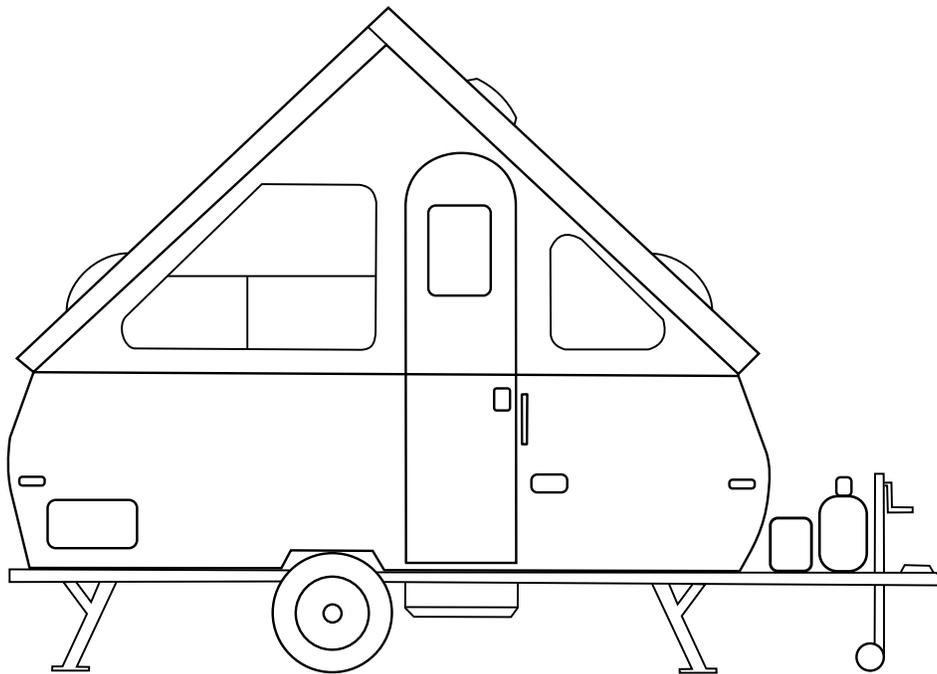


(Company Name)

Trailer Owner's Manual

Sample



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BD Tech Concepts LLC

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Note: This is a sample owner's manual for a fictitious camping trailer, and is not definitive advice.
In all cases, consult your own trailer, appliance, and tow vehicle manuals, and any existing warning labels.

(Print to HTML conversion generated by the \LaTeX Lwarp package.)

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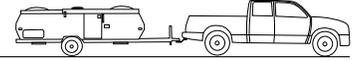
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1 WELCOME



We at (COMPANY NAME) would like to welcome you to your new (PRODUCT SERIES) (PRODUCT NAME) camping trailer!

Many years of wonderful adventures await you as you enjoy a unique blend of outdoor living, indoor comforts, and towing ease.

While folded down for travel, your trailer fits into the garage until needed. Once on the road, its low height means high fuel efficiency and resistance to crosswinds.

At the campground, your trailer fits into small sites which no RV can reach. With the optional off-road package you can even explore forest roads and back-woods campsites.

When setup for camping, the raised roof provide spacious headroom, windows and vents open up the camper to the world, modern conveniences are right at hand, while insects and rain are kept away.

The hard-sided and insulated walls help to keep out the cold of winter or the heat of summer, assisted by the optional furnace or air conditioner.

Quick setup and tear-down allow easy access to the trailer for a lunch break, and a full suite of appliances make your trailer a comfortable place to reside for an extended stay.

Flexible floor plan options provide many combinations of tables, beds, bunk beds, built-in cassette toilet and shower, or an extended kitchen area.

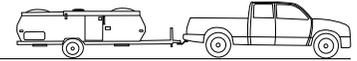
(COMPANY NAME) has designed your trailer for on-the-go campers who love to get out and explore the world, while having most of the comforts and fewer of the limitations of a full-sized RV.

Enjoy!

(COMPANY NAME)

Someplace, Some State

2 INTRODUCTION TO THIS MANUAL



This owner's manual is largely organized by *what you are doing*, such as packing for a trip or breaking camp, rather than by *systems of the trailer*, such as everything about the refrigerator or tow hitch.

While everything related to common camping activities is gathered together in convenient places, you may wish to consult the detailed table of contents to find a particular piece of information regarding some part of the trailer.

Throughout this manual there are various warning notices, repeated wherever they are relevant:

⚠ Warning

This describes a hazard which might result in injury or death.

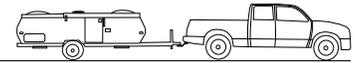
⚠ Caution

This describes a lesser hazard which might result in injury or death.

i Note

This is useful information, or a warning of possible damage to equipment.

4 SAFETY DEVICES



4.1 Emergency Exit

Code standards require an emergency exit in every RV, and the window opposite the entry door is designated as such. Please ensure that this window functions smoothly at all times.

4.2 Fire Extinguisher

Also required by code is a fire extinguisher. In your trailer the extinguisher is located in an easily accessible position near the entry door. Check the pressure indicator on occasion, and replace it with another extinguisher if necessary.

4.3 Smoke Detector

The smoke and CO₂ detector is located on the wall above the sink. Remove its batteries during storage, and reinstall the batteries and test the detector before each trip.

4.4 LP Detector

The propane (LP — liquid petroleum) gas detector is located near the floor, and is powered directly by the trailer's main battery or converter.

An alarm will sound if the detector senses propane or similar gas. In the event of an alarm, turn off flame sources, open windows and the door, and vacate the trailer until the alarm stops.

An periodic alarm will also sound if the battery voltage is too low, warning that the detector might soon lose its ability to function. Recharge the battery if at all possible.

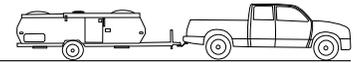
Alarms may be silenced by a button on the detector.

The LP detector consumes a small amount of electricity. In the event that the trailer will be stored for a long length of time with its battery as the only source of 12 V DC power, the LP detector's fuse can be removed to prevent its draining the battery.

 Warning

The LP detector's fuse must be reinstalled before camping in the trailer.

5 OUTFITTING THE TOW VEHICLE AND TRAILER



Throughout this manual, the phrase “tow vehicle” refers to the truck or car which is being used to pull the trailer.

5.1 Weight Ratings

Your tow vehicle and trailer each has its own ratings regarding maximum weights and capacities. These ratings are found in the owner’s manual, and also on a label which is usually found in the door frame.

Not all vehicles are rated to safely pull all trailers. Consult your vehicle’s manual to see if it is recommended to be able to pull your trailer. *Pay special attention to the tow capacity rating for the tow vehicle.* Your vehicle should be rated to pull the weight of the trailer plus any cargo, water, propane tanks, and batteries. This is the first item listed below.

The following explains some of the factors which are involved. See Figure 1.

Gross Trailer Weight Rating (Tow Capacity) — GTWR: The maximum trailer weight that the tow vehicle is rated to pull. This rating can depend on factors such as front- or rear-wheel drive, engine and transmission choices, differential gearing, strength of the hitch-to-frame attachment points, or heavy-duty suspension options. A separate rating may be given for a trailer with or without its own trailer brakes. Find this number in your tow vehicle’s manual.

Gross Vehicle Weight Rating — GVWR: The maximum weight of the tow vehicle, including all passengers and cargo, plus the hitch weight (listed below). This is the maximum total weight that can be carried by the tow vehicle’s springs.

Gross Combined Weight Rating — GCWR: The maximum weight of the tow vehicle, including all passengers and cargo, plus the trailer, including all cargo. This is the maximum total weight which must be stopped by the brakes.

Hitch Weight Rating — HWR: Maximum weight that the hitch may carry. The trailer places some of its own weight onto the hitch, and this weight is carried by the tow vehicle. Find this number on the hitch itself.

Trailer Gross Vehicle Weight Rating — TGVWR: Maximum weight of the trailer plus its own cargo. This is the maximum weight which the trailer springs may carry, and is determined by the trailer suspension springs, axle, and tires.

Trailer Cargo Capacity — TCC: Maximum cargo weight which the trailer may carry. This is trailer gross vehicle weight rating minus its actual unloaded weight. The difference is the amount of cargo which can be carried by the trailer before it reaches its own gross vehicle weight rating.

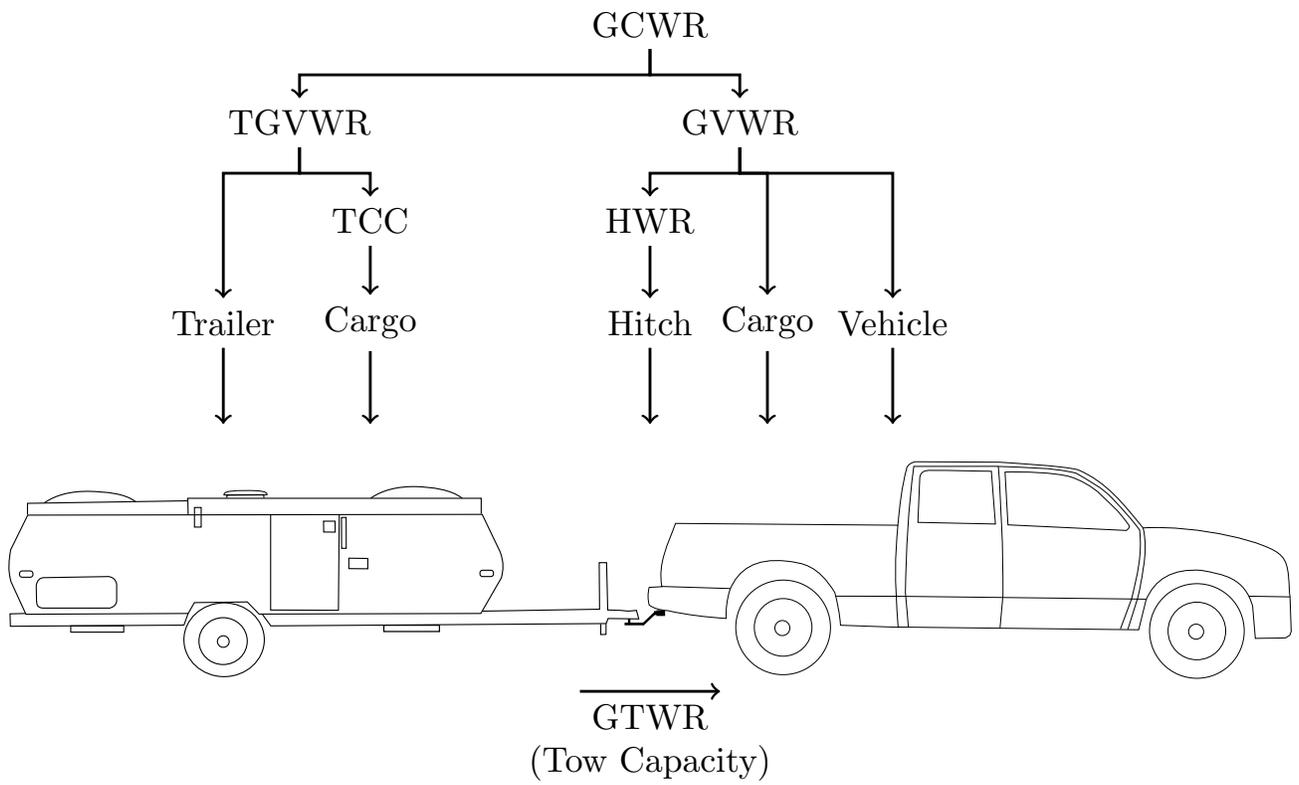
⚠ Caution

Exceeding any of these ratings may result in unsafe operation, a voided warranty, mechanical problems, and/or legal consequences in the event of an accident. If your vehicle or trailer are heavily loaded, including people, luggage, food, and a filled water tank, then it is best to have them weighed at a truck scale to find out the actual weights.

5.2 Hitch and Hitch Ball Selection

See Figure 8 on page 23 for a diagram of the hitch, hitch ball, draw bar, and receiver.

Figure 1: Weight Ratings



Your trailer requires a 2" hitch ball, mounted to a draw bar which is then mounted in the receiver. The draw bar lowers or raises the hitch ball to a height which results in the trailer being close to level or leaning slightly to the front once it is connected to the tow vehicle.

A sway control hitch is usually not necessary. Sway can usually be controlled by proper positioning of the cargo load in the trailer. See Section 6.5 on page 22 for details.

A weight distributing hitch helps take weight off the back end of the tow vehicle, and it might be required for a small tow vehicle to carry the hitch weight of your trailer. Consult your dealer for details.

i Note

A bumper-mounted hitch ball is *NOT* recommended, as the bumper is not usually strong enough to handle the forces caused by towing a camping trailer. A Class 3 receiver is the best option for hitching to these trailers.

5.3 Hitch Electrical Connection

Tow vehicles which have been prepared with a trailer towing package commonly have either a flat four-pin socket or else a round seven-pin socket located either near or on the receiver hitch. The four-pin socket provides connections for basic lights (running, turn signal, and stop), but not for reverse lights, battery charging, or electric brakes. Adapters are available to connect your seven-pin cable to a vehicle with a four-pin socket, but only the basic light functions will work.

A seven-pin socket and its associated wiring is greatly desirable for trailer towing due to the extra functions which are provided. It is worth having the hitch connector rewired if necessary to provide the full seven-pin functions, especially the trailer's electric brake control. See your dealer for details.

See Figure 19 on page 55 for the functions of the trailer's electrical connection, and Figure 20 on page 56 for the connector plug's pin assignments.

5.4 Brake Controller

When the trailer has electric brakes, the tow vehicle must have a brake controller installed to active the trailer brakes. The brake controller applies the trailer brakes when it senses the tow vehicle is slowing down. A better-quality brake controller results in smoother and more accurate application of the trailer brakes, which can mean shorter stops in an emergency.

While choosing a brake controller, look for an electronic "inertial" controller which senses how hard the tow vehicle is stopping, and applies trailer brakes in a similar amount. These controllers help resist skidding and sliding on gravel, snow, or ice. The controller is adjustable, and should be set such that on dry pavement during a hard stop the trailer is just about to skid, but does not. This results in maximum braking assist while still maintaining control. Consult the controller's owner's manual for details.

5.5 Tow Mirrors

In many states, it is a requirement that the driver be able to see around the sides of the trailer. If the trailer is too wide for the driver to see around using the tow vehicle's regular side mirrors, then special towing mirrors should be installed. These mirrors extend further out to the side than the regular mirrors. Tow mirrors not only meet state requirements, but are also very helpful for backing the trailer into a campsite. See your dealer for details.

Figure 2: Flex Handle (“Breaker Bar”), Extension, Deep-Well Socket

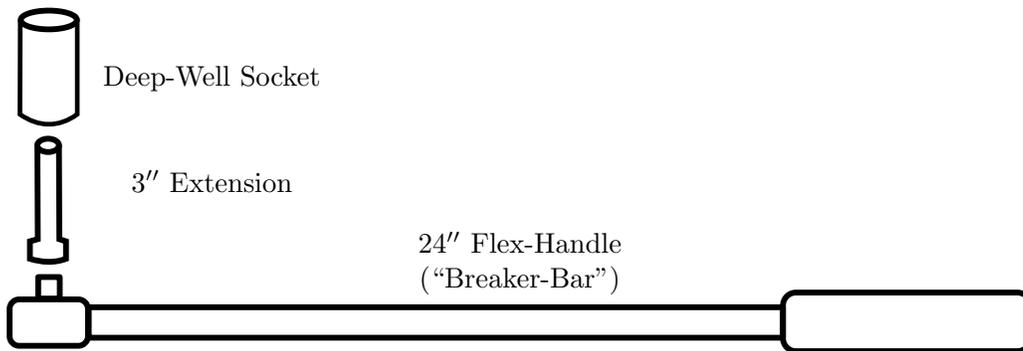


Figure 3: Click-Stop Style Torque Wrench



5.6 Trailer Jack and Lug Wrench

You must have a jack capable of lifting the trailer, along with a lug wrench which fits the trailer’s lug nuts.

Test any jack before starting a trip, to verify that it can actually lift the trailer high enough to change a tire.

The trailer’s stabilizer jacks are not meant to be used to lift the trailer. A dedicated jack must be used instead.

To assist in loosening lug nuts which have been over tightened by a tire shop, it is very useful to purchase a 24" long $\frac{1}{2}$ " drive flex handle (“breaker bar”) plus a 3" extension and a deep-well socket which fits the lug nuts. These tools allow you to easily remove almost any stubborn lug nut.

While replacing and tightening the lug nuts, a $\frac{1}{2}$ " drive torque wrench plus the same 3" extension and deep-well socket allow you to tighten the lug nuts up to the correct amount of torque, without over tightening. This ensures that the lug nuts are properly tight, eliminates the risk of breaking a lug nut, allows much easier removal at a later time, and can extend brake life and reduce brake shudder which can come from uneven torque at the lug nuts. See Figure 2.

A “click-stop” torque wrench is faster and more convenient to use than a “beam” style wrench. Be sure to reduce the click-stop torque setting back to the low end of the range before storing the torque wrench. See Figure 3.

See an automotive parts store or hardware store for a flex handle, torque wrench, extension, and deep-well socket.

5.7 Leveling Tools and Wheel Chocks

Various tools are used to level the trailer and then keep it from moving. The trailer's built-in hitch jack is used to level the trailer from front-to-back, but other tools must be used to level the trailer from side-to-side. The trailer's stabilizer jacks are *not* made for this purpose; they are only designed to keep the trailer steady once it has been set up.

Tools for side-to-side leveling include step ramps made of plastic or wood, interlocking plastic blocks, and a wheel-grabbing screw jack called the "BAL Leveler".

Stacks of wood can be made of 6" wide lumber, either 1" or 2" thick. Use pieces of wood which are long enough to drive onto while still leaving room for wheel chocks on both sides of the wheel. If stacking two pieces, use a longer piece for the lower level to allow a ramp to be built up to the upper level. Use pressure treated lumber for extra strength.

Multilevel plastic step ramps are available, allowing you to pull forward until the correct height is obtained. This will require the help of an assistant to tell you exactly where to stop, and a wheel chock will have to be set against the down-hill side of the wheel to keep the trailer in place.

Interlocking plastic blocks are available, and they allow you to create a ramp of just the right height, with a built-in wheel stop in addition.

The "BAL Leveler" is a metal U-shaped jacking device which grabs the wheel securely, then raises it with a screw and ratchet until the desired height is obtained, doubling as an excellent wheel chock. The device requires that the screw be kept clean and greased often, and it is rather large to carry and store, but it can be very handy in many situations.

Wheel chocks are available made of plastic, rubber, or metal. Plastic wheel chocks can work, but rubber wheel chocks are better at resisting slipping. Be sure to get wheel chocks which closely match the size of the tire. Wheel chocks which are made for a much larger tire will not wrap as well against a smaller tire, resulting in less gripping force.

Folding metal wheel chocks can work, but are more likely to slide, and can collapse if accidentally driven over.

5.8 Electrical Testers

The campground's 120 V AC electrical system should be tested before plugging in the trailer.

An outlet wiring tester is plugged into the outlet and has three lights which display a pattern to indicate proper wiring or one of several possible problems, such as a missing ground or a reversed hot and neutral. This inexpensive tester is available at a hardware store. See Figure 4.

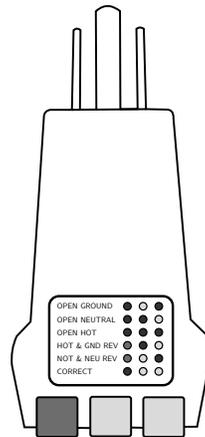
An AC voltmeter plugs into the outlet and shows you the actual voltage present at the socket. Meters are available from R/V parts vendors which show the range of acceptable voltage for an R/V air conditioner. Volt meters are also available which use test probes instead of a 120 V AC outlet plug, but for convenience it is recommended that you purchase a voltmeter which plugs directly into the outlet.

① Note

Do not use the air conditioner if the campsite AC voltage is below 110 V AC. The air conditioner can be damaged.

Check the campsite voltage periodically throughout the day, especially if many neighbors are also using air conditioning.

Figure 4: AC Outlet Wiring Tester

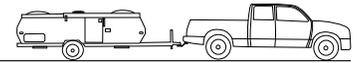


5.9 Water Pressure Regulator

A campground water supply sometimes may have too much pressure for the trailer's plumbing. See an R/V dealer for a water pressure regulator which screws into the fill hose to reduce the water pressure before it goes into the trailer. A short section of hose plus a right angle adapter can be useful to go between the regulator and the trailer's city water connection. See Figure 13 on page 40.

The pressure regulator is only required when connecting the trailer directly to the water supply, but is not required when simply using a hose to fill water into the fresh water tank.

6 PREPARING FOR A TRIP



6.1 Loading Water

Depending on how the trailer is loaded, the trailer might tow better either with a full or empty tank of water. See Section 6.5 on page 22 for details.

6.1.1 Filling the Fresh Water Tank

Use a hose to load water through the fresh water tank fill. While filling the water, air escapes through a small vent hole above the fill opening. Stop filling when the water begins to overflow the fill inlet, and replace the cap. See Figure 5a.

Water may also be supplied to the trailer via the “city water” connection. (Figure 5b) This water supply does not go to the fresh water tank, but it does go to the hot water heater and the faucets.

Figure 5: Water Connections



(a) Fresh Water Tank Fill

(b) City Water Connection

6.1.2 Releasing Air from the Hot Water Heater

If a hot water heater is installed, fill the fresh water tank, then turn on the water pump to move water from the fresh water tank into the hot water heater. After some time, the water pump will stop, indicating that the hot water tank also has water. **If the hot water heater is cool**, then air which is trapped in the top of the hot water tank may be released by temporarily opening the hot water pressure-release valve. This can cause the water pump to resume pumping to add additional water to replace the air which was released. **Only do this if the water in the hot water heater is cool.** Figure 6a shows the pressure-release valve closed, which is the normal position. Figure 6b shows the valve opened to temporarily let air out.

⚠ Caution

Do not open the pressure-release valve if the water is hot, since a spray of scalding water may occur, possibly resulting in burns.

Figure 6: Water Heater Pressure-Release Valve



Close the pressure-release valve once water starts to come out. Turn off the water pump once it has stopped filling the hot water tank.

6.1.3 Releasing Air from the Water Lines

Air may be trapped in the water lines after water has been added to the system. Remove this air by opening each faucet while the water pump is turned on or while the trailer is connected to a shore water supply. Close the faucet once the air has been removed from each of the hot and cold sides of the water system.

i Note

Turn off the water pump during travel, in case a faucet opens or a leak develops in the water system.

6.2 Connecting the Batteries

The batteries (one or two) are connected to the trailer with two electrical cables. The colors of these cables follow either of two standards. See Figure 7.

If the cables are red and black, then they are following the automotive standard of red/positive and black/ground. The red cable goes to the \oplus battery terminal, and the black cable connects to the \ominus terminal.

If the cables are white and black, then they are following the housing standard of black/hot and white/neutral. The black cable goes to the \oplus battery terminal, and the white cable goes to the \ominus terminal.

There will also be an additional cable which goes to the frame of the trailer, and this cable must go to the \ominus terminal of the battery.

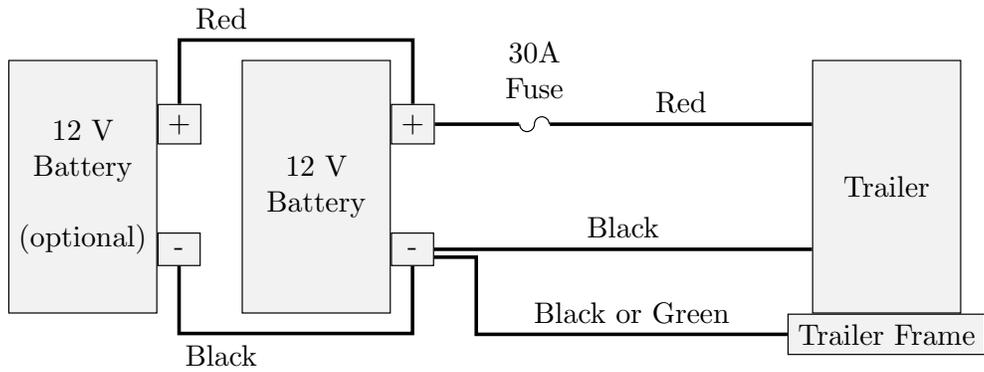
In the event that the battery is miss-wired, a fuse near the battery's \oplus terminal or else fuses inside the trailer's converter panel will be blown and the 12 V DC system will be inoperable until the wiring is corrected and the fuses are replaced.

The trailer frame has brackets which are designed to hold one or two vented plastic battery cases, commonly available at automotive or RV supply stores. Each case must be attached to the frame brackets to prevent it from sliding, and each case with its enclosed battery must be strapped down to the frame brackets. For added security, the strap may be replaced by a locking clamp, available from mail-order sources.

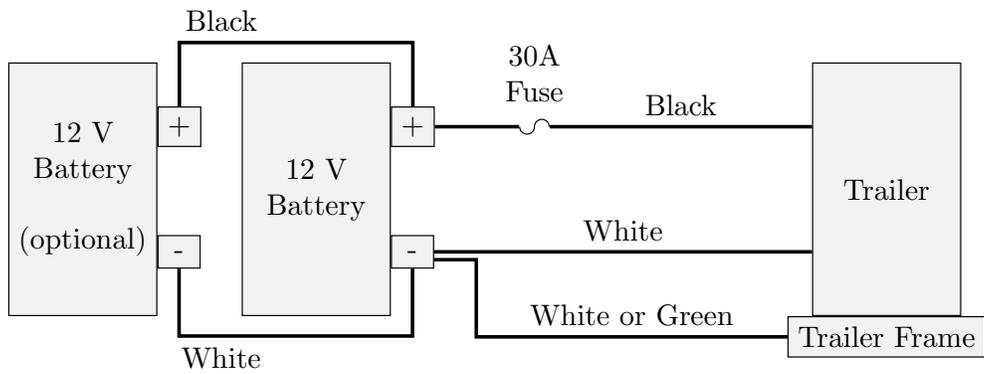
The battery cases have gaps near the top where the wires are routed to go to the battery terminals. Be sure that the wires go through these gaps and are not pinched by the top of the case when the case is closed.

Figure 7: Battery Wiring — Two Color Standards

Red Positive / Black Negative — Automotive Standard:



Black Hot / White Neutral — Housing Standard:



⚠ Warning

The battery can emit gasses which can explode if allowed to gather in a confined space, causing injury or death.

The battery should be mounted outside the trailer if possible. If the battery is mounted inside the trailer, it must be in a compartment which is vented to the outside to allow the explosive gasses to leave the trailer, sealed from the inside of the trailer, and also sealed away from any flame sources and electrical devices.

6.3 Connecting the LP Tanks

For a diagram of the LP tank connections, see Figure 15 on page 45.

Place each LP (“Liquid Petroleum” or “propane”) tank upright on the bracket, turned such that each hose can connect directly to the tank nozzle. Clamp each tank down from above. Check this clamp on occasion for tightness.

Connect each hose to each LP tank using the green knob with moderate hand tightness. Do not over tighten.

Keep each LP tank’s valve in the closed position until the hose is connected and the LP tank will actually be used for heating or cooking.

⚠ Warning

Ensure that the mounting clamp is secure.

Do not mount LP tanks horizontally. The tank valve must be kept upright.

When not in use, LP tanks should be stored in a vented cabinet in an outdoor location away from any enclosed household or garage, allowing any vented gasses to escape instead of gathering in an enclosed area. LP gas is heavier than air, and it will gather in the low points of basements or crawl spaces if allowed to do so, possibly resulting in an explosion if a flame source such as a furnace pilot light is present.

Do not store LP tanks inside an enclosed household or garage, the tow vehicle, or the trailer.

Do not hook up the LP tanks if they will be left in an enclosed garage before travel. Wait until final packing is complete and you are ready to travel before hooking up the LP tanks.

If possible, use the 120 V AC power mode for the refrigerator during preheating and packing, and during travel use the 12 V DC power mode instead of the LP gas mode, allowing the LP tank valves to remain closed until you have arrived at camp.

6.4 Loading the Refrigerator

The refrigerator cools slowly, so it should be pre-cooled for a day before loading it with food.

Be sure to close and latch the refrigerator door, then turn on the refrigerator with either LP propane or 120 V AC electric “shore” power. Do not use 12 V DC battery power since this will drain the trailer battery unless the trailer is plugged into a 120 V AC power source. The 12 V DC fridge option is not recommended even if shore power is available, since the fridge cools more efficiently with either LP propane or 120 V AC power.

 **Warning**

Do not connect and open the LP tanks to cool the refrigerator if the trailer is stored in an enclosed garage. Any leak could cause a buildup of explosive gas. The LP power mode of the refrigerator also consumes oxygen and generates carbon dioxide and possibly carbon monoxide gasses, which could cause a deadly condition in the garage or any connected housing.

If possible, pre-cool the food before loading it into the refrigerator.

Load food loosely in the refrigerator, allowing air to circulate inside the fridge. An overly-full refrigerator will not cool evenly.

Once loaded, be sure that the door is closed and secured with its latch. With some models, it might be possible to adjust the latch for tightness.

6.5 Packing the Trailer and Tow Vehicle

See Figure 21 on page 64 for an illustration of the below discussion.

Where the cargo is positioned in the tow vehicle or trailer can be important.

When the trailer is connected to the tow vehicle, it presses down on the back end of the tow vehicle. Too much weight on the back of the tow vehicle can cause problems with steering and stability, and too little weight can cause the trailer to sway side to side as it is being pulled down the road.

It is recommended that the trailer be packed such that 10% to 15% of its own weight is on the trailer hitch. This can be accomplished by placing heavier cargo in front of the trailer's axle. Avoid placing most of the cargo in the far back of the trailer, which can result in side to side swaying of the trailer as you drive down the road.

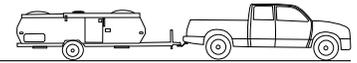
If the trailer is pressing down on the hitch so much that the front of the tow vehicle is pointing noticeably upwards, then cargo in the trailer may be moved somewhat further back to help take weight off of the hitch. Another possibility is to move cargo in the tow vehicle forward away from the hitch.

Water in the fresh water and hot water tanks count as cargo weight. These tanks are behind the trailer's axle, so water added to the tanks means less weight on the trailer hitch and a greater likelihood of trailer sway.

 **Caution**

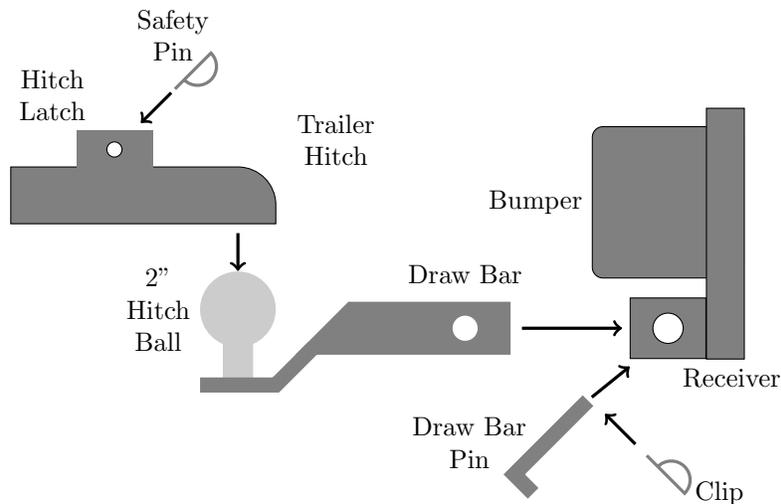
If the trailer starts to sway side to side while being towed down the road, loss of control could occur. Move trailer cargo weight forward, or remove water from the freshwater tank.

7 CONNECTING THE TRAILER



See Figure 8 for a diagram of the hitch, hitch ball, draw bar, and receiver.

Figure 8: Hitch, Draw Bar, and Receiver



7.1 Hitch Height

When connected to the tow vehicle, the trailer should be level or slightly sloped to the front. A hitch draw bar can be selected with a drop or rise height as necessary to result in the proper trailer hitch height off the ground to result in a level trailer. See your dealer for details.

7.2 Connecting the Hitch Draw Bar to the Receiver

The draw bar holds the hitch ball, and connects it to the tow vehicle receiver. To connect the draw bar to the receiver:

1. Insert the draw bar into the tow vehicle's receiver.
2. Align the pin holes.
3. Insert the receiver's draw bar pin.
4. Connect the clip to the draw bar pin so that the draw bar pin cannot come out.

For additional security, a locking draw bar pin may be used.

ⓘ Note

Two diameters of draw bar pin are commonly available. Be sure that the draw bar pin fills the pin holes with only a small amount of slack left over. If the draw bar pin is too small for the pin holes, the receiver will shift back and forth too much, causing premature wear of the pin or hitch.

7.3 Connecting the Trailer Hitch to the Hitch Ball

Once the hitch draw bar is connected to the receiver, the trailer may be connected to the hitch ball:

1. Close the trailer.
2. Raise and stow the trailer's entry step.
3. Raise the trailer's stabilizer jacks.
4. Verify that the trailer's hitch is high enough that the hitch ball will not hit it when the tow vehicle is backed up to the trailer. This step may require raising the hitch jack so that the hitch is high enough to fit over the hitch ball.
5. Position the tow vehicle such that the hitch ball is located below the trailer's hitch. Products are available to assist in the positioning of the hitch ball, such as mirrors, hitch sticks, etc. See your dealer for details.
6. Remove the hitch safety pin and unlatch the hitch.
7. Lower the trailer's hitch jack so that the hitch is over the hitch ball.
8. Latch the hitch and install the hitch safety pin.
9. Raise the hitch jack all the way up.
10. Remove the hitch jack wheel.

7.4 Connecting the Safety Chains

In the event that the trailer's hitch somehow falls off the hitch ball, the safety chains help to prevent the trailer from escaping from the tow vehicle. These chains should be connected to the openings or loops which are provided by the tow vehicle receiver, located next to where the draw bar plugs into the receiver. One chain goes to each side, and the chains should be crossed once underneath before being connected to the receiver. The crossing of the chains helps to catch the trailer hitch if it disconnects from the tow vehicle. Leave enough slack in the chains so that they droop approximately half way down to the pavement. If the chains are too tight, they can bind while performing a hard turn. If they are too loose, they can drag on the ground while driving. Be sure that the chains are clipped securely to the receiver so that they do not fall off and drag on the ground.

7.5 Connecting the Break-Away Switch Cable

Trailers with electric brakes will have a break-away switch. This switch connects to the tow vehicle, and it is activated to trigger the trailer brakes if the trailer becomes totally disconnected from the tow vehicle and thus becomes a run-away. The cable should be connected to the tow vehicle receiver along with the safety chains, using a clip or removable chain link. The cable should be long enough that it will not be pulled unless the trailer disconnects, but also short enough that it does not drag on the ground.

The trailer brakes will only work if the battery is connected and has a charge, and the fuses are intact.

In the event that the break-away switch cable is pulled, the brakes will be activated but only so long as the battery holds a charge. Be sure to block the trailer wheels so that it does not roll any further, even if the trailer is essentially destroyed, then reinstall the break-away switch cable into the switch housing again to prevent the battery from being depleted.

7.6 Connecting the Electrical Cable

See Figure 20 on page 56 for a diagram of the seven-pin electrical connector. If your tow vehicle has a four-pin connector, you will have to use an adapter to connect it to the seven pin trailer cable.

7.6.1 Inserting the Cable

The cable and socket have tabs to allow the cable to go into the socket in only one way. Open the door of the socket, align the tab on the cable with the socket, and push the cable into the socket until it stops. Alignment must be correct for the cable to go into the socket, and small adjustments in angle might be necessary.

Once the cable is inserted into the socket, close the door down to the top of the cable such that a tab on the door engages the cable and locks it into the socket.

 Caution

The connector pins can corrode with time unless protected from the elements, possibly causing the loss of trailer brakes or lights, increasing the chances of a vehicle accident. It is recommended that you add some dielectric grease to each pin to help prevent corrosion. See an auto parts store for a large tube of dielectric grease, and apply a generous amount to each pin of the connector.

7.6.2 Testing the Trailer Lights

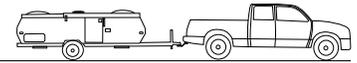
Once the electrical cable is connected to the tow vehicle, the trailer's lights and brakes should be tested.

Test the lights by turning on the tow vehicle's emergency flashers and marker lights¹. The trailer's marker lights and tail lights should be lit, and the trailer's left and right brake/turn lights should be flashing. Check the tow vehicle's marker and brake/turn lights as well.

The tow vehicle's brake controller should display an indicator to show that the trailer's electric brakes are connected. On some brake controllers, the tow vehicle brake pedal must be momentarily depressed to wake up the controller's display.

¹Also known as "running lights" or "parking lights", these are all the extra lights which come on when the headlights are turned on. On most vehicles, it is possible to turn on everything except the headlights, and this is sufficient for testing the trailer's lights.

8 DURING TRAVEL



8.1 Refrigerator Power

During travel, some refrigerators have the option of powering with either LP gas or 12 V DC electric power.

The 12 V DC refrigerator power option may be used during travel while the tow vehicle is running, but only if the tow vehicle is wired correctly and has sufficient alternator power available. This allows the LP tanks to be closed for maximum safety, and you do not have to worry about turning off the refrigerator before pulling into a gas station. Before relying on the 12 V DC option, test it for a day or two and monitor the refrigerator temperature to be sure that the system is capable of keeping up with the demand for electric power. Once you have arrived at camp and turned off the tow vehicle, it is necessary to turn off the 12 V DC refrigerator power to avoid quickly draining the batteries. LP or 120 V AC power options must be used at camp.

The LP gas option is usually more powerful and efficient, and may be required on especially hot days if the 12 V DC option cannot keep up. Monitor the refrigerator temperature on occasion, since the gas flame may be blown out during travel. It might be possible to monitor the flame by opening a small window in the baffle, or by feeling the chimney to be sure that it is still hot. Additional baffling may be available to prevent flame-out during travel. See the refrigerator's owner's manual or the dealership for details.

The 120 V AC option can be used in camp if the trailer is plugged into a 120 V AC "shore power" connection.

i Note

Open the LP gas tank valves slowly. Each tank has a built-in check valve which is designed to trip if it senses a sudden rush of gas leaving the tank. If this occurs, close the valve, wait a while, and slowly re-open it.

The valve to use is the large one with a knob on the top of the tank. Do not use the small pressure-release valve on the side of the valve body. See Figure 16 on page 46.

Open each valve all the way until it stops. Use only gentle hand pressure; do not force the valve.

If this is the first time using the LP gas system since the tanks were installed out of storage, the gas lines may have to be purged of air before the gas appliances can be used. See Section 10.7.5 on page 47 for information about purging the LP gas lines.

i Note

Only use one refrigerator power source at a time. This power applies heat to the refrigerator's ammonia system, and too much can damage the refrigerator.

⚠ Warning

During travel, turn off all pilot lights before pulling into a gas station for refueling. A refrigerator, water heater, furnace, or other LP gas appliance with a pilot light may ignite the gas fumes which are released while refueling the tow vehicle at a gas station, possibly resulting in a fire or explosion.

Some long tunnels require that LP tanks be closed before entering the tunnel. If using LP power for the refrigerator during travel, be sure to remember to re-open the valves and restart the refrigerator after exiting the tunnel.

8.2 Towing the Trailer

8.2.1 Route Planning

There are some things to consider when planning what route to take to your destination:

Toll Roads: Toll roads usually charge extra for towing a trailer, sometimes significantly more than expected. Look up their rates beforehand to avoid price shock, keeping in mind the tradeoff in time of taking back roads instead.

Interstate v.s. Back Roads: From the point of view of someone towing a trailer, the Interstate highway system offers quicker travel at the expense of less fuel efficiency, a steady supply of services such as fuel and food, and also a network of gas stations and truck stops which offer larger gas station fuel pump lots with more maneuvering room than a typical small town gas station. When starting travel with a new trailer, it is recommended that you begin with the Interstate system to get access to these easier-to-use gas stations.

Fuel Efficiency: A low height pop-up or folding camping trailer does not cost as large a hit in highway fuel efficiency as a full height trailer or camper, but in stop-and-go traffic or while climbing mountains the trailer still has to be dragged forward and stopped again. Be aware of conditions, and plan to drive conservatively. Best fuel efficiency will be found while driving steadily at a moderate speed, such as a rural highway v.s. the faster speeds of the Interstate expressway.

Terrain And Switchbacks: Tight mountain switchbacks can be a problem with a trailer in tow. In general, the trailer usually can be turned as tight as the tow vehicle, but it cannot do much of a three point turn without hitting the back of the tow vehicle. In the event of a very tight turn, it might be necessary to have someone get out and watch carefully to warn before something hits. It also might be possible to temporarily remove the propane tanks to gain a little more clearance in the hitch/bumper area, in which case it is best to set them out of the way by the side of the road during the turn, then reinstall them before continuing travel.

Warning

Do not move the trailer if the LP tanks are resting on the trailer but not secured with the bracket. Do not transport LP tanks in a vehicle unless they are secured in an upright position, and a window is left open to vent any gasses which are released. LP gas which is allowed to gather in an enclosed space can explode.

8.2.2 Maximum Speeds

While it may be tempting to try to get to your destination as quickly as possible, there are some real limits to how fast you should go while pulling a trailer. Pay special attention to the following:

Warning

A camping trailer with ST class tires is only rated to a maximum speed of 65 M.P.H. In many conditions, a slower speed will be required. Vehicle and trailer loading, crosswinds, and poor road conditions are important reasons to slow down. Exceeding the rated speed of the tire, or failure to slow down due to conditions, can result in loss of control, injury or death.

Caution

Trailers with LT class tires can be rated for higher speeds than ST tires if proper loading and tire inflation is used, but other factors such as wind and traffic still make 65–70 M.P.H a practical maximum cruising speed. Safety quickly degrades at higher speeds.

8.2.3 Following Distance

While towing the trailer, maintain a larger than normal following distance behind the vehicle in front. Attempting a hard stop becomes more dangerous with a trailer, both in terms of controlling the vehicle and trailer, and in terms of the potential consequences of a collision.

8.2.4 Panic Stops

In the event of a panic stop, it is best not to try to swerve too hard to avoid hitting something. The trailer may swing out further than you expect, and pull the back end of the tow vehicle sideways, causing a loss of control.

8.2.5 Lane Changes

Use extra caution when changing lanes. It is hard to tell in the mirrors exactly how far back the trailer goes and whether someone is next to it. When changing lanes, use the turn signal for a few seconds, then move over slowly to give other people time to react.

8.2.6 Brake Failure

 Warning

It is possible to overheat the brakes during long down hill slopes such as found while driving in mountains. This causes a loss of braking power and maybe a runaway vehicle.

To avoid overheating the brakes, downshift the tow vehicle's transmission to a lower gear and stay off the gas pedal so that the engine can help slow down the vehicle and trailer. It's normal to go down a mountain road with the engine roaring at high speed while hardly touching the brakes. The engine and transmission are built for this, as long as the engine is not allowed to go into the "red line". Modern vehicles have computers to control the automatic transmission, and they will keep the engine within an acceptable range. With a manual transmission, shift into the lower gear early and keep the engine out of the "yellow" or "red" RPM ranges. Press the brakes if necessary to slow down a bit.

Some mountain roads have "escape ramps". These are short and deep gravel ramps next to the road which a runaway truck with overheating brakes can drive onto to come to a stop. You should never need these if you downshift the transmission to a lower gear to help slow down the vehicle and trailer.

8.2.7 Trailer Sway

Trailer sway is a side to side swaying motion which can occur while towing a trailer with too little weight on the hitch. This motion is most likely to occur at highway speeds.

When trailer sway occurs, one method to control it is to gradually slow down until it subsides.

To more quickly control trailer sway, slightly activate the brake controller by pushing its lever over a bit while coasting down in speed. This lever triggers the trailer brakes, causing the trailer to fall back into place behind the tow vehicle.

 Warning

Keep your eyes on the road and pay attention to steering while trying to reach the brake controller's activation lever. Practice a few times when nothing is around before trying to do this in traffic. Failure to pay attention to your surroundings can result in a vehicle accident.

For information on how to pack the trailer to avoid trailer sway, see Section 6.5 on page 22.

It is possible to add an anti-sway hitch to the trailer and tow vehicle. This is a small shock absorber which rests next to the hitch and which resists left to right turning of the trailer hitch. An anti-sway hitch should not be necessary for a small pop-up or folding camping trailer, and can also cause problems on low traction surfaces such as snow or ice if attempting to make a turn. See your dealer for details.

 Note

Note that "trailer sway" does *not* refer to "roll over". Rollover is a tendency of the trailer or tow vehicle to roll onto its side if a turn is taken too hard. Rollover is controlled by reasonable driving, plus items such as tire pressures, shock absorbers, suspension, width v.s. height of the trailer or vehicle, and an anti-roll bar on the tow vehicle.

8.2.8 Hitting the Curb

Swing a little wide when making sharp turns to avoid having the trailer hit a curb. The trailer tires tend to turn in a little closer to the curb than the tow vehicle.

8.2.9 Gas Stations

Extra care should be taken when attempting to refuel at a gas station. Look ahead and see if there is a sensible way to get to a pump with the trailer in tow, and then exit from that pump back onto the street. Keep in mind the length of your vehicle and trailer combined, which often means that you will take two or more places, or the trailer will be blocking parking lot traffic flow behind you.

Watch carefully while pulling away from the pump, so that the trailer does not hit something while you turn. It will be necessary to swing wider than normal around object to avoid hitting anything.

Truck stops and large gas stations generally have larger and easier to navigate pump lanes.

 Warning

During travel, turn off all pilot lights before pulling into a gas station for refueling. A refrigerator, water heater, furnace, or other LP gas appliance with a pilot light may ignite the gas fumes which are released while refueling the tow vehicle at a gas station, possibly resulting in a fire or explosion.

8.2.10 Backing the Trailer

For information on how to back up the trailer, see Section 9.2 on page 32.

8.3 Changing a Flat Tire

In the event of a tire blow-out while driving:

1. Coast down to a slow speed. Do not use the brakes.
2. Turn on the hazard lights as soon as possible.
3. Continue at a slow speed until you can find a safe place to pull off the road.
4. Set the parking brake.
5. Keep the trailer connected to the tow vehicle, or chock the good trailer tire before changing the flat tire. The trailer must not move while it is jacked up.
6. Remove the spare tire to have it ready.
7. Before jacking up the wheel, use the lug wrench to loosen the lug nuts a bit while the wheel is still on the ground. When the wheel is up in the air it will be harder to keep the wheel from turning while trying to remove the lug nuts. Do *not* remove the lug nuts all the way while the wheel is resting on the ground.
8. Jack the wheel off the ground enough that the fully inflated spare tire will be able to go onto the axle.
9. Finish removing the lug nuts. If they cannot be removed, lower the wheel until the flat tire is pressing into the ground a bit, and loosen the lug nuts a bit more before raising the wheel into the air again. Do *not* remove the lug nuts all the way while the wheel is resting on the ground.
10. Remove the wheel with the flat tire.
11. Place the spare tire and wheel onto the axle and install the lug nuts to be hand-tight. Push into the wheel to seat it against the axle while tightening each lug nut.
12. Before lowering the wheel to the ground, check once again that the wheel seated is all the way onto the axle and that every lug nut is hand tight.
13. Lower the jack until the spare tire is on the ground. Remove the jack.
14. Tighten the lug nuts in a star pattern to only medium tightness. See Figure 10. If using a torque wrench, set it to 50 ft-lb.
15. For final tightening of the lug nuts:
 - If using a lug wrench, tighten the lug nuts in a star pattern to full tightness.
 - If using a 24" flex handle ("breaker bar"), it is possible to over-tighten the lug nuts. To reduce the total torque, hold the handle approximately $\frac{1}{3}$ of the way in from the handle end. While holding the bar here, apply full tightness to each lug nut in a star pattern. See Figure 9.
16. Put the flat tire into the spare tire holder.
17. Remove any wheel chocks and stow the jack and wheel chocks.

ⓘ Note

Do NOT apply full torque to the far handle end of the 24" flex handle, or the lug nut will be over-tightened and may break.

- If using a torque wrench, set it to 90 ft-lb and tighten the lug nuts in a star pattern.

Figure 9: Holding The Breaker Bar

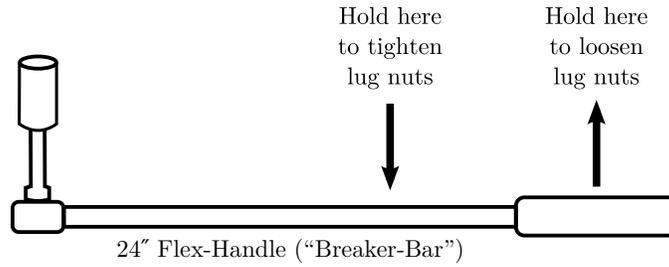
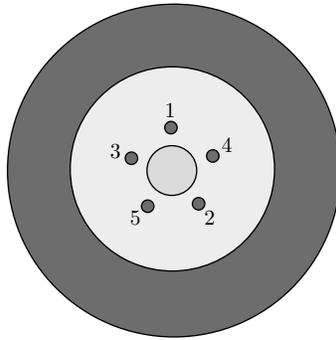
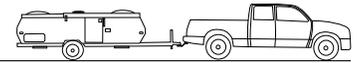


Figure 10: Lug Nut Tightening Sequence — Star Pattern



18. After driving a few miles, stop to check the tightness of the lug nuts.
19. After driving a few hundred miles, again stop to check the tightness of the lug nuts.

9 ARRIVING AT CAMP



9.1 Choosing the Campsite

Pull-through sites are often available, but if there is a wide open back-in site then it may be useful to go ahead and practice backing into the easy site before you one day are forced to back into a harder campsite. For information on how to back up the trailer, see Section 9.2 on page 32.

Campsites which are not level can add some complications:

- Backing uphill can be harder on a transmission and/or clutch since reverse gears are often not as strong as the first forward gear.
- On any hillside, it is especially important to fully secure the tow vehicle and trailer to prevent them from rolling away. See Section 9.3 on page 35 and Section 9.5 on page 36 for details.
- Leveling the trailer may require extra blocks below the stabilizer jacks in order for them to reach the ground. See Section 9.6 on page 37.

Other things to watch for when choosing a campsite:

- Locations of sign posts which may be hit while backing into the site. These are often very close to the edge of the parking pad.
- Overhanging tree limbs.
- Neighbors with slide-outs which are too close.
- Location of the picnic table.
- Location of the campsite utility connections.

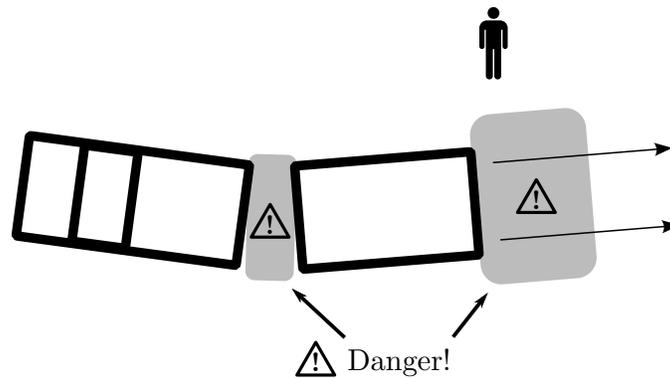
9.2 Backing into the Site

Backing the trailer is often required to back into a camp site or garage, and is sometimes required on the road to do a U-turn to reverse direction. Any of these cases requires extra care to avoid damage to the trailer, tow vehicle, nearby objects, or other vehicles.

Things which can help back a trailer successfully include:

- Good wide tow mirrors. The trailer will swing out a ways, and a larger mirror will help to see what is happening.
- Reverse lights. Extra bright reverse lights may be installed to assist in nighttime parking. See your dealer for details.
- Flashlights. At night, a flashlight may be placed on the ground at the back of the parking pad to help see where you want the trailer to end up. Put the flashlight at the edge of the parking spot, on the same side as you will be looking as you turn in the trailer, so that you can see the light and place the back corner of the trailer right next to it. A light can also be placed next to any objects you wish to avoid, such as a campsite number post or a picnic table.

Figure 11: Backing Up — Danger Zones



- An assistant. Have someone stand near the back but also **OFF TO THE SIDE** so that they do not get hit. Roll down the side windows so that you can hear their warnings. Have them yell if you are about to hit something.

⚠ Warning

When an assistant or other people are in the area while backing up the trailer, DO NOT let them stand near the hitch between the tow vehicle and the trailer, and DO NOT let them stand behind the trailer. Keep them within sight in your mirrors, and DO NOT MOVE the vehicle and trailer if you have lost track of where anyone is standing. See Figure 11.

⚠ Warning

Before leaving the vehicle, secure the vehicle in place:

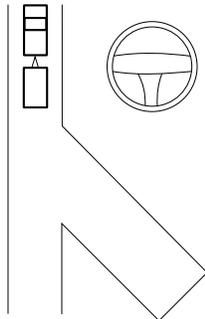
- Set the parking brake.
- When on a steep slope, turn the steering wheels away from the down-slope. This helps keep the vehicle from rolling downhill.
- For an automatic transmission, shift to the transmission to Park.
- For a manual transmission, turn off the engine and leave the transmission in first gear.

Failure to secure the vehicle can result in a roll-away.

Backing the trailer is a skill which can be acquired with practice. When starting out, try the following:

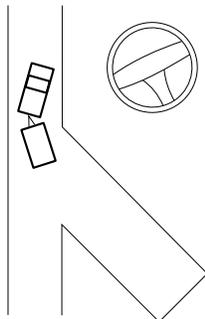
1. Use the hazard flashers.
2. *Secure the vehicle*, then get out and look around before starting, taking note of the positions of any nearby vehicles, campground sign posts, picnic tables, trees, and so on.
3. Remember to watch the trailer tire, the back corner of the trailer, and also both front corners of the tow vehicle. The front end of the tow vehicle will be swinging around in a wide arc while backing the trailer around a corner, so be sure to pay attention to the front of the tow vehicle to avoid hitting anything.

4. Pull forward a bit past the parking spot, and near the middle of the road. This gives room on both sides to swing the front of the tow vehicle while backing up.



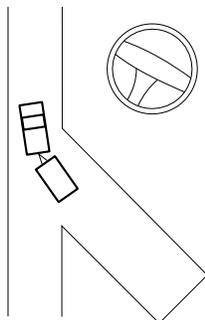
- Look at the parking pad for obstacles.
- Stop in the middle of the road with the trailer just past the parking pad.

5. Turn the bottom of the steering wheel a bit in the direction which you want the trailer to go. If you will be backing to the right, turn the steering wheel somewhat counter-clockwise so that the bottom of the steering wheels moves to the right. Do not turn the steering wheel all the way, just part way. After backing up a little bit, the tow vehicle and trailer are bent compared to each other. The more you back up, the more the trailer will bend inward. Be sure not to go too far or the trailer will be sideways and “jackknife” with the tow vehicle.



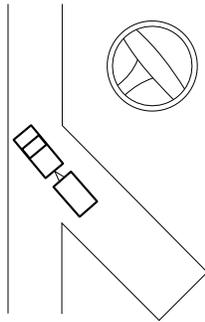
- Turn the bottom of the steering wheel into the direction you wish to go.
- Back up a bit.
- Watch the front corners as the tow vehicle swings around!
- Stop when the trailer has bent part way into the turn.

6. Once the trailer has bent into the turn a nice amount, turn the steering wheel back to straight, then a bit further the other way so that the front of the tow vehicle follows around the curve without causing the trailer to turn tighter still. At this point, the tow vehicle follows the trailer without causing the trailer to bend in more, and you could continue backing up with the tow vehicle following the trailer in a full circle if there were room.



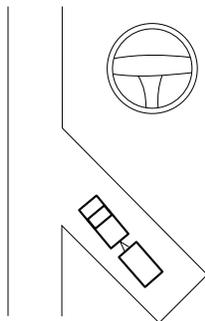
- Turn the steering wheel the other direction.
- Back up a bit.
- Stop when the trailer is *almost* aiming straight back, but not quite.

7. When you want the trailer to begin to straighten out, turn the steering wheel even more the other way to straighten out the tow vehicle and trailer and undo the curve while backing up.



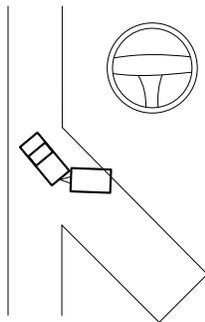
- Turn the steering wheel even further, to undo the bend at the hitch.
- Back up a bit.
- Stop when the tow vehicle and trailer are aimed straight back.

8. When the tow vehicle and trailer are straightened out and facing back into the parking pad, continue straight back with the steering wheel aimed straight.



- Turn the steering wheel straight.
- Back straight back, making minor adjustments to the steering wheel as needed.
- Stop when parked in desired location.
- *Set the parking brake and transmission to secure the vehicle.*

9. If the trailer is turning much too tight and is about to go off the pad, or is about to “jackknife”, then aim the steering wheel to go forwards to the middle of the pad, and pull forward a bit to straighten out the trailer.



- If the trailer bends too far and “jackknifes”, *STOP!* The trailer may hit the tow vehicle.
- Aim the steering wheel forward.
- Pull forward a bit to straighten out the trailer.

9.3 Securing the Tow Vehicle

Once the trailer and tow vehicle are positioned in the campsite parking pad, the tow vehicle and trailer must be secured to prevent them from rolling away. Secure the vehicle every time you leave it for any reason.

 Warning

Before leaving the vehicle, secure the vehicle in place:

- Set the parking brake.
- When on a steep slope, turn the steering wheels away from the down-slope. This helps keep the vehicle from rolling downhill.
- For an automatic transmission, shift to the transmission to Park.
- For a manual transmission, turn off the engine and leave the transmission in first gear.

Failure to secure the vehicle can result in a roll-away.

9.4 Testing the Campsite Utilities

Test any campsite utility connections before setting up the trailer, in case you have to move to another site.

Check any water faucet for operation and distance to the trailer.

Incorrect wiring or voltage can damage the trailer's components. To check the campsite's electrical system:

- Open the campsite's circuit breaker box.
- Turn off all the electrical circuit breakers.
- Plug an electrical outlet tester into the socket which will be used to power the trailer. This may require a 30 A to 15 A adapter. See Section 9.7 on page 38 for details.
- Turn on the breaker for the outlet and verify correct wiring for hot, neutral, and ground lines using the lights on the outlet tester.
- Remove the tester and plug in a 120 V AC meter.
- Verify voltage is in the range of 110 V AC to 130 V AC.
- Remove the AC volt meter. Once the trailer is set-up, the meter may be plugged into an outlet to verify voltage stays within the correct range throughout the day.

 Note

Do not use the air conditioner if the campsite AC voltage is below 110 V AC. The air conditioner can be damaged.

Check the campsite voltage periodically throughout the day, especially if many neighbors are also using air conditioning.

9.5 Securing the Trailer

Secure wheel chocks firmly between all trailer tires and the ground to prevent the trailer from rolling away.

If a tire is on a leveling block, try to use the leveling block's built-in chock (if there is one) on the down hill side of the tire, and add an additional chock on the uphill side as well.

In some cases, it might be more useful to reverse the chock to gain contact between the tire and the ground.

A BAL trailer leveler doubles as a very secure wheel chock.

Small circular chocks exist for the hitch jack wheel, but the jack cannot hold much sideways force, and so these jack chocks should not be relied on to hold the vehicle.

For more information on wheel chocks, see Section 5.7 on page 16.

9.6 Leveling

Once you have decided on a camp site, the trailer should be leveled, both left-to-right and also front-to-back. Left-to-right level affects your sleeping position and also which way water will flow on the counter-top. It can be useful to cause water to flow towards the backstop of the counter instead of dripping off the front of the counter onto the floor. Front-to-back level is important to avoid damaging the refrigerator. See your refrigerator's manual for details.

A recommended method for leveling the trailer is as follows.

1. Level the trailer side to side first, by driving the low side trailer tire onto a wooden plank or any of the commercially available plastic ramps or stacking blocks designed for this purpose. It can be easier on the transmission to position the leveling ramp such that you will drive forward onto the ramp instead of backwards. Another option is the BAL trailer leveler, a device which holds onto the wheel on both sides and lifts it up with a screw jack. Use a bubble level on the back bumper to verify left to right level. For more information on leveling tools, see Section 5.7 on page 16.
2. Use wheel chocks on both tires to hold the trailer in place. See Section 9.5 on page 36.
3. Temporarily keep the safety chains connected to the tow vehicle in case the trailer tries to roll away.
4. Disconnect the electrical connection to the tow vehicle.
5. Disconnect the trailer from the tow vehicle hitch, *while the safety chains are still connected*.
 - (a) For a diagram of the hitch assembly, refer to Figure 8 on page 23.
 - (b) Attach the wheel to the trailer's hitch jack.
 - (c) Lower the hitch jack until the wheel is touching the ground. Do not lift the hitch yet.
 - (d) Unlock and remove the safety pin on the trailer's hitch latch.
 - (e) Lift the hitch latch to disengage the trailer hitch.
 - (f) Use the jack to lift the hitch off the tow vehicle's hitch ball.
 - (g) If the trailer tries to roll away, use wheel chocks to secure the trailer.
 - (h) Once the trailer is secured, disconnect the safety chains.
 - (i) Before lowering the trailer to level it, the hitch ball must be moved out of the way. Either drive the tow vehicle forward, or unlock and remove the draw bar's pin and remove the draw bar.
6. Use the trailer hitch jack to level the trailer front to back. Use a bubble level on the hitch frame to verify front to back level.
7. For a folding trailer, raise its roof before deploying the stabilizer jacks, since the jacks can slightly twist the frame and make it harder for the roof latches and pins to align with the side walls.
8. Deploy the stabilizer jacks to secure and stabilize the trailer. To lower the scissor/stabilizer jacks, crank counter clockwise with the jack handle provided with your trailer.

9. Once the trailer is known to be secure against movement, remove the safety chains from the tow vehicle. Once the trailer is level, you can mount a bubble level permanently on the tongue of your trailer to aid in future leveling.

9.7 Connecting to Shore Power

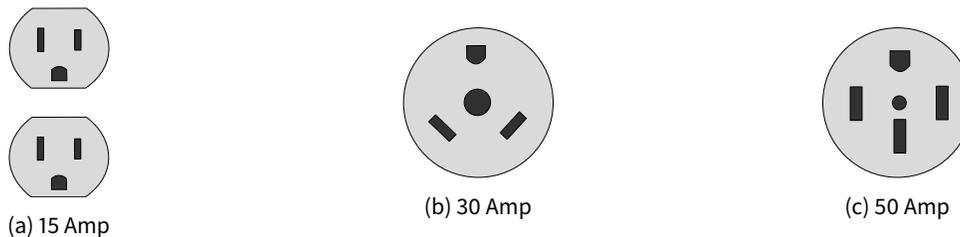
9.7.1 Selecting the Campground Power Outlet

Campgrounds may have several sockets available for connecting your trailer, each with its own circuit breaker (ON/OFF switch). See Figure 12.

Use the socket which matches your trailer's electrical cord, or use an adapter to connect to a different type of socket if necessary.

For information about the limits of each kind of power socket, see Section 10.8.2 on page 49.

Figure 12: Campground Power Outlet Types



9.7.2 Extension Cords

If at all possible, park the trailer close enough to the campground electrical power post that an electrical extension cord is not needed. If absolutely necessary, a heavy-duty extension cord must be used. For a 15 A circuit, the electrical cord must have at least 14-gauge wires, and it should have 12-gauge wires if a longer run is desired. For a 30 A or 50 A extension cord, only a cord designed as an RV extension cord should be used, and it must have 10-gauge or thicker wires inside.

9.7.3 Connecting to the Campground Power System

To connect the trailer to the campground power:

1. If you have not yet done so, be sure to test the campsite power system before connecting your trailer. See Section 9.4 on page 36.
2. Turn off the campsite circuit breakers.
3. Disconnect the trailer's 12 V DC electrical cable from the tow vehicle.
4. Connect the trailer's 120 V AC electrical cable to the campsite outlet.
5. Turn on the campsite's circuit breaker for the outlet which you are using.
6. If necessary, switch the refrigerator from 12 V DC to 120 V AC. See Section 9.9 on page 39.

9.8 Turning on the LP Gas

The LP gas tanks must be opened to use the gas powered furnace, water heater, stove, or refrigerator. See Section 10.7 on page 45 for instructions for opening the tanks.

① Note

Open the LP gas tank valves slowly. Each tank has a built-in check valve which is designed to trip if it senses a sudden rush of gas leaving the tank. If this occurs, close the valve, wait a while, and slowly re-open it.

The valve to use is the large one with a knob on the top of the tank. Do not use the small pressure-release valve on the side of the valve body. See Figure 16 on page 46.

Open each valve all the way until it stops. Use only gentle hand pressure; do not force the valve.

If this is the first time using the LP gas system since the tanks were installed out of storage, the gas lines may have to be purged of air before the gas appliances can be used. See Section 10.7.5 on page 47 for information about purging the LP gas lines.

9.9 Fridge Changeover to 120 V AC Electric Power or LP Gas

Once arriving at the campsite, switch the refrigerator out of 12 V DC mode, to either the 120 V AC or LP gas mode.

The LP gas option often has a choice of high/medium/low flame power, in which case you will have to guess which level to use depending on the outdoor temperature. Use a stronger flame on warmer days.

The 120 V AC option, if available, often has a thermostat setting. Use a higher power for warmer days.

The 12 V DC option is only for use while towing. It is not as powerful as either the LP gas or 120 V AC electric options, and it does not have a thermostat control. The 12 V DC option will quickly drain the battery unless the trailer is connected to either a tow vehicle with a running engine, or the trailer is connected to 120 V AC power from the campsite or a generator, in which case the converter will keep the battery charged. In either case, using the 120 V AC or LP gas option will be much more efficient.

① Note

Only use one refrigerator power source at a time. This power applies heat to the refrigerator's ammonia system, and too much can damage the refrigerator.

① Note

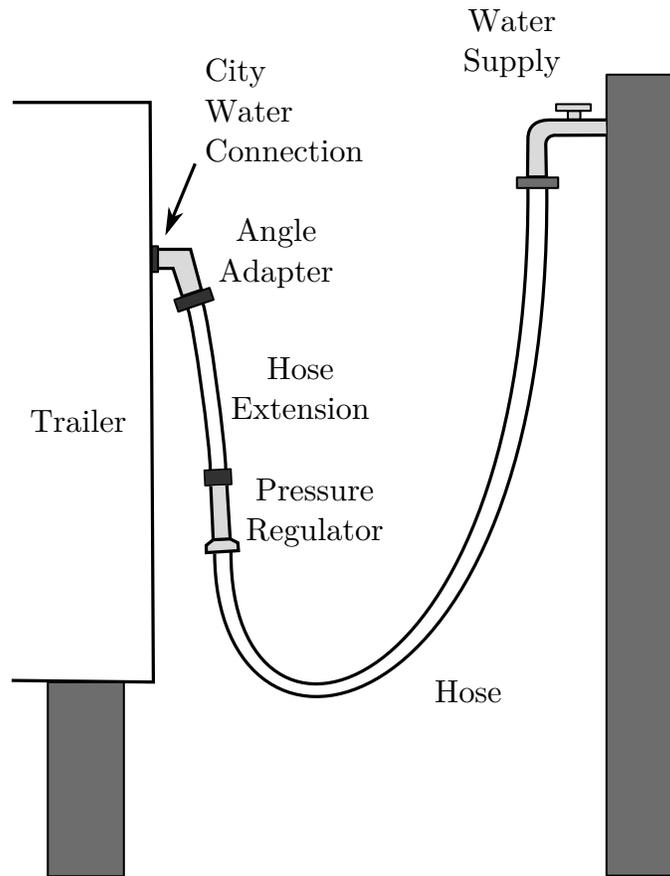
Open the LP gas tank valves slowly. Each tank has a built-in check valve which is designed to trip if it senses a sudden rush of gas leaving the tank. If this occurs, close the valve, wait a while, and slowly re-open it.

The valve to use is the large one with a knob on the top of the tank. Do not use the small pressure-release valve on the side of the valve body. See Figure 16 on page 46.

Open each valve all the way until it stops. Use only gentle hand pressure; do not force the valve.

If this is the first time using the LP gas system since the tanks were installed out of storage, the gas lines may have to be purged of air before the gas appliances can be used. See Section 10.7.5 on page 47 for information about purging the LP gas lines.

Figure 13: Shore Water Connection



9.10 Connecting to Shore Water

Water may be filled into the fresh water tank, as seen in Section 6.1 on page 18, in which case the water pump must be on to use the water, and the water tank must be filled on occasion to prevent it from running empty.

Water may also be connected to the city water connection, which bypasses the water tank, as seen in Figure 13. Be sure to use a water pressure regulator as shown. While connected to the city water supply, the trailer's water pump is not needed, but the water tank is not filled.

9.11 Opening the Trailer

Consult your trailer's owner's manual for instructions on raising the roof and opening the trailer.

ⓘ Note

Use caution while setting up or taking down the trailer during high winds.

9.12 Starting the Water Heater

Water heaters are available with either a manually-lit pilot light or else an electric-start ignition.

i Note

Open the LP gas tank valves slowly. Each tank has a built-in check valve which is designed to trip if it senses a sudden rush of gas leaving the tank. If this occurs, close the valve, wait a while, and slowly re-open it.

The valve to use is the large one with a knob on the top of the tank. Do not use the small pressure-release valve on the side of the valve body. See Figure 16 on page 46.

Open each valve all the way until it stops. Use only gentle hand pressure; do not force the valve.

If this is the first time using the LP gas system since the tanks were installed out of storage, the gas lines may have to be purged of air before the gas appliances can be used. See Section 10.7.5 on page 47 for information about purging the LP gas lines.

9.12.1 Manual Pilot-Light Ignition

This style of water heater has a knob with settings for OFF/ON/PILOT, and a lever which controls the thermostat.

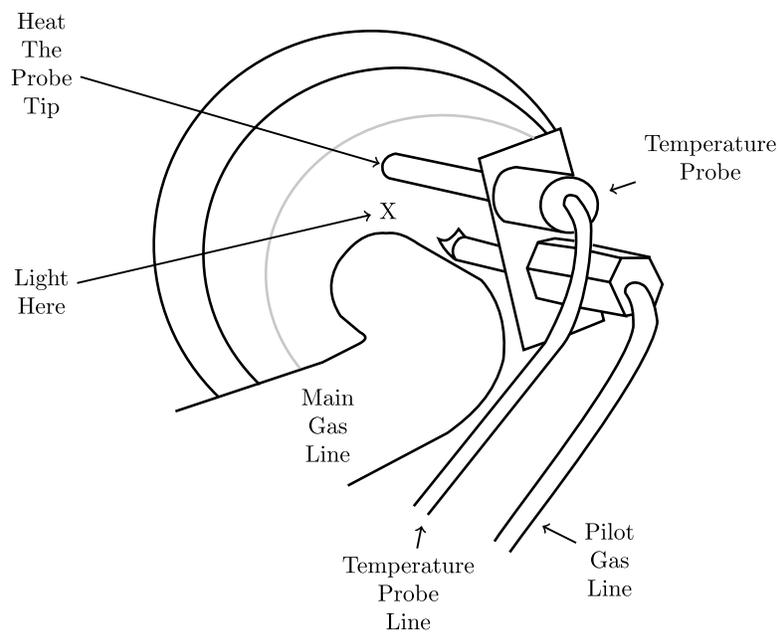
To light the manual pilot light:

1. Slowly open the valves on the LP tanks. See Figure 15 on page 45.
2. Turn the water heater's control knob to PILOT.
3. Gently try to keep turning the knob further still, so that you are holding the knob all the way at the end where it stops.
4. While holding the knob against the PILOT stop, apply the lighter flame at the position marked 'X' in Figure 14.
5. Apply the flame so that the tip of the temperature probe is in the flame. This causes the control to allow gas to come out at the pilot line.
6. If air is in the line, you will hear air hissing out of the pilot gas line, but the pilot will not yet light. Continue holding the knob past the PILOT position while applying flame to the probe tip.
7. Once the pilot is lit, continue holding the knob for another half minute to allow the probe to absorb additional heat.
8. Turn the knob towards the ON position until the water heater lights.
9. Adjust the temperature control lever to a medium position.

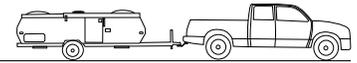
9.12.2 Electric-Start Ignition

Several types of electric-start water heaters are available. **Do not attempt to light an electric-start water heater by hand.** Consult the water heater's owner's manual for details of how to start an electric-start water heater.

Figure 14: Lighting The Manual-Start Water Heater Pilot



10 OPERATING THE SYSTEMS



10.1 Roof Vents

Roof vents provide several very important functions:

- While cooking with the stove, a side window and a roof vent must both be opened at the same time to allow fresh air into the trailer. Using the stove without fresh air *will* result in death.
- An open roof vent plus an open side window can greatly improve comfort while camping in warm conditions.
- During a storm, a roof vent can be cracked slightly open without letting in rain because the vent's top has a wide edge, whereas a side window can let in rain even if it is only slightly open.
- People exhale water vapor as they breathe, and this vapor can build up in the trailer, causing condensation to appear in the form of water drops on the insides of windows and metal surfaces, freezing if conditions are cold enough. A slightly open roof vent and side window can be sufficient to let out this water vapor and prevent condensation on the inside of the trailer.

⚠ Warning

Any time the stove is in use, open both a side window and also a roof vent to allow fresh air to enter the trailer and stale air to exit. The stove consumes oxygen from the trailer's living area, and replaces it with carbon dioxide and possibly carbon monoxide. This condition *will* cause death, and a supply of fresh air is absolutely *required* during stove operation.

Do not use the stove for comfort heating. The furnace is vented to the outside, but the stove is not.

Simple roof vents have just a knob to crank the vent lid open and closed, plus a screen to keep out insects. For those trailers with a very high roof, a plastic PVC pipe with notches cut into the end may be used to turn the knob from below.

Roof vents are also available with a power fan, using battery power to move large amounts of air, either inward or outward. An open side window plus a low fan power setting blowing air out of the trailer is usually sufficient. The fan might not run until the vent lid is opened a sufficient amount.

Some roof vents have a powered system to open and close the vent lid, perhaps with a sensor to automatically close the lid when rain is detected.

Some roof vents have a latch to help keep the vent closed while traveling. Be sure to secure any roof vents before towing the trailer.

⚠ Warning

Do not leave a person or pet unattended in the trailer with the windows closed and air conditioning on or an automatic vent open. If the campground loses power to the air conditioner, or if an automatic roof vent senses rain and closes, the trailer can quickly become dangerously hot.

10.2 Sink and Water Pump

The sink receives water either from the fresh water tank via the water pump, or the city water connection which does not use the water pump. For information about supplying water to the trailer, see Section 6.1 on page 18.

Water going into the sink drains through an outlet on the exterior of the trailer. Water from this outlet should be gathered in a container instead of being allowed to spread on the ground. This container must allow air to escape for water to flow down the drain, but may also be a sealed container which is collapsed when empty and expands as necessary when water flows into it.

The water pump has an on/off switch which provides power to the pump. Keep this switch off while the trailer is being towed, so that the pump does not run water in the event that a faucet is shaken open or a pipe is loose. When the pump is turned on, it runs until the water lines are pressurized, then the pump stops. The pump continues to monitor the water pressure, and it runs again to fill the lines as necessary.

If the hot water heater is empty when the pump is turned on, the pump might run for a while as it fills the tank. If the hot water tank or the water lines had air in them, this air will spurt out the faucets when they are first opened. If this occurs, allow the pump to run until both the hot and cold water lines flow freely.

For information about upgrades to avoid the loud hammering actions of the typical on-demand water pump, see Section 16.2 on page 66.

10.3 Stove

Warning

Any time the stove is in use, open both a side window and also a roof vent to allow fresh air to enter the trailer and stale air to exit. The stove consumes oxygen from the trailer's living area, and replaces it with carbon dioxide and possibly carbon monoxide. This condition *will* cause death, and a supply of fresh air is absolutely *required* during stove operation.

Do not use the stove for comfort heating. The furnace is vented to the outside, but the stove is not.

10.3.1 Manual Ignition

10.3.2 Electric Ignition

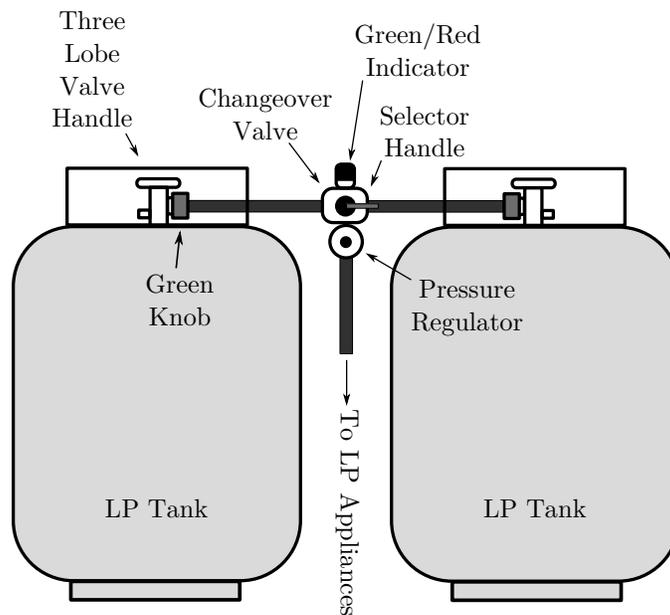
10.3.3 Indoor / Outdoor Stove

10.4 Furnace and Air Conditioner

Warning

Do not leave a person or pet unattended in the trailer with the windows closed and air conditioning on or an automatic vent open. If the campground loses power to the air conditioner, or if an automatic roof vent senses rain and closes, the trailer can quickly become dangerously hot.

Figure 15: LP Gas System



10.4.1 Thermostat Controls

10.5 Outside Shower

10.6 Cassette Toilet

10.7 LP Tanks

10.7.1 Overview

The LP (“Liquid Petroleum”) tanks supply gas (“propane”) to various appliances for heating and cooling uses. LP tanks are an efficient way to package and transport a large amount of energy.

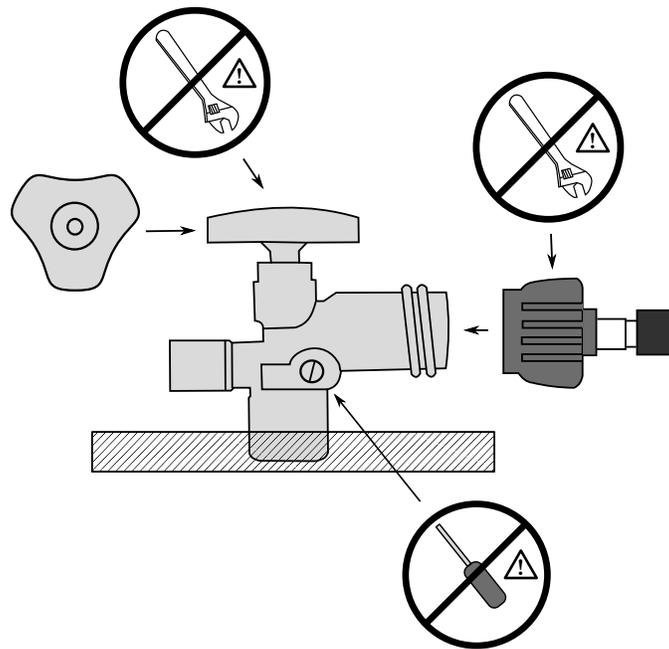
LP fuel is kept under pressure in a liquid form inside the tank, and it is released in a gas form when it comes from the tank into the system. If two tanks are included, a changeover valve selects which tank is currently being used. A pressure regulator controls how much gas is available to the appliances. Some appliances may have an additional pressure regulator built into them.

10.7.2 Safety Improvements

Modern LP tanks have several safety improvements. These tanks are recognizable by the three lobed valve handle on top of the tank, and the green knob used to connect the hose to the tank.

OPD: The tank valve has an “Overfill Protection Device” (OPD) built in, which limits how much fuel can be stored in the tank.

Figure 16: LP Gas Tank Valve



Green Knob: The green pigtail hose knob tightens in the expected direction using only moderate hand force, and includes a system which cuts off the propane supply in the event of a fire.

Flow Limit Valve: In the event that a gas line breaks or a stove burner is left on while opening the LP tank valve, a flow limit valve in the tank closes to allow only a small flow of gas to escape.

Pressure-Release Valve: Another valve releases excess pressure built up when a tank gets overly hot, such as when sitting in direct sunlight on a hot day.

10.7.3 Choosing which LP Tank — The Changeover Valve

In a system with one LP tank, the tank's output is directly connected by a hose to the pressure regulator, which is then fed into the trailer's LP gas lines which go to each appliance.

In a system with two LP tanks, a changeover valve is included. Each tank is connected to this valve, the valve is then connected to the pressure regulator, and then the regulator is connected to the gas lines which go to each appliance. See Figure 15 on page 45.

The changeover valve feeds to the pressure regulator the output of only one of the two tanks. Which tank is used is determined by a selector lever on the valve, pointing to either one side or the other. A small indicator with a green or red color shows whether gas pressure is present in the selected tank. So long as this tank has gas, its gas will be fed to the regulator, and gas from the other tank will not be used. Once the selected tank runs out of gas, the changeover valve's indicator will change to red, and the valve will route gas from the opposite tank instead. Appliances will still be fed gas as long as any is available in the second tank. When this occurs, move the selector lever to point to the new tank, and the indicator will change back to green if the new tank has gas pressure. Once both tanks are empty, the indicator will show red regardless of which tank is selected.

When a tank is empty and the changeover valve is pointing to the opposite tank, the empty tank can be closed and removed from the system and taken for refilling. After it is refilled, it can be reconnected to the system and it will be selected automatically by the changeover valve once the opposite tank is empty.

10.7.4 Opening the LP Gas Tanks

 **Warning**

Be sure that all LP appliances are turned off before opening the LP gas tank valves. If a stove burner is unknowingly left on when the LP tanks are opened, explosive gas will be released into the trailer.

Open the LP gas tank valves slowly. Each tank has a built-in check valve which is designed to trip if it senses a sudden rush of gas leaving the tank. If this occurs, close the valve, wait a while, and slowly re-open it.

The valve to use is the large one with a knob on the top of the tank. Do not use the small pressure-release valve on the side of the valve body. See Figure 16 on page 46.

Open each valve all the way until it stops. Use only gentle hand pressure; do not force the valve.

10.7.5 Purging the LP Gas Line

If this is the first time using the LP gas system since the tanks were installed out of storage, the LP gas lines may have air inside of them, causing it to be hard to light the refrigerator, water heater, furnace, or stove. You may quickly purge the air from the lines by trying to light the stove until it finally starts up, or you may wait for a few minutes after opening the LP tank valves before trying to start the LP appliances.

Even after the air has been purged as far as the stove top, there may still be additional air in the rest of the gas lines leading to other LP gas appliances, so you can expect that they may still be harder to start the first time they are used.

To purge the LP gas line with the stove:

1. Slowly open the valves on the LP tanks. Opening the valves quickly may cause the internal anti-leak stop valve to trigger. See Figure 15 on page 45.
2. *Open a side window and a roof vent.* These must be opened any time the stove is in use to prevent dangerous oxygen depletion.
3. Open the stove.
4. Have a lighter ready.
5. Turn on the stove to its light position. Listen for the sound of air or gas coming from the stove.
6. While the air is coming out of the stove, light the lighter and hold it near the stove.
7. The stove will not light until the air is purged and replaced by LP gas from the tanks. This can take several seconds.
8. Continue applying flame or spark to the stove until it finally lights.
9. Turn off the stove and the lighter.
10. At this point, most of the air has been purged from the LP gas line, and other appliances such as water heater or refrigerator will now be easier to light.

⚠ Warning

Any time the stove is in use, open both a side window and also a roof vent to allow fresh air to enter the trailer and stale air to exit. The stove consumes oxygen from the trailer's living area, and replaces it with carbon dioxide and possibly carbon monoxide. This condition *will* cause death, and a supply of fresh air is absolutely *required* during stove operation.

Do not use the stove for comfort heating. The furnace is vented to the outside, but the stove is not.

10.7.6 LP Gas Starvation

If an LP appliance is for some reason left on (such as a stove-top valve having been left open) when the LP tank is opened, the tank's flow-limit valve should activate, allowing only a small flow of gas to be available. This means that an LP gas appliance might work, but not very well, and several using appliances at once could cause a starvation of the gas supply, resulting in low or no operation of the LP appliances.

If it seems that the LP gas appliances are not working:

1. Turn off all LP gas appliances.
2. Keep the LP tank supply valves open.
3. Wait 15 seconds to several minutes for the flow-limit valve to open again.
4. Try turning on the LP gas appliances again.
5. If the LP gas appliances still do not work, try this procedure again with a longer wait time.
6. If the LP gas appliances still do not work, turn them off and search for leaks in the LP gas system. See Section 10.7.9.

10.7.7 Purging New or Exposed LP Tanks

A new LP tank must be purged of regular air before being filled with LP fuel. Some tanks are purged at manufacture, but if much time has passed they should be purged again before being filled. See the tank's labels for details.

Any LP tank which is emptied and exposed to the atmosphere while its valve is still open must be purged before being refilled.

10.7.8 Refilling the LP Tanks

A propane tank may be exchanged or refilled when it is empty. To remove and reinstall the tank:

1. Close the hand valve of the empty tank.
2. On a system with two tanks and a changeover valve, point the changeover valve handle to the full tank.
3. If both tanks are empty, or soon will be, turn off all gas appliances and close the hand valve on both tanks before removing either one.
4. Unscrew the green knob to disconnect the tank from the gas line.
5. Unscrew the bracket holding the tank to the trailer.
6. Remove the tank and have it exchanged or refilled by a technician.

7. To connect the LP tanks, see Section 6.3 on page 21.

⚠ Warning

Do not move the trailer if the LP tanks are resting on the trailer but not secured with the bracket. Do not transport LP tanks in a vehicle unless they are secured in an upright position, and a window is left open to vent any gasses which are released. LP gas which is allowed to gather in an enclosed space can explode.

10.7.9 Testing for Leaks

A technician can test for leaks using special tools. You may test for leaks yourself using either an electronic leak detector, or a commercial LP gas leak detection fluid which is sprayed onto the lines and fittings. Do not use soap and water, as it can corrode the brass fittings and eventually lead to new leaks.

10.7.10 Re-Certification of LP Tanks

Propane tanks must be inspected and re-certified for safety on occasion. Read the tank's label for details.

10.8 Electrical Systems

10.8.1 Overview

Figure 17 shows a block diagram overview of the electrical system.

Electric power from the campground comes into the trailer through the trailer's large power cord, and is sent into the electrical panel which has a series of circuit breakers. This power is the same as your household wall outlets, and the circuit breakers protect the wiring from overload the same way your household circuit breakers do. See Section 10.8.3 for information about the circuit breakers.

Your trailer will have a main circuit breaker for the entire system, along with separate circuit breakers for things such as the converter, air conditioning, and the trailer's internal wall outlets.

The converter is also inside this electrical panel, and it takes this power and converts it to a low voltage 12 V DC format for use in several major trailer components, such as the lights and furnace. These components are protected by a fuse panel, which is also located inside the electrical panel. The fuse panel will have a pair of main fuses for the entire panel, plus a row of additional fuses, one per circuit. A label on the electrical panel will show the functions of each fuse and circuit breaker.

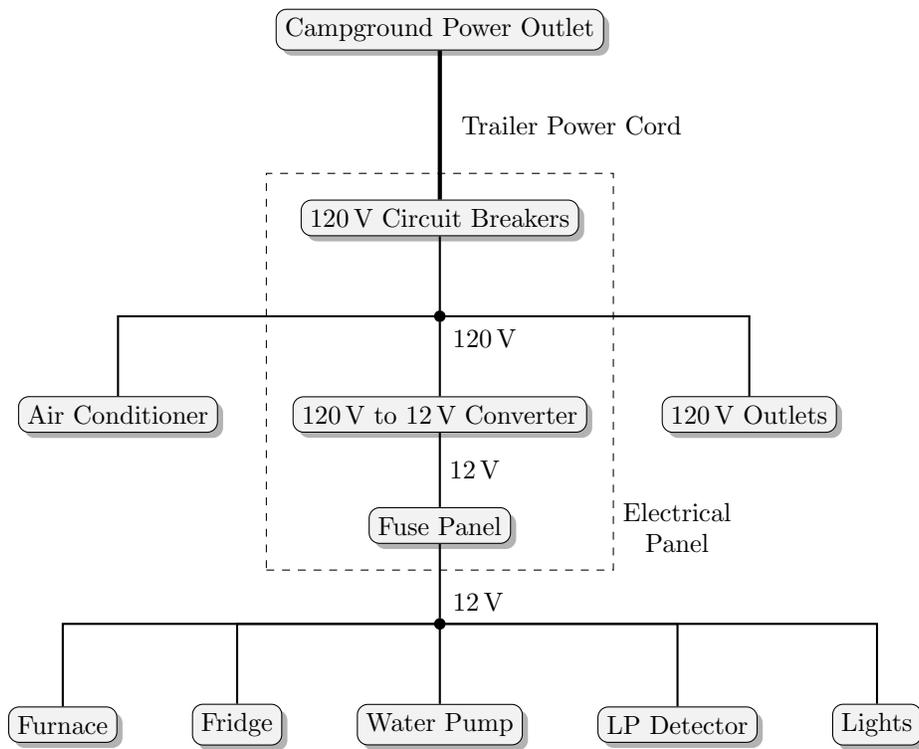
10.8.2 Power Limits

Your campsite might have several type of power outlets for your trailer to plug into. For a diagram of the outlets, see Figure 12 on page 38. Each style has limits to how much electrical power it can handle:

15 A: Similar to a regular household outlet. Limited to one small air conditioner or one other high power item, *but not more than one high power item at a time*. This limit applies to both 15 A outlets as a combined total.

30 A: Specific to camping RVs only, this is a 120 V AC outlet intended for higher current use. Allows the use of an air conditioner, and might allow one more high power item at the same time.

Figure 17: Electrical System – Overview



50 A: Two 120 V AC circuits which may be combined into a 240 V AC circuit. Used in large RVs to allow the simultaneous use of a second air conditioner. Limited to two air conditioners, and might allow one more high power item. Air conditioners may have to be turned off if using other large appliances.

High power items include an air conditioner plus electric items such as a room heater, water heater, coffee maker, iron, etc. It is best to only use one of these at a time. If too much power is used at once, a circuit breaker will trip, shutting down much of the 120 V AC electrical system.

10.8.3 Overloads and Circuit Breakers

When too much power is drawn from the electrical system at once, causing an overload, a circuit breaker should trip to prevent an electrical fire. The electrical circuit will be disabled and everything connected to it will lose power. To re-enable the circuit:

1. Turn off or unplug all high power appliances.
2. Look for a tripped circuit breaker, both in the trailer's electrical box and also at the campsite electrical box where the trailer is plugged in. On some trailers, an additional circuit breaker may be located behind the electrical converter. A tripped circuit breaker looks like it is mostly but not quite all the way ON.
3. Switch the circuit breaker all the way to OFF.
4. Switch the circuit breaker back all the way ON.
5. Turn on or plug in fewer of your appliances at the same time. Turn off one before turning on the next.

10.8.4 Outlets

The trailer's wall outlets are similar to household wall outlets. Normal appliances may be plugged into these outlets, but they will only work if the trailer is plugged into the campsite's power outlet or a generator.

Some outlets are protected by a "ground fault interrupt" (GFI). This is a device with two buttons on the face of the outlet, labeled TEST and RESET. This outlet is wired so that it turns off if it thinks that you might be receiving an electric shock. Keep the area around the outlet dry, and do not poke anything into the outlet or touch it with wet hands. To re-enable the outlet, press the RESET button. If it still doesn't work, have an electrician look for a wiring problem.

To see if the GFI outlet works properly, press the TEST button and verify that the outlet makes a click sound and no longer powers anything. Press the RESET button to return the outlet to normal operation, and verify that the outlet now powers an appliance. Repeat the TEST and RESET buttons once more to be sure that the outlet clicks off when TEST is pressed, and returns to operation when RESET is pressed.

Round 12 V DC "cigarette lighter" style power outlets might also be available. These outlets are active whenever the trailer's battery is charged up, and they power automotive-style devices such as cell phone chargers.

10.8.5 Battery Voltage

The 12 V DC battery is recharged by the tow vehicle if wired properly and if the tow vehicle engine is running. The battery is also recharged by the trailer's converter when the trailer is connected to the campground power post or a generator. The battery might also be recharged by a solar or wind system.

If none of these is available, the battery will be gradually drained as you use the 12 V DC appliances such as lights, furnace, or water pump. To avoid damaging the battery, it is important not to drain the battery too far. The battery should be recharged as soon as possible. A battery which is left uncharged for a long period of time gradually becomes damaged through an internal chemical process, and the longer it sits uncharged the less well it will work in the future.

To estimate the battery's remaining charge, turn off all 12 V DC appliances such as lights and furnace, wait a minute, then check the voltage using a battery voltage meter plugged into a 12 V DC outlet. See Table 2.

Table 2: Battery Voltage And Capacity

Voltage	% Full	Comments
12.7	100	On a hot 100 °F day.
12.6	100	On a mild 60 °F day.
12.5	100	On a cold 10 °F day.
12.0	50	Stop using the battery. Recharge now!
11.5	0	Dead battery.

10.8.6 Battery Charging

Several methods may be used to charge the trailer's battery:

Tow vehicle via hitch cable: While the trailer is connected to a properly wired tow vehicle, the tow vehicle can slowly charge the trailer's battery through the hitch electrical cable. A low battery can take all day to recharge this way.

Tow vehicle via battery jumper cables: Faster than the hitch cable, but will still take a while to charge the battery.

Campground power, trailer has a simple one-stage converter: Much faster charging, but it can still take hours. On a hot day, avoid battery overcharging by turning off the converter at its circuit breaker and re-activate as necessary to recharge on occasion.

Campground power, trailer has a three-stage converter: Boost mode gives much faster charging, and storage mode avoids over-charging. Plug it in and don't worry about it.

Campground power, trailer has a four-stage converter: Similar to the three-stage, but the converter activates boost mode every now and then to keep the battery stirred up. Can cause boil-over on hot days, so you may wish to disable the converter once the battery is full, then re-enable it every now and then to recharge as needed.

Generator, trailer has a single-stage converter: Use the 120 V AC generator output to plug in the trailer. Slowly recharges the battery.

Generator, trailer has a three- or four-stage converter: Use the 120 V AC generator output to plug in the trailer. Recharges much faster than a single-stage charger.

Solar panel or wind turbine: Use an intelligent charge controller. Slowly charges the battery and keeps it at full charge.

In storage, trailer has a single-stage converter: Plug in the trailer for one day per month to keep the battery charged up. Unplug the trailer the rest of the time to avoid over-charging.

In storage, trailer has a three-stage converter: Leave the trailer plugged in all the time.

In storage, trailer has a four-stage converter: Leave the trailer plugged in all the time. Unplug the trailer during very hot weather to avoid boil-over from the fourth stage's boost mode, unless it has temperature compensation.

In storage, battery removed from the trailer: Leave the battery plugged into an intelligent three-stage charger full time, or a simple battery charger for one day per month.

10.8.7 Electrical Circuit Diagram

See Figure 18 for a detailed diagram of the trailer's internal wiring.

10.8.8 Tow Vehicle — Trailer Connections

See Figure 19 for a diagram of the tow vehicle to trailer connections, including tail lights, marker lights, reverse lights, brakes, and power.

10.8.9 Cable Plug Pins

See Figure 20 for a diagram of the pin assignments of the trailer cable's plug.

Figure 18: Internal Wiring Diagram — Example

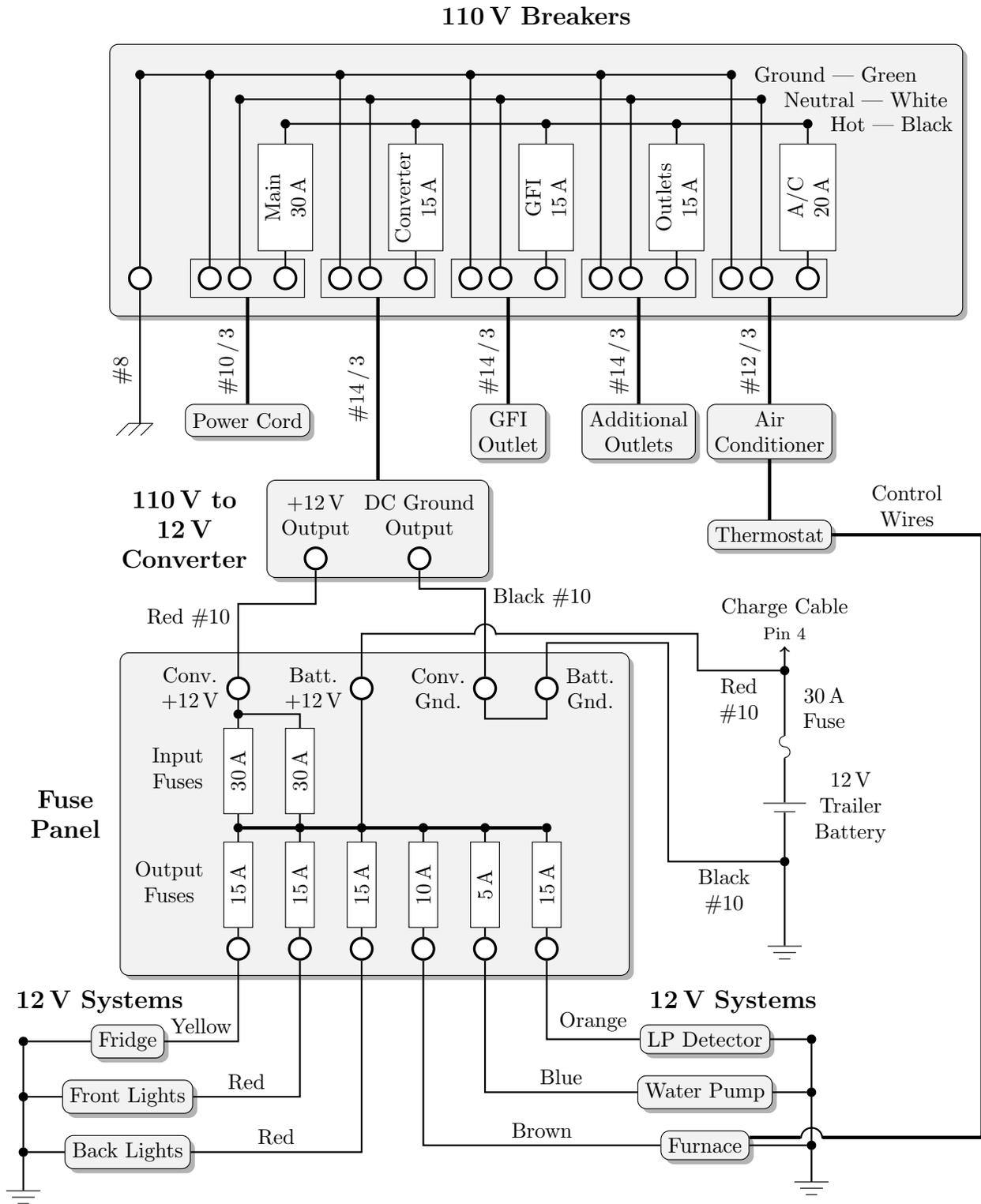


Figure 19: Trailer Cable — Wiring Example

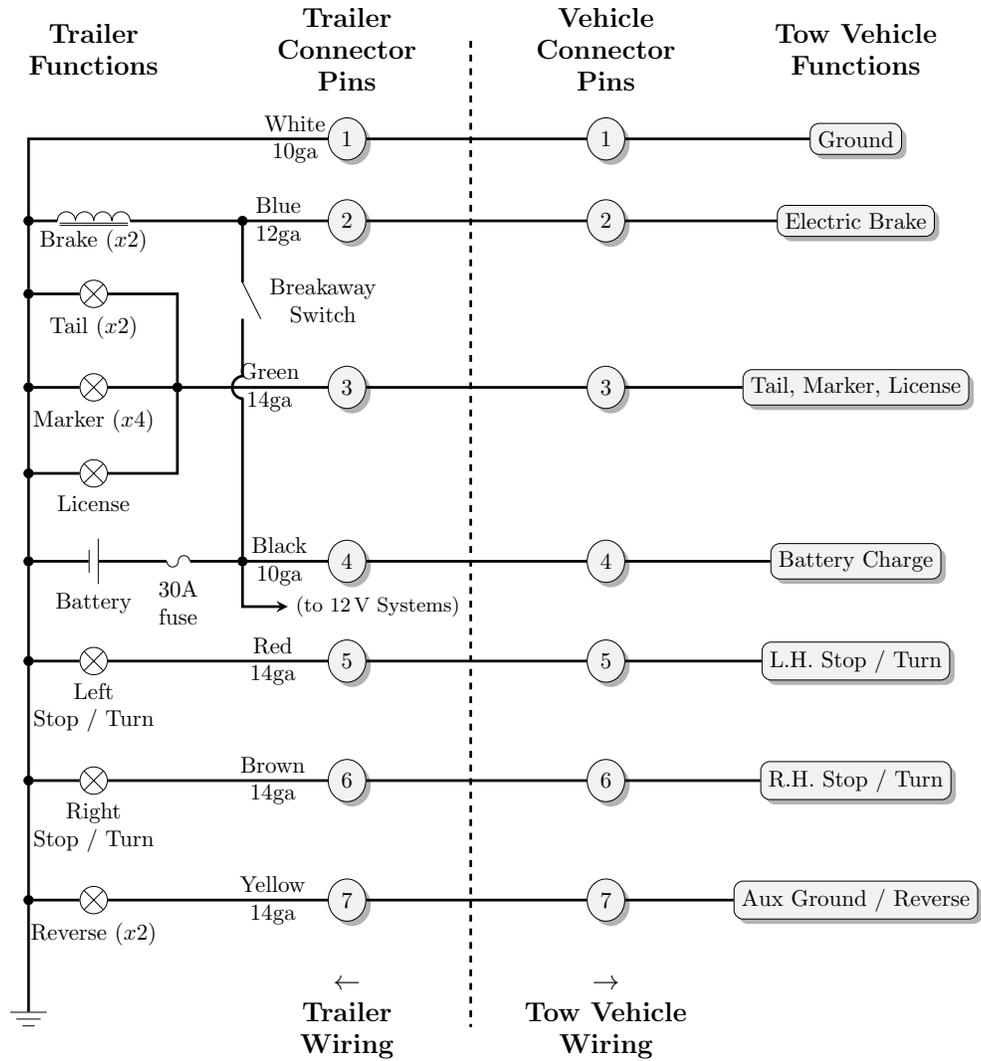
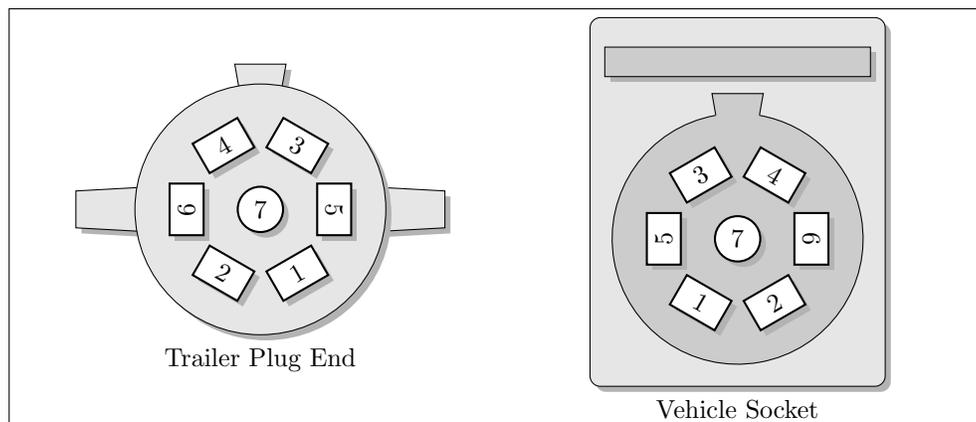
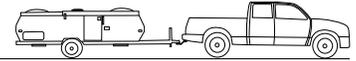


Figure 20: Trailer Cable Plug — Pin Assignments



1. Ground
2. Electric brake
3. Tail lights, marker lights, licence plate lights
4. Battery charge
5. Left stop / Turn
6. Right stop / Turn
7. Aux / Reverse

11 LEAVING CAMP



11.1 Closing the Trailer

11.1.1 Roof Vents

11.2 Stabilizers Up

11.3 Step Up

11.4 Hitching to the Tow Vehicle

11.5 Turning Off the Water Heater

11.6 Changing the Refrigerator to DC or LP Power

11.7 Disconnecting from Short Power and Water

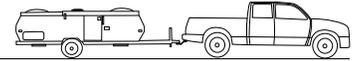
11.8 Closing the LP Tanks

11.9 Wheel Chocks

11.10 Leveling Blocks

11.11 Dump Station

12 STORING THE TRAILER



12.1 Refrigerator

Be sure that the refrigerator is turned off.

The refrigerator door should be left propped open slightly so that mold does not form inside. On some models there may be a latch position which keeps the door open a small amount.

12.2 LP Tanks

See Figure 15 on page 45.

To store the LP tanks:

1. Close the valves on each of the LP tanks.
2. Disconnect the hose from each LP tank.
3. Loosen the bracket which holds the LP tanks onto the trailer.
4. Remove the LP tanks.
5. To prevent insects or dust from entering the LP tank valve fittings, close off the LP tank valve fittings with a cap or piece of plastic bag tied around the fitting.
6. To prevent insects or dust from entering the LP lines, close off the open hose ends with a cap or a piece of plastic bag tied around the hose end.
7. Store the LP tanks in a vented outdoor location away from any enclosed housing or garage space.

⚠ Warning

When not in use, LP tanks should be stored in a vented cabinet in an outdoor location away from any enclosed household or garage, allowing any vented gasses to escape instead of gathering in an enclosed area. LP gas is heavier than air, so it will gather in the low points of basements or crawl spaces if allowed to do so, possibly resulting in an explosion if a flame source such as a furnace pilot light is present.

Do not store LP tanks inside an enclosed household or garage, the tow vehicle, or the trailer.

12.3 Water

12.4 Battery

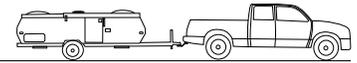
For information about keeping the battery charged during storage, see Section 10.8.6 on page 52.

12.5 Tires

12.6 Roof

12.7 Smoke Detector

13 WINTER CAMPING AND STORAGE



13.1 Water

13.2 Seals

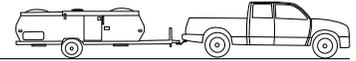
13.3 Condensation

13.4 Heating

13.5 Towing and Braking

13.6 Battery Charge

14 SUMMER CAMPING



14.1 Overheating The Trailer

Always leave windows and roof vents partially open when leaving a person or pet unattended in the trailer during the summer heat.

⚠ Warning

Do not leave a person or pet unattended in the trailer with the windows closed and air conditioning on or an automatic vent open. If the campground loses power to the air conditioner, or if an automatic roof vent senses rain and closes, the trailer can quickly become dangerously hot.

14.2 Battery Boil-Over

Higher temperatures make it easier to over-charge the battery. If the trailer has a three or four-way converter then it may be possible to tell the converter to use “storage” mode to keep the converter from over-charging the battery. See the converter’s manual for details of how to force “storage” mode. If it is not possible to use “storage” mode, it may be required to turn off the converter during especially hot days.

Simple one-way converters only have one choice of charge voltage, and this voltage may be too high when the outside temperatures are too hot. In this case, it is best to turn off the converter once the battery is charged.

The converter may be turned on again during the cool night hours to top-off the battery again.

If the converter has its own circuit breaker in the electrical panel, this circuit breaker may be used to turn the converter on and off again when camping for a long time in one place. It is best not to use the circuit breaker as a routine ON/OFF switch.

Other options to prevent battery over-charging include disconnecting the battery by hand, or installing a battery disconnect switch. In either case, be sure to reconnect the battery before travel so that it can power the electric brakes in the event that the trailer disconnects from the hitch.

Finally, the entire trailer can be disconnected from the campground power pole during the heat of the day, which also means the loss of air conditioning and other 120 VAC appliances.

14.3 AC Current Draw

14.4 Campground Voltage

Too many campers with air conditioning units can pull down the AC voltage across the entire campground. Low voltage can damage the air conditioning unit. Monitor the campsite AC voltage with a meter plugged into an outlet.

① Note

Do not use the air conditioner if the campsite AC voltage is below 110 V ac. The air conditioner can be damaged.

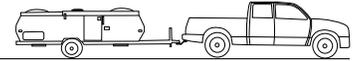
Check the campsite voltage periodically throughout the day, especially if many neighbors are also using air conditioning.

14.5 Storms

14.6 Water Heater Temperature

14.7 Shade and Awnings

15 MAINTENANCE



15.1 Engine

Towing a trailer up steep hills or over long distances at highway speeds cause the engine to work harder than usual. It is best to change the engine oil before a long trip, and maintain the severe duty service schedule for oil change replacement.

Likewise, the cooling system is stressed more than usual, and so the engine coolant should be tested and/or changed before a long trip. Likewise, the engine fan and fan clutch or motor should be checked for proper operation, and any old hoses or thermostat should be replaced to avoid problems during travel.

15.2 Transmission

Like the engine, the automatic transmission also works harder than usual while towing a trailer. Its fluid should be changed according to the severe duty maintenance schedule, and an additional transmission cooler should be added if the vehicle does not already have one.

A manual transmission does not heat up as much as an automatic while towing, but its fluid should still be changed according to the severe duty schedule. The clutch should be replaced if it is showing any signs of slipping, since it will be worn more than normal in order to start the trailer moving.

15.3 Brakes

Your tow vehicle's braking system should be maintained even when not camping, but it can become especially important when a trailer is being pulled, especially if the trailer does not have brakes of its own. A camping trailer can add 50% or more to the weight which must be stopped, resulting in much longer stopping distances.

Brake pads, rotors, and drums are all important to maintain, but there are some other additional things to remember:

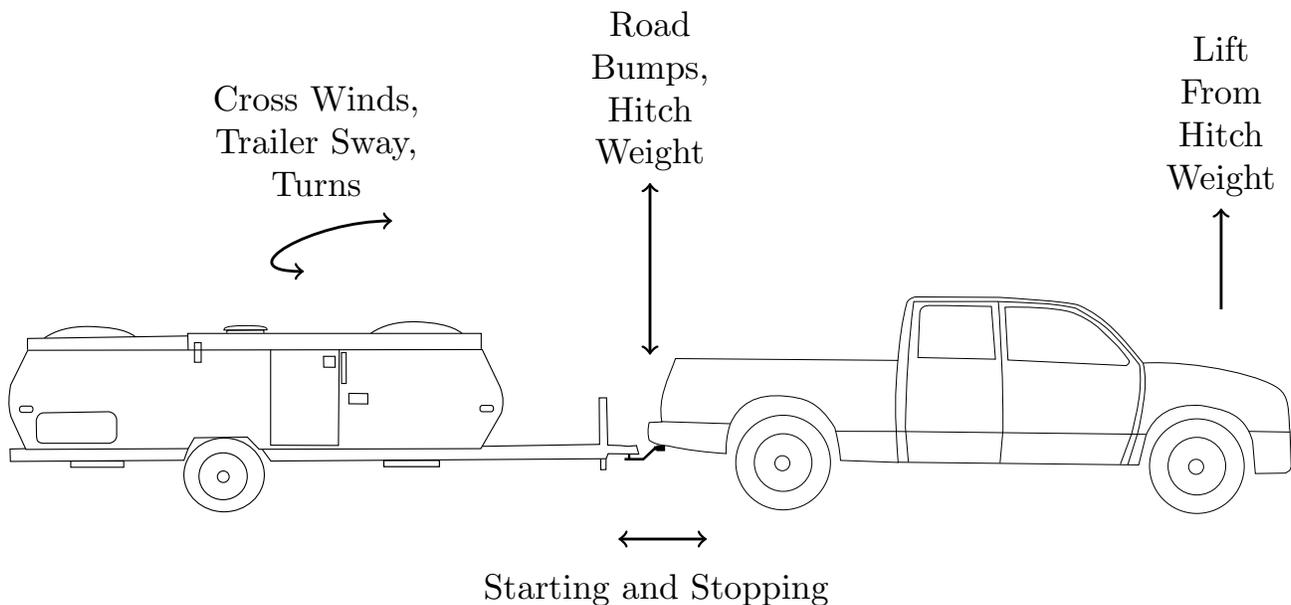
Brake fluid: Brake fluid naturally absorbs moisture. This water in the brake system can boil during hard braking, resulting in "brake fade". Have your vehicle's brake lines flushed every few years.

Brake lines: Brake lines carry the brake fluid to each brake. Metal lines can rust from the inside or the outside, and the flexible rubber lines at each wheel can crack or decay. Either problem can result in the sudden loss of braking power, often to two wheels at once. These brake lines should be inspected periodically, and replaced if there is any question of their integrity.

Parking brakes: The parking brake can be especially important while traveling and camping. Many roads and campsites are nowhere near level, and the transmission alone should not be relied on to keep your vehicle stationary. Learn to set the parking brake whenever the engine is turned off. Test the brake for function, and replace old cables or brake hardware if necessary.

Brake hardware: During routine maintenance, brake calipers and drum hardware should be lubricated as a standard procedure, but after enough years it will be time to consider all new brake drums, rotors, and pistons. Any sign of a leaking or sticking brake system should be addressed before leaving on a camping trip.

Figure 21: Extra Forces On The Vehicle While Towing



15.4 Suspension

The trailer places extra weight on the back end of the tow vehicle, and this weight also causes a lifting of weight away from the front end of the tow vehicle. Crosswinds and turns cause the trailer to tug sideways on the back end of the tow vehicle, and braking while turning can cause the trailer to want to push the back of the tow vehicle straight while the tow vehicle is trying to turn. All of these forces result in additional wear on the tow vehicle's suspension and steering components. See Figure 21.

Any looseness in the steering or suspension system or worn out shock absorbers should be corrected before towing a trailer. The shock absorbers should be upgraded to heavy-duty shocks if possible, since they will be receiving a much heavier work out from the trailer tugging and bouncing on the hitch.

15.5 Tires

Correct tire air pressure is essential due to the increased stresses on the tires, both from the extra load which must be carried, and from the extended highway speeds and high summer temperatures. Consult the owner's manuals for the tow vehicle and trailer to determine the recommended pressures for your tires. Some manuals instruct you to add extra air pressure while carrying heavy loads, and also add extra air pressure while traveling at highway speeds for extended periods of time. Be sure to take each of these factors into account when setting the tire pressures. Check and inflate the tires while they are cold, and check them on occasion during your travels.

⚠ Caution

Tires age with time and exposure to sunlight and ozone. Consult the tire manufacturers for recommendations for safe tire replacement intervals. Trailer tires are usually replaced due to age, rather than due to worn out tire tread. A spare trailer tire will have to be replaced after some time, even if it has never been used. Failure to replace tires which are old can result in a tire blowout, loss of control, injury, and death.

Signs of damage in tires include bulges in the sides, irregular wear, punctures, or small cracks in the sides or between tread blocks. Any of these should be reason to consult a tire dealer for possible replacement.

15.6 Tow Hitch

The tow vehicle's tow hitch is responsible for keeping the trailer connected to the tow vehicle, and if either the hitch or its attachment points have become severely corroded, failure could occur resulting in possible damage or injury. Inspect both the hitch and also the connection hardware which mounts the hitch to the tow vehicle. Replace anything which is questionable.

15.7 Axles

15.8 Hubs

15.9 Bearings

15.10 Brakes

15.11 Caulking

15.12 Exterior

15.13 Windows

15.14 Skylight Domes

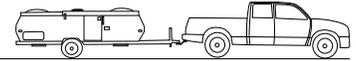
15.15 Hitch

15.16 Lift Springs

15.17 Shock Cords

15.18 Sanitizing the Water System

16 UPGRADES



16.1 Electrical

16.2 Plumbing

The presence of a hot water heater tank helps to buffer the hot water lines and evens out the water pump activations, but the cold water side of the lines have such little capacity in them that the water pump tends to hammer on and off very quickly. A “pump silencing kit” with two long hoses helps to reduce the hammering and smooth the water pump activations. An “accumulator tank” provides an even larger buffer to better control the problem. A “variable flow pump” is an upgraded pump which can pump small amounts of water if needed, and avoids the hammering problem altogether.

16.3 Refrigerator

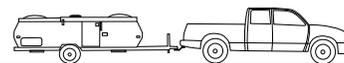
16.4 Suspension

16.4.1 Shock Absorbers

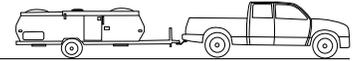
16.4.2 Heavy-Duty Spring Shackles

16.5 Wind Control

17 WARRANTY



18 NHTSA REPORTING — SAFETY DEFECTS



If you believe that your vehicle 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 (COMPANY NAME)

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

To contact NHTSA, you may:

- Call the Vehicle Safety Hotline toll-free at:
1 (888) 327 – 4236
1 (800) 424 – 9153 TTY
- Go to:
<http://www.safercar.gov>
- Write to:

Administrator
NHTSA
1200 New Jersey Ave SE
Washington, DC 20590

You can also obtain other information about motor vehicle safety from:

<http://www.safercar.gov>

19 CHECKLISTS

