

Chapter 7: Plumbing System

A recreational vehicle plumbing system consists of two sub-systems: The fresh water system and the wastewater system.

Potable fresh water is supplied by either the fresh water tank aboard the unit or from an outside source connected through the city water connection. When using the fresh water tank, the water is pumped through the water lines by means of the water pump. When utilizing an exterior source, such as a campsite water supply, the pump is not needed as the water is already pressurized and will flow through the water supply lines within the trailer.

Water Pump

The 12 Volt water pump installed is self-priming and totally automatic, operating upon demand. When a fixture is opened the pump draws water from the tank and pressurizes the lines, providing water to the open fixture. The pump has an on/off switch and is located on the monitor panel. DO NOT turn on the pump if the fresh water tank is empty.

Before Turning On The Pump Switch

1. Check the water level in the fresh water tank – if empty, refill. (See “Fresh Water Tank Fill”)
2. Open kitchen and bathroom faucets, hot and cold valves, and any shower/tub fixtures.
3. Check to make sure Water Heater By-Pass Valve is set to “Normal Flow” to allow water into the hot water heater.
4. Turn on switch for water pump and allow the pump to fill the water lines and hot water heater tank.
5. Close each faucet after it delivers a steady stream of water.
6. The water pump should stop running after all faucets are closed.
7. Pump should now run on “demand” when a faucet is opened, and stop when the faucet is closed.

Fresh Water Tank

A fresh water tank is equipped on all travel-trailers and fifth-wheels. Tanks vary in size according to product and model. To determine how much fresh water the system can hold, refer to the RVIA TRAILER WEIGHT INFORMATION label located on the inside of the kitchen cabinet door near the sink.

The full capacity rating of fresh water for the travel-trailer / fifth-wheel includes the cumulative total of the tank, lines and the hot water heater tank.

Fresh Water Fill

To fill the fresh water tank, remove the cap, on the exterior connection labeled “Fresh Water Connection”, and insert a garden hose. Check the monitor panel to determine the level of water in the tank during filling. When full, water may spill out back through the valve, as there is no automatic cutoff. When filling the fresh water tank it is a good idea to also fill the hot water heater and lines to provide the maximum system capability.

When traveling with the water tank full, the cargo carrying capacity is reduced.



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CAUTION

Never let the water pump run while the fresh water tank is empty. Damage to the pump and / or a blown circuit may occur.



Water should be drained from the fresh water system when not in use for more than one week.

City Water Fill

The city water fill allows a direct connection to an outside source, such as campsites with water risers. There is no need to use the water pump as the water coming from the exterior source is already pressurized and will bypass the pump and tank. Connect the city water fill by using a hose manufactured for potable water use. Open faucets and allow any air to be purged.

City water fills are marked with a label and may be installed as a separate piece of equipment or as a part of a combination water inlet housing.

Sanitizing the Fresh Water System

Keeping the fresh water system clean and free of any potential contaminations is a top priority. Sanitizing the system before initial use and thereafter annually, or whenever water remains unused for prolonged durations, is recommended. This will help keep the water system fresh and discourage harmful bacterial or viral growth. To sanitize your system, perform the following:

1. Drain the tank by opening the low point drain for the fresh water tank.
2. Prepare a chlorine bleach solution of $\frac{1}{4}$ cup to one gallon of water for every 15 gallons of tank capacity.
Example: Use $2\frac{3}{4}$ gallons of the solution for a 40-gallon tank. If using Ultra bleach concentrations, reduce bleach to $\frac{1}{8}$ cup to one gallon of water.
3. Add solution to tank and fill with water. Open each faucet/fixture until a distinct chlorine odor is smelled. Close faucets and let stand 4 hours.
4. Drain system and flush with fresh water until chlorine odor and smell is gone. (If a water filter has been added, change it at this time).

About Vibration While Traveling

Although the fresh water system was thoroughly inspected for leaks before delivery, fittings can loosen over time, from vibration during travel. Periodically check the fittings at the faucets and visible connections and tighten when necessary.

Water Heater

The Water Heater installed is a LP gas appliance. Carefully read the manufacturer's manual for complete operational and safety instructions, provided in the unit packet, prior to using the appliance.

The water heater installed is typically a 6-gallon (standard) or 10-gallon (optional on some units).

Dependent upon the model installed, the water heater will operate only on gas or on upon either gas or AC current. For specific water heater operating instructions, please consult the user's manual located in the unit packet. Prior to operating the water heater, be sure there is water in the fresh water tank and in the water heater.

Care and Maintenance

Proper maintenance of the water heater relies on inspection and awareness. *(Full maintenance requirements are listed within the manufacturer's user's manual located in the unit packet.)*

An anode rod within the tank increases the life of the tank and under normal use will deteriorate. Replacement of the anode rod should be done yearly or more frequently if water supplies contain high levels of iron or sulfate. Another important maintenance procedure is periodically checking the water heater screen in the exterior door for any obstructions, such as animal /insect nests or debris. Proper ventilation is essential to the safe operation of the water heater.

A qualified technician should do any repairs that need to be performed. If soot is present anywhere, immediately shut the unit down and contact a qualified service technician. Soot is a sign of incomplete combustion and must be corrected before operating the water heater.

Pressure Relief Valve - Weeping or Dripping

As in residential water heaters, the water heater equipped in recreational vehicles contain a pressure relief valve that is designed to open if the temperature of the water within reaches 210 degrees F or if excessive pressure is built up. When pressure reaches 150 pounds, the relief valve will open and water will drip from the valve. The valve will close automatically once the pressure falls below 150 pounds. This dripping is normal and does not indicate a malfunctioning or defective valve.

Also, as water is heated it expands and with the closed water system in a recreational vehicle, water expansion will cause weeping at the pressure relief valve. One way to minimize this weeping is by maintaining an air pocket at the top of the water heater tank. The air pocket forms naturally by design but will reduce overtime through normal use.

Replenishing the Air Pocket

1. Turn off water heater.
2. Turn off cold water supply.
3. Open a faucet in the RV.
4. Allow time for water to cool and Pull out handle of the Pressure Relief Valve and allow water to flow from the valve until it stops.
5. Release handle on valve-it should snap shut.
6. Close faucet and turn on cold water supply, as tank fills, the air pocket will be replenished.

Water Supply and Odor

Water supplies sometimes contain high levels of sulphur, which causes an unpleasant smell, similar to rotten eggs. While unpleasant, the water is not harmful. Sanitizing the water system, as described earlier and allowing the sanitizing solution to remain for a few days, should eliminate the odor. Remember to thoroughly flush the system after sanitization. Adding a filtration system will help reduce such occurrences.

Draining and Storage

When not using for long periods or storing during the winter months, the water heater must be drained to avoid damage from freezing during the winter and / or deterioration of tank life from mineral content in water supplies.

To Drain the Water Heater





1. Turn off power to the water heater at the switch or the main breaker.
2. Shut off the gas supply and the water pump.
3. Open all fixtures, both hot and cold throughout the unit.
4. Place the bypass valve (if equipped) in the "by-pass" position.
5. Remove/open the exterior access door to the water heater.
6. Remove the anode rod from the tank. Water will drain out tank.

By-Pass Kit (Optional)

The by-pass kit is a popular convenience feature that allows for easier drainage of the hot water heater tank and winterization of the unit. The by-pass kit is installed near the cold water inlet of the water heater and allows for blockage of water flow into the water heater, saving time and reducing the amount of anti-freeze needed during winterization.

Monitor Panel

The monitor panel allows you to check the approximate liquid levels in the fresh water and the gray and black holding tanks. Dependent upon the type of monitor panel, 3 or 4 tanks can be monitored along with the charge condition of the battery. (The water heater switch is located on some models.)

Operation

Depress the button for the desired reading (tank or battery.) The levels readout for the tanks will read at Empty (E), 1/3, 2/3, or Full (F). All lights will be lit when full. The battery conditions are as follows:

- C Charge
- G Good
- F Fair
- L Low

Erroneous Readings

The monitor panel displays readings from sensors attached to the tanks. These sensors can send false readings when the following conditions occur:

1. Water with low mineral content. Minerals in water help conduct the electrical signal to the monitor display. Some water, which is very low in mineral content, may not conduct the signal properly. Although infrequent, this condition can exist. Check the panel reading when the fresh water tank is filled.
2. Material trapped on the sides of the holding tanks also may provide full readings when the tank is actually empty. Use of a spray to wash out the tank following dumping should help prevent this condition.
3. Grease build up on the sensor probes may indicate false readings or no readings at all. Avoid pouring any grease, oils or similar substances down drains or the toilet. If this occurs, wash the tank(s) out with soapy water.

Winterization

RV components can be damaged from the effects of freezing. Protection of the plumbing system and related components is crucial. Damages due to weather are not covered under warranty at any time. Many recreational vehicle owners choose to have their units winterized by their dealer, while

others choose to do it themselves. Following are descriptions of two methods used to winterize:

1. Compressed Air (Dry) Method

Uses compressed air to blow out any remaining water in the system after draining the system of all water. This method requires an air compressor and appropriate adapters.

2. RV Anti-Freeze (Wet) Method

Uses RV approved, nontoxic, potable, anti-freeze in the system and does not require any special tools.

Many Keystone products include an optional by-pass kit that allows the plumbing system to bypass the hot water heater, reducing the amount of anti-freeze that will be needed (by-pass kits are available at most RV service centers for a reasonable expense and can be installed during winterization). Without a by-pass kit installed, an additional 6 – 10 gallons of anti-freeze will be required.

On the following page are the procedures for both methods. Your local dealer is best suited to answering any questions as well as providing information on winterization and storage that may be particular to the climate in your area.

If using the compressed air method, a special adapter should be purchased to allow compressed air to be delivered through the city water fill. These adapters are available at most RV supply stores.

Method 1

Compressed Air
(With By-Pass Kit Installed)

1. Purchase 1-2 gallons of RV non-toxic anti-freeze.
2. Drain the fresh water tank and empty the waste water holding tanks* (see pg 6-12).
3. Turn water heater by-pass valve to by-pass position. (The by pass valve is located near the water heater incoming lines – an access panel may have to be removed depending upon the model.)
4. Drain water heater (see pg 6-6).
5. If installed, remove water filter from assembly and discard. Install diverter if included.
6. Open all faucets, including shower head sprayer, toilet flushing device and any other water lines that are closed.
7. Turn on the water pump for 30 seconds to clear out any water in the lines.
8. Connect an air hose with an adapter to the city water fill connection.
9. Set the pressure no greater than 30 pounds and blow out the water lines until no water can be seen coming out of the fixtures and lines.
10. Pour RV anti-freeze into drains, p-traps, toilet, and tanks.

Method 2

RV Anti-Freeze
(With By-Pass Kit Installed)

1. Purchase 4 -6 gallons of RV approved, non-toxic, anti-freeze.
2. Drain all tanks, fresh water and sewage tanks*(see pg 6-12).



**For Winterization Procedures,
See the section “Winterization”
in this chapter.**

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3. Turn water heater by-pass valve to by-pass position. (The by pass valve is located near the water heater incoming lines – an access panel may have to be removed depending upon the model.)
4. Drain water heater.
5. If installed, remove water filter from assembly and discard. Install diverter if included.
6. Pour an amount of RV non-toxic anti-freeze into the fresh water tank to fill the tank above minimum water pump operating level. (Use of a long funnel may be helpful) Add more, if necessary, during procedure.
7. Turn on pump switch and open the cold water side of all faucet fixtures. Leave open until the anti-freeze comes out (generally, pink in color). Repeat for hot water side.
8. Flush toilet until anti-freeze begins to flow into the bowl and then pour one gallon of anti-freeze down the toilet to winterize the black tank.
9. Pour anti-freeze down each shower/tub, lavatory sink, and kitchen sink to fill p-traps.
10. To winterize gray tank(s) pour one gallon down each related sink drain.

De-winterization / Removal of Anti-freeze

If purchasing a coach which is winterized with RV anti-freeze, or having had an existing unit winterized before winter storage, the plumbing system must be flushed and sanitized prior to use. Do Not Attempt to turn on water heater if system is winterized. Perform the following prior to attempting to operate the water heater or use the plumbing system.

1. Drain all tanks, fresh water and sewage*
2. Attach garden hose to fresh water fill and fill tank.
3. Turn on pump switch and open cold water side of all faucet/shower fixtures. Leave open until water runs clear. Repeat for hot water side.
4. Flush toilet until clear water runs into bowl.
5. Dump tanks again.
6. Sanitize water system. (See page 6-3)
7. If a water filter is installed, drain lines, remove filter assembly, clean and reinstall with new filter.
8. When ready to use the water heater, turn by-pass valve to open position to allow water to enter hot water heater tank and fill according to instructions

Waste Water System

The wastewater system inside the recreational vehicle is self-contained, while on the road or set up in a campsite. The main parts of the waste system are the toilet, holding tanks and tank dump valves. As in residential households, the drainage system also includes p-traps and roof vents to allow escape of odors and gases.

Toilet

The toilet operates from water supplied either by the fresh water tank or from an exterior water supply connected at the city water hook-up. (The water pump must be turned on when utilizing the water from the fresh water tank.) The toilet flushes directly into the black water tank. Complete instructions and care for the model installed are located in the unit packet.



DO NOT USE Automotive Anti-Freeze. Automotive Anti-Freeze is poisonous and not for use in potable water systems.

Solid Build-Up

The most common problem associated with the waste system is solid build up. Using plenty of water when flushing the toilet, and keeping the tank valves closed until ready to flush the system can reduce the risk of build up. Should you ever have a build up of solids, close the valves, fill the tanks about $\frac{3}{4}$ full with fresh water, drive a distance to agitate the solids and drain the tanks.

Do not put these items in toilet or drains

1. Facial tissues, paper towels, sanitary products (including those labeled flushable).
2. Detergents or bleach. Use a sewage tank deodorizer, available from dealer.
3. Automotive antifreeze, ammonia, alcohols, or acetones.
4. Grease from cooking, table scraps or other solids that may cause clogging.

Holding Tanks

Waste water is divided into two categories: *Black water* and *gray water*. The term black water refers to the waste flushed down the toilet and stored in a separate tank*, referred to as the *black tank*. Gray water is the wastewater from the sinks, tub and shower drains and is stored within one (or more) *gray tank(s)*. Waste tanks empty through a single outlet, but a separate valve controls each tank.

The dump valves should remain closed even if connected to an exterior sewer hook up. For proper dumping, empty tanks only when they are nearly full. The idea is to send a large volume of water through the tanks and hose at the same time to assist the solid waste in flushing from the system.

Dumping Instructions

1. Twist off the termination outlet cap.
2. Connect the sewer hose by turning counterclockwise, locking the end levers over the termination end.
3. Place the other end of the sewer hose into an approved dump station inlet.
4. Open the black tank termination valve and drain.
5. Open the gray tank termination valve and drain. (If unit has 2 gray tanks, drain one at a time.) *
6. Close termination valves.
7. Disconnect sewer hose and store.
8. Replace termination cap on the outlet.
9. Add chemical deodorant / breakdown agent approved for RV use.

**If unit is equipped with the No-Fuss Flush System, perform flush at this time.*

After the sewage tank has been emptied, close the gate valves and put approximately five gallons of water in the sewage holding tanks. This will help prevent solids from building up. The addition of a deodorizing agent like Aqua-Kem® will help prevent odors.

No Fuss Flush (Optional)

If equipped, the no fuss flush kit has been installed to rinse the interior of the black tank. Similar to the water fills located on the exterior of the unit, a separate hookup is placed on the exterior.





Wastewater tanks must be dumped at state approved locations.

Flush the tank after dumping by connecting the sewer hose and attaching a garden hose* to the inlet labeled *“Sewer Valve Must be Open When Using This Inlet”* OR *“Black Tank Flush.”* Open the water supply to full pressure to flush tank. When water runs clear from sewer hose, shut off water supply and disconnect garden hose from source. Do not disconnect hose from flush inlet until water has drained from system.

