LTV UNITY FX MODIFICATION:
AUXILIARY FRESH WATER TANK

Project: Remove the OEM rolling ottoman / computer desk under the rear couch and replace it with an auxiliary tank to increase fresh water capacity by 40%.

Cost: $50 = tank. $75 = plumbing parts Time: 8 hours+

Materials:

Amazon: 13 gallon Fresh or Gray Water Holding Tank RV Concession Trailer T-1300 Class A Customs [Attachment 1]

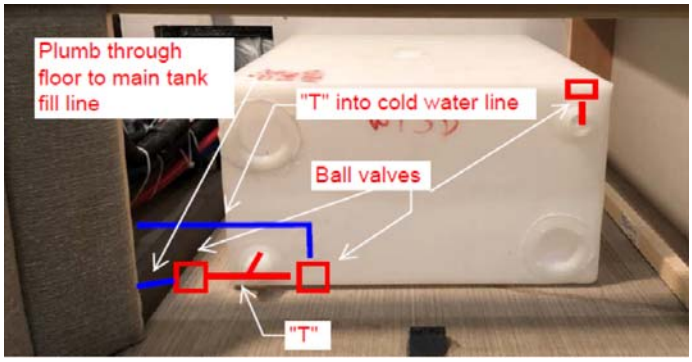
Lowes: PEX: 1/2" blue tubing (2 x 10'), 1/2" ball valve (3), 1/2" 90° angle (11), 1/2" SharkBite® coupling (2), 1/2" MNPT male adapter (2)

1/2" clear plastic tubing (1 x 15')

Home Depot: 1/2" SharkBite® 18" braided stainless steel supply hose

Design:

A "T" is installed in the threaded hole in the lower left corner of the tank. Both sides of the "T" are fitted with in-line ball valves. The left valve is plumbed to a line to the galley sink cabinet and then through a hole in the floor to a "T" installed in the main tank fill line. The right valve is plumbed to a "T" installed in the cold water line, immediately adjacent to the left, that runs to the pump outlet. Finally, a pressure relief ball valve is installed in the threaded hole in the upper right corner of the tank.



With a hose connected to the service bay water inlet, and the selector valve on "Normal And City Water", the aux tank will fill when the right ball valve and pressure relief ball valve are opened. When the left ball valve and pressure relief ball valve are opened, the aux tank will gravity feed the main tank.

Construction:

1. Remove the OEM rolling ottoman / computer desk from under the rear sofa. Remove the upholstered front panel from the ottoman / computer desk unit. Pry the stapled cloth-covered piece and the stapled latch assembly and strap from the inside of the upholstered front panel.

2. Remove all horizontal and snap-held vertical cushions from the rear sofa. Remove the right side and rear vertical cushions, which are held in place by upper and lower stapled hook and loop strips and require some force to pull free. Use fingers to pry the top edge slowly away from the wall and then pull the cushion down to horizontal. Pound down staples, if any, loosened in this process. Remove the cushion support frame under the window, then the back frame, pulling it from under the upholstered corner wedge [Photo 1].

3. Remove the plastic latch catch on the coach floor, and the finished side rail.

4. Starting under the galley sink, near the outlet side of the pump, feed a 10' length of 1/2" blue PEX pipe out of the pump compartment, past the wheel well and under the pantry, past the furnace, back to the sofa cavity [Photos 04 - 07]. This will be the gravity feed line to the main tank, and must be kept as low as possible. Once out of the pump compartment, keep the new pipe in contact with the floor by lifting the existing bundle of red and blue pipes and allowing the bundle to rest on top of or next to the new pipe. Leave approximately equal lengths of the new pipe sticking out of the pump compartment and extending past the upholstered end of the sofa frame.

5. Identify the blue PEX line feeding the output side of the water pump [Photos 02 - 03]. Trace this line back to the new sofa cavity, flag it for future access and mark a convenient location approximately 6" to 12" aft of the end of the upholstered sofa frame for later insertion of a 1/2" PEX "T".

    - Note 1: It is likely that this line will change positions in the piping bundle between the pump compartment and the sofa cavity.

    - Note 2: If necessary, cut a couple of the cable ties to facilitate viewing / tracing / marking. (These can be replaced at the end of the project).

6. Starting under the galley sink, near the outlet side of the pump, feed a 15' length of 1/2" clear plastic tubing out of the pump compartment, past the wheel well and under the pantry, past the furnace, back to the sofa cavity. [Photos 04 - 07] This will be the pressure relief line for the aux tank, and can be placed on top of or next to the existing bundle of red and blue pipe. Leave approximately 2 1/2 feet of tubing extending past the end of the upholstered sofa frame, with the rest sticking out of the pump compartment.

7. Test fit the aux tank into the sofa cavity. The tank should be placed as far as possible to the right, and tight against the rear panel. Devise and construct an anchor system that will prevent the tank from shifting. One way is to use 2"x 2" pine for side rails slightly shorter than the tank, U-bolts through the side rails, a front stop and nylon cord.

   (a) Screw the right side rail to the floor, tight against the existing side frame and rear panel, using stainless steel deck screws that penetrate the floor 1". Put the aux tank in place tight against the right side rail, place the left side rail in position tight against the tank and rear panel, mark the left side rail's location on the floor, remove the tank and screw the left side rail to the floor.

   (b) Using foam core poster or insulation board, make a base 1/2" thick to fit snugly between the side rails [Photo 08].

   (c) Remove the side rails and install 4 U-bolts, countersinking the nuts and washers on the bottom side [Photos 09 - 10]. Reinstall the side rails and base material [Photo 11].

8. Remove the plugs from the lower left and upper right threaded holes in the tank. Using white plumbers thread tape, install a 1/2" x 1/2" PEX - MNPT male threaded adapter in each hole. Fabricate the tank plumbing as generally described below and shown in Photo 12.

   - Note 1: The configuration and measurements are offered as approximations and suggestions. You should customize your own installation by test fitting the tank and plumbing frequently in your coach, making sure the piping fits into the available area inside the upholstered facing of the sofa frame [Photos 13 - 14].

   - Note 2: It is easier to do this on a bench than in the coach.

   - Note 3: Make all PEX connections as short as possible, consistent with keeping the retention rings 1/8" to 1/4" from the end of the tubing.

   - Note 4: Photos 12 and 15 show a series of 90° angles at the upper right corner of the tank. I was attempting to facilitate tank fill above this outlet, but only succeeded in demonstrating that I am not a hydrodynamics engineer. At some point, I may (or may not) change this to a simple 90° angle, as described in Step 8.(a), below.

(a) Attach a 1/2" PEX 90° angle to the upper right adapter nipple, oriented horizontally to the left.

(b) Attach a 1/2" PEX "T" to the lower left adapter nipple, oriented horizontally.

(c) Attach a 1/2" PEX ball valve to each of the three nipples. Orient the bottom two valves vertically, and the upper valve horizontally.

(d) Attach a 1/2" PEX 90° angle to the aft end of the previously installed 1/2" PEX gravity fill line, oriented toward the sofa cavity, and attach a 3" piece of 1/2" PEX piping to the nipple. Attach one of the 1/2" SharkBite® couplings to the other end of the 3" piece. Pull / push the gravity fill line so the SharkBite® coupling clears the aft end of the upholstered sofa frame by approximately 2".

(e) Using a combination of PEX 90° angles, fabricate piping from the lower left ball valve that terminates in a piece of 1/2" PEX pipe of sufficient length to insert in the open end of the gravity fill line SharkBite® coupling. However, do not connect to the coupling yet.

(f) Install a 1/2" PEX "T" at the previously identified and marked location on the blue PEX line feeding the output side of the water pump, orienting the "T" toward the sofa cavity. Attach a 3" piece of 1/2" PEX piping to the nipple. Attach the other SharkBite® 1/2" coupling to the other end of the 3" piece.

(g) Using a combination of PEX 90° angles, fabricate piping from the lower right ball valve that terminates in a piece of 1/2" PEX pipe of sufficient length to insert in the open end of the SharkBite® coupling referenced in Step 8.(f). However, do not connect to the coupling yet.

09. Under the galley sink, there is a white reinforced plastic drain line [Photo 16] that extends from Valve D of the Truma piping through the pump compartment below and then out through the coach floor. In the 4"x 4" area immediately forward of this drain, drill two holes up through the floor from below. The 1 1/4" inch hole will be used for the gravity fill line, and the 5/8" hole will be used for the clear plastic pressure relief line [Photo 17].

- Note 1: Raising the rear of the coach 4"-6" with the aft pair of ES levelers, lego blocks or planks will greatly ease this step and Step 10.

- Note 2: Shop glasses or goggles will keep road grime and dirt out of your eyes during this step and Step 10.

- Note 3: Leave at least 3/4" spacing between the two new holes, and between each hole and the existing Truma drain outlet.

10. Cut the supply line running from the service center to the main tank [Photo 18] 2"- 3" inches above the top of the nearest (immediately adjacent) end of the tank, install a 1/2" PEX "T" and attach 6' of 1/2" PEX pipe to the remaining nipple [Photo 19] .

    - Note: Photo 19 shows the addition of a short piece of 1/2" PEX pipe above the "T", with a butt connector. This piece was added because when the coach was raised with the aft pair of ES levelers, there seemed to be some additional tension placed on the vertical feed line as the springs and suspension elements dropped. This addition may or may not be necessary on your coach, depending on whether you have the ES leveling system.

11. The gravity fill line extending out of the pump compartment must be cut to length and exited through the floor using the 1/2" SharkBite® 18" braided stainless steel supply hose.

    (a) Attach a 1/2" PEX 90° angle to a 5" - 6" piece of 1/2" PEX pipe.

    (b) Confirm the proper positioning of the aux tank end of the gravity fill line as described in Step 8.(d) and alignment with the aux tank piping described in Step 8.(e). Dry fitting the Step 11.(a) assembly, carefully mark and cut the gravity fill line to a length such that after attachment of the assembly, the short pipe will (i) pass clear of the end of the pump under the blue PEX line feeding the output side of the pump, (ii) lie flat on the pump compartment floor and (iii) extend toward the new 1 1/4" hole in the floor.

    (c) The diameter of the 1/2" SharkBite® 18" braided stainless steel supply hose is 1", and will pass through the new 1 1/4" hole in the floor. Approximately half of this hose should end up inside the coach and half should end up outside under the floor, in a U-shape without any sharp bends or kinks. With the Step 11.(a) assembly dry fitted into the end of the gravity fill line and lying on the pump compartment floor, and the hose in the correct position, mark the short pipe piece of the assembly for appropriate length for insertion into the SharkBite® hose-end fitting. However, do not connect to the fitting yet.

    (d) Cut the short pipe piece of the Step 11.(a) assembly to the marked length, attach the remaining angle nipple to the gravity fill line and feed the Step 11.(a) assembly and gravity fill line back into their final position in the bottom of the pump compartment.

(e) Attach the pump compartment end of the 1/2" SharkBite® 18" braided stainless steel supply hose to the short pipe piece of the Step 11.(a) assembly.

12. Cut the 1/2" PEX pipe extending from the main tank fill line "T" to the appropriate length, and attach it to the fitting on the external end of the 1/2" SharkBite® 18" braided stainless steel supply hose.

- Note: The PEX pipe should run downward from the hose to the "T", and should sag slightly [Photo 20].

13. When you are satisfied with the tank and the PEX piping, connect the SharkBite® couplings to their adjacent 1/2" PEX pipes, making sure that the gravity fill line is as low as possible from the aux tank to the pump compartment. Secure the tank in position with your chosen anchor system.

- Note 1: If desired or necessary, stabilize the tank piping system with cable ties to screw eyes in the sofa framing.

- Note 2: If necessary, replace any cable ties removed pursuant to ¶ 5, Note 2. Do not include the gravity feed line, which must remain on the floor next to or under the pipe bundle.

- Note 3: Use the removed finished side rail as a front tank stop.

14. Attach the back end of the 1/2" clear plastic tubing to the open nipple on the relief ball valve. Because this line will never be under pressure, use a 1/2" worm gear clamp which, with the two SharkBite® couplings, will permit removal of the tank and its plumbing if necessary [Photo 15].

15. Feed the front end of the 1/2" clear plastic tubing out the new 5/8" hole in the floor, without any bends or kinks, and cut it off approximately 6" from the exit point. Cable tie the end to the stainless steel supply hose, but not tightly enough to deform the tubing. Fill gaps in the floor holes with expansion foam [Photo 21].

16. Fasten offset hinges to the bottom of the upholstered front panel and to the floor [Photo 22], lining up the front of the panel with the adjacent upholstered sofa frame [Photo 23]. Attach a sliding brace on the right side of the door to stop opening at a 45° angle, and a magnetic catch off-center so the indentation at the top of the door can be used as a finger pull [Photo 22].

17. Re-install the cushion support frames and cushions, and you are done [Photos 24-25].

Operation:

To fill aux tank: With a hose connected to the service center city water inlet, and the selector valve on "Normal And City Water":

(1) Open the upper relief ball valve.
(2) Open the lower right ball valve.
(3) When water reaches the level of the relief port, by observation, shut the lower right ball valve and then shut the upper relief ball valve.

To transfer from aux to main tank:

(1) Open the upper relief ball valve.
(2) Open the lower left ball valve.
(3) When the tank is empty, by observation, shut the lower left ball valve and then shut the upper relief ball valve.

Hints And Observations:

- The aux tank will fill in 2-3 minutes, depending on the incoming water pressure.

- Because of the location of the pressure relief port, the last 1" at the top of the aux tank is unusable, so the 13.0 gallon tank actually provides a potentially usable volume of 12.0 gallons.

- With the main tank mostly empty (tank gauge at 30%), the unassisted gravity transfer time from aux tank to main tank is about 30 minutes, and leaves approximately a gallon in the aux tank, reducing the useable volume to 11.0 gallons.

- When the rear of the coach is raised at least 4", by use of the aft pair of ES levelers or parking on a downhill grade, with the main tank completely empty, the transfer time is 20 minutes and results in another half-gallon out of the aux tank, increasing the usable volume to 11.5 gallons.

If you have any questions, text, call or email Mark:

616-540-8980
mverwys@gmail.com

Aux FW Tank: Photo 01

Aux FW Tank: Photo 02

This is the high pressure (outlet) side of the pump. Trace this line back to the new aux tank site in these bundles.

To pump compartment under galley sink

Aux FW Tank: Photo 04

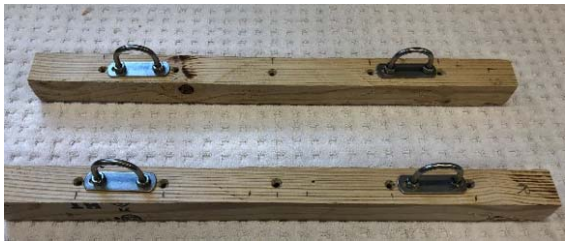
Aux FW Tank: Photo 03

Aux FW Tank: Photo 05

Aux FW Tank: Photo 07

Aux FW Tank: Photo 06

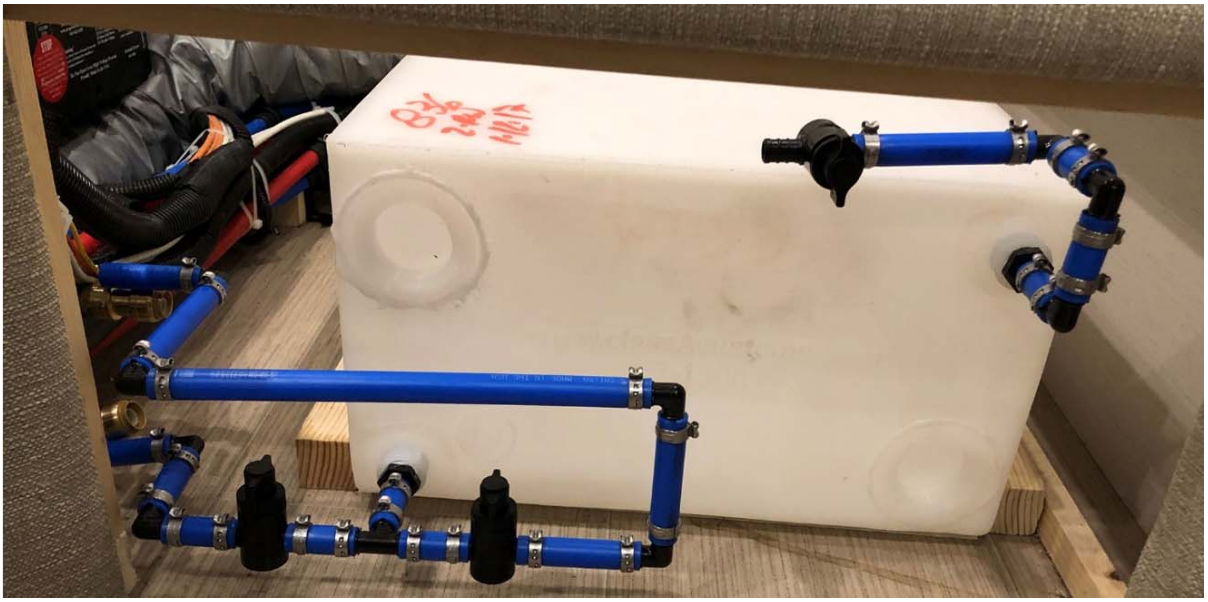
Aux FW Tank: Photo 08



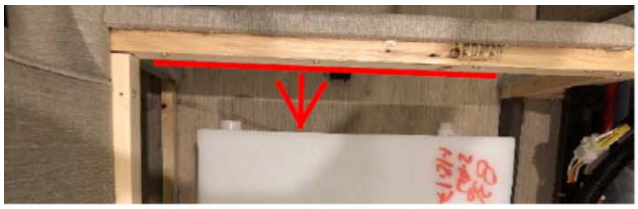
Aux FW Tank: Photo 09

Aux FW Tank: Photo 10

Aux FW Tank: Photo 11



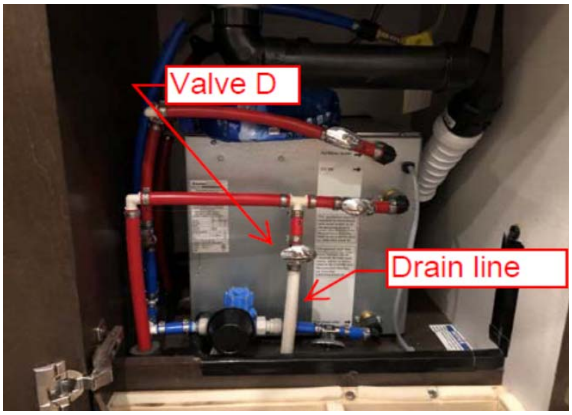
Aux FW Tank: Photo 12



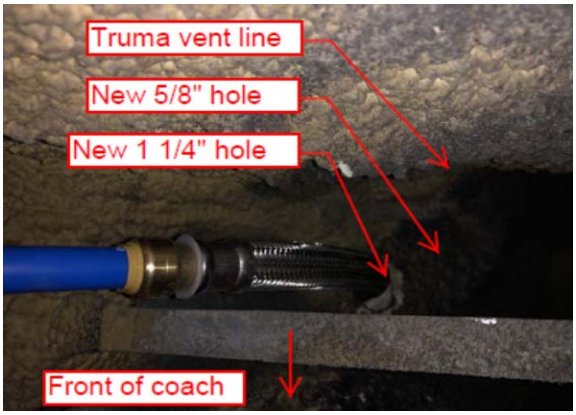
Aux FW Tank: Photo 13

Aux FW Tank: Photo 14

Aux FW Tank: Photo 15



Aux FW Tank: Photo 16



Aux FW Tank: Photo 17

Aux FW Tank: Photo 18

Aux FW Tank: Photo 19

Aux FW Tank: Photo 20

Aux FW Tank: Photo 21

Aux FW Tank: Photo 22

Aux FW Tank: Photo 23

Aux FW Tank: Photo 25

Aux FW Tank: Photo 25

ATTACHMENT 1

13 Gallon Fresh or Gray Water Holding Tank rv Concession Trailer T-1300 Class A Customs

by Class A Customs

4.4 out of 5 stars 5 customer reviews | 5 answered questions

Price: $37.95 + $12.25 shipping

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Note: Not eligible for Amazon Prime.

- 13 Gallon Capacity Fresh / Gray Water Holding Tank by Class A Customs NSF / FDA Certified Material - Fresh, Drinking Water Safe
- WATER TANK MEASUREMENTS: 21" Longest Length (not including fittings) x 9" x 16" (rotate tank to change height or width) Average thickness 7/32" +/- (+/- .25" on each measurement)
- BUILT-IN FITTING: (TWO) 1½ " Dia screw in balloon fitting (threaded female - NPT Standard) fitting will be closed, to use remove inner membrane with razor knife (TWO) ½ " Dia screw in fittings (threaded female - NPT Standard)
- NON-PRESSURIZED TANK: you will need to vent this tank to use it, letting air in and out during use. Do NOT hook garden hose to tank use a fill dish.

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