

## Adding a Fuel Priming Pump to your Discovery (Cat Engine)

Many early Discovery Motor Homes (and other makes and models built on the Freightliner chassis) were delivered with only one fuel filter. (Mine is a 2003 Discovery with a Caterpillar 3126E engine). It has long been known that if the Caterpillar 3126E engine gets any significant amount of air in the fuel lines -- during fuel filter changes or as a result of running out of fuel -- it is very difficult to prime without a primer pump. On these early motor homes, Freightliner ordered the Caterpillar engines without any engine mounted fuel filters (where the optional OEM primer pump would have been mounted OR could be easily added). With the single 2 micron fuel filter mounted on the chassis at the rear of the motor home, changing the filter without introducing air into the lines has been problematic. Although the engine operating and maintenance manual specifically states that the fuel filter should not be pre-filled - due to the concern about introducing unfiltered fuel into the lines -- the prevalent practice has been to fill the new fuel filter by pouring fuel into the outer ring of holes on the filter in order to filter out impurities before the fuel is delivered to the injection pump and injectors.

After I experienced an air lock after changing my fuel filter (and an extremely difficult recovery procedure), I was motivated to add a fuel priming pump at the rear mounted fuel filter. After this modification, you can change the fuel filter, mount the new filter dry and pump fuel manually to fill the filter and prime the lines. Also in the event of running out of fuel, once fuel is reintroduced into the tank, the primer pump can be used to purge the air from the lines.

Here is the procedure for adding the pump. It requires only moderate skills and the total cost is approximately \$80, which for me is a small price for the "peace of mind" that it provides. The primary components are a Caterpillar 9H2256 Fuel Priming Pump (in my case, a new after-market part) that I purchased on e-bay for about \$35 (including S & H) and a 3/8" 3-way, quarter-turn ball valve that I purchased online for about \$15. The rest of the fittings, brackets, fuel lines, etc. came from my assortment of on-hand materials, plus some fittings purchased at my local NAPA parts store and Lowe's Home Improvement store. My total cost was approximately \$80. You may want to modify the arrangement to fit your specific layout and/or parts on hand. It will work so long as you preserve the "circuit" and do not add

additional restrictions in the "RUN" path (minimum number of bends and no less than 3/8" pipe fittings).

The photo on the left is the "before" photo of the spin on fuel filter - it is mounted at the back of the motor home rearward of the radiator. The fuel/water separator bowl is on the bottom of that filter (out of sight in this photo).



The photo on the right is the "after" photo. In the original setup, the fuel line into the filter from the tank was on the far side. In order to make room for the primer pump assembly, I had to rotate the filter base 180 degrees to put the filter "inlet" line on this side. I also had to slightly cut out the fiberglass dust shield to clear the valve assembly - a saber saw made short work of that. The line from the tank comes into the bottom of the 3-way valve (the "common" port). After rotating the filter base, I had to

extend that line about 8" for it to reach the valve. That is the  $\frac{1}{2}$ " OD flared copper line you see coming in from the bottom - it connects with the end of the original fuel line with a  $\frac{1}{2}$ " flare to  $\frac{1}{2}$ " flare fitting. I fabricated the bracket out of a piece of 2" X 2" angle iron from my scrap bin - it bolted to the top of the fuel filter base bracket with 2 of the original filter mounting bolts. Here is the description of the added parts/components that you see in the photo. Proceeding from the near end of the photo toward the filter, the parts are: The  $\frac{1}{4}$ " OD line going down to the inlet of the primer pump, a  $\frac{1}{4}$ " flare to 3/8" MPT fitting, the 3/8" 3-way quarter-turn valve, a 3/8" pipe nipple, a 3/8" pipe tee, another 3/8" pipe nipple and a 3/8" to  $\frac{1}{2}$ " pipe reducer bushing. There is also a 3/8" MPT to 1/2" OD flare fitting in the bottom of the valve and a 3/8" MPT to 1/4" OD flare fitting in the bottom of the tee.

Here are the front and back views of the bracket and pump sub-assembly with the partially completed primer fuel lines in place.





The primer pump is mounted vertically through a  $\frac{1}{2}$ " hole in the bracket. The clamp at the top left in the front view is a  $\frac{1}{2}$ " conduit clamp that I added to support the outboard end of the plumbing - it is attached with a  $\frac{1}{4}$ "-20 bolt tapped into the bracket. After I took these two photos, I realized that I had the primer pump ports reversed (the pump inlet port is the lower one and should be oriented to the right in the last photo). I turned the pump 180 degrees and swapped out the adapter fittings before proceeding, but I did not take photos of the revised sub-assembly. The two adapter fittings are 1/8" MPT to  $\frac{1}{4}$ " OD flare -- one straight and one a 90 degree ell. I then installed the sub-assembly and marked where to cut the  $\frac{1}{4}$ " lines and add the other flare nuts. This subassembly used a total of four  $\frac{1}{4}$ " OD tubing flare nuts. Tighten everything up, add a label to describe the valve positions and you are ready to go!

**The following describes the priming process:**

The primer pump is mounted vertically in the rear of the motor home and adjacent to the fuel filter. When the pump is not being used, it is stowed by pressing down the handle against the spring pressure and turning it slightly clockwise, which locks it in the down position. To prime the lines, depress the handle slightly and turn it CCW a few degrees to release the handle. Then turn the 3-way valve to the UP/PRIME position and pump the pump handle up and down for 20 - 30 strokes. The primer pump will force fuel through the filter, into the injector pump and injector rail and eventually through the pressure relief valve and back to the tank via the return line. Then return the primer pump to the stowed position, return the 3-way valve handle to the LEFT/RUN position and start the engine. Usually it will start

on the first try, but if not, repeat the sequence as necessary.

*Submitted by John Beroset*