection is a positive terminal for use when towing a trailer equipped with a battery. The positive terminal maintains the charge of the trailer battery.

Tow Plug Connection

The tow harness wires are color-coded. Pin assignments are:

- Yellow, 14 gauge - Back Up.
- Green, 14 gauge - Marker Lights.
- Red, 14 gauge - Left Turn Signal.
- White, 10 gauge - Common Ground.
- Blue, 14 gauge - Brake Light.
- Brown, 14 gauge - Right Turn Signal.
- Black 10 gauge - Battery 30 Amp Circuit Breaker.



CAUTION: The positive terminal connection of the tow plug remains live at all times. When towing a trailer equipped with a battery be sure to unplug the electrical tow connection when parked. Failure to unplug the tow connection may result in discharged chassis batteries.

The motorhome uses a seven inch LCD monitor and color camera that provides the driver with a view of the rear of the motorhome. The monitor offers four different perspective views.

Rear View System

Power Requirements:

- Main battery disconnect switch (located in the battery compartment) must be on.
- House battery cut-off switch (located at the entry door) must be on.

To View:

- Press the **OPEN** button. The monitor will automatically slide out and stop in a vertical position.
- Press the **blue** power button.
- Pressing the **MODE** button manually turns ON the monitor. Adjust vertical axis of monitor for optimum view. Use the **LEFT** or **RIGHT** button until the hand points to **CAMERA**. Pressing the **ENTER** button selects the Camera functions. The monitor automatically switches to a rear vision system with **BGV AUTO** selected and placing the transmission in reverse with the engine running. Pressing the **ASPECT** button toggles between the four views **FULL**, **ZOOM**, **JUST** and **NORMAL**.



NOTE: Reset monitor angle position before stowing.

BACKING UP A MOTORHOME

If the destination does not have “pull-through” sites try to pick a solid, level site. If possible, pick a site located on the left side. The driver 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 your criteria, prepare to back in carefully.

Backing up can be a challenge for even a long-time owner of recreational vehicles. Follow some simple guidelines to 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 backing up, with the co-pilot’s guidance, in a large unobstructed parking lot. Backing up a motorhome 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 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.

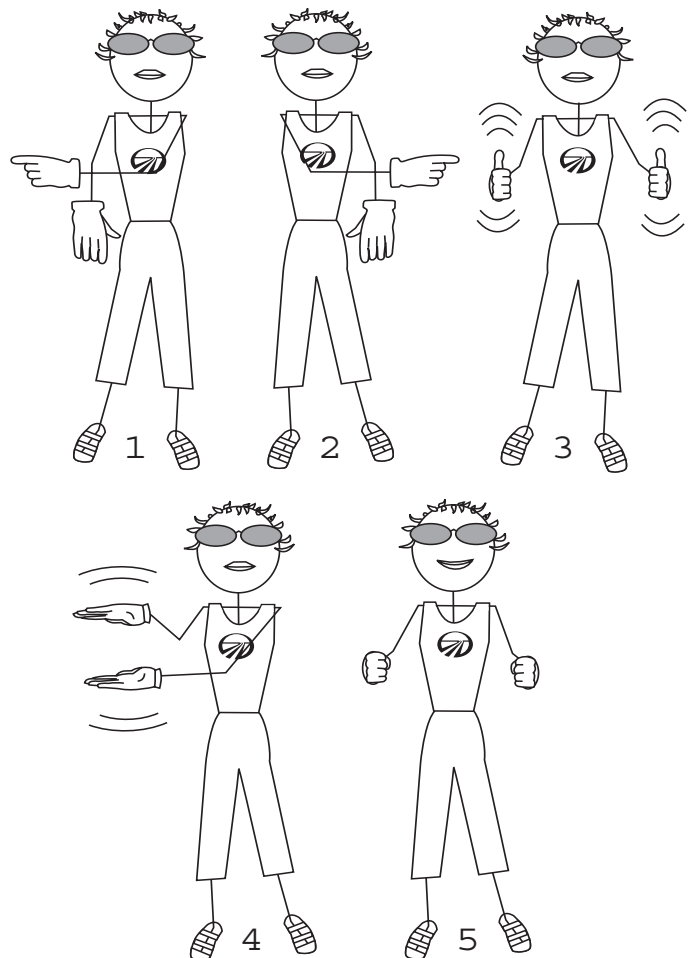
The co-pilot's job is just as important as the driver. When guiding the driver, the co-pilot should be located safely at the left rear corner of the motorhome, facing forward, while remaining visible in the driver side mirror at all times. The co-pilot should make a conscious effort to maintain sight 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 is in 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.

Five clearly defined signals should be used, with only one signal given at a time, when the co-pilot is guiding the driver. Flailing arms with indecisive signals only confuse the driver. Signals should be precise. 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 uses his/her right arm and forefinger to point distinctly left, with arm and finger held on a horizontal plane, to indicate the desired direction of travel of the rear of the motorhome. This type of directional signal can be easily discerned in the mirror by the driver. The directional signal given should remain steady until the 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 the 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. This 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. Try to avoid putting the motorhome and tow vehicle in a backing situation. The only way to back up this combination is to completely disconnect the tow vehicle from motorhome. Trying to back up this combination, even as short of a distance as a foot, can 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 backing a trailer into a space, maneuver the tow vehicle in a wide sweep, then turn back to the opposite direction to set the motorhome and trailer into position to maneuver into the space. When backing a trailer, the driver may become disoriented with the direction of the steering wheel in relation to the direction of the trailer. A tip here is to move the bottom of the steering wheel in the direction the trailer is desired go in. 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 of alignment, pulling forward just far enough to align the trailer with the space. The co-pilot should stand safely at the left rear corner of the trailer, within view of the driver in the roadside mirror, and use the five hand signals for guiding the driver.



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.

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. This checklist has information on hooking up the utilities and preparing the appliances for use. Specific information on the slide room, awning and leveling system operations is discussed in detail in other sections.



For more detailed information refer to the section pertaining to the item of interest.

- If applicable, unlock any travel locks which may be securing the slide room awning. Check for lateral clearance before extending the slide out room.



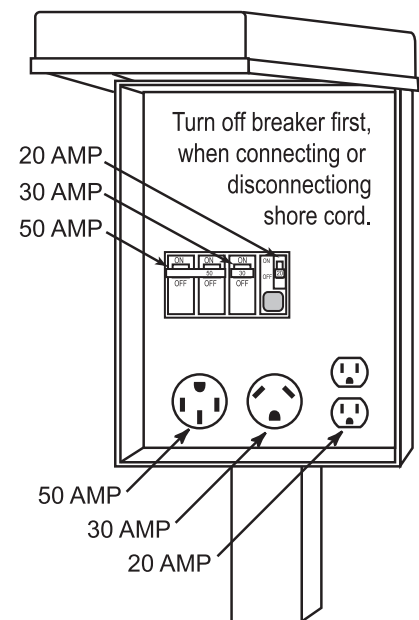
NOTE: To operate the kitchen slide: The ignition must be OFF, the park brake must be set and the bay doors directly under the slide room must be closed.

CAUTION: Before leveling the motorhome survey the area around and under the motorhome for obstructions which can damage the motorhome or undercarriage components when the air bags are deflated.

- Follow the procedures and guidelines for “Leveling the Motorhome.” If the motorhome is equipped with hydraulic jacks, be certain the parking surface will accommodate the weight placed on the jacks.

CAUTION: Hot asphalt may not support the weight that is placed on the hydraulic jack pads. Place thick plywood under the jack pads to help disperse the weight. Never use the leveling system to support the entire weight of the motorhome. Damage from excessive torsional twists can result.

- Open the LP-Gas tank valve.
- If possible, begin appliance operation on LP-Gas for the first 60 minutes. This will allow time for the inverter to stabilize the battery charging. Switch the refrigerator operation to gas, start the water heater and furnace (if needed).
- 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. Operate electrical appliances in sequence when hooked to a limited shore power service. Turn shore power circuit breaker OFF prior to plugging in the shore cord.



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

- If cable service is provided, hook-up a 75 Ohm, RG59 or RG6 cable to the cable connection in the service center. If the motorhome has a video selector box press the appropriate viewing button for the item desired.
- A phone connection port is provided in the service center. Phone utility outlets are placed throughout the motorhome, including a phone line attached to the satellite receiver for Pay Per View movies and events.

- Hook 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.”



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

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

DRY CAMPING TIPS

With a little planning and conservation of resources, dry camping will be no more difficult than using full hook ups.

Dry camping requires fully charged and maintained batteries (corrosion cleaned, terminals tightened, cables checked, etc.). If the battery water needs to be refilled, use only distilled water. Water containing high concentrates of chemicals will ruin the batteries.

Verify the fresh water tank is full and empty the holding tanks. Many dry camping sites have a running waterspout at the site. Do not refill the fresh tanks at the site without first emptying the waste holding tanks as they will be unable to hold the extra waste water.

Equip the motorhome with solar panels. Solar panels are a valuable tool in keeping the batteries charged. If the motorhome is equipped with two panels, the first will sustain the parasitic loads. The second panel (and third if available) will charge the battery during the sunlight hours. Keep in mind the solar panels require regular cleaning. Dust, dirt, grime and pollution from the road and air can decrease their efficiency. Clean the solar panels with a spray window cleaner using a soft cloth.

Have a full tank of diesel fuel, gasoline or LP-Gas, depending on what type of generator you have.

There are plenty of dry camping locations with suitable sites that can accommodate a motorhome. Confirm with the campground host that a particular facility will accommodate a motorhome. Arrive at the campground during daylight hours so you can properly park the RV and prepare for the night ahead. Getting to the site on the narrow and winding campground roads takes skill and patience to avoid the low hanging limbs and tree trunks lining the path. Have the co-pilot or the campground host assist with maneuvering the motorhome around the curves and bends.

Because hookups are not a concern, take the extra time to ensure proper setup. Make sure there is plenty of room to extend the slide-out room(s). When dumping the air bags and leveling the motorhome, remember that the leveling process will drain some of the battery power.

For units equipped with auto leveling, be sure no people or pets are moving in the coach during the leveling process. Manual leveling will be less critical.

Setting up for dry camping:

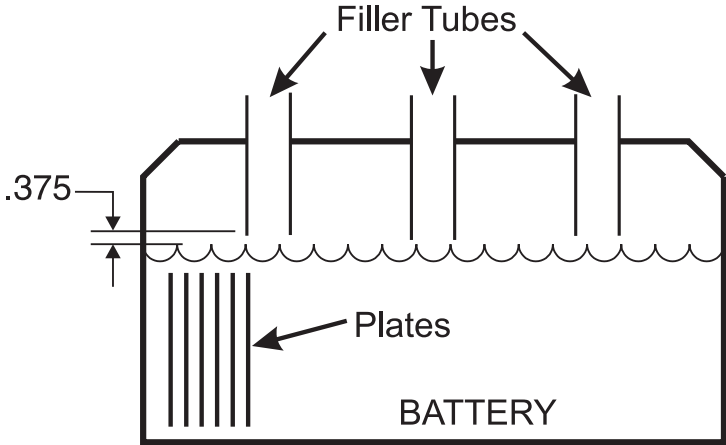
- Turn the refrigerator off auto and switch over to gas.
- Switch the water heater to LP-Gas and turn it on about an hour before hot water is needed.
- Set the furnace to a desired nighttime temperature and keep it a bit cooler to prevent the furnace from cycling all through the night.
- Check on small items that use battery power, such as the porch light, bay lights, under step light, generator compartment lights, engine compartment lights, etc. If the television is not being used, turn off the 12 Volt booster. One light left on, such as under the front cap near the wipers, can reduce the battery considerably. Do not forget to check the engine block heater in the event it has been plugged into the outlet and is operating a 1,400-watt element when the inverter is on. In a case like that, the batteries will not stay up for even 12 hours.
- Some battery draw has to be left on. Leave the battery kill switch on at the entry door because the eyebrow in the refrigerator (some models) requires 12 Volts to operate. In most motorhomes, even though it is switched to gas, the furnace requires 12 Volts to operate the fan.
- Keep flashlights handy. If some nighttime hours are to be spent outdoors, build a campfire. Illuminate the vicinity around the outside of the motorhome with some inexpensive tiki torches. Just remember to transport the torches empty of fuel (keep the container in the storage bay) and extinguish the flames before retiring for the night. Many campgrounds place wood or cement barriers between the site space and fire pit. Be sure to illuminate any barriers or obstacles in the pathway to the motorhome.
- A large size flashlight positioned at the front door is perfect for navigating through the coach during the dark of night without having to use the interior lights. If interior lights are needed, remove excess bulbs in the fixtures to conserve on battery usage. Just one bulb in a central location, such as the vanity, will be sufficient.

- During the day it is still important to conserve on energy. Turn on the water pump only when using water; get in the habit of turning the pump off when not in use. While the water pump does not draw an abundance of power, the battery amp hours while dry camping are important and should be conserved.
- If it is too early or too late in the day to run the generator, use the inverter. Remember to turn off the inverter when not in use. When the rest of the campground is up and about, turn on the generator and run it for a couple of hours. The generator may seem loud and intrusive, however, the noise is minimal just a short distance away from the coach. Run the generator during clean up and preparation for the day.
- Check the monitor panel frequently and keep track of the water usage and battery consumption. Routinely check the LP-Gas and remember that more gas is used in cold weather.
- Careful management of water is critical when dry camping. Know the motorhome tank capacities. Picture the amount of liquid it takes to fill a two-gallon container and visualize that amount each time you run the water. If you are dry camping for a time, limit the shower usage. Turn the water off when soaping down in the shower. If water conservation is a must, take a sponge bath. Conserve water while brushing your teeth or join the tent campers at the outdoor water spigot. Chances are a campground without hookups will not have large comfortable shower rooms or bathrooms. It may only be equipped with a primitive outhouse, however, if it helps to economize on water, use it.
- Do not fill a sink full of water to wash a few dishes. Use disposable dishes whenever possible. Cook dinner over the campfire. However, if cooking over the campfire is not desired, use the microwave. If you choose to use the microwave, do not run the microwave with just battery power and the inverter because battery power will be consumed quickly. Use the generator to operate the microwave. It is healthy for the generator to run under a strong load such as the microwave.
- Allow the generator to power up for five minutes before plugging in a load.
- Plan ahead what is needed from the refrigerator prior to opening it to conserve the battery power. If the weather does not permit eating out at the picnic table (or if no picnic table is available), eat at the dinette table by candlelight. Leave shoes outdoors to avoid having to run the vacuum cleaner. Open the windows during the day instead of running the air conditioner.

- Get back to nature and still enjoy the comforts of the motorhome. With a little imagination, the ways to stretch out available resources while dry camping are endless. Camping without hookups is nothing to fear – it is a challenge to overcome. It will be a pleasant surprise to discover how little of an inconvenience dry camping can be.

Typical Current Draw:

- 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 has a 2.1 Amps draw.



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

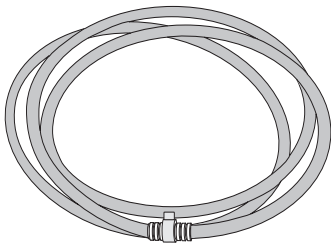
Battery State of Charge vs Voltage/Specific Gravity			
VOLTAGE	SPECIFIC GRAVITY	STATE OF CHARGE	DEPTH OF DISCHARGE
12.66	1.265	100%	0%
12.45	1.225	75%	25%
12.25	1.190	50%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%

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. Properly securing and storing items will help prevent them from getting lost or being damaged during travel.

Outside Checklist:

- Disconnect the cable TV, lower the television antenna and (if applicable) the satellite dish.
- Disconnect and stow the phone line.
- Retract the awnings and secure them for travel.
- Close LP-Gas tank valve. Check the level of the LP-Gas Tank to ensure a sufficient amount is available.
- 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 allowing 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, 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 using the potable hose only. 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.
- Inspect fluid level in oil bath hubs (if applicable) and check the pressure in all tires.
- Secure all compartment doors and entry door.
- Inspect tires and wheels.
- Check for fluid leaks under or around the motorhome.



Screw the ends of the hose together before storage to prevent leakage and to prevent dust and insects from entering hose.

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.
- Inspect gauges and controls for proper operation.

Interior Checklist:

- If applicable, start the engine. Retract leveling jacks allowing the air suspension to obtain proper ride height before moving the motorhome.
- If applicable, clear the slide room path, clean the floor, move the driver seat forward and make sure the bay doors are shut. Once the slide room is fully retracted secure any slide room awning locks.



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.
- Turn off interior lights.
- Turn off water heater, water pump and furnace.
- Walk through the interior and check for any unsecured items.
- Turn the interior lighting off.
- Check the fuel level gauge. Check all other dash gauges for operation and correct level indications.

Departure Checklist:

- Check items in storage bays to make sure shifting or damage of items will not occur.
- Look around, above and under the motorhome for obstructions. Check for debris stuck between the rear dual tires.
- Walk around the motorhome and camp area checking for forgotten items.
- Outside compartment doors should be closed and locked.
- Check operation of all exterior lights, headlamp, taillamp, brake and clearance lights.
- Carefully pull forward out of the campsite. If necessary, clean the site and check for any forgotten items.
- Secure and lock the entry door for travel.

EMERGENCY PROCEDURES-ROADSIDE

If an emergency situation should occur, use the appropriate braking technique and pull off the roadway a safe distance from traffic (if possible). Set the parking brake. Turn ON the hazard warning flashers especially when parked alongside traffic lanes. In the event of an emergency stop due to a mechanical breakdown or other motorhome related problems contact Monaco Coach Corporation Customer Support (1-877-466-6226) or your emergency services provider.

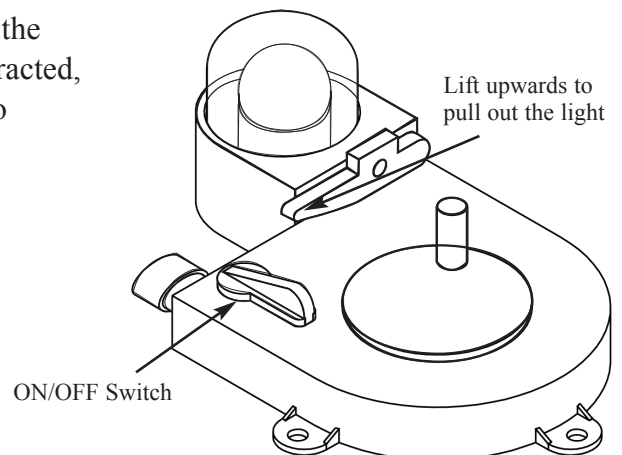
An emergency road kit should include at least three reflective warning signs, road flares, flashlight, spare automotive fuses and an assortment of hand tools. For added safety a separate fire extinguisher should be considered. The motorhome is equipped with a fire extinguisher located inside next to the co-pilot seat. Road flares or reflective warning signs can be displayed if the motorhome is alongside of the road for any length of time.

Guidelines for placing the warning triangles depend upon the road characteristics and visibility. For example: The standard placement is 10 feet, 100 feet and 200 feet from the rear of the motorhome when on a divided highway or one-way road. On a two-way road with traffic traveling both directions the same placement would also be required at the front of the motorhome. Roads with curves and hills may require the placement of the last/furthest triangle to be 500 feet behind the motorhome in order to safely warn approaching traffic.

Light - Retractable

The retractable light is located in places of limited lighted for emergency purposes. Normally one will be on the front fire wall, the outside access of the rear engine compartment and the roadside electrical compartment. To use:

1. The bay light switch (located just inside the entry door) will need to be turned ON. To activate the light: Move the switch to the ON position.
2. The light has an 18' retractable reel cord. **To operate:** 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:** 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 full throttle as you may spin the wheels and bury yourself 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.

When using jumper cables to start the engine, make sure the cables are connected in parallel. That is positive (+) to positive (+) and negative (-) to negative (-). **Always connect the positive (+) before the negative (-) and disconnect the negative (-) before the positive (+) to prevent arcing.** When using an external electrical source to start the engine shut the disconnect switch to **OFF** position.

Jump Starting

Batteries can emit explosive gases. Always ventilate the battery compartment prior to any work or service to the batteries. Extinguish all smoking material and keep all open flame and spark producing devices away from battery area.

In the event of a roadside emergency, contact the nearest Cummins Center or phone **1-800-DIESELS** for Cummins Customer Assistance Center.

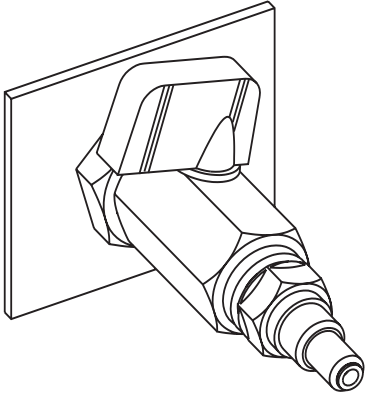


WARNING: The gases around the battery can explode if exposed to flames, sparks or lit cigarettes. An explosion can result in injury or vehicle damage. Batteries contain sulfuric acid, which burns skin, eyes and clothing. Do not connect the end of the second cable to the negative (-) terminal of the battery to be jumped. A spark may cause an explosion of the gases that surround the battery. Connect only to chassis, away from the battery.

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.

**TOWING
PROCEDURES**

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

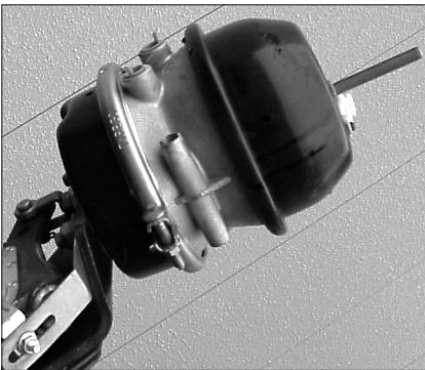


- Secure any loose or protruding parts if the motorhome is damaged.
- Inspect points of attachment on a disabled motorhome. If attachment points are damaged, select other attachment points at a substantial frame structural member.
- Never allow anyone to go under a motorhome while it is being lifted 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: If the motorhome requires towing, ensure all precautions are followed. The driveline must be disconnected and the mud flap may need to be removed. When towing a motorhome equipped with the HWH Air-Leveling System, the ignition switch MUST be left in the ON position and the ignition must be in working order so that air suspension may operate. Damage to the motorhome from a towing company will not be covered by the manufacturer.

Brake - Disabling the Parking Brake



Brake Chamber.

- Block wheels securely before attempting this procedure.
- Remove plug from center rear brake chamber. Save plug for reuse.
- Remove the caging tool from its holder on the rear brake chambers and insert it into the hole. Turn the tool clockwise to engage.
- Use a wrench to tighten the nut down, which compresses the internal spring, releasing the brake.
- Repeat procedure for the other side.
- After towing, or when air pressure is again available, loosen the nut and remove the tool. Return the tool to its original location and replace the plug.
- Repeat process for the other side.



WARNING: Do not attempt to disassemble brake chambers without required tools and without having studied specific manufacturer's instructions. Chambers contain springs under high tension. Improper handling can result in component damage or personal injury.

TIRES

Tires for the motorhome are a technical and precisely engineered product. For maximum wear and the best service from the tires, it is helpful to understand the function of the tire. A tire is a “container” that holds air. The combination of air and the tire casing supports the motorhome and its contents. Because the tire is the only contact the motorhome has with the road surface, it must provide functions such as traction for moving, stopping, steering, as well as, provide a cushion for the motorhome.

Maintaining proper inflation is the most important factor in maximizing the life of the tires. Driving on a tire with incorrect 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 exceed the design limits of the rubber and radial cords, resulting in sudden failure. Underinflation can also cause poor handling of the motorhome, rapid and/or irregular tire wear and an increased rolling resistance, resulting in decreased fuel economy.

Over-inflation of the tire reduces its “footprint” or contact with the road; therefore, reducing traction, braking capacity and handling of the motorhome. An over-inflated tire for the load produces a harsh ride, uneven tire wear and is more susceptible to impact damage. Maintaining correct tire inflation pressure for each loaded wheel position on the motorhome is of the utmost importance and must be a part of regular motorhome maintenance.



WARNING: Improperly inflated tires can affect recreational vehicle handling or may fail suddenly, possibly resulting in loss of vehicle control. Use an accurate tire pressure gauge.

Federal law requires that the specifications for the tire’s maximum load rating be molded into the sidewall of the tire. The amount of air pressure to use is dependent on the weight of the motorhome when it is fully loaded. The chart within this section shows weights that can be supported by various air pressures. Utilizing less air pressure means a lesser load can be carried by the tire.

Always comply with the tire manufacturer's recommended pressure inflation guideline. The actual weight of the motorhome can vary significantly depending on how it is loaded. Periodic inflation adjustments to comply with the tire manufacturer's guideline may be necessary to provide optimum handling and ride. A tire inflation chart, listing proper inflation for different loading conditions of various size tires, is contained in this section of the manual. Monaco Coach Corporation inflates the tires of the motorhome to pressure(s) appropriate for the actual weight on each axle in the unloaded, shipped condition. When the motorhome is loaded, it is important to check and adjust the inflation pressure on each tire as needed. Always inflate tires at a pressure high enough to handle the actual load on the tires. **DO NOT OVERINFLATE THE TIRES.**

The Importance of Air Pressure

How Much Air Should I Carry in My Tires?

Tire Pressure Inflation Guideline

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

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

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

Weight Label

MODEL YEAR: <u>2002</u> MAKE: <u>MONACO COACH</u> MODEL: <u>EXECUTIVE</u>	
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 the towable product (*2)..... _____
	FACTORY INSTALLED OPTIONS are options installed at the factory but do not include dealer installed after market equipment... _____
CARGO CARRYING CAPACITY (CCC) COMPUTATION	
GVWR	_____
minus UVW	_____
minus fresh water (*3) weight of ___ gallons @ 8.3 lbs./gal	_____
minus LP-Gas weight of ___ gallons @ 4.5 lbs./gal	_____
minus SCWR of ___ persons @ 154 lbs./person.....	_____
CCC for this motorhome (*4)	_____
CONSULT OWNER MANUAL(S) FOR SPECIFIC WEIGHING INSTRUCTIONS AND TOWING GUIDELINES.	
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 for 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.	

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) shows 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**, the motorhome must be weighed in a loaded condition to know its actual weight. Weigh the front axle, the total unit and the rear axle. 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 gives 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. The following is an explanation of commonly used weight abbreviations.

- **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 Combined 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.
- **Gross Combined Axle Weight (GCAW):** GCAW means the sum of the total weight of all axles when added together.

WEIGHING THE MOTORHOME

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 load 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's side. The tire inflation pressure of the driver's side tires determines the inflation pressure for all tire(s) on that axle. This is due to the weight transfer that occurs when cornering. Approximately the same weight load will be transferred to the passenger side around left-hand corners.



NOTE: When weighing a motorhome equipped with a slide-out room, each tire on any axle must be inflated to the same pressure. The wheel position carrying the most weight will determine the tire inflation pressure for each tire of that particular axle.

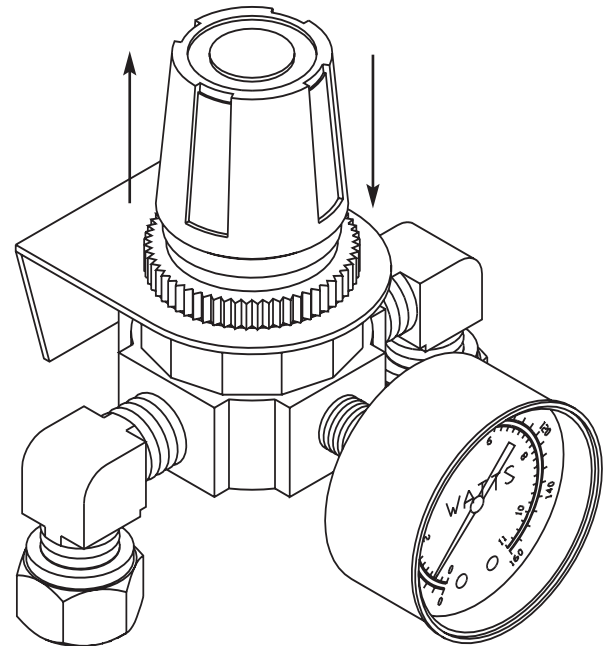
Tag Axle Motorhome (Roadmaster Chassis):

A motorhome equipped with a tag axle will require adjustment to the air pressure regulator for the tag axle. Adjustment of the regulator helps maintain proper axle weight distribution ratios. The adjustable regulator and gauge package is located in the engine compartment on the roadside.

The regulator controls the amount of air pressure in the tag axle air bags. Increasing the regulator air pressure gauge reading increases the amount of air pressure in the tag axle air bags, which increases the downward force of the tag axle. Applying more downward force to the tag axle increases the weight carried by the tag axle. Increasing the weight carried by the tag axle decreases the weight carried by the drive axle and slightly increases the weight applied to the front steering axle.

Tag Axle Regulator Adjustment:

The pressure regulator adjustment knob has a positive lock. Pull up on the knob to unlock, push down on the knob to lock. Tighten or turn the knob clockwise to increase air pressure. Loosen or turn the knob counterclockwise to decrease air pressure. When decreasing regulator air pressure the regulator will release excess air through the regulator discharge port. Each time an increase or decrease of air pressure to the regulator is made an air pressure stabilization procedure will also be performed.



Pull knob up to unlock. Push knob down to lock.

The stabilization procedure equalizes the regulator to hold a constant air pressure setting.

To perform the stabilization procedure:

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

When increasing the air pressure setting allow approximately a two pound pressure increase before the stabilization process. Example: If the desired setting is 30 psi., slowly rotate the regulator adjustment knob clockwise to 28 psi. Perform the stabilization procedure. Regulator setting will stabilize to approximately 30 psi. When decreasing the air pressure setting rotate the regulator adjustment knob counterclockwise, allowing the excess air to be discharged. Next, perform the stabilization procedure.

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.

For the location 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. Slide-out motorhomes with a Tag Axle will require a six position 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.

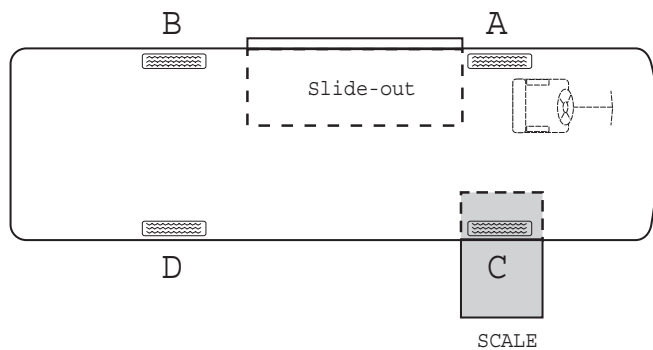
Example:

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 $GAWR \div 2$. Example: If rear axle GAWR is 13,000 lbs., $GAWR \div 2$ would be 6,500 lbs.
- Weigh the roadside rear corner (scale B) and record the scale reading next to Gross Axle Weight (GAW) for scale B. Example: Scale B reading is 5,100 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 1. GAWR \div 2 (6,500)

B 2. GAW (5100)

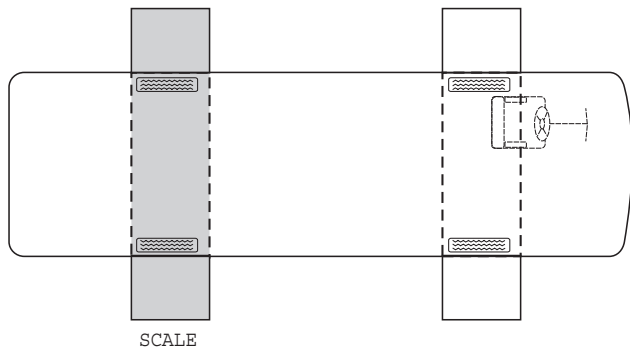
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1. GAWR (13,000)
2. GCAW (10,000)

Scale 1. GAWR \div 2 (6,500)

D 2. GAW (4,900)



Weighing a two-axle, non-slide motorhome:

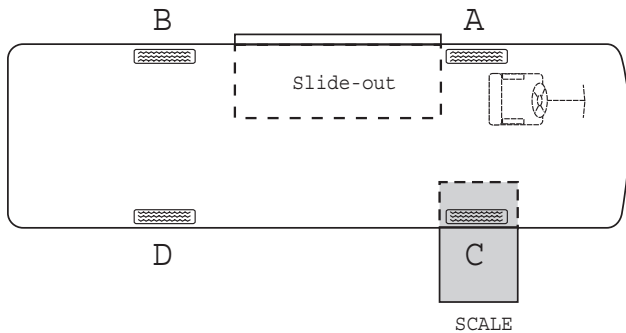
- Record the Gross Axle Weight Ratings (GAWR) and the Gross Vehicle Weight Rating (GVWR).
- Weigh and record each wheel position or total axle weight.
- If necessary, adjust the payload so the GAWR is not exceeded. Total combined weights must not exceed the GVWR.
- Using the tire chart, locate the recommended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

$$\underline{\text{GAWR (Rear)}} + \underline{\text{GAWR (Front)}} = \underline{\text{GCVW}}$$

$$\underline{\text{GAW (Rear)}} + \underline{\text{GAW (Front)}} = \underline{\text{GCAW}}$$

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

$$\begin{array}{r} \text{Scale B} \\ \frac{\text{GAWR} \div 2}{\text{GAW}} \end{array} + \quad = \quad \frac{\text{GAWR}}{\text{GCAW}}$$

$$\begin{array}{r} \text{Scale D} \\ \frac{\text{GAWR} \div 2}{\text{GAW}} \end{array}$$

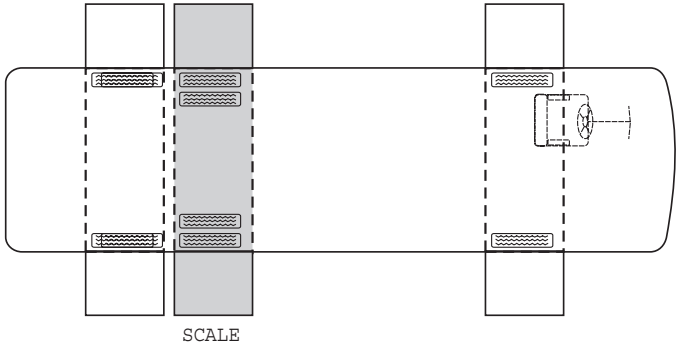
Front

$$\begin{array}{r} \text{Scale A} \\ \frac{\text{GAWR} \div 2}{\text{GAW}} \end{array} + \quad = \quad \frac{\text{GAWR}}{\text{GCAW}}$$

$$\begin{array}{r} \text{Scale C} \\ \frac{\text{GAWR} \div 2}{\text{GAW}} \end{array}$$

Weighing a tag axle, non-slide motorhome:

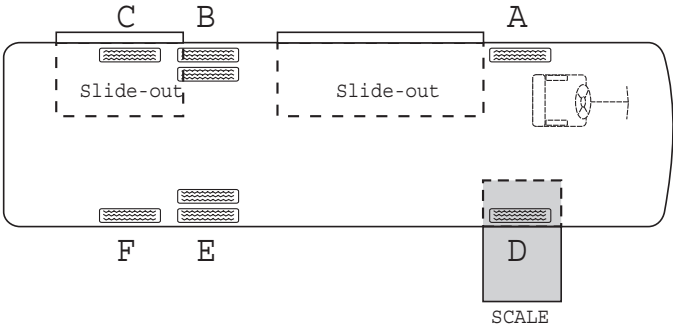
- Record the Gross Axle Weight Ratings (GAWR) and the Gross Vehicle Weight Rating (GVWR).
- Weigh and record each corner or total axle weight.
- If necessary, adjust the tag axle regulator to compensate for the payload carried by the tag, drive and front axles.
- Perform the regulator stabilization procedure.
- 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.



$$\begin{aligned} \text{GAWR (Tag)} + \text{GAWR(Rear)} + \text{GAWR (Front)} &= \text{GCVW} \\ \text{GAW (Tag)} + \text{GAW (Rear)} + \text{GAW (Front)} &= \text{GCAW} \end{aligned}$$

Weighing a tag 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 each side of each axle.
- If necessary, adjust the tag axle regulator to compensate for the payload carried by the tag, drive and front axles.
- Perform the regulator stabilization procedure.
- If necessary, adjust the payload so the GAWR is not exceeded. Total combined weights must not exceed the GVWR.



TAG

Scale C

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \\ + &= \frac{\text{GAWR}}{\text{GCAW}} \end{aligned}$$

Scale F

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \end{aligned}$$

DRIVE

Scale B

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \\ + &= \frac{\text{GAWR}}{\text{GCAW}} \end{aligned}$$

Scale E

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \end{aligned}$$

FRONT

Scale A

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \\ + &= \frac{\text{GCVW}}{\text{GCAW}} \end{aligned}$$

Scale D

$$\begin{aligned} \frac{\text{GAWR}}{2} \\ \text{GAW} \end{aligned}$$

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)						
275/70R22.5	75	D S				4535 4885	4855 5265	5080 5515	4960 5305	5165 5530	5370 5750	5575 5965	5775 6185	5975 6400	6175(H) 6610(H)			
275/80R22.5	75	D S							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	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				
315/80R22.5	75	D S					5840 6415	6070 6670	6395 6940	6540 7190	6770 7440	6940 7610	7210 7920	7610(J) 8270(J)	6940(H) 7830(H)			
285/75R24.5	75	D S		4740 4770		4930 4990	5205 5210	5310 5420	5495 5675	5675(G) 5835	6040	6175(G)						

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

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 noticing 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 flat tires on the same side of 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 starting the 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 the tires must be checked when they are warm or hot, allow for a slight increase in air pressure and make sure they are within a couple of pounds of each other on the same axle (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 the inflation of the inner dual wheel, which has the valve stem pointing outward, to be checked. The outer wheel has the valve stem pointing inward. Nothing should restrict the ability to check air pressure in the tires daily when traveling in the motorhome. Pressure sealing valve caps should always be used to prevent air from escaping from the valve stem. If valve stem extension hoses are used, make sure they are of 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. Air pressure of all tires should be checked and corrected prior to travel, or daily 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.



WARNING: Improperly inflated tires can fail suddenly or cause difficulty in handling the motorhome, resulting in loss of vehicle control. Use an accurate tire gauge to check pressure.

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 SENTRY (Optional)

The tire sentry continuously monitors the tire pressure of all wheel positions, including the tow vehicle. The LED (Light Emitting Diode) display indicates the respective wheel positions. Each wheel position has a battery-operated sensor that uses a specific radio frequency to transmit information to the display. If a low-pressure condition occurs, the sensor broadcasts a low power signal received by the display. The display illuminates the respective LED, accompanied by a 30 second alarm. The manufacturer programs a specific pressure on each sensor at which the signal broadcasts. The sensors are marked with an assigned wheel position.

System Operation:

- System normal no alarm or illuminated LED.
- Sensor detects air pressure loss.
- Display illuminates respective LED accompanied by a 30 second alarm.
- Press reset to ensure alarm was not erroneous. Display cancels system normal. No further action required.
- Display illuminates again accompanied by alarm.
- If traveling, safely exit roadway as soon as possible to a hard, level surface.
- Use tire pressure gauge to verify tire pressure.
- If the motorhome tire pressure is low, contact professional help. Do not attempt to remove tire. Special equipment is required to perform the task.

System Maintenance:

- Display requires no maintenance.
- Sensor batteries require occasional replacement.
- Display will activate a Low Battery indication when sensor battery is low. It is recommended replacing batteries in sets rather than individually. Observe polarity when replacing batteries.

***Battery type: 357G or 1154S.**



NOTE: Replacement sensors are available. Specify (cold) tire inflation pressure when ordering replacement sensors.



CAUTION: Sensors are programmed for a specific tire location. Do not cross match sensor location. This effects the accuracy of the system.



CAUTION: When replacing tires observe the following information. Tire manufacturers emboss into the sidewall of the tire the maximum tire load and recommended tire inflation pressure. If the replacement tire inflation pressure differs from the original with respect to load, a new sensor must be obtained.

Tire rotation assists in uniform wear on all tires of the motorhome and can help achieve a longer tire life. 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 that has developed should be evaluated before rotation. Misalignment, imbalance or other mechanical problems may exist and need to be corrected prior to rotation.

The tire rotation should be performed every 6,000 to 8,000 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.

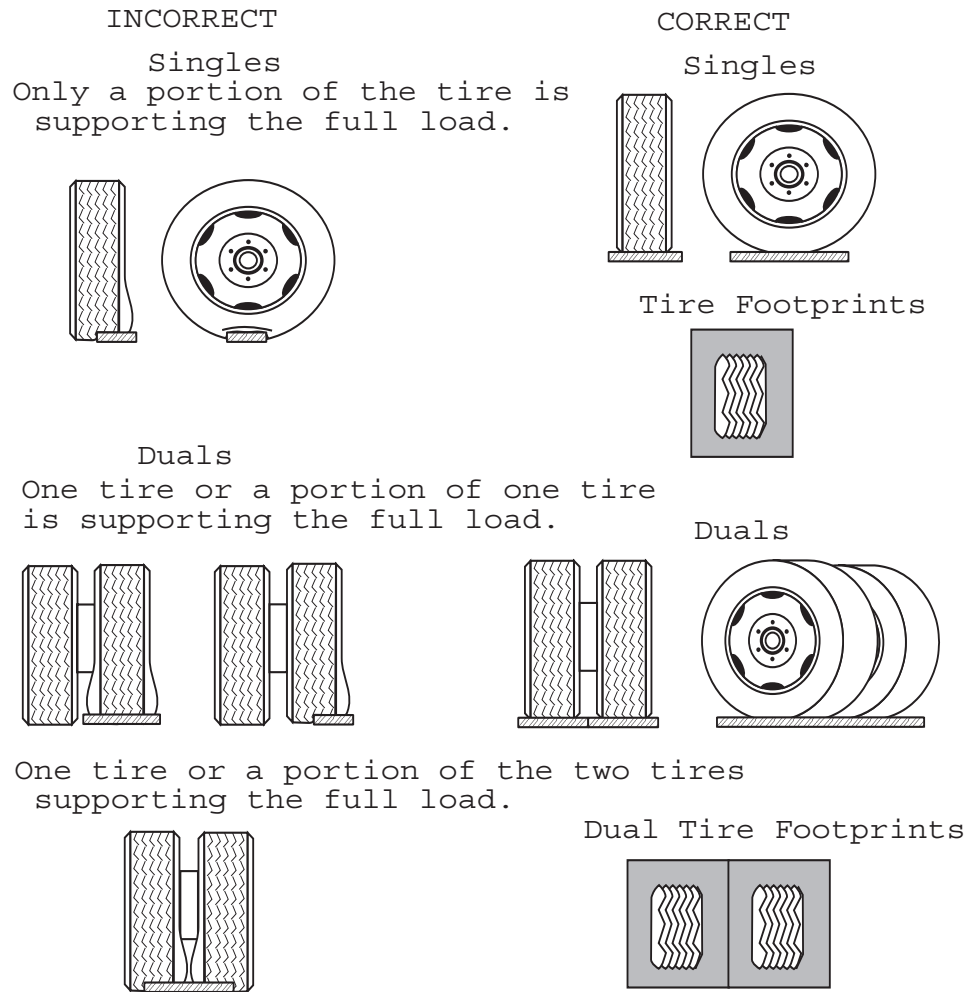
Tires are covered by the tire manufacturer only. Monaco Coach is not responsible for tire wear.

Tire Rotation

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.

Tire "Blocking" Methods



Proper 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.

Proper care and methods of cleaning must be used to obtain the maximum years of service from the tires. Use a soft brush and a mild detergent to clean the tires. If a product is applied to "protect" the tires from aging, use extra care and caution. Petroleum or alcohol based products may cause deterioration or cracking. A chemical reaction to the rubber may occur over time.

When these same 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, motorhome tires may last longer due to limited annual mileage and exposure.

Storage of Tires - Long Term

The motorhome is designed for recreation, not long-term storage. However, unless occupied full-time, it will need to be stored. Rubber tires age faster when they are not in use. A cool, dry, sealed garage is the preferred method of storage. Many motorhomes 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 can help protect the tires.

If the motorhome is out of service for a period of thirty days or more, it should be prepared for long-term storage. The ideal conditions would be to place the motorhome on blocks to remove all weight from the tires, and reduce tire inflation pressure to 15 PSI. However, this is not always possible. A few simple steps can reduce the aging effects from long-term storage or non-use periods.

- Thoroughly clean the tires.
- Unload the motorhome so there is minimum weight on the tires.
- Ensure the surface is level, firm and clean with good drainage.
- The tire inflation pressures should be increased to 25% above the actual load when the tire is placed in the storage condition.
- Move the motorhome every three months to prevent cracking in bulge areas as well as flat-spotting from prolonged sidewall strain and tread deflection.
- Cover the tires to block direct sunlight and ultraviolet rays.
- Store the motorhome out of a high ozone area.

Failure to take these steps can cause early deterioration and shorten the life of the tires.



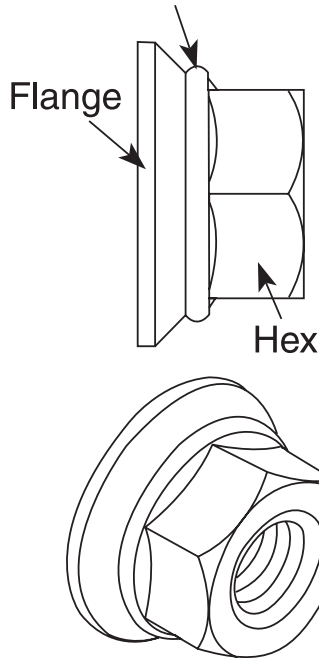
NOTE: When the motorhome is stored without using blocks, the tires should be inflated to maximum inflation pressure as indicated on the sidewall of the tire.

Before removing the motorhome from long-term storage, thoroughly inspect each of the tires. Closely examine the tread area and air pressure of each tire. If the tires have lost air pressure during storage, inflate them to the correct pressure for the current load before putting the motorhome into service.

In case of a flat tire it is recommended to call for roadside service. The size and weight of the motorhome and tires require that the proper equipment be used to change the tire. Professional service technicians have the equipment and training necessary to repair or replace the tire. In the case of sudden tire failure, avoid heavy braking. Hold the steering wheel firmly and gradually decrease speed. Slowly move to a safe place off the road, which should be a firm, level spot. Turn the ignition off and the hazard flasher system on. Goodyear Tire Company has an emergency number which offers 24 hour assistance. To contact Goodyear call **(877) 484-7376**. Be sure to save the tire that is removed for warranty purposes.

In Case of Flat Tire

For used nuts: Add 2 drops of oil between Flange & Hex.

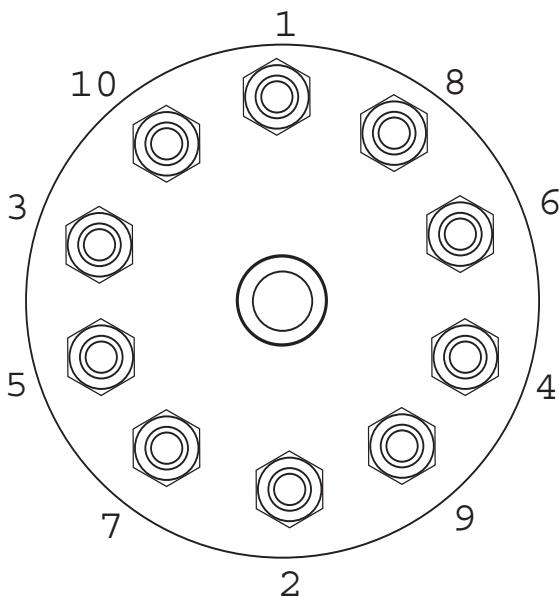


Hub Piloted Mounting:

- 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 to the nuts and may cause 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. lb. first, then sequence tighten to 500 lb. (over-tightening can cause distortion).



Nut Tightening Sequence

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 500 ft.lbs in sequence (as shown in the illustration).

Dual Rear Wheels:

Slide the inner dual wheel over the studs, being careful not to damage the stud threads. Align the hand-holds 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 500 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.

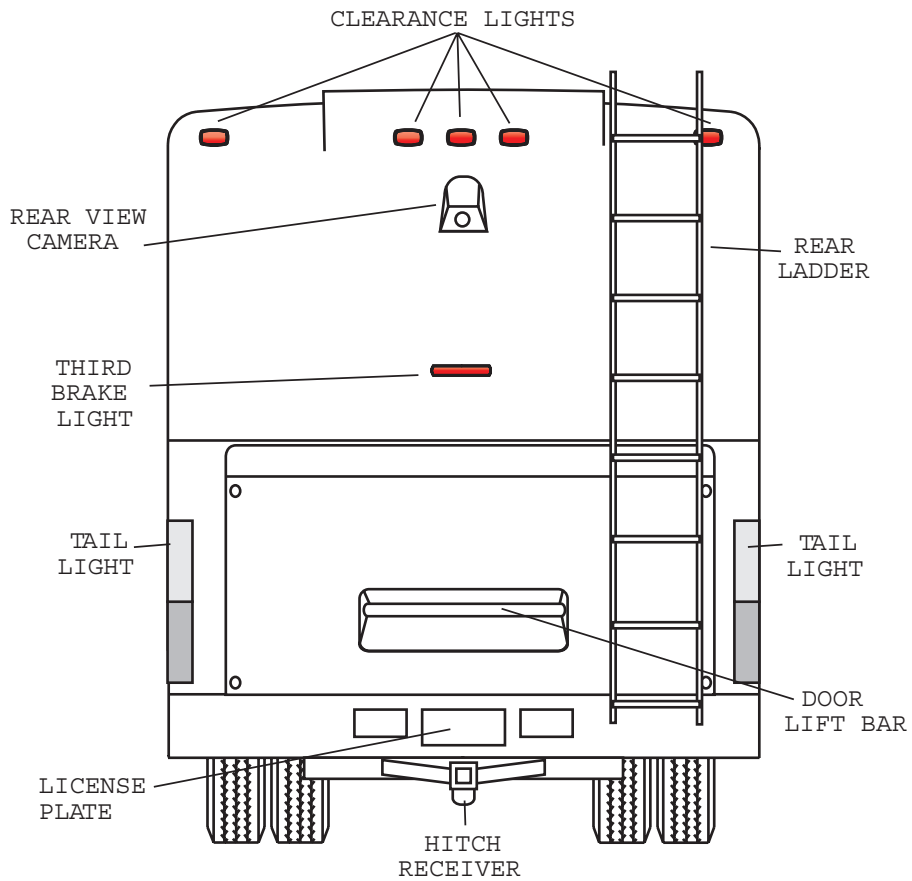
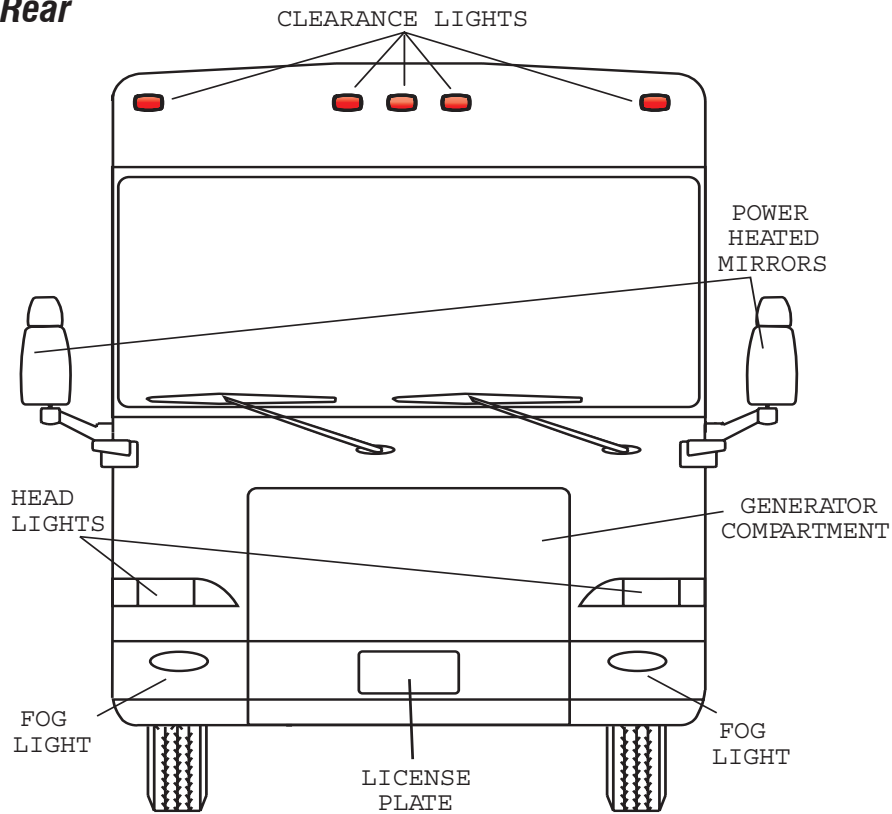
SPECIFICATIONS - DIMENSIONS CHART

Measurements

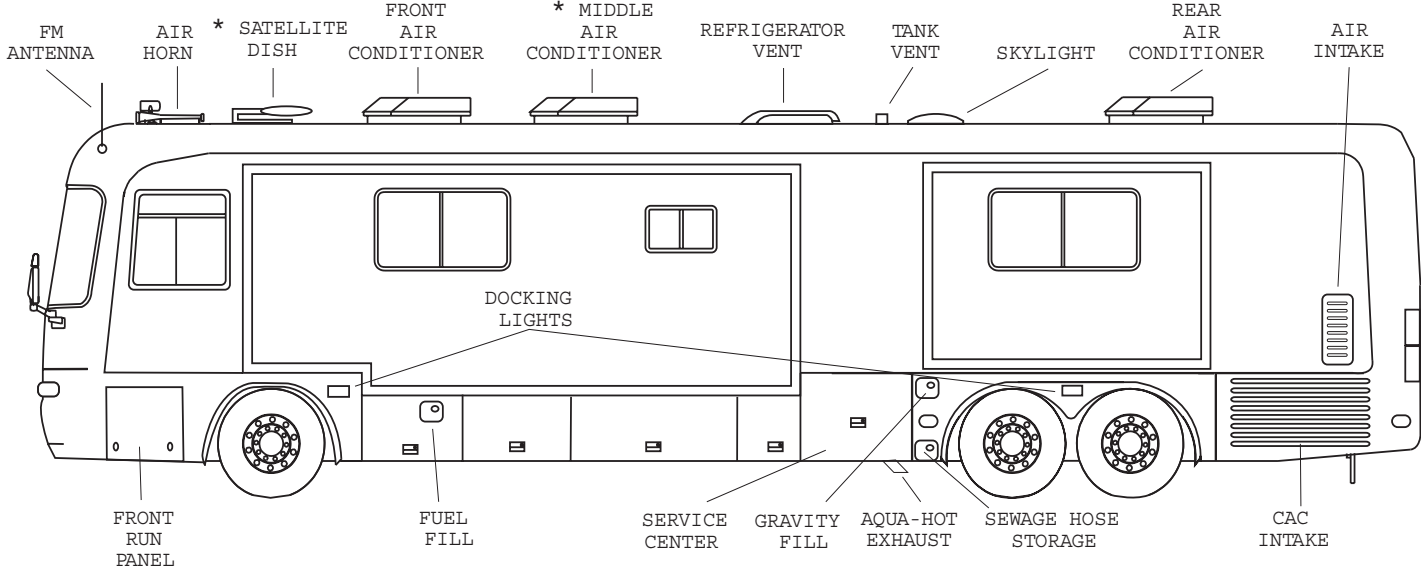
	40DSFD	40' DBL. S/O	40' Triple S/O
Wheel Base	245"	245"	245"
Overall Length	41' 5"	41' 5"	41' 5"
Overall Height	11' 10"	11' 10"	11' 10"
Interior Height	79"	79"	79"
Interior Width	95"	95"	95"
Exterior Width	100 1/2"	100 1/2"	100 1/2"

	42' DBBS	42' DBL. S/O	42SBW	43 DS2	43 DS
Wheel Base	261"	261"	261"	271"	271"
Overall Length	42' 4"	42' 4"	42' 4"	43' 4"	43' 4"
Overall Height	11' 10"	11' 10"	11' 10"	11' 10"	11' 10"
Interior Height	79"	79"	79"	79"	79"
Interior Width	95"	95"	95"	95"	95"
Exterior Width	100 1/2"	100 1/2"	100 1/2"	100 1/2"	100 1/2"

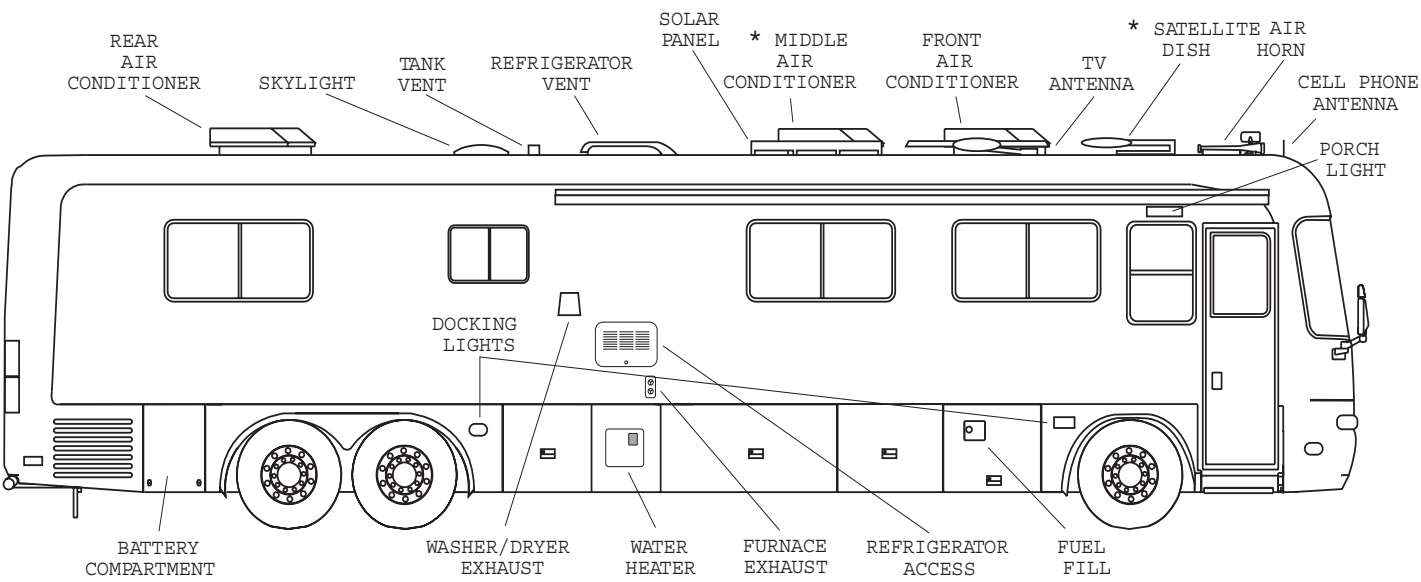
VIEWS - Front & Rear



VIEWS - Roadside & Curbside



*Optional Equipment.



*Optional Equipment.

SECURITY SYSTEM (Optional)

The “Viper” security system is designed to provide years of trouble free operation. The only maintenance required is changing the battery in the remote once a year. The range of the remote will decrease and the green LED will dim when the battery becomes weak. The two remote transmitters (key fobs) are programmed to the receiver using a computer based “Learn Routine.” The learn routine will dictate how the system operates. The Standard transmitter configuration is set at installation. An authorized dealer can customize the transmitter configuration.

Transmitter Configuration – Standard:



AUX Button - Controls the silent mode function.



Lock Button - Controls the arming function.



Green LED - Indicates power at the Key Fob.



Unlock Button - Controls the disarming function.



Horn Button - Controls the panic function.

Operation

Arming the Security System:

The system is armed by pressing the **LOCK** button on the transmitter remote for one second. When armed, the system will “chirp” once. The parking lights flash once, the entry door and selected bay doors will lock. The **red** LED system status light flashes once per second indicating the system is armed and functioning properly.

If the system chirps twice when armed, the **red** LED will flash in groups. These groups are system diagnostic codes. The second chirp is a “Bypass Notification.” Bypass notification will arm the system, however, one or more system sensors are “open.” The system arming mode can be changed to “Passive Arming.” In the **PASSIVE ARMING** mode and the ignition is OFF, thirty seconds after the entry door is opened and closed, the system begins a countdown. The **red** LED flashes twice per second. An audible chirp will occur twenty seconds after the last protected door or zone is closed. The system will then arm and lock the doors ten seconds later.

When the Security System is Armed:

- The System will use “Warn Away” chirp signal for impact sensing. Light impact, siren will chirp.
- A Heavy impact, continuous alarm will sound.
- Opening any door, alarm will chirp for three seconds followed by a continuous alarm.

Disarming:

The system is disarmed by pressing the unlock button. The parking lights flash twice, the alarm will chirp twice and the doors unlock. Any additional chirps are “Tamper Alert.” When the system chirps four or five times during disarming, the red LED will blink the code for the zone that has been tampered with.

Panic Mode:

Press the horn button for one second. The siren will sound and the parking lights will flash for the programmed duration. The panic mode can be exited at any time by pressing the horn button again. If you are threatened, this is helpful in attracting attention to the motorhome.

Silent Mode:

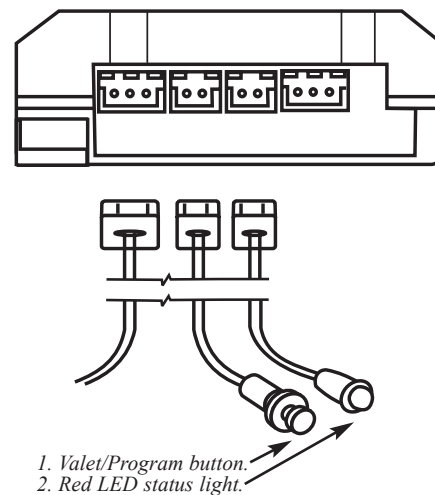
Prior to arming or disarming the system, the confirmation chirp(s) can be temporarily turned OFF. Press the **AUX** button for less than one second prior to arming or disarming the system. System will either **Arm** or **Disarm** silently. The chirp will be silenced only once each **Arm** or **Disarm** cycle.

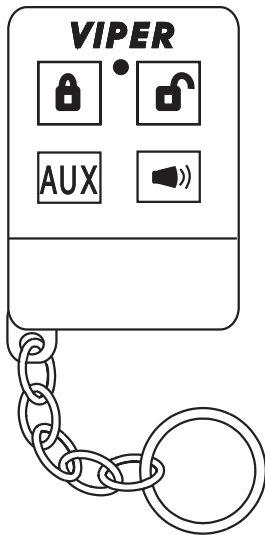


NOTE: A Warn Away chirp will not sound when the system is armed in Silent Mode. A heavy impact will sound a continuous alarm.

Valet Mode:

This feature is useful in servicing, washing or storing the vehicle. The **VALET** Mode will not allow the system to sound an alarm. While in **VALET** mode the remote will lock and unlock the doors. The **red** LED status light is a solid glow in the **VALET** Mode. There are two ways to access the **VALET** Mode: One is with the key fob, the other is with the **VALET/PROGRAM** button.





Entering Valet Mode with Key Fob:

1. Open entry door.
2. Press the **LOCK** button.
3. Press the **UNLOCK** button.
4. Press the **LOCK** button again.
5. Ensure the **red** LED is a steady glow.

Entering Valet Mode with Valet/Program Button:

1. Turn the ignition ON.
2. Turn the ignition OFF.
3. Press and hold the **Valet/Program** button ten seconds and release.
4. Ensure the **red** LED is a steady glow.

Multi-Level Security Arming:

This feature applies to one arming cycle only. The selection of which sensor inputs are active and which are bypassed can be set when arming. Press the **LOCK** button within five seconds after arming. Each time the **LOCK** button is pressed another zone or zones are bypassed. Reset the system to monitor all zones by turning the ignition key on.

Table of Zones:

- Zone One - Pin switches.
- Zone Two - Warn away.
- Zone Three - Entry Door.
- Zone Four - Bay Doors.
- Zone Five - Ignition.

Quick Reference Guide:

- **Lock** - Arms or activates the system.
- **Unlock** - Disarms the system.
- **Lock - While driving** will arm the system.
- Ignition ON and the **VALET** button pressed will disarm without a transmitter.
- Ignition ON, then OFF, then pressing the **VALET** button for ten seconds enters or exits the **VALET** Mode.
- Press and hold the **HORN** button for one second to enter the **PANIC** Mode.
- Press the **HORN** button to exit the **PANIC** Mode.
- Press the **AUX** button for **SILENT** Mode activation.

Tips:

- Remember the location of the **VALET/PROGRAM** button.
- Know the number of **VALET/PROGRAM** button pulses for disarming.
- There is a 24 hour support number located on the back of the key fob.
- The headlights will only flash when using the Key Fob.
- The range of the remote key fob is about 1,200 feet.

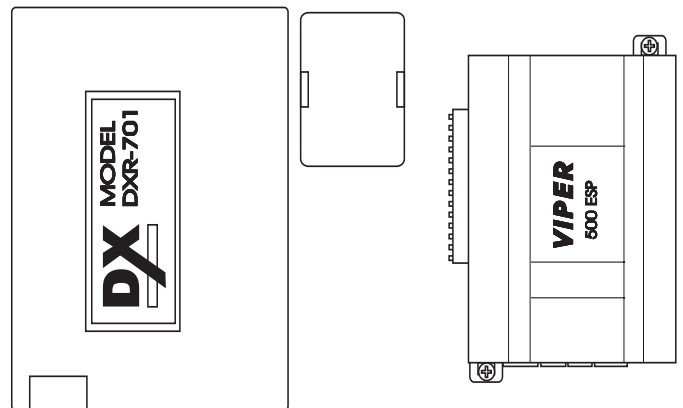
Troubleshooting:

- **VALET/PROGRAM** not responding - Ensure the button is plugged into the blue port of the receiver.
- **Red** Status LED doesn't work - Ensure the LED is plugged into the correct socket.
- Shock Sensor won't trigger alarm - Ensure NPC system has not triggered.
- System has no power - Ensure the 15 amp fuse (front run panel) is not blown.
- The system is not responding to the remote - Ensure the **VALET** Mode is not entered.

Changing the Programming - "Learn Routine":

The following information is provided for changing the programming features. It should be used only by an authorized service center.

1. Open the door.
2. Turn ignition ON, then OFF.
3. For menu selection: Press and hold the **VALET/PROGRAM** button.
4. Select a feature.
5. Program a feature.
6. Release the **VALET/PROGRAM** button.

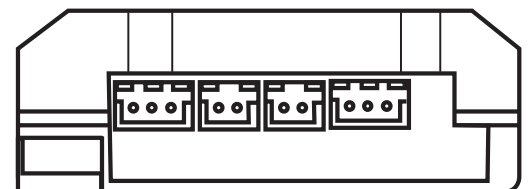


When the feature is programmed:

- Other features can be programmed within the same menu.
- Another menu can be accessed.
- The learn routine can be exited.

To access another feature in the same menu:

- Press the **VALET/PROGRAM** button the number of times necessary to advance to the desired feature.
- Press the **VALET/PROGRAM** button and HOLD.



Selecting another menu:

- Press and hold the **VALET/PROGRAM** button.
- The system will advance and chirp is audible to accessed menu after three seconds.

Exiting the Learn Routine:

This can be done in one of four ways:

1. Close the door.
2. Switch ignition ON.
3. Do not respond for longer than 15 seconds.
4. Press the **VALET/PROGRAM** button an excessive number of times.

System Features Menus:

The system features are broken into two separate menus. Both can be accessed to customize the system by an authorized dealer. The following features have been programmed into the security system.



NOTE: *Bold indicates the factory default settings.

Basic Features - Menu One:

Active/Passive Arming:

Select ***ACTIVE**. When active arming is selected, the system will only arm with the transmitter. Passive arming will allow automatic arming after the door is closed.

Chirp ON/OFF:

Select ***Chirp ON**. Allows control of the chirp which confirms arming or disarming.

Ignition Controlled Door Locks ON/OFF:

Select ***ON**. When turned on the doors will lock three seconds after the ignition is turned ON and unlock when the ignition is turned OFF.

Active/Passive Locking:

***Active** selected. Active locking means the doors will not lock when the system is passively armed. Passive locking means the doors will lock when the system is passively armed.

Panic with the Ignition ON:

Turned ***OFF**. Many states prohibit a siren from sounding in a moving vehicle. This feature is designed to comply with those laws and regulations.

Door Lock Pulse Duration: *.8

Forced Passive Arming ON/OFF:

Forced Passive Arming ***OFF**. Forced Passive Arming will occur one hour after the ignition is turned OFF. When this feature is turned on it will force passive arming, even if a zone is left open or invalid.

Automatic Engine Disable (AED) ON/OFF: *Not wired.

Armed While Driving/Vehicle Recovery System (VRS): Turned *OFF.

Code Hopping ON/OFF:

Turn ***ON**. This enables a mathematical formula to change the code each time the transmitter and receiver communicate.

Advance Features - Menu Two:

Siren/Horn Honk: *Continuous.

Siren Duration 30/60 Seconds: *180 seconds.

Nuisance Prevention Circuitry (NPC) ON/OFF:

With ***OFF** selected. This enables the system to respond to repeated triggers on the sensor inputs indefinitely. When a zone triggers three times in one hour, it may be necessary to switch to ON. This will bypass that zone for an hour. That hour will determine if that zone can trigger the system. If that zone triggers in the hour it will reset the one hour timer. If that zone does not trigger in the hour the zone will become active and allow the system to be triggered again.

Progressive Door Trigger ON/OFF: *ON.

Valet Pulse Count 1 to 5 Pulses:

***ONE**. This is the number of times the VALET/PROGRAM button must be pressed before disarming the system.

Door Trigger Error Chirp ON/OFF: *ON.

Ignition Controlled Dome light Supervision ON/OFF: *Not wired.

Double Pulse Unlock ON/OFF: *OFF.

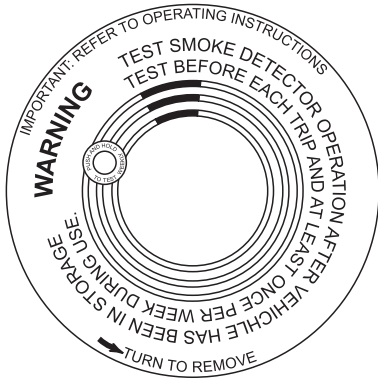
Channel 3 Validity/Latched/Latched Rest with Ignition/30 Second.

Timed/Second Unlock Output: *ON AUX Channel 3.



NOTE: *Bold indicates the factory default settings.

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 or using flammable cleaning fluids. Please be safety conscious and avoid unnecessary risk.



WARNING: There is no way to insure there will be no 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.

Operation

Once a 9 Volt DC battery is correctly connected, the smoke alarm is operating. The LED will flash every minute showing the battery is supplying power. A load alarm will sound when a production of combustion is sensed.



NOTE: The unit will not operate without a battery. A battery flag will pop up preventing the unit from being installed to the mounting bracket without a battery. Most carbon zinc batteries average service life is one year. Most alkaline batteries service life is one to two years.

How to Test

Simply press the test button on the smoke alarm cover for approximately three seconds. The alarm will sound if all electronic circuitry, horn and battery are working properly. The smoke alarm should be tested at least once a week when the motorhome is in use. Prior to each trip, and when the motorhome has been in storage, are other times when the smoke alarm must be tested. When testing the smoke alarm it is advised to stand at arms length.



CAUTION: Never use an open flame to test the smoke alarm. You may ignite and set fire to the alarm and to the motorhome.

Maintenance

A smoke alarm is designed to be as maintenance free as possible. However there are some simple steps that must be performed to keep the smoke alarm working properly:

- Test the smoke alarm once a week.
- Keep a supply of 9 Volt DC batteries on hand.
- Vacuum the slots in the cover and sides with a soft brush attachment every month. Test the smoke alarm once the unit has been vacuumed.
- The smoke alarm should be cleaned every six months to help keep the unit working efficiently.
- The smoke alarm will beep once a minute when a low battery condition exists. The battery must be replaced immediately.

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

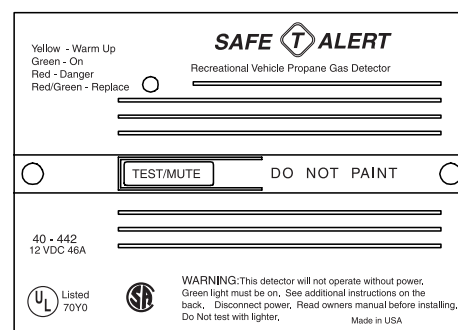
- Inspect for obvious damage.
- Check for the recommended battery type.
- Check the battery for proper connection or replace the battery if needed.
- Gently vacuum as recommended.

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 your dealer. Smoke detectors beyond the warranty period cannot be economically repaired.

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 the reset button to stop the 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 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.

LP-GAS DETECTOR



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 Volt DC, with a current draw less than 1/10th of 1 Amp.

Operation



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

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

Testing



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

Fault Alarm:

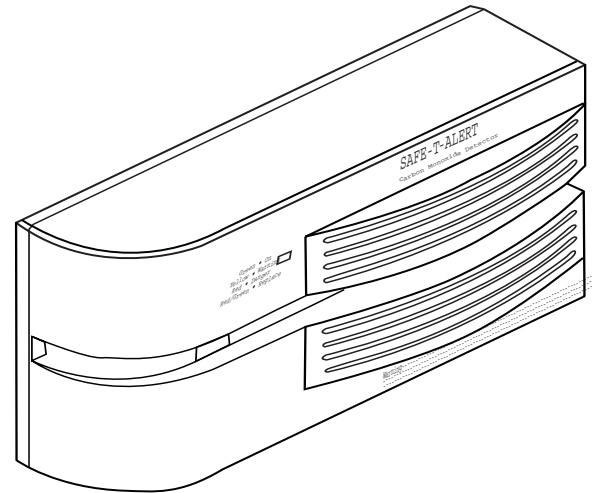
Should the microprocessor sense a fault in the gas detector, a fault alarm will sound twice every 15 seconds. The LED will alternately flash **red to green** and the **MUTE** switch will not respond to any command. The gas detector must be repaired or replaced.

Care

- Vacuum the dust off the detector cover weekly (more frequently in dusty locations) using the soft brush attachment of your vacuum.
- 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.

The motorhome is equipped with a carbon monoxide detector. Carbon monoxide (CO) is a colorless, odorless and tasteless gas. Even low levels of carbon monoxide 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 carbon monoxide 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.

CARBON MONOXIDE DETECTOR



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 your hearing.

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. The indicator light displays a specific color to monitor the conditions as follows:

- **Green** - indicates “ON” or normal condition. The CO detector has power and is sensing air for the presence of carbon monoxide 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.

Operating Instructions

Alarm

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

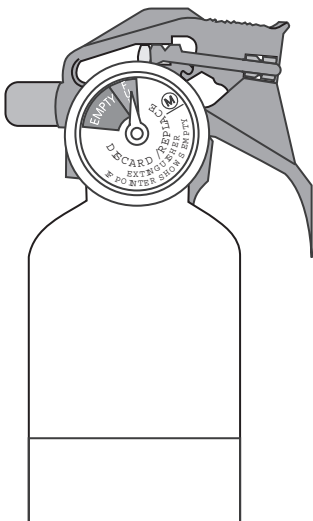
Testing

Test the carbon monoxide detector operation after the motorhome has been in storage, before each trip and at least once a week during use. 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 occupants of the motorhome have any doubt on how to operate the fire extinguisher, practice using it. Be sure to replace or recharge the extinguisher immediately after use.

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

Use the **PASS** word!

Pull the pin to unlock the extinguisher.

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

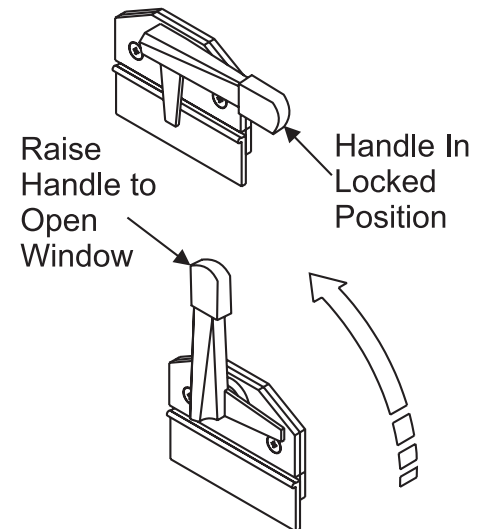
Squeeze the lever to discharge the agent.

Sweep the spray from left to right until totally extinguished.

An egress window is designated for use as an exit in the event of an emergency. Inside the motorhome the egress window is easily identified by the red locking handle. It is also marked as an "EXIT". Outside of the motorhome the egress window is identified by hinges along the top of the window. The glass slider in the egress window operates the same as all other windows. To open the egress window lift the red handle and push outward on the window. 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. Over time, the rubber seal will tend to stick to the egress window. Occasional operation will help prevent the rubber seal from sticking.

EGRESS EXIT WINDOW



Egress Window Handle

NOTES

EXECUTIVE

SECTION 3 CARE & MAINTENANCE

EXTERIOR CARE •	81
<i>Corrosion •</i>	81
<i>Washing •</i>	81
<i>Drying •</i>	82
<i>Waxing •</i>	82
<i>Tire Care •</i>	83
<i>Care & Maintenance of Aluminum Wheels •</i>	83
<i>Bright Metal •</i>	84
<i>Maintenance - Exterior •</i>	84
<i>Roof Care & Seal Inspections •</i>	84
INTERIOR CARE •	86
<i>Fabrics •</i>	86
<i>Fabric Specifications Charts •</i>	88
<i>Vinyl •</i>	92
<i>Leather •</i>	94
<i>Ultrasuede •</i>	95
<i>Floors - Carpet Cleaning •</i>	96
<i>Floor - Tile •</i>	97
<i>Shower - Cleaning •</i>	98
<i>Ceiling •</i>	98
<i>Wall Coverings •</i>	99
<i>Countertops •</i>	100
<i>Windows •</i>	101
<i>Mini-Blinds •</i>	102
<i>Day/Night Shades (Optional) •</i>	102
STORAGE - Short Term •	102
STORAGE - Long Term •	103
CHECKLIST - Winter Storage •	107
STORAGE - Removal •	108

EXTERIOR CARE
Corrosion

The most common cause of corrosion to the motorhome is the accumulation of road salt, 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 salt is 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. A high-pressure washer or a steam cleaner is the most effective way of cleaning off the underside and inside wheel openings. **Avoid directly spraying the painted surface with a high pressure washer.** Remove road debris and mud that has accumulated. Material left behind can intensify the corrosion problem.



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

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.

Washing

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 quickly occur. These types of products are generally used to correct or flatten a surface by removing high spots or small amounts of material.

When selecting a product the container should be marked, “safe for clear coats” or “clear coat safe.” Carefully follow 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 occurs, 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 an application of a glaze. These types of glazes fill the scratches or swirl marks.

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

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.

Tire Care

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

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

-
- Clean frequently with high pressure water from a hose. Use a mild detergent to speed up the cleaning process. Do not use harsh alkalis, alcohol or acidic cleansers. A secondary hand washing with a soft cloth may be required to remove some stubborn road films.
 - When the tires are removed the entire wheel must be cleaned and inspected. With a wire brush or sandpaper, remove dirt, corrosion or any foreign materials from the tire side of the rim. Do not use a wire brush or other abrasive substances to remove dirt and corrosion on the polished surface of the wheel.

Care & Maintenance of Aluminum Wheels

To maintain the original appearance of the aluminum wheels the following procedures are recommended:

1. After installing new wheels (prior to operating the motorhome), use a sponge, cloth or soft fiber brush to wash the exposed wheel surfaces with a mild detergent and 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, wax the cleaned surface with a high-quality car wax.
6. Clean the aluminum wheels as frequently as required to maintain their appearance.

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. Aluminum wheels should be cleaned regularly with a non-abrasive cleaner recommended for aluminum wheel care. Do not use rubbing compounds. Do not use any abrasive cleaners or compounds to clean the mirrors.



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 subject 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 in operation the coach is subject to twisting and flexing caused by (for example) going in and out of driveways, bouncing through potholes and driving through winding mountain roads.

Roof Care & Seal Inspections

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 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.

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 normal twisting and flexing that 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 of the product manufacturer's safety requirements.

Sealant Types:

Acryl-R:

Acryl-R is used on all roof openings such as vents, skylights, any roof mounted antennas and ladder roof mounts. The sealant should be applied only where the equipment bases meet the roof. Clean the old sealant that is lifting before applying with new. Make sure the roof is dry and free of dirt. This product is usually found in a caulking tube. Care should be used when near an edge, as the product will spread out. Masking tape may be used to mask around area to avoid mishaps. The roof air conditioners use a closed cell foam base gasket. No sealants are required. The roof air conditioners should be checked for tightness by the four mounting bolts located in each interior corner of the air conditioner roof opening. Torque specification is 40-50 in/lbs. The base gasket should be compressed to approximately one half 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 which can scratch the painted surface. Use nylon sticks or equivalent. Avoid using

lacquer thinners or ketone based solvents as these chemicals can damage the painted surfaces. Be sure the surface is clean and dry before application. Cut the tube at an angle with smallest usable opening. Avoid a heavy bead as a little goes a long way. Use finger at a 45° angle on beaded surface to smooth out product. Do not moisten finger, use a disposable latex glove. Keep rags or paper towels handy for clean up. Use care when applying silicone. Plan ahead before starting a bead, look for obstacles that may impede application.

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 the same way as silicone does. Clean up 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 as a sealant where a hole has been made for items such as water lines or wires that are coming through a floor opening.

INTERIOR CARE
Fabrics

The motorhome fabrics have been manufactured with the same quality of fabrics found in a furniture store. If the fabric is abused, it can be damaged.

Special care needs to be taken when the motorhome is exposed to a very humid climate for an extended period of time. Cover all upholstery. Make sure the 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 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.

“W/S” - 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 160° F.
No bleach or fabric softener.

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

“Finishing” - If necessary, press as following:

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

Fabric Specification Charts

FABRIC	CONTENT	CLEANING CODE	WHERE USED
MIDNIGHT ROSE .407			
35037 56 Merlot	100% Polyester	W	BR Pillow, BR Valance
550101 077-038 MO26564-005	66% Acrylic 34% Polyester	S	Sofa, Painted Pillow, BR Valance
Cambridge 1/2” Tri-color Cord w/ Tab Cream	38% Olefin 32% Polyester 30% Acetate	W/S	Cord Trim, BR Pillow, BR Valance
Cambridge 2” Brush Fringe Cream	38% Olefin 32% Polyester 30% Acetate	W/S	BR Pillow, Fringe
Duncan Lavender	64% Cotton 36% Polyester	S	LR Pillow, LR Valance Welt, BR Valance
Krinkle 16 Bone	100% Polyester	*W	Bedsread, BR Pillow, Headboard
Pearl 009 Natural	100% Polyester	W/S	Windshield
Sensuede Bone 8300	88% Polyester 12% Polyurethane	Dry Clean Only - S	LR Valance
Vouge Heather	55% Rayon 45% Polyester	S	LR Pillow, FSD, LR Valance, Chair, Dinette Cushion

FABRIC	CONTENT	CLEANING CODE	WHERE USED
TRUFFLE TAN .410			
550101 077-076 MO26564-007	66% Acrylic 34% Polyester	S	Sofa, Painted Pillow
550411 000-090 MO32391-001-4	34% Polyester 17% Rayon	S	LR Pillow, FSD
Bellagio Olive	100% Polyester	W/S	BR Pillow, Headboard, BR Valance
Cambridge 1/2" Tri-color Cord w/ Tab Taupe	58% Rayon 42% Olefin	W/S	Cord Trim, BR Pillow, BR Valance
Cambridge 2" Brush Fringe Taupe	99% Rayon 1% Polyester	W/S	BR Pillow, Fringe
Cordovan Driftwood	100% Polyester	S	LR Pillow, LR Valance, Chair, Dinette Cushion
Kodiak 02 Oyster	100% Polyester	Dry Clean Only	Bedsread, BR Pillow, BR Valance
Microsan Drizzle 215	50% Cotton 50% Polyester	Dry Clean Only - S	LR Valance
Sensuede 3852-501 Cedar	88% Polyester 12% Polyurethane	Dry Clean Only - S	Ceiling (Outside Frame)
Shantung - SH Lynx 302	57% Cotton 43% Rayon	Dry Clean Only - S	Windshield
GOLD PARCHMENT .421			
63 2267 & 2277 Color 58 Panther & Kenia Raya	62% Rayon 38% Polyester	S	LR Pillows
Cambridge 1/2" Tri-color Cord w/ Tab Ebony	40% Olefin, 26% Acetate 17% Polyester, 17% Rayon	W/S	Cord Trim, BR Pillow
Cambridge 2" Brush Fringe Ebony	36% Polyester 34% Rayon 30% Acetate	W/S	BR Pillow, Fringe
K33355 XO L233	65% Cotton 32% Rayon 3% Polyester	S	Sofa, Painted Pillow, LR Valance
K34199 MC L230 XX	56% Cotton 44% Nylon	S	FSD, Chair, LR Valance, Dinette Cushion
Microsan Chateau 214	50% Cotton 50% Polyester	Dry Clean Only - S	LR Valance
Naive FSR Jet	53% Cotton 47% Rayon	S	Bedsread, BR Pillow, BR Valance
Pearl 009 Natural	100% Polyester	W/S	Windshield
Sensuede 3852-0050 Ebony	88% Polyester 12% Polyurethane	Dry Clean Only - S	Ceiling (Outside Frame)
Sari Sauterne	60% Cotton 40% Polyester	S	BR Pillow, Headboard, BR Valance

FABRIC	CONTENT	CLEANING CODE	WHERE USED
GREEN ATRIUM .412			
40062 65 Lake	100% Polyester	Dry Clean Only	Bedspread, BR Pillow, BR Valance
Cambridge 1/2" Tri-color Cord w/ Tab Cream	38% Olefin 32% Polyester 30% Acetate	W/S	Cord Trim, BR Pillow, BR Valance
Cambridge 2" Brush Fringe Cream	36% Polyester 34% Rayon 30% Acetate	W/S	BR Pillow, Fringe
CJ9486 Downtown/ W. Wash	79% Rayon 21% Polyester	S	LR Pillow, FSD, LR Valance, Dinette Cushion
Hermia Lagoon	81% Acrylic 19% Essera	W/S	Sofa, LR Valance Welt, Chair, BR Valance
Krinkle 55 Nile	100% Polyester	*W	BR Pillow, Headboard
Pearl 009 Natural	100% Polyester	W/S	Windshield
Sensuede 1011 Cement	88% Polyester 12% Polyurethane	Dry Clean Only - S	LR Valance, Painted Pillow

ULTRASUEDE	WHERE USED	CLEANING
VINTAGE ROSE .409		<p>Follow cleaning instructions for Ultrasuede under INTERIOR CARE.</p>
Ultrasuede 3273 Doeskin	Ceiling (Inside Frame)	
Ultrasuede 3279 Sandstone	Ceiling (Outside Frame)	
TRUFFLE TAN .410		
Ultrasuede 3279 Sandstone	Ceiling (Inside Frame)	
PARCHMENT GOLD .421		
Ultrasuede 3582 Almond	Ceiling (Inside Frame)	
ATRIUM GREEN .412		
Ultrasuede 3279 Sandstone	Ceiling (Inside Frame)	
Ultrasuede 4398 Lichen	Ceiling (Outside Frame)	

VINYL	WHERE USED	CLEANING
VINTAGE ROSE .409		Follow cleaning instructions for <i>Vinyl</i> under INTERIOR CARE.
Ambassador M29 Purple Gray Tumbleweed New Oyster	Pilot Seat Welt - Vinyl Vinyl	
TRUFFLE TAN .410		
Tumbleweed - Black Tumbleweed - Taupe	Pilot Seat Welt - Vinyl Vinyl	
PARCHMENT GOLD .421		
Allente Cream Tumbleweed New Oyster	Pilot Seat Welt - Vinyl Vinyl	
ATRIUM GREEN .412		
Ambassador M28 Aqua Gray Tumbleweed Pearl	Pilot Seat Welt - Vinyl Vinyl	

LEATHER	WHERE USED	CLEANING
VINTAGE ROSE .409		Follow cleaning instructions for <i>Leather</i> under INTERIOR CARE.
RVAA Tumbleweed New Oyster CAX-7963	Leather	
TRUFFLE TAN .410		
RVAA Tumbleweed Taupe CAX-7947	Leather	
PARCHMENT GOLD .421		
RVAA Tumbleweed New Oyster CAX-7963	Leather	
ATRIUM GREEN .412		
RVAA Tumbleweed Pearl CAX-8008	Leather	

* See instructions for "Machine Washing 100% Polyester" under ***Fabric Cleaning Codes***.

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

Vinyl

Several areas of the motorhome can be covered in vinyl, such as the dash and items of furniture. 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: Lacquer solvent will cause immediate irreparable damage to the vinyl. Do not use wax 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 will cause 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:

Rub out any spots with a clean cloth soaked in cool water. 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.

Leather

Spots & Spills:

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

Stubborn Spots and Stains:

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



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

Ultrasuede® Fabric is easy to keep plush and beautiful for years. The fabric is vitally maintenance free.

Everyday Upkeep:

Quick once-overs with a medium-bristle brush restores the sensuous nap and soft luster appearance of Ultrasuede®.

Laundering/Dry Cleaning:

Ultrasuede® is machine-washable by design. However, when combined with materials for lining that do not stand up to a washing machine, the fabric can be dry-cleaned with exception to one shade of clear white used in some garments. **Check the manufacturer's care instructions for details.**

Stain Removal:

Stains ranging from red wine to black coffee; can be spot-cleaned with just a touch of mild soap and water. Tougher stains may require mild cleaning fluid or solutions, which are available at most hardware and drug stores.

TYPE OF STAIN	MILD DETERGENT	MILD CLEANING FLUID
Coffee, Tea	○	
Red Wine, Liquor	○	
Coke, Soft Drinks	○	
Milk	○	
Ketchup	○	
Steak Sauce, Soy Sauce	○	
Mayonnaise, Butter	○	○
Salad Oil	○	○
Chocolate	○	○
Cosmetic Foundation	○	○
Lipstick	○	○
Face Cream	○	○
Suntan Oil/Lotion	○	○
Shoe Polish	○	○
Machine Oil		○

Floors - Carpet Cleaning

Use the solution specified in order from 1-8 until stain is removed.	A DRY CLEANING FLUID	B NAIL POLISH REMOVER	C DETERGENT SOLUTION	D WARM WATER	E VINEGAR SOLUTION	F AMMONIA SOLUTION	G SPOT REMOVAL KIT	H CALL PROFESSIONAL	I 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	*

Spot Removal Procedures:

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

Cleaning Solutions:

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

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

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

(D) Warm Water: Lukewarm tap water.

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

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

Various types of surfaces that vary in porosity and abrasive finishes are used in a motorhome. These surfaces can be difficult to protect and maintain. Regular maintenance is all it takes to keep the tile in the motorhome looking showroom new. Once the slide-out has been extended, keep the tile floor clean to prevent dirt from scratching the tiles prior to retracting the slide-out.

Floor - Tile



NOTE: Tile is ceramic and will chip and break easily. Avoid dropping heavy or sharp objects on the tile.

Cleaning Tile:

Use a damp sponge mop or a cloth to clean tiles to maintain their luster. If moderate staining occurs, cleaning with a window cleaner such as *Windex* should do the job. If preferred, a mild solution of hot water and all-purpose cleaner can be used for cleaning 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. It also promotes the growth of mildew and bacteria. Do not use powdered cleaners on unglazed tile floors. Undissolved powder will dull the surface. Grout sealers are available that protect the porous surfaces. If a sealer is used, follow the sealant manufacturer guideline for application. Additionally, never use sealers on unglazed tiles. With the exception of terra cotta, which may be oiled or waxed, polishing or buffing the tiles is not necessary to maintain their finish.

Grout:

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



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

Shower - Cleaning

Showers are susceptible to 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 spray the shower with household chlorine bleach and allow it to stand for five minutes. Clean the glass shower doors with window cleaner on a weekly basis to maintain the shine. If water spots cannot be removed from the glass, rub lightly with the flat edge of a razor blade to 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. To replace the sealant, remove the old sealant using a sharp instrument. Apply a new sealant, which can be found at recreational vehicle supply stores.

Ceilings

The ceiling of the motorhome can be a variety of material and fabrics. Many of these materials and fabrics require little or no care or maintenance.

Sensuede and Ultrasuede®:

Refer to the manufacturer's cleaning instructions for cleaning materials. Cleaning codes and care information is also available under **Interior Care - Ultrasuede**, and **Interior Care - Fabric Specifications Charts** in this section.

Vinyl:

The soft touch padded vinyl ceiling can be cleaned using the procedures discussed in the vinyl article of this section. Generally a mild soap and water is sufficient for cleaning.



NOTE: Care should be observed not to puncture the padded vinyl.

Wall Coverings

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

Nail polish, Shellac, or Lacquer:

Remove liquid using a dry cloth. Use care not to spread the stain. Quickly clean the remaining stain with rubbing alcohol. Rinse with clean water.

Ink:

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

Chewing gum:

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

Countertops

The Solid Surface was created for a lifetime of easy care. Just follow the simple guidelines listed here to the keep countertop surface looking nice.

Routine Care:

The 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. Follow the recommendations below.

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 *Scotchbrite* 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 *Scotchbrite* Pad. Scrub the sink, rinse and towel dry. Do this as often as 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 *Scotchbrite* 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.

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.

Windows**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 using the following steps:

- Partially open the roof vents and windows so that outside air can circulate into the interior. Increase the ventilation when large numbers of people are in the motorhome. Even in raining or snowing conditions the air outside will be far drier than the interior air.
- Install a dehumidifier. 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 preventing the possibility of ice formations.

Mini-blinds

- To maintain the mini-blinds, on a frequent basis vacuum with the brush attachment or use a dusting tools (available on the market) designed specifically for mini-blinds.
- Wash the mini-blinds with mild soap and water in a tub or hang the blinds on a fence or wall and gently rinse them with a hose.

Day/Night Shades (Optional)

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

STORAGE - Short Term

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

Checklist - Short Term Storage:

- If applicable, retract the slide room(s). Do not store the motorhome with the slide room(s) extended.
- Shut off all appliances. Close the LP-Gas valve.
- Remove all articles from the refrigerator and freezer. Clean thoroughly. Prop the doors open to prevent mildew.
- The holding tanks should be drained and the fresh water system winterized with potable antifreeze, or winterize the plumbing system using air pressure.
- Retract and secure all awnings.
- Turn the battery cut-off switch OFF.
- If applicable, disable the auto-genstart feature.
- Batteries should be stored fully charged. Batteries stored in a discharged state will readily freeze.
- If possible, park the motorhome leaving the batteries accessible. A battery may be charged or changed without moving the motorhome.
- If shore power is available, leave the motorhome hooked up to it. Leave the main battery disconnect switches ON.
- Careful placement of a small heat source in the interior will help control moisture. Desiccate filter systems will help remove interior moisture.
- If AC power is not available, turn the main battery disconnect switches OFF.
- If possible, store the motorhome inside a storage building.
- If stored outside, inspect all seams and seals for possible leaks.
- Store the motorhome with a full fuel tank to guard against moisture condensation at the top of the fuel tank.
- Vents and windows should be closed in wet weather to prevent rain or snow from being blow in by the wind.
- Tires should be stored at maximum inflation pressure.
- A full interior inspection for water leaks should be made bi-monthly, inspecting behind all cabinet doors and drawers.

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 just as a house or a car would. When stored out in the environment without proper maintenance, a motorhome, house or car is vulnerable to the moisture and oxidation processes inherent in the environment.

STORAGE
- Long Term

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 30° F or more in one day. Humidity readings of 60% or greater will allow the accumulated moisture to remain for extended periods of time.

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

- Turn off all 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. When using preventative measures, taking 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. The type of surface can effect the tires of the motorhome, as well.

- **Gravel covered parking area** - Still allows moisture to evaporate from the ground, through the gravel and to the underside of the motorhome.
- **Concrete pads** - Seals the surface, allowing for better ventilation under the motorhome.
- **Storage buildings with concrete floors or heated storage facilities** - Greatly reduce the amount of moisture accumulation and protect the motorhome from moisture damage.

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

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. Diesel fuel is an organic material which will develop a microbe growth (black slime). Fuel stabilizers may be added to help prevent the microbe growth. Consult the Cummins manual or a Cummins distributor for further detailed information on fuel stabilizers and additives.

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.

CHECKLIST
- Winter Storage

- **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.
- **Refrigerator** - Clean and leave both doors propped open. Cover the exterior panels and roof vents.
- **Batteries** - Add distilled water and recharge if needed. Disconnect the cables. Remove 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.
- **Air Conditioner** - Remove the air filters. Clean or replace.
- **Roof** - Keep clear of snow accumulation or damage may occur.
- **Interior/Exterior** - Storing under cover or indoors helps extend interior and exterior life.
- **Fuel Tank** - Diesel fuel tank should be full of fuel.

STORAGE - Removal

If the motorhome was properly and carefully prepared for storage, removing it from storage will not be difficult. The following checklist pertains to items or areas which should be checked before operating or moving the motorhome. If the motorhome was not properly winterized, extensive freeze damage or other serious deterioration may have occurred. Consult a dealer or an authorized service center for advice.

- Thoroughly inspect the outside of motorhome. Look for animal nests in the wheel wells or in other out of the way places.
- Remove all appliance flue vent covers, ceiling vent covers and air conditioning covers. Be sure the refrigerator openings are free of debris, insect nests, webs, etc.
- Open all doors and compartments. Check for animal or insect intrusion, water damage or other types of damage which may have occurred.
- Check the state of charge of the batteries. If necessary fill the cells with distilled water only and charge as necessary. Inspect the cable ends and terminals. They should be clean and free of corrosion.
- Check all the chassis fluid levels: engine oil, engine coolant, hydraulic fluid reservoir, transmission oil and rear axle oil.
- Start the engine, allowing it to reach operating temperature. Ensure the engine instruments are indicating proper readings.
- While the engine is running check the operation of headlights, tail-lights, turn signals, back-up lights, license plate light and emergency flasher. Operate the dash air conditioner. If the air conditioner does not work, or the compressor makes unusual noises, have the system checked by a qualified air conditioner technician.
- Shut the engine down. Adjust or add fluids as necessary. Inspect the engine for fluid leaks. Look under the motorhome for any other type of fluid leaks.
- Drain, sanitize and flush the fresh water system as outlined in the **Water Section**. Inspect the sewer drain hose and connections for leaks. Replace if necessary.
- Operate all faucets and fixtures in the fresh water system. Run a sufficient amount of fresh water through all the water lines and faucets to thoroughly purge any potable antifreeze from the fresh water system.



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

- Open cabinet doors and drawers inspecting for water leaks at joints or fittings. Repair as necessary.

- Operate all 12 Volt lights and accessories. If something does not work there may be a bad 12 Volt circuit breaker or blown fuse.
- Install new batteries in battery operated safety detectors or devices. Test the carbon monoxide, LP-Gas and smoke detectors for proper operation.
- Check that the monitor panel is functioning properly.
- Inspect the 120 Volt electrical system which includes the power cord, inverter/converter all outlets and exposed wiring.



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

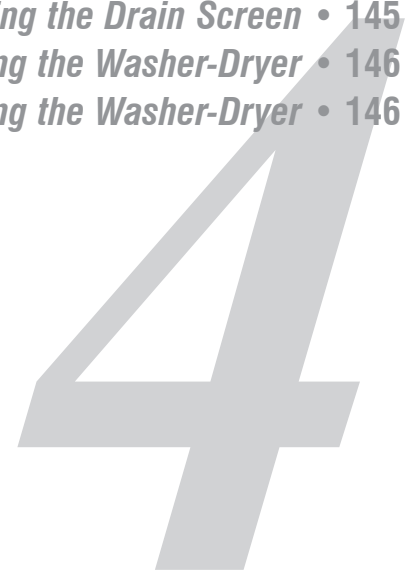
- Start and run the generator.
- Ensure the batteries are being charged. Operate the 120 Volt appliances and air conditioners. If an electrical item or appliance is not functioning properly, contact the dealer or an authorized service center to have it evaluated.
- Have a qualified technician inspect the LP-Gas system and perform an LP Gas leak test. The leak test should also include an LP-Gas regulator adjustment (if needed). The test can also verify if the regulator is faulty and should be replaced. Have the LP-Gas tank inspected.
- Operate each LP-Gas appliance. Observe all burner/pilot flames for proper color and size.
- Inspect and clean the interior.
- Check the sealant around all roof and body seams and windows. Reseal if necessary.
- Lubricate all the exterior locks, hinges and latches with a graphite lubricant.
- Check the windshield wiper blade condition. Check the wiper/washer operation.
- Wash and wax the exterior. 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 desired, have the dealer or repair center double check any preparation and correct any defects or make any necessary adjustments.

NOTES

EXECUTIVE

SECTION 4 APPLIANCES

INTRODUCTION	• 113	FURNACE	• 133
REFRIGERATOR	• 113	<i>Furnace Operation</i>	• 133
<i>Operation Specifics</i>	• 114	<i>Using the Furnace</i>	• 134
<i>Tips</i>	• 114	<i>Tips</i>	• 134
<i>Refrigerator Controls</i>	• 115	<i>If the Furnace Fails to Light</i>	• 134
<i>Doors</i>	• 115	WATER HEATER	• 135
<i>Control Panel</i>	• 115	<i>Before Using the Water Heater</i>	• 135
<i>Manual Mode Operation</i>	• 115	<i>Operation</i>	• 136
<i>Auto Mode Operation</i>	• 116	<i>Pressure-Temperature Relief Valve</i>	• 137
<i>Alarm</i>	• 116	<i>Burner Compartment</i>	• 138
<i>Ice Maker Operation (Optional)</i>	• 116	<i>Water Heater Bypass System</i>	• 138
<i>High Humidity Operation</i>	• 117	<i>Tips</i>	• 138
<i>Cooling Unit Fans (Four Door Models)</i>	• 117	<i>Draining & Storage</i>	• 139
<i>Defrosting the Refrigerator</i>	• 117	<i>Troubleshooting</i>	• 139
<i>Cleaning the Refrigerator</i>	• 117	AQUA-HOT (Optional)	• 140
HOT WATER DISPENSER (Optional)	• 117	<i>Aqua-Hot - Use of Chlorine Bleach</i>	• 140
MICROWAVE OVEN	• 119	<i>Bay Thermostat</i>	• 142
<i>Operation</i>	• 121	<i>Maintenance Schedule</i>	• 142
<i>Microwave Cooking</i>	• 123	<i>Fuel Filter/Water Separator</i>	• 142
<i>Convection Cooking</i>	• 124	WASHER-DRYER PREPARED	• 143
<i>Tips</i>	• 126	WASHER-DRYER (Optional)	• 144
<i>Care & Cleaning</i>	• 126	<i>Operating Instructions</i>	• 144
COOKTOP	• 127	<i>Cleaning the Drain Screen</i>	• 145
<i>Operation</i>	• 127	<i>Winterizing the Washer-Dryer</i>	• 146
<i>Surface Grate</i>	• 128	<i>Cleaning the Washer-Dryer</i>	• 146
<i>Tips</i>	• 128		
<i>Care & Cleaning</i>	• 129		
WALL THERMOSTAT	• 129		
<i>Comfort Control Reset</i>	• 130		
AIR CONDITIONER - ROOF	• 130		
<i>Return Air Filters</i>	• 131		
<i>Operation</i>	• 132		



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.

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. A compressor will pump refrigerant vapor into a condenser where the heat from the refrigerant will be dissipated and the vapor will change 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 will “extract or absorb” heat from the inside of the refrigerator. Using gravity, the droplets return through the absorber coils to the absorber vessel to start the process again. The cooling unit has specific guidelines that need to be followed for proper operation and insured longevity. Keeping these guidelines in mind should give years of faithful trouble-free service.

REFRIGERATOR

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 maximum and 108 Volts AC minimum.

The refrigerator (from front view) needs to be leveled within 3°, side-to-side and 6° front-to-back. Place a torpedo or bulls-eye (fence post) level onto the freezer plate. It should read within the circle by a half of a bubble, which is generally 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 (British Thermal Unit), is concentrated to a specific area of the cooling unit.

Operating the refrigerator in an “off level” condition separates the sodium chromate which will crystallize from the heat source. This blocks the recirculation action of the cooling unit and causes accumulative, irreparable damage. It is safe to operate the refrigerator while driving the motorhome because the chemicals are in a constant state of agitation from the movement and will not be at risk for separation.

The LP-Gas side of the refrigerator and the LP-Gas pressure need to be serviced yearly, depending on use. Over time, the BTU rating of the LP-Gas can change affecting the performance of the refrigerator. Ambient air temperature, humidity and a lower BTU rating when operating on LP-Gas at an altitude higher than 5,500 feet can also affect the performance and function of the refrigerator. If possible, switch mode operation to 120 Volts AC electric while at a higher altitude.



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



NOTE: All-electric motorhomes may be equipped with a different style refrigerator. Consult the refrigerator manufacturer’s owner’s manual, located in the Information File Box, for operation of the refrigerator. All-electric motorhomes require no LP-Gas connections.

Tips

Tips for Efficient Refrigeration Operation:

- If possible, cool items first before putting them into the refrigerator.
- Keep the door shut. Consider what is needed before opening the door.
- Allow the refrigerator to operate approximately 24 hours before actual use to get a “head start” with the refrigeration process.
- An open box of baking soda helps absorb food odors. Wipe up any spilled soda.



NOTE: Keep the interior box temperature at or below 54° 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.

Refrigerator Controls

The refrigerator controls are DC operated through an electronic circuit board. The refrigerator, which operates from heat (described previously) gets its source from two different means: an electric heating element or a flame from LP-Gas. Mode operation and temperature selection is made by controls on the front 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 outside, behind the 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, behind the refrigerator access door).

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 ½ inch and slide the latch into the cut-out of the strike plate.

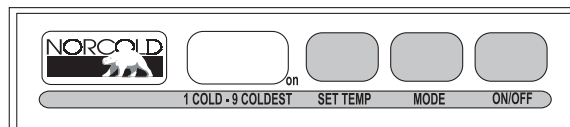
ON/OFF Button - Press this button to turn the refrigerator ON. Press and hold this button to turn the refrigerator OFF.

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



The Refrigerator Control Panel requires 12 Volt DC to operate.

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.

Auto Mode Operation

This feature automatically selects 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.

Alarm

The refrigerator has an audible alarm which sounds for the following reasons:

1. DC or AC voltage is higher or lower than allowed specifications.
2. Refrigerator is set to **AUTO** mode and 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 54° 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.

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 in vanity cabinet) 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 few trays of ice if the refrigerator has been in storage as they may contain contaminates. Do not operate the ice maker without water pressure supplied to the refrigerator. This can cause damage to the ice maker assembly.

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.

High Humidity Operation

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.

Cooling Unit Fans (Four Door Models)


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.

Defrosting the Refrigerator

 **CAUTION: Do not use a hot air blower. Permanent damage could result from warping metal or plastic parts. Do not use a knife, ice pick or any other sharp tool to remove ice from the freezer as they can create a leak in the ammonia system.**

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.

Cleaning the Refrigerator

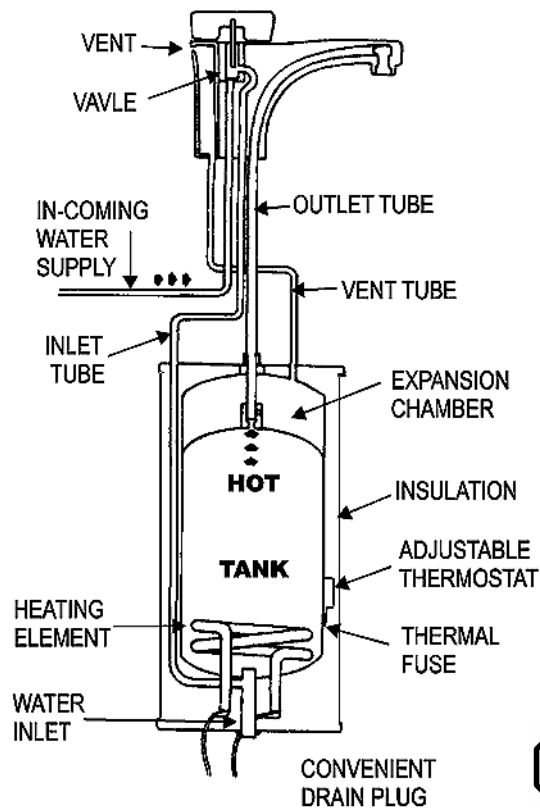
 **NOTE: Do not use abrasive cleaners, chemicals or scouring pads. They can damage the interior of the refrigerator. Wash the interior with a mild cleaner or a solution of liquid dish detergent and warm water. Rinse with a solution of baking soda and clean water. Dry with a clean cloth.**

The water is electrically heated to a brewing/cooking hot 190° F (88° C) by a compact tank that mounts under the sink. A thermostat maintains the water at this approximate temperature. When you turn the tap, cold water enters the bottom of the tank and forces hot water out of the faucet. The system is vented so the tank is not pressurized.

HOT WATER DISPENSER (Optional)

Operation:

Turn **ON** the insta-hot switch, located in the galley. The Insta-Hot must be plugged in to 120 Volt receptacle. It will take 10 to 15 minutes for water to reach temperature. Steam or hot water may come out of the faucet without turning it on. After 10 to 15 minutes, turn on the faucet for about 20 seconds to bleed off any steam. Allow the water in the tank to reheat. Repeat this step one or two times. When hot water with no steam is dispensed, turn the faucet on to use hot water. To shut off the system, turn the galley switch to the **OFF** position.



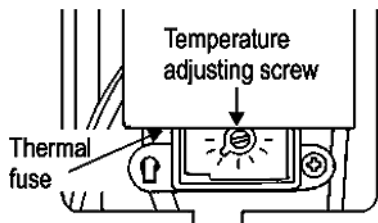
Temperature Adjustment:

If the steam cannot be stopped, or the water boils, adjust temperature as follows:

- Turn the galley switch off and unplug the power cord.
- Remove the screw and access cover.
- Insert a screwdriver in the slot of the thermostat adjusting screw and turn clockwise a 1/2 notch to increase the water temperature, or counterclockwise a 1/2 notch to decrease the water temperature.
- Reinstall the access cover, reconnect the electric power and turn on the galley switch.
- Draw three or four cups of water and allow unit to reheat.
- Repeat the procedure until desired temperature is reached.



CAUTION: Do not allow the water to boil.



Cleaning Hot Water Dispenser:

Use only mild cleaners to clean the dispenser spout and plastic components. Use of cleaning agents containing acids, alkalis and organic solvents will result in the deterioration of plastic components.



WARNING: Use care when operating this unit. Do not allow children to operate this unit. The tank is a non-pressurized tank, DO NOT modify this system. DO NOT close the vent tube or connect other types of faucets or valves to the tank. Use only the faucet supplied. DO NOT allow the water to boil. The water and steam dispensed can instantly cause scalding or burns.



WARNING: To minimize the possibility of fire DO NOT store flammable items such as rags, paper or aerosol cans near the tank. DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this unit. DO NOT remove or alter the thermal safety fuse. If the thermal fuse is open contact your authorized service center. To prevent electrical shock turn the power switch OFF and disconnect the power cord before removing the access cover to adjust or service the thermostat.

**MICROWAVE
OVEN**

The microwave oven is operated from 120 Volt AC supplied by 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. A turntable rotates inside the microwave when it is operating in order to heat 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 features which may include: varied cooking times with different power settings, automatic sensor cooking, a kitchen timer, a 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.

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.
- 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.
- The glass tray and roller guide must always be in place during cooking.
- Place the food in a suitable container.
- Ensure the door is firmly closed before use.

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.



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

About Cooking:

- Food should be arranged with the thickest area 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 160° F to 180° F. Never leave the thermometer in during cooking as it can shatter.

FOOD	DO	DO NOT
Eggs, Sausages, Fruits & Vegetables	<ul style="list-style-type: none"> Puncture egg yolks before cooking to prevent bursting. Pierce skins of potatoes, apples, squash, hot dogs & sausages to allow steam to escape. 	<ul style="list-style-type: none"> Cook eggs in shells. Reheat whole eggs.
Popcorn	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Pop popcorn in regular brown bags or glass bowls. Exceed maximum time on popcorn package.
Baby Food	<ul style="list-style-type: none"> Transfer baby food to small dish & heat carefully. Stir often. Check temperature before serving. 	<ul style="list-style-type: none"> Heat disposable bottles Heat rubber nipple. Heat baby food in original jar.
General	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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 while operating and check frequently 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.

The microwave/convection oven operates from 120 Volt AC supplied by shore power. The microwave has a power output of 850 watts and a convection heater output of 1,400 watts. Oven capacity is 1.1 cubic feet.

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. A brief overview of these features may aid in the operation of the microwave/convection oven.



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

Operation

Safety Lock:

The microwave comes with a safety lock feature, which 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 locked. If any button is pressed, “**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. Normal operation will resume.

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.

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.

Press the STOP/CLEAR pad to:

- Erase, if a mistake is made during programming.
- Cancel the kitchen timer.
- Stop the oven, temporarily, during cooking.
(Press **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.

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.



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.

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.

Microwave Cooking**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 lock out 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

The interior of the microwave produces heat just as 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 and 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. The microwave uses 30% power on **HIGH/MIX** and 10% power on **LO/MIX** while in this mode. 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** and use the number pads to enter cooking time. Press the **START/TOUCH-ON** pad to begin the mixed cooking cycle.

CompuRoast or CompuBake:

These features 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, enter the food type from list next to the mode used and enter the food type being cooked by using the number pad.

To use **CompuBake**: Press the **START/TOUCH-ON** pad to begin the 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 microwave-safe paper towel or upside-down plate to keep food spattering to a minimum. Place a paper towel on the turntable to keep clean-up at a minimum.
- Clean up 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 amount 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

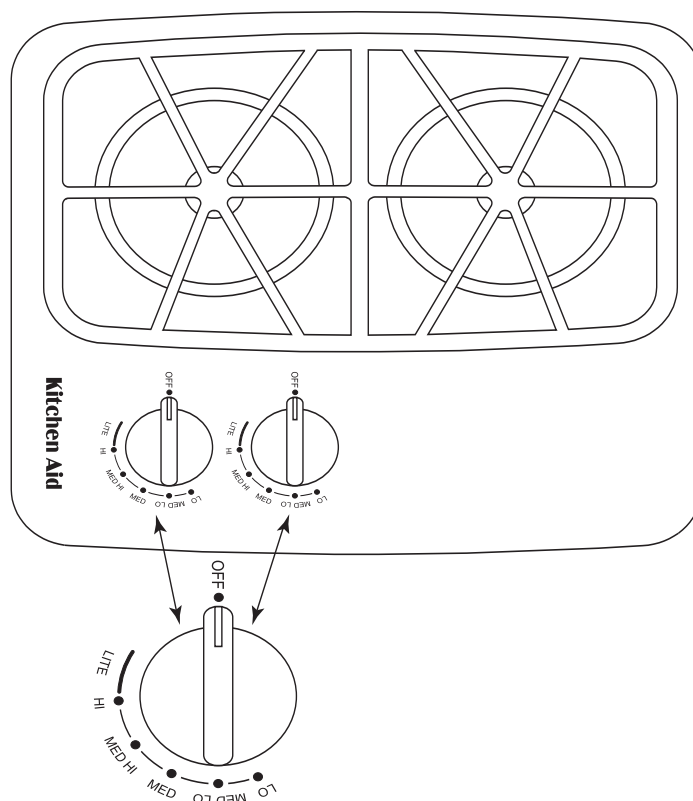
The cooktop utilizes sealed glass cooktop surface burners that spread heat evenly across the bottom of the cookware surface. The cooktop uses an electric ignition system which requires 120 AC to operate, and LP-Gas as a fuel source. The cooktop should be used for cooking purposes only, not as a heating 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 flame tips indicate a rich fuel mixture, which can leave a black color or carbon on the bottom of a pot or pan.

The cooktop will operate when the following conditions are met:

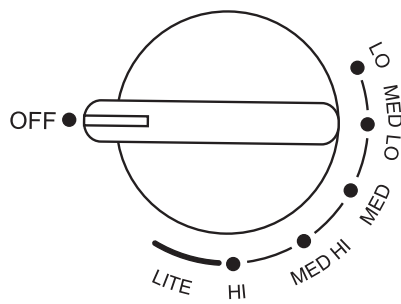
1. The LP-Gas valve on the LP tank is open.
2. The LP-Gas valve under the cooktop (located next to the regulator) must be open.
3. The control knobs are opened.

Operation**Using the Cooktop:**

Place the cookware on the burner grate over the desired surface burner first. Open the desired burner valve by applying a downward pressure on the knob and rotating counter clockwise from the **OFF** position. This will allow the flow of LP-Gas through the burner. Rotate the knob to the **LITE** position to activate the igniters. All igniters will click at the same time. The only burner to produce a flame will be the one with the knob in the **LITE** position. Once the burner lights, rotate the knob to the desired cooking setting. In the unlikely event of a power outage or igniter failure, the cooktop can be lit manually.

**Surface Burners:**

The surface burners have an independent heat rating. The rating for the burners used are 6,000 BTU's and 12,500 BTU's. The smaller rated burner (left burner) should be used for simmering or smaller quantities of food in small cookware. The larger rated burner (right burner) should be used for deep-frying, large quantities of food and large cookware. The amount of heat produced is controlled at the control panel. The flames at the surface burners should have an even appearance at the burner base. Uneven flames may indicate the need to clean the burners.



Control Knobs:

- **LITE** - Used to activate electric spark to light the burner.
- **HI** - Used to start the cooking process and bring liquids to a boil quickly.
- **MED HI** - Used to hold a boil in liquids.
- **MED** - Used for gravy and large amounts of vegetables.
- **MED LO** - Used to keep food cooking at a reduced heat after starting from higher settings.
- **LO** - Use to keep food warm or simmer.



WARNING: Do not leave burners unattended during cooking.

Surface Grate

The surface grate uses a locator pin which **MUST** be positioned in the burner cap indent hole to keep the grate held in place.



WARNING: Do not leave burner valve(s) open while burner(s) are not lit. LP-Gas is heavier than air and will settle on the floor and “hide” in corners. 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. 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.

Tips

- A yellow flame is an indicator of incorrect fuel/air ratio. Lowered BTU output and carbon build up can occur.
- When cooking at an altitude above 5,000 feet, the flame may change appearance and the flame BTU output will be lowered. Allow extra cooking time.
- Do not allow the tips of the flame to extend beyond pan or pot edge. When this occurs, heat is wasted and possibility of injury increases.
- Cooking time can be reduced if the least amount of liquid is used. The choice of cookware selected can make a big difference.
- Additional information can be found in the “Use and Care Guide” located in the Information File Box.

Care & Cleaning

Cleaning the cooktop is quick and easy. Regular cleaning with a soft cloth and a warm detergent solution is generally enough to keep the cooktop clean. Wash, rinse and dry with soft cloths. Clean the cooktop when it is cool. Use a dry cloth or paper towel to clean spatters or spills when the surface is warm, before it gets baked on. 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:

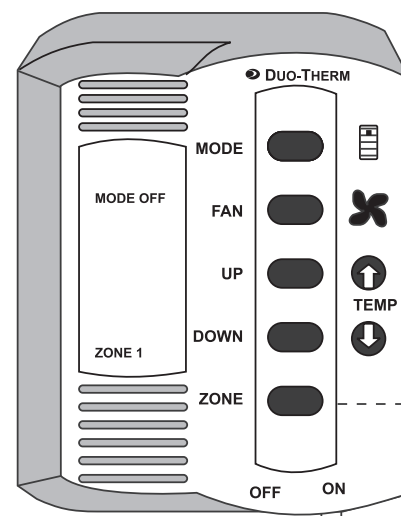
Porcelain enamel is a type of glass fused on steel at a very high temperature. It is not extremely delicate, but it must be treated as glass. Sharp blows, radical surface temperature changes, etc., will cause enamel to chip or crack. Some foods, such as vinegar, lemon juice, tomatoes and milk, contain 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 coarse, gritty cleanser will scratch or mar the surface. Any gentle kitchen cleanser powder or grease cleaner will be suitable. For further information on care and maintenance of the porcelain, call “*Hopes Cultured Marble Polish*” at 800-325-4026.

Two comfort controls are used for the **HVAC** (**H**eating, **V**entilating and **A**ir **C**onditioning) system. One comfort control, located in the living room, operates the front roof air conditioner functions and the LP-Gas furnace operation. If the motorhome is equipped with an Aqua-Hot, the living room Comfort Control will operate the dinette and living room heat exchangers.

The other comfort control, located in the bedroom, operates the rear roof air conditioner and (if equipped) the mid roof air conditioner functions. If the motorhome is equipped with an Aqua-Hot, the bedroom Comfort Control will operate the hallway, bathroom and bedroom heat exchangers. The Comfort Control uses a liquid crystal display to inform the operator of current mode status.

There are six different functions of the HVAC system: **OFF**, **FAN**, **COOL**, **HEAT PUMP**, **AUX HEAT** and **FURNACE**. These may be selected by repeat pressing of the **MODE** button. The roof air conditioner fan speed is controlled by the **FAN** button. Three speeds are available: **low**, **medium** and **high**. Fan speed control applies to the roof air conditioner’s blower speed only. Selecting the fan speed Auto adjusts the fan speed automatically, depending on temperature set

WALL THERMOSTAT



point and actual temperature in a selected zone. The roof air conditioner will use all three blower speeds (low, medium or high) when Auto fan is selected in Cool mode. If operating in the Heat Pump mode, and Auto Fan is selected, only low or high blower speeds are used. Depending on the floor plan and style of the motorhome, all will be divided into operating zones. Two or three zones are the breakdowns. Two operating zones are Front and Bedroom. Three operating zones divide the motorhome: Front (Zone 1), Middle (Zone 2) and Rear (Zone 3). The living room Comfort Control is Zone One, although this is not displayed. The bedroom Comfort Control operates the middle area, which is displayed as Zone Two. The bedroom area is considered Zone Three; however, it is displayed as Zone One on the bedroom Comfort Control. Zone selection is made by pressing the zone buttons. The number flashing indicates the selected zone. The mode currently displayed will activate. The temperature for any HVAC function is controlled by pressing the UP or DOWN buttons.



NOTE: The Comfort Control must be turned to ON to operate any HVAC function. Comfort Control modes cannot be mixed. One zone cannot be on Cool while another zone is set to Furnace.



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

Comfort Control Reset

Should the Comfort Control exhibit unusual symptoms or not respond to commands, it may need to be reset.

To Reset the Comfort Control:

- Press the **MODE** button. Display backlighting should illuminate.
- Press the **MODE**, **UP** and **DOWN** buttons simultaneously and hold five to ten seconds. The Comfort Control should return to mode **OFF**. The factory default settings of 72° F for **COOL** and 68° F for **FURNACE** should be established.

AIR CONDITIONER - ROOF

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 telephone type 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 or (if equipped) Aqua-Hot operation. The refrigerant operation principal of the roof air conditioner is the same as the dash air conditioner or a household type refrigerator. It functions as an enclosed system. 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. The air conditioning principal is reversed when operating the roof air conditioner in heat pump mode. The refrigerant flow is reversed blowing heated air into the interior of the motorhome. There are ambient temperature limitations of the HEAT PUMP mode.



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



NOTE: The roof air conditioner will not operate in HEAT PUMP mode with ambient temperatures at or below 26° F.

AUX HEAT Mode:

If the HEAT PUMP mode is selected when ambient temperatures are approximately 30° F, or if operating in HEAT PUMP mode and temperature drops to approximately 30° F, the air conditioner will stop HEAT PUMP operation and AUX HEAT operation will begin. The furnace is automatically selected as an auxiliary heat source and begins operation. The AUX HEAT mode is automatically selected due to refrigerant characteristics in cold temperatures. The furnace remains the primary heat source until ambient temperature rises above 42° F. When ambient temperature is between 30-42° F, a defrost cycle is initiated approximately every 40 minutes of compressor operation. The blower motor will stop for five minutes and **Defrost** will be displayed. After the Defrost cycle, the Heat Pump operation will resume.

If the motorhome is equipped with an Aqua-Hot and the AUX HEAT cycle is initiated, the Aqua-Hot will need to be turned ON by using the Aqua-Hot control switches located in the galley. The living room and dinette heat exchanger blowers will automatically begin operation. Use the bedroom Comfort Control to select Zone One or Zone Two heat exchangers.

The return air filters should be cleaned frequently. They are located on the motorhome ceiling inside the air intake vent covers. Never operate 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.

Return Air Filters

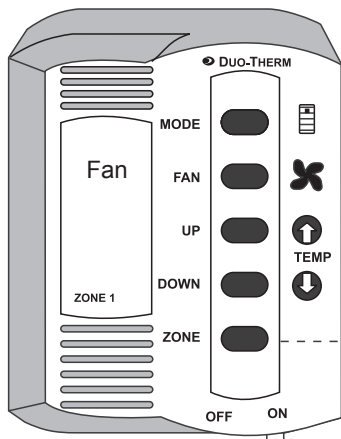
To Clean the Return Filters:

- 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.

Operation

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

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



Fan Operation:

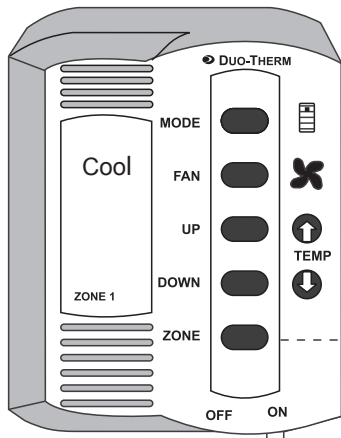
This mode circulates the interior air by using the roof air conditioner blower. The fan speed controls the roof air conditioner blower speed in the following modes: **FAN**, **COOL** or **HEAT PUMP**.

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

Air Conditioner Operation:

The living room Comfort Control will operate the front roof air conditioner functions.

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

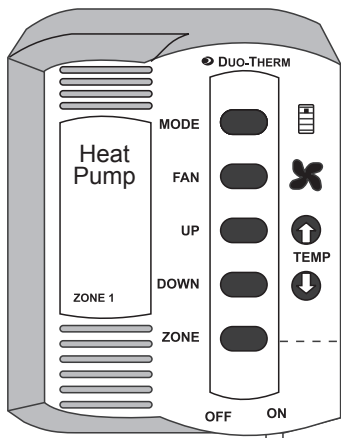


The Bedroom Comfort Control will operate the rear roof air conditioner functions and (if equipped) the center roof air conditioner.

- Press the **MODE** button repeatedly until **COOL** is displayed.
- Press the Zone button to alternate between Zone One and Zone Two. Zone One controls the bedroom roof air conditioner and Zone Two controls the center roof air conditioner.
- Set desired fan speed by pressing the **FAN** button.
- Set desired cooling temperature by pressing the **UP** or **DOWN** buttons.



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



Heat Pump Operation:

Living room Comfort Control will operate the front roof air conditioner.

- 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.

The bedroom Comfort Control will operate the rear roof air conditioner and (if equipped) the center roof air conditioner.

- Press the **MODE** button repeatedly until **HEAT PUMP** is displayed.
- Press the **Zone** button to alternate between Zone One and Zone Two. Zone One controls the bedroom roof air conditioner and Zone Two controls the center roof air conditioner.
- Set desired fan speed by pressing the **FAN** button.
- Press the **UP** or **DOWN** buttons to set desired heating temperature.

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 holding tanks of the motorhome.

FURNACE

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, when 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.

Furnace Operation

The furnace will operate when the following conditions are 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.
3. The battery cut-off switch at the entry door is in the **ON** position.



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.

Using the Furnace

- Slide the **ON/OFF** switch to the **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.



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

If 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.

To Charge the House Batteries:

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



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

WATER HEATER

The water heater in the motorhome will heat water using two different methods. The first method is 120 Volt 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 similar to the one 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 for the 120 Volt and the other 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 temperature and pressure safety relief valve and a by-pass valve.



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 as this damages the thermostats and the electric heating element.

Prior to using the water heater, purge all trapped air from the water system. To purge the air and pressurize the system, fill the water heater tank by using the on board water pump or hooking up to city water. Check the tank for any obvious water leaks. When the system has 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 during this process.



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 that 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.

***Before Using the
Water Heater***

Operation

Water Heater Operations:

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

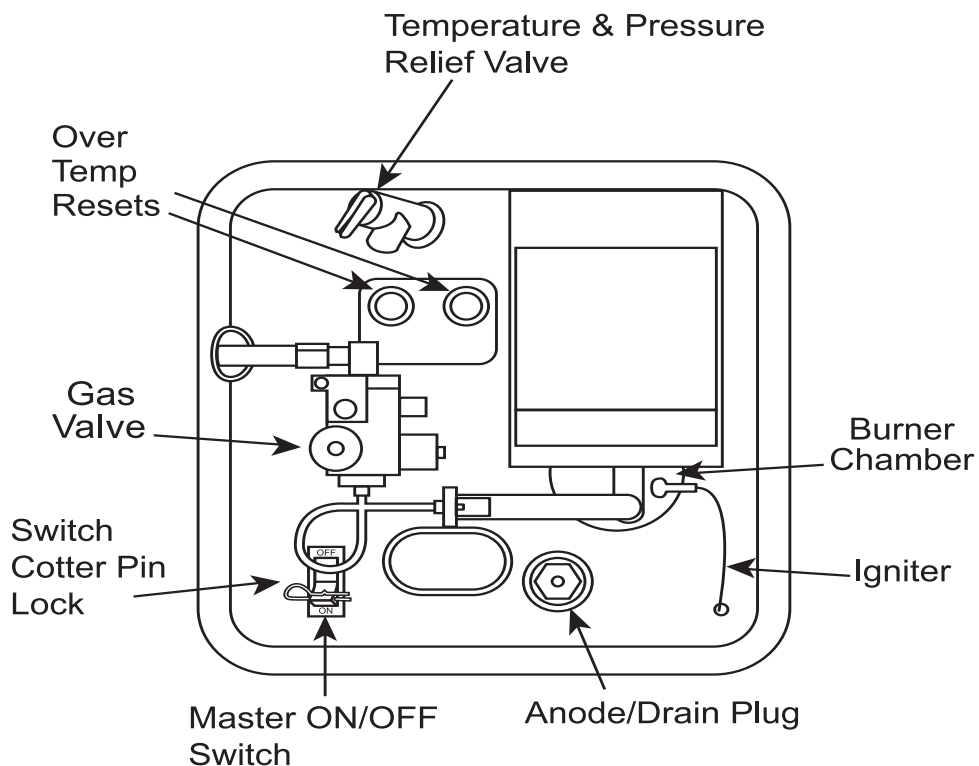
The on/off switch controls the operating circuit to the water heater. In the lock-out mode, or if the water heater fails to ignite, the switch light will illuminate, also on start-up. The switch light illuminates for 12-18 seconds.

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

1. The board has a timing circuit, which allows 12-18 seconds before ignition occurs.
2. The board will then apply current to the gas valve. At the same time, it produces a high-voltage current supply to the electrode to produce a spark at the burner.
3. The board will also confirm the presence of a flame.

The Thermostat-Limit controls the power to the module board. At 130° F, the thermostat will open shutting off the burner. If the thermostat fails, the limit switch will open and requires manual resetting.

If the flame is not sensed after 6-9 seconds, the module board will try two more times and then go into lock-out. The flame sensing is through the spark wire.



LP-Gas Operations:

- Make sure the LP-Gas is turned on.
- Turn the water heater switch to 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."

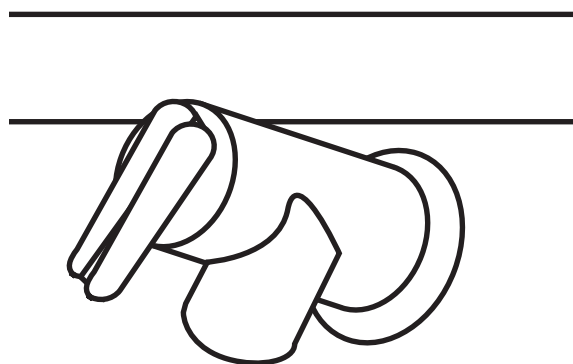


NOTE: It is recommended not to operate the water heater on LP-Gas while the motorhome is in transit.

120 Volt AC Operations:

- Have either shore power or the generator supplying AC voltage.
- Turn on the water heater switch located under the galley counter.
- Both gas and electric may be used at the same time. This will speed up the process of heating water for large volume usage.

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. A discharge is a normal occurrence and is not necessarily a faulty valve. The water heater has an internal air pocket to reduce the possibility of dripping or weeping. Eventually, the expansion of the water will absorb the air pocket. When this occurs, the air will have to be replaced utilizing the following procedure.

Pressure - Temperature Relief Valve

CAUTION: Ensure the water heater storage tank is cool prior to checking the valve.

Re-establishing the Air Pocket:

Step 1: Turn off the water heater.

Step 2: Shut off the incoming water supply.

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

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.

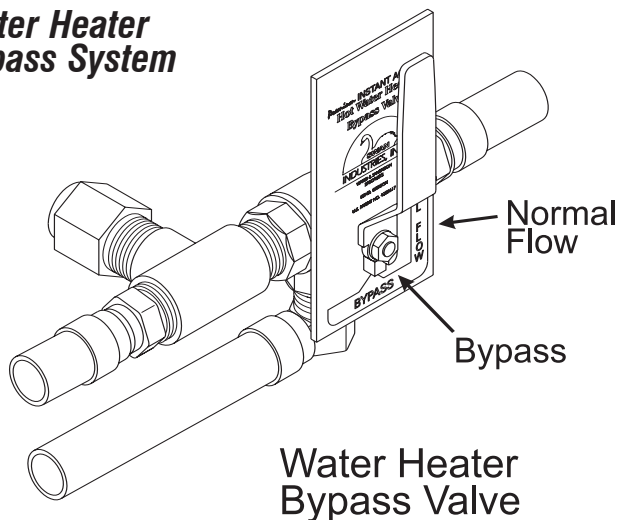
Step 6: Turn ON the water heater.

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

**Burner
Compartment**

Periodically check the outside service compartment and screen in the door to ensure no foreign material has accumulated preventing the flow of combustion and ventilating air.

**Water Heater
Bypass System**



The water heater bypass is a valve located on the back of the water heater. Turning the valve to **BYPASS** position diverts 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 normal water heater operation turn valve so that handle points to **NORMAL FLOW**.

Tips

- Turn off water heater when not in use to conserve LP-Gas.
- The water heater tank capacity is ten gallons. When using the shower, conserve water by shutting the shower water off when not in use.
- Use caution when adapted to 30 Amp shore service, or anything less than 50 Amps. 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.

- Remove the anode during the winterization procedure. If the anode has deteriorated, replace it. Water with a heavy sulfur content will coat the anode. Hot water will smell like rotten eggs. Replace the anode to eliminate the odor.
- 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.

If the motorhome is to be stored for a long period of time, or during the winter months, drain the water heater to prevent freeze damage.

Draining & Storage

1. Turn off the electrical power to the water heater.
2. Shut off the LP Gas supply to the water heater.
3. Open low point drains.
4. Open both Hot and Cold faucet.
5. Remove Anode Rod from the tank. Install a 3/4" drain plug if RV antifreeze will be added to the system.
6. Place the Bypass lever in **BYPASS**.



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

- 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, ensure 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.

Troubleshooting

AQUA HOT (Optional)

The Aqua-Hot heat system is specially designed for use in motorhomes. The Aqua-Hot is an appliance combining a water heater with a furnace. The Aqua-Hot will provide an almost endless supply of hot water and heat the interior of the motorhome. A 50,000 BTU diesel fired burner and a 1,650 watt AC element heats a 60/40 antifreeze solution to approximately 200° F. The antifreeze solution is pumped through heat exchangers located throughout the motorhome. Four pumps are used to circulate the antifreeze solution. Three pumps supply the solution to the interior heat exchangers. The fourth pump circulates the antifreeze solution of the engine. Fresh water is heated when pumped through a coil tube inside the Aqua-Hot.

Aqua-Hot - Use of Chlorine Bleach

Chlorine bleach or other concentrated chlorine bearing chemicals can cause failure to the Aqua-Hot's Domestic Water Loop (copper tubing) if not properly and thoroughly rinsed. The Aqua-Hot's copper tubing is rated for use with fresh water and winterization solutions only. Periodic flushing with common household chemicals, including bleach, has little or no effect on the heating system if properly rinsed with the fresh water afterwards. Failure of copper tubing, especially soft or flexible copper, can result if materials other than water or winterization solutions are allowed to reside inside the piping for extended periods such as during storage or other periods of non-use. The most common cause for failure is due to an extended exposure to chlorine, solutions containing chlorine (i.e. bleach) or hydrochloric acid.



NOTE: The Aqua Hot must be turned ON before using any heat feature.

Diesel Burner:

The diesel burner will consume approximately ½ gallon of diesel for each hour of continuous burner operation. The diesel burner is rated at 12 Volt/65 watts. Three circulating pumps are rated at 12 Volt/12 watts each. The diesel fired burner has a fast recovery rate. To heat the Aqua-Hot from the diesel burner turn the switch to the **ON** position. The switch will illuminate when the Aqua-Hot is ON. Allow 20-30 minutes for the Aqua-Hot to reach operating temperature before operating heat exchangers or using hot water.

Electric Heat Element:

The electric element works well if plugged into 50 Amp service. If the motorhome is plugged into less than 50 Amp service, exercise care so the electric service provided will not be overloaded. Electric operation recovery rate is slower than the diesel burner. When the switch is turned on a relay will send power from the 110 Volt AC panel to the electric element in the Aqua-Hot. Allow two to three hours for the Aqua-Hot to reach operating temperature when operating from the electric element.

Engine Heat Exchange System:

The Aqua-Hot system has an engine preheat feature to aid in starting in cold or frigid weather. Located inside the Aqua-Hot is a separate engine coolant loop and an engine coolant pump. The Aqua-Hot will heat the engine coolant and the internal engine pump will circulate the coolant heating the engine. When traveling, the water pump (on the engine) circulates the heated engine coolant through the Aqua-Hot. Through convection, the heat will be transferred to the Aqua-Hot coolant, providing hot water and interior heating.

Engine Preheat:

Turn the diesel switch to the ON position. The diesel burner will light. Turn the Engine Preheat to the ON position. This activates the engine pump circulating the engine coolant through the Aqua-Hot.

Interior Heat Exchangers:

The heat exchangers are small radiators with 12 Volt DC blower motors. Current consumption is approximately .25 watt per large heat exchanger. The small heat exchanger used in the private bath and for the holding tank bay is .10 watt.



NOTE: The HVAC (Heating, Ventilating, Air Conditioning) system will not operate correctly when both comfort controls and all zones are not in the same mode. DO NOT set control to display furnace in one zone and cool in another zone.

To Operate the Furnace:

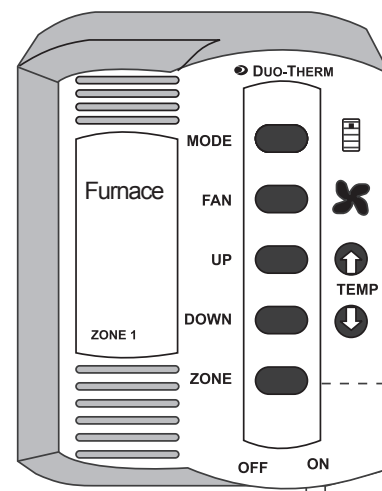
- Select either diesel burner or electric element operation.
- Turn living room Comfort Control to ON.
- Press the **MODE** button repeatedly until furnace is displayed.
- Select desired temperature setting using the up or down buttons.

Bedroom Comfort Control:

- Press the **MODE** button repeatedly until furnace is displayed.
- Pressing the **ZONE** button will alternate between Zones One and Two. Zone One controls hallway and bathroom exchangers. Zone two operates bedroom exchanger.
- Select desired temperature setting using the up or down buttons.

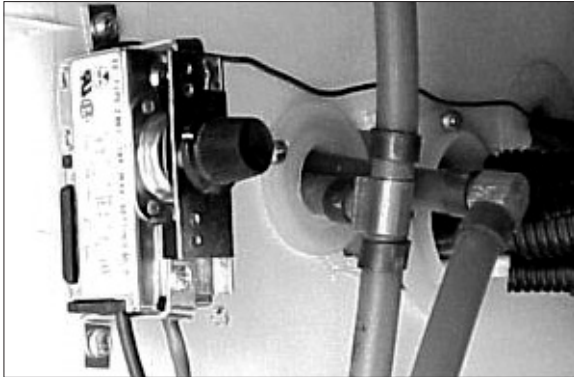


NOTE: The blower motor of the heat exchanger in a private bathroom is controlled by the switch in the private bathroom. When the switch is on, the bathroom blower motor will cycle on and off when the hallway heat exchanger blower motor cycles on or off.



Comfort Control in FURNACE mode.

Bay Thermostat



Adjust the Bay Thermostat here.

If the motorhome is used in cold weather conditions, locate the bay thermostat next to the Aqua-Hot. This thermostat controls the heat exchanger for holding tank bay heat. Adjust the thermostat to 40-50° F. This will help prevent freezing of the water system.



NOTE: The Aqua-Hot must be turned ON when using the holding tank bay exchanger.

Maintenance Schedule

Monthly:

Check the Aqua-Hot's 50/50 solution of water and antifreeze to ensure a proper level. Do this by visually checking coolant level in Aqua-Hot's expansion tank. This should be checked only when the Aqua-Hot is at operating temperature. Adding solution to the expansion tank when the unit is cold will result in a solution overflow when the Aqua-Hot heats to normal operating temperatures.

Annually:

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



CAUTION: Before cleaning or servicing disconnect all power supplies.



For more details about the Aqua-Hot system see the Owner's Information Box.

Fuel Filter/Water Separator

The filter is located on the curbside of motorhome behind the fuel access door. Remove the two bolts at the bottom of the fuel door and swing the door upwards. The Aqua-Hot fuel filter/water separator is mounted on top of the chassis frame support.

Draining the Collection Bowl:

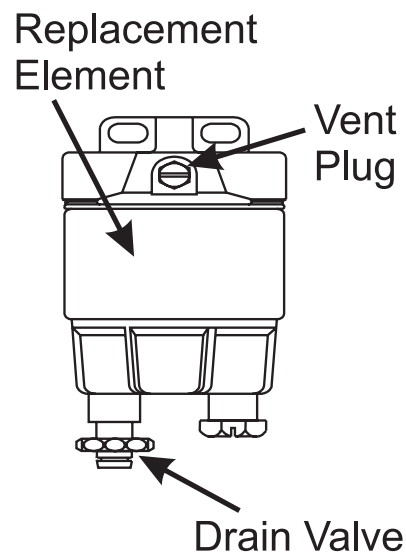
Water is heavier than fuel and will settle to the bottom of a fuel bowl which will make it appear different in color. Check the collection bowl more often in a high humidity environment. With the engine and the Aqua-Hot off, open the drain to evacuate any contaminants and then close it.

Element Replacement:

The contamination levels in the fuel determine the element's replacement frequency. Fuel flow to the Aqua-Hot becomes restricted as the element gradually plugs up with contaminants, resulting in noticeable heating loss and/or hard starting. If this occurs, change the element as soon as possible. As a guideline, change the element every 500 hours, annually or at first indication of heat loss, whichever occurs first. Always carry an extra replacement element as one tankful of contaminated fuel can plug a fuel filter.

To Replace the Element:

- Drain the filter unit of fuel by opening drain valve.
- Spin bowl/element from head and remove element.
- Coat new seals with motor oil and the install new element.
- Prime spin bowl/element with clean fuel.
- Spin bowl/element onto head and tighten firmly by hand.
- Start Aqua-Hot and check for leaks.



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:

**WASHER-DRYER
PREPARED**

- Color coded water supply lines: red line for hot, blue line for cold.
- An 1½” 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.



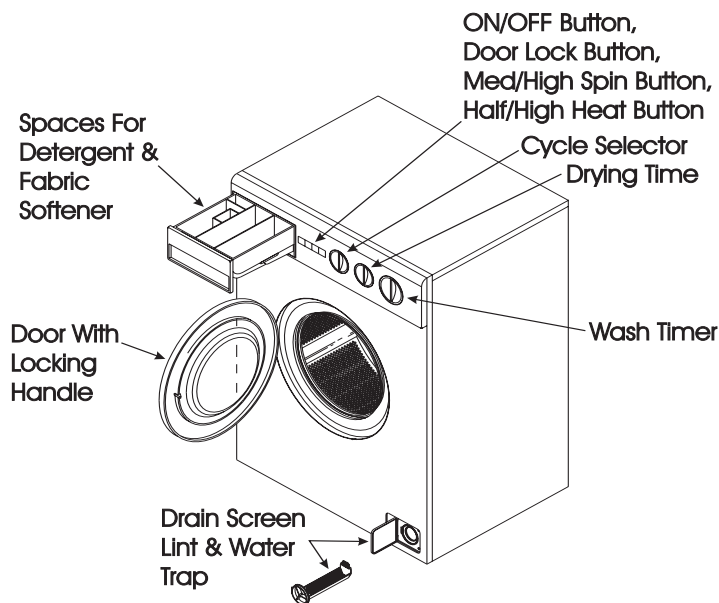
Refer to the manufacturer's installation instructions if a washer-dryer is to be installed at a later date.

Follow these instructions for safe and reliable operation:

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

**WASHER-DRYER
(Optional)**

The washer-dryer is automatic with a load 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 VAC.
- To operate the washer-dryer, the motorhome must be plugged into shore power or the generator must be running.
- The washer-dryer can be operated while the motorhome is traveling. The generator must be running and the water pump needs to be on. Make sure the grey tank has enough room for the rinse cycle.
- The washer-dryer water use will be approximately 16 gallons of water per load.

**Operating
Instructions**

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 a 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 push button ON.
- After the cycle is complete wait two minutes for the door lock to release before attempting to open the door.



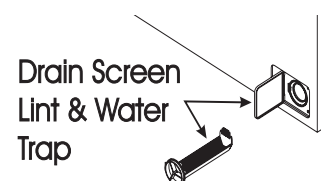
WARNING: Do not wash or dry articles that have previously been cleaned, washed, soaked or spotted with gasoline, dry cleaning solvents or other flammable or explosive substances. Do not add these substances to the wash water as they produce vapors that could ignite or explode. Do not use dryer to dry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

Cleaning the Drain Screen



Winterizing the Washer-Dryer

Winterizing the Washer-Dryer to Avoid Freeze Damage:

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 valves located at the manabloc water manifold 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. Maximum air pressure must not exceed 35 psi.

Using Antifreeze in the System:

1. When putting antifreeze into the water system of the 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 approximately 10 seconds.
3. Advance the unit to a spin cycle to remove the majority of the water from the unit.
4. 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.
5. 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.

Cleaning the Washer-Dryer

As the washer-dryer is used, 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.

EXECUTIVE

SECTION 5 EQUIPMENT

- INTRODUCTION • 149**
- ENTRY STEP • 149**
 - Operation • 149*
 - Tips • 150*
 - Maintenance & Lubrication • 150*
- STEPWELL COVER • 151**
 - Adjustments • 151*
- ENTRY DOOR • 151**
 - Keyless Entry • 152*
 - Latch Adjustments • 152*
 - Screen Door - Changing the Glass • 153*
 - Screen Door - Adjusting • 153*
 - Screen Door - Removing the Screen • 153*
- SLIDE-OUT OPERATION • 154**
 - Extending Main Room • 155*
 - Retracting Main Room • 156*
 - Manual Override - Hydraulic • 157*
 - Manual Override - Electric • 158*
 - Extending Bedroom • 159*
 - Retracting Bedroom • 160*
 - Manual Override - Bedroom • 160*
- AWNINGS • 162**
 - Front Door • 162*
 - Awning Care & Maintenance • 162*
 - Awnings - Patio • 163*
 - Awning - Automatic Carefree (Optional) • 165*
 - Awning - Automatic Girard (Optional) • 167*
 - Tips • 169*
 - Slide-out Awning • 169*
- FANS • 170**
 - Exhaust Fan • 170*
 - Bathroom Fan • 171*
 - Tips • 171*
- PRIVACY DRAPERY - ELECTRIC (Optional) • 172**
 - DOOR - SLIDING • 172**
 - SOFA BED CONVERSION • 173**
 - Sofa to Sleeper • 173*
 - Sleeper to Sofa • 173*
 - DINETTE BED CONVERSION (Optional) • 173**
 - STORAGE - UNDER BED • 173**
 - SUPER SLIDE (Optional) • 174**
- RADIO & NAVIGATION SYSTEM • 174**
 - Operation • 175*
 - Back-up Camera Operation • 176*
 - Radio Operation • 176*
 - Navigation System • 177*
- RADIO - BEDROOM • 181**
- CITIZEN BAND RADIO (CB) • 182**
 - CB Components • 182*
 - Operating Procedures • 183*
 - Transmission • 184*
 - Standing Wave Radio • 185*
 - Weather Alerts • 186*
- CELL PHONE ANTENNA • 186**
- ENTERTAINMENT SYSTEMS • 187**
 - Television (Front) w/Lock-out Feature • 187*
 - Television Antenna • 188*
 - Hook-ups - TV Cable, Computer & Telephone • 189*
 - DSS Conduit • 190*
 - Video Selector Box • 190*

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.



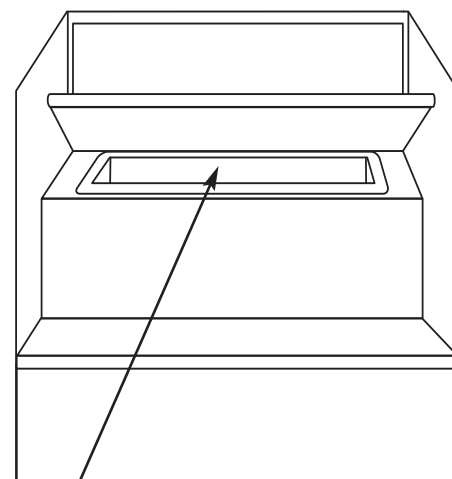
Detailed information with CAUTION or WARNING instructions for the various electronics, other than what is provided in this section, can be found in the manufacturer's manual.

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. The uppermost step has a **storage compartment** w/removable tray. The storage can be utilized to store frequently used items such as, gloves (for refueling), tire pressure gauge, flashlight, or outside slippers.

ENTRY STEP - Operation

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.



Storage Compartment.

Tips

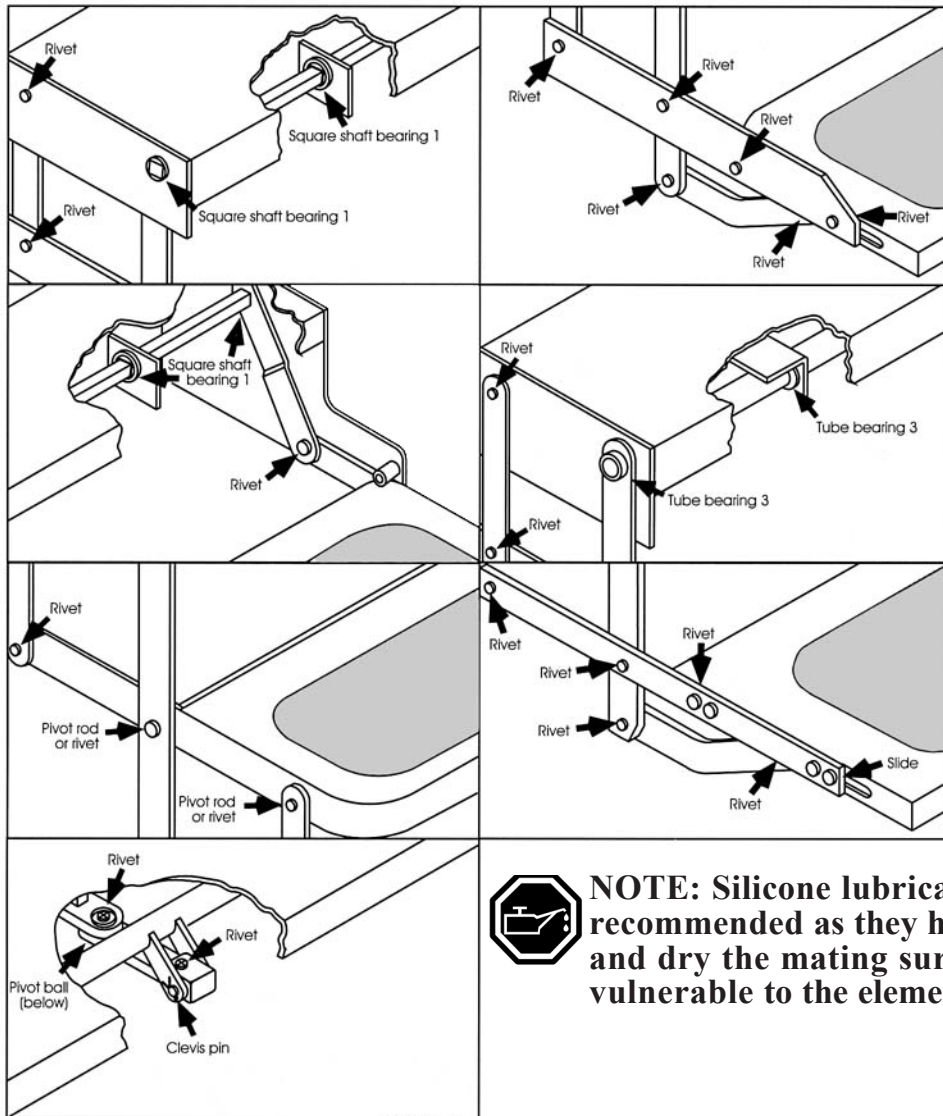
If the step fails to operate:

- Verify that the step switch is **ON**.
- Check the main power supply for the step. A 25 Amp 12 Volt DC fuse is located in the front distribution panel.
- 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 7 ½ Amp ATO blade fuse is used to illuminate the **STEP OUT** dash warning light. The fuse is located on the front run box.



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 **Kwikkee 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.

STEPWELL COVER

The motorhome is equipped with a sliding stepwell cover that is extended and retracted by the use of a dual action air cylinder. The air cylinder is controlled by an electrically operated air valve. The air solenoid, known as a “MAC” valve, receives air pressure from the front air tank. The “MAC” valve will direct the air pressure to either side of the dual action air cylinder, moving the stepwell cover in or out. The stepwell cover will not operate without sufficient air pressure (approximately 60 psi).



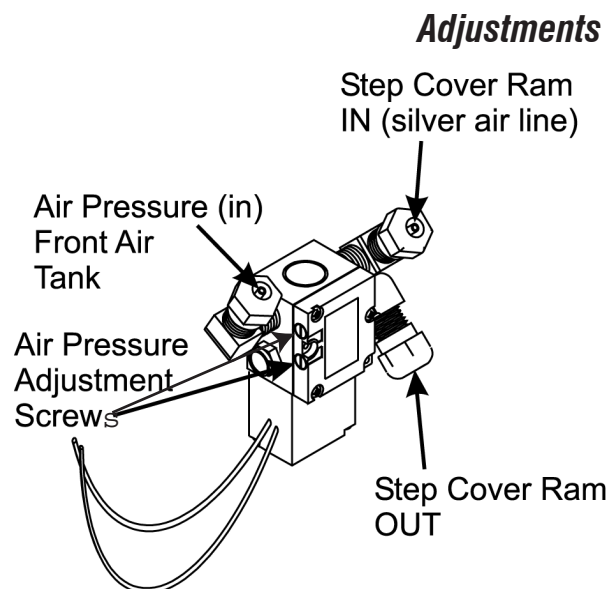
CAUTION: The stepwell cover is under air pressure. When operating the stepwell cover be sure there are no pets, shoes or other obstructions in the stepwell area. Do not operate the stepwell cover while standing in the stepwell area.

The “MAC” air valve is located in the front of the motorhome, behind the generator door mounted to the frame. The easiest way to identify the location is have someone operate the stepwell cover with the generator door open and listen for the release of air.

The “MAC” air valve has two adjustment screws. The adjustment screws regulate the air flow to either side of the air cylinder. Adjusting the screws will affect the speed in which the air cylinder moves in or out. Clockwise adjustment on the screw will decrease air flow. Counterclockwise adjustment on the screw will increase the air flow. For proper stepwell cover adjustment it is recommended that adjustments be performed by a qualified service person.



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



Adjustments

Step Cover Ram
IN (silver air line)

Air Pressure (in)
Front Air
Tank

Air Pressure
Adjustment
Screws

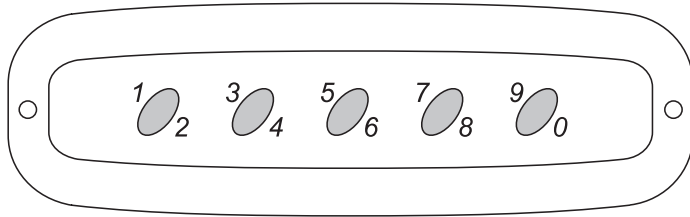
Step Cover Ram
OUT

ENTRY DOOR

The entry door is adjusted at the factory and tested for all operations. The door incorporates three separate seals to eliminate wind noise during travel. The door uses two separate locks for safety and security. One locking system is the door handle and the other is a dead bolt. The door handle incorporates a primary and secondary latching system. This is used to ensure secure and safe latching. There are adjustments which can be made to help maintain entry door performance.

Keyless Entry

The entry door and bay doors can be locked or unlocked using the touch keypad located adjacent to the entry door. The system lock or unlock codes can be personalized.



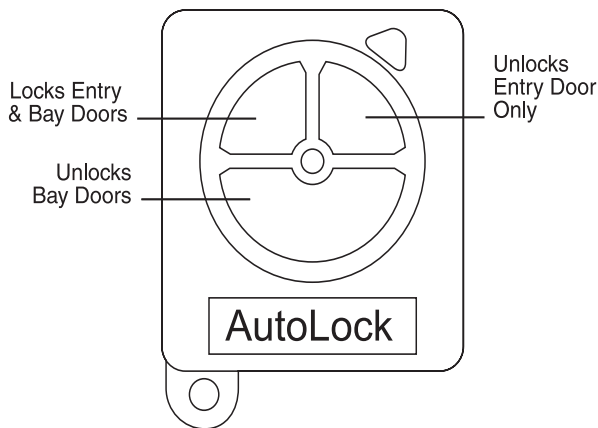
- To lock, shut the door. Press 559 to lock the entry door and bay doors.
- To unlock, enter your 3 to 8 digit personalized unlock code.
- Press 9/0 to unlock the bay doors.



CAUTION: It is recommended to change the unlock code upon receipt to a personalized number. Consult the system owner's manual for programming information.



NOTE: These instructions are for motorhomes equipped with "keyless entry" only.



To Authorize the Remote:

If the remote does not respond, it may need authorization.

- Locate the keyless entry receiver box behind the instrument cluster.
- Unplug the receiver box. Plug receiver box back in.
- Within three seconds, press the lock button on one remote. The entry door should lock.
- Press the lock button on the other remote.



NOTE: If the motorhome is factory equipped with an optional security system, the security system remote will lock or unlock the entry door and bay doors when the system is armed or disarmed.

Latch Adjustments

Adjusting the Entry Door Latch:

- Determine which bolt needs adjustment.
- Slowly close the entry door observing the latch and strike bolt alignment. Do not attempt to latch if the alignment is off. If the alignment is correct, allow the latch to catch in the first (primary) position only.
- The latch should move to the second position with just slight pressure applied to the entry door. Upper and lower latches should be evenly timed. Press on the entry door to see if there is any further movement of the door.
- The entry handle should operate with little effort to open the entry door. An excessive amount of pressure indicates the bolts are set too far back.

- With a 5/8" inch box wrench or socket, loosen the movable strike bolt. Make all adjustments in small increments. Tighten the bolt firmly after making adjustments. The bolts should have slight up and down movement for vibration control in travel.
- Test the operation of the dead bolt lock to ensure proper functions.
- Silicone should be applied weekly to the entry door rubber gaskets to prevent squeaking while the motorhome is traveling. Use a one inch sponge paint brush, sprayed with silicone for easy application.



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

Changing the Glass in the Screen Door:

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

**Screen Door
- Changing the Glass**

Adjusting the Screen Door For Up and Down Location:

- Loosen the chrome bolts on the hinge side of the screen door. Four on the top and four on the bottom.
The hinge should fit tightly to the trim of the door when the screen door is latched to the door and the door is open.
- The steel hinge has slots to allow up and down movement.
- Four Allen type screws are on the top hinge, and four on the bottom hinge, to adjust the screen door to properly fit to the entry door.
The hinge should fit tightly to the trim of the door when the screen door is latched to the door and the door is open.
- Check to see that the pad on the inside of the door is not sitting on top of the aluminum trim of the door. If it is, it will hold the screen door away from the door and you will not have a proper seal. If the pad is too large, re-size the pad.

**Screen Door
- Adjusting**

Removable Screen:

- The top half of the screen door is removable. This allows clear viewing through the entry door glass while traveling.
- To remove the top half of the screen door for travel, rotate clips and remove the screen.
- To store the screen for travel, use the clips provided on the bottom half of the screen door.

**Screen Door
- Removing the Screen**

SLIDE-OUT OPERATION

The main slide-out room operates electrically or through electric switches controlling hydraulic cylinders. Slide-out room operations use many safety features preventing mechanical damage or physical harm. The slide-out room(s) will not operate until all safety requirements are met.

The design of the slide-out system requires very little maintenance. To ensure long life of the slide-out system, follow these simple guidelines:

- The roof of the slide-out should be checked for debris such as pine needles, dirt, leaves, sticks, etc. 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 wipe seal. The seal should be clean and free of dirt or other foreign material. Inspect the seal for tears.
- In the event the slide-out room leaks, fully retract it. If necessary, tape the exterior opening closed with duct tape until repairs to the motorhome can be completed.



NOTE: Do not use any petroleum based products on the slide-out seal. Petroleum based products can damage the paint and will cause premature aging of the rubber seal.



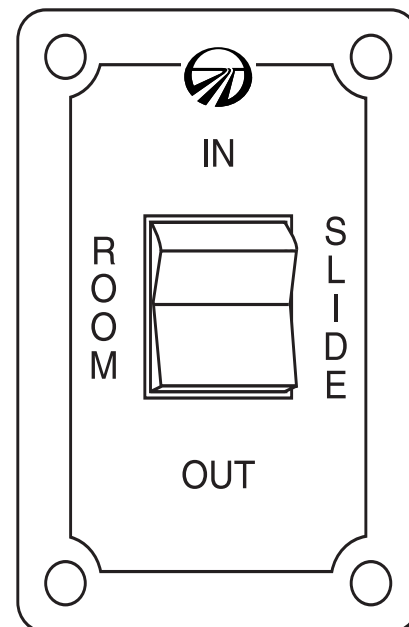
WARNING: Move the driver's seat forward before activating the slide-out room. Damage to the upholstery can occur. The outside area must be clear of any obstructions restricting slide-out room operation. Ensure there is five or more feet of clear space outside the slide-out room prior to extending or damage can occur. When retracting the slide-out room, ensure there is sufficient clearance inside the motorhome. Never move the motorhome with any slide-out room extended.



CAUTION: Continuous operation of the slide-out room can drain the batteries and damage the motor from overheating.

**Extending
Main Room****To Extend the Slide-Out Room:**

- Move the driver seat forward.
- 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.
- The house batteries are fully charged.
- Ensure all people, pets and objects are clear of the slide-out room path.
- The control switch for the slide-out room is on the overhead compartment on the curbside of the motorhome.
- Press and hold the slide-out room switch in the OUT position. The slide-out room will slowly move to the OUT position. Release the switch to stop room movement. To continue the room movement, push and hold the switch in.
- Release the slide-out switch when the room is fully extended (a change in motor sound indicates extension). The slide-out drive motor will not stop automatically; the switch must be released.
- If equipped, extend the bedroom slide-out.
- Level the motorhome with the leveling system.



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



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

Retracting Main 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 operation.
- Move the driver's seat forward.
- Inspect the exterior to ensure all bay doors are closed and there are no sags in the awning material.
- Remove any debris from the top of the slide-out room.
- Prior to retracting the slide-out room, start the motorhome. Allow the air bags to fully inflate to normal travel height.
- Retract the leveling system or prepare the air leveling system for travel prior to operating the slide-out.
- Turn the ignition switch OFF. The slide-out room will not operate with the engine running.
- The house batteries are fully charged.
- The park brake must be applied.
- Ensure all people, pets and objects are clear of the slide-out room path.
- Press and hold the switch in the **IN** position. The slide-out room will move slowly in. To stop the slide-out room, 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 retracted.
- Release the switch.



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 floor is clean before you retract the slide-out room. Trapped dirt or grit under the slide-out room can scratch the floor surface. Never move the motorhome with the slide-out room extended.

Manual Override Hydraulic-Emergency Procedures:

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

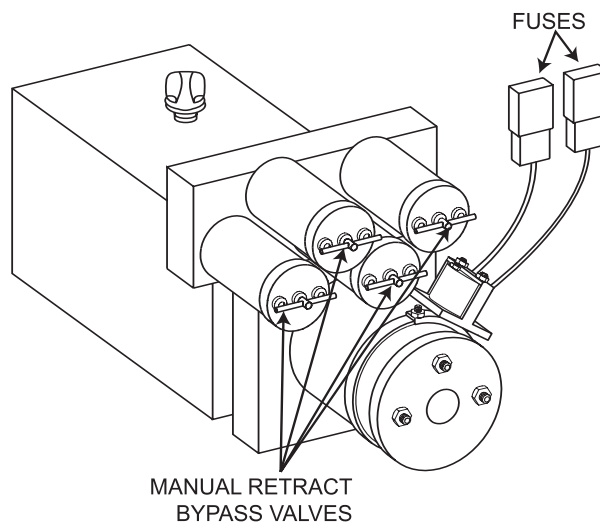
- The ignition key is off.
- The park brake is applied.
- Shut all bay doors under the slide-out room. If, after checking all the safety requirements, the room does not respond and the hydraulic pump does not operate, a bay door below the slide may have faulty electrical connection at a safety switch, or one of the safety switches is out of adjustment.

If the pump motor operates but the room does not move:

- Slide-out the generator, check the two fuses adjacent to the hydraulic pump. If the room does not operate it can be retracted manually. Several people (8) are needed to push in the room.

To move the slide-out room manually, retract the motorhome leveling jacks (see "Leveling Jacks"). Locate the slide-out room hydraulic pump on the lower left front frame of the chassis. Turn the T-Handles counterclockwise approximately six turns each. The T-Handles may turn easily at first; however; they will become difficult to turn as the internal springs are compressed. The room may move slightly as the valves are opened and internal pressure is released.

1. Line up equal distance along the outside wall. Do not push on the flange.
2. In synchronized movements, push the room in with repeated attempts.
3. Close the T-handles when the room is fully retracted.



NOTE: The slide-out room is heavy and will require several persons to push it into the retracted position. When the slide-out room is in the fully retracted position tighten the T-Handles to hold the room in place.

**Manual Override -
Electric**

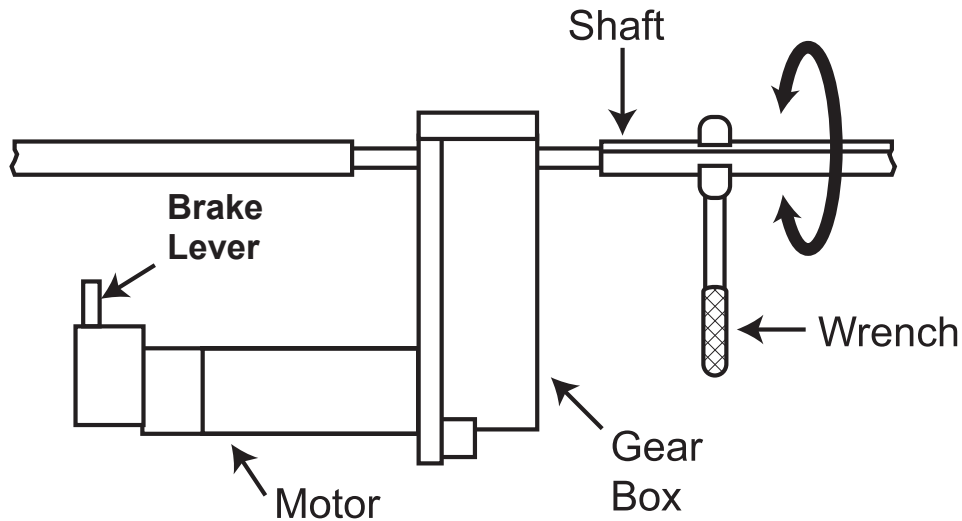
Manual Override Electric Slide - Emergency Procedures:

To move the slide-out room manually, retract the motorhome leveling jacks (see "Leveling Jacks").

1. Open the outside storage compartment doors underneath slide-out room.
2. Remove plastic covers, if applicable, from top of compartments to gain access to drive shafts and motor assembly.
3. To move the slide-out room, move the brake lever on the drive motor counterclockwise to the Release position. Turn the shaft next to the gearbox using a 7/8" open-end wrench.
4. When the room is in apply pressure to the wrench so the room is sealed. Move the brake lever to the Engage position locking the room in place.
5. Take the motorhome to an authorized dealer for service.



NOTE: The brake lever remains in the Engage position during normal operation.



Bedroom Slide-out-Extending:

The bedroom slide-out operates electrically. The bedroom slide-out room operates using many safety features preventing mechanical damage or physical harm. Firmly latch any cabinet doors located adjacent to the bedroom slide-out. Damage to the door or fascia can occur.

To Extend the Bedroom Slide-out:

- Confirm that there is at least five feet of clearance outside the motorhome for the slide-out room to extend.
- Ensure the ignition key is in the **OFF** position.
- The house batteries are fully charged.
- The house battery cut-off switch must be on.
- Locate the control switch for the slide-out, usually on the vanity cabinet.
- Ensure all people, pets and objects are clear of the slide-out room path.
- Press and hold the slide-out room switch in the **OUT** position. The slide-out room will slowly move to the **OUT** position. Release the switch to stop room movement. To continue the room movement, push and hold the switch in.
- Release the slide-out switch when the room is fully extended (a change in motor sound indicates extension). The slide-out drive motor will not stop automatically; the switch must be released.
- Level the motorhome with the leveling system.



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



CAUTION: Dirt 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 motor from overheating.

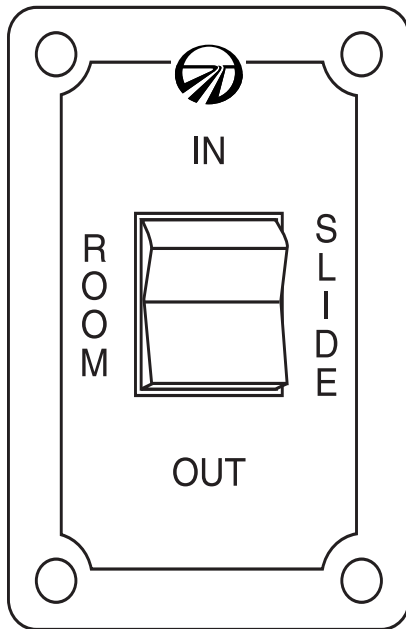


NOTE: Do not leave the slide-out in the extended position during severe weather. Conditions such as high winds or heavy rain may cause damage.



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

Retracting Bedroom



To Retract the Bedroom Slide-out:

- Check for sufficient clearance inside the motorhome before retracting the slide-out room.
- Clean the floor, if applicable, to ensure there is no dirt or grit that could result in floor damage during slide-out retraction.
- Remove any debris from the top of the slide-out room.
- Prior to retracting the slide-out room, start the motorhome. Allow the air bags to fully inflate to normal travel height.
- Retract the leveling system or prepare the air leveling system for travel prior to operating the slide-out.
- Turn the ignition switch **OFF**. The slide-out room will not operate with the engine running.
- The house batteries are fully charged.
- The house battery cut-off switch must be on.
- Locate the control switch for the slide-out, usually on the vanity cabinet.
- Ensure all people, pets and objects are clear of the slide-out room path.
- 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 retracted.
- Release the switch.



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

Manual Override - Bedroom Slide-out

Manual Override-Bedroom Slide-out:

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

- The ignition key is off.
- The battery cut-off switch is on.
- The house batteries are fully charged.

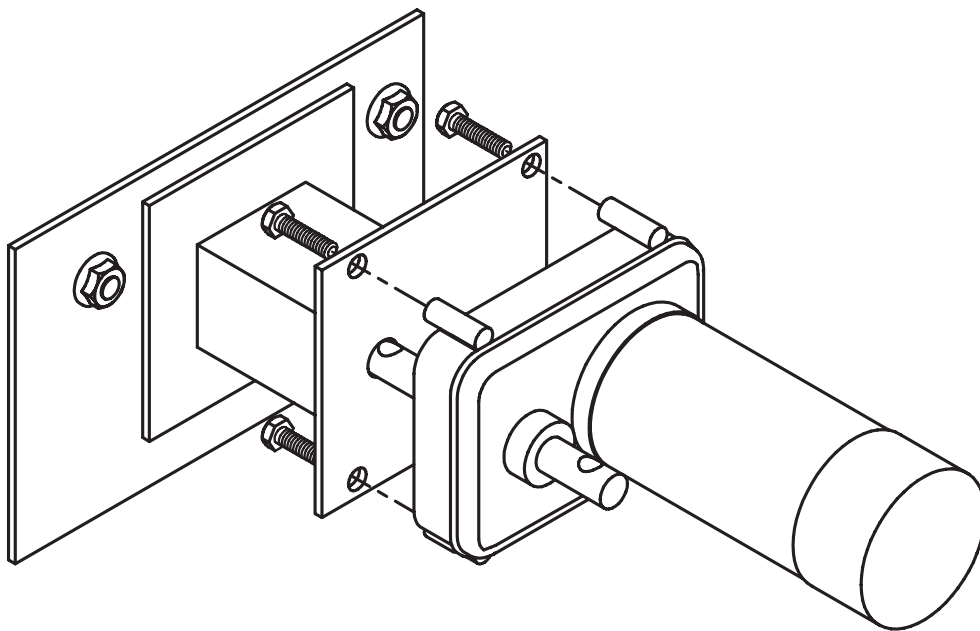
If the slide-out room will not operate after verifying the safety features, check the Slide-Out fuse in the fuse strip marked Domestic of the front electrical panel. If the fuse is good, the bedroom slide-out can be retracted manually.



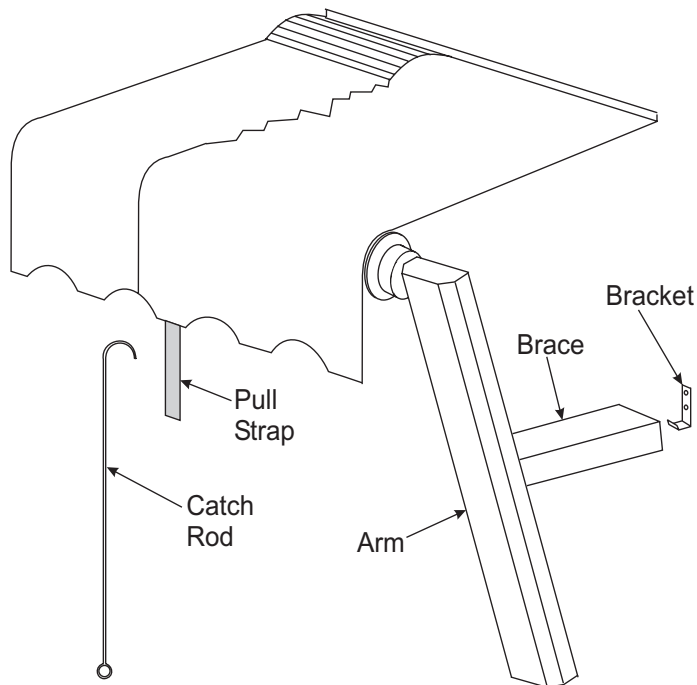
WARNING: Do not work on the slide-out system unless the battery is disconnected. Make sure the floor is clean before retracting the slide-out room. Dirt or grit that is trapped under the slide-out can cause damage to the floor.

After the previous items have been checked, if the room still does not move when the slide-out switch is pressed, follow these simple steps to manually override the slide-out room:

1. Lift up the mattress to gain access to the slide-out cover board.
2. Remove the cover screws and cover to access the motor and mechanism.
3. If the battery power to the slide-out motor needs disconnecting, mark the wire color and location.
4. Two methods may be used. Unbolt the four fasteners retaining the motor to the flange. Make sure everything is clear of the slide-out room path. Manually push the room into place. Install the motor to retain the room in place.
5. The alternative method is to move the brake lever to the Release position. Place a $\frac{3}{4}$ " end wrench or socket to the nut at the opposite end of the drive shaft. Crank the room in. Move the brake lever to the Engage position.
6. Take the motorhome to an authorized dealer for service.



AWNINGS Front Door



To Extend The Awning:

- Hook the pull strap loop with awning pull rod.
- Pull strap until awning is at full extension. With free hand, lever out inner arms.
- Mate the slot of inner arm with hook on side of the motorhome. Repeat procedure for other arm.
- Release strap slowly ensuring inner arms are secure. Slide the strap to rear of awning roll tube and tie to rear arm.
- Loosen locking knobs for both arms and extend arms so the canvas will clear door in the open position.

To Retract Awning:

- Loosen locking knobs for both arms. Lower arms to stop bolts. Tighten knobs.
- Untie the pull strap and slide strap to center of awning roll tube.
- Pull down on pull strap with a firm grip until tension is off the inner arms. Fold inner arms and attach them to the velcro.
- Carefully allow material to wind onto awning roll tube while holding strap in a neutral position. This will allow material to roll up evenly.
- Awning end caps should be against the rubber bumpers. If one end cap is off, pull down on awning pull strap while holding strap slightly to opposite side, allowing awning to roll back up into 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.

Awning Care & Maintenance

Mildew will not form on the awning material itself, but it may form on the dust accumulated on the canopy. A quality vinyl cleaner, such as Carefree Awning Magic, will help keep your awning looking new. Be sure to follow the instructions on the container.



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 - Patio**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.

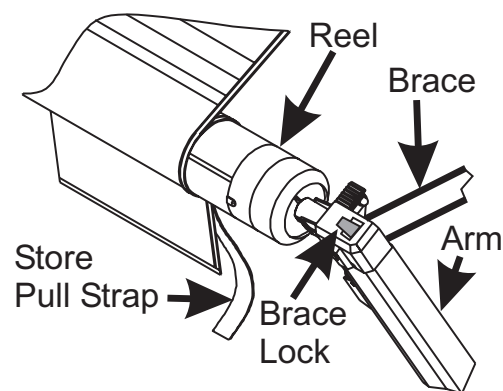
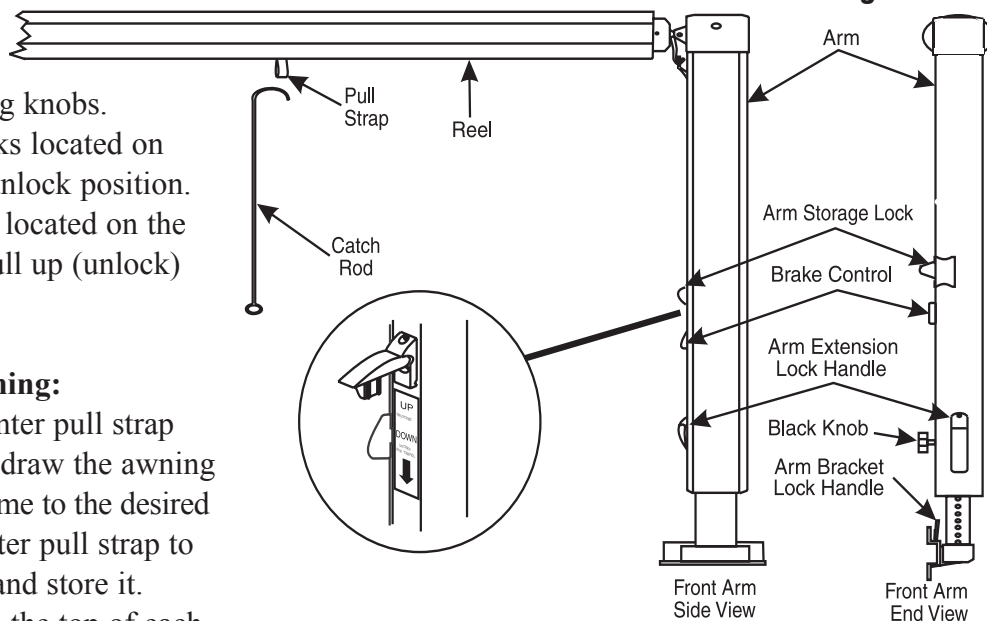
To Extend The Patio Awning:

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.

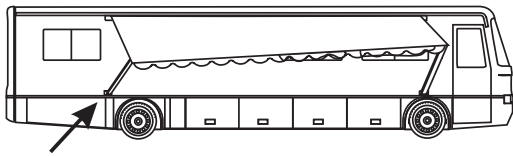
To Retract The Patio Awning:

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.



Rain Release Setting



One arm should be set lower than the other for proper water run-off.

Rain Release Setting:

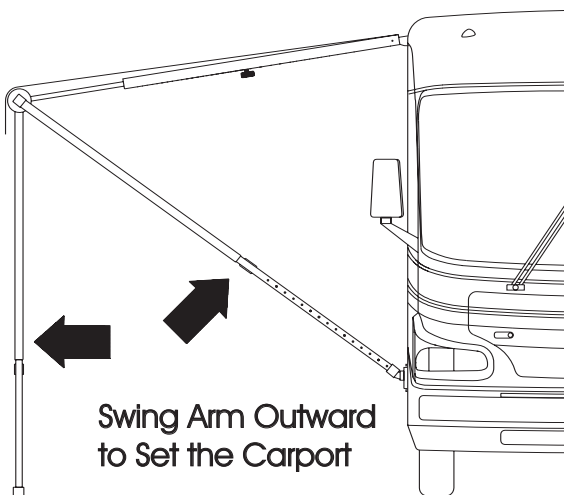
After the awning has been extended, choose the rain release position to prevent water build up on the awning. To position the awning in the rain release setting, lower one arm of the awning and leave the other arm in the normal position. This will create enough of a slope for adequate water run off.

Using The Carport Feature:

(Not available with Carefree One Touch Awnings.)

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 with a quality vinyl cleaner solution using an awning brush. This process can be made easier with awning maintenance products.

Saturate the fabric with the 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.

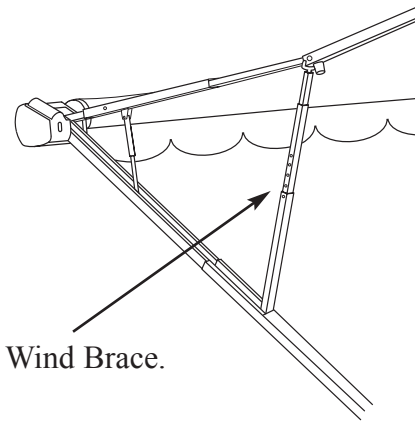
- **Storm Precautions:** The warranty does not cover damage caused by acts of nature; therefore, steps should be taken to prevent damage from occurring due to wind, rain or storms. If you are leaving or retiring for the night, close the awning. This takes only a few seconds and it gives the best protection for the awning. If unable to close the awning, lower both ends of it as far as you can. This will 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.

Awning - Automatic Carefree (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.
- Install the wind braces (2) between the upper rafter and the main arm. Adjust wind brace so the inner spring is under tension.



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.

To Retract the Awning:

- Remove the wind braces.
- 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.

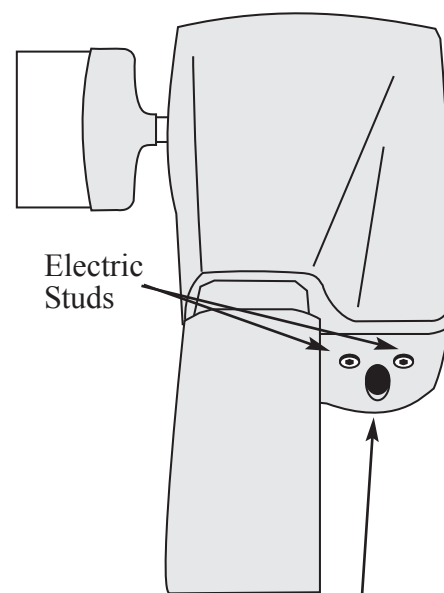
Tips - If the awning fails to retract or extend:

- 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.



Insert the 9/64" Allen Hex Wrench here.

12 Volt Motor.



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.

The Girard Lateral Arm Awning incorporates the very latest in technology and design. This box awning offers total protection in all weather as it applies the following advanced features:

- Convenient push button operation and an optional remote control for state of the art convenience.
- Retractable arms have twin cables for increased fabric tension and longer life. Angle of arm is adjustable from 5° to 35° for maximum comfort.
- All profiles are made from aluminum, which is then powder coated to give maximum protection for both housing and mechanical parts.
- 100% acrylic fabric is weatherproof, permeable to air and resistant to mildew, rotting and fading.
- Motorized operation, which includes a manual/crank override.
- Wind sensor and/or optional remote control.

***Awning
- Automatic Girard
(Optional)***

Motorized Operation:

Motorized operation is simple in itself. Motor (110 Volt) is housed in roller tube where it is protected from view and elements. Push the bottom button momentarily to extend the awning all the way. The awning will extend until it reaches the full extend position. Press the top button to retract the awning. The awning can be stopped in either direction, at any point, using the center stop button.



CAUTION: The motor is not designed for continuous use. In the event that the motor is used to excess, it will automatically shut off and be inoperative until internal breaker cools down and resets. The run time is four to five minutes per hour. Reset time will be 30 minutes to one hour depending on the outside temperature.

The awning will then extend to its full projection. To retract the awning, put the switch in the UP position. There is no need to hold the switch once it has been activated. To stop the awning at any point in its projection, or retraction, move the switch to the center position. The switch should be left in the center position at all times when the awning is stationary. The motor used in the Girard uses 300 watts and draws approximately three amps of power.

Manual Operation:

To manually operate the awning, use the telescoping crank handle supplied and follow the instructions in Manufacturer's manual.

Wind Sensor:

The awning is fitted with a wind sensor which is designed to retract automatically in the event of high winds, as long as it has 110 Volt power supply and wind has unrestricted access to wind sensor cup on roof of motorhome. Push the bottom button to extend the awning and the top button to retract it. The awning can be stopped at any point by pushing the center button marked **STOP**.

The wind sensor dominates and will override any push button commands in the event of excessive winds. If the wind sensor is activated the awning will close completely. The awning will not re-open automatically. It must be opened by using the extend button once again. This feature is intended to prevent the awning from extending or retracting excessively, further preventing possible overheating of the motor.

Care and Cleaning of Acrylic Fabric:

The acrylic fabric should be cleaned regularly before substances such as dirt, leaves, etc., are allowed to accumulate on, and become embedded in, the fabric. The fabric can be cleaned without being removed from the awning. Simply brush off any loose dirt, leaves, etc. Hose down and clean with a cloth and mild soap. **Do not use detergents.** Allow to air dry, preferably on a warm sunny day. Should you have to retract the awning when the fabric is wet, it should be extended at the first opportunity to finish air drying.

Tips

- Avoid leaving the awning partially extended during rainy conditions. The awning is at the strongest setting when the awning is fully extended.
- If the wind sensor retracts the awning, it is recommend leaving it in until the winds subsides.

The motorhome is equipped with a slide-out awning that will automatically roll out when the slide-out room extends. With the slide-out room extended, the awning can be rolled out completely as a window awning

Slide-out Awning**To Extend the Awning:**

The slide-out awning arms are equipped with locks.

- Open the locks with the awning wand.
- Use the wand to pull down on the strap. Grasp the strap firmly hooking the loop on the end of the strap to the catch.

To Retract the Awning:

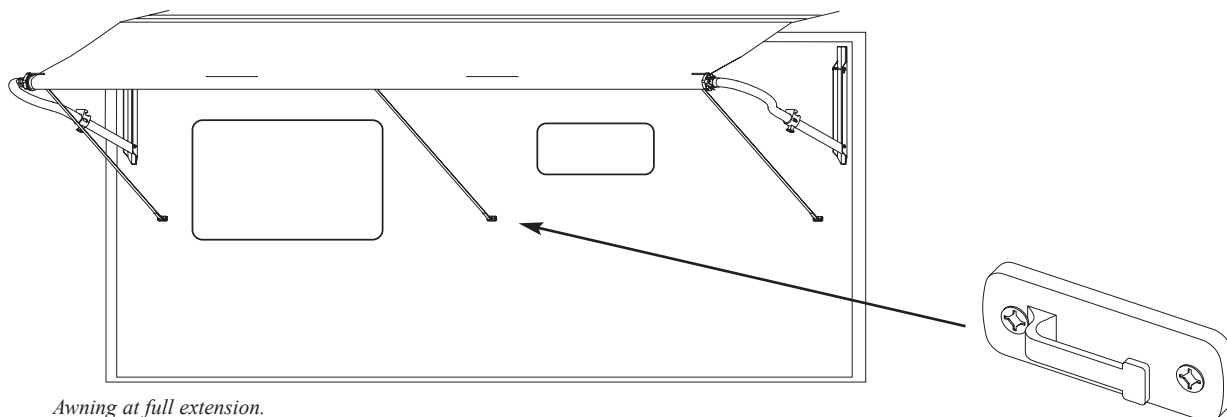
- With a strong grasp unhook the awning strap and insert the awning wand into the loop of the strap.
- Carefully allow the spring tension to wind the awning fabric onto the awning roll tube. Do not allow the awning to snap back into place. Damage to the awning or the motorhome may result.
- Secure the awning arm locks with the awning wand.



CAUTION: The slide-out 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.



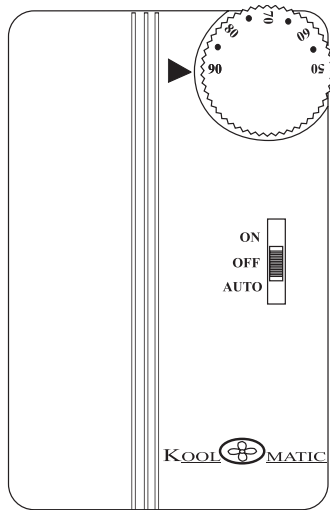
NOTE: At least five feet of clearance is needed between the side of the motorhome and any objects, such as trees or fences, to allow the slide-out room and slide-out awning to be fully extended.



Awning at full extension.

FANS Exhaust Fan

A wall thermostat controls the galley exhaust fan using 12 Volt DC to operate.

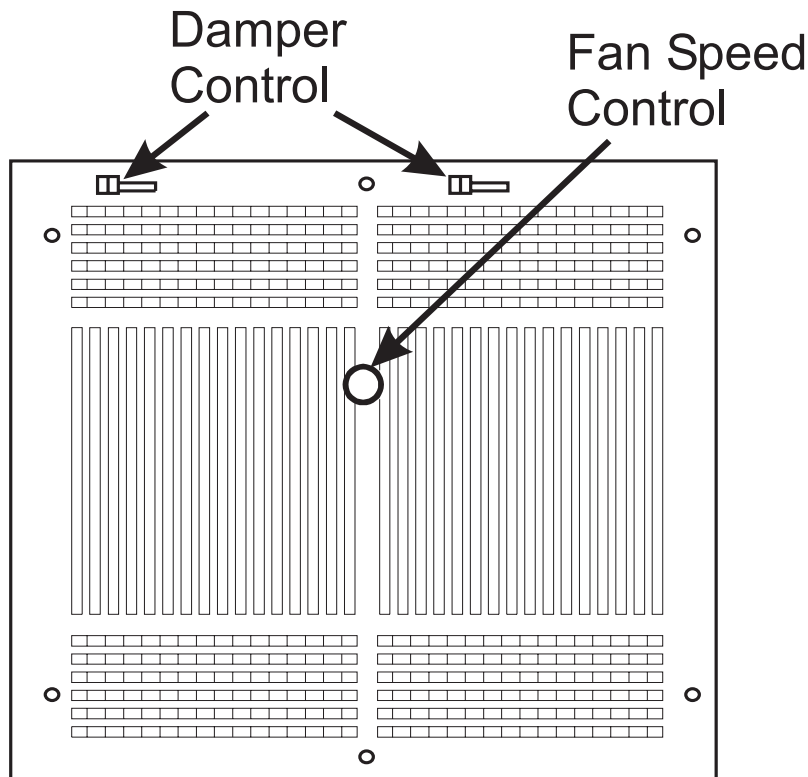


To Operate the Fan:

- Remove the ceiling grill cover.
- Open the grill dampers.
- Select one of three fan speeds using the round knob on the grill.
- Set the thermostat to ON for continuous airflow or set the thermostat to **AUTO** and set the desired air temperature for thermostatically controlled airflow.
- To turn the fan off set the thermostat to **OFF**. Close the grill dampers and install the ceiling grill cover.

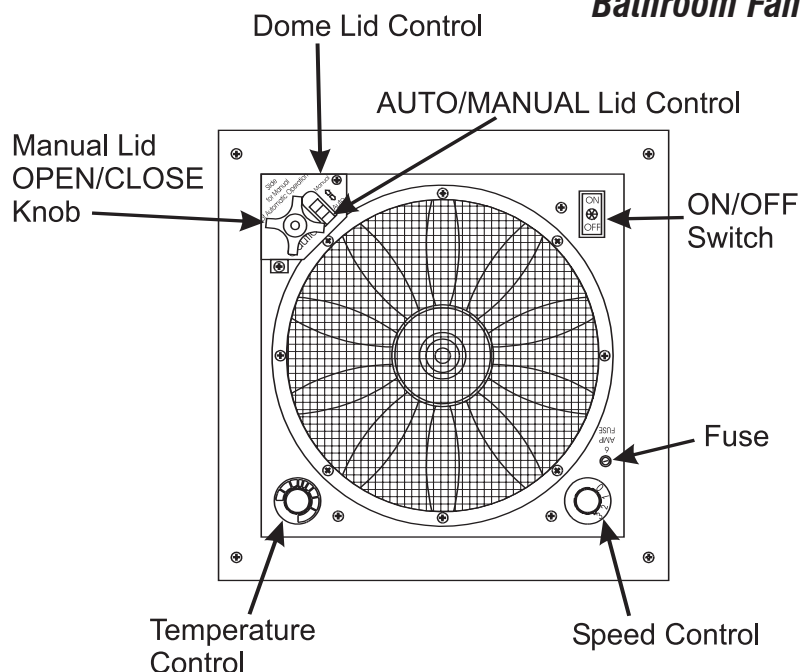


NOTE: Close the grill dampers before installing the grill cover. Failure to close the damper will result in the cover blowing off while the motorhome is moving.



Bathroom Fan

The bathroom fan has three speeds with a **0** or **OFF** position. A built in thermostat has an operating range of 22° F to 123° F. This is based on inside ambient air temperature. The dark blue zone on the thermostat is cool while the dark red zone indicates heat. The fan lid operates electrically during normal operations. When the lid opens approximately two inches, the fan motor will operate. The fan can be operated manually. Place the thumb switch to the manual position. Rotate the crank handle to close the lid. Return the thumb switch back to the **AUTO** position immediately after using the **MANUAL** position.

**To Operate the Fan:**

- Set fan switch to ON.
- Select the desired fan speed.



NOTE: If the speed switch is in the "0" position the fan cover will not operate automatically.

- To keep condensation from accumulating operate the fans when cooking. 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 cook top. Shower use is another source of condensation.
- If the fan fails to operate, check for a blown fuse either in the domestic fuse panel or the 6 amp fuse on the fan.
- To clean, remove the eight screws holding the screen. Use a non-abrasive soap and water to clean. Install the screen after cleaning.
- Slightly opened window(s) on the shaded side of the motorhome creates the most airflow, especially on hot sunny days. Direct air-flow by slightly opening selected windows. Position yourself between the open window and the Fantastic Vent for maximum comfort.

Tips

NOTE: Do not leave the fan switch in the active mode while the motorhome is stored or unattended for extended periods. High winds other unusual conditions or obstructions may prevent closing. The resulting leakage could cause serious damage.

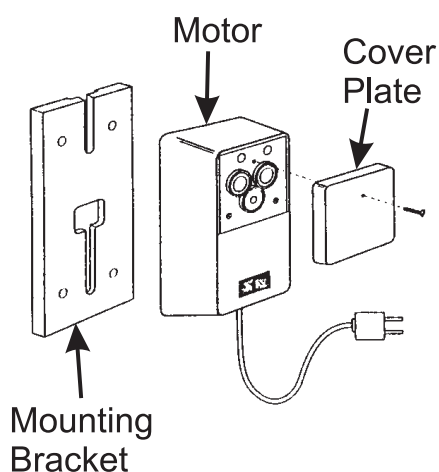
PRIVACY DRAPERY - ELECTRIC (Optional))

- The receptacle is powered by shore power, the generator or the inverter.
- Press and hold the rocker switch to open or close the drapes. Release the switch to stop movement.
- Release the switch when the drapes are at the end of travel.

Internal Thermostwitch Shut-Off: The drapery motor is designed for normal use. If run excessively, such as every few minutes, the internal thermostwitch shuts off the motor for several minutes. The thermostwitch prolongs the motor life and prevents inadvertent or accidental abuse of the mechanism.



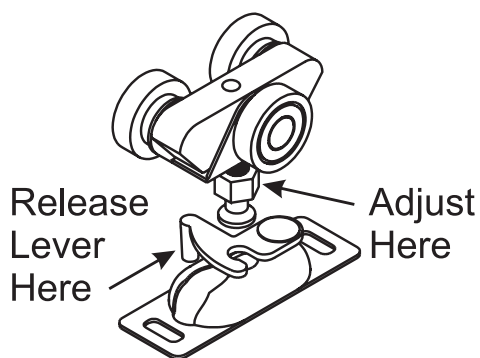
NOTE: If the cord stretches after use, adjust the tension by moving the motor on the wall bracket.



Replacing the Driver Tire:

- Turn off all power and unplug the receptacle.
- Remove the screws holding the cover.
- Roll the tire manually and divert the drapery cord out of the mechanism.
- Cut the old tire off using care not to cut the plastic drive roller.
- Wipe the roller with a dry cloth to remove any dirt or residue. Snap the new drive tire in place.
- It may be necessary to adjust the motor on the wall bracket to get the drapery cord back into position

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

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 BED CONVERSION

- 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.

Sofa to Sleeper

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

Sleeper to Sofa

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.

DINETTE BED CONVERSION (Optional)



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.

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.

STORAGE - UNDER BED



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

SUPER SLIDE (Optional)

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

- The motorhome must be level before opening.
- There are two latch releases: lift and hold up to release one, pull outward while pulling on the super slide to release the other.
- The maximum weight capacity is 1,000 lbs. Never exceed this amount.



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

RADIO & NAVIGATION SYSTEM

The system is designed for an Uncluttered Dashboard in the motorhome. Four separate functions are joined in order to offer a neat package that fits neatly and attractively into the dashboard.

The "Uncluttered Dashboard" features the following components:

- Panasonic CQ-VA707WEUC - AM/FM CD control with a 7.0" retractable LCD monitor.
- Panasonic TW-CC200B - Color back-up camera.
- Panasonic CX-DP88U - 8 Disk DC changer.
- VDO Dayton MS5000 - Navigation system, GPS, CD-ROM.

The unit can be operated from the display unit or a remote control unit. Since the radio is powered from the house batteries, there is no need to have the ignition switch turn on. However, the battery cut off switch must be ON at the entry door. The radio screen may be stowed when not in use.



NOTE: It is recommended to thoroughly read all of the following instructions before attempting to program the system. These instructions are a simple guide to some of the features. It is not a replacement for the systems manual. It may be easier to have a partner read the instructions while programming the system.



NOTE: The navigation system is widely used in Europe. Some information services are not available in the United States. Certain screens will not apply.

Radio Features Include:

- Navigation map display.
- On screen programming.
- Back-up camera automatically displays when the motorhome transmission is placed in reverse.
- CD changer operation.
- Adjustable color and brightness settings.
- Twelve AM and eighteen FM preset stations.
- Adjustable tilt angle.

Navigation Features:

- Virtual map of the United States.
- Instant location display.
- Alternate route planning.
- A 12 or 24 hour clock.

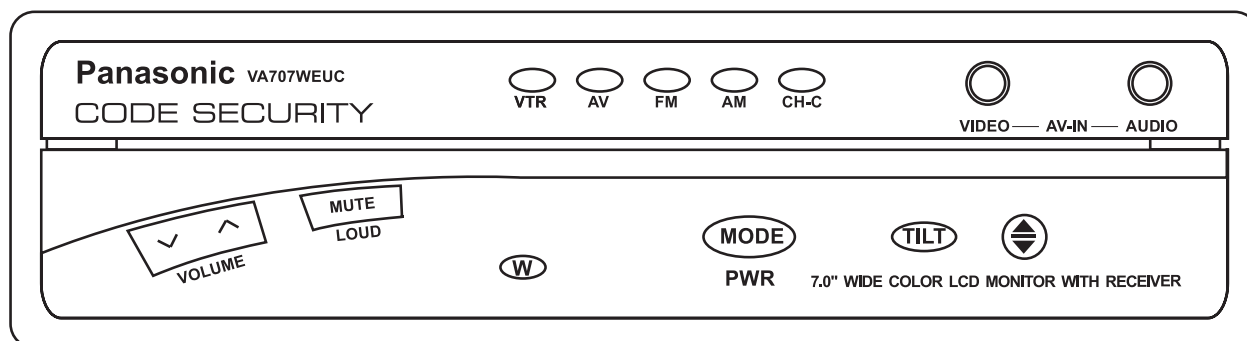


NOTE: The radio system will operate either with the radio remote control or from the radio push buttons. The navigation system operates with the navigation remote only.

Power Requirements:

- Main battery disconnect switches, located in the battery compartment, must be **ON**.
- House battery cut-off switch, located on the entry door, must be **ON**.

Operation for the monitor is done from the Panasonic remote or the Panasonic monitor. Push the **OPEN/CLOSE** button. The radio will extend then tilt to an upright position. Press the blue **POWER** button to turn the monitor on. Press the **MODE** button to select between the Radio and CD changer. **VTR** (Video Tape Recorder) and **AV** (Audio/Video) are not used.

Operation

Back-up Camera Operation

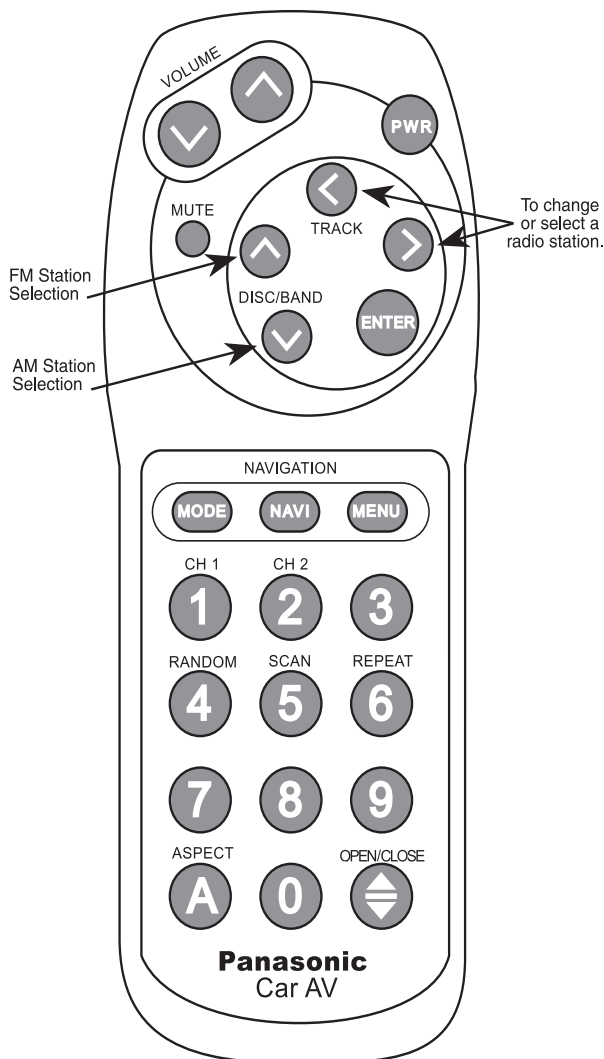
The back up camera displays automatically when the motorhome is placed in reverse. To display the camera continuously, momentarily press the **MENU** button. Use the **LEFT** or **RIGHT** arrows until the hand points to camera. Then press **ENTER**. The selection will be highlighted in **yellow**.

There are four different aspect ratios of the camera lens, which is displayed in the upper left hand corner of the screen.

1. **FULL**
2. **ZOOM**
3. **JUST**
4. **NORMAL**

Press the **ASPECT** button to change the camera lens ratio, which will obtain a different perspective.

Radio Operation



Radio Station Select and Preset:

To display the radio, press the **MODE** or **MENU** button. The **UP** and **DOWN (DISC/BAND)** buttons select between the AM or FM library.

- **UP** button is the **FM** library.
- **DOWN** button is the **AM** library.

The **LEFT** or **RIGHT (TRACK)** buttons change the radio station. Press and hold either button to scroll or press either button momentarily to select an individual station.

To enter a selected station into memory:

Press and hold any number between **1** and **6** on the radio remote for three seconds.

To enter programming mode:

Push and hold the **MENU** button approximately two seconds to enter the programming menu.

Three categories are available:

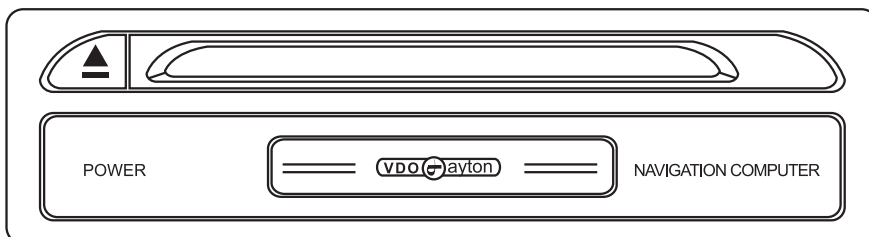
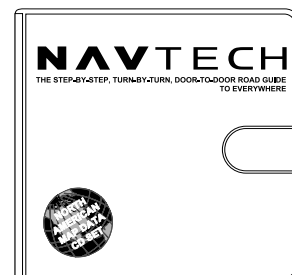
1. **USER**
2. **SOUND**
3. **SCREEN**

Use the **UP**, **DOWN**, **LEFT** or **RIGHT** buttons to scroll through the categories and features. Press **ENTER** to select any area (highlighted in pink) or to select a setting.

To set the radio clock:

- The clock is located under the **USER** section. Continue to scroll up or down to the **CLOCK** section.
- Scroll to the section **CLOCK OFF**: Press **ENTER** to turn the clock display on or off.
- Scroll down to the **ADJUST** section, then press **ENTER**. Use the **LEFT** arrow to set the hour. Use the **RIGHT** arrow to set the minute. Press the **MENU** button when done.
- Scroll down to **SEC RESET**. Press **ENTER** to reset the clocks internal seconds to the beginning of the minute.
- Exit the programming mode by pressing the **MENU** button.

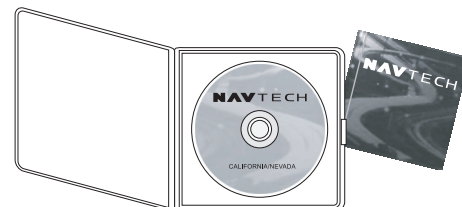
The navigation system uses a seven-disc map library to operate. The library is located in the owners information packet. The system remote control is used to program settings and retrieve information. Only areas that are highlighted are accessible. A planned destination, point of interest from the virtual map and an alternate route may be programmed. When a destination has been programmed, it may be necessary to change map discs while in route. An audio voice will provide instructions.

Navigation System

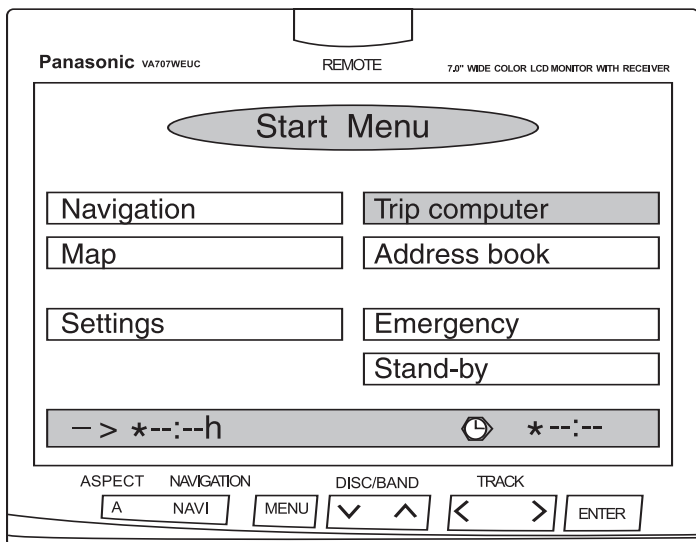
NOTE: It is recommended to thoroughly read all of the following instructions first before attempting to program the navigation system. These instructions are a simple guide to some of the features. It is not a replacement for the systems manual. It may be easier to have a partner read the instructions while programming the system.

Before beginning any navigation system programming ensure the radio screen is programmed to display the navigation system.

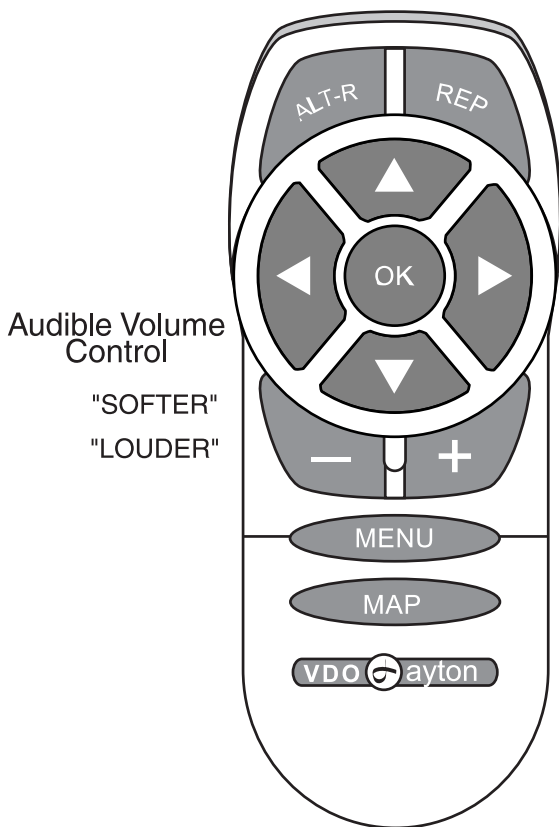
- With the monitor **ON**, enter the radio programming mode by pressing the **MENU** button for two seconds.
- Under the **USER** section scroll up or down to the **NAVI IN** section. Press **ENTER**.
- Using the **LEFT** or **RIGHT** buttons, move the hand cursor to **VTR**. Press **ENTER** to select. Selection will be highlighted in yellow.
- Press **MENU** to exit programming mode.
- The navigation system is now able to be viewed.



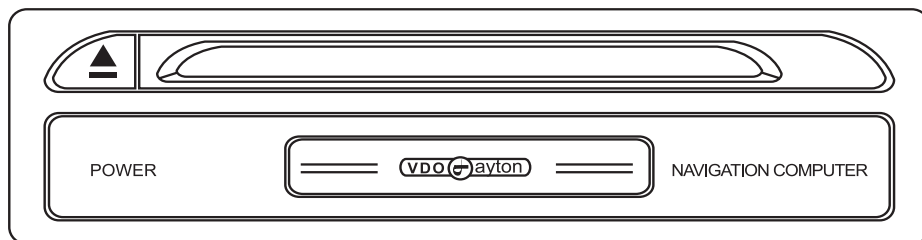
Familiarize yourself with how the system functions; experience is the best teacher. Be patient. The system, in many cases, will select the correct dialogue box automatically. Press **OK** on the navigation remote to enter any dialogue box. The **RETURN** box will return to the previous screen.



- Using the Panasonic remote or the monitor, select **NAVI**.
- A warning statement will appear. Read and understand this warning.
- Press the **OK** button on the navigation remote to accept this warning. A statement will appear indicating to install a map disc. Press **OK** to advance to the next screen. A map disc will be installed later.
- To experiment with the Start Menu use the **UP, DOWN, LEFT** or **RIGHT** buttons to highlight the available fields. Only highlighted fields are accessible.
- Press the **OK** button to enter information or to select a different field that is highlighted.
- Proceed to the next step.



WARNING: Do not attempt to program, alter or retrieve information while the vehicle is in motion. An accident resulting in injury or death may occur.



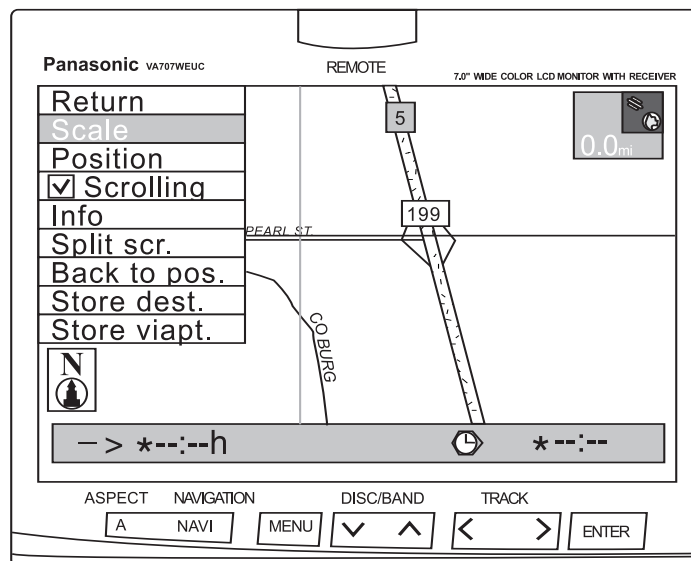
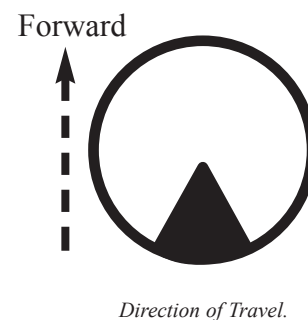
Programming Guidance to Point of Interest Using Map:

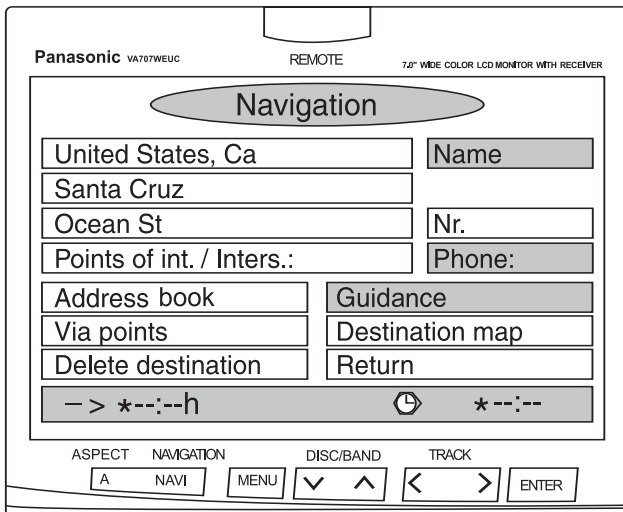
- Insert a map disc with the area of interest or destination, with label up, into the navigation system.
- Using the navigation remote, press the **OK** button.
- Highlight the **NAVIGATION** text box and press **OK**.
- Select **MAP** from the menu and press **OK**.

The location of the motorhome appears as a circle. The black area inside the circle is displaying the forward direction of the motorhome.

- Browse the current map by using the **UP**, **DOWN**, **LEFT** or **RIGHT** buttons on the remote.
- Press **OK** to open the Function option in the map area (upper left).
- Scroll down and select the Scale option to increase or decrease the field of view from 400 feet to 50 miles. To change the scale use the **UP** or **DOWN** buttons then press the **OK** button. Cities are best displayed with the map scaled to 10 miles.
- When an area of interest is selected from the map, press **OK** and enter the Function option. Scroll down to **DESTINATION** or **STORE DESTINATION**. Press **OK**.
- Press **OK** again and enter the function option. Scroll up and select **RETURN** by pressing **OK**. The system will return to the **NAVIGATION** menu. Scroll to highlight **NAVIGATION**. Press **OK**.

- The Guidance box is automatically highlighted. Press **OK**. The map returns to the screen. The circle indicates your current location. Miles to and general direction to the location is displayed in the upper right-hand corner. Begin driving. Audio guidance will instruct you to the destination. Adjust volume as necessary.



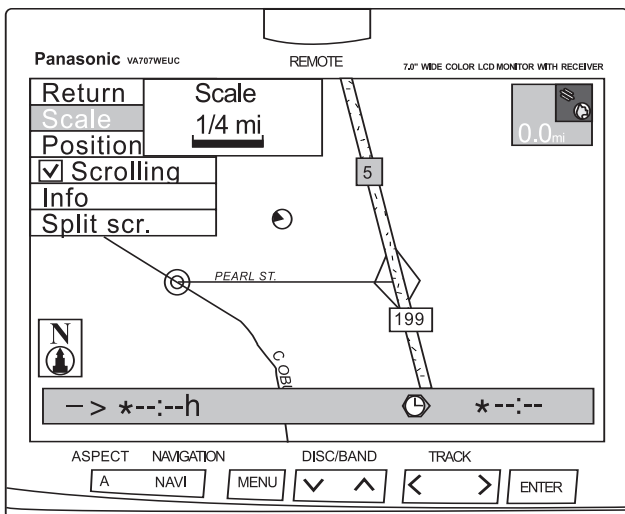


Programming a known location:

- Insert a map disc containing the desired location.
- Start from the **Main Menu**. Use the **OK** button on the remote to enter **Navigation** dialogue box.
- Enter the **Country** dialogue box. Enter the United States for the location and press **OK**.
- Enter the **City** dialogue box. The alphabet will appear. Use the **UP**, **DOWN**, **LEFT** or **RIGHT** buttons to orient the correct letter. Select each letter. If a mistake is made, press **Delete**. If the name of the city is more than one word, use the **Space** button. If the **List** box is highlighted after the city name is entered, the system will ask which city as there may be more than one city with that name.
- Enter the **List** box and scroll to the correct city and select by using the **OK** button.



NOTE: The system will automatically narrow the field of search by eliminating non-essential letters. Some roads or small cities may not be listed. If this is the case try scrolling the map to locate the desired location. If the location is mapped use the Map set of instructions to obtain guidance.



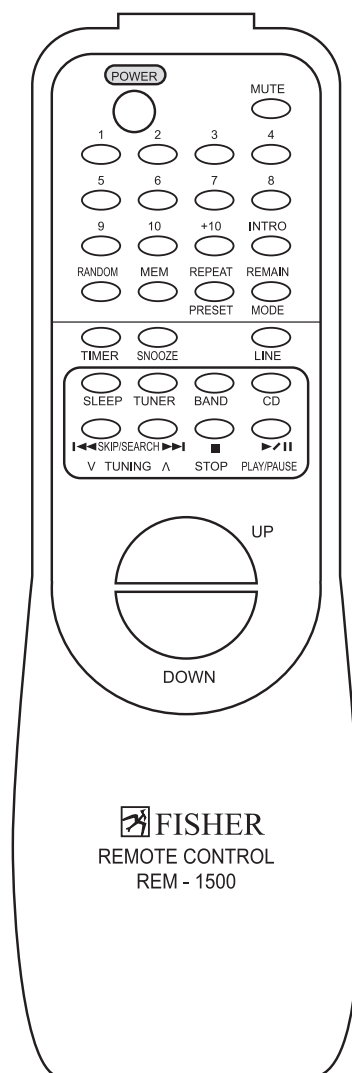
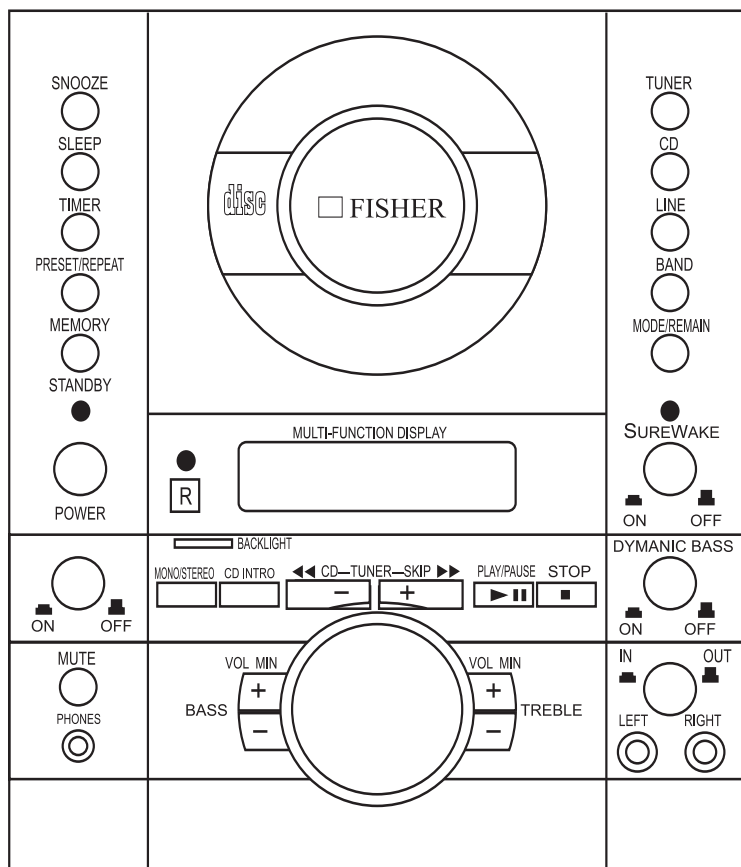
- Enter the **Road** dialogue box. Select each letter. If the name of the road is more than one word use the **Space** button.
- If the street number is known enter the **Nr** dialogue box. The number screen will appear. Enter the address.
- Select the **Guidance** dialogue box. It will be returned to the map. The circle indicates current location. Miles to go and the general direction to the location is displayed in the upper right-hand corner. Begin driving. Audio guidance will instruct you to the destination.
- The **Destination Map** will display the preset destination with the map scaled to 1/4 mile.
- Enter the Function dialogue box. Use the **Scale** feature to scale down the map size increasing map definition.



NOTE: Complete and return the warranty registration form located in the map library. Map discs will be updated periodically. When any or all updated discs are released, one full set will be sent free of charge to the registered owners.

The Bedroom stereo system is a three-piece system consisting of **AM/FM stereo tuner, CD Player and Clock**. The unit also incorporates a remote control for ease of operations. The system operates from 120 Volt AC and is powered from Shore Power, Generator or Inverter. Eight "C" cell batteries (if installed) enable all programmed settings to remain in case of loss of 120 Volt AC power.

RADIO - BEDROOM



Detailed information with **CAUTION** or **WARNING** instructions for the bedroom radio can be found in the manufacturer's operation manual.

To Set the Clock:

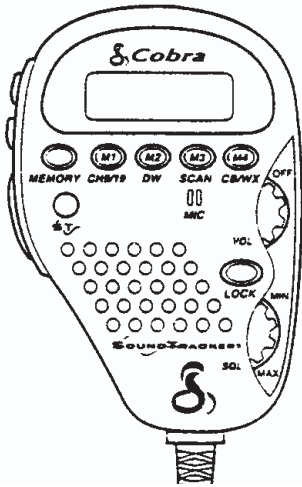
1. Press the **POWER** button to turn off "standby".
2. Press the **MEMORY** button once. The minute segments display "00". The hour segments flash continuously.



NOTE: Pay attention to the "AM" or "PM" setting.

3. Press the **CD-TUNING-SKIP** + or - button to select the desired hour.
4. Press the **MEMORY** button again and the minute segments will flash.
5. Press the **CD-TUNING-SKIP** + or - button to select the desired minute.
6. Press the **MEMORY** button once more. The flashing stops and the time is set.

CITIZEN BAND RADIO (CB)



The Citizens Band Radio (CB) is used for two-way, short-distance business and personal communications. The CB radio can be useful when traveling if operated properly.

Some limitations may apply to the use of the CB radio. The CB radio is actually a low-powered transmitting device that works well when within a line of sight of the person being spoken to. Many factors can limit the range of the CB radio, including the following items: terrain, trees, other vehicles, weather conditions and/or the power of the radio and its antenna. As was previously stated, only one radio can occupy the same airwaves at one time. Consequently, the radio with the greatest power and best antenna will always overpower the weakest one.

Some motorhome owners turn on the CB radio first thing and leave the CB on the entire trip. An obvious reason for doing so is the ability to be informed during transit of potential road hazards. Truckers or other CB owners can inform a motorhome driver of these types of hazards. The CB can be a very useful tool if, for example if there are problems with the tow car.

The CB Radio can assist in the following:

1. Warn of traffic tie-ups ahead.
2. Provide weather and road information.
3. Provide help fast in event of emergency breakdown.
4. Suggest good spots to eat and sleep.
5. Make long trips more interesting and fight driver's fatigue.
6. Provide direct contact with office or home.
7. Make friends during travel.
8. Provide "local information" to find your destination.
9. Communicate with friends and family during outdoor activities.
10. Help law enforcement officers by reporting drunk and reckless drivers.

CB Components

Volume Control:

The radio has an off/on volume control switch. It must be turned on and the volume adjusted to a comfortable range. The volume control deals strictly with the volume level in receiving (what is audible) and has no effect on the transmission level (how loud it will transmit over the airways).

Squelch:

Squelch control is also available. This control is first turned up to a point where static or background noise is heard and then reduced to a point where the static disappears.

Channel Selection:

There is also a channel selector which is used to select the channel of operation (1 through 40). For most highway use, channel 19 is used. This channel is used by most truck drivers. It is useful to monitor channel 19 to obtain information concerning traffic delays, construction, lane closures, etc. One drawback of monitoring this channel is the language that is sometimes used. For the most part, truckers are courteous and polite on the radio; however, there are always exceptions. When traveling with other CB users, it is wise to use a channel other than 19 to allow for conversations without interruptions.

CB Microphone Function:

The microphone is the key to using the CB radio. A push button switch is located on the side the microphone. When the button is pressed, the CB radio switches from a listening device to a transmitter. Anything spoken into the microphone is transmitted over the airway of the channel selected. To carry on a conversation, after each outgoing transmission, release the push button switch in order for a reply to be received. The radio cannot receive and transmit at the same time. Conversations should be brief as only one CB radio can occupy the airwaves at one time.

Operating Procedure for Emergency Communications:

1. For Emergency communications, set the CB radio to Ch. 9. For non-emergency communications, select the desired channel by pressing the Channel up/down-tuning buttons until reaching the channel desired.
2. When asking for emergency aid on Channel 9, request a React base (if available) to respond by saying "Break Channel 9 for a React base" and provide the CB Distress Data (called "**CLIP**"):

CLIP

CALL SIGN - Identify yourself and vehicle.

LOCATION - Be exact.

INJURIES - Number. Type. Are persons trapped?

PROBLEM - Give details and be specific about the assistance needed. Transmit the "CLIP" repeatedly so the nearest monitor may be of assistance.



NOTE: Channel 9 is for emergency use only.

***Operating
Procedures***

CB Radio Rules of Use:

1. Do not carry on a conversation with another station for more than five minutes at a time without taking a one-minute break to give others a chance to use the channel.
2. Do not blast others off the airway by overpowering them with illegally amplified transmitter power or illegally high antennas.
3. Do not use the CB to promote illegal activities.
4. No profanity allowed.
5. Do not transmit music over the CB airway.
6. Do not use the CB to sell merchandise or professional service.

Transmission

CB Transmission Range:

All CB radios transmit using the maximum FCC allowable power output of four watts. The type of antenna used, its condition, location and physical length, and the proper matching of the Standing Wave Ratio or SWR can effect the amount of power that actually goes out.

Other factors that can enhance or detract from the effective range include: the environment that the CB is used in, interference from other CB radios, tall buildings or trees and certain atmospheric conditions.

If all negative environmental factors were eliminated, a properly set up base station could transmit up to 10 to 15 miles. A mobile unit could transmit five to seven miles, and a hand held unit up to approximately two miles with the only variable being the type of antenna used with the unit. Unfortunately, optimum conditions do not always exist and the range of the unit will be less dependent on the conditions it is operated in.

CB Radio Antenna:

A good antenna is necessary for optimum performance of the CB radio. The type of antenna used depends upon the type of CB and its intended use. Purchase the best quality antenna for the greatest impact on the overall performance of the CB radio.

Mobile CB antenna come in many different sizes and configurations for just about any need or application. In general, the longer the antenna the better the performance, although the longer lengths of 102 inches may not be practical for most people. Different types of antenna mounts are available. Some antennas mount to the roof gutter or the mirror mount. Some mount to the vehicle bumper. Some have a magnet mount that attaches to any metal surface on the vehicle body. If the mobile radio is equipped for weather reception, a center-loaded antenna will fit that requirement. If good weather reception and regular CB distance is a priority, a dual band antenna is recommended. For distance only, a base loaded antenna is recommended. If the vehicle does not have a metal body, a groundless plane antenna is recommended. These antennas are designed for special applications where grounding the antenna is a problem.

Standing Wave Ratio**SWR (Standing Wave Ratio):**

In order to set the SWR (Standing Wave Ratio) on the unit, the CB radio must be equipped with a built-in SWR meter or an external SWR meter. Using an external SWR meter will also require a short piece of co-axial cable with CB plugs on both ends. Attach the external SWR meter according to the instructions included with the meter.

To Set the SWR (Standing Wave Ratio):

- Make sure your antenna is properly mounted and grounded. If you are setting the SWR on a mobile antenna, make sure all vehicle doors are closed, all other accessories are turned off and the vehicle is in an open area away from any obstructions when setting the SWR.
- Set the CB radio to the CB mode and to channel 20. On Cobra radios with built in SWR meter set the S slash RF, SWR, Cal switch to the Cal setting.
- Push and hold the "push-to-talk" button on the microphone. This causes the needle on the SWR meter to swing to the right. Adjust the needle to the calibration mark on the meter by turning the Cal knob.
- Continue pressing the push button on the microphone and move the "S" slash RF, SWR, Calibration knob to the SWR setting. External SWR meters will have to be set to the SWR setting. This will cause the SWR meter's needle to swing to the left. A reading of 3 or above will impact the performance of the radio and should be adjusted downward. A reading of 1.5 is average and acceptable under most conditions. A reading of 1 is ideal.

Adjusting the SWR Setting:

To adjust the SWR setting, try either extending or retracting the antenna in small increments while repeating procedure after each change until the best setting available is reached. If retracting the antenna is necessary to obtain a better reading, it is acceptable to clip the whip in small increments to obtain the proper length. Do not cut more than $\frac{1}{4}$ of an inch at any given time, as the adjustment needed may be very small.

Check the SWR reading on channel 40 and channel 1. If either of these channels is above 1 to 3.0, adjust the antenna so that the SWR setting is acceptable for that channel while maintaining the lowest possible reading on channel 20. It is important to note that adjustments made for the optimum SWR setting on one channel will affect the SWR setting of another channel on the other side of the dial. If channel 1 is optimized, channel 40 will suffer. Try to balance adjustments to optimize across all channels.

If an acceptable reading cannot be obtained, recheck the antenna mounting and grounding. A properly grounded antenna is necessary to obtain an acceptable SWR reading.

Weather Alerts

Weather Alerts:

A Weather Alert warns of a weather emergency as defined by the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce commonly known as NOAA.

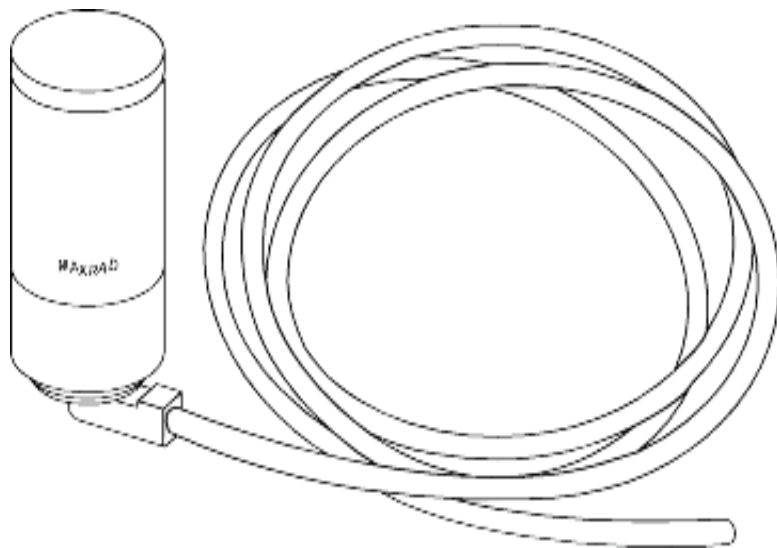
NOAA maintains a system of approximately 380 stations throughout the United States that transmit continuous broadcast of the latest local weather conditions 24 hours a day, 7 days a week. A broadcast is announced on one of seven high-banded, FM frequencies. It is tailored to suit the needs of local listeners.

During severe weather the normal NOAA forecast is interrupted with special warning messages. The NOAA then transmits a 10 second signal that can be picked up on CB radios equipped with the Weather Alert feature. This signal can be picked up whether the radio is turned on, off or in the CB mode. During the transmission of a weather emergency, the radio will emit a high pitched tone to alert the user to tune in to one of the weather channels and listen for emergency information.



NOTE: It is normal for a Weather Alert CB Radio to beep for a second when the unit is turned on or when power is first applied to the unit. This is only a self-check tone.

CELL PHONE ANTENNA



The motorhome is equipped with a cell phone antenna. The antenna lead is located behind the dash instrument cluster. To access the lead remove the inspection panel located on top of the dash pad. The antenna lead run is installed from the roof down the driver's side A-pillar. This is the section between the driver's side window and the windshield. The coiled antenna lead should be located toward the front fire wall, directly behind the instrument cluster.

The components used to make up the entertainment center are carefully selected to provide the highest quality in audio and visual enjoyment. There are several pieces of equipment which encompass the entertainment center. The following paragraphs will discuss the operations and various components. Use the instructions given in the Video Selector Box section to use these components.

Home Theater System:

The remote for the home theater system is the most versatile of all the items of equipment. The programmable remote can control television if manufacturer's codes are programmed. A complete listing of the manufacturer's codes is located in the AV System Guide supplied in the warranty information file.

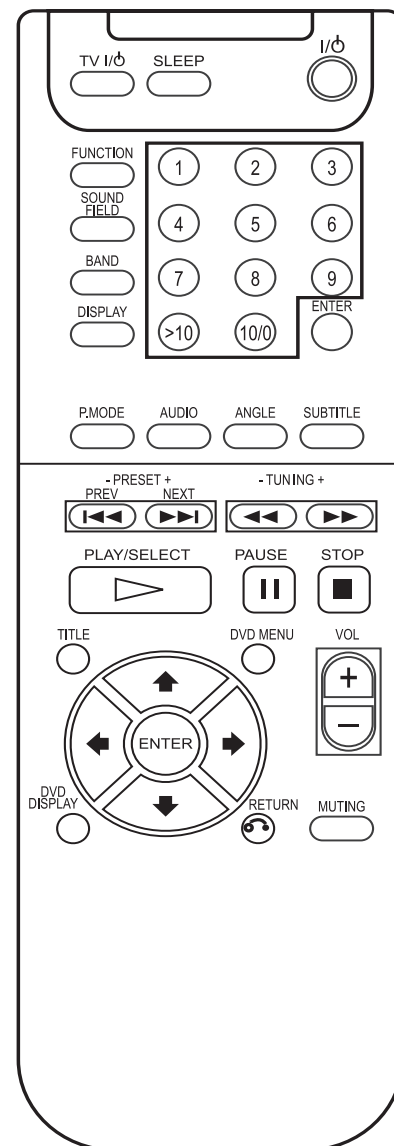
The Home Theater System can be used as a tuner for radio listening. Twenty FM stations and ten AM stations can be programmed, station named and recalled using the remote.

A built-in DVD player enables DVD, CD and Video CD to play through to the televisions.

Video Cassette Recorder (VCR):

The videocassette recorder is the same one found in any home. The VHS Compatibility allows recording and playing back programs on standard VHS tapes. The Audio/Video Input Jacks in the front allow for quick, easy connections of additional video equipment. Easy Setup procedures provide the flexibility to quickly adapt the configuration for RV usage.

ENTERTAINMENT SYSTEMS



Home Theater Remote.

The motorhome is equipped with a remote control color television located above the pilot seat. The ignition switch controls the outlet for front TV so that the front TV can only be viewed while the vehicle is at rest. The TV operates from 120 Volt AC 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.

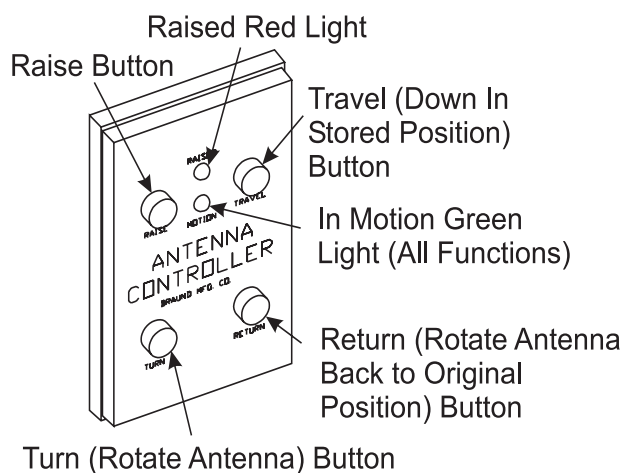
Television (Front) w/Lockout Feature

Television Antenna

The motorhome is equipped with a power television antenna with built in electronics that uses 12 Volt DC to "boost" signal strength. Weak or fuzzy signals can be amplified by turning on the antenna boost switch. The antenna and booster work together providing the best possible picture for most situations. Signal amplification under certain conditions can make the picture worse. The television station sends a signal that resembles waves, like rings from a rock thrown into a still pond. The radiating television signal can bounce back from an object such as a mountain. 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 by lowering the antenna.



WARNING: Do not raise the TV antenna near overhead electrical wires. Contact may cause serious injury or death. Do not move the motorhome when the TV antenna is up. There is an ANT UP warning light on the dash panel. When this light is lit lower the antenna before moving the motorhome.



To Raise the Antenna:

Visually check for clearance above the motorhome before raising the antenna. To raise the antenna press the **RAISE** button. The **green** light illuminates when the antenna is in motion. The **red** light illuminates when the antenna is raised.

To Rotate the Antenna:

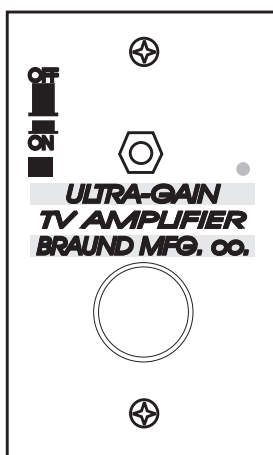
Press the **TURN** button to rotate the antenna for improved reception. Press the **RETURN** button to rotate the antenna to the original position for further adjustment. The **green** light is **ON** when the antenna is in motion.

To Lower the Antenna:

Press the **TRAVEL** button to lower the antenna into the stored position for travel. The **green** light is **ON** when the antenna is in motion. Do not move the motorhome until the antenna is all the way down.

Antenna Booster Operating Instructions:

- The antenna booster is located in the cabinet above the driver's seat, to the left.
- The power supply switch must be on.
- The **green** light will glow when the amplifier is on.



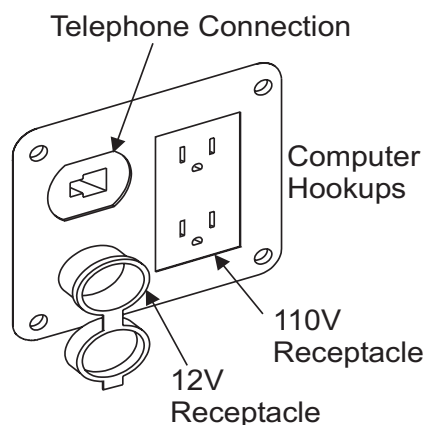
To Troubleshoot TV Reception With Amplifier Installed:

- Check the domestic battery for correct voltage. The antenna booster receives power from the domestic fuse block inside the coach.
- Check the fuse from the grey wire.
- If there is no picture or the picture is weak, confirm the antenna is operating. If it is working and the picture is weak, an amplifier may not improve the signal.
- Check for 12 Volt DC and correct polarity on the input lines. Make sure the coax fitting and center wire are making contact at the antenna and the amplifier.

Troubleshooting the Coax Wire:

Weak or no picture can indicate a possible shorted or open coax. The coax cable is made of two conductors. A center conductor, which is usually copper, and the ground, which is woven or braided aluminum. The "die-electric" insulating material separates the two conductors. The ground and center conductors are to remain electrically separate from one another. When installing a metal end onto a coax cable, use care so none of the woven ground strands come in contact with the center conductor. A continuity tester is required to test a suspected fault in a coax wire. Unscrew both ends of the suspected bad coax run, with the continuity tester check between the center conductor and the outside threaded ring. If continuity is present, the coax is shorted. To test for an open connection of a particular coax run use one test lead and touch the threaded end of the coax. With the other test lead, touch the threaded ring at the opposite end. Continuity should be present. Perform the same test procedure on the center conductor. Proper electrical coax operation should indicate continuity from the center conductor at one end to center conductor at other end. Continuity should be present between each coax terminal end. There should be no continuity between the terminal end and center conductor. Though damage does not usually occur from a shorted or open coax cable, picture quality is compromised.

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 telephone or laptop computer.



**Hook-ups TV
Cable, Computer
& Telephone**

DSS Conduit

If the motorhome is not equipped with a factory installed satellite dish, a length of 1" conduit was added. The conduit allows an after market installation of a satellite dish. One end of the conduit is in the front overhead on the curbside. Removing the ceiling speaker above the copilot seat accesses the other end.

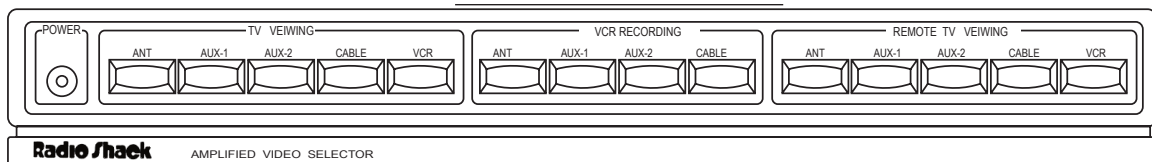
When securing a satellite system the length of the fasteners should not extend further than 1" into the roof surface of the motorhome. Damage to other wiring may occur. Seal all holes in the roof surface with a suitable sealant.

Video Selector Box

Televisions have many different input signals available. Depending on preference these can vary from selecting between a satellite dish, DVD (Digital Video Disc) player and a roof antenna just to name a few. A video selector box interfaces these different input signals from the various components to the televisions and VCR.

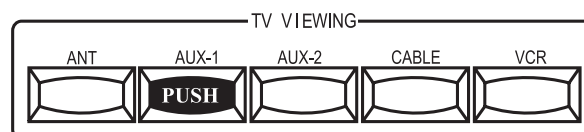
The video selector box requires a 120 Volt AC power source to function. When the power requirement is met the red LED will illuminate.

There are three separate control areas of the video selector box: **TV Viewing**, **VCR Recording** and **Remote TV Viewing**. The TV VIEWING section controls the input signals to the front television and the optional storage bay television (if offered). The VCR Recording section controls the input signals to the VCR. The Remote TV Viewing section controls the input signals to the bedroom TV. The push buttons under each control area selects between the different input signals a particular section receives.



Push Button Selections:

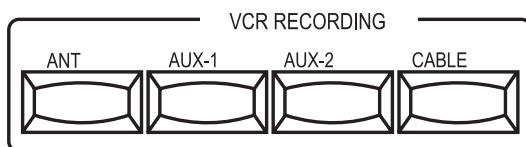
- **Ant** is the input signal from the Roof Television Antenna. Use the TV or VCR tuner for channel selection.
- **Aux 1** is the input signal from the **SATELLITE RECEIVER** (Optional).
- **Aux 2** is the input signal from the DVD player. The TV channel selection must be on channel 3 to receive the picture from the DVD player.
- **Cable** is the input signal from Shore Cable.
- **VCR** is the input signal from the VCR. The TV must be on channel 3. Use the tuner inside the VCR to change channels.



NOTE: The optional bay TV receives the same input signal as the front TV.

These same push buttons are located in the **REMOTE TV VIEWING** section. These are for use with the Bedroom television.

The section labeled **VCR RECORDING** selects between the various input signals the VCR receives.



- **Ant** is the **Roof Television Antenna**. Use the VCR tuner for channel selection.
- **Aux 1** is the **SATELLITE RECEIVER** (Optional).
- **Aux 2** is the **DVD**. Generally DVD discs are copyright protected and cannot be recorded to VHS tapes.
- **Cable** is the **Shore Cable coax feed**. Use the VCR tuner for channel selection.

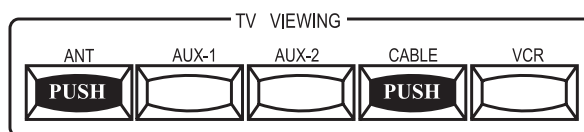
The televisions operate from 120 Volts AC only. Hook to shore power, start the generator or turn on the inverter. Viewing time from the inverter will vary. The push buttons perform the same function in each of the two television categories.



NOTE: For more in depth information about each component, refer to the manufacturer's instructions.

To Watch the Television:

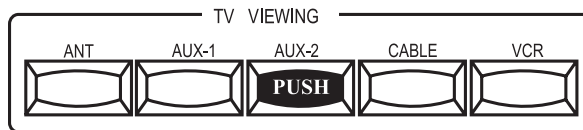
1. **Using the Roof Antenna:** Raise the roof antenna and turn on the TV Amplifier. The green light will come on.
Using the Shore Cable: Connect shore coax cable to coach service bay.
2. Push either the **ANT** button or the **CABLE** button located on the Video Selector under **TV VIEWING**.
3. Turn the TV on and select the desired TV channel.
4. Use the TV or the TV Remote to adjust the volume.



ROOF ← OR → SHORE CABLE

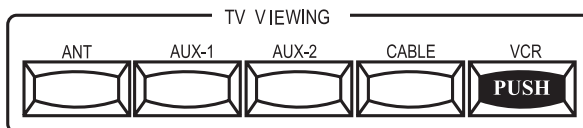
To Watch a DVD:

1. Push the **AUX 2** button located on the **Video Selector** under **TV VIEWING**.
2. Turn the TV on. Select Channel 3.
3. Turn the DVD player on and insert a disc. The disc will start playing automatically.
4. Use the TV or TV Remote to adjust the volume as desired.



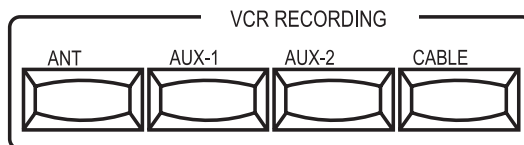
To Watch a VCR Tape :

1. Push the **VCR** button located on the **Video Selector** under **TV VIEWING**.
2. Turn on the VCR and insert a tape. The tape will start playing automatically.
3. Turn on the TV and select channel 3.
4. Adjust the sound level on the TV or by using the TV remote.



To Record Using the VCR:

1. On the **Video Selector** under **VCR RECORDING** push the button that represents the program source you wish to record.
 - **ANT** is the **Roof TV Antenna** which uses the VCR tuner for channel selection.
 - **AUX 1** is the **SATELLITE RECEIVER** (Optional)
 - **AUX 2** is the DVD. DVD discs are copyrighted and cannot be recorded.
 - **CABLE** is the Shore Cable coax feed which uses the VCR tuner for channel selection.



2. Please use the prior instructions on how to activate each piece of Audio/Video equipment as desired.
3. Turn on the VCR and insert a blank VCR tape.
4. Push the record button on the VCR or VCR remote to begin recording.



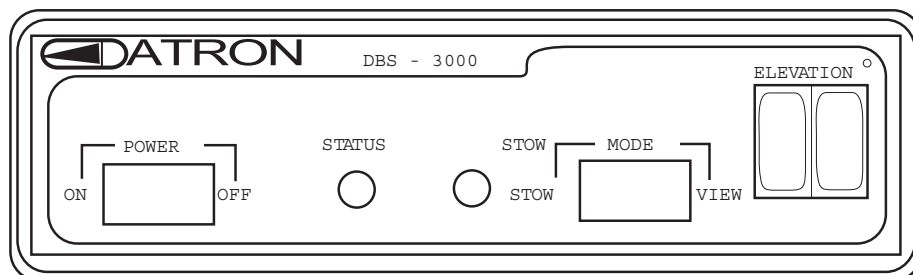
NOTE: If recording a “Surround Sound” program from the satellite receiver only, you must select **Line Input** from the VCR remote, using the **Input Select** button. This is the highest quality audio.



NOTE: You can record something from one source, such as the satellite receiver, while viewing a TV program from the shore cable.

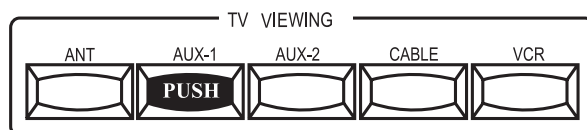
To Watch the Satellite (DSS) - (Optional):

1. Turn the power ON for the Antenna Control Unit. This requires 12 Volt DC. The Battery Cut-Off switch must be on.
2. Ensure the **Elevation Angle Selector** is set to the proper elevation. This setting will change with locations. The DSS User’s Guide describes this process.



Antenna Control Unit

3. Select the **VIEW** mode on the **Antenna Control Unit**. The Antenna will search for the Satellite.
4. The **Satellite Receiver** will turn on automatically when **VIEW** is pressed.
5. Use the Video Selector under **TV Viewing**. Push the **AUX 1** button.



NOTE: The satellite remote can be programmed for **Infrared (IR)** or **Radio Frequency (RF)**. This will enable either line of sight or control from another area. The IR setting requires the remote to have a direct line of sight to the satellite receiver. The RF setting allows the remote to operate the receiver from any room.



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



NOTE: An alternate method to view the satellite is through the VCR. Select VCR under TV Viewing. Press the TV/Video button, and input select on the VCR Remote. L1 will be displayed.

Sound System:

The sound system operates from 120 Volts AC supplied by shore power, generator or the inverter. The audio from the VCR or DVD can be played through the sound system speakers. Whether viewing the satellite system, antenna, shore cable or VCR, audio desired through the sound system requires using the VCR. The audio output of the VCR plays through the sound system.

To Use the Sound System:

Television and VCR:

1. Turn on the desired TV and select channel 3.
2. Turn on the VCR. Under the **VCR Recording** section, select the desired input signal from the selector box. Using the VCR remote press the **TV/Video** button until the word "**VIDEO**" displays on the VCR. If viewing the satellite system press the **Input Select** button until **L1** displays on the VCR.
3. Turn on the DVD/receiver.
4. Using the DVD/receiver remote, press the **function** button until **VIDEO 1** displays on the DVD/receiver. Adjust the volume.

DVD and S-Video:

When viewing a digital video disc select the **S-Video** function for the highest sound and picture quality.

1. Turn on the front television.
2. Turn on the DVD player. Using the remote or the player, press the **function** button until "**DVD**" appears on the screen. Insert a disc.
3. Using the TV remote press the **Input Select** button until **S-Video** appears on the television.

EXECUTIVE

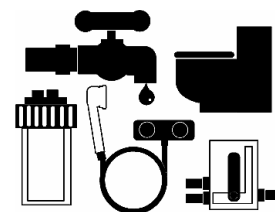
SECTION 6 WATER SYSTEMS

WATER SYSTEM - General Information	• 197
MONITOR PANEL - Measurement & Calibration	• 197
WATER TANK - FRESH FILL	• 199
WATER TANK - (FRESH) GRAVITY FILL	• 199
PLUMBING MANAFOLD	• 199
WATER - CITY HOOK-UP	• 200
WATER PUMP	• 201
<i>Troubleshooting</i>	• 202
PRESSURE ACCUMULATOR TANK	• 203
WATER FILTERS	• 203
WATER SYSTEM - Troubleshooting	• 204
WATER SYSTEM - Disinfecting Fresh Water	• 205
<i>Aqua-Hot Maintenance</i>	• 206
TANK CAPACITIES - CHART	• 206
WASTE WATER SYSTEMS - <i>Drain & Sewage Tanks</i>	• 207
<i>Black Tank Flush</i>	• 207
<i>Sewer Hose</i>	• 207
<i>Proper Waste Disposal</i>	• 208
<i>What Not to Put in Waste Holding Tanks</i>	• 208
TOILET	• 209
<i>Operating Instructions</i>	• 209
<i>Cleaning</i>	• 209
<i>Maintenance</i>	• 210
<i>Troubleshooting</i>	• 210
<i>What to Put into the Holding Tanks - Black Water Tank</i>	• 210
<i>What to Put into the Holding Tanks - Grey Water Tank</i>	• 211
<i>Drain Traps & Auto Vents</i>	• 211
<i>Draining the Waste Holding Tanks</i>	• 212
SOAP DISPENSER - LIQUID	• 213
COLD WEATHER USE	• 213
WINTERIZING - Using Air Pressure	• 213
WINTERIZING - Using Nontoxic Antifreeze	• 215

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 is used by the average person everyday. Newcomers to a self-contained motorhome soon discover water does not last very long unless consumption is drastically reduced. For example, less water can be used for showering if the shower is turned off while soaping down, then turned back on to rinse. This way a good shower uses a couple gallons of water or less. There is plenty of water to meet personal needs once habits are adjusted.

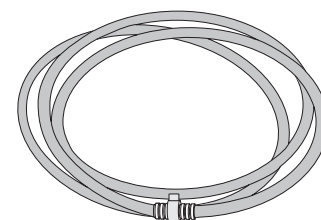
WATER SYSTEM General Information



Fresh Water System:

The fresh water system consists of: fresh water tank, water pump, pressure accumulator tank, Manabloc Plumbing Manifold, gravity fill connection, water filters and a city/fresh water connection.

Use the water hose that is marked for potable water use only. Care of the hose is a must. After each use, drain the water hose and coil the hose neatly. Attach the ends together to keep dirt, debris and insects out of the hose.



Waste Water System:

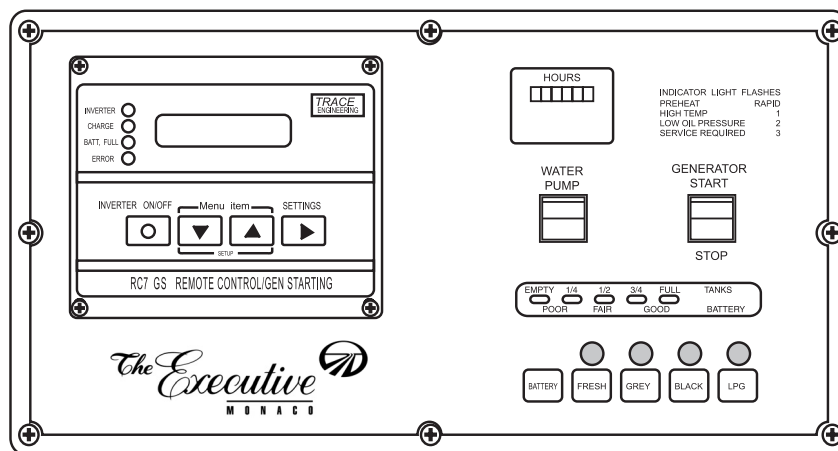
The waste water system consists of: a waste holding tank (grey water), a sewage holding tank (black water), flush system, toilet and drains.

The monitor panel includes a combination gauge that reads all water holding tanks (fresh, grey and black).

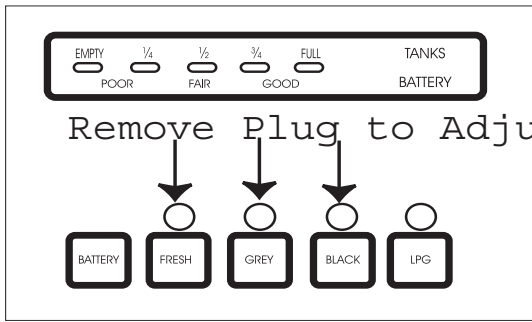
Tank Measurement:

To measure the level of any holding tank, push the switch on the monitor panel corresponding to the tank you wish to measure.

MONITOR PANEL Measurement & Calibration



 **NOTE: If the domestic batteries are not at a full state of charge tank readings will not be accurate.**



Monitor Adjustment Tool.

Calibration:

The monitor panel is calibrated at the factory for accuracy and should not require adjustment. If the system is displaying incorrectly, calibration may be necessary.

- Completely fill the tank to be calibrated.
- Locate the corresponding adjustment screws (one for each tank) under the removable plug.
- Using the monitor adjustment tool, simultaneously push the button for the tank and rotate the adjustment screw until a full tank reading is obtained.
- Repeat the procedure as necessary for the remaining tanks.
- The water tank sensors are located curbside of the motorhome on the end of the holding tanks.



- Connect a potable water hose to city/fresh water hook-up located in the service center on the roadside of the motorhome.
- Turn the city water/tank fill valve to the fresh water tank/open position.
- Turn on the water supply.
- The water pump should be in the OFF position.
- When the water tank is full water will flow out the vent opening of the gravity fill compartment. Shut the water supply off as soon as possible.

WATER TANK - FRESH WATER FILL



NOTE: When connecting the motorhome to fresh water be sure to use a hose manufactured and labeled for potable water to ensure that the hose will not flavor the water. Monitor the tank filling process at all times. Use the inside monitor panel as a tank fill guide.

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.

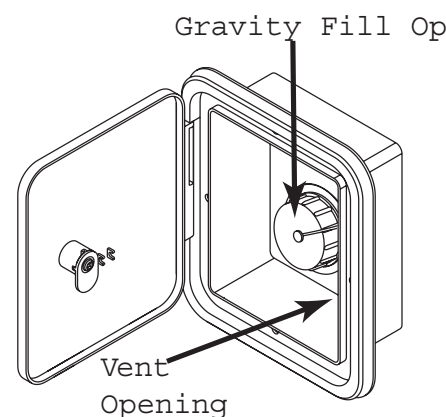
Filling the Tank:

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.



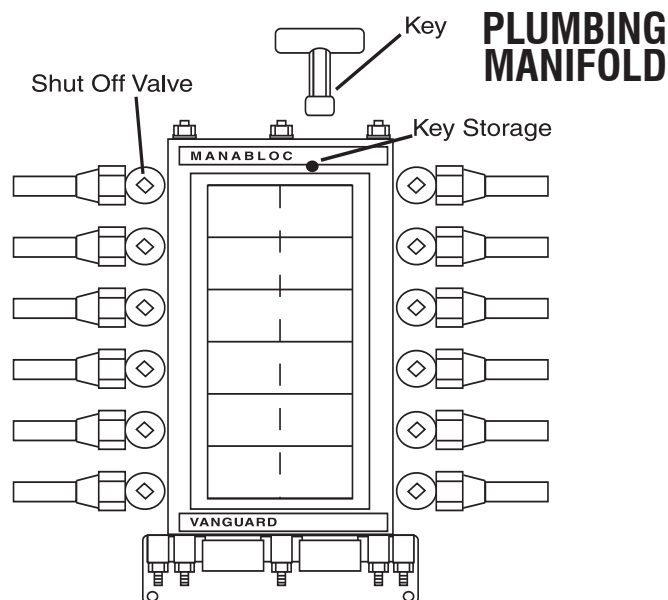
NOTE: When filling tank do not leave hose unattended.

WATER TANK - (FRESH) GRAVITY FILL



The Manabloc water manifold system separates the main hot and cold lines. The main hot and cold inputs are divided into the individual branch lines. Water flows unrestricted, with no hidden fittings located behind walls.

Each faucet or appliance water line may be turned off individually. The hot water valves are located on the left and the cold water valves are on the right. Use the key provided to turn on or off any water line. When key is horizontal the water line is open. Turning the key to the vertical position shuts that water line off. Each water line is labeled for easy reference. Snap the Manabloc key into the storage position after use.

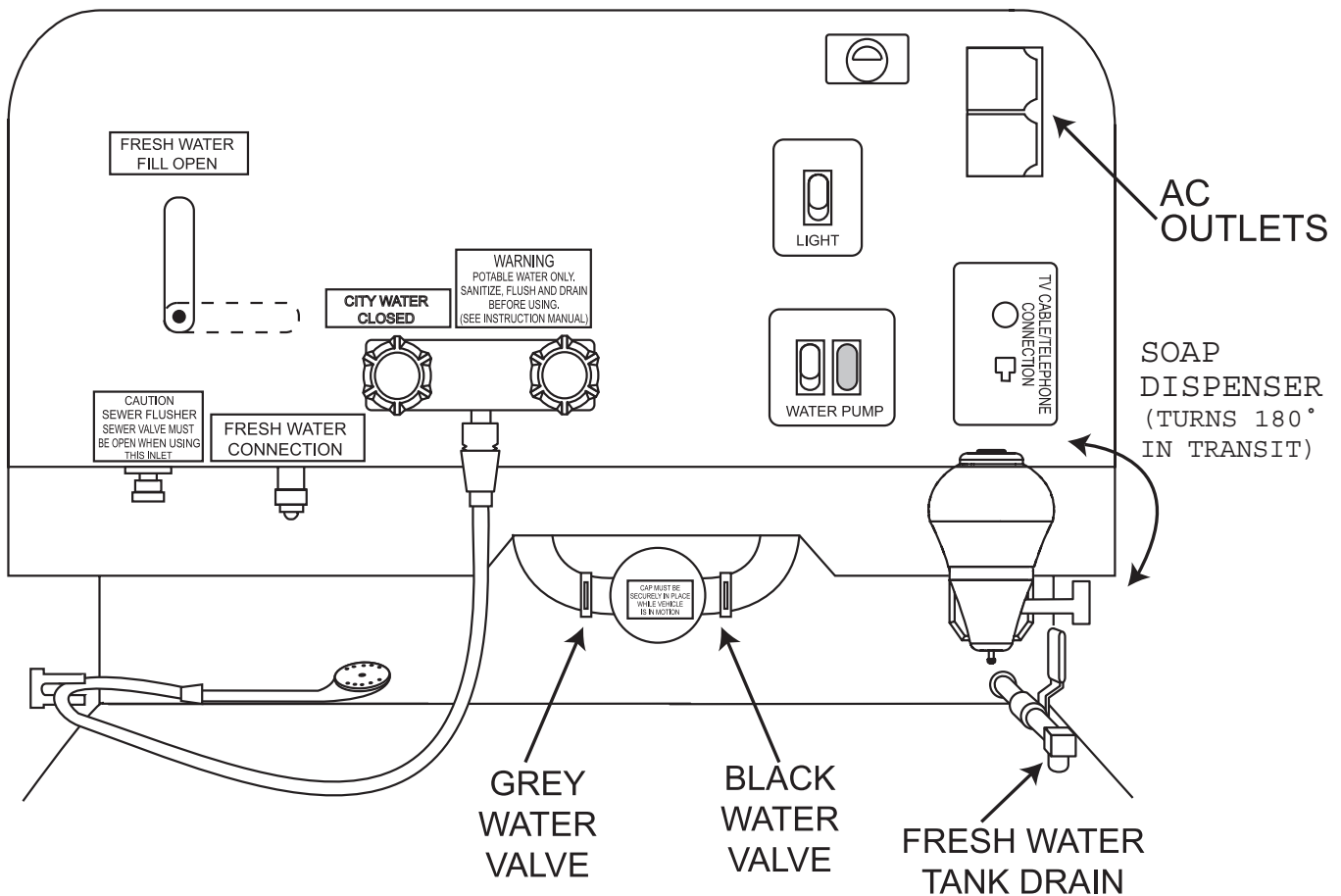


WATER - CITY HOOK-UP

- Connect a potable water hose to the city water hook-up located in service center on the roadside of motorhome.
- Turn the city water/tank fill valve to the city water/closed position.
- Turn on the water supply.
- The water pump can either be off or on. It will not affect the water pump to leave it on.
- The city water hook-up in the service center has a built in pressure regulator and one way check valve. The pressure regulator limits the water pressure to approximately 45 lbs.

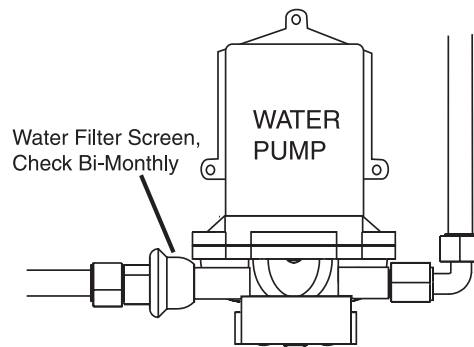


CAUTION: Some outside water sources develop high water pressure, particularly in mountainous regions. High water pressure is anything over 55 psi (pounds per square inch). Excessive water pressure may cause leaks in water lines and/or damage the water heater. An additional pressure regulator should be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



The water pump pressurizes the fresh water system when the motorhome 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.

WATER PUMP



WARNING: Before leaving your 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 the responsibility of the owner, not the manufacturer.

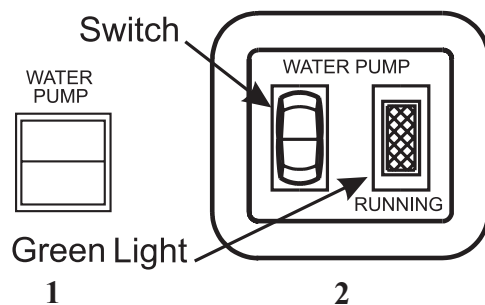
Latching Controller:

The latching controller circuitry allows multiple switch locations to operate the water pump. Pressing one of the water pump switches provides a momentary ground signal to the latching controller, turning the water pump on or off from any location. An indicator lamp at each switch location illuminates when the water pump is on.

The water pump may be operated from the following locations:

- The monitor panel.
- The bathroom.
- The service center.
- The galley.

To turn the water pump **ON** or **OFF**, momentarily press the water pump switch. The indicator lamp will illuminate when the water pump is turned **ON**.



1. Monitor Panel Switch.
2. Bathroom, Service Center & Galley Switch.

CAUTION: Do not continue water pump operation when the fresh water holding tank is empty. Damage to the water pump or electrical supply system may result.

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).

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 tightening the hardware. Check the following items:

The water pump will not start/blows the fuse:

- Check the electrical connections, fuse or breaker, main switch and ground connection.
- Check the electrical connections at the latching controller.
- Is voltage present at the pressure switch? Bypass the pressure switch.
- Is the latching controller grounding the water pump?
- Check the charging system for correct voltage and good ground.
- Check 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.

The water pump is rapid cycling:

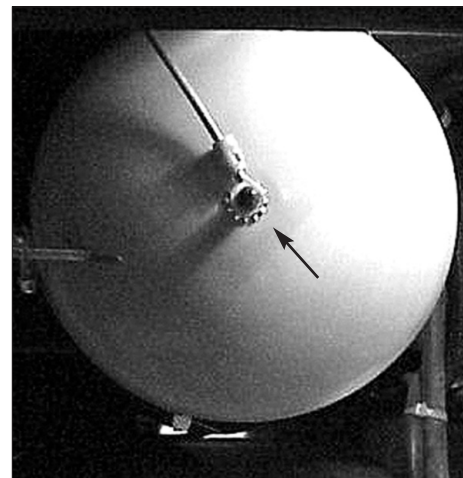
- Look for restrictive plumbing/flow restrictors in the faucets or shower heads.

The pressure accumulator tank is mounted in the water bay near the water pump. The accumulator tank will need to have maintenance checks completed monthly. The accumulator features:

1. Smooth flow from the faucets.
2. Reduced water pump cycling.
3. A precharged air cushion.
4. Elimination of pulsations and water hammer.
5. Pressure of water at faucets.

The accumulator tank has a tire valve for checking the air pressure in the tank. The precharged pressure must not exceed the water pump cut-in pressure, the pressure at which the pump restarts. The water pump has a cut-in pressure at 40 psi. Air pressure in the accumulator tank should be set at 18 to 22 psi and should not exceed 25 psi. To check the air pressure in the accumulator tank the water pump and city water will need to be **OFF** so that the water pressure is relieved. Open a faucet to relieve the remaining water pressure. Using a tire air pressure gauge, one which reads low air pressure, check the accumulator tank pressure bi-monthly. In the event air pressure needs to be added to the accumulator tank, a manual pump is recommended. Airflow and pressure from a compressed air system can overcharge the tank too quickly causing the tank to rupture.

PRESSURE ACCUMULATOR TANK

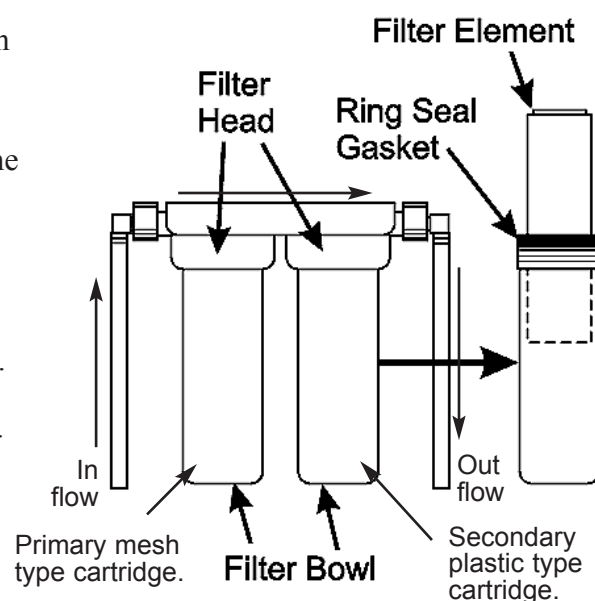


Remove tank valve cap to check air pressure.

A two-stage filtration system if used and consists of the following filters:

- **First Stage 5 Micron Sediment Filter:** For reduction of suspended solids, dirt and rust down to 5 microns in size. Life expectancy varies with incoming water condition. Recommended change of six months to one year depending on incoming water quality and use.
- **Second Stage 56 Cubic Inch Granular Activated Carbon Filter:** Improves water quality by reducing volatile organic chemicals, chlorine, tastes and odors. Capacity of 1,500 gallons. Recommended change of six months to one year depending on incoming water quality and use.

WATER FILTERS





Water Filter Removal Wrench.

The filter elements will need to be removed and the filter bowls reassembled, without the elements, before disinfecting the water system with a chlorine bleach solution. To change the filter elements use the following procedure.

To Remove:

- Turn off the water supply and the water pump. Open the faucet to bleed off pressure.
- Unscrew the filter bowl from the filter head.
- Remove the old element and empty any remaining water in the bowl.

To Install:

- Place the elements in the bowls, observing primary and secondary filter locations.
- Screw the bowls onto the filter heads, hand tight.
- Turn on the water pump or city water.
- Open the outside faucet and purge air from the filter assembly.
- Check for leaks.

**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 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. If a water line or fitting is leaking, tighten the fitting. If the leak has not stopped, use the water manifold key to shut off the water supply valve. Have the leak repaired before returning the supply line to service.



NOTE: A small water leak can cause severe water damage. Shut off the water supply and have the leak repaired.

If the hot water appears not to be heating to factory set temperature, check the faucet sprayer knobs located at the service center. Both faucets must be in the **OFF** position when not in use.

In addition, opening the city water/tank fill valve with the water pump off will remove all water line pressure within the motorhome.

Disinfecting the water system with chlorine bleach (superchlorination) protects the drinking water from bacterial or viral contamination that may come from any common water source.

WATER SYSTEM **- Disinfecting** **Fresh Water**

Disinfect the Water System:

- If your motorhome is new.
- If your 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 fill cap.



CAUTION: Do not use vinegar to disinfect water system on units using Aqua-Hot Heating Systems. Vinegar will deteriorate copper tubing.

Use the following procedures to disinfect water system:

- Remove the filter elements from the filters and reassemble the filters 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) disinfecting solution 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. Run the water until you smell a distinct chlorine bleach odor.
- Allow the system to stand for four hours.
- Drain the system and flush with fresh water. The drain is located in the outside water service compartment. Install new water filters. Thoroughly flush with fresh water until no chlorine bleach taste or smell is detected in the water system.

**Aqua-Hot
Maintenance**

If not properly and thoroughly rinsed, chlorine bleach or other concentrated chlorine bearing chemicals can cause failure to the Aqua-Hot's Domestic Water Loop (copper tubing). The Aqua-Hot's copper tubing is rated for use with fresh water and winterization solutions only. Periodic flushing with other common household chemicals, including bleach, will have little or no effect on the product if properly rinsed with the fresh water afterwards. Failure of copper tubing, especially soft or flexible copper, can result if materials other than water or winterization solutions are allowed to reside inside the piping for extended periods (during storage or other periods of non-use). The most common cause for failure is due to an extended exposure to chlorine, solutions containing chlorine (i.e. bleach) or hydrochloric acid.

TANK CAPACITIES - CHART

TANK CAPACITIES (Approximate Gallons)

	40DSFD	40' DBL.S/O	40' Trple S/O	42' DBBS
Water Heater	10	10	10	10
Grey Holding Tank	60	60	60	60
Black Holding Tank	40	40	40	40
Fresh Water Tank	100	100	100	100

	42' DBL.S/O	42SBW	43 DS2	43 DS
Water Heater	10	10	10	10
Grey Holding Tank	60	60	60	60
Black Holding Tank	40	40	40	40
Fresh Water Tank	100	100	100	100

WATER FILTERS

First Stage	Premier 5M-10
Second Stage	Premier GAC-10-56

WASTE WATER SYSTEMS

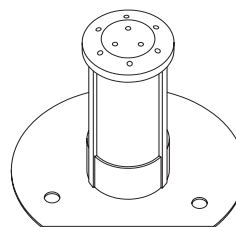
Drain & Sewage Tanks

The waste drain system provides adequate and safe storage and/or discharge of waste materials. The drain system uses ABS plastic piping and fittings connected to sinks, shower, toilet and holding tanks draining to an outside termination. The motorhome should be reasonably level for optimum operation of the systems. The wastewater holding system consists of a wastewater holding tank (grey tank). The grey water tank stores the sink, shower and clothes washer drain water. A sewage holding tank (black tank) stores waste from the toilet only.

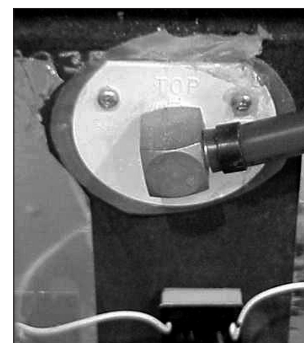
Drain valves and a tank flush system dispose waste through a common termination. Each holding tank has a separate drain valve dumping the waste water (grey water) and sewage (black water) through a common single discharge outlet. The tank drain valves are located service center on the roadside. Use the water monitor panel to observe tank levels. When ready to drain the tanks, drain the sewage tank first. Next, flush the black tank with the flush system. Drain the grey water tank. Using this sequence helps flush solids from the sewer hose. When traveling, it is recommend both holding tanks be empty or less than half full.

The motorhome comes equipped with a power flush system to aid in cleaning the holding tank. The power flush nozzle, located in the black tank (curbside), helps reduce solid build-up. Use the tank flush each drain cycle. Failure to thoroughly rinse the tank each drain cycle may result in solids accumulating and a clogged spray nozzle.

The flush system water hook-up is located in the service center. When using the flush system the sewer hose must be connected and the black tank dump valve open.



Black Tank Flush

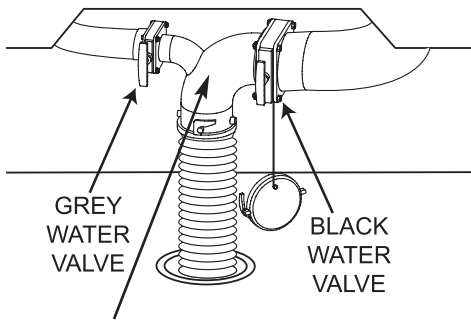


Tank Flush Valve.

WARNING: When using the black tank flush, do not leave the motorhome unattended. Flooding may occur. The sewage tank flush system should be used each time the black water holding tank is dumped. Failure to routinely use the sewage flush system will result in a clogged spray nozzle. Turn off the water supply to the black tank flush when finished.

A flexible three inch sewer hose attaches between the termination drain and the shore facility. Sewer hoses usually come in 10 or 20 foot lengths. The sewer hose is stored in a tube accessed through a compartment door on the roadside next to the drain valves. The shore fitting for the sewer hose may be three or four inch pipe, which could be male or female thread. Another possibility may be a four inch pipe, with no threads, covered by a metal plate. There are many configurations. Different style adapters are available to fit most configurations. Hose ladders may also be purchased to support the hose.

Sewer Hose



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

To attach the Sewer Hose:

1. Remove sewer hose from carrier.
2. Remove termination cap. Align coupler tangs with termination tabs. Twist the coupler clockwise 90° locking coupler to termination outlet.
3. Attach the other end of the hose to the drain service. Restrain hose to prevent movement during use.
4. Grasp with both hands and rotate downward to align hose with discharge port.
5. Open the (small) grey water valve.

The (large) black water valve remains closed until the tank is full or until time of departure. This will help prevent accumulation of solids. Use the outside faucet or shower attachment for washing or rinsing.



NOTE: Lubricate the O-ring on the sewer hose adapter periodically with silicone spray. Use care when connecting the sewer hose adapter to the termination outlet in cold weather.

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 similar publications. Some major oil companies offer dump facilities at selected stations. With a little planning you will find few inconveniences in proper and legal disposal of holding tank waste.

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 be 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.
- Household tissues are thicker, softer and stronger than a rapidly dissolving tissue. White toilet paper dissolves faster than colored papers.



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

A simple test to determine a tissue's dissolving ability is to immerse one square into a jar of water. Shake five times to determine if the tissue disintegrates into pieces or remains in one piece. Any type of tissue remaining in one piece should not be used.

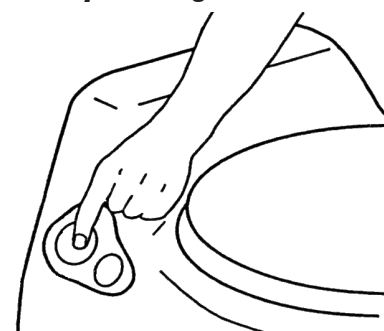


CAUTION: Do not use any products that contain petroleum distillate or ammonia in place of RV odor controlling chemicals. Petroleum distillate or ammonia will damage the ABS plastic holding tanks and seals.

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

- To add water to the toilet before using press and hold small button until the desired water level is reached. Generally, more water is required only when flushing solids.
- To flush the toilet push the large button once.

TOILET Operating Instructions



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 your holding tank capacity, after cleaning and every few days during use.

Maintenance

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



NOTE: If the motorhome is in storage for six months it is a good idea to spray silicone on the toilet valve and work it back and forth. Perform this maintenance monthly (silicone will evaporate in about 30 days).

Troubleshooting

Leaks:

- Back of toilet: Check water supply line connection.
- Between closet flange and toilet: Check screws for tightness. If leak continues, remove toilet and check flange height. Adjust, if necessary, to 7/16" above floor. Replace flange seal if damaged.
- Poor flush: A good flush should be obtained within 2 to 3 seconds. If problem persists remove the water supply line and check flow rate. The flow rate should be at least ten quarts (9.5 liters) per minute.
- Bowl will not hold water: Check for foreign material in valve blade groove in the flush drain.



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

What to Put into the Holding Tanks - Black Water Tank

Holding Tank Chemicals:

Before using the toilet, treat the sewage holding tank with water mixed with an odor-controlling chemical. These chemicals are readily available at any RV supply store. Pour the chemicals into the holding tank through the toilet. Add approximately three gallons of water to the holding tank first. Next, mix the chemicals, in accordance with the manufacturers instructions, with approximately one gallon of water. Pour mixture through toilet to the holding tank. Be careful not to spill the chemical on your hands, clothing, toilet bowl or carpet as it can cause a permanent stain. Extremely hot weather areas may require adjusted amounts of chemical to help with odor control. Repeat the chemical pre-charge to the holding tank each time the tank is cycled.



CAUTION: Do not use any products that contain petroleum distillate or ammonia in place of RV odor controlling chemical. Petroleum distillate or ammonia will damage the ABS plastic holding tanks and seals.

The grey water waste tank stores the sink, shower and clothes washer drain water. No chemical is required in this holding tank; however, a waste holding tank can produce odors. A reduced mixture of chemicals can help with odor control.

Ensure that there is enough liquid in the holding tanks prior to dumping the waste holding tanks. This provides a smooth flow through the valve, drain pipe and drain hose. When cycling the tank with sufficient liquid, a swirling action should remove accumulated solid wastes along with the waste liquid. Empty the sewage tank weekly to prevent stagnation and overflowing.

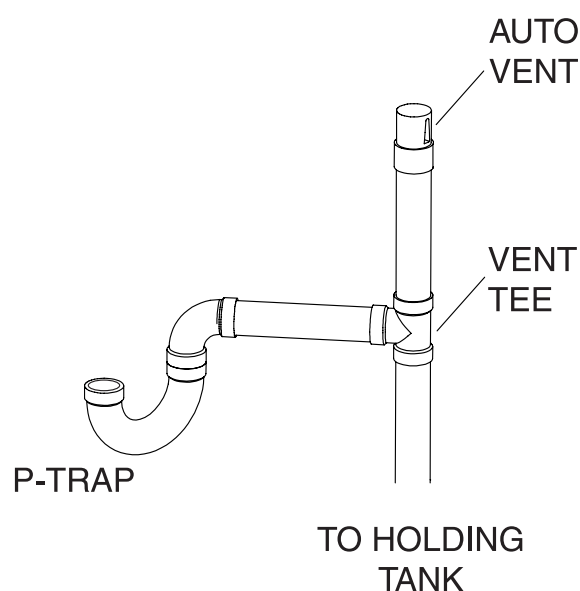
What to Put into the Holding Tanks - Grey Water Tank


Sinks, shower and clothes washer drains incorporate a water trap or "P-trap" and auto vents to prevent waste water holding tank odor from entering the motorhome. These P-traps are usually within 54" of a vent tee. These traps must have water in them to block odors.

During storage water can evaporate and allow odor into motorhome. If odor is detected run water into sinks, shower and clothes washer to fill drain traps. The auto vent by design is to assist in the flow of water in the drain lines. They enable a smooth flow of water in the drain without creating a vacuum.

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 case the line has to be "snaked" out.

Drain Traps & Auto Vents



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

 **NOTE: During cold weather antifreeze must be added to the drain traps.**

Draining the Waste Holding Tanks

1. Before dumping the black tank, first close the grey water valve.
2. Fill the grey tank to at least 50% by running water in the shower or sinks.
3. Use the monitor panel to observe tank fluid levels. When the grey tank is 50% full stop filling the tank.
4. Open the black water valve. Allow the black tank to drain.
5. Use the tank flush system.
6. Connect a non-potable water hose, with pressure regulator, to the flush system fitting.
7. Turn on the faucet allowing water to rinse the black tank at least three minutes. Never operate the system unattended. Ensure the water flows freely through the drain hose.
8. When completed turn off the faucet and close the black water valve.
9. Open the grey water valve. The water in the grey tank flushes any remaining solids from the hose. With the grey water valve open, run two gallons of water down any drain to flush the grey tank. The grey valve remains open until the next drain cycle or departure.



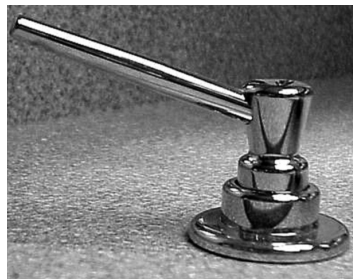
WARNING: Never operate the flush system unattended. Flooding may occur. Use the tank flush system each time the holding tanks are cycled. Failure to routinely use the flush system will result in a clogged spray nozzle. Turn off the water supply when finished flushing the tank.

10. If preparing for travel, close both the valves. Undo any restraining devices from the hose. Disconnect the hose from the termination outlet by rotating the fitting counterclockwise 90°.
11. Raise hose and drain using hand over hand method working hose towards shore fitting. Rinse the hose with outside facility and repeat the hose drain process.
12. Remove the hose from shore fitting. Install hose in carrier and lock door. Secure the termination cap (required by law in some states).
13. If desired, add chemicals to the tanks to control odor. Follow the chemical manufacturer's directions.



NOTE: Dump the black tank before driving the motorhome.

The liquid soap/lotion dispenser can be used with any type of liquid soap or lotion. The liner of the bottle will not corrode or discolor the contents of the dispenser. To clean, use a soft cloth and blot dry. Do not use harsh abrasive cleansers or polishes, this can damage the finish on the dispenser.



Liquid Soap Dispenser

SOAP DISPENSER - LIQUID



Funnel for re-filling the dispenser.

A motorhome is not designed for extended use in below freezing (32° F/0° C) weather; however, you may not experience any problems 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 temperature the motorhome will tolerate, winterize with a potable antifreeze.

COLD WEATHER USE

Storage:

If storing the motorhome where freezing temperatures may occur, the domestic fresh water loop will need to be completely drained of water. When draining the domestic fresh water system start off by draining the fresh water tank. Open the drain lever for the fresh tank and allow the water to drain.



NOTE: Ice makers, water filters, water purifiers, water heaters, washers and the Aqua-Hot all use domestic water and should be drained and stored in accordance with the manufacturer's recommendation for winterization.

The motorhome owner is the one who decides how to store the motorhome and protect the water lines. The decision may be to have the water lines blown out with air to remove standing water, or to fill the lines using an approved FDA RV antifreeze. When using either method, all the interior and exterior faucets will need to be opened and closed, one at a time, to verify that all water has been purged. All low point drains should be opened, and holding tanks emptied.

To winterize the motorhome using air pressure, an air compressor and adapter will need to be accessed to connect the air line to the water system. Adapters can be found at RV supply stores. System pressure should not exceed 50 psi. when hooked to the water lines. Higher pressure will damage the lines.

WINTERIZING - Using Air Pressure

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. Opening the low point drains clears water out of the hot and cold water lines. Leave the low-point valves open until the motorhome is to be used again.
4. Let all the water drain. Turn the pump on and allow it to run so that all 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 50 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/handle down until the water has stopped running.
8. Unhook the air hose and close the city water connection.
9. One gallon of RV antifreeze is needed to protect various water drain lines in the motorhome. Pour 1 pint into both the kitchen and bath shower drains. Pour 2 pints into the bath sink drain, with some of the antifreeze going into grey tank to protect the drain valve. 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. Pour the last pint of antifreeze into the toilet after the flush pedal is released. Use a soft cloth to wipe out the sinks and shower after the antifreeze is added to protect the surfaces from stains.
10. Leave the low-point drains open until the motorhome is going to be used again.



WARNING: When draining the low point hot water drain lines, and the water heater, be sure the water is cool. Hot water from the lines can burn or scald skin.

WINTERIZING
- Using Nontoxic
Antifreeze

Approximately ten gallons of FDA approved RV antifreeze will be required to winterize the motorhome.

1. Remove the water filter elements from the filters and reassemble the filters without the elements (see "Water Filter").
2. Open all faucets, low point drains (next to the Aqua-Hot) and drain valves for the fresh water tank, water heater tank, holding tanks and fresh water lines.
3. Let all the water drain. Turn on the pump and allow it to run for 30 seconds to 1 minute so that all water is cleared out of the pump.
4. If the motorhome has a water heater, when cool, remove the anode to drain the internal tank and open the pressure release valve located in the water heater outside compartment. At the back of the water heater turn the water valve to the "by-pass" mode so no FDA RV antifreeze enters the water heater tank.
5. Turn off both LP Gas and electricity to the water heater tank.
6. All holding tanks and fresh water lines are the drained.
7. Close all faucets drain valves and low point drains.
8. Pour the antifreeze into the fresh water tank using the fresh water gravity fill. Turn ON the system water pump and operate each faucet (hot and cold valves) individually until a small amount of antifreeze is present.
9. Close off the faucets.
10. Open the shower faucets and toilet valve to allow a small amount of antifreeze to run into the holding tanks.
11. Approximately one gallon of RV antifreeze is required to protect various water drain lines in the motorhome. Pour 1 pint in both kitchen and bath shower drains, 2 pints go in bath sink drain with some of antifreeze going into gray tank to protect drain valve. While holding down toilet flush pedal pour another 3 ½ pints into toilet letting antifreeze run into black tank to protect valve located there. Pour last ½ pint of antifreeze into toilet after you have released flush pedal.
12. Use a soft cloth to wipe out the sinks and shower to protect surfaces from antifreeze stains.
13. Open the exterior faucet using the same procedure as the interior faucets.
14. If the motorhome is equipped with an icemaker, remove the ¾" fitting and flush antifreeze through the water line.
15. Disconnect the power supply line effecting water pump operation.

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 an authorized selling dealer.

EXECUTIVE

SECTION 7 LP-GAS SYSTEMS

LP-GAS SYSTEM • 219
LP-GAS DETECTOR • 220
<i>Operation</i> • 220
<i>Testing</i> • 220
<i>Alarm</i> • 221
<i>Care of the Detector</i> • 221
MONITOR PANEL MEASUREMENT • 222
CHECKLIST - LP-GAS EMERGENCY PROCEDURES • 222
LP-GAS TANK CAPACITY • 223
LP-GAS TANK • 223
<i>Operation</i> • 224
<i>LP-Gas Tank Filling</i> • 224
LP-GAS FUNDAMENTALS • 225
LP-GAS REGULATOR • 226
LP-GAS CONSUMPTION • 227
LP-GAS DISTRIBUTION LINES • 228
LP-GAS SAFETY TIPS • 228



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 recreational 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.

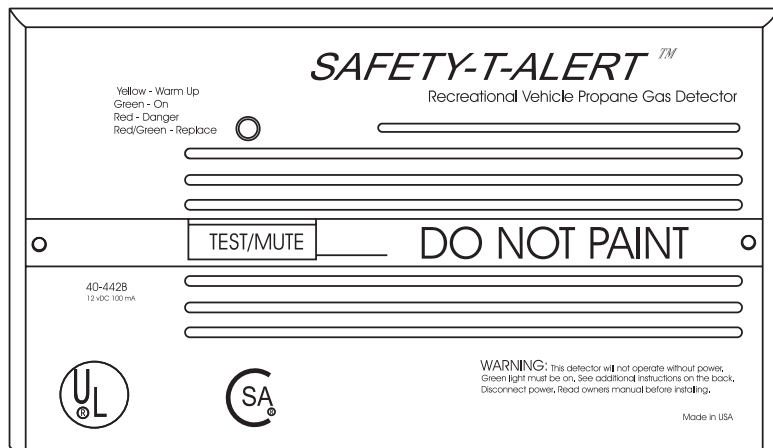
Have the LP-Gas system checked by an authorized dealer at least once a year, and thereafter before every extended trip. Although the manufacturer and the dealer test the system carefully for leakage, travel vibrations can loosen fittings.

Leaks can be easily found by applying a leak detector solution on all connections. 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 a leak is suspected (which can be easily identified by the odor of rotten eggs or sulfur) never light a match, have an open flame or use any spark producing equipment or appliance.



WARNING: 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



The LP-Gas detector is provided for safety. The gas detector detects both LP-Gas and Methane Gas. Liquefied Petroleum Gas (LP-Gas) is heavier than air and 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 this occurs, press the reset button to stop alert sound for 60 seconds and allow the air to clear.

The other detectable vapors 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: The detector will not alarm during the three minute warm up cycle.

Testing

Press the **TEST** switch any time during the warm up cycle or while in normal operation. The LED 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.

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.

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.

**Care of
the Detector**

MONITOR PANEL MEASUREMENT



LP Tank Gauge

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. If system does not read accurately recalibration may be necessary.

To recalibrate LP tank gauge proceed as follows:

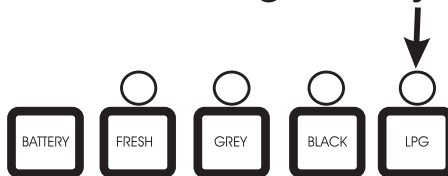
- Using adjustment tool, simultaneously push button for tank and rotate adjustment point.
- Turn counterclockwise until the light indication is decreasing.
- Gently rotate the adjustment back, clockwise, until the light indication is at full.



NOTE: Fill LP tank prior to calibration.



Remove Plug To Adjust



Adjustment Point

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 as this can produce a spark ignite the gas.
- Open windows and doors.
- Evacuate the motorhome. Stay clear of the surrounding area.
- Keep open flames, spark producing devices and smoking material out of the area.
- Contact a qualified service technician to find the source and repair the gas leak.



WARNING: A fire or explosion from ignited gas or gas fumes can seriously injure you or cause death.

LP- GAS TANK CAPACITY

LP-GAS TANK CAPACITIES (Approximate Gallons)

	40DSFD	40' DBL.S/O	40' Trple S/O	42' DBBS
LP-Gas Tank	55	55	55	55
	42' DBL.S/O	42SBW	43 DS2	43 DS
LP-Gas Tank	55	55	55	55

*Actual filled LP-Gas capacity is 80% of listing due to safety shut-off required at tank.

LP-Gas exists in both the liquid and vapor state within 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 at the tank, when full, will only read 3/4 full. The monitor panel is adjusted to indicate “FULL” at this point. When storing portable LP-Gas tanks that are not connected to an LP-Gas system, install an approved plug in the tank outlet holes to prevent leaks. Do not transport or store LP-Gas tanks, gasoline or other flammable liquids inside the motorhome.

LP-GAS TANK



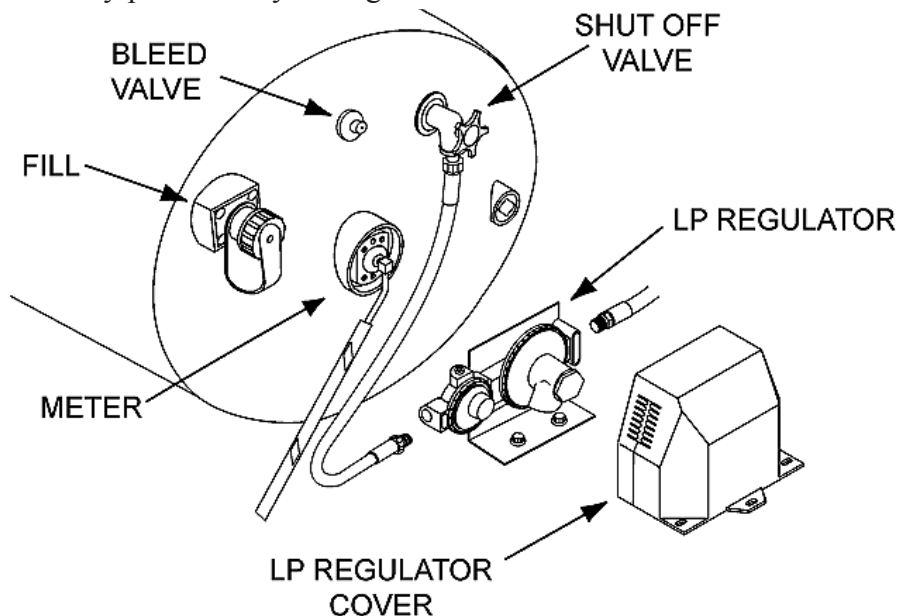
WARNING: Do not store or transport empty LP-Gas tanks, portable tanks, gasoline or other flammable liquids inside the motorhome. Keep open flame and spark producing materials away from the LP-Gas area. Shut off all appliances and LP-Gas tank valve (located on side of LP-Gas tank underneath the motorhome) 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.

Operation

- Manually open the main shut-off valve located on the LP-Gas tank.
- Turn off the manual valve on the LP-Gas tank when the motorhome is in 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.



LP-Gas Tank

LP-Gas Tank Filling

Woodall's Campground and Trailer Guide and other similar 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 is 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 a strong rotten egg odor near the tank and/or a hissing noise may be detected.



WARNING: Turn off all pilot lights and appliances while filling the LP-Gas tank to prevent a fire or explosion.

**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° - 32 ÷ 1.8 = C°)
11 in. Water Column	= 6 1/4 ozs. per sq. in. pressure.
27.7 in. Water Column	= 1 lb. per sq. in. pressure.

The above capacities allow for 20% vapor space on each cylinder.

Data taken from the National Fire Prevention Association (NFPA). Pamphlet #58-1998.

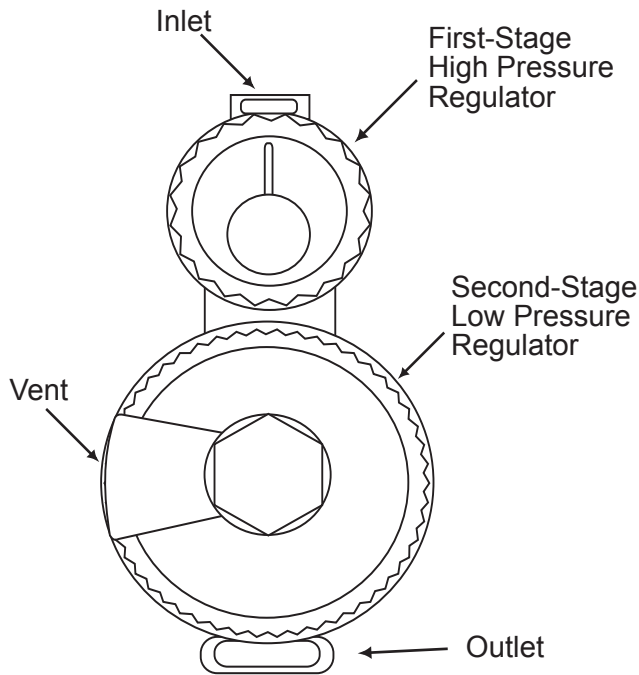
Basic Facts About LP-Gas:

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	- 44° F
Vapor Pressure at 0° F	31
Vapor Pressure at 70° F	127
Vapor Pressure at 100° F	196
Vapor Pressure at 110° F	230
Flash Point	842° F



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.

LP-GAS REGULATOR



Typical two-stage 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. The first stage regulator reduces the full tank pressure down to a range of 10-13 psig (pounds per square inch gauge). The second stage further reduces the pressure down to an outlet pressure of 0.4 psig (11 inches of water column). The regulator is equipped with a vent that allows it to breathe. 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 downward. If the vent becomes clogged clean it with a toothbrush.

Under normal atmospheric conditions an 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 possibilities 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!

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.

Determine Fuel Consumption:

To determine approximately how many hours an LP-Gas appliance will operate on one gallon of LP use the following formula:

- LP-Gas appliances are rated in Input BTU (British Thermal Units). The rating is usually stamped or printed on tag affixed to the appliance. For example: the Input rating of the appliance is 10,000 BTU's.
- One gallon of LP-Gas produces 91,502 BTU's.
- Divide the amount of BTU's of one gallon of LP-Gas (91,502) by the rating on the appliance in this example 10,000. Net continuous operation time for one gallon of LP Gas for this appliance would be approximately 9.2 hours.

The above formula can be useful when trying to determine the approximate length of time a tank of LP-Gas will last. Generally, LP-Gas appliances do not operate continuously. An example would be the typical cycling of the furnace or water heater.

Determining how long a tank of LP-Gas will last:

- Combine the BTU input totals of all appliances and the approximate length of time these appliances operate per day.
- Multiply the number of liquid gallons in the LP tank by 91,502.
- Divide the total of BTU's of the LP tank by the total number of BTU's the appliances consume equals the approximate number of hours of operation before refueling.



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 perform 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 a gas leak is suspected, get the system inspected and repaired by a qualified service technician as soon as possible.

LP-GAS SAFETY TIPS

Liquid Propane gas is one of the safest and most reliable fuels available on the market if it is handled properly. LP-Gas, however, does have a great explosive "potential" if handled improperly. Danger is minimized by becoming familiar with and following a few safety precautions, and by learning how to properly operate LP-Gas appliances. Use of LP-Gas requires the responsibility to enforce extra safety measures.

The motorhome is equipped with many LP-Gas operated appliances because it is a convenient and efficient source of fuel. LP-Gas appliances must be operated and maintained in accordance with the product manufacturer's instructions.

The National Propane Gas Association (NPGA) has a special service program offered called GAS[®] (Gas Appliance System) Check. The GAS[®] Check program is aimed at educating users in the association about the convenience of propane use with safety and peace of mind. For information on the **NPGA Gas[®] Check program, call (630) 515-0600 or visit www.npga.org.**

LP-Gas Tanks and Cylinders:

Tanks are built to American Society of Mechanical Engineers (AMSE) Code. The cylinders are built to DOT (Department of Transportation) Code. The major difference between cylinders and tanks is in required testing and inspection procedures and in the construction of the containers. Both tanks and cylinders are required to undergo pressure testing and inspections; however, the procedures for how they are tested and inspected differ.

The difference between the two codes are that the valves, fittings and brackets are located only on the ends of the DOT cylinders; however, on the ASME tanks they may be located on ends, as well as the sides. There is also a difference in how the tanks are rated. Required tank ratings are in gallons (ASME ratings) or pounds (DOT) water capacity. The Federal DOT (Department of Transportation) regulations require periodic inspections and re-qualifications of cylinders.

American Society of Mechanical Engineers (AMSE) tanks or bulk containers are generally used in the motorhomes and motorized products. These tanks are permanently mounted on to the unit.

An alloy steel two-piece welded and brazed tank is used on all towable products. The marking on the collar, DOT 4BA240 identifies, the DOT specifications and service pressure. Other pertinent information included on the collar is the water capacity (WC) and the tare weight (TW), both which are measured in pounds, and the Manufacture date (one of the most important items). There is a required 12 year re-qualification. The final piece of information is for the Dip Tube (DT) length. This is part of the overfill protection and maximum liquid allowance in the cylinder.

Maintenance and Safety Tips for the LP-Gas Refrigerator and the Propane Furnace:

- Have the refrigerator, furnace and venting inspected annually by an authorized service center.
- Before firing up the refrigerator, or using the propane gas furnace for the first time each season, have the venting system checked for blockage. Insects may have built nests that will obstruct flow.
- At the first indication of incomplete combustion (yellow flame instead of a blue flame or soot is present) contact a service technician immediately. Improper combustion can cause carbon monoxide buildup, which is potentially fatal!

Maintenance and Safety Tips for the Propane Range:

- Burner flame should be a blue color, indicating complete combustion. If not, have the unit serviced by a qualified technician.
- Do not cover the oven bottom with foil. Air circulation will be restricted.
- Never use gas ranges or ovens for heating purposes.
- Always have pot handles turned inward.
- Ensure children understand never to turn or play with the knobs on the front of the propane gas range.

Maintenance and Safety Tips for the Propane Water Heater:

- Test the operations of the temperature and pressure relief valve. Maintain setting at no more than 210° F. to reduce the chance of hot water scalding.
- Keep flammable substances away from the water heater. Do not store items close to it as this may block the airflow the water heater needs to operate properly.
- At the first indication of incomplete combustion (yellow flame instead of a blue flame or soot is present) call a service technician immediately. Improper combustion can cause carbon monoxide buildup, which is potentially fatal!

NOTES

EXECUTIVE

SECTION 8 ELECTRICAL SYSTEM - HOUSE

INTRODUCTION	• 233	DISTRIBUTION PANEL - HOUSE 110	• 261
<i>Shore Power</i>	• 233	<i>Circuit Breaker</i>	• 262
<i>Generator</i>	• 233	GFCI BREAKERS & OUTLETS	• 263
<i>Inverter/Converter</i>	• 234	DISTRIBUTION PANEL - HOUSE 12 VOLT	• 264
BATTERY DISCONNECT - HOUSE	• 234	FUSES	• 264
BATTERY CUT-OFF SWITCH	• 235	<i>Tools of the Trade</i>	• 265
SHORE POWER HOOK-UP	• 235	<i>Know When to Say When</i>	• 265
<i>Power Cord Reel (Optional)</i>	• 237	BATTERY - HOW IT WORKS	• 266
<i>AC Volt & Amp Meter</i>	• 237	<i>Starting Battery</i>	• 266
TRANSFER SWITCH	• 238	<i>Deep Cycle Battery</i>	• 266
GENERATOR - 120 AC	• 238	<i>Battery Maintenance</i>	• 267
<i>Prestart Check</i>	• 239	<i>Battery Trays</i>	• 268
<i>Starting the Generator</i>	• 239	<i>Testing the Battery</i>	• 268
<i>Stopping the Generator</i>	• 239	<i>Reasons Why Batteries Fail</i>	• 270
<i>Powering the Equipment</i>	• 240	<i>Battery Voltage & Current</i>	• 271
<i>Resetting the Circuit Breaker</i>	• 240	<i>Battery Charge Time & Consumption Rate</i>	• 272
<i>Generator Exercise</i>	• 241	<i>Battery Specifications</i>	• 274
INVERTER/CONVERTER	• 241	SOLAR PANEL (Optional)	• 275
<i>RC7 GS Remote</i>	• 241	<i>Charge Controller Features</i>	• 276
<i>Stand-by Operation</i>	• 242	<i>Solar Panel Care</i>	• 277
<i>Battery Charging with the Inverter</i>	• 242	BULB USAGE - INTERIOR	• 277
<i>Battery Temperature Sensor (BTS)</i>	• 243	ALL ELECTRIC (Optional Only)	• 278
<i>Pass-through AC Power</i>	• 243	<i>Overview</i>	• 278
<i>Operating Display</i>	• 243	<i>Meters</i>	• 279
<i>Meter Menu</i>	• 244	<i>Remotes</i>	• 279
<i>Programming the RC7 GS</i>	• 244	<i>House Batteries</i>	• 281
<i>Adjustable Field Settings</i>	• 245	<i>Main Battery Disconnect</i>	• 282
<i>Automatic Generator Start</i>	• 247		
<i>Equalize Charging</i>	• 249		
<i>Re-booting the Inverter</i>	• 251		
INVERTER - SINE WAVE (Optional)	• 251		
<i>Remote</i>	• 252		
<i>Programming & Resetting</i>	• 253		
<i>Stand-by Operation</i>	• 254		
<i>Battery Charging</i>	• 254		
<i>Battery Temperature Sensor</i>	• 255		
<i>Pass-through AC Power</i>	• 255		
<i>Meters Menu</i>	• 255		
<i>Automatic Generator Start</i>	• 256		
<i>Inverter Facts</i>	• 260		



INTRODUCTION

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 using the house batteries in the motorhome. This source has limited AC power output and should be used sparingly.

The main 120 Volt AC circuit breaker panel of the motorhome is supplied with power from two different sources: 50 Amp shore power cord or the on-board generator. The selection of the power source being used is done automatically by using an automatic electrical switching device known as the transfer switch.

The power requirement for the motorhome is 50 Amp 120/240 Volt AC single-phase. If a 50 Amp shore power service is available, the motorhome can be directly plugged into the 50 Amp shore power source with the supplied shore power cord. If a 50 Amp service is not available, proper electrical adapters will be required to convert the end of the 50 Amp shore cord into a compatible type of connection for the available receptacle. When plugged to anything other than a 50 Amp service, appliances and other AC loads will have to be operated in sequence.

Shore Power



NOTE: In many instances 50 Amp shore service may not be available. Therefore, care will have to be taken when drawing power from multiple appliances and outlets so that the shore power service will not become overloaded. Use only power cords which are rated at 50 Amps. Avoid using extension cords when connecting the motorhome to shore power. In most cases, extension cords are unsafe and inadequate for carrying the level of current required by the motorhome.

The generator can be selected for use when AC shore power is not available. The on-board generator in the motorhome has limited 120 Volt AC power output capabilities. The generator's maximum amount of output power is specified in watts, calculated at an elevation of 500 feet above sea level. The maximum power available will decrease when there is an increase in altitude. Ambient 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 that the generator will not be overloaded. The generator is fueled from the main fuel tank.

Generator

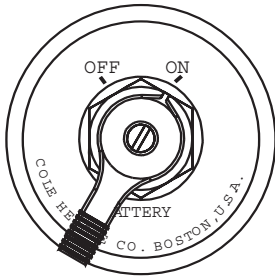
Inverter/ Converter

The inverter/converter can be used for silent AC power if shore power is not available and using the generator is not going to be selected as a secondary power source option. This device has limited AC power output measured in watts. It operates only selected appliances and outlets.

The inverter/converter is two components in one:

1. Functioning as an auxiliary 120 Volt AC power source that uses 12 Volt DC house battery power to invert to 120 Volts AC power.
2. Using 120 Volts AC, supplied from either shore power or the generator, and converting it to 12 Volts DC power to recharge the batteries.

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. 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. There are small parasitic loads that are present on the house battery. Some are federal mandate items such as the LP-Gas detector. If an AC power source is not available and the motorhome is not going to be used or is stored more than 48 hours, it is recommended to turn the battery disconnect switch off.



NOTE: The solar panels will charge the batteries with the disconnect switch off.

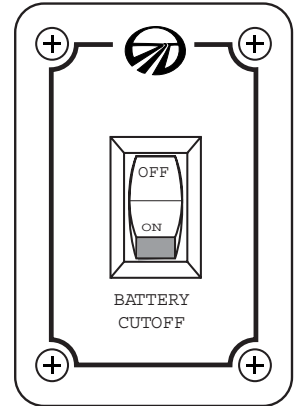


WARNING: When the frame or other welding is involved for motorhome repair or modification, the following precautions are required to protect electronic components in the motorhome chassis:

1. Disconnect the (+) positive and (-) negative battery connection, and any electronic control ground wires connected to the frame or chassis.
2. Cover electronic control components and wiring to protect from hot sparks.
3. Disconnect the wiring harness connectors at the transmission electronic control unit.
4. Do not connect welding cables to electronic control components.
5. The welding ground cable should be attached no more than two feet from the area to be welded.

The battery cut-off switch is located inside and next to the entry door. This switch controls the 12 Volt DC power to the domestic fuse panels. When the switch is ON power is supplied to all interior DC lighting and DC operated appliances. Some appliances will require both DC and AC power to operate, such as the roof air conditioner. This switch is helpful when dry camping and can be used to conserve house battery power. Refrigerator and inverter operation are unaffected by the operation of this switch. When turned off, this switch will not stop all parasitic loads and therefore is not a substitute for the main battery disconnect switch.

BATTERY CUT-OFF SWITCH



The power requirement for the motorhome is 50 Amp 120/240 Volt AC single phase. The shore cord is stored in the roadside compartment. If 50 Amp shore power service is available, all that is necessary is to connect the supplied shore power cord. If 50 Amp service is not available, electrical adapters will be required.

SHORE POWER HOOK-UP



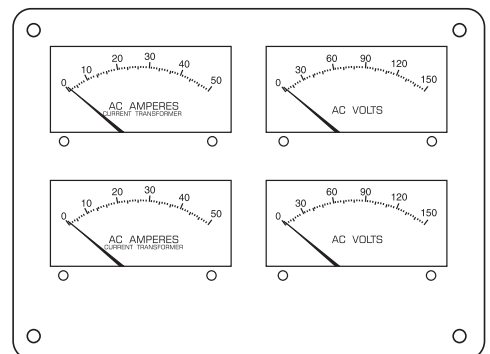
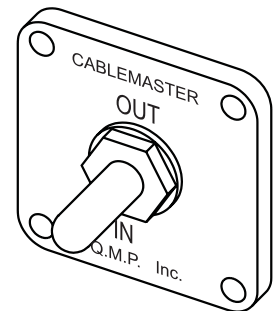
CAUTION: Avoid flash damage to electrical contacts. Before plugging the motorhome into shore power, starting the generator or using the inverter make sure all the appliances are off.

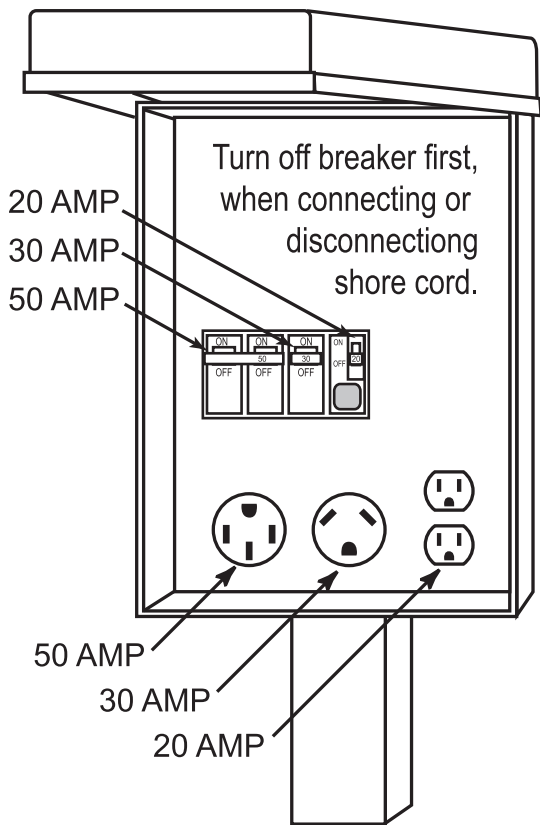


WARNING: Keep fingers away from metal contacts of shore plug end. Avoid standing in water when making electrical connections. Serious electrical shock and personal injury can occur. To avoid the risk of an electrical shock turn the circuit breaker off for the power supply outlet before making shore power connection.

Plugging in the shore cord:

- The shore power cord is located on the roadside compartment. Locate the power cord switch.
- Extend a sufficient amount of cable to reach the power supply. If 50 Amp service is not available, install the proper electrical adapters to the cord.
- Always turn off the breaker to the power supply before connecting or disconnecting the shore cord. This will prevent an accidental shock and flashing of contacts.
- When the connection is made, turn the breaker on. The transfer switch should make an audible click.
- Go inside the motorhome to check the AC Volt gauges to ensure proper voltage.





After connecting the motorhome to shore power, wait approximately one minute for the inverters to "stabilize" charging of the batteries before starting air conditioners or other large AC loads.

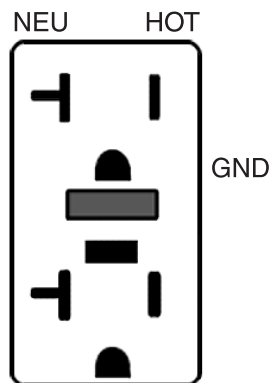
In the instance 50 Amp service is not available, use caution not to overload the supplied shore service breaker. Operate appliances and outlets in sequence rather than all at the same time.



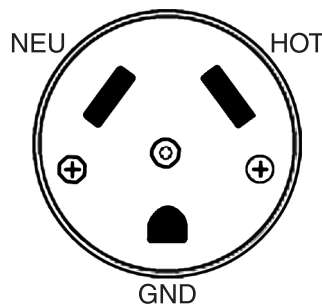
CAUTION: If shore power service is limited to 15 or 20 amps, use of light duty extension cords and electrical adapters will create a voltage loss through the cord and at each electrical connection. Line voltage loss and the resistance at each electrical connection can be a hazardous combination. Damage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



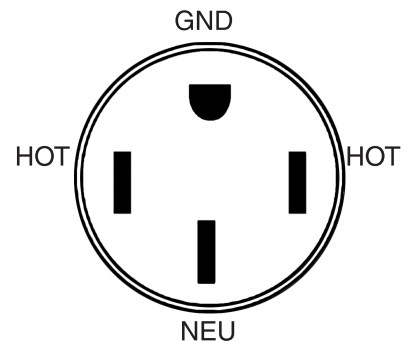
CAUTION: Avoid the risk of electrical shock or component damage by disconnecting from shore power during electrical storm activity. Use the inverter or start the generator if AC power is needed.



15-20 AMP
120 VOLT



30 AMP
120 VOLT



50 AMP
220 VOLT



NOTE: Shown are the three types of shore power outlets most commonly used.

The power cord reel is a 12 Volt DC motorized assembly that mechanically coils and stows the shore cord. The 12 Volt battery cut-off switch must be ON in order for the power cord reel to operate. The 50 Amp power cord reel is located in the roadside compartment of the motorhome. The other end of the cable power cord is wired directly to the transfer switch. The motor control switch is labeled **IN** and **OUT**. This switch operates the 12 Volt DC motor.

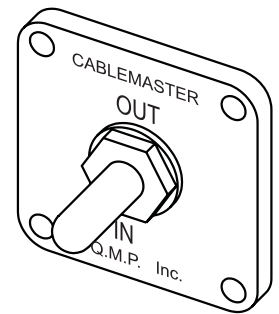
When extending or retracting the power cord, turn the switch to the direction desired. Assist the cord, following the direction of travel. Extend only as much power cord as necessary for reaching the outlet. The cord should not be taut but slightly slack.

Maintenance:


When only a short section of the shore power cable is frequently used the cable may coil sharper than normal, causing the cable to kink. To relieve this condition, routinely extend the cable full distance. Straighten the power cable on the ground. It is important the cable remains clean. Dust and dirt on the cable may cause difficulty in retracting the cord. After cleaning and straightening the cable, allow the cablemaster to retract the cable into the motorhome.


Check all AC and DC wiring connections at least once a year. Be sure they are secure and free of corrosion. Check the neoprene covers on the in-limit switch and the power switch to be sure they are free of cracks or fracture.

Power Cord Reel (Optional)



Power Cable Reel.

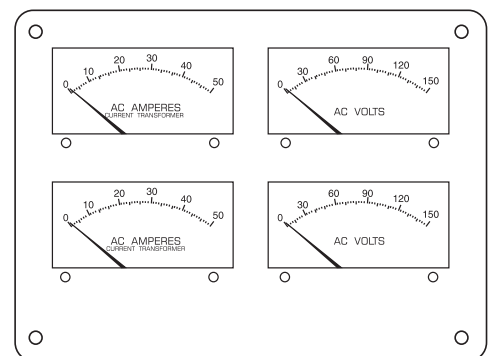
 **WARNING: Disconnect the shore power cord and the negative (-) 12 Volt DC battery cables (at the inverter) before working on the electrical system.**

 **WARNING: Turn OFF the inverter/charger before disconnecting the negative terminal from the Inverter. Remove rings, metal watchbands and other metal jewelry before working around batteries and connectors. Use caution when working with metal tools. If the tool contacts a battery terminal or metal connected to it, a short circuit could occur causing personal injury, explosion or fire.**

The meters for voltage and amperage monitor AC voltage values. Each pair of volt and amp meters monitor one of the two "hot" supply lines of the 240 Volt system. Voltage and amperage values are measured inside the AC breaker panel. These meters are useful guides indicating correct, high or low AC voltage conditions.

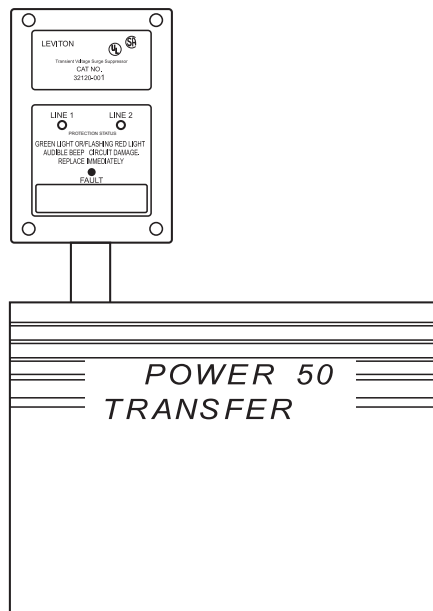
Monitor current consumption when using appliances and hooked to anything less than 50 Amp service. The meters monitor AC power supplied from either shore power or the generator. The meters are non-functional when using the inverters.

AC Volt & Amp Meter



 **NOTE: When operating from the inverter, use the inverters remote display to monitor AC and DC voltage or amperage.**

TRANSFER SWITCH



The transfer switch automatically transfers AC power from the shore power cord or generator through the transfer switch to the 110/220 Volt AC breaker panel. When using the generator as the power source, the transfer switch has a time delay built into it before transferring power to the AC breaker panel. This allows the generator time to warm up before applying an AC load. When starting the generator while hooked to shore power, the transfer switch automatically selects generator power as priority over shore power.

Electronics in the transfer switch monitors voltage input for high or low voltage cutout. If incoming voltage exceeds 138 Volts, or if voltage drops below 105 Volts, the transfer switch automatically disconnects electrical service. This prevents damage to voltage sensitive equipment.



NOTE: The shore cord is NOT tied to the generator at any time. When the generator is running, the leads on the shore cord will NOT be energized.

A surge protector with line sensor mounts to the transfer switch. The surge protector prevents the motorhome from receiving a sudden "spike" of incoming voltage. This may be from a lightning strike or a power flash during storm activity.

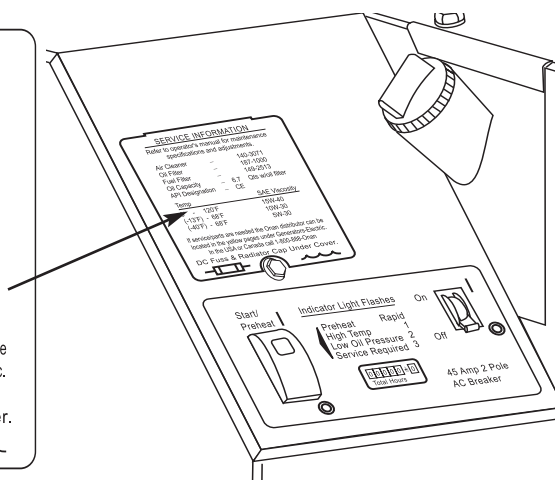
The line sensor monitors the two "hot" conductors from the provided electrical service. If the two incoming conductors have power, the two green lights illuminate. If one of the conductors should drop out, the respective green light extinguishes and the red fault light illuminates, accompanied by an alarm.



NOTE: To prevent damage to the transfer switch contacts do not have appliances on or AC loads plugged into outlets when hooking up to shore power or starting the generator. The transfer switch will begin to disengage at approximately 105 Volts AC. Operation at this voltage may damage the transfer switch, appliances or other items plugged into outlets. Start the generator and disconnect from shore service until service supply voltage stabilizes.

GENERATOR - 120 AC

SERVICE INFORMATION	
Refer to operator's manual for maintenance specifications and adjustments.	
Air Cleaner	140-3071
Oil Filter	187-1000
Fuel Filter	149-2513
Oil Capacity	6.7 Qts w/oil filter
API Designation	CE
Temp	SAE Viscosity
5° - 120°F	15W-40
(-13°F) - 68°F	10W-30
(-40°F) - 68°F	5W-30
If service/parts are needed the Onan distributor can be located in the yellow pages under Generators-Electric. In the USA or Canada call 1-800-888-Onan DC Fuss & Radiator Cap Under Cover.	



The generator is located in the front compartment of the motorhome. The generator can be started from the following locations:

- Generator remote switch on the dash.
- Generator control panel located on the generator.
- Generator remote switch in the bedroom.
- Inverter remote panel.

Prestart Checks

Prior to the first start of the day perform a general inspection including oil and coolant levels. Keep a maintenance log on number of hours in operation since the last service. Perform any service or maintenance that may be due.

Before starting the generator:

- People and animals must be clear of hazards of electrical shock and moving parts.
- All appliances and other large AC electrical loads must be off.

Push and hold control switch in **START** position until the generator starts. Release switch. On diesel models the control switch may flash up to 15 seconds, indicating engine preheat.

Starting the Generator

NOTE: Diesel models may require priming. Hold control switch in the **OFF** position for one minute. Repeat if necessary. The diesel generator fuel pick-up tube is cut to approximately 1/4 tank so as not to run the main engine out of fuel.



WARNING: Excessive cranking can overheat and damage the starter motor. Do not crank the engine more than 30 seconds at any one time. Wait at least two minutes before resuming. If the generator fails to start refer to the manufacturer's manual.



WARNING: When the motorhome is parked, position the dash air conditioner vent control in the **OFF** position to prevent exhaust gases from entering the motorhome. The engine exhaust contains carbon monoxide, which is an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and/or death. Inspect the exhaust system thoroughly before starting the generator. Do not block the exhaust pipe or situate the motorhome where the exhaust may accumulate either outside, underneath, or inside the motorhome or any nearby vehicles. Operate the generator only when safe dispersion of exhaust can be assured. Monitor the outside conditions to be sure that the exhaust continues to disperse safely.



WARNING: When parking near high grass, be sure that the hot exhaust does not come into contact with the grass, it could be a fire hazard. Hot exhaust pipe or hot exhaust gases can ignite the grass.

Turn off the appliances and disconnect other AC loads being used. Allow the generator to run unloaded for at least one minute before shutdown. This will allow the engine to cool. Push and hold the control switch in the **STOP** position until the generator stops. Release the switch.

Stopping the Generator

NOTE: Diesel models require only a momentary stop signal.

Powering the Equipment

The AC output of the generator powers the motorhome air conditioners, the AC inverter/converter charger, all appliances and items plugged into the electrical outlets of the motorhome. The number of electrical appliances that can be operated at any given time depends upon how much power is available from the generator. If the generator is “overloaded” or a short circuit causes “over current,” either the generator will shut down or the circuit breaker will trip. If power consumption, in total, exceeds the generator power output, compensation for temperature and elevation may be necessary. Operate some appliances in sequence rather than all at the same time.



NOTE: The generator may shut down when it is loaded nearly to full power and an air conditioner (or other large motor load) cycles on. For a brief moment during start up an electric motor can draw up to three times the rated power. For this reason it may be necessary to operate some appliances in sequence when air conditioners or other large motor loads are on.

It is important to remember that air density decreases as altitude increases, causing the generator engine power to decrease. Power decreases at approximately 3% of the rated power each 1,000 feet (305M) of increase in elevation above sea level. It may be necessary to operate fewer appliances at the same time when the camping location is at a higher elevation. For example: 7,500 watt generator at 5,000 ft. = 6,375 watts net. Temperature also affects maximum output power. For example: at 120° a 7,500 watt generator produces 6,000 watts net.



REFERENCE: The diesel generator may shut down for other reasons beside “overloads.” A blink code may appear on the control switch. Refer to the manufacturer’s manual to obtain an explanation of the codes.

Resetting the Circuit Breaker

If a circuit breaker trips in the main AC breaker panel, or on the generator control panel, there may be a short circuit or too much load.



NOTE: The generator will continue to run after a circuit breaker trips.

If a circuit breaker trips, disconnect or turn off as many loads as possible. To reset the circuit breaker, switch the circuit breaker to **OFF**; then switch back to **ON** to reconnect the circuit. If the circuit breaker immediately trips, the electrical distribution system has a short or the circuit breaker is faulty. Call a qualified electrician. If the circuit breaker does not trip, reconnect a combination of loads that will not overload the generator or cause the circuit breaker to trip again. Remember to compensate for elevation and temperature changes when reconnecting loads.



NOTE: An appliance or load may have a short if it causes a circuit breaker to trip after reconnection. DO NOT continue to reset breaker. Have the problem corrected before resuming operation.

Generator Exercise

If use of the generator is infrequent, “exercise” the generator once a month by operating it at approximately half the maximum rated output for two hours. This “exercise” will help promote better starting, more reliable operation and longer engine life. This procedure drives off moisture, relubricates the internal engine parts and replaces the old stale fuel with a fresh supply. It also promotes removing oxides from the electrical switches and contacts.



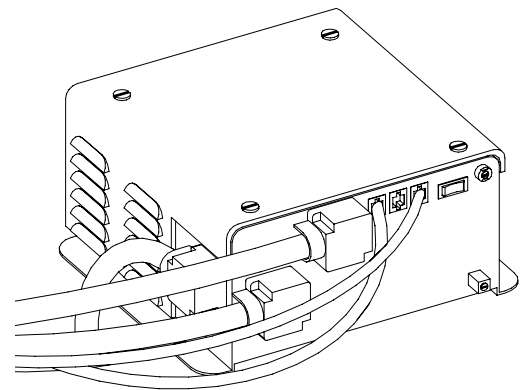
NOTE: Avoid short run periods of the generator set. Run the generator set under a load for a minimum of one-half hour.

Use the inverter when shore power is not available and the generator is not going to be used as the secondary AC power source option. To turn the inverter on or off, momentarily depress the inverter **ON/OFF** button on the RC7 GS remote. This will supply silent AC power to most receptacles, the television and microwave. It is important to remember that use of the inverter will greatly increase house battery power consumption. Turn off the inverter when not in use to conserve house battery power.

The inverter is programmable with many features. The RC7 GS remote control is used to change or add features and set variable parameters. Inverter remote may also be used to start and stop the generator.

Some available features include:

- Automatic generator start.
- Fully adjustable battery charge rates.
- Adjustable fuel gauge cut-out.
- Adjustable charging curves for different battery types.
- Adjustable power sharing.
- Meters Menu.

INVERTER/CONVERTER

The remote control liquid crystal display (LCD) and light emitting diode (LED) lights are used for operation status conditions. The LED lights give inverter status, charge status, battery condition and error indications at a glance. The LCD screen displays charging cycle status, various meter readings, automatic generator operation status, programming field and error messages. The inverter **ON/OFF** button turns the inverter on or off. This button can be used to start or stop the generator. The up or down arrows are used to scroll up or down through the operations field or meters field. The up arrow is used to toggle between operations and meter fields. Pressing the up and down arrows simultaneously accesses the programming field. The settings button is used to set or scroll through a particular programming field.

RC7 GS Remote

NOTE: The main switch on the inverter is to remain ON.

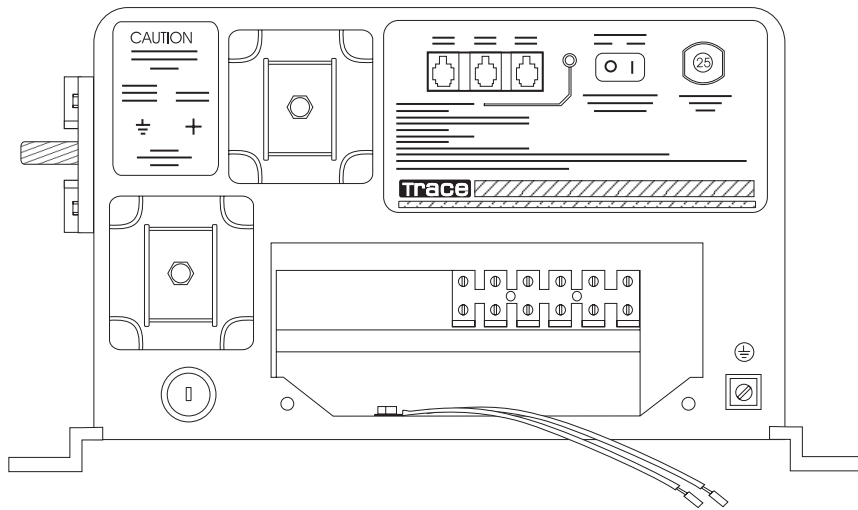
Stand-by Operation

The inverter can be set-up for stand-by power operation. If AC input is discontinued to the motorhome the inverter will automatically provide AC power. When AC power is resumed the inverter will automatically return to “stand-by” mode. The stand-by mode is activated by momentarily pressing the “on/off” inverter remote button while the motorhome is plugged into shore power or operating from the generator. Stand-by mode is indicated by the inverter status light blinking. Battery charging is not affected by stand-by operation.



NOTE: Disable stand-by operation when not in use. House battery power may accidentally be consumed, causing the house batteries to be drained.

Battery Charging with the Inverter



Whether hooked to shore power, or operating from the generator, the internal battery charger of the inverter will automatically charge the batteries when AC power is supplied to the input terminals of the inverter. The time it takes to charge the batteries to a full state of charge varies greatly. It can take several hours or even days depending on the inverter set-up parameters and actual state of charge of the batteries.

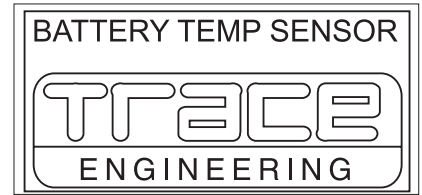
The inverter uses a three stage charging cycle. The first stage is “bulk” charge. The bulk charge will bring the DC voltage up high, initially between 14.2-14.6 Volts, actual bulk charge voltage depends on which battery type has been selected in the programming menu. The bulk charge cycle is controlled by voltage and current. The length of time the inverter is in the bulk charge cycle will vary with the state of charge of the batteries. The second stage is the “absorb” cycle. The battery voltage in the absorb cycle is the same as the bulk charge cycle between 14.2-14.6 Volts. The length of the absorb cycle is a timed event determined by the inverter. The final charging stage is the “float” charge cycle. Approximately 80% of the charging cycle has been completed by this time. The float charge voltage is generally around 13.3-13.7 Volts. The last 20% of the charge cycle typically takes the most amount of time.



NOTE: The inverter will charge the batteries with AC power applied regardless of remote status.

The inverter uses a battery temperature sensor to adjust charge voltage. When the battery temperature rises the BTS will send this information, registering as counts, to the inverter to decrease charge voltage. Voltage compensation with temperature variation is necessary to keep charge voltage at optimum figures. The BTS should be adhered to a house battery. If the BTS is unplugged, the inverter default setting of 77° F/25° C is used as the charge temperature reference point.

Battery Temperature Sensor (BTS)



Incorporated in the inverter is a double pole “pass-through” relay which trips when AC power is supplied to the input terminals. This will transfer AC power through the inverter to a sub panel supplying AC power to outlets and appliances. When AC power is supplied to the inverter, the internal battery charger will “ramp up” battery charging voltage. A 20 second time delay allows charge stabilization before pass through AC power is supplied to the sub-panel.

Pass-through AC Power

This field is a general overview of system status. This is the primary screen of the RC7 GS remote. This field area includes the Main Menu.

Operating Display

Main Menu:

Waiting for AC: System inactive waiting for AC power to be supplied.

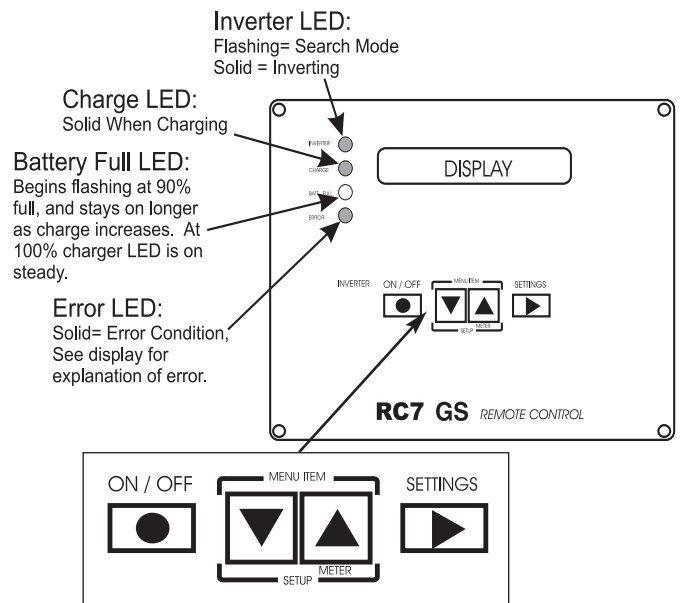
Inverting: Unit is inverting.
Charging Cycle Status: Bulk, Absorb or Float mode.

Battery State of Charge: Based on the Fuel Gauge Cutout setting. It may be displayed in percentages or as a fuel gauge.

Time Left To Run: This evaluates the battery reserve capacity at current operating load. It is based on the Fuel Gauge Cutout and Battery Bank Capacity settings.

Time Left To Charge: Estimated time left to charge batteries to full state of charge. This is based on Fuel Gauge Cutout and Battery Bank Capacity settings with current battery voltage.

Generator Start/Stop: Use inverter **ON/OFF** button to remotely start the generator or to override automatic generator start feature for manual operation. This feature is available to use without altering automatic generator start programming.



Meter Menu

This is an alternate field of main system status. To access the various meters available, press and hold the **UP** arrow button for five seconds. The RC7 GS remote will beep. Release the button. The Avg Shunt Amps will be displayed. This field area includes:

Avg Shunt Amps: This measures the DC current either charging or discharging. Most of the house DC current usage is monitored by the inverter.

Battery Voltage: This monitors the house battery voltage.

Inv/Chg Current: This measures the AC current usage when the inverter is charging.

Inverter Output VAC: This monitors the AC output voltage while the unit is inverting.

AC Input Amps: The inverter uses a double pole pass through relay. This measures current consumption through the Hot 1 terminal.

Battery Temperature: This monitors counts of the battery temperature sensor (BTS). Counts are measured impulses which the inverter uses to calculate the battery case temperature. The charging voltage is adjusted to optimum values.

Xformer Temp: This monitors the transformer temperature which is measured in counts. Higher count readings are registering lower temperatures.

FET Temp: This monitors the Field Effect Transistor temperature which is measured in counts.

Est Batt Cap: This estimates the battery bank capacity in amp hours (Ahrs). Charging and discharging on a cyclic basis will give an approximate indication of the battery capacity in amp hours. Observe the reading and multiply by eight to obtain an approximate reserve capacity. This figure is only approximate and will change with cyclic use.

Programming the RC7 GS

To enter programming mode:

- Press and hold the Set-Up buttons (**UP** and **DOWN arrows**) for five seconds. The RC7 GS remote will beep.
- Release the buttons. The programming mode has been entered when the Search Sense is displayed.
- Use the Menu buttons (**UP** and **DOWN arrows**) to scroll through available field settings.
- Use the Settings button (**right-pointing arrow**) to scroll through available settings for selected field.

To exit the programming mode:

- Allow 20 seconds to elapse from the time the last key is pressed. Program changes are then accepted by the inverter in non-volatile memory.
- Momentarily pressing the set-up buttons (**UP** and **DOWN arrows**) exits the programming menu. Program changes are automatically saved in non-volatile memory.
- The inverter is now ready to use. “**Waiting for AC**” will be displayed. If any program changes were made with AC applied, one of the three stages of the charge cycle will be displayed.



NOTE: Non-volatile memory is a permanent programming change accepted by the inverter. Turning the main battery disconnect switches off does not affect programming changes. Only the inverter clock time and automatic generator start/stop programming will be erased.

Search Sense:

The inverter searches for an AC load. For example: While inverting, AC loads of various amperage may be applied. These loads may range from a few watts to several amps. Search Sense is the cut-in point which the inverter will exit the “sleep mode” and start inverting at a standard output voltage. The Defeat setting allows the inverter to be at a constant standard output voltage. The AC loads must be evaluated for proper inverter operation when changing the Search Sense value.

Adjustable Field Settings

Auto LBCO:

The Automatic Low Battery Cut-off may be turned on or off. These settings allow the inverter to use available DC voltage to a set value while inverting. Turning the LBCO **ON** stops the inverter when the battery voltage drops to 10.5 Volts DC. Turning the LBCO **OFF** stops the inverter when the battery voltage drops to 8.5 Volts DC. This leaves the batteries discharged, but not completely dead.

Battery Capacity:

The battery bank capacity is adjustable in Ahrs (amp hours). These settings change charging curves and the length of time of the charging cycles. The range is from 125 Ahrs to 1,000 Ahrs. Select the closest Amp Hour rating for the house battery bank capacity. The auto setting will “learn” the battery bank size by user characteristics. For example: Discharging and recharging the batteries on a cyclic basis. The inverter takes several charging cycles to “learn” an individual battery bank size. When the main battery disconnects have been tuned off, the “learning” curve is erased.

Battery Type:

Many types of batteries with different chemical compositions are available. Different chemical types require different charging characteristics at different voltages.

Selection of available battery types are:

- AGM (absorb glass matte)
- Gel Cell
- Liquid Lead Acid

Charge Rate:

Charge rate is adjustable from 10 to 100%. This feature may be used in many different ways. Selecting a lower percentage charge rate lowers the inverter AC battery charger's current consumption. It will take longer to charge batteries but will leave user a few extra AC amps when operating from a limited AC power source.

Shore Power Amps:

This is a load shedding feature of the battery charger in the inverter. For example: Shore Power amps set to 30 Amps will decrease the AC current available for the internal battery charger's use, as pass through AC current value approaches 30 Amps. Lowering shore power amps will limit the available AC current for the internal battery charger's use. This is adjustable from 5 to 30 Amps, in 5 Amp increments.

RC7 GS Setup:

This option allows the user to select the desired screen display. The Last Key will leave the menu active with the last status viewed on the display. The Rolling Display will continue to scroll through the active menu status display. Power Saver allows the display to "sleep" after viewing the status. Touch any key to "awaken" the RC7 GS remote, then press the desired key.

LCD Contrast:

This changes the display screen contrast. Six settings are available. Lighter contrast settings may leave the screen difficult to see in a bright atmosphere.

External Shunt:

The inverter monitors both AC and DC current values, whether charging or discharging (figures are approximate), by using internal or external shunts. A shunt monitors partial current consumption, allowing the majority of current to pass on heavier conductors. Programming shunt selection affects which shunt the inverter is using to monitor DC current values. Single inverter systems use their internal shunt to monitor system DC current values. When programming single inverter systems select External Shunt None. Dual inverter systems use an external shunt to monitor system current values. When programming the

shunt selection of a dual inverter system, the master inverter is programmed by the remote installed in the monitor panel. The master inverter will be programmed as External Shunt This Inverter. The slave inverter will be programmed as External Shunt Other Inverter.

Fuel Gauge Cutout:

Battery chemistries and types have different static voltage readings at different states of charge. The battery voltage may be used to determine an approximate state of charge for that battery type and chemistry. The Fuel Gauge Cutout voltage is a reference point the inverter uses to determine a battery with no reserve capacity amp hours remaining. Changing the value of the Fuel Gauge Cutout will affect the fuel meter, automatic generator start and stop points if set by SOC (state of charge) and time left to run or charge. The Fuel Gauge will read 0 when the Fuel Gauge Cutout pre-programmed voltage reaches 50% SOC.



NOTE: The remaining field items are used to program the Automatic Generator Start parameters.

The house batteries operate most interior lighting and appliances. As the house battery power is consumed, the reserve battery capacity diminishes. The inverter can be programmed to automatically start and stop the generator to keep up with the drain on the house batteries. All field reference points are house battery indications or conditions. A wide field of parameters may be chosen for the generator start and stop points. These points may be set in three categories:

1. House battery voltage.
2. State of charge (SOC). The Fuel Gauge Cut-out affects SOC.
3. Absorb or Float point of the charge cycle.

For example: The inverter can be programmed to start the generator when house battery voltage falls to 11.4 Volts. As the battery voltage rises the inverter can be programmed to stop the generator when the house battery voltage obtains a percentage of state of charge (SOC). When selecting the field reference points make sure that the start and stop points are spread apart.

It is possible to set parameters too close, causing short cycling of the generator. The menu will display the status of the generator while pending generator start. The generator must be operating correctly for proper automatic generator start and stop operation.

NOTE: If the generator is started manually from any remote switch other than the RC7 GS remote while the automatic generator start feature is enabled, the generator will shut down due to field parameter settings.



To override the automatic generator operation so that the generator

Automatic Generator Start

may be operated manually, use the RC7 GS remote Inverter button to start or stop the generator. This is done using the **UP** or **DOWN** arrows while in the main menu until Generator Start/Stop: Press (**ON/OFF**) is displayed. The display will inform the user of the generator's status. The generator will need to be manually stopped.

To enable the automatic generator operation, the programming mode must be entered. Before any field reference points can be established the clock must first be set. The clock set field is the last item in the programming menu.

Clock Set:

The clock is a 24 hour clock. If the display reads 00:01, it is 12:01 a.m. If the clock reads 13:00, it is 1:00 p.m. The hours and minutes will flash, alternating every eight seconds. Use the **SETTINGS** button to advance hours or minutes. **The clock time and the generator start/stop programming will be erased whenever the main battery disconnects are turned off.**

Generator Start:

Selecting a state of charge (SOC) generator start point is affected by the Fuel Gauge Cutout voltage setting. SOC start points are between 40-60%, or the generator may be programmed to start at a specified voltage. The manual start disables the automatic start.

Generator Stop:

Selecting a state of charge generator stop point is affected by the Fuel Gauge Cutout voltage setting. SOC stop points are between 90-99%, or the generator may be programmed to stop at the Absorb or Float point of charge cycle. The manual off disables the automatic stop.

Begin Generator Quiet Time or End Generator Quiet Time:

The automatic generator start feature may be programmed to operate only at certain times in the 24 hour clock period. For example: The user wants the automatic generator to start operation at 10:00 a.m. and stop operation at 7:00 p.m.

End Generator Quiet Time:

This is the time which the automatic generator operation is to begin. Using the example time above, the 24 hour clock would be set to 10:00 hrs.

Begin Generator Quiet Time:

This is the time which the automatic generator operation is set to stop. Using the example time above as a reference, the 24 clock would be set to 19:00 hrs.



NOTE: If the generator started from the automatic start program and has not reached the automatic stop set point when quiet time begins, the generator will stop and “Gen Quiet Fault” will be displayed.

Select Generator:

The inverter has the capability to operate more than one generator manufacturer type. The selections are:

- Onan Quiet Diesel
- Power Tech, two and three wire.
- Other 30-80 (reserved for future).

To Disable Automatic Generator Operation:

- Set Generator Start and Generator Stop points back to manual **ON/OFF** positions.
- Switch off the house and chassis main battery disconnects to erase the clock time and generator start/stop programming.

Batteries can sulfate over time. When this occurs some of the sulfuric acid has adhered to the lead plates of the battery and cannot enter the electrolyte solution through normal battery charging. A battery with a low concentration of acid in the electrolyte will effect the battery's performance. Sulfation can occur when a battery is stored in a discharged condition or when a battery is continually cycled below a 50% state of charge. An indication a battery has sulfated is when the inverter is in float charge and the hydrometer reading has stabilized below a full state of charge (approximately 1260). An equalize charge cycle may promote the acid to leave the lead plate and enter the electrolyte solution. This is done by charging the battery at a slightly higher than normal voltage for a short duration. The equalization cycle will charge the batteries at approximately 15.5 Volts for three hours. To maximize the results from an equalize charge initiate the equalize cycle after the batteries have entered float charge. Only liquid lead acid or absorb glass matte (AGM) type batteries should be equalize charged. Other battery types can be damaged if equalize charged. Monitor the electrolyte solution closely when equalizing a liquid lead acid battery. A battery's "healthy" cell(s) can be damaged if overcharged. High DC charge voltages can also damage voltage sensitive electronic equipment. Several precautions should be used when performing an equalize charge:

Equalize Charging

Equalization cycle precautions:

- Only equalize charge batteries with the motorhome in a well ventilated area, preferably outdoors. Liquid lead acid batteries produce explosive hydrogen gas when charging. Extinguish all flames and other sources of ignition.
- Secure the battery compartment door in the open position. Extend battery trays to full open position when equalize charging.
- Remove the liquid lead acid battery caps during the equalize charge cycle. AGM battery caps are not removable and may void the battery's warranty if removed.
- A liquid lead acid battery will consume water at an equalize charge voltage.

Fill battery cells with distilled water before beginning an equalize charge cycle. Do not overfill the battery cells. Overfilled battery cells will spatter excess electrolyte.

- Protect all painted surfaces from any electrolyte solution which may spatter during equalize charging. If the electrolyte solution spatters on the exterior painted surface rinse immediately using large quantities of water.
- Turn **OFF** the battery cut-off switch located at the entry door.
- Remove the fuses from the solar panel charge leads.
- Observing the polarity, disconnect the 12 Volt DC supply from the refrigerator. Access supply leads through the outside refrigerator compartment. Tape the positive lead to prevent a short circuit.
- Mark the specific location then disconnect the wires from the battery maintainer.
- Avoid operating any electrical equipment while in the equalize charge cycle.

To Equalize Charge:

- Press and hold the Settings button on the remote (**right-pointing arrow**) for six seconds. Charge light will flash rapidly and **System Status: Equalize** will appear on the screen. The inverter will run the equalize charge cycle for three hours.

To Exit Equalize Charge:

- The equalize charge cycle may be discontinued at any time during the charge cycle. Press and hold the settings button for six seconds. The inverter will display **System Status: Absorb** for thirty seconds then switch to float charge.
- Allow the batteries to cool for approximately three hours. Check the electrolyte solution with a hydrometer. Avoid overcharging the battery resulting in damage to the healthy cells.
- Add distilled water if necessary. Install battery caps. Use large quantities of fresh water to rinse the entire battery compartment and surrounding area.
- Install fuses to solar panel charge leads.
- Observing polarity, hook the 12 Volt DC supply leads to the back of the refrigerator. Do not reverse polarity. Damage to the refrigerator circuit board can result.
- Hook up the battery maintainer. Be sure the wires are connected to the correct location.



CAUTION: Never equalize charge a frozen battery.



WARNING: Liquid lead acid batteries produce highly explosive hydrogen gas when being charged. Extinguish all flames and other sources of ignition. Never smoke around batteries. Danger of explosion, fire, property damage, serious personal injury or death can result!

Re-booting the Inverter

The remote is used to program or turn on or off the inverter. The RC7 GS remote is a display only. All the programming information is retained in the inverter. If the inverter exhibits unusual symptoms or behavior such as not responding to commands, or displaying erroneous error conditions, re-booting the inverter may alleviate these symptoms.

To Re-boot the Inverter:

1. Remove AC power from the inverter by disconnecting shore power and/or shutting the generator off.
2. Turn the main switch on the inverter to the OFF position.
3. Switch house and chassis main battery disconnects to the OFF position.
4. Wait 30 seconds, this allows time for capacitors to discharge.
5. Switch house and chassis main battery disconnects to the ON position.
6. Turn the main switch on the inverter to the ON position.
7. Connect the shore power cord or start the generator.

Use the inverter when shore power is not available and not using the generator as a secondary power source. The inverter/charger has limited power output, exercise care when operating from the inverter. It may be necessary to operate items in sequence rather than everything all at once. Remember operating from the inverter quickly consumes house battery power.

When hooked to shore power, or operating from the generator, the inverter charges the house battery bank. The inverter will not automatically begin charging when hooked to shore power or operating the generator. **A charge mode must be selected.** The amount of time to charge the batteries to a full state of charge will vary with the depth of discharge when the charge cycle begins and any additional DC loads such as lights.



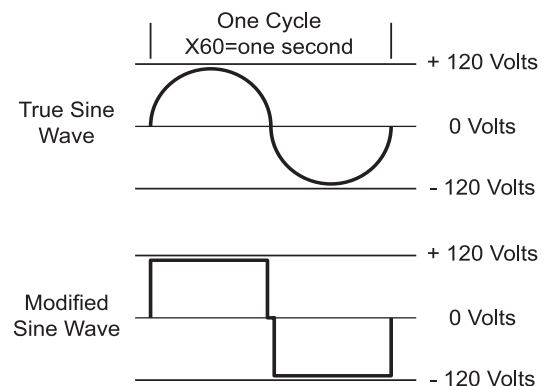
NOTE: This is not a substitute for the owners manual for the inverter. The inverter is very comprehensive with many variables. Not all the programming details are covered.



NOTE: When hooked to shore power or operating the generator, press the red button to enter a charge mode by selecting either “On” or “Chg” in the main menu. Failure to enter a charge mode will result in dead batteries.

Sine Wave Cycle Patterns:

Inverters use battery power to make AC power. (Alternating Current - Meaning the power signal alternates from positive to negative 60 (cycle) times a second.) The term "sine wave" refers to the oscillating characteristic of the cycle. Inverter output cycles commonly come in two configurations **Modified Sine Wave** or **True Sine Wave**.



INVERTER - SINE WAVE (Optional)

The output cycle of a true sine wave inverter closely mimics the electrical wave pattern of a utility company or generator when observed with electronic equipment.

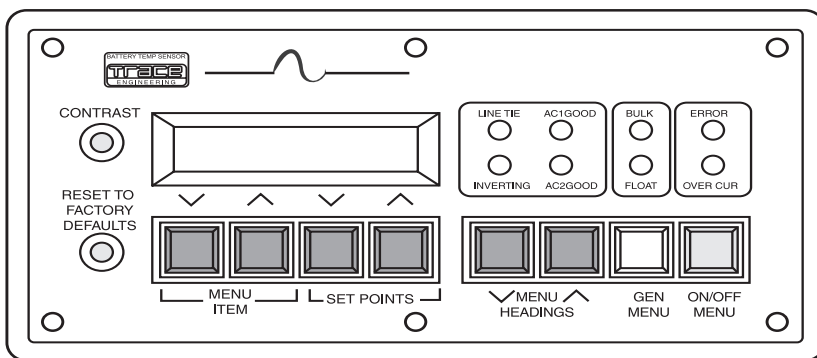
When AC power is available, the inverter will time itself to follow the incoming wave pattern. If the inverter is in stand-by operation when AC power discontinues, the inverter will provide a constant AC supply to the loads.



NOTE: The main switch on the inverter remains ON.

Remote

The sine wave inverter is fully programmable with many features. Use the remote control to change or add features and set variable parameters. The inverter remote may also be used to start and stop the generator.



Features of the remote:

- Automatic generator start.
- Manual generator start.
- Fully adjustable battery charge rate.
- Adjustable charging curves for different battery types.
- Adjustable power sharing.
- Meters menu.

The remote control uses a liquid crystal display (LCD) and light emitting diode (LED) lights for operation status and programming. The LED lights give inverter status, AC input, charge status and error indications at a glance. The LCD screen displays various meter readings, automatic generator operation status, programming field and error messages.

There are 14 main headings listed in the programming field. These are referred to as Menu Headings. Most of the Menu Headings have several subheadings. The subheadings are referred to as Menu Items.

- Pressing one of the **Menu Headings** buttons enters **Menu Heading** numbers 1 to 8, the **User Menu**.
- Pressing the **Red** and **Green** buttons simultaneously accesses **Menu Heading** numbers 9 to 20, the **Setup Menu**.
- Use the **Menu Headings UP** or **DOWN** arrows to scroll the various main headings. A number in the lower right hand corner of the screen indicates the number of the heading.
- Use the **Menu Item UP** or **DOWN** arrows to scroll the various subheadings of a **Menu Heading**.
- Use the **Set Points UP** or **DOWN** arrows to change the values of a subheading.



NOTE: A complete description of the Menu Headings and Menu Items are listed in the inverter manual. Refer to the list when accessing the menu or changing program values.

Red Button:

Press the **red** button to exit programming mode or to return to the **Menu Heading number 1, Inverter Mode**. An underscore of the first letter indicates the selected mode. Press the **red** button to scroll the cursor.

OFF - Turns the inverter and charger off. The charger will not activate in this mode when AC is available.

SRCH (Search) - Turns the inverter on when a specified load, rated in watts, is applied to the inverter. Generally, there are enough loads to turn the inverter on in this setting.

ON - Turns the inverter on regardless of load. When AC is available the charger turns on and places the inverter in Stand-by mode.

CHG - Turns the charger on only when AC is available. If AC power discontinues, the charger will stop.



NOTE: When hooked to shore power or operating the generator, use the red button to enter a charge mode by selecting either “On” or Chg in the main menu. Failure to enter a charge mode will result in dead batteries.

Green Button:

Press the **green** button to exit programming mode or to return to **Menu Heading number 2, Generator Mode**. An underscore of the first letter indicates the selected mode. Press the **green** button to scroll the cursor.

OFF - Turns off the inverter control over any generator function.

AUTO - Enables the automatic generator start function.

ON - Overrides the automatic start program and starts the generator.

EQ - Starts an Equalize Charge to the house batteries on the next start cycle of the automatic generator start.



WARNING: An Equalize Charge uses a significantly higher than normal voltage. This voltage can damage sensitive electronic equipment. Several precautionary measures are required when performing an Equalize Charge.

The inverter factory default settings are of optimum value in most situations. Slight adjustments may be necessary depending on the amperage available from shore power, personal habits and battery type. If the programming was altered, it is easily reset to the factory default values.

**Programming
& Resetting**

To Reset the Inverter:

- Press the **Menu Headings down button** on the remote until Trace Engineering heading **3** displays.
- Using the **Menu Item** buttons, scroll down until “**Press Reset Now For Default**” displays on the screen.
- Using the eraser end of a pencil or a pen, press the **Reset to Factory Default** button on the remote.
- If necessary, repeat the procedure for the other remote.

Stand-by Operation

The inverter can be set-up for stand-by power operation. For example: If AC input is discontinued to the motorhome, the inverter will automatically provide AC power. When AC power resumes, the inverter will automatically return to "STAND-BY" mode. Battery charging is not effected by STAND-BY operation. When AC power resumes the inverter will automatically return to “STAND-BY” mode.

To Activate Stand-by Mode:

- Press the red "ON/OFF" button until the cursor indicates **ON**.



NOTE: Remember to disable stand-by operation when not in use. House battery power may be accidentally consumed. The inverters supply the power necessary to operate the refrigerator if shore power is not available or not operating from the generator.

Battery Charging

Whether hooked to shore power or operating from the generator, the internal battery charger of the inverter will charge the house batteries. Battery charging does not begin automatically when AC power is available. The inverters must be turned on to begin battery charging. The time it takes to charge the batteries to a full state of charge varies greatly. It can take several hours or days depending on the actual state of charge of the batteries and DC power consumption.

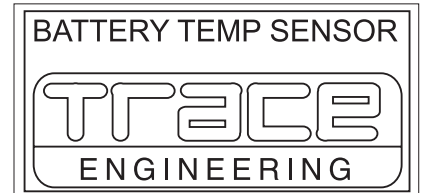
The inverter uses a three stage charging cycle. The first stage is "bulk" charge. The bulk charge will bring the DC voltage up high, initially between 14.2-14.6 Volts depending on ambient temperature. Voltage and current control the bulk charge cycle. The length of time the inverter is in the bulk charge cycle will vary with the state of charge of the batteries. The second stage is the "absorb" cycle. The battery voltages in the absorb cycle are the same as the bulk charge cycle between 14.2-14.6 Volts. The length of the absorb cycle is a timed event determined by the menu item Set Absorption Time under the menu heading number 9, Inverter Setup. The final charging stage is the "float" charge cycle. Approximately 80% of the charging cycle is completed by this time. The float charge voltage is generally around 13.3-13.7 Volts. The last 20% of the charge cycle requires the most amount of time.

To Begin Battery Charging:

- Hook to shore power or start the generator.
- Press the **red** button on the inverter remote until the cursor indicates either **CHG** or **On**.

The inverter uses a battery temperature sensor to adjust charge voltage. When battery temperature rises, the BTS sends this information, registering as counts, to the inverter to decrease charge voltage. Voltage compensation with temperature variation is necessary to keep the charge voltage at optimum figures. The BTS should be adhered to a house battery. If the BTS is unplugged, the inverter uses the default setting of 77° F/25° C as a temperature reference point.

Battery Temperature Sensor



Incorporated in the inverter is a double pole "**pass-through**" relay that trips when supplying AC power to the input terminals. This relay transfers AC power through the inverter to the AC sub panel supplying power to outlets and appliances. When AC power is supplied to the inverter, the internal battery charger will "ramp up" battery charging voltage. A time delay allows pass through AC power to the sub panel before ramping up the battery charge.

Pass-through Power

The meter heading number **4** in the user section displays various voltage and amperage readings.

Meters Menu

To access the meters:

- Scroll the menu using the **Menu Headings** buttons until meters heading number **4** displays on the screen.
- Use the **Menu Items** buttons to view the available meters.



NOTE: The meters do not display a (+) symbol for positive values.

Explanation of the Meters

Inverter/Charger:

Amps AC - Displays the total number of AC amps used by the internal charger when hooked to shore power or operating from the inverter. This meter also displays the AC amp load when using the inverter.

Input Amps AC - Combined total of AC amps including the internal charger and pass through relay amps.

Load Amps AC - Displays the total number of AC amps of the pass through relay.

Battery Actual Volts DC - Displays the DC battery voltage at the inverter when hooked to shore power or operating the generator.

Battery Temp/Comp Volts DC - Displays the bulk voltage setting in the menu item Set Bulk Volts DC under the menu heading Battery Charging number 10. Actual charge voltage will differ depending on ambient temperature. This is due to battery temperature compensation.

Inverter Volts AC - Displays the inverter's AC output voltage.

Grid (AC1) Volts AC - Not used.

Generator (AC2) Volts AC - Displays the incoming line voltage from either shore power or generator to the inverter.

Read Frequency Hertz - Displays the number of cycles per second of incoming power to the inverter.

Automatic Generator Start Programming

This section covers the procedure to program the automatic generator start function. There are several variables to the program. Some settings may work fine in one location, but not in another. The order of instructions will follow the sequence of the headings. Read all instructions thoroughly. This is not a substitute for the inverter manual.

Setting the Clock (24 hour):

1. Using the **Menu Headings** buttons scroll to menu number “6 Time of Day.”
2. Press the **DOWN** button on the **Menu Items** button, **Set Clock Hour** will display. Use the **Set Point** buttons to set the hour. Time changes in ten minute increments. The clock is a 24 hour clock. For example: 9:00 a.m. would be 09:00, 3 p.m. would be 15:00 and 7 p.m. would be 19:00.
3. Press the **DOWN** button on the **Menu Items** button, “Set Clock Minute” will display. Use the **Set Point** buttons to set the minute.
4. Press the **DOWN** button on the **Menu Items** button, “Set Clock Second” will display. Use the **Set Points** buttons to set the second.

Setting Generator Timer:

1. Press the **Menu Headings DOWN** button, Menu Heading number “7 Generator Timer” will display.

2. Press the **DOWN** button on the **Menu Items** button, “Start Quiet Time h:m” will display. **Start Quiet Time** is the time you want the generator to stop running, not start at, or after quiet time begins. Use the **Set Point** buttons to set the hour and minute (24 hour clock) the generator will start quiet time.
3. Press the **DOWN** button on the **Menu Items** button, “End Quiet Time h:m” will display. **End Quiet Time** is the time you want the generator to begin operation. Use the **Set Points** buttons to set the hour and minute (24 hour clock). This will end quiet time.



NOTE: If desired the quiet time may be disabled. Set the Start and End Quiet Times to the same hour and minute.

The next set of instructions covers many variables to program the starting or stopping events of the generator. Many different starting conditions, length of operation or stopping conditions are available. If in doubt about changing any settings, the factory default settings are average settings and will work in most situations.



WARNING: Use caution when programming the automatic generator start function. When this feature is enabled the generator may start at any time. Disable this feature when performing service to the generator or when stored in an enclosed building.

Gen Auto Start Setup:

1. Press the **red** and **green** buttons simultaneously to continue the generator **autostart** programming. Heading number “**9 Inverter Setup**” should appear.
2. Press the **Menu Headings DOWN** button to scroll to heading number “12 Gen Auto Start” setup. Press the **Menu Items DOWN** button to advance through the next set of variables. Read all options first before setting any values of the **Menu Items** in Menu Heading number “12.”
3. Press the **Set Point** buttons to change the settings of a Menu Item.
Menu Items in Menu Heading 12 Gen Auto Start Setup:

Set Load Start amps AC - Starts the generator when the AC current on the pass through relay of the inverter meets or exceeds the preset number of amps. For example: Setting the preset number of amps to 15 when hooked to a 20 Amp service starts the generator when the total current exceeds 15 Amps on the pass through relay.

Set Load Start delay min - This is the time delay period used with Set Load Start amps AC menu item. Example: setting the time period to 00:00 starts the generator immediately when the total number of amps exceeds the setting of menu item Set Load Start amps AC.

Set Load Stop delays min - This is the time period the generator continues to operate after the generator started from the setting in the Set Load Start amps AC menu item.

Set 24 hr start volts DC - Starts the generator if the voltage drops below the setting for a consecutive 24 hour period. For example: If the voltage is set for 12.5 Volts DC, and house battery voltage drops below 12.5 Volts for a continuous 24 hour period, the generator will start. This setting is helpful when storing the motorhome.



CAUTION: It could be several days before the generator starts from the 24 hour voltage setting. Do not use this setting when storing the motorhome inside a storage building. Do not park the motorhome near dry grass.

Set 2 hr start volts DC - Starts the generator if the voltage drops below the setting for a consecutive two hour period. For example: If the voltage is set for 12.0 Volts DC, and house battery voltage drops below 12.0 Volts for a continuous two hour period, the generator will start. This voltage setting is usually lower than the 24 hr start voltage setting. Primarily used when dry camping. An example would be a light loads on the house batteries over time. Voltage drops at relatively steady rate until obtaining the preset voltage for two continuous hours.

Set 15 min start volts DC - Same operating principal as the previous two menu items. This voltage setting is used when applying heavy loads to the house batteries. An example: Using many lights and the inverter to watch the television and operating the microwave. These types of loads rapidly deplete battery reserves. Battery voltage drops quickly when applying heavy loads to the house batteries.

Read 30 sec LBCO start VDC - Used with the **menu item** Set Low Battery Cut Off VDC under menu heading number “9 **Inverter Setup.**” If house battery voltage drops to this point, the inverter waits 30 seconds before starting the generator.



NOTE: This start setting overrides quiet time.



NOTE: The generator will operate until the bulk and absorption cycle are complete if the generator started from one of the low battery settings.

Set Exercise period days 30 - Starts the generator regardless of any other setting. Periodically starts the generator for maintenance reasons. The generator should be operated at least every 30 days to lubricate the internal engine components.

Set Maximum run time h:m - Displays an error message if the generator operates longer than the time period set. This is only a message. To cancel the message return to heading number “**2 Generator Mode.**” Use the green button to scroll to **Off**. Setting the time and minute to 00:00 defeats this function.

Gen Starting Details:

1. Use the down arrow on the **Menu Headings** button to scroll to menu heading number **13, Gen Starting Details.**
2. Use the **Menu Items** button to scroll down to “**Set Gen warm-up seconds.**” Use the **Set Points** buttons to set the time to 90 seconds. If it is not set to 90 seconds, the generator will shut down prematurely.
3. Use the **Menu Items** button to scroll down to “**Set Post Crank seconds.**” Use the **Set Points** buttons to set the time to 90 seconds. If it is not set to 90 seconds, the generator will shut down prematurely.

To Enable or Disable the Auto Gen Start Program:

After completing the programming schedule, use the green button to return to heading number “**2 Generator Mode.**”

- **To Enable the Automatic Generator Start Feature:** Press the **green** button and scroll to “**Auto.**”
- **To Disable the Automatic Generator Start Feature:** Press the **green** button and scroll to “**Off.**”

Inverter Facts

Important Facts About the Inverter:

- The inverter will not charge automatically unless the remote is set to **CHG** or **QN** by using the **red** button.
- With AC available, if for any reason battery voltage dropped below 8.5 Volts DC, before the remote was set to **CHG**, the inverter will not charge the batteries. The inverter requires at least 8.5 Volts DC to operate the internal "brain." Use an alternate method of inducing a charge voltage to the house batteries.

If this situation occurs:

1. Hook to shore power or start the generator.
2. Start the engine. The alternator on the engine should supply a charge to the house batteries.
3. The LCD screen should display. Press the **red** button until the cursor is under **CHG**.
4. After the remote indicates the inverter is charging, the engine can be shut off.
5. If this method does not work a battery charger may be used. Observe polarity when hooking up cables. Reverse polarity will damage the inverter.



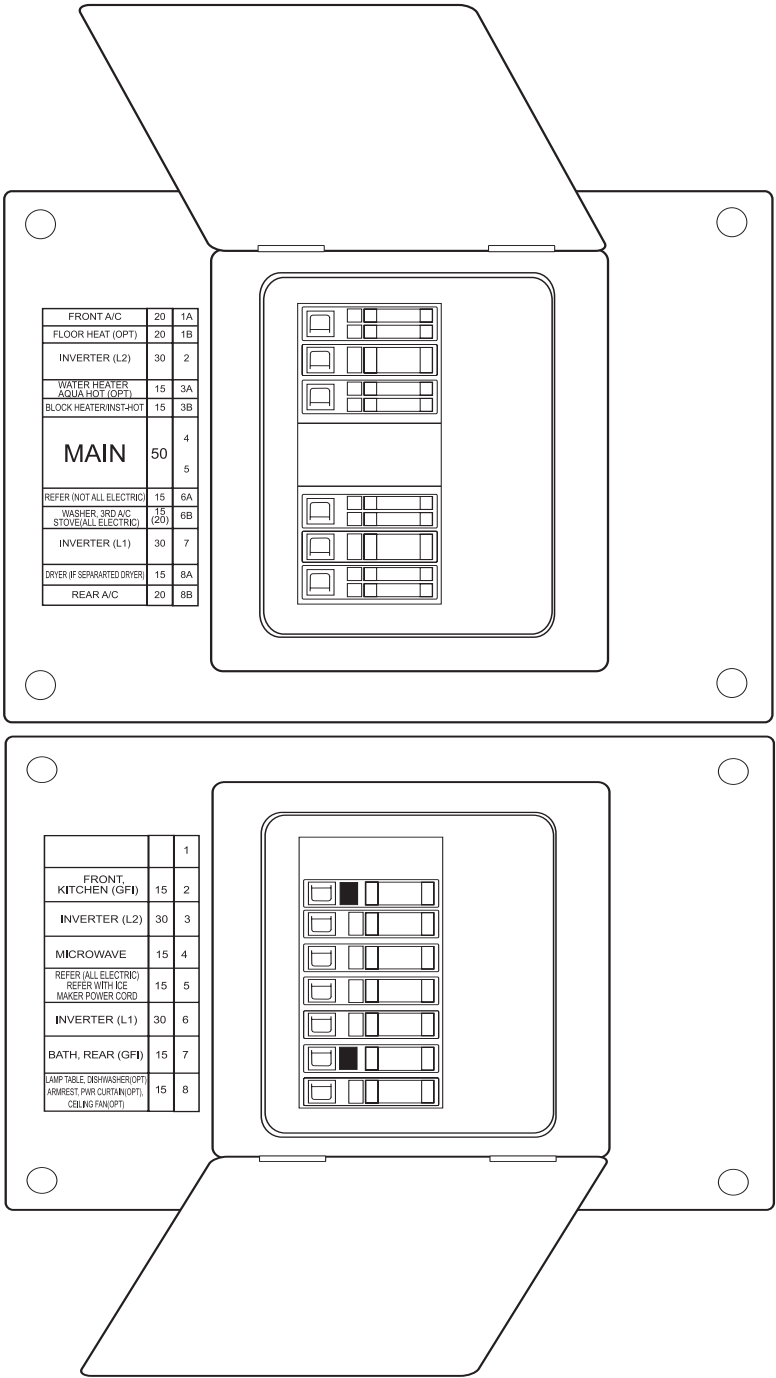
WARNING: The gases around the battery can explode if exposed to flames, sparks or lit cigarettes. An explosion can result in injury or vehicle damage. Batteries contain sulfuric acid, which burns skin, eyes and clothing. Do not connect the end of the second cable to the negative (-) terminal of the battery to be jumped. A spark may cause an explosion of the gases that surround the battery. Connect only to chassis, away from the battery.

- When the main battery disconnect switch is turned off, or if battery power to the inverter is removed, all program settings are lost. When battery power is restored, the inverter will need to be programmed.

DISTRIBUTION PANEL - HOUSE 110

The AC distribution panels are located in the bedroom. The main 120 Volt AC panel receives power from the transfer switch, which is supplied by either shore power or the generator. The AC power is supplied to the 50 Amp main breaker first, then the power is supplied to the individual branch circuit breakers. The panel label describes the breaker layout and the item, outlet or appliance to which they pertain. The sub panel receives AC power from the inverter. The sub panel supplies power to items which can be operated by the inverter. When operating from either shore power or the generator, the sub panel is automatically supplied with AC power from the pass through relay in the inverter. When hooked to shore power or operating from the generator, the AC power goes to the main AC panel first. The branch circuit breakers in the main panel then supply AC power to the input terminals of the inverter. The pass through relay inside the inverter trips, supplying AC power to the sub panel.

When using the inverter as the AC power source, the pass through relay is normally closed. The AC power produced by the inverter supplies power to the sub panel only.



WARNING: The 120 Volt AC panels contain high voltage which can cause serious injury or death. Before beginning any work or testing procedures involving the electric panels, or any of the branch circuits, be sure the motorhome is unplugged from shore power, the generator is not running and the inverter is in the off position. Certain testing procedures may require the AC power to be on. Only qualified personnel 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 should be tested or disconnected to determine the reason the breaker tripped. 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 correctly diagnosed and corrected.

Circuit Breaker

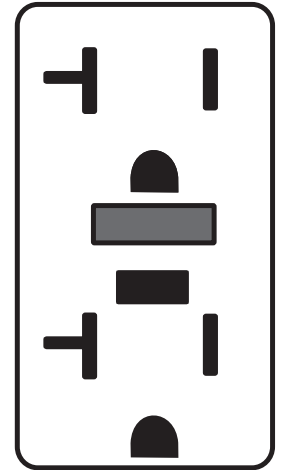
Breaker current ratings are current set points in which the breaker is designed to operate. The internal configuration of the circuit breaker is designed to trip when excess current is drawn through the breaker. The breaker will heat up from the excess current causing the breaker to trip. The trip action of the circuit breaker can occur within milliseconds due to the speed at which electricity can travel. Breakers are designed to operate at a continuous load of 80% of the breaker’s rated capacity. For example: A breaker with a 20 Amp rating will operate a continuous 16 Amp load. This design leaves a small amount of working capacity within the breaker. When an inductive load is applied, such as when an electric motor turns on, the motor starts to spin and current consumption may momentarily exceed the rated capacity of the breaker. As the electric motor comes up to operating speed, the electric motor’s current consumption will 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, such as air conditioners. When using outlets, care should be considered when applying loads such as electric motors, heaters, coffee makers, toasters, hair dryers or other large current consuming loads. The current rating is usually stated on most electrical items. The current rating will either be rated in amps or watts. Current ratings stated on electrical items will change slightly with voltage fluctuations. As voltage increases current consumption decreases. As voltage decreases current consumption increases. This may explain why in some instances items operated at borderline voltage to current tolerances may seem fine in one location but problematic in another.



NOTE: To calculate watts to amps simply divide the watt figure by the voltage of which the item operates from. For example: The electrical item is rated at 1,370 watts. Divide that by the operating voltage of 115 Volts which equals 11.913 Amps. Use this formula to calculate the amount of load to the available power supply.

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, bath tub 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 shock, can still be seriously injured. A GFCI outlet or breaker will not protect against shock from a normal current flow. For example, a shock from touching both metal prongs of an electrical cord or appliance while plugging it in.

GFCI BREAKERS & OUTLETS



GFCI Outlet.



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.

DISTRIBUTION PANEL - HOUSE 12 VOLT



Fuse Panel Label located in bedroom.

The 12 Volt DC house distribution panel contains fuses (located in the bedroom) that protect the electrical circuits. These fuses are a standard automotive type.

When a fuse is “blown,” the wire in middle of the plastic case will be burnt. A broken, bad or “blown” fuse must be replaced with a fuse of the same rating and type. Using a fuse with a different rating or type will defeat the circuit protection provided by that fuse and could result in damage to the motorhome’s electrical system.

Fuse assignments are as follows:

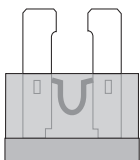
CIRCUIT ASSIGNMENT	Wire Color	Fuse Size
1 Dinette, Rope Light, Furnace	Brown	20 Amp
2 Bed, Carousel Closet, Ceiling Rope	Blue	20 Amp
3 Galley and Galley Fan	Purple	20 Amp
4 Bedroom Wardrobe, Hall, Service Bay, Bed, Ceiling Rope	Green	20 Amp
5 Galley Fan and Bar	PUR/BLK	20 Amp
6 Bedroom Make-up, P/S and D/S Ceiling, Slide-out O/H	GRN/BLK	20 Amp
7 Bathroom	Orange	20 Amp
8 Stove	Yellow	02 Amp
Comfort Controllers- F,R, and C	BLU/WHT	02 Amp
9 Toilet Room Lights and Fans	YEL/BLK	20 Amp
10 DSS and China Toilet	RED/WHT	10 Amp
11 Water Pump and Monitor Panel	RED	30 Amp
12 Window Shades	Black	05 Amp
13 LV. Room Ceiling :Rope	Grey	20 Amp
14 Plasma TV (SIG)	BLU/BLK	20 Amp
15 Maps, Entry Step, Grab Handle, Porch	GRY/BLK	20 Amp
16 Bedroom Wall, Clock, Radio	Black	20 Amp

NOTE: Fuse assignment information is correct at the time of printing. Due to line changes, fuse label may change slightly.

FUSES

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

Amperage Chart.



ATO Fuse

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.

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 for testing a 12 Volt problem is the test light. Test lights come in a variety, 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.

Should it become necessary to use testing tools, take precaution 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, "Oh 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.

Knowing When to Say When

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 store. 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

Batteries come in different sizes, types, amp hours, voltages and chemistries. There are nearly as many descriptions of battery types and how they should be used as there are people willing to offer advice on them. Although it is not possible to cover batteries in their entirety, there are guidelines that can be followed to ensure that the batteries are well maintained.

The operation of the battery is based on a chemical reaction. The battery is a container of lead plates, insulators and a solution of distilled water and sulfuric acid. The solution, when mixed together, is known as “electrolyte.” The 12 Volt battery is actually six batteries in one case. When charged, each cell has a voltage of 2.1 Volts. When six cells are hooked together this makes a 12.6 Volt battery (fully charged).

Electrons are stored on the negative plates. When a load (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.

Starting Battery

Starting batteries are designed for high output cranking power, but not for deep cycling like the house batteries are designed to do. Starting batteries will not last long in deep cycle application. The way they are rated should give a good indication of their intended use. “Cold Cranking Ampere” is a measurement of amperage output that can be sustained for 30 seconds. Starting batteries use thin plates to maximize the surface area of the battery. This allows a very high starting current but lets the plates warp when the battery is deep cycled (discharged).

Deep Cycle Battery

Deep cycle batteries are best suited for use with 12 Volt operated lights, appliances and inverters. Deep cycle batteries are designed to have a majority of their capacity used before being recharged. These are available in many sizes and types. The most common is a non-sealed, liquid electrolyte battery. The non-sealed types have battery caps. The caps should be removed periodically to check the level of electrolyte. When a cell is low, only distilled water should be added. Water consumption will vary depending on many factors: how far

the batteries are depleted, how long the voltage is being applied to charge the batteries, how much voltage is used and how often this occurs.



NOTE: Tap water contains minerals which can alter battery chemistry and ruin the battery. Use only distilled water when refilling the battery.

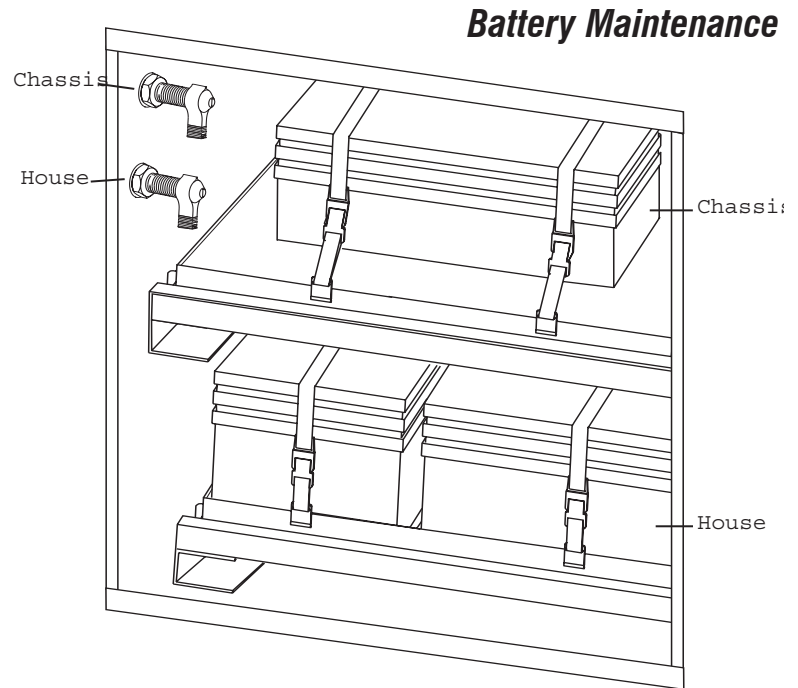
At a minimum, the battery electrolyte level should be checked at least once a month. Check the level sooner if the battery is frequently used. The level should be above the top of the plates, but not overfull. Most batteries have a plastic cup or well. The electrolyte level should be approximately 3/8" below the well to allow room for expansion while the battery is being charged. Over-filling the battery will allow the electrolyte solution to boil or gas out of the battery cap. Remember to use only distilled water to refill the battery. A battery with a low electrolyte level will 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 level 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 and surrounding area when done. Carefully hook the cables back to the battery. Coat the terminals with petroleum jelly or an anti-corrosion grease.

The battery cable to battery terminal connections should be metal to metal. Periodically check the batteries for corrosion. Look for cracks and check the vent plugs. Replace the plugs 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.

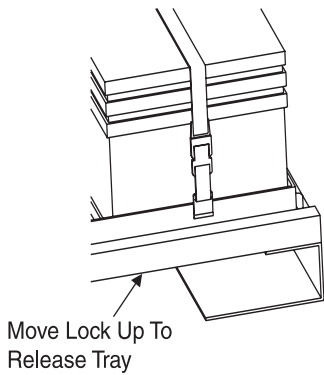


WARNING: Liquid lead acid batteries produce hydrogen gas while being charged. This is highly explosive. Do not smoke around batteries. Extinguish all flames in the area. The hydrogen gas may explode resulting in fire, personal injury, property damage or death.



Battery Trays

The engine (chassis) and domestic (house) batteries are located in a curbside compartment. The slide-out battery trays are secured in place by a locking mechanism at the front of the trays. To slide the tray out, lift up on the handle and pull until the tray stops. To secure the battery tray, push it back in until the tray latches.



The battery tray slides will occasionally need to be lubricated. When performing maintenance to the batteries clean the old lubricant and dirt from the battery tray slide with solvent, brake cleaner or equivalent. Do not allow any of the cleaning solution or battery acid by-products to spatter onto the painted surfaces. Damage to the paint surface will result. Lubricate all moving parts of the battery tray slide with white lithium grease or *Kwiklee* brand spray lubricant.

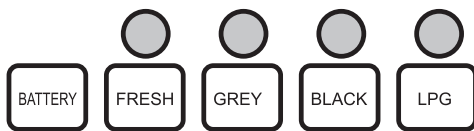


NOTE: Driving without the tray secured can result in damages.

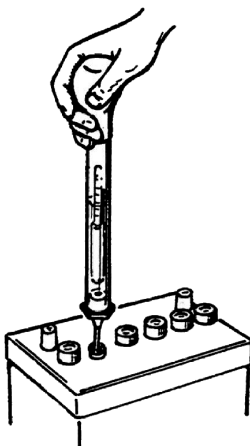


CAUTION: Many types of petroleum based products or battery by-products can damage the paint finish. Do not allow these types of chemicals to get on the painted surfaces, immediately rinse the surface using plenty of water with a mild automotive detergent.

Testing the Battery



Testing at Monitor Panel.



Hydrometer (Cylinder Type).

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.

The most efficient way of testing the batteries is to check the electrolyte solution. The only way to test a battery's electrolyte solution is with a hydrometer. Many styles are available, from types with cylinder graduation (shown here) to types with floating balls. Hydrometers can be purchased from most auto parts stores. The hydrometer tests the battery's electrolyte solution which is measured in specific gravity. Distilled water has a specific assigned gravity of 1,000. The hydrometer is calibrated to this mark. Pure sulfuric acid has a specific gravity reading of 1,840. The acid is 1.84 times heavier than water. The electrolyte solution is about 64% water to 36% acid (fully charged battery). Hydrometers with cylinder graduation are graphed and the exact state of specific gravity can be determined.

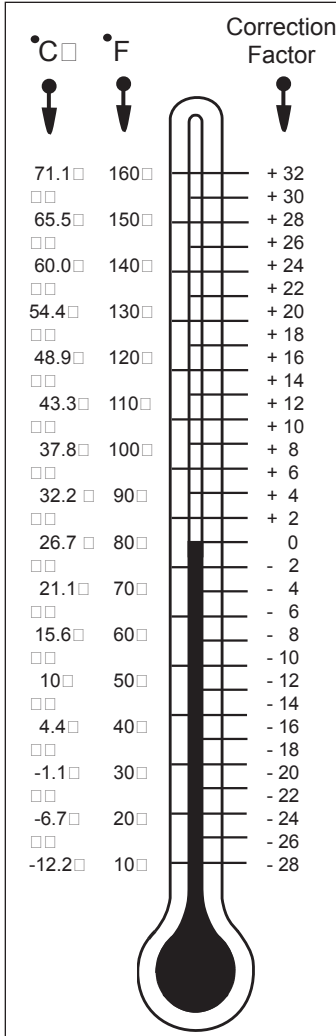
Temperature and recent battery activity (charging or discharging) affect the hydrometer readings. It is best to check the battery when it has been "at rest" for at least three hours, although readings taken at other times will give a "ballpark" figure. When using the hydrometer, draw the electrolyte solution up into the tube. Allow the hydrometer to attain the same temperature as the electrolyte solution. Note the reading for that cell. Complete the same test for the rest of the cells on that battery bank.

The hydrometer is calibrated at 80° F. Temperature affects the hydrometer readings. The higher the electrolyte temperature, the higher the specific gravity reading. The lower the temperature, the lower the specific gravity reading. Add or subtract four points for each 10° variance from the 80° F chart. Readings between cells should not vary more than 50 points.

If one cell in a particular battery bank being tested is at a 50% state of charge, while the others are indicating a full charge, charge only that battery to see if the low cell will come up. At the same time, do not over charge the "healthy" cells.

If the low cell does not come up after charging, this battery can damage the rest of the battery bank and should be replaced. An accurate digital volt meter + .5% will also give an indicator of the battery's state of charge.

Another test that can be performed is to place a specific load on the battery for a predetermined length of time equal to that particular battery's rating. This machine is usually an adjustable carbon pile that can vary the load being applied to the battery(s) while monitoring voltage to see if they will perform to their specific rated capacities.



Temperature Correction Chart.

NOTE: See the chart for temperature compensation. Liquid levels should be even between the cells of the battery being tested as it will affect the accuracy of the test.

WARNING: Sulfuric acid in the batteries can cause severe injury or death. Sulfuric acid can cause permanent damage to eyes, burn skin and eat holes in clothing. Always wear splash-proof safety goggles when working around the battery. If the battery electrolyte is splashed in the eyes, or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous splattering of electrolyte.

Reasons Why Batteries Fail

1. Physical Condition:

Active material flakes off the plates and falls to the bottom of the cell.

This is normal, but sediment accumulation under the plates 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 remains discharged for too long the accumulated lead sulfate in the plate material solidifies and cannot reenter the electrolyte.

When a battery is left in a discharged state the lead sulfate will crystallize. Charging the battery does not move the crystallized lead sulfate off the battery plate. The battery is damaged.

4. Overheating:

The chemical reaction inside of the battery is increased when the battery temperature rises above 125° F. 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 charge a frozen battery. Warm it up first.

6. Corrosion:

Corrosion from spilled or splashed electrolyte form deposits that can conduct electricity and can cause battery drain. Clean off all corrosion, especially around the battery terminals and on the top 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 more than one or two ounces of distilled water is added per-cell per-thousand miles, 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.

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. 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. When 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 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 its 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

Battery Voltage & Current

in the tank drops. Think of siphoning water from a bucket. As the level of the water drops, the volume of water exiting the siphon slows down.

When the tank is full it is capable of feeding more “pressure” to the pump inlet due to gravity, and the pump always has enough water available to maintain its rated pressure and volume. However, if the water tank gets low the pump will not have enough water volume coming in to maintain 12 psi at 15 GPM. If the loads are removed from the pump by closing the valve on the outflow, even with low pressure in the tank the pump will eventually pressure 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 occurring in the electrolyte. When the battery is fully charged the electrolyte has an excess of reactions taking place to feed the battery terminals. This tapers off with time as the electrolyte is spent, so maintaining voltage becomes possible. With no loads the discharged electrolyte will be capable of producing close to the rated voltage, but only after a period of time has elapsed for enough of a reaction to take place to bring the voltage back up. Hopefully, this explanation will clarify why a battery measured at rest can indicate close to its rated voltage but will not run a load.

Battery Charge Time & Consumption Rate

Calculating Run Times:

Calculating run time figures when operating 120 Volt AC electrical items with an inverter can be exponential. This is due to battery characteristics. Flow characteristics of electrons vary with different battery types and chemical compositions. Deep cycle batteries are generally designed to slowly release a majority of their charge capacity. Deep cycle batteries are rated in amp hours (Ahrs) with the discharge occurring over an extended period of time before the battery is charged. Engine starting batteries are designed to quickly release large amounts of current for short durations, without depleting battery reserves. Commercial type batteries bridge the gap of deep cycle and engine batteries. Commercial batteries release medium amounts of current over a longer period of time but they are not designed to cycle their charge capacity.

The working range of a deep cycle battery is between 50 and 100% state of charge (SOC). Deep cycle batteries should not be cycled below 50% state of charge. Discharging a deep cycle battery below 50% state of charge shortens the life of the battery. Deep cycle batteries use an amp hour rating which is usually calculated over a 20 hour discharge interval. For example: A deep cycle battery with a rated capacity of 100 Ahrs. is designed to release current at the rate of 5 Amps per hour. Multiply a 5 Amp load over a 20 hour discharge

period equals the rated 100 Ahr. capacity. These discharge figures are calculated with the battery starting at 100% state of charge with the battery at 80° F when the discharge cycle begins. However, increasing the discharge load applied to the battery from 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. There is also a small efficiency loss of about 10% when inverting. For example: When using the inverter to operate an AC electrical item, which has a current draw rating of 2 Amps, the inverter will use over 20 Amps DC power from the batteries.

Determining Current Consumption:

First determine the amount of current used by an AC item. For example: The television is rated at 200 watts at 120 Volts. 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.

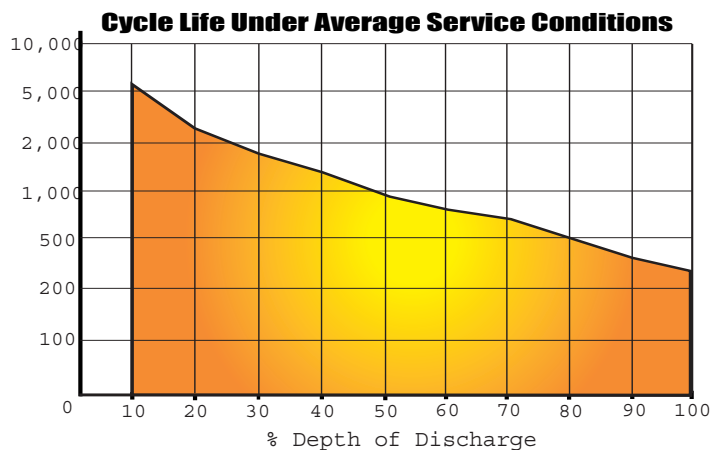
The run time figure will vary greatly with the actual state of charge of the battery bank when the discharge process begins. Ambient temperature, combined with other working loads, such as lights and parasitic loads applied to batteries, affect run times. Calculating the exact run time is not precise 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.

Battery Specifications

CHASSIS	AH (20HR)	CCA	RC (25A) MINUTES
Chassis 12 Volt Chassis 31P-MHD (2 each)	240	950	450
6 Volt Domestic U2200 (4 each)	450*	**	447
All Electric			
12 Volt Domestic AGM GPL-8D	255	**	1350

*Total battery bank capacity. **Battery connections are made in a Series/Parallel connection. Domestic batteries are not rated in Cold Cranking Amps (CCA).

Battery State of Charge vs Voltage/Specific Gravity			
VOLTAGE	SPECIFIC GRAVITY	STATE OF CHARGE	DEPTH OF DISCHARGE
12.66	1.265	100%	0%
12.45	1.225	75%	25%
12.25	1.190	50%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%



Test Conditions: 1. Discharge Voltage = 1.75 V/Cell. 2. Charge Voltage = 2.4 V/Cell. 3. Duration = 1 Hr. Rate. 4. Temperature = 25°C. 5. End of Life = 80% Capacity.

CUMMINS ENGINE COLD CRANKING AMPS REQUIREMENTS				
ISB	1100	CCA	12	VOLTS
ISC	1250	CCA	12	VOLTS
ISL	1500	CCA	12	VOLTS
ISM	1800	CCA	12	VOLTS
N14	1800	CCA	12	VOLTS

SOLAR PANEL (Optional)

The motorhome comes pre-wired to accept this optional solar battery charging system. The system consists of one 85 watt solar panel with mounts, a Combiner box (that allows you to easily expand the system) and a charge controller that can handle up to four 85 watt solar panels.

The Solar Panel:

The solar panel is a BP 85 watt laser-grooved, buried-grid panel that is capable of delivering about 5 Amps of charge per hour, per panel, in full sunlight (usually between 9:30 a.m. and 2:30 p.m.). Extensive testing has shown that one 85 watt solar panel delivers enough power to offset the normal day-to-day drain on batteries caused by various parasitic electrical loads. These parasitic loads are usually associated with transmission memories, alarm systems, natural self-discharge of batteries and other like items. This means that the first 85-watt solar panel is only intended to cover these parasitic loads. Adding a second, third or fourth solar panel (depending upon needs and electrical consumption), can replace what is drawn out of the batteries from the operation of lights, water pumps, inverters, etc., while dry camping.



WARNING: The solar panel needs to be cleaned monthly. The solar panel may need to be cleaned more frequently depending on weather conditions.

The Combiner Box:

The Combiner Box is located on the side of the refrigerator vent on the roof. It has four standard "knock outs" to allow extra solar panels to be added to meet dry-camping needs.

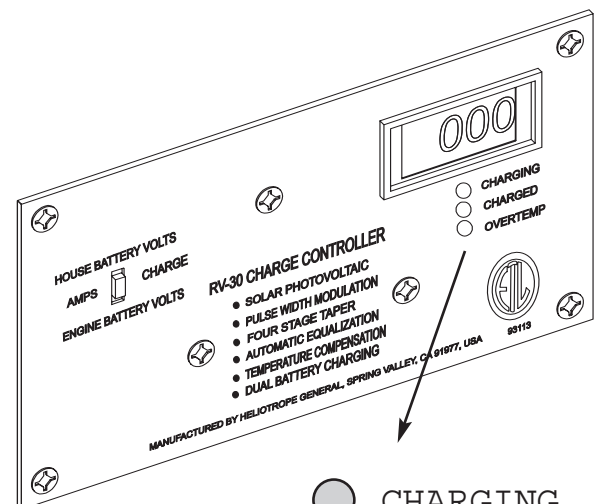
The Charge Controller:




The Charge Controller was built specifically to meet the needs of motorhomes. It can be set to accommodate either Flooded Lead-Acid batteries or Absorbed Glass Mat (AGM) batteries.

A digital readout on the faceplate displays one of three readings by means of a slider switch: **House Battery Voltage**, **Amps Charge** or **Engine Battery Voltage**. Three indicator lights are also there for at-a-glance status:

Charging (the system is actively charging), **Charged** (the batteries have reached their charged set point) and **Over Temp** (the circuit board has reached a high temperature and automatically turns off, and back on automatically when properly cooled).

The faceplate of the controller is used as a heat sink for the electronics attached, and will become warm to the touch, especially when it is processing higher amperage. This is normal and there is no reason to be concerned. Automatic Thermal Shutdown (indicated by the Over Temp light) will be activated if it gets too warm.



-  CHARGING
-  CHARGED
-  OVER TEMP

Close-up of the Indicator Lights. Charging and Charged indicates with a green light. Over Temp indicates with a red light.

Charge Controller Features

The RV-30 Charge Controller has many unique features which are listed and described below:

- 1. Dual Battery Bank Charging** - The above mentioned parasitic loads affect both the House and Engine batteries. The controller automatically charges both the House and Engine batteries at the same time to deal with this issue.
- 2. Pulse Width Modulation** - This charging strategy has been found by the Sandia National Laboratories to maintain the highest state of charge with the least amount of battery water consumption. In effect, it delivers all the available charging amperage until the batteries reach their set point voltage (this stage is called bulk charging) and then it begins to taper off amperage (absorption stage) until it is reduced to all that is needed to simply hold the batteries at their set point voltage (Float Stage).
- 3. Temperature Compensation** - The gassing threshold of the batteries is reached at around 14.1 to 14.4 Volts at room temperature (25° C). If the temperature of the batteries is hotter than 25° C, the gassing threshold is reached at a lower voltage. If the temperature of the batteries is colder than 25° C, the gassing threshold is reached at a higher voltage. This feature protects the batteries from excess water loss and/or plate sulfation by automatically compensating for these temperature changes and adjusting the charging voltage accordingly.
- 4. Automatic Equalization (Only when set to Flooded Lead-Acid Batteries)** - This feature is activated once per day to extend the life of the batteries by allowing the weaker cells a chance to catch up with the stronger cells. This assures that all cells will be at an equal state of charge. The first time the house batteries reach 14.2 Volts during the day, a delay timer is activated that allows a short duration period (20 to 30 minutes) at a slightly higher voltage (14.5 to 15.0 Volts) and then falls back to the 14.2 Volt setting for the remainder of the day.
- 5. Automatic Float (Only when set to Absorbed Glass Mat Batteries)** - This feature resets the charge parameters to work with AGM batteries. It removes the equalization cycle (AGM batteries are sealed and don't like the higher voltage reached during equalization) and changes the Float setting from 14.2 to 13.4 Volts, which is what the AGM battery manufacturer recommends.



CAUTION: The Charge Controller Panel may be hot to the touch. This is a normal function of the Charge Controller.

Solar Panel Care

A critical part of maintaining the solar electric battery charging system is to keep the panels clean. The amount of power that a panel will produce is directly related to the intensity of sunlight that reaches it. A dirty panel will allow less light to reach the panel resulting in less power produced. A single layer of dust or road grime can reduce the power output by 15 to 25%. Leaves and debris that can cover two or three of the 36 individual cells can reduce output power by 50 to 75%.

Use of the basic maintenance tips, regular inspections and regular cleaning will assure maximum charging from the solar electric system. A non-abrasive cleaner and paper towels are recommended. The surrounding environment and the amount of road dust encountered determines how frequently the panels should be cleaned. One to two times a month is preferred.

Tips to Follow:

1. The panels should be cleaned if a film or a layer of dust is on the windshield.
2. On a bright sunny day, the charging amps should be 3.5 to 5 Amps for each panel.
3. High winds blow dust and debris around causing dirt build up. Frequently inspect the panels and clean as necessary.



CAUTION: Avoid damage to the solar panel controller. Cover the solar panel with a blanket when replacing the batteries or performing battery cable maintenance.

BULB USAGE - INTERIOR

INTERIOR BULB CHART	
LOCATION	BULB NUMBER
WALL LAMPS	SYLVANIA 1076
CEILING LIGHTS	GE F15T8 - CW
BEDROOM BULLET LAMP	1383
COSMETIC/VANITY LAMP	12V 13W 9019
PORCH LIGHT	F8T5/CW (2 EACH)
ROUND 3" HALOGEN CEILING LIGHT	12V 10W FC 2585 MP# 08409214
ROPE LIGHT	LITCO 31-120-40
ENTRY HANDLE LIGHT TUBE	MP# 16615157
MAP LIGHT	12V 6W 38886K
CLOSET LAMP	DE 561

ALL ELECTRIC (Optional Only)

This material in this section covers items that are particular to the All Electric motorhome. This is meant to augment the rest of the manual and therefore is not a substitute. The key for the All Electric motorhomes electrical system to function properly is understanding how the AC and DC electrical systems interface. Become familiar with the inverters and programming the remotes. The generator must be operating properly for of the Automatic Generator Start feature to function. The charge condition of the house batteries is equally important. Keep the inverter owner's manual in the motorhome. It will be needed for reference.

The motorhome does not have propane so it operates much differently than the standard propane equipped motorhome. All appliances operate from AC, DC, diesel or a combination thereof. For the electrical system to function properly the 120 Volt AC and 12 Volt DC power supply sources must be operating properly, especially the generator. When shore power is not available, appliance operation relies exclusively on the generator, inverter or batteries for power. The inverter's Automatic Generator Start feature should be enabled when shore power is not available to help prevent dead house batteries. Using the inverter as the 120 Volt power source can quickly consume battery power. Do not allow the batteries to discharge lower than 50% SOC (State of Charge). The batteries ability to obtain a full state of charge, and the number of discharge cycles reduce each time a severe discharge occurs. Eventually the batteries will no longer accept a charge, resulting in electrical system malfunction or total system failure.

The SOC of the batteries determines the length of time the inverter can operate from the batteries. Use arithmetic to calculate inverter run time or DC power loads. When dry camping, closely monitor interior light use. Some lights operate only from 120 Volt AC.



NOTE: One inverter will need to remain on to operate the refrigerator when dry camping

Overview

The motorhome is equipped with two inverters. The two inverters, and the house battery bank, supply an ample amount of power if the system is used wisely. When dry camping, turn the inverters on only if they are needed. The inverters use battery power to supply 120 Volt AC power to operate most of the appliances, outlets and the entertainment system.

The Automatic Generator Start feature should be enabled to start the generator so the battery bank does not severely discharge. When house battery voltage does get low, the generator will start and supply 120 Volt AC power to the main load center and the inverters. The inverters charge the battery bank. The generator will continue to operate until the pre-programmed stop point. The generator stops and the inverters supply 120 Volt AC power, repeating the cycle.



NOTE: This is not a replacement for the inverter manual. Keep the inverter manual in the motorhome as it will be needed for reference.

Meters

The two inverters are electrically linked together with an external shunt that monitors AC and DC current. A shunt allows a majority of the current to flow through the shunt on heavy conductors, while some of the current flows through on light conductors. The external shunt is what the Master inverter uses to monitor DC charging or discharging current. An internal shunt monitors AC current. When hooked to anything less than 50 Amp service, or particularly when dry camping use the Master remote to monitor AC and DC current consumption and charging values. The AC and DC meters are located in the Meters Menu. Analog meters are available for quick AC reference when hooked to shore power or operating from the generator. Use the inverter meters to calculate the amount of DC power the inverter requires to operate the refrigerator, cook top and microwave. Write down the figures to approximate discharge time of the battery bank.



NOTE: When using the inverters as the power source the analog meters do not operate.

In the All Electric motorhome each inverter has its own remote control panel. The RC7 GS remote panel located in the monitor panel is the Master remote. The RC7 panel located adjacent to the monitor is the Slave remote. All programming and monitoring values are established through the Master remote. Programming the inverters, or changing program values, have a significant effect on the performance of the electrical system. The remotes for the All Electric motorhome use a different programming schedule. These different values are Shunt Selection, Battery Type and Battery Capacity. These must be programmed correctly for the electrical system to function properly.

Remotes

NOTE: When programming the inverters make sure the correct shunt option, battery type and battery capacity are programmed. All remote programming information is stored in the inverter. The remote is a display of stored information only.

Accessing the Program Menu:

There are several settings available in the programming menu. Care should be used when selecting or changing a program setting.

- Press the Menu Set-Up (up and down arrows) buttons simultaneously for three seconds. When the control panel beeps, release the buttons immediately.
- The programming menu is successfully entered when Search Sense appears on the screen. Use the Up or Down arrows to scroll the programming menu.
- The Settings button will change the value or option.
- Press the Menu Set-Up buttons to exit the programming mode.

**External Shunt:
This Inverter**

**External Shunt:
Other Inverter**

Shunt Selection - When programming the shunt option, the Master inverter remote in the monitor panel will be programmed "**External Shunt: This Inverter.**" The Slave inverter adjacent to the monitor panel will be programmed "**External Shunt: Other Inverter.**" The Slave remote will then be used as a display only. All AC and DC voltage and current values are viewed through the Master remote.

Auto-Genstart - The Auto-Genstart feature can be programmed to start the generator from either a specific voltage or a percentage of state of charge. The Auto-Genstart feature can be programmed to stop the generator at a point of the charge cycle or a percentage of state of charge.

If the Auto-Genstart feature is programmed to start or stop the generator from a specific state of charge, the voltage setting of Fuel Gauge Cutout will effect at what point the generator starts or stops.

For example: If the Fuel Gauge Cut-out voltage is set to 11.8 Volts with the generator set to start at 80% SOC (state of charge), actual voltage when the generator would start would be approximately 12.5 Volts.

**Battery Type
AGM**

Battery Type - Charge voltage is automatically selected when programming the Battery Type of the Master remote. In the programming menu under **Battery Type:** Select **Battery Type: AGM.** This setting uses a lower charge voltage than the Liquid Lead Acid setting.

**Battery Capacity
1000Ahr**

Battery Capacity - The amount of time in the Bulk and Absorb charge cycles are automatically selected when programming the Battery Capacity of the Master remote. In the programming menu under **Battery Capacity:** select **Battery Capacity 1000Ahr.**

While traveling, the refrigerator may be operated keeping the refrigerator contents cool. The electrical combination of the engine's alternator and the inverters AC output supplies the power necessary to operate the refrigerator on 120 Volts AC. Disable this feature when the engine is off. House battery power is quickly consumed when using the inverter to operate the refrigerator on AC electric. Hook to shore power, start the generator or enable the Automatic Generator Start feature. To conserve house battery power, turn the inverter off when not in use.

House Batteries

The battery bank consists of five Type 8-D 255 amp hour AGM (Absorb Glass Mat) batteries. The batteries are hooked in parallel. Voltage readings are the only way to accurately determine the state of charge of the AGM batteries as they are a sealed battery. Voltage readings are most accurately measured after three hours of battery inactivity. The length of time it takes to charge the battery bank to a full state of charge will vary with the following conditions:

- How deep were the batteries discharged?
- What other DC loads are applied during the charge cycle?
- What is the actual physical condition of the batteries?
- Inverter remote programming.

It may take a number of hours or days, with the motorhome hooked to shore power 24 hours a day, to charge the batteries to a full state of charge. During the charge cycle, one inverter may be in Bulk charge while the other is in Float. This is normal, as the two inverters though electrically linked through a common shunt, do not have a common link between their internal chargers.

Discharge and recharge time of the house batteries will vary depending on the type of load and voltage during the charge or discharge cycle. Discharging the batteries at a slow steady rate to a specific voltage, then charging the battery bank for the same amount of amp hours removed during the discharge cycle, will not yield a charged battery bank. The AGM battery bank, though very efficient, is not a perfect trade with amp hours discharged and charged. In addition, the type of discharge load depends on the charge time. A rapid and heavy discharge cycle yields less available amp hours than a slower discharge rate. Conversely, a rapid discharge cycle, though equivalent in the same amount of amp hours as a slow discharge cycle, requires a longer charge time. Regardless of the type of discharge cycle, it always requires more amp hours to charge the batteries than what the batteries have discharged.

The life of the battery bank will greatly decrease when the Depth of Discharge (DOD) is below 50%. Charge the batteries whenever they have been discharged. Batteries left in a discharged condition eventually will no longer accept a full charge or may not accept a charge at all. Never store the motorhome with a discharged battery bank. It is better to make several small discharge and full charge cycles than a few deep DOD cycles.



NOTE: For optimum battery life, the batteries should not be cycled lower than 60% state of charge.

State of Charge (%)	O.C.V./Cell	O.C.V./12 Volt Battery
100	2.13	12.8 or greater
80	2.10	12.6
60	2.05	12.3
40	2.00	12.0
20	1.97	11.8
0	1.93	11.6 or less

These voltage levels are approximate and give an indication of the state of charge of a battery at rest. As the battery ages these voltage measurements will be lower.

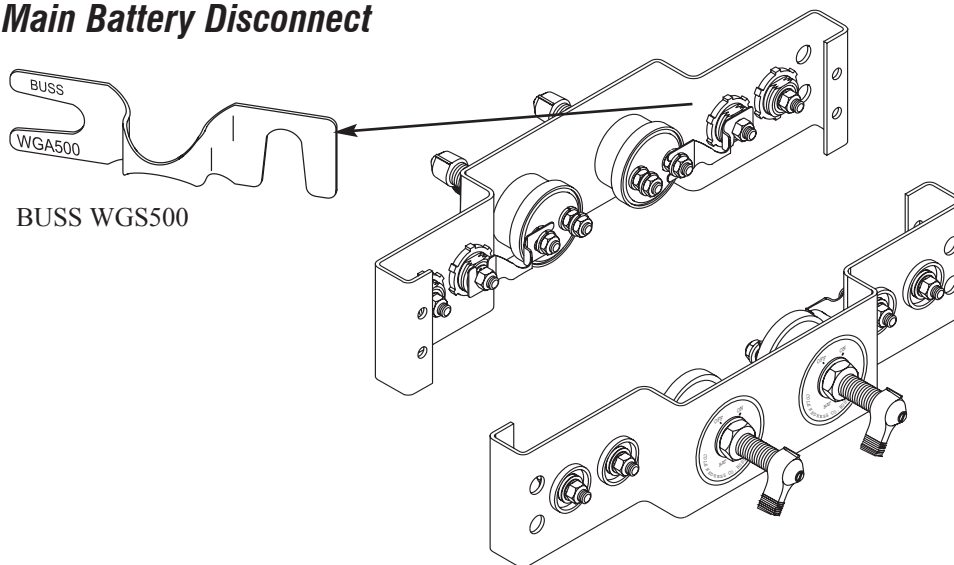
Equalization Charge:

Many battery manufacturers recommend that an Equalize charge cycle is initiated on some periodic basis. How often the batteries should be Equalize charged is strictly up to the battery manufacturer. An equalize charge cycle is a timed event with the Equalize charge voltage generally one volt higher than a Bulk charge voltage. The high voltage of an Equalize charge cycle can damage sensitive electronic equipment. Before performing an Equalize charge cycle, several electronic items need to be disconnected.



NOTE: For more information, refer to the Equalize Charging procedure.

Main Battery Disconnect



Located in the battery bay are two main battery disconnect switches for the house batteries. On the back of each disconnect switch is a 500 Amp fuse. The pair of fuses protects against a shorted battery cable or other over current condition. A weather-proof fuse holder with a 20 Amp ATO fuse for the solar panel is attached to one of the battery disconnect switches.



CAUTION: When working on the batteries use protective measures against short circuits. Place an insulating material over the batteries when working on or near the battery area. Remove any rings or watches. Use extreme caution when working with hand tools. Do not allow the tool to short circuit any battery connection. Always mark cable routing and location before servicing, removing or replacing batteries.

EXECUTIVE

SECTION 9 ELECTRICAL SYSTEMS - CHASSIS

- INTRODUCTION • 285**
- BATTERY DISCONNECT - CHASSIS • 285**
- BATTERY CHASSIS • 286**
- Battery Specifications - Chassis • 287*
- FUSES & CIRCUITS - CHASSIS • 288**
- Distribution Panel - Front • 288*
- Distribution Panel - Rear • 288*
- Relays • 289*
- REAR START BOX • 290**
- ALTERNATOR • 290**
- Alternator Testing Procedure • 291*
- Battery Maintainer • 292*
- STEERING COLUMN & SMART WHEEL • 293**
- Smart Wheel Operation • 294*
- Wiper Function • 294*
- Tilt & Telescope • 296*
- TRANSMISSION • 297**
- Shift Selector • 297*
- Parking Brake • 298*
- Leveling Controls • 298*
- DASH • 299**
- Indicator Lamps • 299*
- Gauges • 301*
- Switches • 303*
- Air Conditioner & Heater Controls • 307*
- NAVIGATION SYSTEM • 314**
- Global Positioning System (GPS) • 314*
- Compass • 315*
- TRIP TEK (Optional) • 316**
- DIAGNOSTIC PLUG LOCATION • 317**
- DIAGNOSTIC BRACKET (ENGINE) • 318**
- BULB USAGE - EXTERIOR • 318**



INTRODUCTION

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.

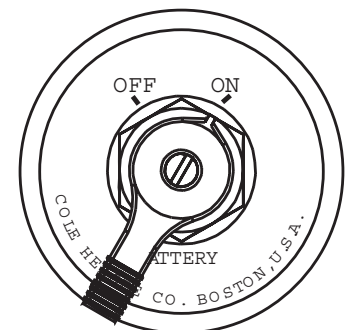
With the all technological advancements taking place in the past several years manufacturers have now incorporated electronics into these systems. It is important to keep the 12 Volt system(s) in good working order. These systems, with their incorporated electronics, are voltage sensitive. Some items can be damaged if the DC voltage is not maintained within the designed specifications.

There are two separate 12 Volt systems. One is the chassis system; the other is the house system. These two systems, for the most part, are separate from one another. The house system does not operate engine functions; as the engine system does not operate house functions. However, within the two systems there are some inner connections. For example: While the motorhome is driven the alternator on the engine will charge the house batteries. Likewise, while the motorhome is plugged into shore power, or the generator is running, the engine 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 by the driver's front wheel. The other 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 front distribution panel located in an outside compartment by the roadside front wheel. This panel contains mostly engine system fuses and wiring such as headlights, taillight, dashboard functions, gauges, etc. The house battery(s) supplies 12 Volt DC power to the distribution panel located in the bedroom. This panel contains fuses for the house, interior lighting and appliances, such as the furnace and water heater.

The main battery disconnect for the chassis battery turns the DC power on or off to the front electrical bay. 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. Some electronic components of the engine and transmission require a constant power source. Turn the main battery disconnect switch off when the motorhome is going to be stored, or when performing electrical maintenance. If possible, leave the motorhome plugged into an AC source with the battery disconnect switch on. This will help prevent

BATTERY DISCONNECT - CHASSIS



the possibility of dead batteries. 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.



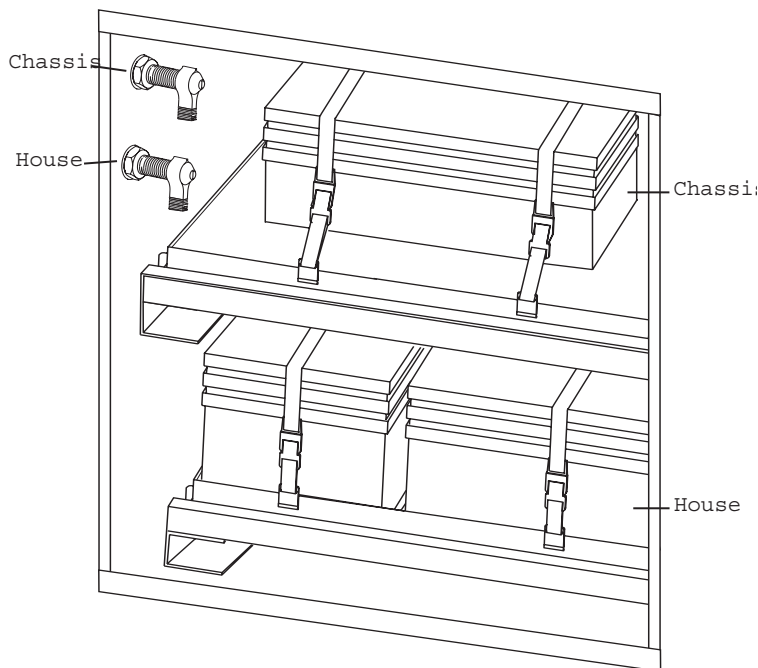
NOTE: The solar panels will charge the batteries with the disconnect switch off.



WARNING: When the frame or other welding is involved for motorhome repair, or modification, the following precautions are required to protect electronic components in the motorhome chassis:

- 1. Disconnect the (+) positive and (-) negative battery connection and any electronic control ground wires connected to the frame or chassis.**
- 2. Cover electronic control components and wiring to protect from hot sparks.**
- 3. Disconnect the wiring harness connectors at the transmission electronic control unit. Open bed storage compartment, open engine access door. The ECU is located above the transmission.**
- 4. Do not connect welding cables to electronic control components.**
- 5. The welding ground cable should be attached no more than two feet from the part to be welded.**

BATTERY - CHASSIS



The chassis battery operates only chassis and engine functions. The chassis battery is a crank type battery, producing the high amperage needed to start the engine. Engine starters initially require a large amount of current to crank an engine. Initial starter amperage draw exceeds 1200 amps. The type of application in which the engine battery is used differs from the house battery application. The engine battery state of charge remains consistent. Maintenance is still required with an engine battery. Regular electrolyte level checks and hydrometer readings, should be performed. High electrolyte consumption, or inconsistent hydrometer cell readings may indicate a charging system problem. Perform a charging system and current draw check if the battery is exhibiting abnormal hydrometer readings.



NOTE: Replacement batteries should have the same cold cranking amp (CCA) rating.

Battery Specifications - Chassis

CHASSIS	AH (20HR)	CCA	RC (25A) MINUTES
Chassis 12 Volt Chassis 31P-MHD (2 each)	240	950	450
6 Volt Domestic U2200 (4 each)	450*	**	447
All Electric			
12 Volt Domestic AGM GPL-8D	255	**	1350

**Total battery bank capacity. **Battery connections are made in a Series/Parallel connection. Domestic batteries are not rated in Cold Cranking Amps (CCA).*

Approximate Hours at Ampere Load					
	5 AMPS	10 AMPS	15 AMPS	20 AMPS	25 AMPS
U2200	55.0	22	12.5	9.1	7.0

Battery State of Charge vs Voltage/Specific Gravity			
VOLTAGE	SPECIFIC GRAVITY	STATE OF CHARGE	DEPTH OF DISCHARGE
12.66	1.265	100%	0%
12.45	1.225	75%	25%
12.25	1.190	50%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%

CUMMINS ENGINE COLD CRANKING AMPS REQUIREMENTS			
ISB	1100	CCA	12 VOLTS
ISC	1250	CCA	12 VOLTS
ISL	1500	CCA	12 VOLTS
ISM	1800	CCA	12 VOLTS
N14	1800	CCA	12 VOLTS

CCA Rating are at 0° F. These are the minimum requirements.

FUSES & CIRCUITS - CHASSIS

Distribution Panel - Front



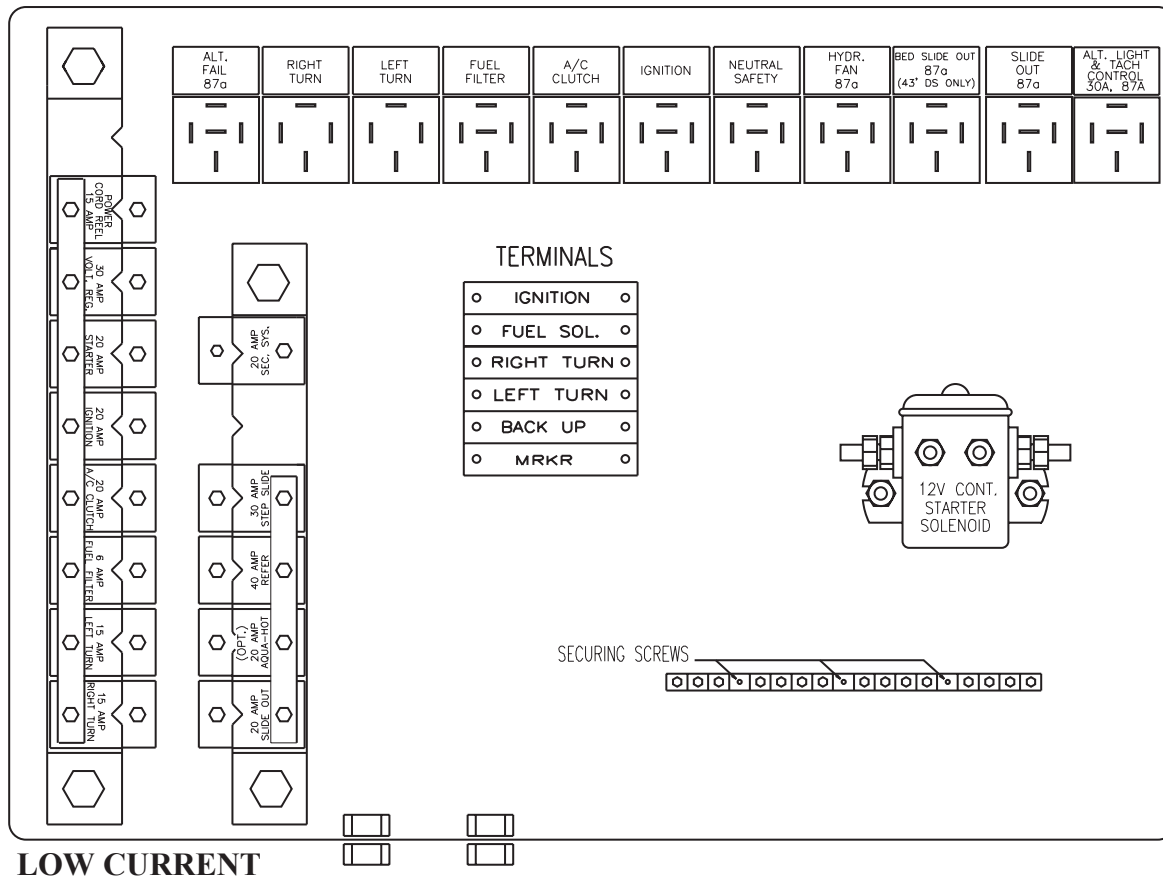
Front Run Panel.

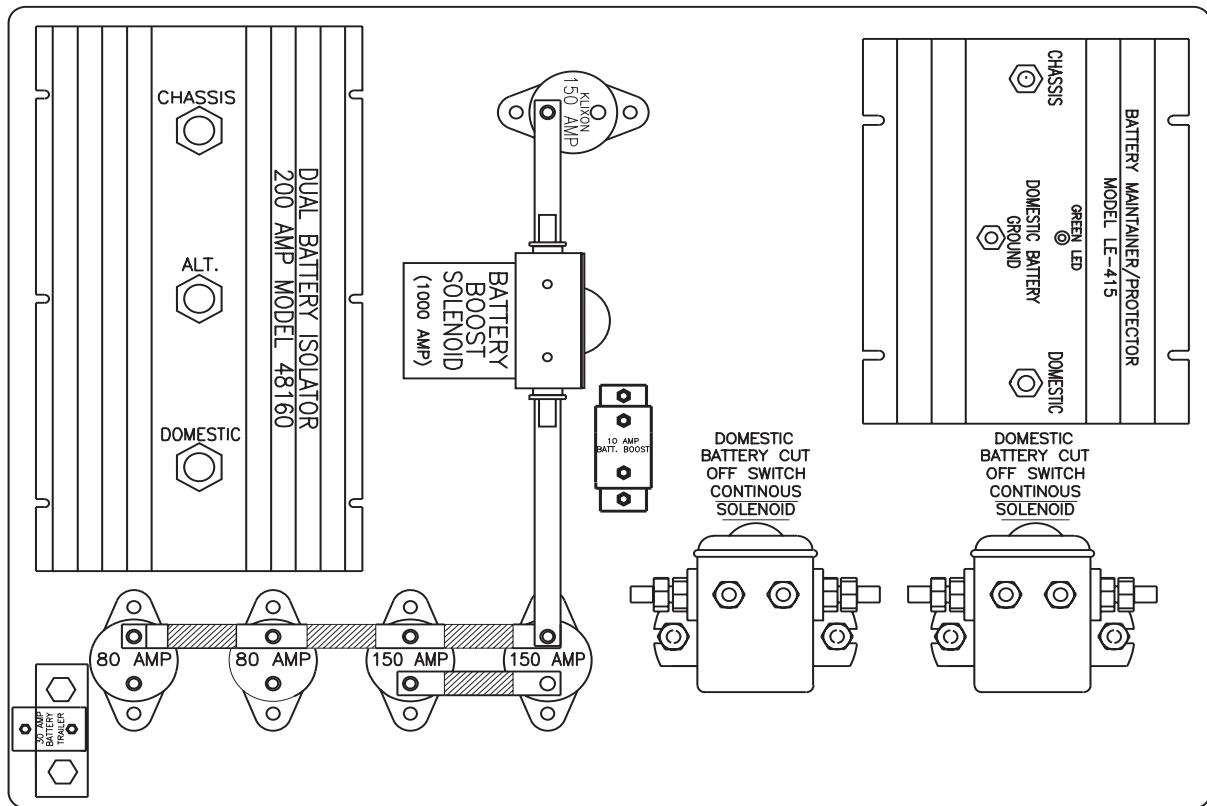
The front electrical panel is located on the roadside, ahead of the front wheel. It contains the fuses, self resetting supply circuit breakers, solenoid and relays.

The automotive fuses and emergency flashers are located in the front electrical panel. The fuses are the standard plug-in type (ATO). When a fuse “BLOWS,” the wire in middle of the plastic case will be broken. A bad or blown fuse must be replaced with a fuse of the same rating and type. Using a fuse of a different type rating will defeat the circuit protection provided by the fuse, which could result in damage to the motorhome’s electrical system. If a fuse has been replaced and it “BLOWS” repeatedly, that may be an indication that a fault exists or an electronic component has failed. It is recommended that the motorhome be taken to a qualified RV technician before any future use to diagnose and repair the problem. Circuits are identified on the fuse label located on the inside of the electrical compartment door.

Distribution Panel - Rear

The electrical panel has been separated into two panels, which are located in the engine compartment.





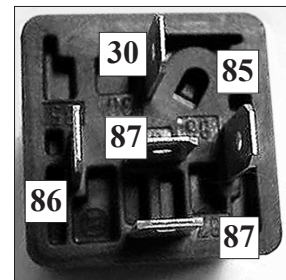
HIGH CURRENT

The coach uses different relays to operate different equipment. If a relay needs to be replaced, carefully record the location of each wire and its color.

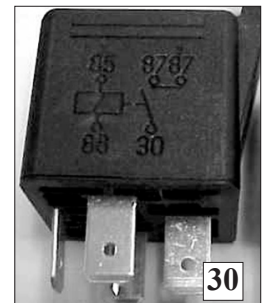
The Bosch relays may look the same, however they are completely different. Look at the side of the relay to determine whether a **87 relay** or an **87a relay** is needed. Relays can be easily mixed up and problems may increase if the wrong one is changed. These two relays can be wired many different ways to operate different functions. Turn the relay over and look at the post. Each post is numbered. It is important to note these differences listed:

1. The 30 post is the incoming fuse and/or breaker power. Some relay applications supply power to the 30 post. Some use it for ground. The 30 post can be used many different ways.
2. The 85 post is one side of the coil, tripped different ways.
3. The 86 post is the opposite side of the coil, tripped different ways.
4. The 87 posts are not common to the 30 post until the relay is tripped. When the relay trips, both 87 posts are common to the 30 post.
5. Using an 87a relay, the 30 post and the 87a post are common. When the coil is tripped, the 87a becomes a dead post and then the 30 post becomes common to the 87 post located on the outside of the relay.

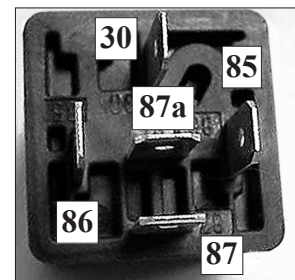
Relays



87 Relay.

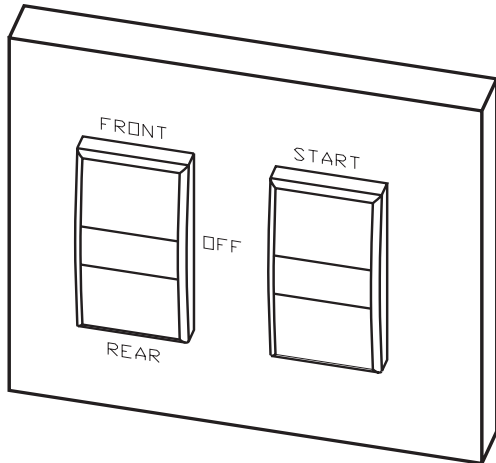


Bosch Relay.



87a Relay.

REAR START BOX



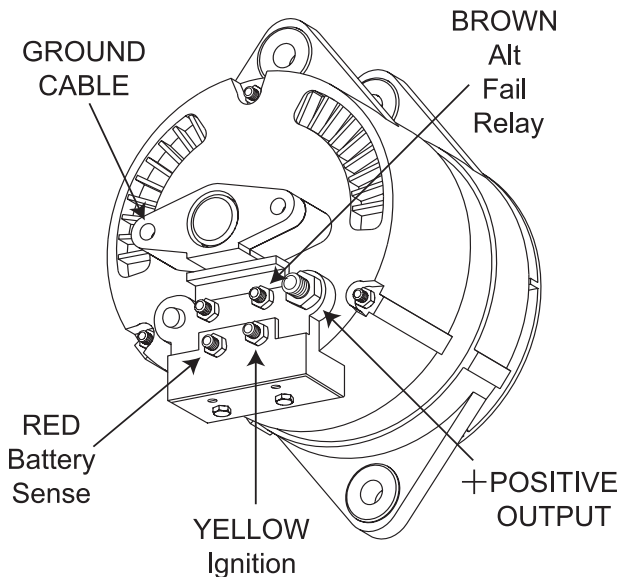
To Start From the Rear:

- Turn ignition key to ON.
 - Move rocker switch to REAR.
 - Ensure everything is clear of rotating parts.
 - Press the switch to START.
 - Moving switch to the center OFF position will turn engine OFF.
 - Return switch to FRONT for normal operation.
 - Return the switch to FRONT run after use.
- If the motorhome will not start from the front, try to start it from the rear start box.



CAUTION: When checking the engine compartment this switch should be placed in the rear start position. This will prevent accidental starting of the engine from the cab area.

ALTERNATOR



The 200 Amp Leece-Neville alternator with integral rectifier, regulator and remote voltage sensor is designed for reliable high output at all RPMs. This alternator offers high output over a broad range of operating speeds. The 4884JB deliver the same reliable, heavy duty performance all Leece-Neville alternators are known for. The 4884JB features an integral regulator and rectifier for compact installations.

The alternator should replace the ampere-hours taken from the battery at start. The amount of charge given to a battery is dependent on engine run time. This allows to maintain a 75% level with enough energy to power the electrical systems. When driving the motorhome for a short distance, or short periods of time, the batteries may not get brought up to above 75% state of charge.



NOTE: Standard - 200 Amp. All Electric Option -270 Amp.

Specifications for Standard Alternator:

- The integral rectifier system utilizes 12: 50 Amp diodes mounted in multiple aluminum heat sinks for efficient heat dissipation during high-output operation.
- Aluminum housings.
- Bi-directional fan.
- Front bearing: 305 cartridge type.
- Enclosed brush system.
- Operation Ambient Temperature Range (-40° to 200°F).
- Negative Ground Configuration.
- Regulator Adjustment Range **13.6 to 15.4 Volts**.
- Batteries may start to gas at 14.3 Volts.
- Maximum operating RPM is 8,000.

Alternator - All Electric (Optional):

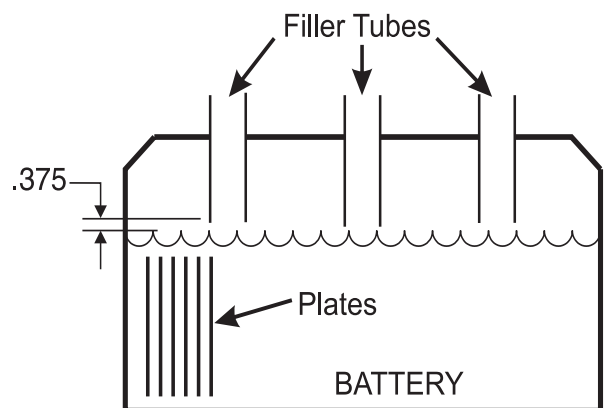
The All Electric option requires the 270 Amp, 4874JB Leece-Neville alternator.

Specifications for All Electric Option Alternator:

- The integral rectifier system utilizes 12: 50 Amp diodes mounted in multiple aluminum heat sinks for efficient heat dissipation during high-output operation.
- Aluminum housings.
- Bi-directional fan.
- Front bearing: 305-cartridge type.
- Enclosed brush system.
- Operation Ambient Temperature Range (-40° to 200°F).
- Negative Ground Configuration.
- Regulator Adjustment Range **13.0 to 15.0 Volts**.
- Maximum operating RPM is 8,000.

- Check all wiring for burnt or loose electrical connections. Repair as needed.
- Check all grounds and electrical connections to ensure they are clean and tight.
 - a. Alternator ground to chassis frame.
 - b. Motor block ground to chassis frame.
 - c. Chassis battery ground to chassis frame.
 - d. Alternator positive output to isolator center terminal.
- Inspect the alternator for damage. A broken fan blade can damage an alternator or put it out of balance.
- Check belt, pulley and fan for wear. Replace as needed.

Alternator Testing Procedure

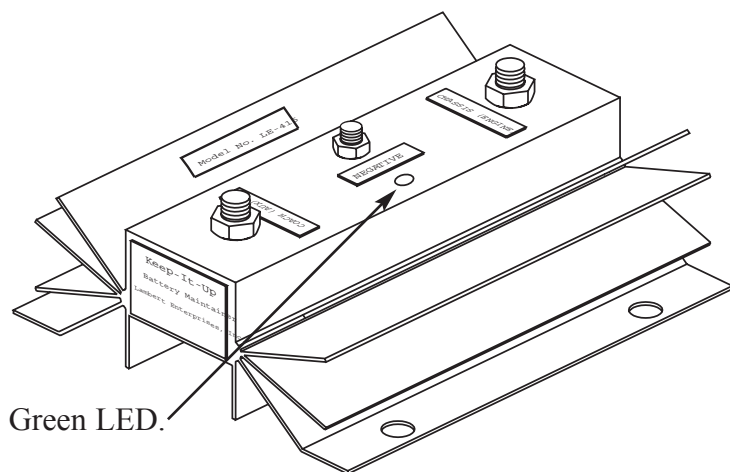


The distilled water level in the battery should be 3/8" below the vent tube.

- Never attempt to disconnect the battery or battery wire from the alternator with the engine running. This can cause damage to the alternator or the regulator.
- The pulley for the alternator should be torqued to 80 foot pounds.
- Chassis battery voltage with the engine OFF should range from 12.2 to 12.7 vdc.
- Chassis battery voltages with the engine at idle should range 13.5 to 14.2 vdc.
- The output of the alternator range is 13.0 to 15.0 vdc. Connect a voltmeter to the (B+) terminal of the alternator and chassis ground. Idle the engine up to 1,200 rpm.
- Connect a clamp-on amp-meter, if available, to the positive battery cable to verify the battery state/rate of charge.

Remember the alternator is not a battery charger. It is designed to maintain the proper operating voltage level for the motorhome. A battery with a low charge, or a dead battery, may cause damage to the alternator.

Battery Maintainer



The battery maintainer is a fully automatic device that keeps the chassis battery fully charged whenever your motorhome is plugged into shore power, or when the generator is running.

- For easy reference, the battery maintainer has a green LED to indicate when it is active. It is illuminated whenever you are plugged into shore power, or when the genset is running, but that is of no consequence.



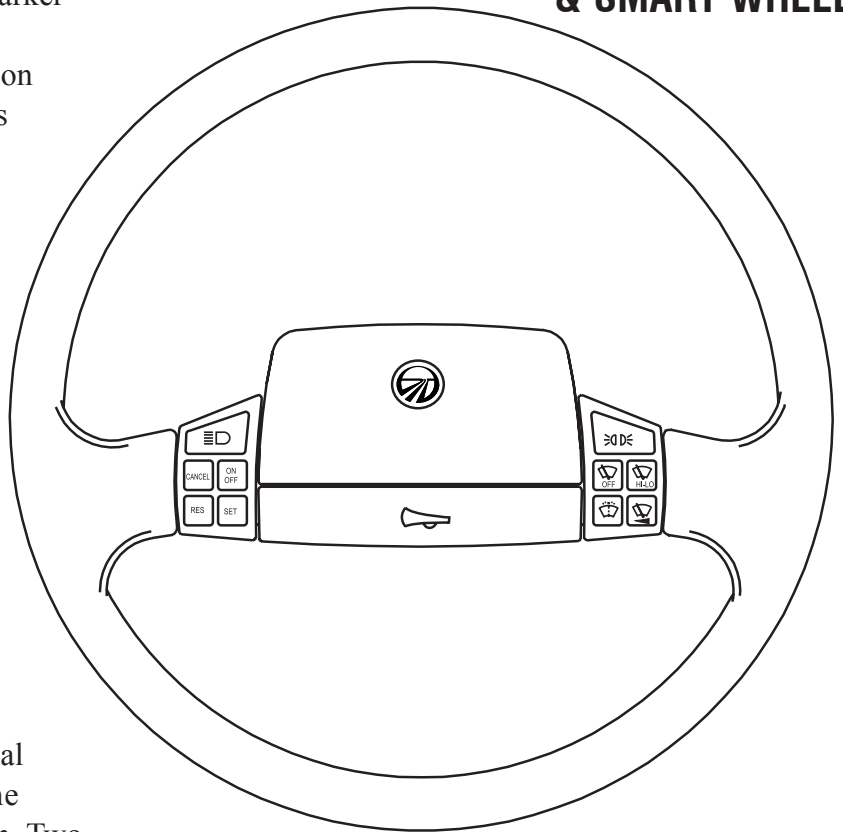
NOTE: If the green LED is not illuminated when you are plugged into shore power, run the engine for a few seconds to activate the battery maintainer.

- The battery maintainer will provide up to 15 Amps to the chassis battery.
- If the chassis battery voltage is low you may hear a clicking sound from the battery maintainer. This is normal and indicates that the chassis battery is trying to draw more than 15 Amps. The sound will stop as soon as the battery has become recharged.
- While dry camping with the generator off, the battery maintainer becomes inactive and the green LED will go out.

STEERING COLUMN & SMART WHEEL

The Smart Wheel Steering Wheel System offers control of the horn, headlamp, marker lamp flash, cruise control and wiper functions from switch panels mounted on the steering wheel. The system consists of electronic modules enclosed in the steering wheel and the Master Controller typically located in the front run box.

Two wires utilizing a "clock-spring" connector in the steering column accomplish the communication between the steering wheel and the Master Controller while allowing steering wheel rotation. The two wires carry a multiplexed communication signal for the steering wheel. The Switch Panels generate unique signals as each switch closes and will then transmit them to the Master Controller. The Master Controller decodes the signal for the closed switch and operates the corresponding outputs for that function. Two additional wires provide power and ground for the steering wheel backlighting.



The 3 Amp fuse on the Master Controller is for backlighting the switch panel. LED's accomplishing backlighting with the ignition ON should last the life of the motorhome. The LED's only draw about 20 mA.

Another function of the smart wheel for an ISM 500 engine is the "**HIGH IDLE**" feature. This feature increases the idle when using the following procedure.

1. Cruise control OFF. To raise the idle, push the resume switch. The idle can be raised in 25 rpm increments by pushing the switch seven different times. (ISL 370 will have an idle up idle down switch.)
2. To lower the idle use the set button on the smart wheel. Again, push downward to lower the idle.
3. With cruise control switch ON: Push the set button and the rpm will raise at one time to 1,250 rpm. Push resume once, idle drops to 1,000 rpm. Push and hold the resume button, the idle will raise to 1,500 rpm.
4. Use cancel or turn the cruise control off to return the engine to idle.

Smart Wheel Operation

Functions and an operational description for the smart wheel are as follows:

HORN:

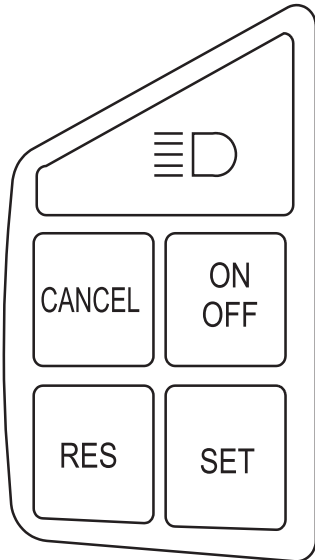
The horn bar on the steering wheel will send the appropriate signal to the Master Controller causing the HORN output to be active while the switch is pressed.

HEADLAMP FLASH:

This function is the ICC courtesy lamp. When the headlights are ON, pressing the switch causes them to go off as long as the switch is pressed. Similarly, when the headlights are OFF, pressing the switch causes them to illuminate as long as the switch is pressed.

CRUISE FUNCTIONS:

- **CRUISE CANCEL** - Operation of this switch signals the cruise system to disengage without losing the current speed memory setting.
- **CRUISE ON/OFF** - Operation of this switch cycles the Cruise system On and Off.
- **CRUISE RESUME** - Operation of this switch actuates the Cruise Resume function of the engine controller.
- **CRUISE SET** - Operation of this switch actuates the Cruise Set function of the engine controller.



WARNING: Do not use cruise control in heavy traffic or on roads that are winding, slippery or unpaved. Do not shift the transmission into "N" (Neutral) with the cruise control on as high engine RPM run up will occur until the cruise control is turned off.

Wiper Function

The wiper control function implementation is via special control circuitry that is intended to control two wiper motors and maintain synchronization between these motors on each wipe cycle. For that reason the faster wiper will pause at the end of each cycle and wait for the slower wiper to complete its cycle before resuming.

MARKER LAMP FLASH:

When the marker lights are ON, pressing the switch causes them to go off as long as the switch is pressed. Similarly, when the marker lights are OFF, pressing the switch causes them to illuminate as long as the switch is pressed.

WIPER OFF:

This switch causes cancellation of all wiper operations. Any time the ignition is off this mode goes active.

WIPER LO/HI:

Operation of this switch initially causes the **Low Speed Wiper** function to activate. If the switch is pressed, again the **High-Speed Wiper** function will be activated. Subsequent presses of this switch will cause alternate operation of the wipers in the low or high-speed mode.

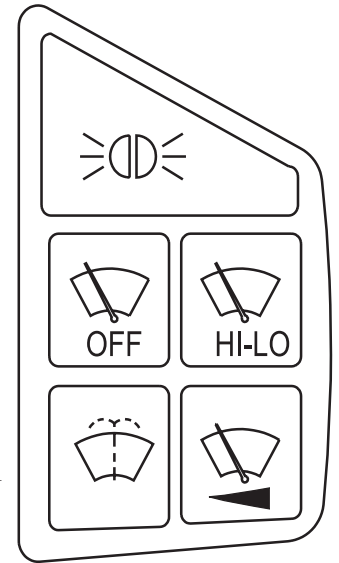
WIPER WASH:

Operation of this switch activates the wash pump relay while the switch is pressed. Additionally, if none of the latching wiper functions (**Wiper Lo/Hi** or **Variable**) had been previously selected, the Low Speed Wiper will be activated for a period of approximately three wiper cycles after the switch is released. If any of the latching wiper functions (**Wiper Lo/Hi** or **Variable**) had been previously selected, the wipers will continue to run in the selected mode after the wash switch is released.

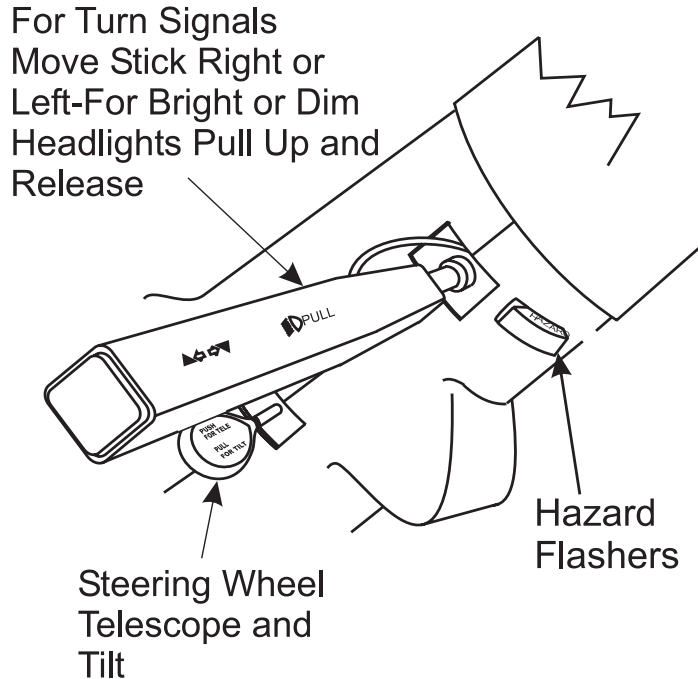
WIPER VARIABLE:

Operation of this switch initially causes the **Low Speed Wiper** function to activate for one wipe. If the switch is pressed again within approximately 30 seconds, the **Low Speed Wiper** function activates again and repeats at an interval determined by the time between the last two operations of the switch. Additional switch operations will shorten the cycle. Activation of any other wiper mode cancels the variable mode. The effect for the driver is thus: In light rain or mist conditions, the driver presses the switch once when the windshield first needs clearing. When the windshield requires clearing for the second time, the driver presses the button again - setting the timed interval between subsequent wipes required by the current conditions.

Any wiper function activation generates a "**Headlamp On**" signal from the Master Controller. This will only reset by turning off the ignition or by activating, then deactivating, the dashboard headlamp switch.



Tilt & Telescope



Tilt and telescope steering wheel control lever is located on the steering column.

- To tilt the steering wheel, pull the lever up. Tilt the steering wheel where you want it. Release the lever and it will lock the steering wheel in the new position.
- To telescope the steering wheel, push and hold the lever down. Push down or pull up on the steering wheel until the wheel is where you want it. Release the lever and the steering wheel will lock in the new position.

Turn indicator and headlight high/low dimmer control lever is located on the steering column.

- Pushing the lever forward will activate the right turn indicator circuits when the ignition is on.
- Pulling the lever down will activate the left turn indicator circuits when the ignition is on.
- Pulling the lever up will select high/low beam circuits when the head lights are ON.

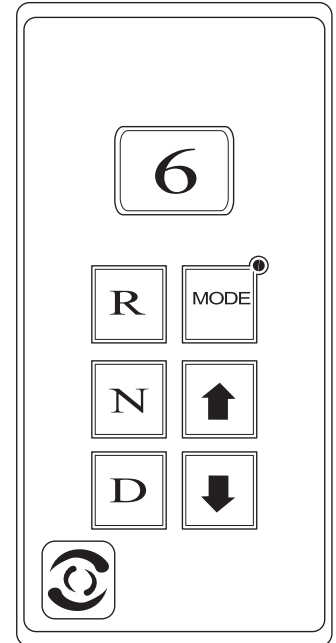
Hazard Flashers:

- The flasher button is located on the steering column.
- To turn four way flasher on, pull out on flasher button.
- To shut off flasher, push button inward.

Transmission Key Pad:

The function of each position of the keypad push-button shifter is as follows:

- Select the **REVERSE** gear by pressing **R**.
- Select **NEUTRAL** by pressing **N**. The area around the **N** button is a raised ridge so the driver can orient his hand to the push buttons by touch, without looking at the display.
- Select **DRIVE** range by pressing **D**. The highest forward gear appears on the **SELECT** display and the transmission will shift to the starting gear.
- The **UPSHIFT** and **DOWNSHIFT** arrow buttons are used to select a higher (if not in **D**) or lower (if not in **1**) forward range. These buttons are not functional in **NEUTRAL** or **REVERSE**. One press changes the range selected by one range. If the button is held continuously the selected range will continue to change up or down until the button is released or until the highest/lowest possible range of gears is selected.
- The fluid level of the transmission can also be checked from the shift selector keypad. Press the up and down arrow button simultaneously while the motorhome is at a rest position. This activates the diagnostic circuitry of the transmission. To exit the diagnostics press **N**.

**TRANSMISSION
- Shift Selector**

Transmission Key Pad.



NOTE: The oil level sensor method of checking the fluid level compensates for transmission fluid temperature between 60° C - 104° C (140° F - 220° F). Any temperature below 60° C (140° F), or above 104° C (220° F) will result in an Invalid for Display condition.

- The **MODE** button will enable the secondary shift point to be selected. The transmission shift point used will be 200 rpm lower. It is further used by a service technician to access diagnostic codes when troubleshooting. The diagnostic circuitry must be enabled to display the codes.

To Enter Economy Mode:

Press the **MODE** button. The LED will illuminate.

To Exit Economy Mode:

Press the **MODE** button. The LED will extinguish.

- When the Auxiliary Braking device is used, the display will change to default reading of two or three. This default is pre-selected at the factory and can only be reprogrammed by an authorized Allison Service center. The transmission is not in second or third gear. This is only the reference for the rpm shifts points to optimize the braking capacity.



CAUTION: Do not use the economy mode in heavy stop and go traffic or mountainous terrains. While in economy mode using heavy throttle applications with frequent shifting will raise transmission fluid temperature. Exit economy mode until road conditions improve.

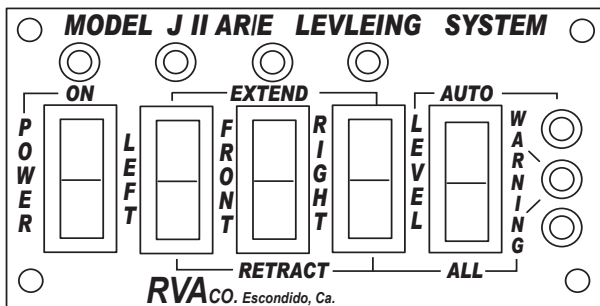
Parking Brake



WARNING: If the air tank is not dumped, there is the possibility of an accidental release of the parking brake. Traveling with small children and/or pets may require a small block to be fabricated to prevent accidental release. The block should be placed under the knob and rested on the dash panel. A wooden clothes pin clasped at the base of the shaft will work.

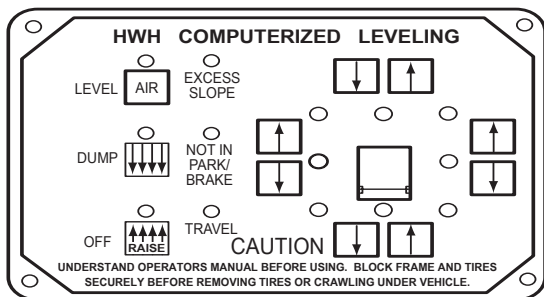
The parking brake system is activated when the push-pull control knob (located on the driver's left console panel) is pulled. When the knob is pushed, the brake is released. Prior to driving, allow time for the air compressor to build up sufficient air to shut off the air warning lamp.

Leveling Controls



RVA Control (Hydraulic Systems):

The three-point hydraulic leveling system is operated from the control module. You can manually or automatically level the motorhome. The control features a multiple warning system with flashing lights and a "bong" alarm to alert you of the jack down position.

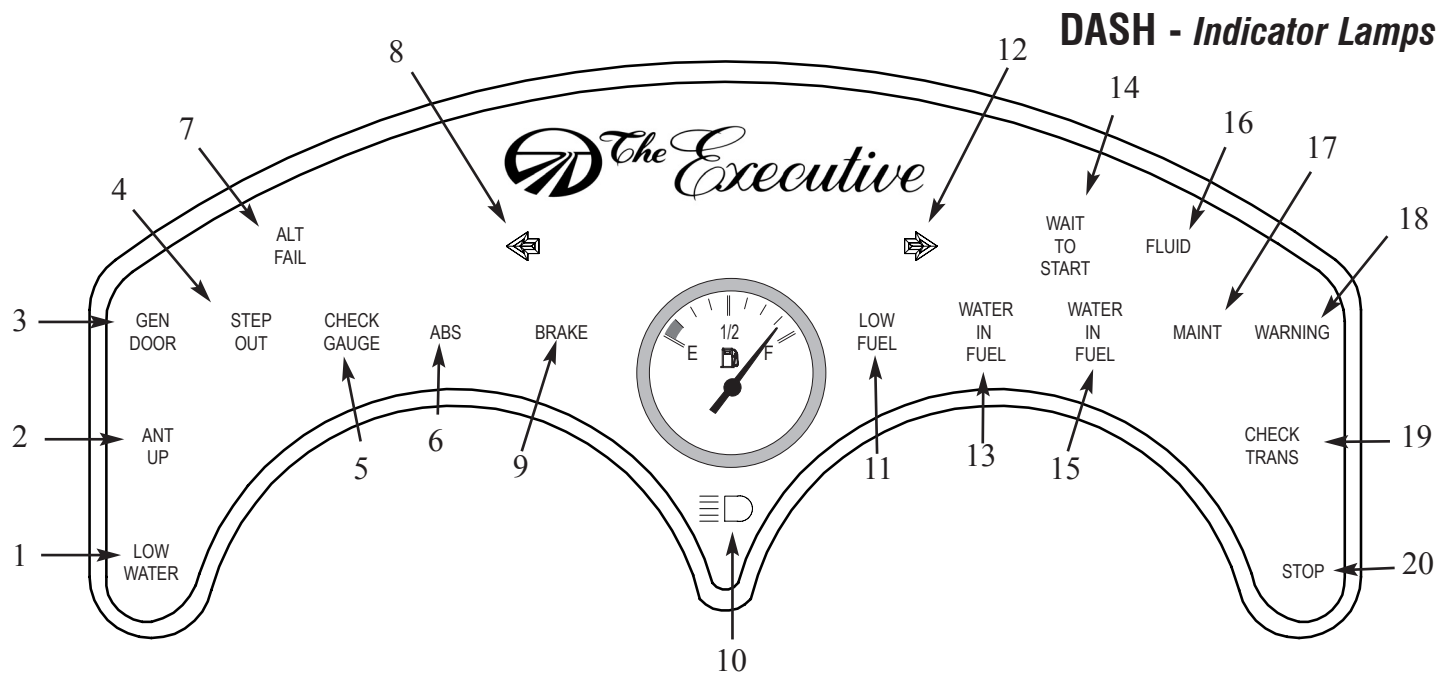


HWH Control (Air Systems):

The touch panel, computer controlled, four-point air leveling system is an option available for the motorhome. The keypad on the system controls the computerized air-leveling operations. The ignition must be ON in order for the suspension system to function.



NOTE: The suspension on the air leveling system will NOT operate unless the ignition is ON.



1. Low Water:

Indicates coolant level in the overflow tank is below acceptable level.

2. Ant Up:

Indicates TV antenna is not resting flat in the storage cradle.

3. Gen Door:

Indicates the generator door is open.

4. Step Out:

Alerts the driver to possible problem with the entry step. Usually the step is in the extended position.

5. Check Gauge:

Alerts the driver to a problem with Temp gauges and Pressure gauges.

6. ABS:

Indicates ABS possible fault in the ABS Brake system. Also indicates faults codes for service technicians.

7. Alt Fail:

Indicates a failure within the alternator charging system.

8. Left Arrow - Audible Turn Indicators:

Indicates left turn indicator circuits active. Will override with brake application.

9. Brake:

Indicates parking/emergency Brake is applied.

10. Headlight Beam:

Indicates high beams when illuminated.

11. Low Fuel:

Indicates fuel level is becoming low.

12. Right Arrow - Audible Turn Indicators:

Indicates right turn indicator circuits active.

13. Water in Fuel:

This is a negative tripped light used only with the ISL Engine.
Indicates water has been detected in fuel.

14. Wait to Start:

This monitors the air intake heater at start. This is only used with the ISL engine.

15. Water in Fuel:

This is a positive tripped light used only with the ISM engine.

16. Fluid:

Indicates out of range condition exists within the engine protection circuits. Stop coach, check all fluid levels.

17. Maint:

Indicates out of range condition exists within the engine protection circuits. Stop coach, check all fluid levels.

18. Warning:

Indicates out of range condition exists within the engine protection circuits. Stop coach, check all fluid levels.

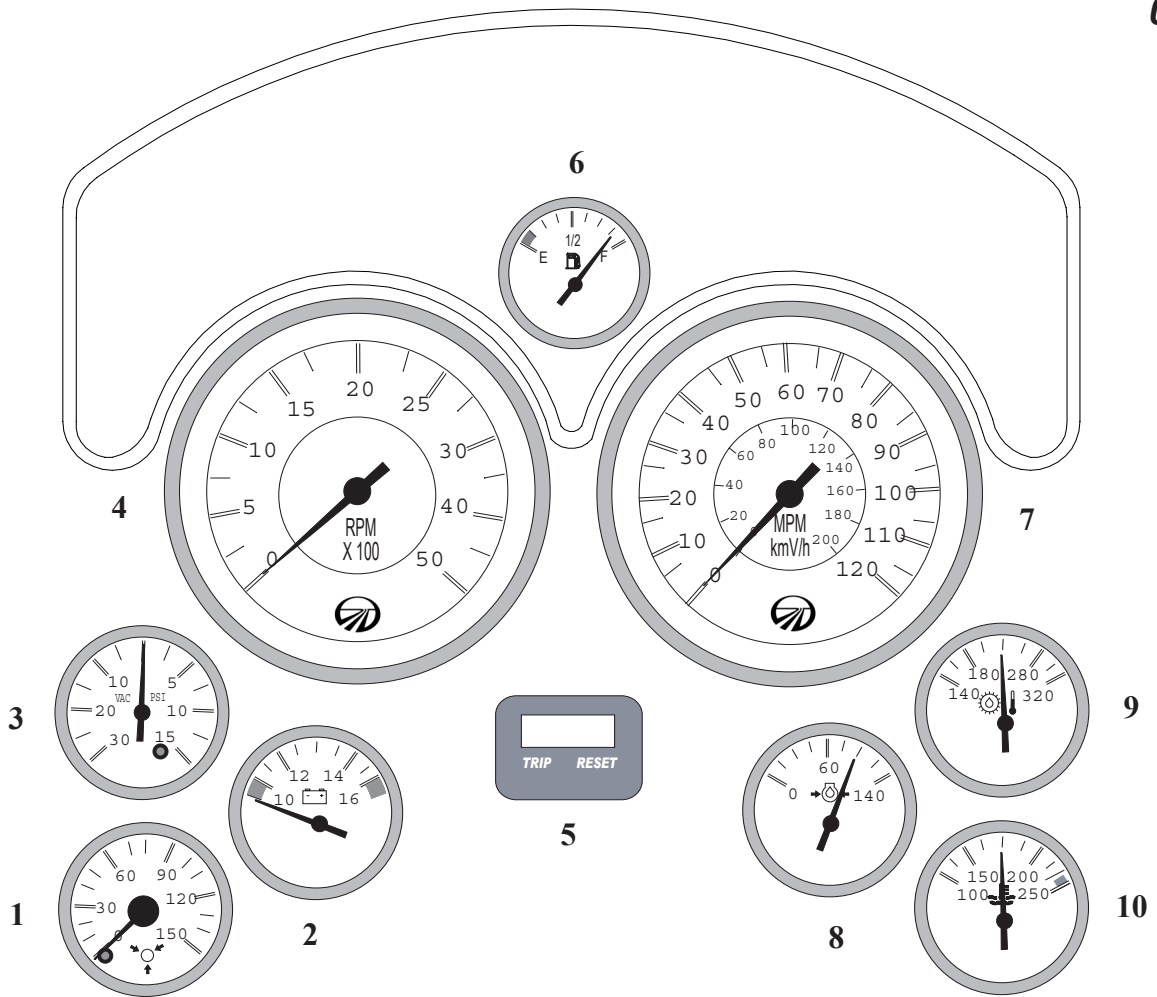
19. Check Trans:

Alerts of problems related to the Allison Transmission.
The light should momentarily illuminate when the ignition is switched ON. When starting the lamp will extinguish indicating the circuits are working properly. If the lamp fails to illuminate, or remains on, the system needs to be checked immediately.

20. Stop:

Alerts of severe out of range condition within the engine protection circuits. Pull over and stop as soon as possible. Shut-off engine to avoid engine damage.

Gauges



1. Air Pressure:

This indicates the air pressure in the front and rear air brake system. The air system operating pressure is 90 to 120 psi. These pressures are preset at the factory. If problems occur with either system maintaining sufficient pressure, contact your dealer immediately.



NOTE: It is not safe to drive a motorhome with low air pressure. Damage could occur to the suspension and drive line.

2. Voltmeter:

This gauge shows the charge condition in the chassis battery. The normal voltage with the ignition switch **ON** and the engine **OFF** varies between 12.0 and 13 Volts. With the engine operating, and not a heavy load, the battery charging voltage is about 14.0 Volts. Battery readings of less than 10.5, or more than 15 Volts, usually indicate a battery or electrical system problem.

3. Turbo Boost:

Indicates boost pressure produced by engine turbocharger.

4. Tachometer:

Displays engine speed in revolutions per minute (RPM).

Tachometer reads output pulse of alternator. If tachometer quits, or indicates irradically, have alternator checked immediately.

5. Odometer/Trip Meter:

Odometer/trip meter is located in dash and records mileage driven, as well as keeps track of mileage on a trip. To operate trip meter push button labeled "trip" which changes odometer mileage reading to trip mileage reading. Reset button sets trip mileage back to zero.

6. 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. Optional diesel Generator and Aqua-Hot system both use fuel from main tank, and will affect fuel mileage figures. Diesel generators and Aqua-Hot will not operate below 1/4 tank to insure there is enough fuel to run main engine.

7. Speedometer:

Indicates the speed of the motorhome. The gauge indicates MPH and KPH. Located on right side of instrument cluster.

8. Oil Pressure:

Indicates pressure of oil and not the amount of oil in system.

Please refer to manufacturer's instructions for specific pressure recommendations.

9. Coolant Temp:

Under average conditions the gauge will read between 180° F and 205° F. Monitor this gauge frequently when CLIMBING HILLS, TOWING OR IN HIGH AMBIENT TEMPERATURES. If the gauge shows that an overheating condition exists (the needle moving above the 212° F area) IMMEDIATE ACTION should be taken.

Overheating may be a result of any of the following conditions:

- Low coolant level.
- Hydraulic fan motor failure.
- Mechanical failure of hoses or belts.
- Blocking of charge air cooler fins.
- Climbing a long hill on a hot day.
- Towing a heavy trailer.
- Idling for long periods of time.

10. Trans Temp:

Shows temperature of transmission fluid. Normal transmission operating temperature is 160-250° F. The maximum transmission to cooler oil temperature is 300° F. Do not let the transmission temperature exceed 275° F. If excessive temperature is indicated, stop motorhome and shift to neutral. Accelerate engine to 1200-1500 RPM and allow temperature to return to normal.

The Dash switches will fall in one of two style switches. One is considered Non-Lighted, while the other is considered Lighted. Both of these switches may be multi-position throw switches and/or spring loaded toggle switches.

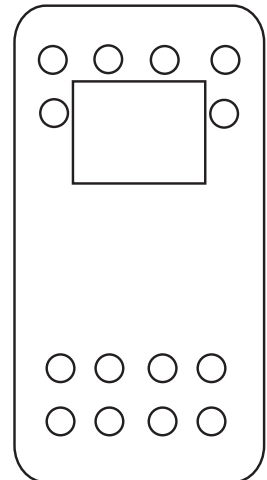
Switches

Non- Lighted Switches:

Step Cover - The motorhome is equipped with a sliding stepwell cover that is extended and retracted by use of a dual action air cylinder. An electrically operated air valve controls the air cylinder. The air solenoid, known as a "MAC" valve receives air pressure from the front air tank. The "MAC" valve will direct the air pressure to either side of the dual action air cylinder, moving the stepwell cover in or out. The stepwell cover will not operate without sufficient air pressure (approx. 60 psi).



WARNING: Stepwell cover is under air pressure. When operating the stepwell cover be sure there are no pets, shoes or other obstructions in the stepwell area. Do not operate the stepwell cover while standing in the stepwell area.



Battery Boost - The Battery Boost 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. The system works this way: A ground wire comes off the front fire wall to the battery boost switch. When the battery boost switch is activated by pressing you will be sending a ground signal to the rear of the coach through the 12-gauge orange wire to the 1,000 Amp solenoid. You should hear a loud clicking noise as the solenoid is being activated. If the boost solenoid is inactive, locate the molex plug and start the troubleshooting process by removing the cover on the dash. It may be necessary to remove the wire from the battery boost solenoid and perform a continuity check from the front to the rear of the motorhome.

Non- Lighted Switches continued:

Fan HI/LO - Operates the dash fans.

Gen IN/OUT - Operates hydraulic slide-out for generator access. The switch will illuminate when the generator door is open.

Brake HI/LO - This switch allows for the selection of different levels of engine braking power. Selecting "**LOW**" activates the engine brake on three cylinders. Selecting the "**HI**" setting activates the engine brake on six cylinders.



NOTE: The ISL engine does not have a HIGH/LOW switch. All six cylinders are activated when the engine brake is used

Ceiling Lights - Illuminates the front ceiling light.

DRVR Shade - Operates the power sun visor located on driver's side.

PASS Shade - Operates the power sun visor located on passenger side.

Pedal In/Out - After sitting in the driver's seat and making adjustments to the mirrors and steering wheel, use the **Pedal In/Out** switch to adjust the brake and throttle pedal to be either closer or farther away. The switch moves the pedals inward or outward approximately three inches. If the pedals need to be moved inward, push the same switch in the opposite direction. When the pedal comes to the end of the traveling distance you will hear a different sound in the noise of the motor. Stop by releasing the switch. Do not continue moving the pedals. Damage to the motor and or fuse may result if operation of the switch continues after reaching the fullest extend or retract position.

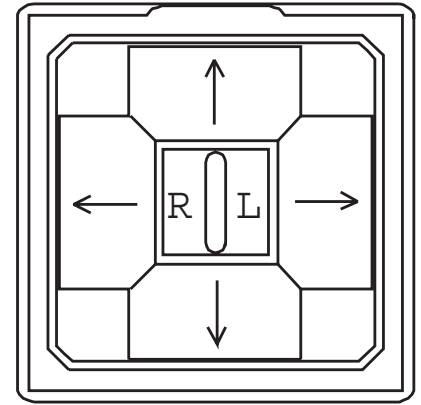
Air Dump - Will manually dump air from the air bags. May be an aid in leveling the motorhome. Releasing the air from air bags will give the leveler more range of travel for leveling.



NOTE: Never drive the motorhome with the air bags deflated. This may damage the motorhome.

INC/DEC - This switch will increase and decrease the engine idle in 25 rpm increments. There are limits to the idle speed, about 700 to 875 rpm.

Mirror Adjust - To adjust the rear view mirror, the small selector in the middle of the switch must be placed in the desired side. The middle position is to prevent accidental bumping of the switch and changing the mirror position. The outside mirrors have been placed so they can be easily adjusted with the Allen wrench. After taking delivery of the new motorhome it will be necessary to sit in the driver's seat and adjust the mirrors to driver's needs. Both the driver and the passenger mirrors should be adjusted. Adjustments to the mirrors can be made with little effort, using your hand.



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.

Using your left hand, you can make the adjustments to the mirrors. When using the mirror heat switch, just turn the switch to the on position. Only use the mirror heat long enough to defrost the mirror.

Top Mirror = convex glass.

Middle Mirror = flat glass.

Bottom Mirror = convex glass.

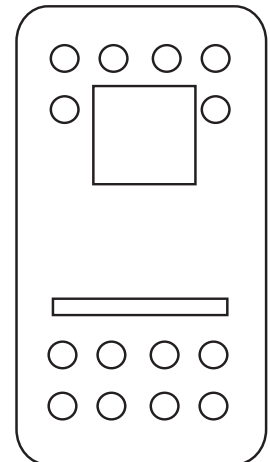
Lighted Switches:

Block Heat - The length of time that the block heater must be on to be effective depends on the length of time that the engine has been shut down and what the ambient air temperature is. For example: If the engine has been shut down overnight in sub freezing temperatures, the block heater may need to be on for a minimum of two to three hours. With lower ambient temperatures, and longer shutdown periods, time required to heat the block increases substantially.

Dock Lts - Operates the side docking lights to increase visibility parking or backing.

Fog Lights - Turns fog lights ON and OFF for better visibility. The fog lights will operate with the Low Beam of the headlights.

GEN ON/OFF - Starts and stops the generator from the dash area.



Lighted Switches continued:

Engine Heat (Optional) - The engine preheat loop is an integral part of the Aqua-Hot heating system. In cold ambient temperatures, use this feature to preheat the engine. The Aqua-Hot will also supply supplemental heating to the interior using the heat created by the engine. While traveling, the water pump on the engine coolant will pass through the Aqua-Hot. When using the supplemental heating feature, use the Comfort Control thermostat to activate the desired heat exchangers.

To Enable Engine Preheat:

- Turn Aqua-Hot switch on.
- Turn the engine heat switch ON. This activates the engine preheat circulation pump. Circulating the engine's coolant through the engine pre-heat loop will adequately warm the engine to operate for easy starting.
- Allow approximately one to two hours (longer for colder, ambient temperatures) of engine preheating run time. The pump can be operated overnight if desired.
- Turn the engine heat switch **OFF** when engine preheating is not desired.

TAG Axle - Switch raises and lowers tag axle. When headlight switch is off, switch light is not illuminated. In certain situations tag axle may require to be in up position. Raise the tag axle when making sharp turns under 5 mph.

When using tag axle switch:

- Tag axle down when switch is not lighted.
- Tag axle in up position when switch is lighted.
- Tag axle switch will illuminate when tag axle is raised or headlights are on.



NOTE: DO NOT drive the motorhome over five MPH with the tag axle raised. The manufacturer will not be held responsible for any damage that may occur from driving with the tag axle raised.

Mirror Heater - This switch turns on the heaters in outside rear view mirrors. The mirror heaters should be used when defogging or deicing is needed. To use the mirror heat, press the switch to the ON position.



NOTE: Mirror heat should not be left on unless continuous fogging conditions occur.

**Air Conditioner
& Heater Controls**

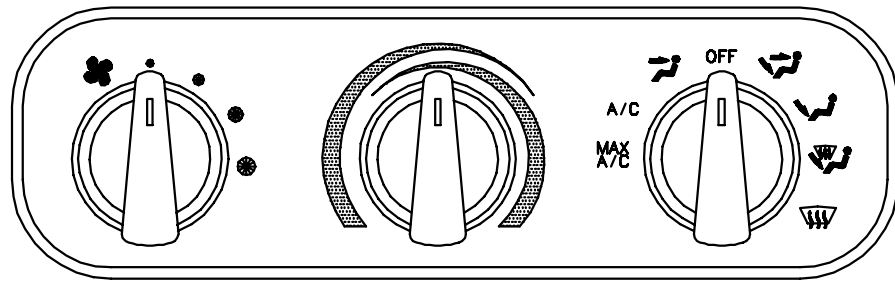
Dash AC and Heater Control: The system is designed to only provide heating, cooling and defrost capabilities for the pilot/co-pilot area. The system is not capable of heating or cooling the entire motorhome.

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.

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.



Blower Speed Control

Temperature Control

Mode Control Switch

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 effected by ambient temperatures 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 30° F cooler than the fresh or recirculated air entering the AC 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.

Trouble Shooting: The dash A/C/Heat system uses a combination of compressed air (developed by the chassis system), vacuum air (developed by the vacuum generator) and electric relays and vacuum switches. Therefore, any repair can be classified in one of five categories:

- **Electrical** • **Vacuum** • **Air Conditioner** • **Heater** • **Defroster**

The 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:

1. A/C switch is turned off.
2. Blower switch is turned off.
3. Verify the proper engine coolant level.
4. Verify that the engine is reaching operating temperature.
5. Verify engine coolant is reaching water valve attached to unit.
6. Verify operation of water valve to permit engine coolant to pass through valve to heater core.
7. Check unit fuses.
8. Check power supply to water valve and grounding.
9. Check wiring.
10. Engine thermostat faulty.

No Cooling:

1. Check blower is operating, A/C switch is in A/C or Max position, temperature control is turned to max cooling (blue area).
2. System fuses are not blown.
3. Condenser fan is operating.
4. Check power supply to unit and grounding of system.
5. Check wiring.
6. Coolant valve leaking.
7. Drive belt loose or broken.
8. Compressor Clutch inoperative, will not engage.
9. Expansion Valve faulty or frozen.
10. Thermostat control faulty.
11. Mode control switch faulty.
12. Compressor faulty.
13. Loss of refrigerant.

Reduced Cooling:

1. Coolant valve not operating correctly.
2. Air passages obstructed.
3. Loose or worn drive belt.
4. Check blower and select switch.
5. Thermostat control valve faulty.
6. Expansion valve faulty.
7. Compressor faulty.
8. Low refrigerant charge.

Blower Does Not Operate or Runs Slow:

1. Check fuses.
2. Check for loose or corroded connection.
3. Check wiring.
4. Check ignition switch is "ON."
5. Check blower and select switch.
6. Motor shaft seized.
7. Blower wheel out of alignment.

Damper Doors Do Not Operate:

1. Does motorhome air tank have pressure?
2. Check vacuum generator is being powered and producing vacuum.
3. Check vacuum line entering unit for vacuum.
4. Check that the vacuum solenoid mounted on unit is receiving power from the mode switch. If operating properly, the vacuum solenoid will feel hot if current is engaging the solenoid.
5. Check mode switch.
6. Check wiring.
7. Check for pinched vacuum line leading to the vacuum motor operating the damper door in question.

Air Conditioner Refrigeration Components:

Compressor - The compressor is belt driven from the engine through the compressor and electronic clutch pulley. The compressor will pump freon from a low pressure gas into a high pressure, high temperature gas. This is the start of the refrigeration process.

Condenser - The condenser in front of the radiator is made of coils and fins which provide rapid transfer of heat from the refrigerant as external air passes over the coils. The high pressure gas is changed to a high pressure liquid.

Condenser Fan - A steady flow of cooling air is maintained across the condenser during system operations. The fan is part of the hydraulic system.

Receiver-Drier - Freon leaves the condenser, enters the dehydrator and is stored until needed. The drier filters out moisture in the system. It only takes one drop of moisture to cause a malfunction in the cooling unit.

Expansion Valve - The expansion valve suppresses the refrigerant into the evaporator according to the cooling requirements. The pressure is reduced in the restrictive effort of the expansion valve. A part of the valve is the capillary tube assembly. The capillary tube is the sensing bulb at the outlet of the evaporator.

Evaporator - A tube core and fins are used in the evaporator similar to the condenser. Air is blown through the fins to allow the evaporator to cool and reduce the pressure.

Blower and Motor - Just as the condenser has a fan, the evaporator has a fan called the blower. The blower will draw air from the cab area and force the air over the evaporator coils and fins. This forced air will ensure continuous vaporizing of the R134a.

Relays and Switches - Both electronic and vacuum switches are used in the control and operations of the system.

Chemical Stability:

The air conditioning system life and efficient operations depends upon the chemical stability of the refrigeration system. The refrigeration system is made of Refrigerant-R134a and Polyakylene Glycol (PAG) synthetic lubricant. It is very important that all materials contained within the refrigerant system be chemically compatible. The only suitable compound for use with R134a is PAG. The total amount of PAG within the refrigerant system is approximately 18% of the total refrigerant in the system.

How much refrigerant is in the system. How much should be used when charging? You will need 1 oz. of PAG for each 7 feet of hose after the first 15 feet of hose. Roughly, a 40 foot motorhome will use 92 feet of refrigerant hose. Take 15 feet off the measurement and the result would be 77 feet. This 77 feet is then divided by 7 for total of 11. This represents the number of ounces of PAG oil needed for the A/C system (11 oz.).

Carrying the formula one step further, the 11 oz. equal approximately 18% of the entire system. The total will equate to approximately 61 oz. or 3.8 lbs. of R134a.

High pressure readings are another way to determine the amount of charge. The ambient temperature reading is measured one inch away from the condenser. The ambient temperature reading, plus 40°F, will equate to a value from the pressure table.

EXAMPLE: 90° F
1 inch from condenser
+40°F
130°F ----- 198.90

TEMP F/ PSIG	TEMP F/ PSIG	TEMP F/ PSIG
16 15.69	60 57.47	112 151.30
18 17.04	65 64.10	114 156.10
20 18.43	70 71.19	116 161.10
22 19.73	75 78.75	118 166.10
24 21.35	80 86.80	120 171.30
26 22.88	85 95.40	122 176.60
28 24.47	90 104.40	124 182.00
30 26.10	91 106.30	126 187.50
32 27.79	92 108.20	128 193.10
34 29.52	93 110.20	130 198.90
36 31.32	94 112.10	135 213.70
38 33.17	95 114.10	140 229.40
40 35.07	100 124.30	145 245.80
42 37.03	102 128.50	150 263.00
44 39.05	104 132.90	155 281.00
45 40.09	106 137.30	160 300.10
50 45.48	108 141.90	165 320.00
55 51.27	110 146.50	170 340.80

PSIG-On fully charged system the expected pressure that should be seen on the HIGH-SIDE gauge will be around 200 PSIG.



NOTE: All systems are charged at the factory with 4.0 lbs of R134A.

R-134a Refrigerant:

R134a is classified non-explosive, non-flammable and non-corrosive.

There is hardly any odor and it is much heavier than air. R134a is ozone friendly; however, it is not technician friendly. Proper care in handling and adequate ventilation must be observed. Under normal atmospheric pressures and temperatures R134a will evaporate so quickly it will freeze anything it comes in contact with. The open container boiling point for R134a is minus 21.7° F. This low boiling point makes for an ideal refrigerant. The tremendous amount heat transfer which occurs when a liquid boils, or vapors condense, forms the basic principles of all A/C systems. The amount of heat required to raise or lower the temperature of one pound of water by 1° F equals one British Thermal Unit (BTU). The BTU is the standard measurement of an air conditioner system.

Safety and Handling of 134A and Pag Oil:

- When working with any refrigerant system wear eye protection and hand protection.
- Pag Oil irritates the skin. Flush with water immediately if in contact with any body part.
- Ensure any service work performed on the A/C system is in a well ventilated work area.
- Keep open flame away from service area. The discharge of a refrigerant gas near an open flame can produce a very poisonous gas.



NOTE: O-rings used in a 134A system are Hydrogenated Nitrile Butadiene Rubber (HNBR). These are green in color and required for the 134A system.

A/C Heater:

The A/C system will also produce heat to warm the air in the dash area. Much like the refrigeration side of the system, a liquid will be used in the process. This liquid is the engine coolant. The coolant is passed from the radiator to an electronic water valve. The water valve, when open, will allow the coolant to flow through the heater core. The heater core is tubing and fins. Air is drawn into the system by a blower motor through the outside recirculation door opening. Air is blown through the A/C evaporator core and then through the heater core. When the temperature control is in the **WARM** position coolant flows through the heater core. When the temperature is in the **COOL** position coolant flow bypasses the heater core. In either position the air flow is felt at the discharge vents.

Diagnosis of Electric Water Valve:

Theory of Operation: Monaco models with a center dial temperature control use a potentiometer at the control head for input of desired temperature. The water valve, which controls the water flow to the heater core is opened and closed by a stepper motor mounted on the water valve. A control module compares the output voltage from the control to that of the feedback for the stepper motor of the water valve. The control module then drives the motor to within one-half volt of the control potentiometer voltage.

Functional Test:

- Start and operate the engine until the water reaches normal operating temperature.
- Set the HVAC temperature control to the full hot position.
- The discharge air outlets should have hot air.
- Rotate the temperature control to full cold position.
- Allow 10 minutes for the temperature to stabilize.
- The discharge air outlets should have cold air.

No Heat:

- Check the blower and air mode operations. Fix or repair prior to proceeding.
- Verify the engine is reaching normal operating temperature. (Check with engine manufacturer for proper procedure.)
- Check the inlet hose at the water valve. The hose has hot water at the valve inlet. The inlet water temperature should be the same as the engine water temp.
- With the temp control on full hot position, check the outlet hose of the water valve. The hose should be at engine water temperature.

Vacuum Generator:

The vacuum generator is important to the operation of the dash heating and A/C systems. This provides the vacuum to open and close the vacuum switches. When the vacuum generator is operating it creates 15 inches of vacuum and is passed to a reservoir ball. Most dash heater and A/C systems will only require 10 inches of vacuum to operate the switches. The output from the reservoir is sent to the vent control knob. The control knob will then direct the vacuum operation to the appropriate vacuum switch to open or close vents and switches. The vacuum generator uses the air from the front air storage tank through a 1/4 inch red air line. Whenever the ignition is ON, and the A/C is operating, the vacuum generator will operate.

NAVIGATION SYSTEM **Global Positioning System (GPS)**

The navigation system can be a very powerful tool in daily traffic. The automatic route planning and guidance enables you to concentrate more on the increase of traffic and ever changing road conditions. The mess from road maps laying around and time consuming route planning is a thing of the past. Simply enter your destination prior to starting out and the visual and audio guidance will assist you. This all can be accomplished in part from the Global Positioning System (GPS). The GPS is comprised of 24 satellites 13,000 miles above the earth.

Signals from only four of these satellites will enable a sufficient, accurate position. The accuracy is between 20 to 40 feet with eight satellites maximum reception.

Remote Control:

A small, hand held, remote control will control the navigation system. The control requires two AA batteries. The batteries will have to be replaced when the system does not respond to a key input or the battery icon illuminates in the status line. When any key is pressed on the remote control the keypad will illuminate. After five seconds of inactivation the keypad will automatically shut off.

The system is wired to operate in conjunction with the domestic power. The battery cut-off switch must be ON. When the system is powered ON, a safety notification for the system will appear. Read and accept this notification with the **OK** key.

Once the **OK** key is pressed the main menu will appear. The **STAND-BY** in the main menu will enable you to switch off the display. You will still have audible guidance advice. Any key on the remote, when pressed, will switch the display back on. The main menu offers various options and other menus for use with the system. You need only press the arrow keys to highlight your desired option. Confirm all selections with the **OK** key.



NOTE: Information entered into the navigation system should only be done when the motorhome is at a safe stop point. Attempting to operate the system while driving can distract your attention from the road and possibly cause an accident. It is more important to keep your eyes on the road and your hands on the wheel.

Keeping Updated:

Highways are changing constantly. A 100% correspondence of the digital map cannot be achieved in all circumstances. Contact Navigation Technologies 1- (888) NAV-MAPS for additional maps, new maps or for difficulties with a current map.



Consult the owner's manual in your information box for more detailed information.

When the ignition is switched ON the compass displays the forward direction of travel and the ambient temperature. When the ignition is OFF the compass remains in sleep mode. The compass may be temporarily awakened by pressing the Mode button for three seconds. Pressing the F/C button will toggle the temperature indication between Fahrenheit and Celsius.

The compass is calibrated at the factory. To retain directional accuracy of the compass, 22 zones are used. To change the zone setting, or calibrate the compass, press the Mode button for 12-15 seconds. The words Zone and Cal will appear in the screen.

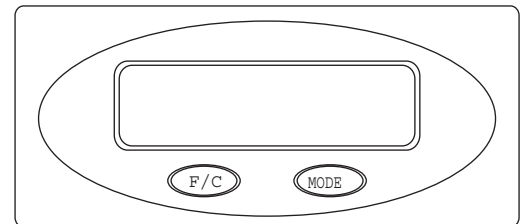
- Press the F/C button to change zones. The compass does not require calibration when selecting a new zone. Press the Mode button twice to escape the calibration time period.
- Press the Mode button to enter the 60 calibration time period. Slowly complete a 360° turn of the motorhome to orient the compass. After the 60 second calibration period the compass will return to a normal display. If the word Cal is flashing the compass is not calibrated and the calibration process will have to be repeated.



NOTE: When selecting a new zone refer to the owner information file to obtain the correct zone for the current location.

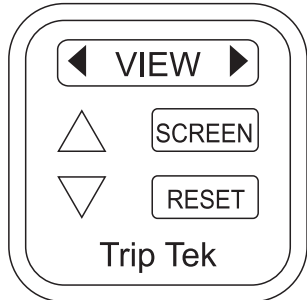


NOTE: The compass is powered from the chassis battery. The compass should not require calibration when the main battery disconnect switch is turned off.

Compass

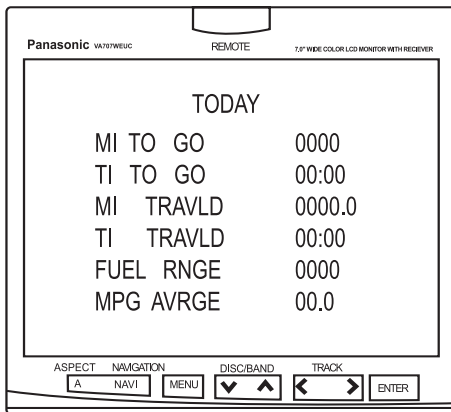
TRIP TEK (Optional)

The Trip Tek system is simplistic in design. Three programmable screens help manage trips, engine/transmission status also displays fuel level and calculated range. The system component consists of a keypad, a computer and utilizes the rear vision monitor for display. The keypad has five function keys, each with a single function. The system is virtually maintenance free.



Key Pad:

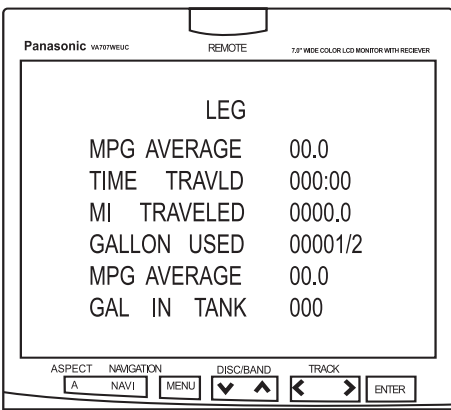
- **View** enables the display on the rear vision monitor.
- **Screen** enables or disables the display from the rear vision system.
- **Rest** zeroes out the screen for **TODAY** and new information for inputting.
- **Arrow Up** scrolls the numbers for inputting.
- **Arrow Down** scrolls the numbers down for inputting.



Screen Displays:

Today Screen will provide daily information.

- **Miles to Go** displays the remainder of miles to the scheduled destination.
- **Time to Go** displays the approximate time to the scheduled destination based upon miles to go and MPH Average.
- **Mi. Traveled** displays the miles traveled since last "Today" screen reset.
- **Time Traveled** displays the time traveled since last "Today" screen reset.
- **Fuel Range** based upon **MPG AVERAGE** and **GAL IN TANK**, displays approximate miles available for remaining fuel.
- **MPG Average** displays the average fuel consumption per gallon since last "Today" screen reset.

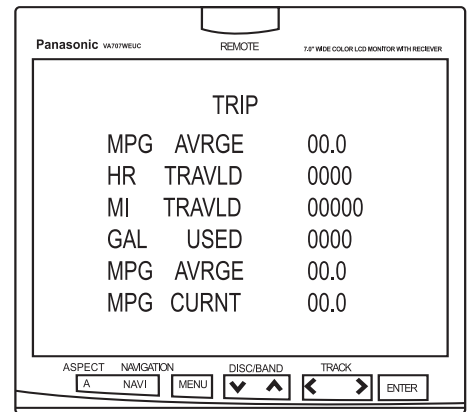


Leg Screen provides information from fill to fill.

- **MPG Average** displays the average fuel consumption per gallon since last "Leg" screen reset.
- **Time Traveled** displays the time traveled since last "Leg" screen reset.
- **Mi. Traveled** displays the miles traveled since last "Leg" screen reset.
- **Gallons Used** displays the gallons of fuel used by the engine since the last "Leg" screen reset.
- **MPG Average** displays the average fuel consumption per gallon since last "Leg" screen reset.
- **Gal in tank** displays approximate gallon in fuel tank.

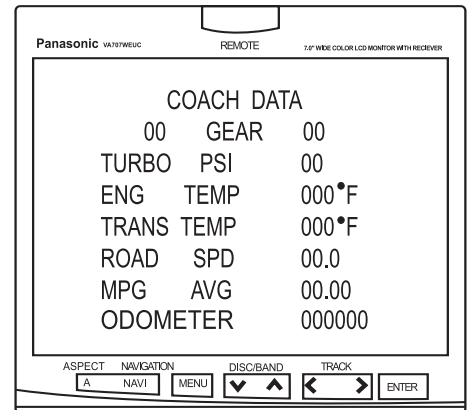
Trip Screen display long term data for a complete trip or longer.

- **MPG Average** displays the average fuel consumption per gallon since last "Trip" screen reset.
- **HRS Traveled** displays the hours traveled since the last "Trip" screen reset.
- **Mi. Traveled** displays the miles traveled since last "Trip" screen reset.
- **Gal Used** displays the gallons of fuel used by the engine since the last "Trip" screen reset.
- **MPG Average** displays the average fuel consumption per gallon since last "Trip" screen reset.
- **MPG Current** instantaneous display current fuel consumption in miles per gal.

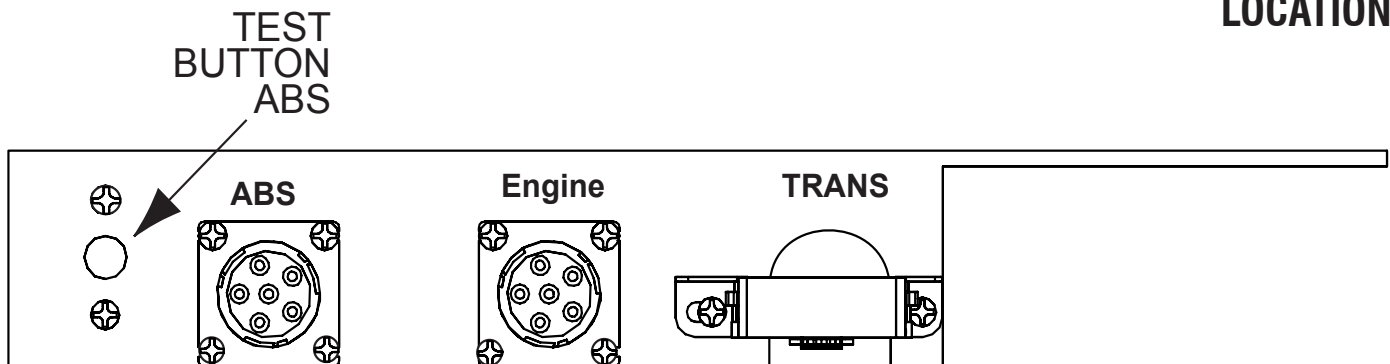


Coach Data Screen displays information for the motorhome and engine performance.

- **Gears** displays the gears selected and attained.
- **Turbo PSI** displays the Turbocharger boost pressure.
- **Eng. Temp** displays the coolant temperature.
- **Trans Temp.** displays the transmission oil temperature.
- **Road SPD** displays the current speed of the motorhome. This indication is NOT intended to replace the motorhome speedometer.
- **MPG Average** displays the average miles per gallon for the life of the motorhome.
- **Odometer** displays the total distance travel for the life of the motorhome.

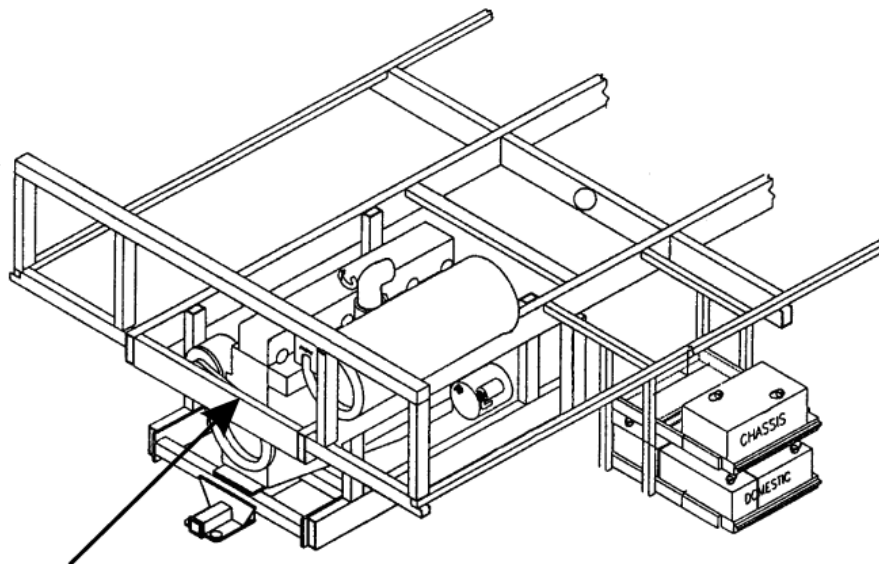


DIAGNOSTIC PLUG LOCATION



Eaton, Cummins and Allison diagnostic plugs are located under the left side of the dash.

DIAGNOSTIC BRACKET (ENGINE)



Auxillary Engine Diagnostic Plug
(Located in this general area.)

BULB USAGE - EXTERIOR

EXTERIOR BULB CHART	
LOCATION	BULB NUMBER
HEADLAMP - LOW BEAM	SYLVANIA 9006
HEADLAMP - HIGH BEAM	SYLVANIA 9005
FOG/DRIVING LIGHTS	GE 894X
TURN SIGNAL - FRONT	SYLVANIA 3157
	SYLVANIA 3057
	PHILLIPS P194
TAIL/STOP - REAR	SYLVANIA 1157
TURN - REAR	SYLVANIA 1141
BACK-UP	SYLVANIA 1141
LOWER & UPPER MARKER LIGHTS	C 194
DOCKING LAMP	1003 or 93

This section contains knowledge and information on various components of your motorhome chassis. Following the guidelines and procedures will help you to understand and operate your motorhome. Complete instructions for various components can be located in the operator's manual included in the Owner's Information File box.



WARNING: When frame or other welding is involved for motorhome repair or modification the following precautions are required to protect electric components in the motorhome chassis.

- 1. Disconnect the (+) positive and (-) negative battery connection, and any electronic control ground wires connected to the frame or chassis.**
- 2. Cover electronic control components and wiring to protect from hot sparks.**
- 3. Disconnect the wiring harness connectors at the transmission electronic control unit.**
- 4. Do not connect welding cables to electronic control components.**
- 5. Attach the welding ground cable no more than two feet from the part to be welded.**

The Roadmaster chassis design provides exceptional balance, handling and braking characteristics. The Roadmaster rear engine chassis is an engine and frame unit featuring a semi-monocoque tubular all steel frame design, providing greater structural integrity and uniform stress distribution. Incorporated in the Roadmaster chassis is the exclusive air glide suspension system using eight outboard mounted air bags and shock absorbers. Tag axle models incorporate two inboard mounted air bags and shock absorbers. The design and set up is intended to provide the smoothest ride, best handling and trouble free service while delivering top notch drivability. The chassis has either a three point hydraulic leveling system or air leveling system. The Roadmaster chassis design offers unsurpassed ease of maintenance and service.

The towing system rating incorporated in the construction of the frame is 10,000 lbs. towing and 1,000 lbs. tongue weight.

The Roadmaster's exclusive cushion air glide suspension consists of front and rear axles, with leading and trailing arms in a parallel four link arrangement. A panhard bar on each axle controls side motion. Each axle mounts to a wide platform H-frame that carries the coach body on eight outboard mounted air bags (4 front and 4 rear). Each of the eight air bags couples with a Bilstein gas shock absorber. The suspension control arms attach to the frame through bushings, which require no lubrication.

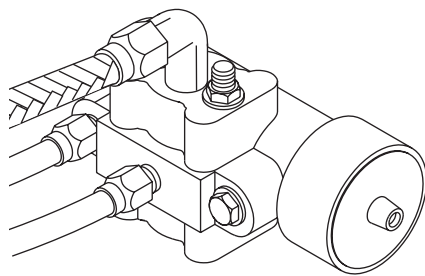
The suspension ride height is preset and will maintain the proper suspension height throughout the load range.

AIR SUPPLY SYSTEM

The air compressing system on the motorhome is comprised of several items: an air compressor, air governor, air dryer, a front air tank and a rear air tank. The compressed air system operates several items, some of which include brakes, suspension, air horns, air gauge and stepwell cover. The air system is charged by a gear driven air compressor mounted on the engine. As engine speed increases, compressed air output increases. When the air is compressed, heat is generated. Heat dissipates as the air is discharged from the compressor. Moisture condenses in the compressed air as it cools. The moisture laden air then enters an air dryer where the air is filtered. The filtered air charges the front air tank. The front air tank is divided in two halves: a wet side and a dry side. The compressed air enters the wet side before entering the dry side. A discharge line from the dry side of the front air tank charges the rear air tank. The discharge lines use inline check valves to prevent back flow of compressed air.

The pneumatically operated items are divided into two categories: brakes and accessory air. Brakes have full use of supplied air pressure. Accessory air items, such as air horns or stepwell covers, receive air through pressure protection valves (PPV). The PPV will not allow compressed air flow until approximately 60 psi. In the event of an air system problem, the pressure protection valve will leave a reserve air charge for braking. Pressure protection valves are installed for safety.

AIR GOVERNOR



The air governor is located in the engine compartment and performs two functions: it regulates the air compressor to cut-in and cut-out, keeping the air system in the specified operating range of 105-120 psi; sends an air "purge" signal to the Air Dryer.

Cut-in pressure of approximately 105 psi. is factory preset from the governor manufacturer and is not adjustable. Cut-out pressure is calibrated to 120 psi. When cut-out pressure is reached, the governor will send an air purge signal to the Air Dryer. This opens the purge port of the Air Dryer, expelling moisture. The purge action of the Air Dryer is identified by the short release of air at the rear of the motorhome.

AIR DRYER

The air dryer is located underneath the motorhome next to the transmission. The air dryer removes moisture from the compressed air system. This is important because if air contains moisture it can freeze and prevent operation of brakes or other pneumatic operated items.

The air dryer has three functions: cooling, filtering and drying the air going through the motorhome's air system. If an excessive amount of water is present when performing the monthly air tank drain service, it may be an indication that the filter for the air dryer needs to be changed.

Air Dryer Operation

During system pressure build-up compressed air passes into the air dryer where the filter system removes contaminants and passes the air into the drying stage. Initially, moisture that condenses out collects in the base of the dryer. Moisture-laden air passes through the desiccant bed in the air dryer cartridge and is dried. When the compressor unloads, the water is expelled and the dry air flows back through the dryer, drying the desiccant for the next cycle.

Air Dryer Cycle

The governor turns the compressor on when supply tank pressure drops below cut-in pressure. Compressed air passes into the air dryer at the inlet port:

- Moisture-laden air and contaminants pass through the desiccant.
- Moisture is retained by the desiccant. Moisture also collects in the base of the dryer.

When the compressor unloads the purge valve opens. The governor turns the compressor off when the system reaches cutout pressure (approximately 120 psi).

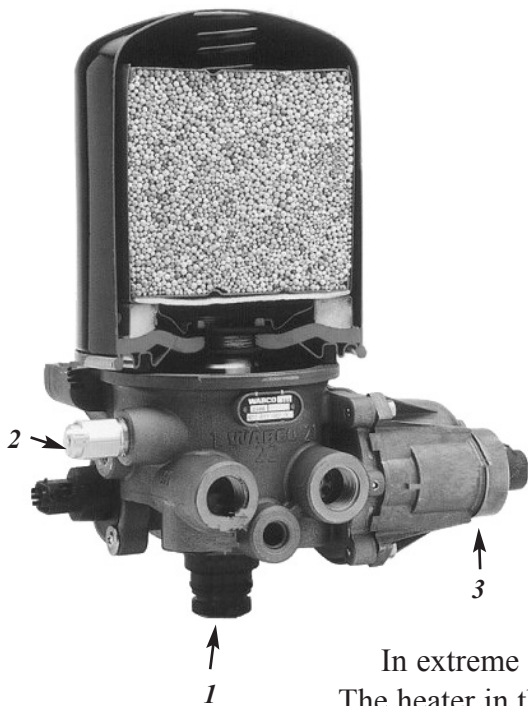
- The dryer purges and expels water collected in the dryer base.
- When the regeneration valve opens, the dry system air flows back through the dryer. A small charge of air from the front tank backflows through the filter. The backflow dries the desiccant, preparing it for the next cycle.

Importance of the Air Dryer

1. When air is compressed the compressor takes in water vapor with the air, compresses the water vapor and puts it into the system as liquid water.
2. Liquid water that accumulates in air lines can damage seals and valves and wash away lubricants.
3. In cold weather water can freeze, block air lines and damage air system components.

Desiccant-Type Air Dryer

1. Warm, humid air from the compressor condenses into either liquid water or water vapor before entering the air dryer.
2. A desiccant-type air dryer protects the motorhome air brake system by drying moisture-laden air before it passes through the air reservoirs and into the brake system.
3. Water collects in the base of the dryer when warm air condenses into water before it enters the dryer, or inside of the dryer before the water reaches the desiccant.
4. The desiccant material then removes additional water vapor, further drying the air.
5. During the regeneration phase, the regeneration valve and pressure-controlled check valve remove water from the desiccant bed with a backflow of dried, expanded system air.



Air Dryer Components:

- 1. Purge Valve:** A valve located on the bottom of the air dryer base that remains open during a compressor unload cycle. The purge valve allows collected moisture, condensation and contamination to be expelled from the air dryer during a purge cycle.
- 2. Pressure Relief Valve:** A valve that protects the air dryer from over-pressurization.
- 3. Regeneration Valve:** The valve that controls regeneration of the desiccant. The regeneration valve allows air from the supply and secondary tanks to bypass the outlet check valve. The air expands and backflushes moisture off the desiccant through the dryer's purge valve.

In extreme cold, make sure the air dryer heater is in good working order. The heater in the air dryer is a 100-watt heater controlled by ignition power and turned off when the ignition is switched off. Thermostat operating range is on below 45° F and off when the temp is above 86° F. The fuse is located in the front electric bay outside, beneath the drivers window.



WARNING: Remove all pressure from the air system before disconnecting any component, including the desiccant cartridge. Pressurized air can cause serious personal injury.

Desiccant Cartridge



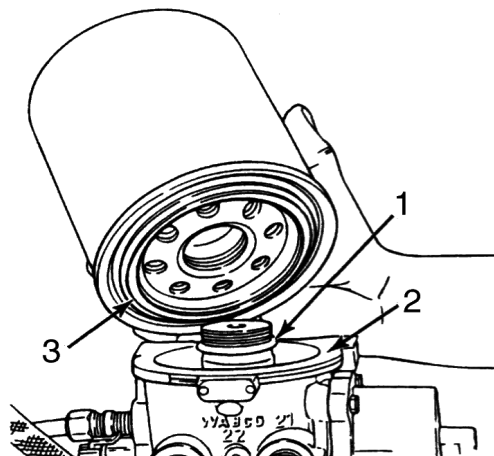
1. Replacement kit contains one cartridge and one O-ring.
2. Loosen and remove the old cartridge. Use strap wrench, if necessary.
3. Remove and discard the O-ring from the dryer base.
4. Inspect and clean the seal seat. Repair any minor damage.



NOTE: If the seats are damaged so badly that a tight seal cannot be maintained, replace the air dryer.

5. Lubricate the O-Ring on the stem with a thin layer of grease.
6. Lubricate the cartridge seal with a thin layer of grease.
7. Thread the replacement cartridge onto the base until the seal touches the base. Tighten the cartridge **ONE** additional turn. **DO NOT OVERTIGHTEN.**

REPLACEMENT REQUIREMENTS		
Components	When to replace	Why
Desiccant Cartridge	Every two to three years. When compressor is replaced. Water in supply tank.	Preventive maintenance. Contaminated cartridge. Saturated or contaminated cartridge, high duty cycle (wrong application of air dryer).



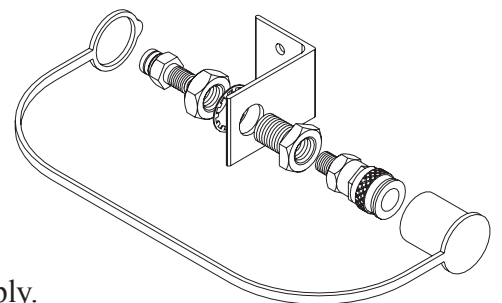
1. O - Ring
2. Seal Seat
3. Seal

The front and rear air tanks should be manually drained once a month, or more, depending on operating conditions where humidity is high. The front air tank has a drain valve for both the wet and dry side. The rear air tank only has one drain valve. Open the drain valves until all air is purged from tanks, allowing five extra minutes for moisture to be expelled. Remember to close the tank drain valves. Both air tanks have a pressure relief valve which is set to release at approximately 130 psi.

AIR STORAGE TANKS

A remote air supply coupler is provided for convenience. This is located in the roadside LP Tank compartment. This universal female fitting will accept several types of 1/4" ID male air fittings, including type C automotive. This auxiliary air fitting may be used to inflate tires, air mattresses or other pneumatic items.

AIR COUPLER - UNIVERSAL



To use this feature:

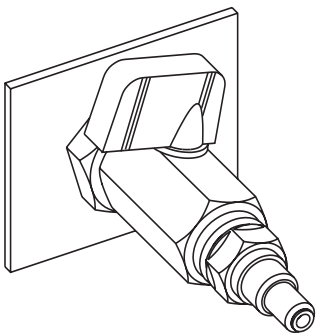
- Remove the plastic protective dust cap.
- Using a firm grip, insert the air fitting into auxiliary air supply. The locking collar is spring loaded and will lock automatically when the fitting is properly inserted.

To remove fitting:

- With a firm grip hold the air hose near the fitting to prevent recoil.
- Slide the locking collar back to release fitting. The collar will lock into the open position when fully retracted.
- Replace the protective dust cap when finished.

This fitting is not designed to charge the air system on the motorhome. The air supply for the auxiliary air fitting is charged from the front air tank through a pressure protection valve. Due to the small air pressure restriction of the pressure protection valve, maximum supply pressure is approximately 95 psi with air system on the motorhome charged to 120 psi.

**AIR SYSTEM -
CHARGING
(External)**



The air system on the motorhome can be charged from an external air supply source. Located in the generator compartment is a type C automotive male fitting. Caution should be used when charging the air system from this fitting. The air supplied from an external source may contain moisture. Compressed air introduced into the air system on the motorhome from this fitting is not filtered by the air dryer. The auxiliary air charge fitting will charge the front and rear air tanks. A shut-off valve is installed to prevent air from escaping.



CAUTION: The external air supply source should be regulated to charge the air system on the motorhome no higher than 120 psi. Damage to the air system or pneumatically operated items may occur.

**RIDE HEIGHT
VALVES -
Adjusting**

Three ride height valves inflate or deflate the air springs keeping the motorhome at the proper suspension height throughout the load range. Two valves are used on the rear drive axle, these control rear suspension heights and left or right tilt of the motorhome. Only one valve controls the front suspension height. The ride height control valves mount to the main frame of the motorhome above the axles. Each valve has a linkage rod connecting the axle, utilizing a clamped rubber link assembly. The valves make small air adjustments to the air springs while traveling. The amount of system air the valves use depends on the type of road surface and driving styles.

The air springs mount between the H-frame assembly and the two main frame rails. The axles mount to the H-frame and the main frame rails support the house. Should it become necessary to check the suspension ride height, start by having the air system fully charged and the suspension at normal ride height. The motorhome must be on a flat level surface.

There is a specific distance between the H-frame and main frame. Other than specified ride height distances effects the shock absorbers, drive line angle and various other running gear components besides compromising ride

quality and handling. Specified distances may vary plus or minus ¼". Small offset adjustments to the rear valves may be necessary to compensate for slight tilt. Example: Adjusting the curbside rear height control valve up will pivot the roadside front corner down.



NOTE: Driveline angle is effected by the suspension ride height. Improper driveline angle can damage suspension or shorten the life of universal joints. Shock absorbers and air springs are in travel centers at proper ride height.

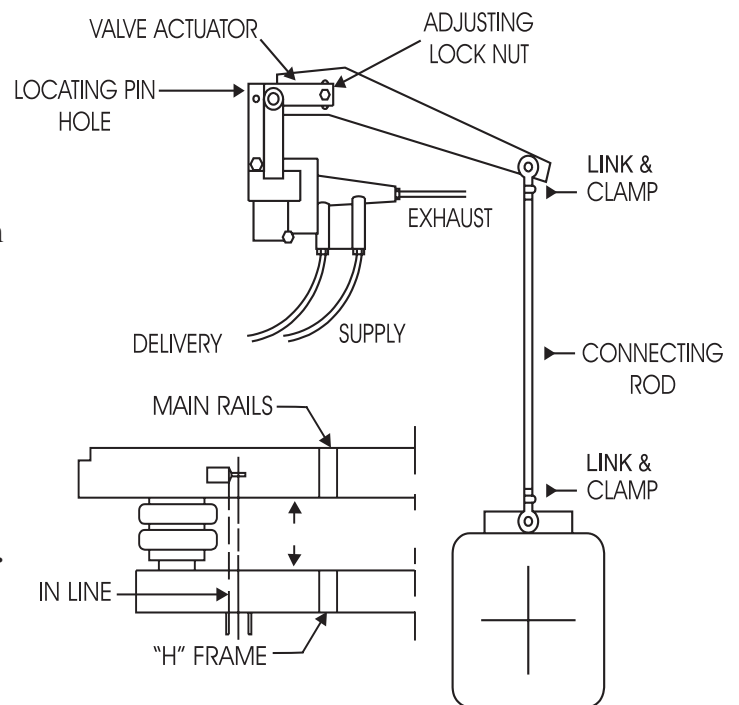
To adjust the suspension ride height:

- The motorhome on flat level surface.
- Ensure Slide Room(s) are fully retracted.
- For models equipped with a Tag Axle, Turn the Tag Axle switch **OFF**.
- Tag Axle regulator pressure set to 37 psi.
- Dump the air system prior to beginning the procedure.
- Allow the air system to fully charge which sets the motorhome to Ride Height.
- With the suspension at Ride Height, begin check procedures.
- For Air leveling systems, the ignition key set to ON for the Travel light on the keypad.

Start by checking the distance in the front.

1. Measure the distance from the top of the H-frame to the bottom of the Main Frame Rail.
2. If the measurement is off, loosen the adjusting lock nut at the eccentric slot on the valve.
3. Move the plastic arm up to raise suspension height, this will inflate all the front air springs. Move the plastic arm down to lower suspension height, this will deflate the air springs. Make adjustments in small increments.

Checking Ride Height



**Measurement for the Executive 2002:
Front = 9 in., Rear = 9 in.**

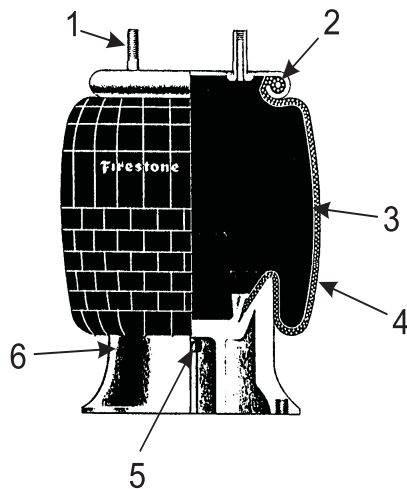
4. After obtaining the specified distance, insert a 1/8" or 7/64" inch twist drill bit into the plastic arm and valve body. This will center the travel of internal piston. Tighten adjusting lock nut between 60-80 in/lbs.
5. Check adjustments made by using the Air Dump switch to deflate air springs. Start the engine and allow the air system to become fully charged. Allow the suspension to adjust and come to a neutral setting.
6. Re-check the suspension height measurement. Follow the same procedure for each rear control valve.
7. Re-check the front suspension height after adjusting the rear height control valves.



NOTE: Do not modify length of the linkage rods. Make any necessary adjustments using eccentric slot on the ride height control valve.

SUSPENSION AIR RIDE BAGS

Air ride springs are available in single, double and triple convolution types, plus reversible sleeve models, for virtually every conceivable heavy-duty vehicle suspension application.



1. **STUD:** Manufactured as a permanent part of bead plate assembly for maximum strength and durability. Used to attach spring to the vehicle's suspension.
2. **BEAD PLATE:** Crimped onto bellows at the factory for a durable design and maximum quality control. Allows 100% leak proof testing prior to shipment.
3. **BELLOWS:** "Air bag" includes four plies of material: an inner layer, two plies of cord-reinforced fabric and an outer cover. Natural rubber construction provides functional properties up to - 65° F.
4. **BUMPERS:** A solid rubber or engineered plastic device designed to prevent significant damage to the vehicle or its suspension in event of a sudden loss of air pressure in spring.
5. **PISTON:** Provides a lower mounting arrangement for air spring. Controls characteristics of spring under changing pressure loads.
6. **PISTON BOLT:** Attaches piston to bellows. Sometimes extended as a means of attaching spring to vehicle suspension.

Listed below are items that can be checked when the motorhome is in for periodic maintenance.



NOTE: Never attempt to service the air suspension on a motorhome with the air bags inflated.

- Inspect the O.D. of the air springs. Check for signs of irregular wear or heat cracking.
- Inspect the air lines to make sure contact doesn't exist between the air line and the O.D. of the air springs. Air lines can rub a hole in an air spring very quickly.
- Check to see that there is sufficient clearance around the complete circumference of the air spring while at its maximum diameter.
- Inspect the O.D. of piston for buildup of foreign materials. (On a reversible sleeve style air spring, the piston is the bottom component of the air spring.)
- The correct ride height should be maintained. All motorhomes with air springs have a specified ride height established by the manufacturer. This height should be maintained within ¼ in. This dimension can be checked with the vehicle loaded or empty.
- The leveling valves (or height control valves) play a large part in ensuring that the total air spring system works as required. Clean, inspect and replace if necessary.
- Make sure to check shock absorbers for leaking hydraulic oil and worn or broken end connectors. If a broken shock is found, replace it immediately. The shock absorber will normally limit the rebound of an air spring and keep it from overextending.
- Check the tightness of all mounting hardware (nuts and bolts). If loose, tighten. Do not over-tighten.

Cleaning:

The approved cleaning method is to use soap and water, methyl alcohol, ethyl alcohol and isopropyl alcohol. Unapproved cleaning methods include all organic solvents, open flames, abrasives and direct pressurized steam cleaning.

The motorhome is equipped with air brakes using much the same system as over the road trucks. This type of braking system is efficient. Proper maintenance and lubrication is the key to keeping the brake system in proper working order. The brake system on the motorhome is designed to accommodate the weight of the vehicle and towing loads. This system differs from a conventional automotive hydraulic braking system and should be treated differently.

BRAKE SYSTEMS - AIR BRAKES

When operating a vehicle equipped with air brakes consideration needs to be given to stopping distances and air system pressures. The heavier the vehicle, the greater the kinetic energy. The motorhome requires longer stopping distances. Each brake application uses air from the air system. Give attention to the air gauge as well as the surroundings. Engine speed is directly proportional to how fast the air system is replenished. Prepare for downhill grades. Grades are generally posted in percentages. It may be necessary to select a lower gear. Make use of the engine or exhaust brake. When making brake applications use individual short applications down long hills rather than “riding” the brakes. This will extend the life of the brake linings. Avoid overheating the brakes. Hot brakes have less stopping power. When maneuvering the motorhome around in small areas, or backing into spaces, several individual brake applications might be made. Watch the air gauge. Plan ahead when parking to make it easier on yourself. When preparing to back into a space swing the motorhome so it is aligned with the parking slot before backing up.

The air braking system on the motorhome is equipped with several safety features unlike that of automotive hydraulic braking systems. One safety feature is a low air pressure warning system. Should a low air condition arise while the vehicle is under operation a warning buzzer will sound and a dash warning light will illuminate alerting the operator of the situation. This warning occurs at approximately 60-65 psi (pounds per square inch).

A simple mechanical explanation of what occurs when a brake application is made is as follows: The air system supplies air to the foot brake, this is called a treadle valve. Pushing down on the treadle valve supplies an air charge signal to a brake chamber. This sealed chamber consists of a spring and air bladder. The air charge signal pushes on the bladder which extends a threaded rod connected to the automatic slack adjuster. The slack adjuster rotates the S-cam expanding the shoes against the drum. Air disc brakes follow much the same principal, with the exception of the S-cams.

BRAKE - PARK & EMERGENCY SYSTEMS

The park and emergency brake systems are combined and apply to the rear drive axle only. These are called spring brakes. When the park brake is applied, air is released from the rear brake chambers allowing the large spring in each rear brake chamber to manually push against the automatic slack adjuster. This rotates the S-cam applying the brake shoes against the drum. The air system must be charged approximately above 35 psi so the park brake will remain released. Pushing down on the park brake handle charges the rear brake chambers with air pressure, overriding the emergency brake springs and releasing the brakes. In the event of air loss, while the vehicle is under operation, the park brake will automatically apply (this occurs at approximately 30 psi) acting as an automatic emergency brake system.

When preparing to depart, allow the air system to achieve full air pressure. This is indicated by the air gauge needles. Listen for the air dryer to purge, indicating full air pressure has been obtained and air dryer is functioning. Look and listen for any abnormalities. Abnormal air pressure readings by either needle of the air gauge should alert the operator. Have the air system checked to avoid an untimely failure.

Should a failure occur in the air system, preventing the air pressure from building, it may become necessary to “cage” the spring brakes. This is an emergency procedure only. Caging the rear air brake chambers manually overrides the spring brakes and allows the vehicle to move. This procedure does not affect normal service braking. The brake disabling procedure is located in Section 2.



NOTE: When the park brake is released the Park illumination lamp will remain lit until air system pressure is above 65 psi.



WARNING: When the motorhome is parked, if the air tank is not depleted there is the possibility of an accidental release of the parking brake. Traveling with small children and/or pets may require a small block to be fabricated to prevent accidental release. The block should be placed under the knob and rested on the dash panel. A wooden clothes pin, clasped at the base of the shaft, will work.

The motorhome is equipped with automatic slack adjusters. As brake linings wear, the slack adjusters will automatically ratchet on the return stroke as needed. This ratchet action will keep the brake linings at proper adjustment. Brake adjustment should not be necessary. Indications of a vehicle needing a possible brake adjustment may be noticed by the park brake not holding on a hill or gradual loss of braking power. Automatic slack adjusters and the connecting S-camshaft require periodic lubrication.

BRAKE ADJUSTMENT/ SLACK ADJUSTER



NOTE: Replacement parts should be of the same original equipment size and type. Mixing brake components may result in unequal braking action. Brake adjustments are part of normal maintenance of the motorhome. Brake adjustments are not covered by the manufacturer.



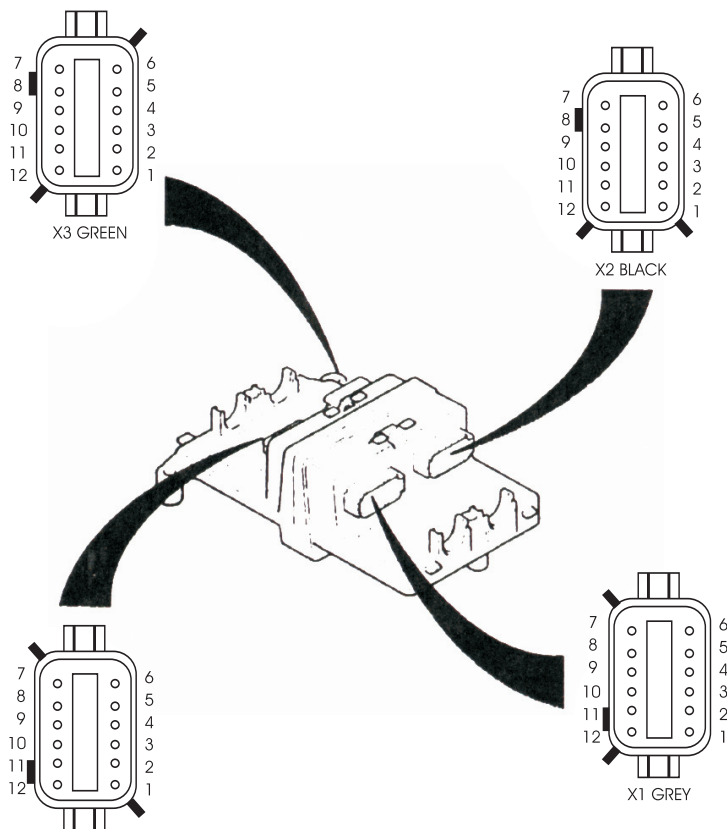
WARNING: Brake lining may contain asbestos material and should only be serviced by qualified service technicians who are trained in the appropriate precautionary procedures. If any loss of braking effectiveness, or abnormal braking indications are noticed, the brakes and slack adjusters should be inspected by a qualified brake technician.

ABS SYSTEM (Anti-lock Brakes)

The motorhome is equipped with an anti-lock braking system (ABS). The ABS system monitors wheel rotation speeds by using a 100 tooth magnetic tone ring mounted to the hub. Revolving with the wheel, the magnetic tone ring is polarized giving positive and negative pulsations. A stationary sensor is mounted adjacent to the tone ring monitoring the magnetic pulses. The pulses are monitored by the ABS electronic control unit (ECU).

The ECU monitors all available wheel sensors at the rate of 100 times per second. The ECU controls Pressure Modulator Valves. Pressure Modulator Valves have two electric over air solenoids, a hold solenoid and a release solenoid. The modulator valves are open under normal braking, allowing a straight through air signal from the treadle valve to the brake chamber. Should a wheel lose traction under a braking application, the ECU will energize the hold solenoid of the Pressure Modulator Valve to interrupt the air signal from the treadle valve to the brake chamber, while the release solenoid vents the existing air signal to the atmosphere allowing the skidding tire to regain traction. Skidding tires have less tractive efficiency. It is possible, under certain conditions, to have the wheel(s) skid with a normal functioning ABS system.

The ABS itself does not apply additional braking power. The purpose of the ABS is limiting brake torque to prevent wheel locking that results in the loss of lateral stability and increased stopping distances. Cautious driving practices and maintaining adequate safe distances when following vehicles is the key to safe vehicle operation.



ABS Component Function:

- Speed sensors and tone rings on each wheel monitor wheel rotation.
- Each speed sensor communicates wheel rotation pulses to the Electronic Control Unit.
- ECU receives the speed sensor inputs, interprets the signal pulses, calculates speed and acceleration rates of each wheel.
- Based on the speed sensor input, the ECU detects impending wheel lock and operates the ABS Modulator Valves required for proper control. The Modulator Valves can be operated in the air, release or hold modes to regulate air pressure to the brake chambers.
- The braking force is applied at a level which minimizes the stopping distances while maintaining as much lateral stability as possible.

ABS Warning Light:

The ABS will perform a diagnostic indicator lamp check and self diagnostic test each time the ignition is switched to the on position. The ABS dash indicator light will illuminate momentarily (2.2 seconds) verifying the self check test. If the ABS indicator light remains on, or illuminates while the motorhome is being operated, there is a fault in the anti-lock brake system only. This fault will not affect normal service braking. The motorhome will need to go to a service center to repair the problem.

ABS Blink Code:

The ABS dash indicator light can be used to obtain system faults by displaying a blink code.

To Retrieve Blink Code(s):

- Turn ignition key to the **ON** position.
- Using Systems Diagnostic Center located left of steering column below dash board. Press and hold the test button for three seconds. The indicator light will illuminate while test button is pressed.
- After releasing test button, the indicator lamp will turn off and blink code will be displayed: **1-1** indicates no system faults.

The motorhome air braking system is equipped with several back-up safety systems and warning alarms in case of an air system failure. Refinements to air braking systems have been instituted with safety as top priority. For example: Should the air compressor fail to charge the air system, and the low air gauge readings go undetected, a low air pressure warning buzzer will sound and low air pressure dash warning indicator lamp will illuminate. These warning indicators occur at approximately 65 psi. This alerts the operator of an impending situation. If the motorhome is allowed continued operation, the pneumatic emergency spring brake relay valve installed in the air system senses the low air pressure condition. The emergency spring brake relay valve releases the air charge from the spring brake air chambers on the rear drive axle. In this case, the park brakes will automatically apply at approximately 30 psi. This safety back-up system acts as an automatic emergency brake system.

Another back up safety is the air system separation of the front and rear brakes, implemented by using two air tanks. One tank is located in the front and the other is located in the rear. This separation allows the front air tank to operate the front brakes; the rear tank operates the rear drive axle brakes and tag axle brakes if equipped with a tag axle. This tank division gives reassurance in case of one tank having a failure of an accessory air item allowing the compressed air to escape. Accessory air items are other pneumatically operated items such as the air horn, step well cover, vacuum

**BRAKE SYSTEMS
- BACK-UP**

generator, etc. The accessory air items operate only when air tank pressures exceed 65 psi. This is done with pressure protection valves. Should an accessory air item fail, the pressure protection valve (PPV) reserves the remaining air pressure of 65 psi for braking. This will leave the motorhome with one air tank fully charged for a safety back up.

In the event that all compressed air has escaped from the rear air tank, a pneumatic back-up safety valve is installed. This is the safety inversion valve. The inversion valve senses the absence of rear air tank pressure. In this case the inversion valve will allow the operator to make a modulated spring brake application, made in conjunction with the emergency spring brake relay valve. The inversion valve allows the front air tank pressure to recharge the rear brake chambers after the modulated spring brake application has been made. This back-up system allows use of all the brakes, allowing the operator to bring the vehicle to a safe stop. In case of all compressed air charge escaping from the front air tank, the operator will still have full use of the rear brakes.

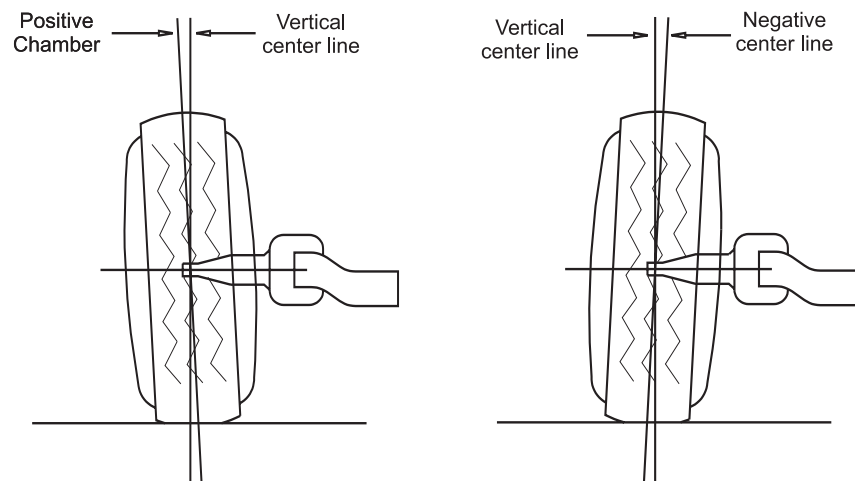
ALIGNMENT SPECIFICATIONS

The correct wheel alignment promotes longer tire wear and ease of handling while minimizing the strain on the steering system and the axle components.

Camber:

Camber, as shown, is vertical tilt of wheel as viewed from the front of the vehicle. This is machined into the axle when manufactured and is not adjustable.

- “**Positive**” camber is an outward tilt of the wheel at the top.
- “**Negative**” camber is an inward tilt of the wheel at the top.



Toe Setting:

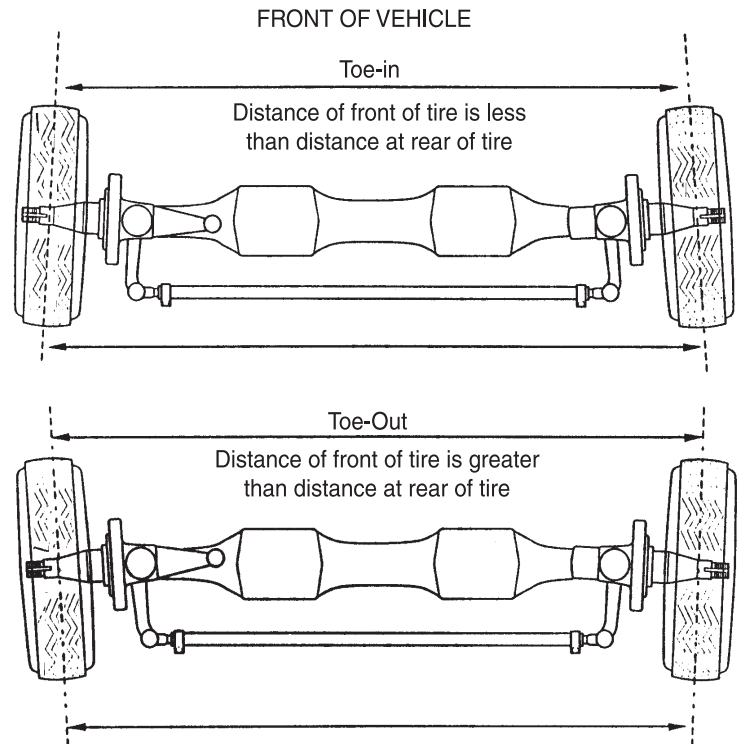
The toe setting represents distances between the front and rear of the tires (measured at the vertical centerline of the tires).

Toe-in occurs when the tire front distance is **less** than the tire rear distance.

Toe-out occurs when the tire front distance is **greater** than the tire rear distance.

Wheels are generally set with initial toe-in. As the vehicle operates tires tend toward a toe-out condition. By starting with an initial toe-in setting, a desirable “near zero toe-in” can be achieved when the vehicle is in motion.

Incorrect toe settings, where toed-in or toed-out, can have a significant effect on tire wear. The toe setting is adjusted by lengthening or shortening the cross tube.



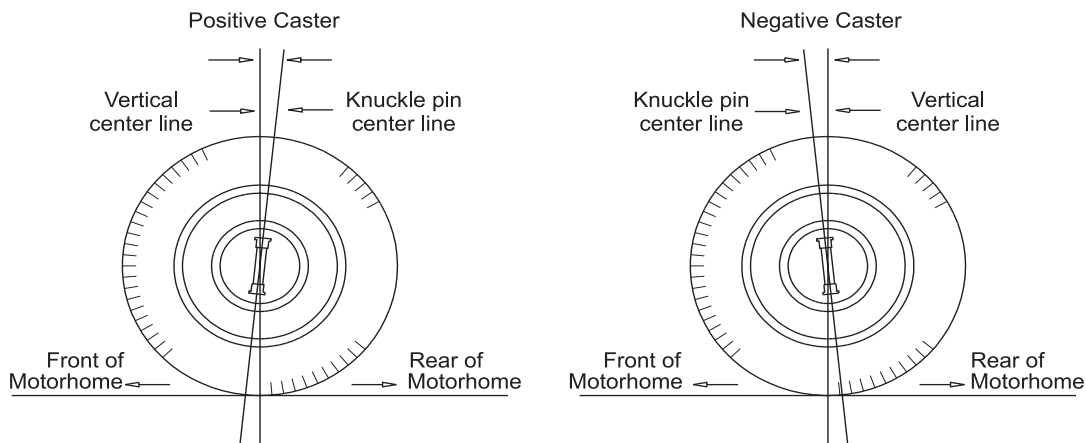
Caster Adjustments:

Caster is the fore and aft tilt (toward the front or rear of the motorhome) of the steering kingpin as viewed from the side of the motorhome.

“**Positive**” caster is the tilt of the top end of the kingpin toward the rear of the motorhome.

“**Negative**” caster is the tilt of the top end of the kingpin toward the front of the motorhome.

A caster angle more positive than specified may result in excessive steering effort and/or shimmy. An angle less positive may result in vehicle wander or poor steering return to center. The caster angle is determined by the installed position of the steer axle.



Left Front

	Min.	Nominal	Max.
Camber	-0.35"	-0.15"	-0.65"
Caster	5.50"	6.00"	6.50"
Toe	-0.05"	-0.02"	-0.08"

Right Front

	Min.	Nominal	Max.
Camber	-0.35"	-0.15"	-0.65"
Caster	5.50"	6.00"	6.50"
Toe	-0.05"	-0.02"	-0.08"

TAG AXLE

The tag axle is standard equipment on all motorhomes that are 40 foot or greater in length. The tag axle design allows a greater weight carrying capacity, thus making it possible to create a larger variety of floor plans.

The switch for the tag axle is located on the left hand shift panel. There are two lights on the switch: One will light when the headlights are turned to the on. The other will light when the tag axle switch is on. Raise the tag axle when performing severe or tight maneuvering under 5 mph to prevent scuffing the tires. A beeping alarm sounds when the switch is on.

The tag axle raises in the following modes:

- When the switch is on and the transmission is in neutral, reverse or first gear.
- With the tag axle in the up position there is not a specific height requirement other than the tire should be off the ground. If extra clearance is desired, moving the lift chain up one link on each side can increase ground clearance with the tag axle in the raised position.

A description of what occurs in a motorhome equipped with air leveling when the tag axle switch is on:

- The tag axle switch supplies 12 Volt DC to the 14 gauge yellow with green stripe wire to the mac valve located at the roadside rear.
- The rear mac valve applies air pressure to the orange air line at both tag axle brake chambers to lift the axle.
- Air pressure in the tag axle air bags is released. The tag axle remains up until the switch is turned to the off.

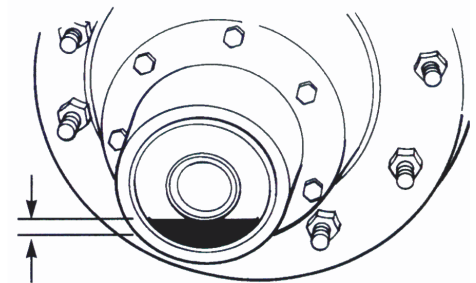
The amount of weight carried by the tag axle may be adjusted by changing the amount of downward force applied to the tag axle. Changing the amount of weight carried by the tag axle affects weight distribution between the tag, drive and steering axles. The amount of down force applied to the tag axle is controlled by the amount of air pressure in the tag axle air bags. An adjustable pressure regulator located in the engine compartment sets the amount of air pressure in the tag axle air bags.

Regulator pressure is preset at the factory and may require adjustment to obtain the proper weight distribution on all axles. To determine the correct setting of the pressure regulator the motorhome will need weighed after it has been loaded for travel.

All tag axles use the oil bath hubs. Inspect the oil level before every trip or every 5,000 miles.

To inspect the Oil Level:

- Remove the chrome hubcap.
- Locate the full and add mark on the outside of the plastic see-through cover.
- If the lubricant level is low, add the recommended fluid until Full. Determine the source of the leak.



Remove the center hub cap to inspect the tag axle oil level.

The recommended oil change interval is based on the operating conditions, speeds and loads. Limited service applications may allow the recommended interval to be increased. Severe applications may require the recommended interval to be reduced. For more information, contact a Meritor service representative.

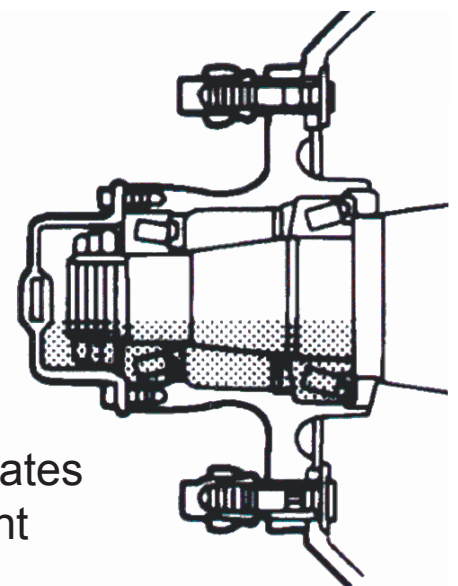
Oil Lube Intervals

Recommended Interval Change:

- Change the fluid whenever the seals are replaced, the brakes are relined or at 30,000 miles (48,000km).
- If yearly mileage is less than 30,000 miles, change it twice a year (spring and fall).
- For low mileage operation, the lubricant may not need changing until every 50,000 miles (80,500km) or two years. However, check the lubricant twice a year (spring and fall) for contamination. Change as needed.

Lubricant Type:

- Shell Hypoid gear oil, GL-5, S.A.E. 80w/90. Specifications, minimum ambient temperature -15°F (-26.1°C). There is no maximum ambient temperature. Lubricant temperature must never exceed 250°F (+121°C).



Shading indicates correct amount of oil

SHOCK ABSORBERS



Normal shock absorber appearance after a long service period.

The shock absorber by definition is a hydraulic device used to dampen suspension/body movement. Road surface irregularities is compensated for by the shock absorber. The roadmaster chassis incorporates the “*Bilstein*” shock in the design of the exclusive air glide suspension system. This shock absorber is a telescopic, monotubed unit filled with nitrogen gas and hydraulic oil. The result of the mixture is uninterrupted damping for the smallest of wheel deflections.

By design, a self lubricating seal is used which will allow approximately 10% of the total oil capacity to pass onto the piston rod. The gradual process of oil loss does not affect the performance of the shock absorber during the service life. This process will be evident after a long period of service by an oil film on the body of the shock absorber. The appearance of a coating or film on the body or rod is completely normal, it is an indication the shock is functioning normally.

The road holding, handling, balance and braking characteristics all can be contributed to the shock absorber. The operating conditions for which the shock absorber must endure will determine the life span. However, since the only moving part is the piston rod, there are no spring or hinge pins to wear out, get weak or deteriorate.

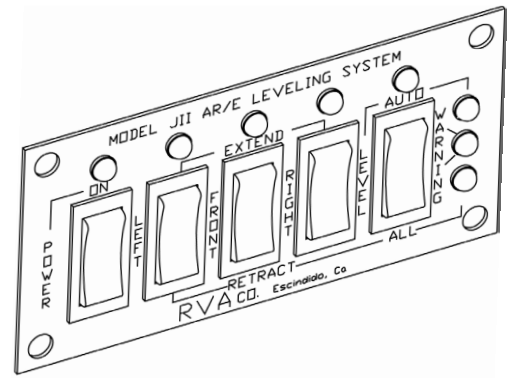
LEVELING SYSTEM - HYDRAULIC (Optional)

The leveling system uses three hydraulic cylinders to level the motorhome, two cylinders located in the rear and one located in the front. The leveling system was designed to reduce site selection problems. A remote control panel located next to the driver seat operates the system. When operating the leveling system, follow these steps:

- Select a level site if possible. If the site is not level, park the motorhome with the front facing downhill.
- Before operating the system, lower the air suspension by making several brake applications, then push the Air Dump switch.
- If parking on soft ground or asphalt, place a wooden 2"x 8" support block under the foot of each jack pad to prevent sinking.
- If operating the system manually, lower the front jack first. The front jack will be the pivot point for the chassis. This reduces torsional stress on the chassis and body of the motorhome. Torsional stress is significantly reduced when operating the system properly. Damage resulting from improper leveling procedures and excess torsional twist can range from windshield damage to the entry door jammed closed.
- The remote control switches will operate with a minimum of 7.5 Volts DC. Optimum requirements for operating the system are voltages above 9.6 Volts DC.

Warning Features Include:

- A warning system consisting of flashing lights and bong alarm when the system is on or a jack is down.
- The Bong alarm may activate momentarily when driving over rough roads, or negotiating curves and corners. Usually this indicates a low fluid level.

**Remote:**

The remote control panel is comprised of three retract/extend switches, a switch for **Automatic Leveling**, a **Retract All** switch and a power **ON/OFF** switch.

Indicator Lamps:

- A **yellow** lamp above any rocker switch indicates a low level condition.
- A **flashing green** lamp indicates the system is in **Automatic Leveling** mode or **Jacks All Retract** mode.



CAUTION: If blocking up a rear jack pad to gain added clearance while motorhome is on a slope, place a block on the opposite set of rear wheels to prevent the motorhome from rolling.



WARNING: Using an improper leveling process can result in applying excess torsional stress to the chassis and body resulting in damage to the windshield or entry door malfunction. The leveling system jacks are not designed for changing tires. This can cause problems with the suspension system, frame alignment and damage to the windshields. Never use the jacks to elevate any wheel position off the ground.



NOTE: In the event the front of the motorhome is high and does not require elevating, it will be necessary to lower the front jack and raise the front of motorhome a minimum of ½ inch. This allows the front jack to act as a pivot point.



NOTE: Air will automatically release from the air bags when the leveling cycle begins. This will lower the chassis of the motorhome and require less extension by the jacks.

Manual Leveling System

Manual Operation:

When manually operating the leveling system always lower the front jack first. The front jack acts as a pivot point for chassis, reducing torsion stress on the body of the motorhome.

- Apply the parking brake.
- Turn the ignition switch ON, do not start the engine. Be sure the transmission is in neutral.
- Lower the air suspension by making several brake applications until system air pressure is below 60 psi. With the ignition on, push and hold the Air Dump switch to lower the suspension.
- Turn on the jack control Power switch.
- Each yellow light and rocker switch combination corresponds to each jack as positioned on the chassis.
- To extend a particular jack, push and hold the corresponding rocker switch to Extend until the yellow light goes off. That particular jack is then in the level position.
- To retract a particular jack, push and hold the corresponding rocker switch until the jack fully retracts.
- Turn off the Power switch.
- Turn off the Ignition switch.



CAUTION: Damage to the mud flap may occur if the mud flap is located over a raised area when the suspension is lowered.

Automatic Leveling System

Automatic Operation:

The **ALL JACKS RETRACT** mode or **MANUAL** mode can be engaged at any time during automatic leveling operation. Prior to and during the automatic leveling process, it is essential that there is no movement in the motorhome.

To begin automatic operation:

- Apply the parking brake.
- Turn the ignition switch to the **ON** position. Be sure the transmission is in neutral.
- Turn the jack control Power switch on.
- Press the **AUTOMATIC LEVELING/ALL JACKS** switch.
- The top green light will start blinking. After a ½ second delay, the pump motor will activate and all jacks will extend.
- The system will attempt to complete the leveling process in one operation. The motorhome is level when all yellow lights, as well as green lights, go out.
- If leveling is unsuccessful on the first cycle the system will attempt to level four subsequent times at seven second intervals.

- If both green lights start flashing alternately the system has reached maximum extension on one or more jacks. One or more yellow lights will blink, indicating additional height is required under one of the jack pads. This can be attained by moving the motorhome to another location, or gain additional height by placing a 2"x 8" block under one of the jack pads.
- When the leveling process is complete turn off the jack control Power switch.
- Turn off the ignition switch.



WARNING: When the jacks are extended, a red JACKS DOWN warning light will blink and the bong alarm will sound. The alarm will sound if the jacks are down and ignition switch is turned ON.

Automatic Retract:

Prior to retracting the jacks, it is advisable to start engine and build air pressure.

Retracting Leveling Jacks

- Turn the ignition switch on. Place the transmission in neutral.
- Be sure the parking brake is applied.
- Turn the jack control power switch on.
- Momentarily press down rocker switch labeled **ALL JACKS RETRACT** and release.
- **BEFORE MOVING THE MOTORHOME ALWAYS PERFORM A VISUAL INSPECTION TO BE SURE THAT ALL JACKS HAVE FULLY RETRACTED.**



CAUTION: Do not move motorhome while the jacks are still in contact with the ground or extended. Damage to jacks can occur. Do not raise any wheels off the ground, which could result in damage to the motorhome.

Hydraulic pressure in all jacks is automatically released when the **All Jacks Retract** switch is pressed. The jacks retract by the weight of motorhome and the retract springs on each jack. The bottom **green** light will begin blinking and all jacks will retract. This operation is on a four minute timer. After four minutes the **green** light will stop blinking and go out.

Manual Retract Valves

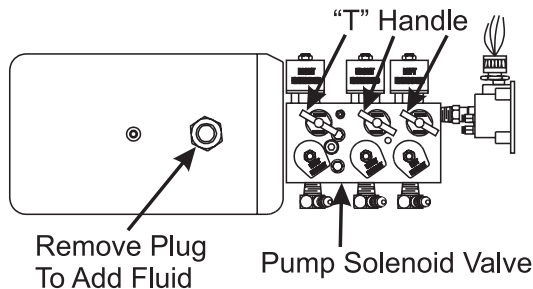
Manual Retract Valves:

The hydraulic pump is located at the curbside front with easy access through the generator compartment. The manifold and valve assembly is mounted on the pump motor, providing access to the manual retract valves.

In case of mechanical or electrical failure that would prevent the leveling jacks from being automatically retracted, the motorhome is equipped with manual emergency retract valves. The manual retract system releases fluid that is under pressure in each jack and allows the fluid to return to the reservoir.



CAUTION: The motorhome will raise or lower when the manual retract valves are opened. If it becomes necessary to manually retract the jacks, do not crawl under the motorhome to access the valves. Make sure there is sufficient clearance so the valves may be opened safely.



To operate the manual system:

Turn all three T-handle valves counterclockwise until they stop. When the jacks are fully retracted, rotate all the valves fully clockwise. In case one of the jacks is not holding pressure, one of the manual retract valves may not be fully tightened.

Maintenance

Maintenance:

Occasionally, when the jacks are fully extended, wipe off the dirt from the jack rod. This will help lengthen the life of the jacks. How often this is done can vary from the amount and type of usage of the jacks. *Dexron III* will serve as a solvent as well as a lubricant. Occasional oil or grease on the extended jack ram is normal and aids in the lubrication of the seals.

Component Replacement Model JII-45S:

The system is designed to be self purging in the event any component of the hydraulic system has been removed or repaired.

To purge the system:

- Fully extend and retract each jack twice.

Calibration:

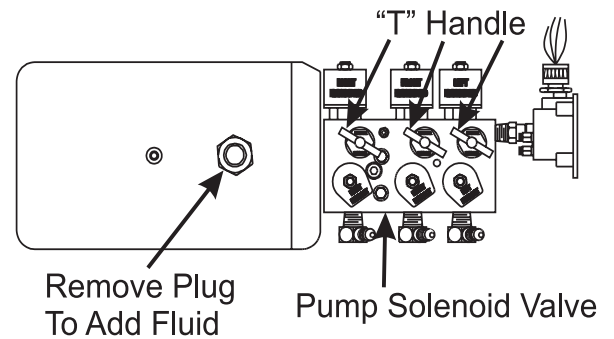
The transmitter module may require calibrating to obtain an accurate level indication. The calibration procedure requires two persons for convenience and accuracy. This should only be performed by qualified service technicians.

Adding Fluid:

An indication of a system needing fluid is the bong alarm intermittently sounding when turning corners, or the pump whining or gurgling. Use *Dexron III* automatic transmission fluid to fill the reservoir.

To fill the reservoir:

1. Turn the ignition switch to the **ON** position. Turn the jack control Power switch on.
2. Extend any jack 6 inches from the full retracted position. All other jacks remain fully retracted.
3. Unscrew the reservoir cap from the top of the reservoir.
4. Open a window, or the entry door, so the bong alarm is audible from outside the motorhome. Slowly fill the reservoir with fluid until the bong alarm stops sounding.
5. Replace the reservoir cap.
6. Push the retract button to retract the extended jack.
7. Turn the jack control Power switch off.
8. Turn off the ignition switch.



A touch panel, computer controlled, four-point or six-point air leveling system is standard on all models. Four-point systems are used on non-tag axle models, whereas six-point systems are used on tax axle models. The ignition must be **ON** for the suspension to operate on the models equipped with the air leveling system. This is critical to note in the event the motorhome requires emergency towing.

**LEVELING SYSTEM
- AIR****Automatic Air Leveling:**

- Air leveling will operate faster if the engine is running.
- Set the parking brake.
- Transmission must be in neutral. (Important: There should be no movement in the motorhome while operating the leveling system.)
- Press **AIR** button once to enter air mode. The **AIR** indicator light and four **AIR BAG** warning lights will glow steady.
- Press the **AIR** button a second time. The **AIR** indicator light will start flashing and air leveling will begin.
- When all four **yellow LEVEL SENSING** lights are out, leveling is complete. The **AIR** indicator light stops flashing and turns steady **red**. The Processor is now in a **SLEEP MODE** for 30 minutes. The engine may now be turned off. Every 30 minutes the processor will check the motorhome's level condition and make any corrections. It then returns to **SLEEP MODE**. This continues until system is turned off by pushing the **OFF** button or the transmission is taken out of the neutral position and the parking brake is released.

Excess Slope:

If system is unable to level motorhome, one or two **yellow LEVEL SENDING** indicator lights will remain on and **EXCESS SLOPE** light will come on. The system will remain on but will not go into **SLEEP MODE**.

Manual Air Leveling Operation:

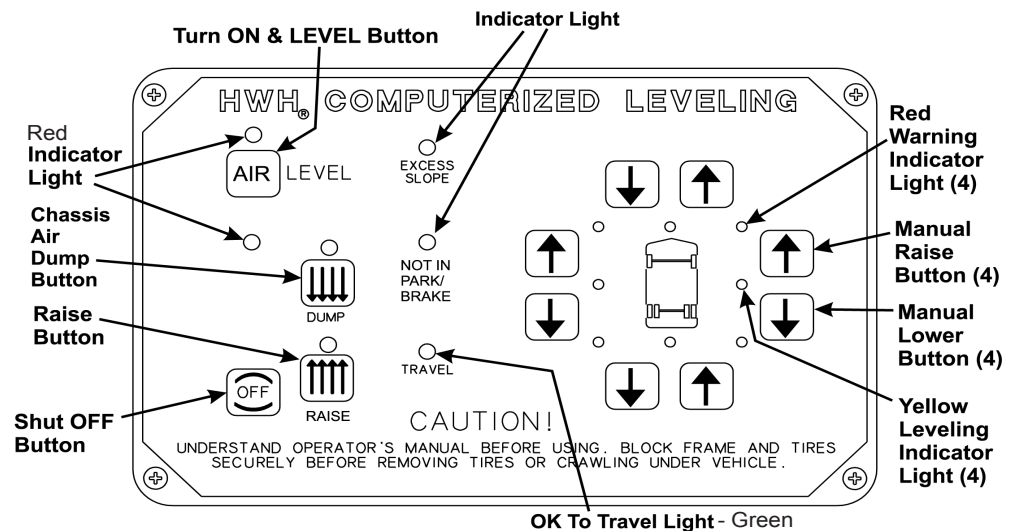
- Air leveling will operate faster if engine is running.
- Set parking brake.
- Transmission must be in neutral.
- Press the **AIR** button once. The **AIR** indicator light will glow steady.
- Individual **RAISE** and **LOWER** buttons (**UP** or **DOWN** arrows) will add or dump air from suspension air bags to raise or lower the motorhome for leveling. These are momentary buttons. Function will stop when the button is released. **Yellow LEVEL** lights indicate that a side, end or corner of the motorhome is low. Lower the opposite side or end of the motorhome to achieve leveling. If a level position cannot be achieved by dumping air, raise the motorhome according to lighted **yellow LEVEL** lights.
- **IMPORTANT: Always give preference to any side light before leveling motorhome front to rear.**
- Turn ignition switch **OFF**. Turn air leveling system **OFF**.

Air Leveling - Travel Preparation

Start the engine and allow air pressure to build to recommended pressure for travel. Push system **OFF** button and allow the motorhome to return to travel position. All **red** indicator lights must be **OFF** and the travel indicator light must be lit before traveling. Ensure the motorhome is at proper ride height before moving. **DO NOT** solely rely upon the warning lights.



CAUTION: Do not rely solely upon warning lights. It is the operator's responsibility to check that the motorhome is at the proper ride height before moving the motorhome.



**ENGINE
- GENERAL
INFORMATION**

The diesel engine operates differently from the conventional gasoline engine. Gasoline engines control engine speed using a butterfly throttle plate controlling air/fuel mixture inlet flow. As the throttle plate opens, vacuum created by the piston velocity draws the metered fuel/air charge into the combustion chamber, then ignites from a controlled electric ignition source. Closing the throttle plate limits the fuel/air supply, slowing engine speed, increasing intake manifold vacuum.

The diesel engine in the motorhome controls engine speed by varying fuel supply only. No throttle plates are used. An exhaust driven turbine system (turbocharger) compresses the fresh air supply into the engine. The fuel is injected under pressure into the combustion chamber. Ignition of fuel/air charge occurs from heat generated by rapid high compression. The turbo boost gauge registers amount of intake manifold compression measured in lbs./in². Therefore, no intake manifold vacuum exists.

Diesel engine RPM (revolutions per minute) operating speeds are generally much lower than that of the gasoline engine. Peak torque and horsepower output values occur at much lower engine speeds. Idle speeds between the two engine types are similar, however maximum engine speeds are quite different. The gasoline engine generally is not regulated to a maximum engine speed. The maximum engine speed on a diesel engine is controlled by an engine speed governor set by the engine manufacturer.



WARNING: Do not operate a diesel engine where there may be combustible vapors. Vapors can be drawn through air intake system and cause engine acceleration and over-speeding, resulting in fire, explosion and extensive property damage. Numerous safety devices are available, such as air intake shutoff devices, to minimize risk of over-speeding where an engine (due to its application) might operate in a combustible environment such as fuel spills or gas leaks. Equipment owner and operator is responsible for safe operation of engine. Consult an authorized repair location for the engine for future information.

The maintenance guidelines found in the Cummins Operation & Maintenance manual is recommended for the engine. When followed, it will help with a longer life, better performance and more cost efficient operations. A good maintenance schedule begins with a daily awareness of the engine and its various systems.

The engine is equipped with an intake manifold grid heater. The grid heater helps engine starting in cold weather. Intake manifold air temperature is monitored by the Electronic Control Module on the engine. If intake manifold temperature is below specified level (approximately 40° F.) manifold grid heater will be activated. Grid heater activation is indicated by the **WAIT TO START** indicator lamp.



WARNING: Use of ether starting fluids may cause an explosion upon grid heater activation.

ISL ENGINE

**STARTING
PROCEDURE
(ISL Normal)**

With throttle in idle position, turn ignition to the **ON** position allowing **WAIT TO START** lamp to extinguish. Turn key to the start position. When the engine is started the grid heater will again energize for a time period determined by the intake air temperature and the fuel temperature. Allow engine to idle with no load for three to five minutes. The engine coolant temperature should be up to normal operating range (140° F/60 ° C to 212° F/100° C) before operating engine under full throttle.



NOTE: It is not recommended to idle the engine for long periods of time. This will simply waste fuel and annoy neighbors. Consistent periods of long idle may cause damage to the engine.

**STARTING
PROCEDURE
(ISM Normal)**

With the throttle in the idle position, turn the key to the start position. When the engine has started release the key. Allow the engine to idle with no load for three to five minutes. The engine coolant temperature should be up to normal operating range (140° F / 60° C to 212° F / 100° C) before operating the engine under full throttle.



NOTE: The ISM engine does not have a “wait to start” feature.

**STARTING
PROCEDURE -
COLD WEATHER**

The engine block heater may need to be plugged in two to three hours prior to starting. The engine block heater is rated at 1,500 watts, 110 Volts AC and requires the motorhome be plugged into shore power or have the generator running. It is not necessary to leave the block heater plugged in for long periods of time. The block heater requires about 13 Amps to operate.

**OIL
RECOMMENDATIONS
(Engine)**

The maintenance guidelines found in the Cummins Operation & Maintenance Manual is recommended for the engine. When followed it will help with a longer life, better performance and more cost efficient operations. A good maintenance schedule begins with a daily awareness of the engine and its various systems.

A high grade 15W-40 multiviscosity heavy duty lubricating oil meeting Cummins Engineering Specification CES 20071 or CES 20076, American Petroleum Institute (API) specification CH-4 which can be used as an alternative to CES 20071 is recommended. Lubricating oils meeting API CG-4 specifications may be used at a reduced drain interval. The engine uses Pennzoil 15W-40 heavy duty engine lubricating oil that meets Cummins specifications. A critical factor in maintaining engine performance and durability is the use of high grade multigrade lubricating oil and strict adherence to the maintenance service intervals.

A straight weight or monograde lubricating oil is not recommended. Shortened drain intervals may be required as determined by a close monitoring

of the lubricating oil condition by means of a oil sampling program. The use of oil analysis to extend drain interval is not recommended. There are numerous variables which is the basis of the recommendation.

Synthetic oils API category III specifications are recommended for extreme cold temperatures only.

Low viscosity oils used for winter operations will aid in starting. Synthetic oils or oil with adequate low temperature properties used for Arctic operations, where the engine cannot be kept warm when shut down, will aid in starting. The use of synthetic oils should not be used to extend drain intervals. Extended oil change intervals can decrease engine life and possibly affect the engine warranty.

Oil additives should not be used unless the oil supplier or oil manufacturer has been consulted and provided positive evidence or data establishing satisfactory performance in the engine.

Function of Engine Oil:

If a lubricating oil is to work in an engine it must be capable to perform various functions. Lubrication of the moving parts is the primary function. The lubricating oil should be able to form a film between metal surfaces preventing metal to metal contact and reducing friction. When you have a metal to metal contact, friction heat is generated. Welding of the part can occur and metal transfer will result in scuffing or seizing. The film of oil contacting the surfaces will provide cushioning and shock dampening as well.

Cleaning is another function. The oil should perform as a cleaner in the engine by flushing contaminants from critical components. These contaminants should be removed in the filtration system or during the course of an oil change. Oil will provide a protective barrier to prevent corrosion of non-like metals.

Internal components of the engine require cooling. The primary coolant system cannot provide this cooling. Oil will transfer heat by contacting the various components then transferring to the primary cooling system at the oil cooler. The uneven surfaces are filled to react as a combustion seal within the cylinder liner and other internal components.

Synthetic Engine Oil:

In extreme environments where ambient temperatures can be as low as -45° C (-50° F) a petroleum based oil will not perform satisfactorily in diesel engines. Synthetic oils were developed for these type applications. These synthetic oils are blend from ether and/or hydrocarbon based oils. These base oils are produced by chemically reacting lower molecular weight materials to manufacture lubricants of desired properties. All synthetic based oils must meet the API category III classifications and SAE viscosity grades. Synthetic oils and petroleum based oils should never be mixed.

Viscosity:

Viscosity is simply a measure of resistance of molecule layers moving relative to an adjacent layer. All fluid viscosity are affected by temperature. A multigrade lubricating oil tends to be less sensitive to temperature changes due to formulation. Lubricating oils are generally selected for use with viscosities appropriate for the expected operating temperature. The correct selection of a lubricating oil of correct viscosity is critical for optimum performance. Some effects of incorrect viscosity when the oil is too thick range from difficulty in starting, to increasing fuel consumption and reducing power output. When the oil is too thin, oil consumption is increased as well as wear from the metal to metal contact. This will also increase engine noise.

Low temperature viscosity specifications are identified by a “W” (winter). High temperature viscosity that meets the 100° C (212° F) requirements have no suffix. When a lubricating oil meets both high and low temperature requirements they are classified as multi-viscosity or multigrade.

Routine Maintenance Recommendations:

1. Check oil level daily.
2. Replace oil filter at every oil drain interval.
3. Cummins Engine Company, Inc. recommends the use of high quality, API (American Petroleum Institute) licensed CH-4 or CES20071, 15W-40, multiviscosity oil or premium oil.
4. Recommended oil drain interval is defined by the API oil performance classification and the engine duty cycle. Refer to the Cummins Operation & Maintenance Manual for complete details.



NOTE: The engine does not require a “break-in” procedure.

Oil Recommendations - Cold Weather

It is possible to operate diesel engines in extremely cold environments. The engine should be properly prepared and maintained. The correct lubricants, fuels and coolant **MUST** be used for the cold weather range for which the motorhome is being operated. Cold weather operation can be defined in two categories: **Winter** and **Arctic**.

WINTER (32° to -25° F) (0° to -32° C): Use a 50% antifreeze to 50% water coolant mixture, use multi-viscosity oil meeting Cummins specifications and fuel to have maximum cloud pour points 10° F (6° C) lower than the ambient temperature in which the motorhome operates.

ARCTIC (-25° to -65° F) (-32° to -52° C): Use a 60% antifreeze to 40% water coolant mixture. Use oil meeting Cummins specifications and fuel to have maximum cloud pour points 10° F (6° C) lower than the ambient temperature in which the motorhome operates.



Refer to the Operations & Maintenance Manual for more detailed information.

General guidelines for shutting the engine down are fairly simplistic. Allow the engine to idle three to five minutes after a full load operation. This allows adequate cool down of pistons, cylinders, bearings and turbocharger components. Under normal driving conditions, exiting the highway is generally lighter engine operation and the need for the three to five minutes is not necessary.

ENGINE SHUTDOWN

When the motorhome has been sitting for extended periods, 30 days or more, verify all the fluid levels are correct. Follow the normal starting procedures. If the oil pressure gauge does not register within 15 seconds, shut off the engine immediately to avoid damage. Consult the Cummins Operation & Maintenance Manual for guidelines on troubleshooting low oil pressure, or contact a qualified service technician. Allow the engine to idle for three to five minutes before operating under a load.

ENGINE SHUTDOWN -Extended

A fully formulated antifreeze or coolant containing a precharge of Supplemental Coolant Additives (SCA) is recommended. The use of either will significantly simplify coolant system maintenance. The difference between fully formatted antifreeze and fully formatted coolant is the percentage of water. Both contain balance amounts of antifreeze, SCA, buffering compounds and a percentage of good clean quality water. The antifreeze or coolant must meet ethylene glycol or propylene glycol recommendations. A good clean quality water in a 50/50 ratio (40 to 60% working range) mixed with fully formatted antifreeze will provide protection from -34° F to 228° F. The 50/50 mix ratio must be premixed prior to being put in the system. Placing antifreeze and water in the cooling system is not recommended. Consult the Cummins Operation & Maintenance Manual for more details.

COOLANT



NOTE: An over concentration of antifreeze, or the use of high silicate antifreeze, can cause damage to the coolant system and engine. Antifreeze is essential in every climate.



WARNING: The ISL engine is equipped with an intake air heater. Use of ether starting fluids can cause an explosion!

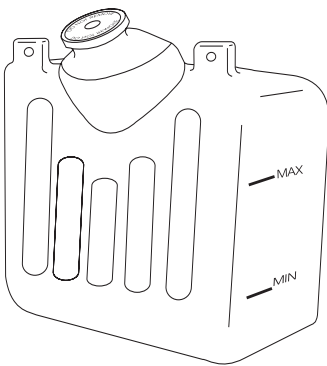
The coolant fluid freeze point should be checked with every oil change interval at 15,000 miles, 500 hours or six months, whichever comes first. Also change the coolant filter at the same interval unless SCA concentration is over three units. The coolant should be drained and flushed at 6,000 hours or two years of service, whichever comes first.

Engine Coolant Reservoir:

A “see-through” plastic reservoir, similar to the familiar windshield washer jar, is connected to the radiator by a hose. As the motorhome is driven, coolant is heated and expands. A portion of fluid displaced by this expansion flows from the radiator into the reservoir tank. When the engine is stopped, and coolant cools and contracts, displaced coolant is drawn back in the radiator by a vacuum. Thus, the radiator is kept filled with coolant to the desired level at all times resulting in increased cooling efficiency. The coolant level should be at or above the appropriate mark on the reservoir tank when the system is cold.



CAUTION: To avoid scalding hot steam or coolant from being released from the engine cooling system, never remove the radiator cap while the engine is running or hot. Failure to follow this warning may result in damage to the engine’s cooling system and possibly cause severe personal injury.



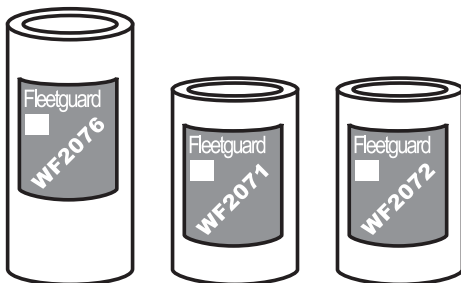
The coolant capacity, when changing the antifreeze, is approximately 11½ gallons.

- Check the coolant level daily or when refueling.
- Drain and flush the coolant system every 60,000 miles or two years, and refill with a heavy-duty coolant (50/50 mix of water and anti-freeze).
- If the coolant is below the MIN mark, the low coolant alarm will sound and the low coolant light will appear on the dash. You will need to stop and check for coolant loss before driving.
- The coolant level to remain between the MAX and MIN level in the reservoir.

Routine Maintenance Recommendations:

1. Check the SCA concentration level every 15,000 miles/6 months.
2. Change the coolant filter every 15,000 miles/6 months.
3. Drain and flush the system every 240,000 miles/2 years, and refill with a heavy-duty coolant (50/50 mix of water and antifreeze).
4. Always use antifreeze. In addition to freeze protection, antifreeze is essential for overheat and corrosion protection.
5. The supplemental coolant additive (SCA) is required.
6. Freeze point should be measured every 15,000 miles/6 months.

Coolant - Additive (SCA)



Fully formulated products contain SCA and are required to protect the cooling system from fouling, solder blooming and general corrosion. The cooling filter is required to protect the coolant system from abrasive materials, debris and precipitated coolant additives.

Supplement coolant additives, or equivalent, are used to prevent liner pitting, corrosion and scale deposits in the cooling system. Use the correct Fleetguard coolant filter to maintain the recommended SCA concentration in the system. Maintain the correct concentration by changing the service filter at each oil drain interval.

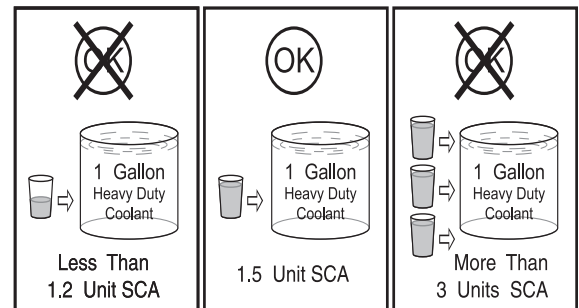


NOTE: The correct filter is determined by the total cooling system capacity and oil drain interval. Refer to the Coolant Capacity Specifications in this section.



CAUTION: Insufficient concentration of the coolant additives will result in liner pitting and engine failure. The SCA concentration must not fall below 1.2 units or exceed 3 units per gallon of cooling system capacity.

Use the correct Fleetguard coolant filter to maintain the recommended SCA concentration in the system. Maintain the correct concentration by changing the service coolant filter at each oil drain interval. The oil pressure gauge, temperature gauge, warning lamps and other safety lamps should be checked daily to ensure proper operations.



NOTE: The correct filter is determined by the total cooling system capacity. If you have any questions refer to the Cummins manual.

Rotten, swollen and worn hoses, as well as loose connections, are frequent causes of coolant system problems. Overheating can be caused by an collapsed hose or a clog caused by rubber shedding from a rotten hose. Replace any hose found to be cracked, swollen or damaged. Connections should be inspected periodically and hose clamps tightened.

Coolant Hoses

If the coolant system becomes frozen, place the motorhome in a warm area until the ice is completely thawed. At this point the motorhome must be towed. If the engine is operated when the cooling system is frozen it will result in engine overheating due to insufficient coolant.

Coolant System - Thawing

Once thawed, check engine, radiator and related components for damage caused by expansion of frozen coolant.

If the engine is overheated, never pour cold coolant into a hot engine. The sudden change in temperature may crack the cylinder head or block. If the engine is hot, fill slowly to prevent rapid cooling and distortion of engine castings.

BRAKE - AUXILIARY

Auxiliary braking devices are designed to supplement a standard wheel braking system. These devices are not designed to bring the motorhome to a complete stop; however, they can assist in controlling the speed of the motorhome. Proper use of the auxiliary braking device can save on costly service brake repairs.

BRAKE - ENGINE

The "Jake" brake is an engine-braking device that operates on a different principal than an exhaust brake. An engine brake functions by releasing the engine's compression. The effect of the engine brake increases with engine speed. When the engine brake is activated the Allison transmission automatically downshifts, utilizing the gear selected and maximizing the engine braking effect.

When the foot switch is activated, an electrical signal is sent to the engine's ECM (electronic control module). The ECM controls a hydraulic circuit that then opens the exhaust valves near the end of the compression stroke. The potential engine braking power depends on turbocharger boost pressure, engine speed, compression ratio, injector timing and when the exhaust valves open.

Located on the driver's left console is a **High/Low** switch. This switch allows for the selection of different levels of engine braking power. Selecting "**LOW**" activates the engine brake on three cylinders. Selecting the "**HI**" setting activates the engine brake on six cylinders.

The engine brake will not be enabled when:

- The cruise control is active.
- The engine speed goes below 850 rpm.
- An electronic fault code is active.

The throttle sensor is a component part of the accelerator pedal assembly and deactivates the engine brakes when the throttle is applied. Applying the service brakes while in cruise control will disengage the cruise control and enable the engine brakes. The Jake Brake foot switch will not disengage the cruise control. Use the Jake Brake when going downhill, freeway or off ramp. The engine brake will allow the engine temperature to drop while going downhill.



NOTE: Idle the engine three to five minutes at approximately 1,000 rpm to warm the engine before activating the engine brakes. Do not operate the engine brakes until the engine oil temperature is above 30° C (86° F).



WARNING: The engine brake is designed to assist the motorhome service brakes.

The Allison World transmission incorporates the World Transmission Electronic Control (WTEC) system. The system is comprised of five major components connected by a wiring harness: the electronic control unit (ECU), engine throttle position sensor, three speed sensors, remote shift selector (keypad) and the control module. The ECU processes information received from the throttle position sensor, speed sensor, pressure switch and shift selector to activate solenoids on the control module in the transmission. The solenoids control oncoming and off going clutch pressure to provide closed loop shift control. This is accomplished by matching rpm during a shift to an established desired profile within the ECU.

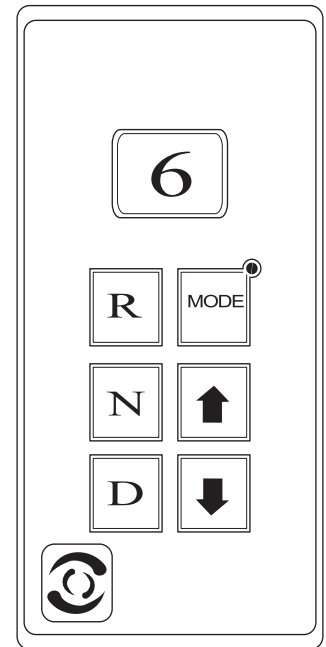
The system is monitored within the first 30 seconds of each engine start. This is referred to as “autodetect.” Autodetect searches for presence of data inputs or transmission components. The autodetect enables the ECU functional or diagnostic response to the items which are detected.

Another feature of the transmission is the ability to “learn” or “adapt.” The electronic control system optimizes shift quality by using “Adaptive Shifting.” A wide variety in shifting under varied conditions will be required before optimizing the shift quality. Generally, five typical shifts of a shift type is needed for shift calibration.

The range selection is accomplished via the remote push button selector. The selector is simplistic in appearance. The controls are **R**, **N**, **D**, arrow **UP**, arrow **DOWN**, **MODE** buttons and a digital display window. Under normal operations the “**D**” button is pressed and the digital display shows the highest forward range attainable for the shift selection in use. The digital display window will also indicate codes for abnormal conditions, and can even be a useful troubleshooting aid. When the ignition is turned ON, the display should be visible. This display indicates the presence of neutral start command. If this display indication is not visible, there is no power to the selector and may indicate electrical problems with the batteries.

- Digital display window enables information requested to be easily read.
- Select the **REVERSE** gear by pressing “**R**”.
- Select **NEUTRAL** by pressing “**N**”. The area around the “**N**” button is a raised ridge so the driver can orient his hand to the push buttons by touch, without looking at the display.
- Select **DRIVE** range by pressing “**D**”. The highest forward gear appears on the **SELECT** display and the transmission will shift to the starting gear.
- The **UPSHIFT** and **DOWNSHIFT** arrow buttons are used to select a higher (if not in “**D**”) or lower (if not in “**1**”) forward range. These buttons are not functional in **NEUTRAL** or **REVERSE**. One press changes the range selected by one range. If the button is held continuously, the selected range will continue to change up or down until the button is released or until the highest/lowest possible range of gears is selected.

TRANSMISSION - Shift Selector



- The **MODE** button enables a secondary shift point to be selected. This is commonly referred to as “Economy.” It is further used by the service technician to access diagnostic codes when troubleshooting. The diagnostic circuitry must be enabled to display.
- When the Auxiliary Braking device is used, the display changes to a default reading of two or three. This default is pre-selected at the factory and can only be reprogrammed by an authorized Allison Service Center. The transmission is not in second or third gear. This is only the reference for the rpm shift points to optimize the braking capacity.

Transmission - Check Light

The electronic control system is programmed to inform the operator of a problem with the transmission system and automatically take action to protect the operator, motorhome and transmission. When the Electronic Control Unit (ECU) detects a **DO NOT SHIFT** (DNS) condition the ECU restricts shifting, turns the **CHECK TRANS** light on the instrument panel and registers a diagnostic code.



NOTE: For some problems, diagnostic codes may be registered without the ECU activating the CHECK TRANS light. An Allison Transmission authorized service outlet should be consulted whenever there is a transmission related concern. They have the equipment to check for diagnostic codes and to correct problems which arise.

Each time the engine is started the **CHECK TRANS** will light, then turn off after a few seconds. This momentary lighting is to show that the status light circuits are working properly. If the **CHECK TRANS** light does not illuminate during start up, or if the light remains on after start up, the system should be checked immediately.

Continued illumination of the **CHECK TRANS** light during vehicle operation (other than start up) indicates that the ECU has signaled a diagnostic code. Illumination of the **CHECK TRANS** light is accompanied by a flashing display from the shift selector. The shift selector display will show actual range attained and the transmission will not respond to shift selector requests.

Indications from the shift selector are provided to inform the operator that the transmission is not performing as designed and is operating with reduced capabilities. Before turning the ignition off, the transmission may be operated for a short time in the selected range in order to “limp home” for service assistance. Service should be performed immediately in order to minimize potential for damage to the transmission.

When the **CHECK TRANS** light comes on, and the ignition switch is turned off, the transmission will remain in **N** (Neutral) until the condition causing the **CHECK TRANS** light is corrected. Generally, while the **CHECK TRANS** light is on, upshifts and downshifts will be restricted and direction changes will not occur. Lever and push button shift selectors do not respond to any operator shift request while the **CHECK TRANS** light is illuminated. The lockup clutch is disengaged when transmission shifting is restricted, or during any critical transmission malfunction.

Diagnostic Codes:

The diagnostic codes are numerical representations of malfunctions in the transmission operations. Each code is a two digit main code and a two digit sub code. The codes, when detected, are logged in the ECU memory. These codes will fall in two classes: active and inactive. Active codes are codes currently effecting the ECU process. Inactive codes are retained but may not effect the ECU process. The diagnostic mode must be entered. A maximum of five codes, **D1** to **D5**, may be listed at one time. The highest priority code will be listed in **D1**. The **MODE** button will enable selection of sequential codes.

- Enable Diagnostic Code Selection Display.
- Stop the motorhome at a safe location.
- Apply the parking brake.
- Simultaneously press the **UP** and **DOWN** arrows twice to enter the stored codes. The first time the arrows are pressed will indicate the oil level sensor information.
- The codes will display one digit at a time.
- The mode button is pressed to scroll through the codes.
- Any code obtained should be noted and reported to an Allison Service Center for evaluation and possible repair.
- Inactive codes can be cleared by holding the **MODE** button for approximately three seconds. Some codes are self clearing while others will require service or ignition cycles to clear.

The Allison MH Series requires minimum maintenance. Careful attention to the fluid level and the connections for the electronic and hydraulic circuits is very important.

For easier inspection the transmission should be kept clean. Make periodic checks for loose bolts and leaking fluid lines. Check the condition of the electrical harnesses regularly. Check the engine cooling system occasionally for evidence of transmission fluid which would indicate a faulty oil cooler. Report any abnormal condition to an Allison dealer.

**Transmission
- Periodic
Inspections**

Prevent Major Problems:

Help the WTEC III control system oversee the operation of the transmission. Minor problems can be kept from becoming major problems if an Allison Transmission distributor or dealer is notified when one of these conditions occur:

1. The shifting feels odd.
2. The transmission leaks fluid.
3. There are unusual transmission-related sounds (changes in sound caused by normal engine thermostatic fan cycling, while climbing a long grade with a heavy load, have been mistaken for transmission-related sounds).
4. The **CHECK TRANS** light comes on frequently.

The Importance of Proper Fluid Levels:

The transmission fluid cools, lubricates and transmits hydraulic power. Proper fluid levels must be maintained at all times. If the fluid level is too low, the converter and clutches do not receive an adequate supply of fluid. If the fluid level is too high, the fluid can aerate. Aerated fluid can cause the transmission to shift erratically or overheat.

The MH Series oil level sensor (OLS) allows the operator to obtain an indication of sensor fluid level from the keypad shift selector. Frequently check for the presence of oil level diagnostics in the transmission. If the OLS has not been detected, troubleshooting of the OLS circuit is required. This will have to be performed by an Allison Service Center.

After the OLS circuit is repaired, ensure that reset of the “autodetect” or manual selection of the OLS function, using the Pro-Link, has been accomplished.

Fluid Level Check with the Keypad:

- Park the motorhome on a level surface, place the transmission in “N” and set parking brake.
- The transmission should be at normal operating temperature.
- The motorhome should be stationary for approximately two minutes to ensure fluid is stabilized.
- Simultaneously press the **arrow UP** and **arrow DOWN** buttons one time.
- The delayed fluid level check will display in the digital display window. The display will be one character at a time. The “**o,L**” represents oil level check mode. This will be followed with fluid level indication readings. The “**o,K**” indicates a correct fluid level. Reading between the OLS and the dipstick may not agree because the OLS compensates for fluid temperatures.

Abnormal indications of the OLS will be “Lo” representing a low fluid level, “HI” for a high fluid level or “oL” for invalid information and system problems. All indications will be followed by numeric values. The “Lo” and “HI” followed by the numeric value represents the quarts of fluid required for the system. The invalid code numbers represent specific symptoms.

Common Oil Level Fault Codes:

- 0,5 settling time too short.
- 5,0 speed RPM too low.
- 5,9 speed RPM too high.
- 7,0 sump temperature too low.
- 7,9 sump temperature too high.
- 9,5 OLS FAILURE.



NOTE: Exit the fluid level display by pressing any range button on the keypad.



NOTE: To correctly check the transmission fluid level using the dipstick, the transmission fluid must be at operating temperature. The oil level sensor method of checking the fluid level compensates for transmission fluid temperature between 60° C - 104° C (140° F - 220° F). Any temperature below 60° C (140° F), or above 104° C (220° F), will result in an Invalid for Display condition.

Any fluid meeting *Dexron-III* specifications are acceptable for use in the transmission. Transmission performance, reliability and durability are important influences in the type of fluids used. Change the fluid internal filters after the first 8,000 km (5,000 miles). The dipstick/oil fill is located between the engine and transmission underneath the engine access door in the bedroom. Change the transmission fluid and internal filters every 40,000 km (25,000 miles) or 18 months, whichever occurs first.

**TRANSMISSION
LUBRICATING
FLUID**

Fluid and Internal Filters Change Interval Recommendations:

The fluid and internal filters may require changing earlier depending on the severity of operating conditions. The fluid must also be changed whenever there is evidence of dirt or high temperature conditions as indicated by discoloration, strong odor or fluid analysis. Local conditions, severity of operation or duty cycle will dictate more or less frequent service intervals.



Refer to the transmission manual for detailed information on transmission lubricating fluid

Transmission Fluid Levels - Cold Check

Cold Check - Manual Check Procedures:

The concept of a cold check is to determine adequate fluid level for safe operating until hot check can be performed.

- Park the motorhome on a level surface using the service brakes.
- The engine is operated at a low idle. Put the transmission in **N** (Neutral).
- Apply the parking brake and chock the wheels to prevent the motorhome from moving.
- Allow the engine to run at idle (500-800 rpm) for one minute.
- Apply the service brakes and shift to **D** (Drive), then to **N** (Neutral) and next to **R** (Reverse) to fill the system. Finally shift to **N** (Neutral) and release the service brakes. Allow the engine to continue to run at idle (500-800 rpm).
- Remove the dipstick and wipe clean. Reinsert the dipstick fully into the tube and remove to check fluid level. Repeat this to verify the reading if needed.
- Safe operating level is anywhere within the **COLD CHECK** band on the dipstick. The fluid level is sufficient enough to operate until a **HOT CHECK** can be run.
- If the level is not within this band, add or drain the fluid as necessary to bring the level to the middle of the **COLD CHECK** band.
- Perform the **HOT CHECK** the first opportunity after reaching normal operating temperatures (160° - 200° F/71° - 93° C).



Transmission Oil Level Dipstick.



CAUTION: Low or high fluid level can cause overheating and irregular shift patterns. These conditions can damage the transmission if not corrected.

Transmission Fluid Levels - Hot Check

- The fluid levels rise as temperature increases. The fluid must be hot to ensure an accurate check.
- Be sure the fluid has reached normal operating temperature (160° - 200° F/71° - 93° C). If a transmission temperature gauge is not present, check the fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under the load for at least one hour.
- Park the motorhome on a level surface and shift to **N** (Neutral). Apply the parking brake and allow the engine to idle (500-800 rpm).
- After wiping the dipstick clean, check the fluid level. Safe operating level is anywhere within the **HOT RUN** band on the dipstick.
- The width of the **HOT RUN** band is approximately one quart of fluid at normal temperature range.
- If the level is not within this band, add or drain the fluid as necessary to bring the level within the **HOT RUN** band.
- Be sure that the fluid level checks are consistent. Check the level more than once. If the readings are not consistent check to be sure that the transmission breather is clean and not clogged. If the readings are still not consistent, contact the nearest Allison distributor or dealer.

Low sulphur #2 diesel fuel or #1 and #2 commercial winter blend diesel fuels are the most common commercially available and recommended for use. The Cummins Engine Company Inc. recommends the use ASTM #2D fuel. The use of #2 diesel fuel will result in optimum engine performance.

FUEL REQUIREMENTS

WARNING: Do not mix gasohol with diesel fuel. This mixture can cause an explosion.



NOTE: Due to the precise tolerances of diesel injection systems, it is extremely important that fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injector. Fuel additives for lubricity are not recommended. There are numerous diesel fuel additives to help remove moisture from fuel, prevent microbe growth and to prevent freeze-up during cold weather. Any fuel additives product should show supporting data for performance and benefits. Engine failures caused by incorrect fuel are not covered under warranty.

FUEL TANK

The diesel fuel tank is made of a 160 thousandths aluminum. The capacity of the tank is 150 gallons. The engine pickup tube is cut at a 45° angle to allow optimum flow to the engine.



NOTE: If the coach has been stored for any length of time you should check the vent for blockage. It is not uncommon for insects to plug the vent tube. If the tank appears to be pressurized the vent tube may be blocked. To inspect the vent tube check on the roadside of the fuel tank, near the bottom. Always store the motorhome with a full fuel tank.

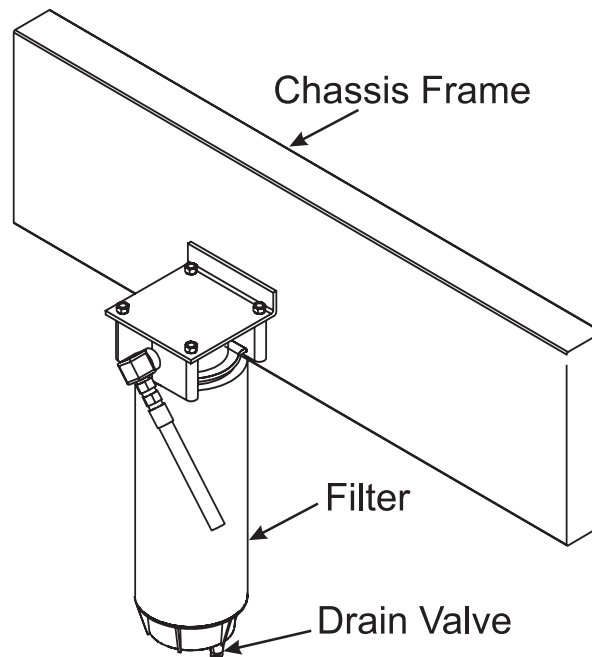
Routine Maintenance Recommendations:

1. Change the fuel filter at every oil change interval.
2. Change the fuel-water separator filter every 12-18 months or every 25,000 miles.

FUEL/WATER SEPARATOR (ISL)

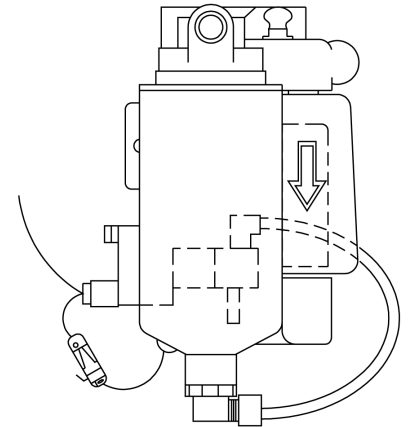
Fuel/Water separator is located in rear engine compartment on the left side of the frame. If the **WATER IN FUEL** light is illuminated, the fuel filter will need to be drained. Shut off the engine and open the drain valve. Turn the valve counterclockwise approximately 1½ to 2 turns until draining occurs. Drain the fuel/water separator of water and sediment until clear fuel is visible. Turn the valve clockwise to close the drain valve.

In the event the engine runs out of fuel, the lift pump on the fuel pump will run for approximately one minute with the ignition ON. The ignition may have to be turned on and off several times before attempting a start. If the engine is unable to be restarted, contact the nearest Cummins Center or phone **1-800-343-7357** for Cummins Customer Assistance Center.



Operation/Restart After Running Out Of Fuel:

- Turn the ignition switch to the ON position.
- The green power light on the control panel should illuminate.
- Remove the cap from the Schrader air valve and press and release the “AIR PURGE” switch on control panel. The yellow “AIR PURGE” lamp will illuminate. Press and hold the Schrader air valve open to release the excess air from the system. The electronics will maintain the pump operation for 50-60 seconds. Recycle the pump and when the clear fuel is observed from the Schrader valve, release the Schrader valve (so the fuel no longer leaks from it).
- The internal pump will continue to run, pressurizing the fuel system while forcing fuel through the fuel lines.
- It may require recycling the “AIR PURGE” about six times before getting enough fuel from the tank to filter.

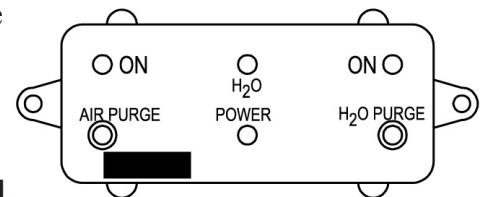
FUEL/WATER SEPARATOR (ISM)

NOTE: The engine may run rough for a few minutes while the remaining air, if any, is forced through the fuel system.

- If the water in fuel light is illuminated on the dash, follow the same procedure using the H2O button on the control panel. It may be necessary to change the fuel filter.



NOTE: Always carry an extra Racor element as one tank full of excessively contaminated diesel fuel can plug a filter.

**Servicing Reusable Pre-Filter:**

- Remove the thumb bolt, washer and top block. Remove the pre-filter and o-rings.
- Clean the pre-filter in a solvent bath or with compressed air as necessary. Remember to wear safety goggles.
- Inspect the O-rings for cuts or damage. Replace if needed, otherwise lube with motor oil or clean with fuel and replace.
- Install the pre-filter back into the bottom block (pre-filter arrow points down). Replace the top block. Make sure the O-rings are properly seated.
- Replace the thumb bolt and tighten by hand. Using pliers, turn the bolt 3/4 of one turn firmly to seat the O-ring seals.



1. Schraeder valve.
2. Thumb screw.
3. Reusable filter.



NOTE: Over tightening may result in damage to the unit.

- Activate the “AIR PURGE” switch, start and operate the engine at high idle for about three minutes.

FUEL SENDING UNIT

The Centroid fuel sender has no moving parts. It works by measuring capacitance, an electrical property, between its inner and outer tubes in the tank. The more fuel between the tubes, the higher the reading. Electronics in the hockey-puck head of the sender convert the capacitance to current to drive the fuel gauge.

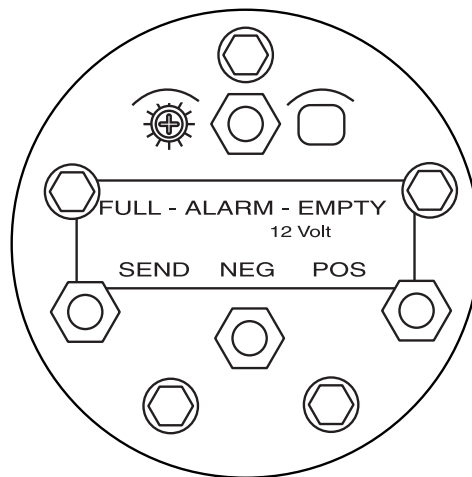
Connections: The Centroid sender has four connections:

- **Positive and Negative:** Battery voltage to run the electronics in the sender head.
- **Send:** Connects to the Send terminal of the gauge on the dash.
- **Alarm:** Makes a connection internally to the Negative terminal when the low alarm fuel level is reached (when gauge is reading about 1/8 tank). This turns on the alarm light on the dash. It is not adjustable.

Adjustments: The Centroid sender has two adjustments:

- **Empty:** Adjusts for length of sender. It has been set at the factory and covered with a sealant. It should not be changed.
- **Full Adjustment:** The full adjustment can be used to correct for slight differences between fuel meters. During installation, it has been calibrated for your meter and should not need readjustment.

The correct adjustment technique, with a full tank of fuel, is to start with the full adjustment screw completely clockwise. This should cause the reading to be above full. Then adjust slowly counterclockwise until the full mark is reached. The intent is to always adjust downscale rather than upscale.



Fuel Sending Unit.

Troubleshooting:

- A. Electronic output:** The sender has a transistorized output which prevents an ohmmeter from getting a correct reading of its output resistance.

- B. Fuel Only:** The sender will not work correctly in conducting fluids such as water (it will read above full all the times in water). One possibility is that when there is a constant above-full reading there may be water in the bottom of the fuel tank.

- C. Contact Centroid:** Probably 90% of the return Centroids test okay on the bench. If you have incorrect readings contact Centroid (telephone: 800-423-3574 or, preferably, fax: 904-423-3709) with the symptoms. A short, “fill in the blanks” troubleshooting test is provided, appropriate to the sender. It is easier to find the problem that way than after the sender has been removed from the system, since the problem is not necessarily with the sender.

Make a visual check for fuel leaks at all engine-mounted fuel lines and connections and at the fuel tank suction and return lines. Leaks in this area can be detected by checking for accumulation of fuel under the tank. Engine performance and auxiliary equipment is dependent upon the ability of flexible hoses to transfer lubricating oil, air, coolant and fuel oil. Diligent maintenance of hoses is an important step in ensuring efficient, economical and safe operation of engine and related equipment.

Fuel Lines & Hoses

Check hoses daily as part of the pre-start-up inspection. Examine hoses for leaks. Check all fittings, clamps and ties carefully. Make sure that the hoses are not touching shafts, coupling and heated surfaces, including exhaust manifolds, sharp edges or other obviously hazardous areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. To ensure continued proper support, inspect fasteners frequently and tighten or replace as necessary.

Engine oil levels above the dipstick full mark or a decrease in lube oil consumption may indicate internal fuel leaks into the crankcase. Check oil level frequently for fuel contamination.

The motorhome uses an engine driven hydraulic pump to operate both the power steering system and the engine hydraulic cooling fan system. The hydraulic pump is a dual stage pump that uses one half of the pump to supply pressurized hydraulic fluid to the power steering. The other half of the pump supplies the engine cooling fan motors. The hydraulic system uses

**HYDRAULIC
SYSTEM
(ISL)**

the same fluid for both systems, sharing one common reservoir. The hydraulic fluid used is an automatic transmission fluid (*Dexron III*) which has a wide ambient temperature operating range.



CAUTION: If ambient temperatures approach 0° F, Pennzoil Arctic Blue hydraulic fluid, or equivalent hydraulic fluid, should be used. Using incorrect hydraulic system fluid weights in cold or arctic temperatures will raise the hydraulic system operating pressure and may damage the hydraulic cooler.

Hydraulic Pump

The hydraulic pump creates pressure by meshing sets of gears together inside a close tolerance housing. A filtered supply of hydraulic fluid from the hydraulic reservoir enters the intake side of the pump. The meshing gear assembly "squeezes" the oil through the pump to the output side delivering the pressurized fluid to the power steering gear and the switching valve of the engine cooling system. Each half of the pump is equipped with an internal by-pass pressure relief spring. If the hydraulic pressure should exceed the specified pressure limit, the internal by-pass relief valve will be forced open to keep the hydraulic fluid at operating pressure. The hydraulic pressure generally is not rated in psi but is rated in the term bar. One bar is equivalent to approximately 14.5 psi. Hydraulic system pressures with a system at no load may be as low as eight bars on the output side of the pump. This is due to the hydraulic fluid flow of the pump. When a load is placed on the hydraulic pump, such as turning the steering wheel, hydraulic fluid flow slows from hydraulic fluid restriction and creates pressure.

This may be understood as a faucet with a garden hose attached. Crimping the hose with the faucet on will create pressure from the restriction. This principal applies to the hydraulic system. The hydraulic pump is the supply, the load would be the power steering gear or the hydraulic fan motors. Hydraulic system pressure at full load can exceed 130 bar or 2000 psi. Hydraulic system pressure falls dramatically after the load. The return line pressure may be as low as six to eight bars. The fluid enters the hydraulic cooler where the heat is dissipated.

Hydraulic Cooler

The hydraulic cooler is an important part in the hydraulic system. This helps keep the hydraulic fluid from overheating. When a load is placed on the hydraulic system, heat is created in the fluid. The hydraulic pump builds pressure that creates heat in the fluid. The restriction from the loads applied also creates heat. This heat must be dissipated to keep the hydraulic fluid from overheating and breaking down. After cooling, the fluid is filtered before returning to the reservoir.

Care must be used when starting an engine in very cold or arctic climates. As with any oil, lower temperatures thicken the oil. Hydraulic system pressures

increase due to the thickness of the fluid. Although the hydraulic pump is equipped with pressure relief valves, the thick oil on the return line can exceed the operating pressure of the hydraulic cooler.

The hydraulic fan drive system cools the radiator, charge air cooler, hydraulic fluid cooler, transmission cooler and the dash air conditioning condenser. The components of the hydraulic fan system are: hydraulic reservoir, filter, pump, two hydraulic fan motors (ISM), one hydraulic fan motor (ISL) hydraulic switching valve and thermovalve. Cooling fan speed is proportional to engine speed and radiator temperature. When radiator temperature rises above 185° Fahrenheit, the wax thermovalve slowly closes off the bypassing hydraulic fluid from the switching valve. As radiator temperature rises, a spool valve begins to move in the switching valve. This directs the pressurized hydraulic fluid to the fan motors. The higher the radiator temperature, the further the spool valve is moved in the switching valve, providing a higher volume of pressurized hydraulic fluid to the fan motors. Fan motor speed is increased to meet the demand for cooling. The action of the thermovalve is designed to move the spool in the switching valve to ramp up fan motor speed. This design saves horsepower and increases fuel mileage by precise control of hydraulic fan motor speed. The fan motors will increase in speed when the motorhome is ascending long hills or operating in high ambient temperatures. It is normal for the fans to "roar" when they are operating. Fan motor speed and engine rpm are approximately the same with the switching valve at full engagement.

Hydraulic Fan System

The wax filled thermovalve is mounted at the top of the radiator sensing coolant temperature. The thermovalve controls the action of the switching valve. When the radiator is cool, the hydraulic fluid is allowed to flow through the inlet and outlet ports of the thermovalve and return to the hydraulic reservoir. As the coolant temperature inside the radiator rises to approximately 185° Fahrenheit, the wax inside the thermovalve begins to melt and expand. This begins to restrict hydraulic fluid flow through the thermovalve. The restricted hydraulic fluid pressure then begins to move the internal spool valve of the switching valve. This process will continue until coolant temperature inside the radiator reaches approximately 199° Fahrenheit. At this temperature hydraulic fluid flow through the thermovalve is stopped, moving the spool valve to full open position.

Thermovalve



NOTE: The ISM series engine has a piloted orifice at the inlet port of the switching valve. This allows the fan motors to spin at a low rpm, even when the radiator is cool. This is to keep the dash air conditioning compressor at proper operating temperatures. It is normal for the engine fans to spin when the engine is idling even at cool radiator temperatures.

Switching Valve

The switching valve is mounted to the fan motor. This valve controls direction of high pressure hydraulic fluid flow. High pressure hydraulic fluid comes from the hydraulic pump to the switching valve before returning to the reservoir. Either the thermostatic valve or the electric override valve directs the fluid to the spool in the switching valve. When the radiator is cool, pressurized hydraulic fluid will bypass the fan motors and return to the fluid reservoir. As radiator temperature rises, the thermostatic valve signal is slowed or stopped to the switching valve. High pressure fluid is then directed to the fan motors, cooling the radiator.

Electric Override Valve (ISM)

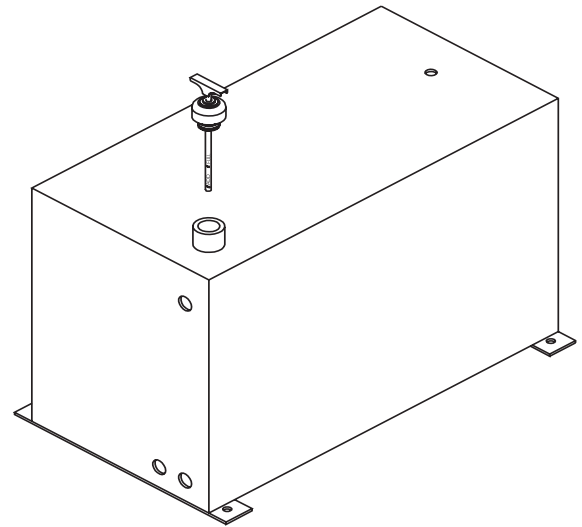
Motorhomes equipped with an ISM engine have an electric override hydraulic control valve. The override valve is located at the lower rear corner of the radiator package. This valve is a normally closed valve that is plumbed parallel with the thermostatic valve. It performs the same hydraulic signal function as the thermostatic valve, but is electrically controlled by the ISM engine. The ISM engine monitors intake manifold temperature. The electronics of the ISM engine control an 87a relay located in the rear run box marked Hyd. Fans. When intake manifold operating temperatures are normal, the electronic engine energizes the coil of the relay. This energizes the coil of the override valve and the hydraulic fluid signal flows through the override valve to the thermostatic valve. If the ISM engine detects an over temperature condition of the intake manifold, the coil of the 87a relay is deactivated. Power to the override valve is removed, hydraulic fluid flow signal is stopped and internal spool of the switching valve moves to full open position. The high pressure fluid is directed to fan motors cooling the radiator.

Fan Motor

The fan motors are driven by hydraulic fluid pressure from the switching valve. The fan motors work on the same mechanical principal as a hydraulic pump only the mechanical principal when applied to the fan motors is reversed. Instead of creating hydraulic pressure by meshing gears together in a close tolerance housing, the fan motors receive hydraulic pressure. The hydraulic fluid drives the fan motor's internal gear assembly, spinning the fan motors and the attached fan blades. The switching valve is mounted to one fan motor. The fluid is directed to the input of that motor first. The output of the first motor is hooked to the input of the second motor. The hydraulic fluid is then cooled and filtered before returning to the reservoir.

The hydraulic reservoir is located in the engine compartment. It is made from aluminum so the tank will not be affected by any moisture that may condense. The oil level in the reservoir should be checked when the hydraulic fluid is at operating temperature. This should be done every 6,000 miles or three months. The oil dipstick/oil fill is located on top of the reservoir. The oil level should be kept between the full and add marks on the dipstick. When performing fluid level checks, inspect fittings and hoses for signs of leakage. Look underneath the motorhome for any signs of fluid leakage. Avoid untimely and costly failures by having leaks repaired. Change the hydraulic oil filter every 15,000 miles or once a year. Total system capacity is approximately 46 quarts.

Hydraulic Reservoir



Hydraulic Fluid Reservoir.

The Interceptor series hydraulic filter system located in the engine compartment has special features to protect the precision tolerance hydraulic components. The filter head assembly has a built in sight gauge that indicates fluid flow through the filter. A specially designed media filter absorbs harmful contaminants such as moisture and dirt. When the engine is running, use the sight gauge to check the filtering process. The green zone indicates the hydraulic fluid is being properly filtered and flowing unrestricted through the filter and head assembly back to the reservoir. As the filter traps harmful debris and contaminants, the indicator will move into the red zone. When the indicator is in the red zone, it is indicating filter is clogged and fluid is bypassing the element returning to the reservoir. The filter head is equipped with a built in bypass valve. This prevents a clogged filter from developing a leak due to excess hydraulic fluid pressure inside a clogged filter.

The filter is rated at ten micron*. Change the filter before the built in sight gauge is operating in the red zone. This will ensure the hydraulic fluid is properly filtered.

Filter number: Parker IN HC 5720 (ten micron)

***One micron is one millionth of one meter.**

Hydraulic Filter

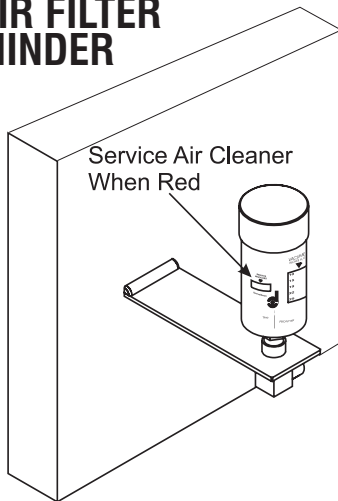


Hydraulic filter for the power steering and hydraulic cooling fans.

STEERING GEAR

The M-100 series Sheppard steering gear requires no maintenance. Power steering is provided by using hydraulic pressure to assist rotating the output shaft of the steering gear. Located at the end of the input shaft of the steering gear is poppet valve and worm drive. The poppet valve directs the hydraulic fluid pressure to a type of spool. There are worm drive threads in the center of the spool. When in the center position, pressurized hydraulic fluid bypasses the spool. When a turn is made, the poppet valve shifts to one direction or the other, directing the hydraulic pressure to one side of the spool depending on turning direction. The hydraulic fluid is then cooled before returning to the reservoir. Inspect for signs of leakage when performing fluid level checks. Changing the hydraulic filter at regular intervals will help ensure trouble free operation.

AIR FILTER MINDER



Located in the engine compartment.

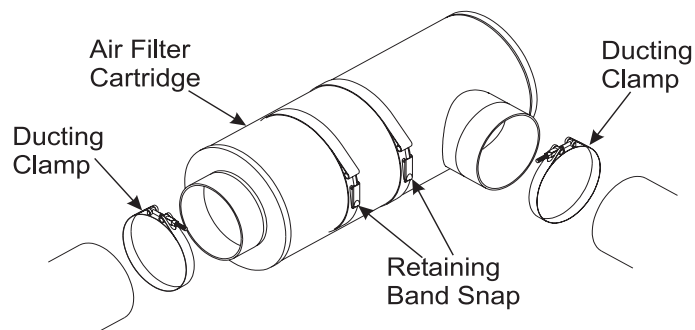
The air filter minder is a precision overflow restriction gauge designed to take the guesswork out of air cleaner replacement.

The air filter minder is located in the engine rear compartment. Its operation is simple and virtually foolproof. As dirt captured by filter cartridge slowly builds up the system pressure drop increases and is indicated by the filter minder on an easy to read scale. The indicator locks up at the point of maximum restriction so readings can be taken with or without the engine running.

When the desired change-out point is reached, the air filter should be replaced and the service indicator is easily reset by pushing the button at the bottom of the minder.

AIR FILTER - CHANGING

When the air filter needs to be changed, the entire air filter cartridge is discarded and replaced by loosening the inlet and outlet ducting clamps and releasing the retaining band snaps. The air filter is located in the rear engine compartment. Changing the air filter may need to be performed from the bed deck access.

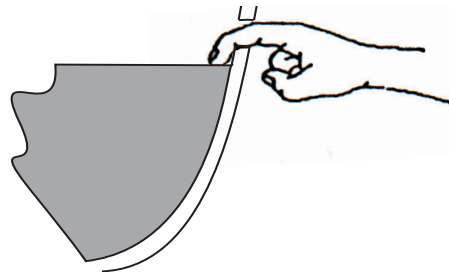


Proper Drive Axle Lubricant Level:

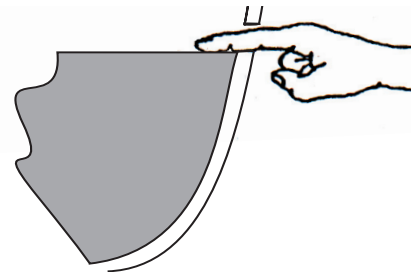
- Regular inspection of the drive axle lube levels is an essential maintenance procedure.
- The lubricant should be level with bottom of the hole.
- Important: The lube level close enough to the hole to be seen or touched is not sufficient. The lube must be level with the hole.
- The differential is filled with API GL-5 or MT-1 type gear lubricant, Pennzoil Gear Plus Super-EW 75w-90.



NOTE: When checking the lube level also check the housing breathers. Clean the breathers if dirty or replace them if damaged.



Incorrect Oil Level.



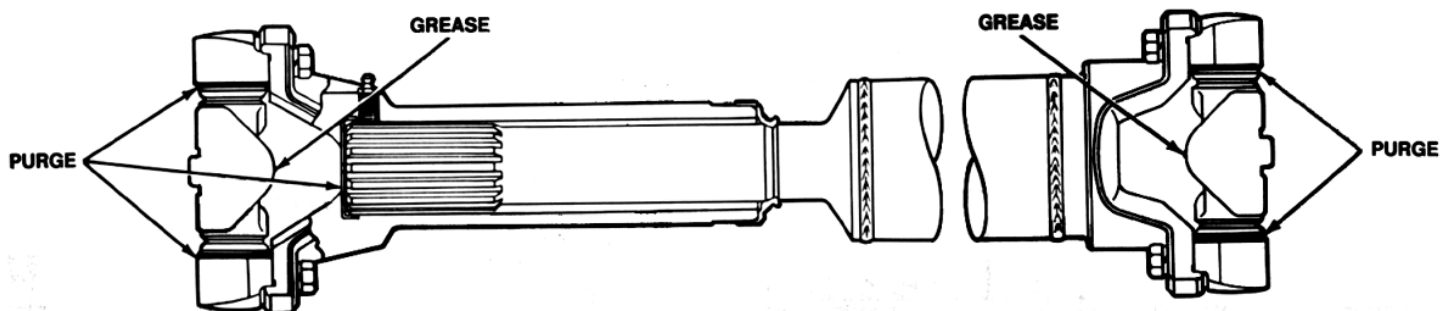
Correct Oil Level

Greasing the Driveline Universal Joint:

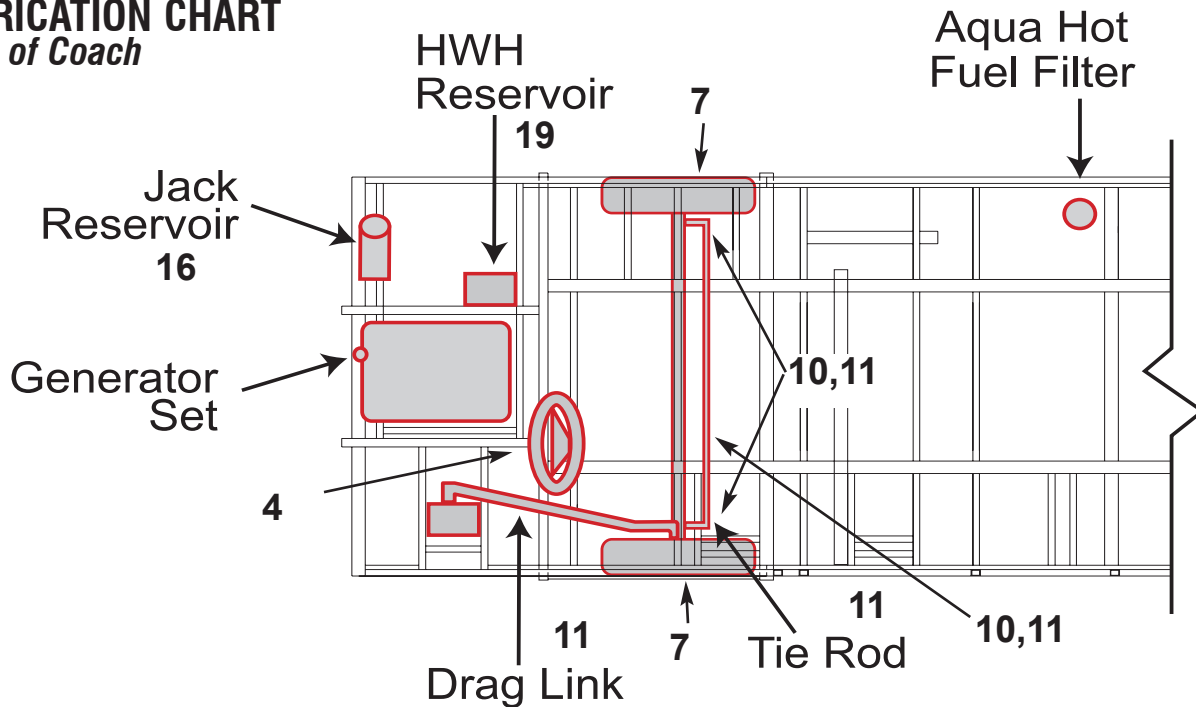
1. Check the driveline for looseness. If loose, service as necessary.
2. Apply the specified grease at the grease fitting on the universal joint. Apply grease until the new grease purges from all the seals.
3. If the new grease does not purge at the seals loosen the bearing cap bolts and regrease until all four caps purge. If the new grease still does not purge replace the universal joint.

DRIVELINE**Greasing the Driveline Slip Yoke and Splines:**

1. Check the driveline for looseness. If loose, service the driveline as necessary.
2. Cover the air hole so that grease can flow easily to the seal. Apply the specified grease at the grease fitting on the slip yoke. Apply grease until new grease purges from the air hole in the end of the slip yoke. Greasing Intervals-10,000 miles or annually.



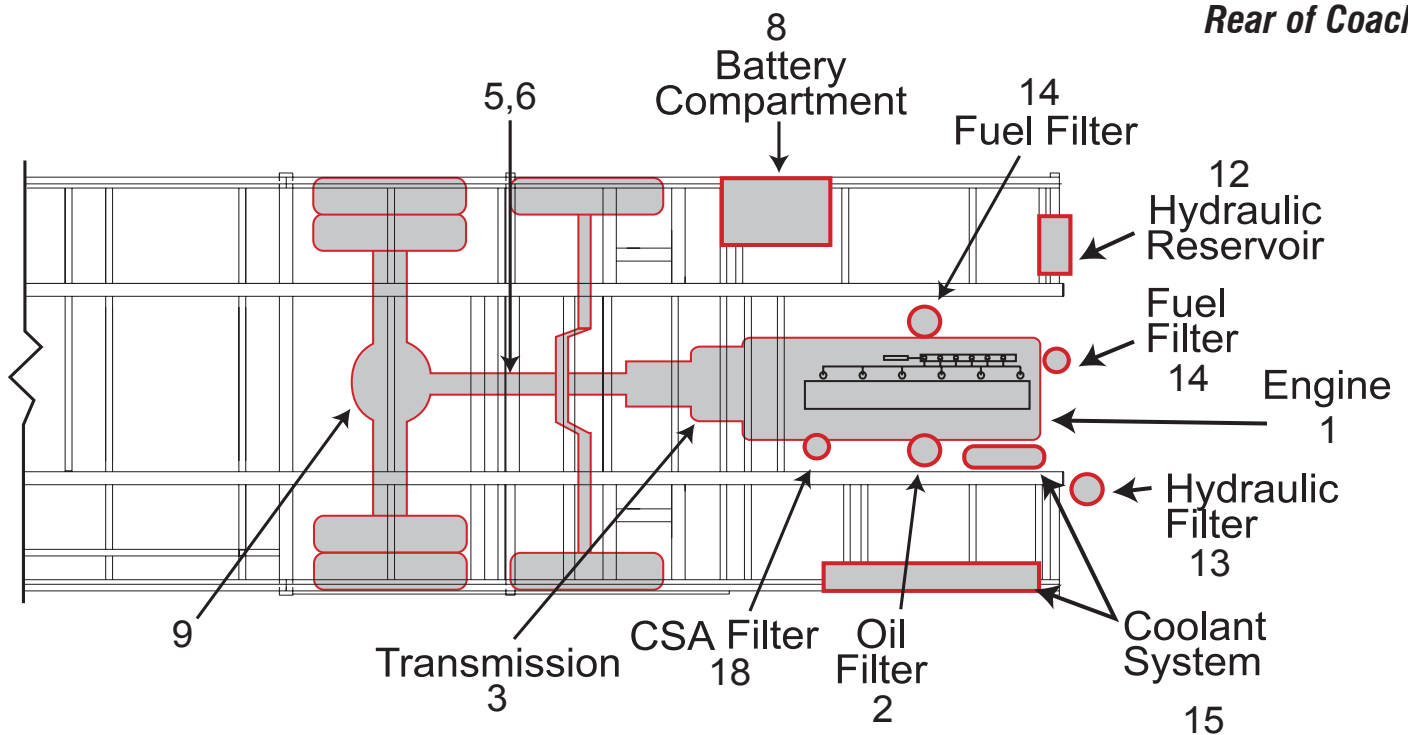
LUBRICATION CHART
Front of Coach



Lubrication Chart:

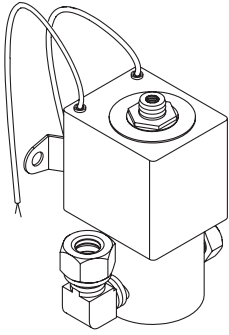
Service must be performed every twelve (12) months, regardless of actual mileage, to protect seals, bearings and gaskets from drying out and failing. The motorhome must be started and driven for at least 20 miles bimonthly.

1. Engine Oil	Keep To Full Mark	Check Daily	EO
2. Engine Oil Filter	Replace At Oil Change	Refer to Cummins	OP
3. Transmission	Refer To Service Manual	Check Daily	TF
4. Steering Shaft (Inside Coach)	3 Fittings	Every 2 Years	CL-4
5. Drive Shaft U-Joints	2 Fittings	10,000 or Annually	CL
6. Drive Shaft Slip Joint	1 Fitting	10,000 or Annually	CL
7. Wheel Bearings	Repack	30,000 or Annually	HT
8. Battery Terminals	Apply Coating	10,000 or Annually	P
9. Rear Axle Differential	To Filler Plug	250,000 or Every 3 Years	MP
10. King Pins & Knuckles	2 Fittings Each End	30,000 or Annually	CL
11. Drag Link/Tie Rod	4 Fittings	30,000 or Annually	CL
12. Hydraulic Fluid Reservoir	Keep To Full	Check Daily	TF
13. Hydraulic Fluid Filter (if applicable)	Replace	15,000 or Annually	TF
14. Fuel Filter	Replace	At oil change	FF
15. Engine Coolant Capacity	Replace	Every 2 Years	AF
16. Hydraulic Leveler Reservoir	Replace	Every 36 Months	TF
17. Generator Set	Refer to Service Manual	Refer to Onan	EO
18. Hydraulic CSA Water Coolant Filter	Refer to Service Manual	Refer to Cummins	

Rear of Coach**Lubrication Chart Code:**

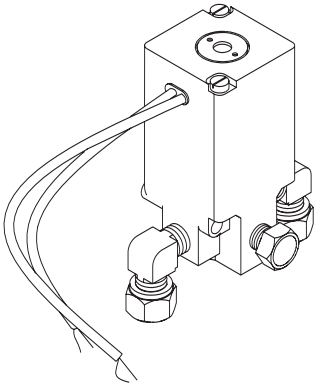
- CL-4** U-Joints located inside the coach under the steering column cover
- EO** Engine oil as recommended by engine manufacturer
- OP** Refer to operator's manual
- MP** API GL-5 or MT-1 type gear lubricant - Pennzoil Gear Plus SUPER-ew 75w-90, Synthetic
- HT** High temperature bearing grease
- CL** Chassis lubricant should be a high quality noncorrosive multipurpose lithium soap pressure gun lubricant that is water resistant and designed to withstand extremely high operating temperatures
- P** Petroleum jelly, or a commercial battery terminal corrosion inhibitor
- AF** Consult Cummins Owner's manual for antifreeze type
- TF** Transmission fluid. Use Dexron III transmission fluid only
- FF** Fuel Filter

PARTS - COMMON SOLENOIDS & SENDERS



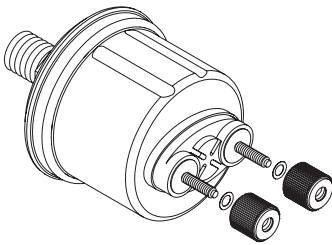
Rear Bag Dump Solenoid:

- Used on hydraulic level and air level systems.
- Dumps air in air bags on hydraulic level units and is used to dump air from tag axle on air level units.
- Located in the engine compartment on the roadside, attached to frame below alternator.
- Type- Allen Air 36BXA-HB



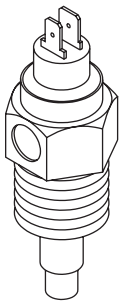
Front Bag Dump or Tag Axle Solenoids:

- Used on hydraulic level and tag axle units.
- Dumps air in front air bags and is used to raise or lower tag axle.
- Located in the generator compartment on the curbside.
- Type- MAC 225B-601BAAA



Oil pressure Sending Unit:

- One post is used for the oil pressure gauge and one post is for the warning light.
- Type- VDO 360 0238NDO 0-100 Ohm

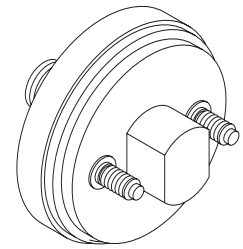


Water Temperature Sending Unit:

- One post is used for the water temperature gauge and one post is used for the warning light.
- Type- VDO 323 0998

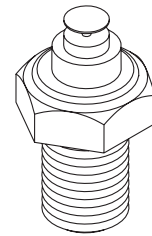
Low Air Switch:

- 1/8-27 NPT thread.
- Normally closed until approximately 65 psi.
- Located behind dash panel.
- Type- Merritor Wabco 89404 16062



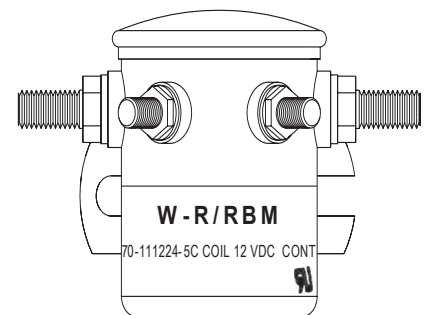
Transmission Sending Unit:

- Located on the bottom of the tailshaft housing, between hoses.
- Type- VDO 323 0868



House Disconnect and Starter Solenoid:

- Solenoid interfaces start signal to Cummins starter.
- Solenoid interrupts DC power to the house fuse panel.
- Four post solenoid with isolated coil.
- Located in high and low current plates.
- MP # 8206



Link Assembly:

- Located on ends of connecting rod between axles and ride height valve
- Secures connecting rod with hose clamp.
- Type Hadley Products HPB450-3
- MP# 2057



CHART - FILTERS & BELTS

FILTERS & BELTS	Manufacturer	ISL-370	ISM-5
Oil Filter	Fleetguard		LF9009
Fuel Filter - Primary	Raycor	S 3201 T	
Fuel Filter - Secondary	Fleetguard	FS1022	FS:
Serpentine Belt	Dayco		3911581
A/C Belt	174D Dayco		3401283
Hydraulic Filter	Parmer	5720	IN HC 5720
Air Filter	Donaldson		P53744802
Coolant filter	WFFleetguard	WF 2071	
AquaHot Filter	Raycor	R 12 T	
Air Dryer Filter	R950011		

Transmission	Size	Filter Number
Transmission Filter	MH4000	2952898

QD Generator Set 10,000 KW	
Air Cleaner	140-3071
Oil Filter	187-1000
Fuel Filter	149-2513
Oil Capacity w/filter	6.7 w/filter


SERVICE INFORMATION

Refer to operator's manual for maintenance specifications and adjustments.

Air Cleaner	-	140-3071
Oil Filter	-	187-1000
Fuel Filter	-	149-2513
Oil Capacity	-	6.7 Qts w/oil filter
API Designation	-	CE

Temp	SAE Viscosity
5° - 120°F	15W-40
(-13°F) - 68°F	10W-30
(-40°F) - 68°F	5W-30

If service/parts are needed the Onan distributor can be located in the yellow pages under Generators-Electric.
In the USA or Canada call 1-800-888-Onan
DC Fuss & Radiator Cap Under Cover.



Service Data Information Plate on the Generator Set.



NOTE: Filter and belt numbers were correct at time of printing. Verify numbers at time of removal. The manufacturer is not responsible for incorrect filter or belt usage. Please refer to the engine manufacturer's operating instructions for specific maintenance information.

CHART - SPECIFICATIONS

Measurements	40SFD	40'DBL.S/O	40'Trple S/O	42' DBBS	42' Dbl. S/O	42 SBW	43 DS2	43 DS
Wheelbase	245"	245"	245"	261"	261"	261"	271"	271"
Overall Length	41' 5"	41' 5"	41' 5"	42' 4"	42' 4"	42' 4"	43' 4"	43' 4"
Overall Height	11' 10"	11' 10"	11' 10"	11' 10"	11' 10"	11' 10"	11' 10"	11' 10"
Interior Height	79"	79"	79"	79"	79"	79"	79"	79"
Interior Width	95"	95"	95"	95"	95"	95"	95"	95"
Exterior Width	100 1/2"	100 1/2"	100 1/2"	100 1/2"	100 1/2"	100 1/2"	100 1/2"	100 1/2"

Weights	40SFD	40'DBL.S/O	40'Trple S/O	42' DBBS	42' Dbl. S/O	42 SBW	43 DS2	43 DS
Gross Vehicle Weight Rating	47,600 lbs.	47,600 lbs.	47,600 lbs.	47,600 lbs.	47,600 lbs.	47,600 lbs.	47,600 lbs.	47,600 lbs.
Gross Combined Weight Rating	57,600 lbs.	57,600 lbs.	57,600 lbs.	57,600 lbs.	57,600 lbs.	57,600 lbs.	57,600 lbs.	57,600 lbs.
Front Gross Axle Weight Rating	14,600 lbs.	14,600 lbs.	14,600 lbs.	14,600 lbs.	14,600 lbs.	14,600 lbs.	14,600 lbs.	14,600 lbs.
Rear Gross Axle Weight Rating	23,000 lbs.	23,000 lbs.	23,000 lbs.	23,000 lbs.	23,000 lbs.	23,000 lbs.	23,000 lbs.	23,000 lbs.
Tags Axle Weight Rating	10,000 lbs.	10,000 lbs.	10,000 lbs.	10,000 lbs.	10,000 lbs.	10,000 lbs.	10,000 lbs.	10,000 lbs.

ENGINE SPECIFICATIONS	ISL 370	ISM 500
Cubic Inch Displacement	8.8L/504.5 CI	11L/661 CI
Engine Torque	1,200 lbs./ft.	1,550 lbs./ft.
Rear Axle Ratio	4:78:1	4:30:1
Alternator Size *	200 Amp	200 Amp

* 270 Amp for All Electric Option.

TANK CAPACITIES (Approximate Gallons)

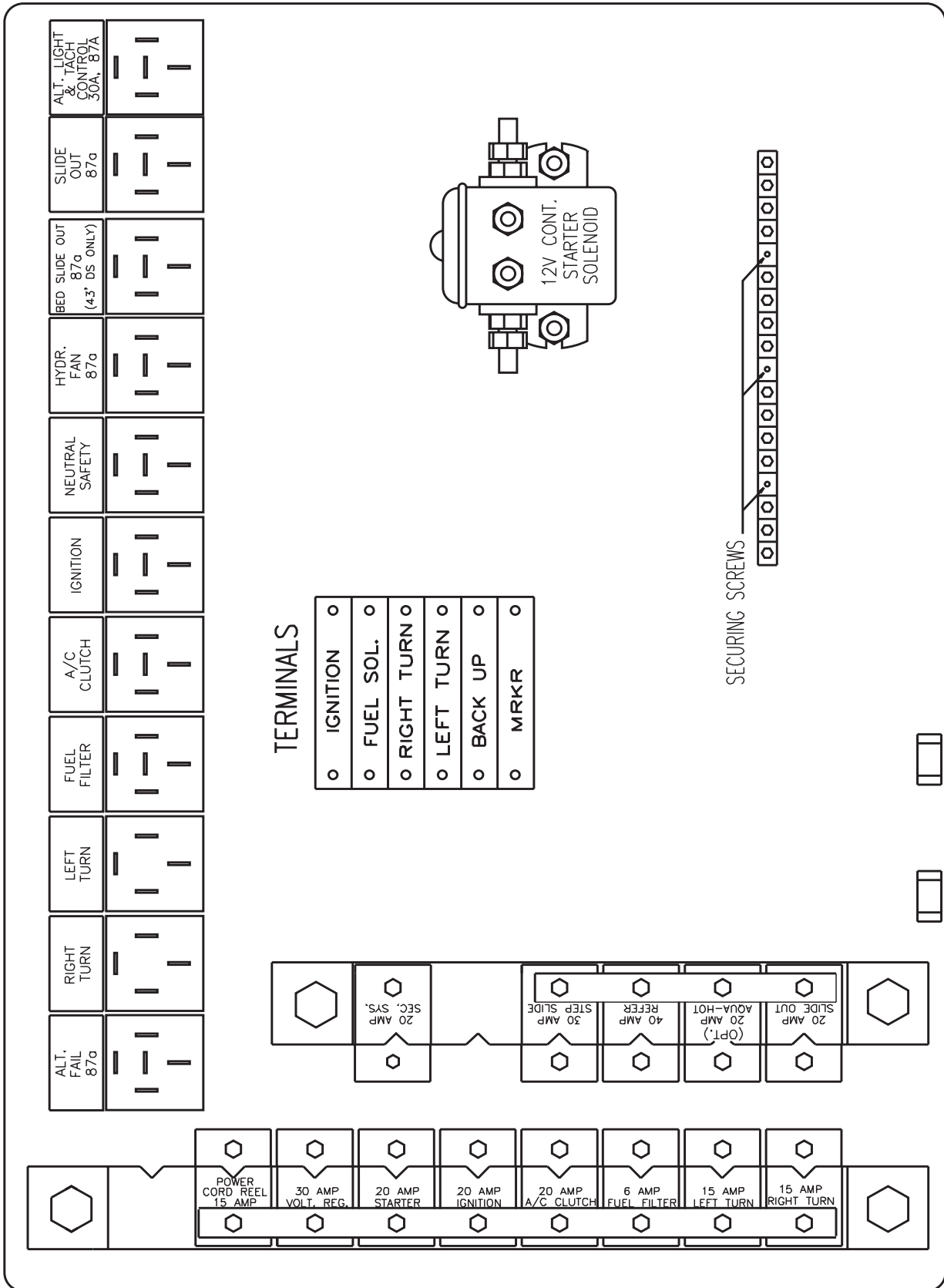
	40SFD	40' DBL.S/O	40' Trple S/O	42' DBBS	42' DBL.S/O	42SBW	43 DS2	43 DS
Water Heater	10	10	10	10	10	10	10	10
Grey Holding Tank	60	60	60	60	60	60	60	60
Black Holding Tank	40	40	40	40	40	40	40	40
Fresh Water Tank	100	100	100	100	100	100	100	100

LP-GAS TANK CAPACITIES (Approximate Gallons)

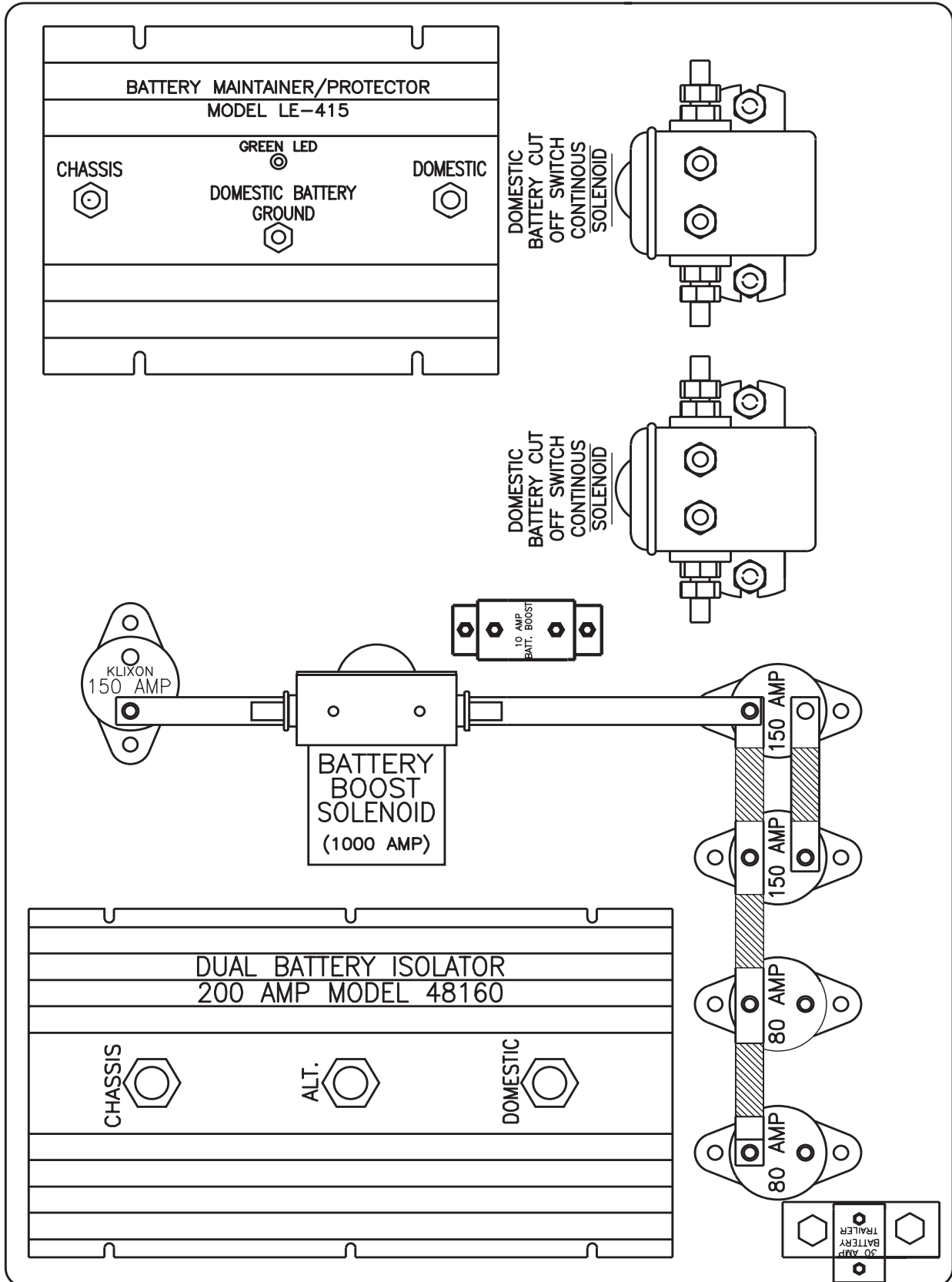
	40SFD	40' DBL.S/O	40' Trple S/O	42' DBBS	42' DBL.S/O	42SBW	43 DS2	43 DS
LP-Gas Tank	55	55	55	55	55	55	55	55

*Actual filled LP-Gas capacity is 80% of listing due to safety shut-off required at tank.

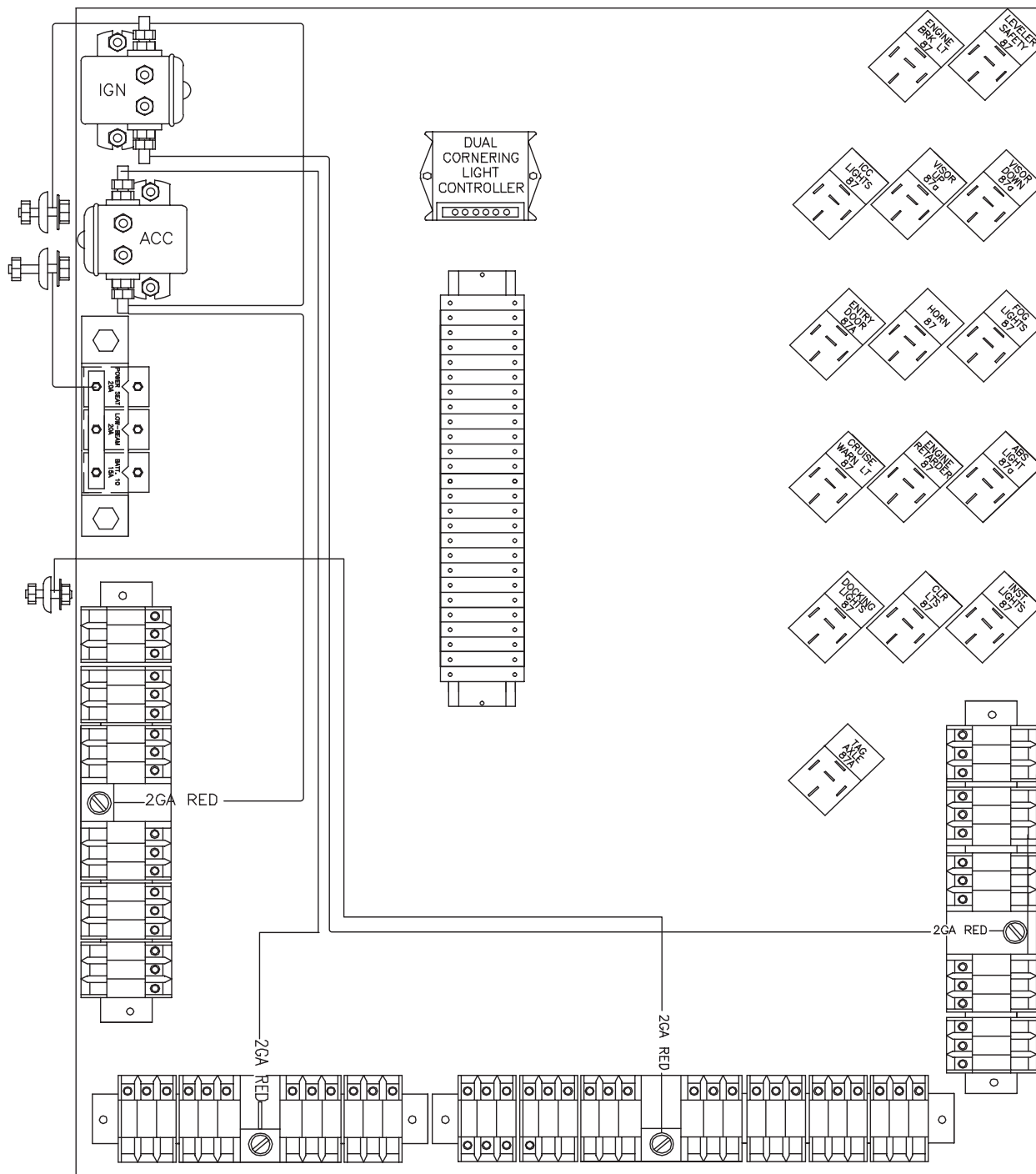
**LABELS -
Low Current Label**



High Current Label



Front Run Label



12 Volt Circuit Assignment Label

COACH START# 1555		2001 & 2002 ALL COACHES 12V D.C. CIRCUIT ASSIGNMENTS
1	BROWN: 20 AMP	DINETTE, ROPE LIGHT, FURNACE (NOT SIG)
2	BLUE: 20 AMP	BED. CAROUSEL CLOSET, CEILING ROPE (SIG) (ONLY DOUBLE SLIDE)
3	PURPLE: 20 AMP	GALLEY AND GALLEY FAN
4	GREEN: 20 AMP	BEDROOM WARDROBE, HALL, SERVICE BAY, BED. CEILING ROPE
5	PUR/BLK: 20 AMP	GALLEY FAN & BAR
6	GRN\BLK: 20 AMP	BEDROOM MAKE-UP, P/S & D/S CEILING, SLIDE O/H
7	ORANGE: 20 AMP	BATH ROOM
8	YELLOW: 2 AMP BLU/WHT:2 AMP	STOVE, MICROPHOR TOILET (SIG.) F., R. & C. A/C CONTROLLER,
9	YEL/BLK: 20 AMP	TOILET ROOM LIGHTS AND FAN
10	RED/WHT: 10 AMP	DSS (OPT), CHINA TOILET (EXE, DYN, NAV)
11	RED: 30 AMP	WATER PUMP, MONITOR PANEL
12	BLACK: 5 AMP	WINDOW SHADES (SIG)
13	GREY: 20 AMP	LV. ROOM CEILING, CEILING ROPE LT (SIG), P/S W. ROPE (SIG), P/S O/H
14	BLU/BLK: 20 AMP	OPTIONAL PLASMA TV (SIG)
15	GRY/BLK: 20 AMP	TV B., MAPS, ENTRY STEP, GRAB HANDLE, PORCH, SLIDE & D/S W. ROPE (SIG)
16	BLACK: 20 AMP	BEDROOM WALL, CLOCK (EXE & SIG), RADIO (EXE)

Information is correct at the time of printing. Label assignments may be different on certain models.

CHART - METRIC CONVERSION

U.S. Customary to Metric			Metric to U.S. Customary			
Measurement	Multiplied By	Equals/Measurement	Multiplied By	Equals		
<u>Length</u>						
inches (in)	25.4	millimeters (mm)	0.03937	inches (in)		
inches (in)	2.54	centimeters (cm)	0.3937	inches (in)		
feet (ft)	0.3048	meters (m)	3.281	feet (ft)		
yards (yd)	0.9144	kilometers (km)	1.094	yards (yd)		
miles (mi)	1.609		0.6215	miles (mi)		
<u>Area</u>						
square inches (in ²)	645.16	square millimeters (mm ²)	0.00155	square inches (in ²)		
square inches (in ²)	6.452	square centimeters (cm ²)	0.15	square inches (in ²)		
square feet (ft ²)	0.0929	square meters (m ²)	10.764	square feet (ft ²)		
<u>Volume</u>						
cubic inches (in ³)	16387.0	cubic millimeters (mm ³)	0.000061	cubic inches (in ³)		
cubic inches (in ³)	16.387	cubic centimeters (cm ³)	0.06102	cubic inches (in ³)		
cubic inches (in ³)	0.01639	liters (L)	61.024	cubic inches (in ³)		
fluid ounces (fl oz)	29.54	milliliters (mL)	0.03381	fluid ounces (fl oz)		
pints (pt)	0.47318	liters (L)	2.1134	pints (pt)		
quarts (qt)	0.94635	liters (L)	1.0567	quarts (qt)		
gallons (gal)	3.7854	liters (L)	0.2642	gallons (gal)		
cubic feet (ft ³)	28.317	liters (L)	0.03531	cubic feet (ft ³)		
cubic feet (ft ³)	0.02832	cubic meters (m ³)	35.315	cubic feet (ft ³)		
<u>Weight/Force</u>						
ounces (av) (oz)	28.35	grams (g)	0.03527	ounces (av) (oz)		
pounds (av) (lb)	0.454	kilograms (kg)	2.205	pounds (av) (lb)		
U.S. tons (t)	907.18	kilograms (kg)	0.001102	U.S. tons (t)		
U.S. tons (t)	0.90718	metric tons (t)	1.1023	U.S. tons (t)		
<u>Torque/Work Force</u>						
inch-pounds (lbf.in)	11.298	Newton-centimeters (N.cm)	0.08851	inch-pounds (lbf.in)		
foot-pounds (lbf.ft)	1.3558	Newton-meters (N.m)	0.7376	foot-pounds (lbf.ft)		
<u>Pressure/Vacuum</u>						
inches of mercury (inHg)	3.37685	kiloPascals (kPa)	0.29613	inches of mercury (inHg)		
pounds per square inch (psi)	6.895	kiloPascals (kPa)	0.14503	pounds per square inch (psi)		
Measurement	Subtract	Divide By	Equals/Measurement	Multiply By	Add	Equals
<u>Temperature</u>						
degrees Fahrenheit (°F)	32	1.8	degrees Celsius (°C)	1.8	32	degrees Fahrenheit (°F)

EXECUTIVE

GLOSSARY OF TERMS • 387

INDEX • 391

SURVEY • 395

GLOSSARY OF TERMS

AC Electricity - Alternating current also known as household power.

Air Compressor - A device that pumps air to and builds air pressure in an air system.

Air Dryer - A device that cools, filters and dries the air delivered by an air compressor.

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

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.

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.

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

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

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

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.

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

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

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

DC Electricity - Direct current also known as battery power.

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

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

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

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

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

Dump Station - 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 campground that has city water, shore power and sewer hook-ups or connections available.

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

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

LED - (Light Emitting Diode) Indicator light.

Low Point - 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.

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

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

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

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 campground 120 Volt electrical supply.

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

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

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.

— A —

ABS System (Anti-lock Brakes).....	332
Air Conditioner - Roof	130
Air Coupler - Universal.....	325
Air Dryer.....	322
Air Filter - Changing.....	368
Air Filter Minder.....	368
Air Governor.....	322
Air Storage Tanks.....	325
Air Supply System.....	322
Air System - Charging (External).....	326
Alignment Specifications.....	334
All Electric (Optional Only).....	278
Alternator.....	290
Aqua-Hot (Optional).....	140
Auxiliary Brake.....	352
Awnings.....	162

— B —

Backing Up A Motorhome.....	34
Battery Cut-off Switch.....	235
Battery - Chassis.....	286
Battery Disconnect - Chassis.....	285
Battery Disconnect - House.....	234
Battery - How It Works.....	266
Brake - Auxilary.....	352
Brake - Engine.....	352
Brake Adjustment/Slack Adjuster.....	331
Brake - Park & Emergency Systems.....	330
Brake Systems - Air Brakes.....	329
Brake Systems - Back Up.....	333
Breaking Camp.....	42
Bulb Usage - Exterior.....	318
Bulb Usage - Interior.....	277

— C —

Carbon Monoxide Detector.....	75
Cell Phone Antenna.....	186
Chart - Filters & Belts.....	374
Chart - Specifications.....	375
Chart - Tire.....	56
Chart - Lubrication.....	370
Chart - Metric Conversion.....	380
Checklist - LP-Gas Emergency Procedures..	222
Checklist - Pre-trip Preparations.....	31
Checklist - Set-up Procedures.....	36
Checklist - Winter Storage.....	107
Citizen Band Radio (CB).....	182
Cold Weather Use.....	213
Cooktop.....	127
Coolant.....	349
Customer Relations.....	13

— D —

Dash	299
Diagnostic Bracket (Engine).....	318
Diagnostic Plug Location.....	317
Dinette Bed Conversion (Optional).....	173
Distribution Panel - House 110.....	261
Distribution Panel - House 12 Volt.....	264
Door - Sliding.....	172
Drive Axle Lubricant.....	369
Driveline.....	369
Driving & Safety.....	27
Dry Camping Tips.....	38

— E —

Egress Exit Window..... 77
 Emergency Procedures - Roadside..... 44
 Engine - General Information..... 345
 Engine Shutdown..... 349
 Engine Shutdown - Extended..... 349
 Entertainment Systems..... 187
 Entry Door..... 151
 Entry Step..... 149
 Exterior Care..... 81

— F, G —

Fans 170
 Fire Extinguisher..... 76
 Fuel Requirements..... 359
 Fuel Sending Unit..... 362
 Fuel Tank..... 360
 Fuel/Water Separator (ISL)..... 360
 Fuel/Water Separator (ISM)..... 361
 Furnace..... 133
 Fuses..... 264
 Fuses & Circuits - Chassis..... 288
 Generator 120 AC..... 238
 GFCI Breakers & Outlets..... 263
 Glossary of Terms..... 387

— H, I —

Hitch..... 32
 Hot Water Dispenser (Optional)..... 117
 Hydraulic System (ISL)..... 363
 Interior Care..... 86
 Inverter/Converter..... 241
 Inverter - Sine Wave (Optional)..... 251
 ISL Engine..... 345

— J, K, L —

Labels..... 376
 Leveling System - Air..... 343
 Leveling System - Hydraulic (Optional)..... 338
 Limited Warranty..... 1
 Limited Warranty - Roadmaster Chassis..... 5
 LP-Gas Consumption..... 227
 LP-Gas Detector..... 73, 220
 LP-Gas Distribution Lines..... 228
 LP-Gas Fundamentals..... 225
 LP-Gas Regulator..... 226
 LP-Gas Safety Tips..... 228
 LP-Gas System..... 219
 LP-Gas Tank..... 223
 LP-Gas Tank Capacity..... 223
 Lubrication Chart..... 370

— M, N, O —

Maintenance Records..... 381
 Microwave Oven..... 119
 Monitor Panel..... 197, 222
 Navigation System..... 314
 Oil Recommendations (Engine)..... 346
 Owner's Record - Insurance..... 19
 Owner's Record - Personal Property..... 18
 Owner's Record - Serial Numbers..... 17

— P, Q, R —

Parts - Common Solenoids & Senders.....	372
Plumbing Manifold.....	199
Pressure Accumulator Tank.....	203
Privacy Drapery - Electric (Optional).....	172
Radio - Bedroom.....	181
Radio & Navigation System.....	174
Rear Start Box.....	290
Refrigerator.....	113
Reporting Safety Defects.....	14
Ride Height Valves.....	326

— S —

Security System (Optional).....	66
Service Suggestions.....	15
Shock Absorbers.....	338
Shore Power Hook-Up.....	235
Slide-Out Operation.....	154
Smoke Detector.....	72
Soap Dispenser - Liquid.....	213
Sofa Bed Conversion.....	173
Solar Panel (Optional).....	275
Specifications - Dimensions Chart.....	63
Starting Procedure (ISL Normal).....	346
Starting Procedure (ISM Normal).....	346
Starting Procedure - Cold Weather.....	346
Steering Column & Smart Wheel.....	293
Steering Gear.....	368
Stepwell Cover.....	151
Storage- Long Term.....	103
Storage- Short Term.....	102
Storage Removal.....	108
Storage - Under Bed.....	173
Super Slide (Optional).....	174
Suspension - Air Ride Bags.....	328

— T, U —

Tag Axle.....	336
Taking Delivery.....	14
Tank Capacities - Chart.....	206
Tire Chart.....	56
Tire Sentry (Optional).....	58
Tires.....	47
Toilet.....	209
Towing Procedures.....	45
Transfer Switch.....	238
Transmission.....	297,353
Transmission Lubricating Fluid.....	357
Trip Tek (Optional).....	316

— V, W, X, Y, Z —

Views - Curbside & Roadside.....	65
Views - Front & Rear.....	64
Wall Thermostat.....	129
Vendor List.....	20
Warranty Information File.....	8
Washer-Dryer (Optional).....	144
Washer-Dryer Prepared.....	143
Waste Water System.....	207
Water - City Hook-Up.....	200
Water Filters.....	203
Water Heater.....	135
Water Pump.....	201
Water System - Disinfecting Fresh Water.....	205
Water System - General.....	197
Water System - Troubleshooting.....	204
Water Tank - Fresh Fill.....	199
Water Tank - (Fresh) Gravity Fill.....	199
Weighing the Motorhome.....	50
Weight Terms.....	49
Winterizing - Using Air Pressure.....	213
Winterizing - Using Nontoxic Antifreeze.....	215

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