

Rebuilding a Carter Fuel Pump

Well the time had come in the process of bringing my '54 Clipper Deluxe Touring Sedan back to life when I needed to work through the fuel system. The heart of the fuel delivery system is the Fuel Pump. When I pulled my '54 out of the field in was sitting in the car was in very bad shape. I picked this car as a teaching vessel so I could learn everything there is about car mechanics, and body work. Now if I bought a car that was ready to go, then I wouldn't have learned that much would I? The front rubber fuel line on the car was completely rotted through as I discovered when the car was winched onto the flatbed backwards and it started leaking very old fuel from the gas tank through that rotted line all over the back on the tow trunk. By the way, that doesn't make for a happy tow truck driver. Based on the condition of the rubber lines, and the varnish that was once fuel in the tank, I figure out pretty quick the inside of the Fuel Pump was in less than pristine shape.

First a basic primer on how a mechanical fuel pump works. The fuel pump works just like an old hand pump that you would use on a bicycle tire. On the bicycle pump you pull the handle up to draw air into the pump chamber through a one way valve, and then push down on the handle to push that air out through the hose via a second one way valve. A fuel pump works exactly the same way. Instead of a long handle that you "pump" by hand, it uses a small lever that is actuated by a special lobe on the engine camshaft. As the camshaft spins, the lobe strokes the lever up and a return spring in the fuel pump pulls the lever back down. Inside the pump the lever is attached to a central push rod this push moves a diaphragm up and down. When the diaphragm is pulled up, it sucks fuel in from the inlet port through a one way valve. When the diaphragm is pushed back down the inlet valve closes and the outlet valve opens and the fuel is pushed out through the outlet port. The only difference between a single action and double action fuel pump is that there is a second diaphragm that works to suck air and create a vacuum that is often used to drive things such as vacuum powered windshield wipers. Think of it as a Bicycle pump with two hoses coming out of it and each hose is hooked up to a different tire. One tire gets the pump pressure when you push the handle down and the other tire when you pull the handle up. This is referred to as 'Double Action'.

The diaphragms on these fuel pumps could have been made from several different types of rubber, or just tar impregnated cloth. Just about any fuel pump that is rebuildable would have been originally built with materials that are not very compatible with today's fuels. When a fuel pump diaphragm fails on the fuel side, there is a possibility that fuel could get pumped through the crack in the diaphragm, and into the engine, which ends up in your oil pan. This is very bad. So while your fuel pump may be ok at the moment, this should be something to consider rebuilding with modern materials that are compatible with today fuels.

So what I have tried to do here is create a little photo essay of the process of rebuilding the Carter Double Action fuel pump that is on my Clipper. Now before you say that you don't have a Clipper, a Carter fuel pump, or even a Double Action fuel pump, this process applies to just about ever rebuildable mechanical pump out there. So it's worth at least a read through if you have never done this before. This was my first try at rebuilding a fuel pump, so you can learn just as I did.

So here is what I started with. A Carter double action fuel pump. The top of the pump is the vacuum section that feeds the wiper motor with help from the intake manifold vacuum. The bottom part of the pump is the fuel section. In this picture I have already remove the hard fuel line between the pump and the carburetor, and you can see the remains of the old rotted rubber line.



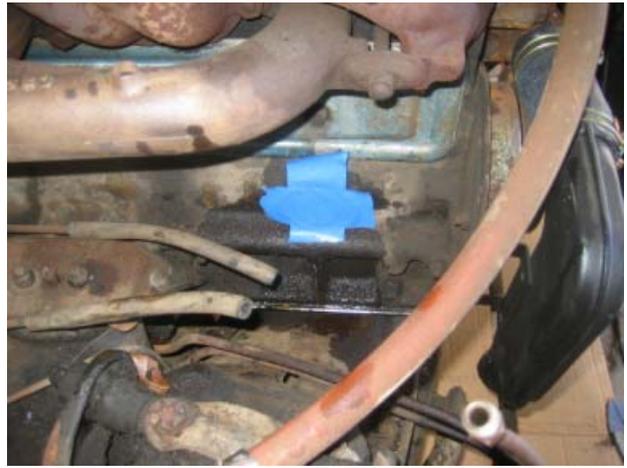
I generously sprayed the mounting bolts with a little PB Blaster (my favorite penetrator) and let it sit for a couple minutes. If you notice in the picture the pump mounting bolts use safety wire to prevent them from backing out from the vibration of the pump. The safety wire will have to be clipped off.



With the pump removed, you can see exactly what we are going to be dealing with. On this model of pump there were inserts in the flange between the pump body and the mounting bolts. Do not lose these. Also make note of the location of any spacers, washers, or brackets.



Once the fuel pump has been removed, tape over the mounting hole to prevent any dirt, tools, or critters from getting in there.



As my fuel pump was completely dirty and made it almost impossible to read any of the model numbers off the pump, I placed it in a parts pan and sprayed it with engine cleaner and let it soak a bit. After that I followed up with some brake cleaner and a wire brush.



Now that it is a bit cleaner, I need to get the kit number from the mounting flange of the fuel pump. On Carter fuel pumps this typically starts with a "M" and is followed by a few numbers. A "S" may appear at the end. It is hard to see in this picture, but the flange number is "M2049S".

With that number in hand, I can now start making calls to the part houses and track down the correct kit. Always check with the part house to make sure the kit is a new one made with modern materials and check what parts are included in the kit. Some kits only include the diaphragms and not the valves.



With the kit in hand you are ready to start working on the pump. Please be aware that your pump may still have fuel in it. So do not take it apart on your wife's kitchen table. I have an old desk in the garage that takes most of the abuse.



The first order of business is to take a file and mark an index the both the vacuum and fuel section halves where they meet the main body. The helps during assembly to verify that you have put the pump pieces back together in the correct orientation for your car. The halves have no built in index, so that is what these marks will accomplish.



Next remove the rocker arm spring. This just pulls out with our pliers.



The next step is to remove the plug covers the end of the rocker arm hinge pin. My kit came with a new one and because this plug is soft aluminum, I just drilled out the center and pulled it out with needle nose pliers. If your kit did not come with a new one, then you will need to carefully remove it so you can reuse it later.





With the plug removed, next you need to remove the small clip that holds the rocker hinge pin in place. Once again our trusty needle nose works great here.



With the clip removed, you can grab the pin where the clip was with the pliers and push it out far enough until you grab it from the outside and pull it out the rest of the way.



With the pin removed, the rocker arm should come right out.



Next I removed the vacuum section mounting screws. I first went around in a cross pattern and loosened all the screws, and then went back and took them all out.



With the screws out, the vacuum section comes apart. The rubber piece on the body section is the diaphragm assembly.



The diaphragm just pulls out from the body.



The vacuum section has a return spring, and the two valves. As you can see some type of oil contamination was present in the vacuum section. The housing could be cleaned with a mild solvent and I wire brushed to the outside to make it look presentable again.



The diaphragm, screws and spring are put aside for later.

Next we repeat the process for the fuel section. Just keep in mind that there may be fuel still in the pump. So no smoking while doing this. Some pumps have a drain fitting on the bottom that can be removed to drain some of the fuel out.



Once drained and all the screws removed the halves will come apart. Old varnished fuel may act like glue, so a little gentle persuasion may be required.



With the halves apart, what we have here is very similar to the vacuum section. A diaphragm assemble and some valves. You can see that this pump uses three valves in the fuel section. As you can see from the picture, the fuel section diaphragm assembly was not in great shape.



Next file an index mark on the two sections of the fuel housing and remove the two screws that hold the fuel housing together. A little PB Blaster may be required to free up any rust and varnish.



With the lower section apart, you can see what nasties have collected in the fuel pump. There was a mix of varnish, rust, and little bugs in there. The car when I found it had no gas cap, so I would gather who ever drove it last sucked all those critters up from the gas tank. Also you can see in this picture that the lower seal is past its prime.



With the lower seal removed you can see the other side of the valve assembly and the fuel screen. The screen just pulls off. If your's has any holes in it you can make a new one from brass screen material.



So with the screen removed, we what you can see here is the 2 inlet valves and one outlet valve.



Next we need to disassemble the valves so we can replace the seals. This is where every pump can be a little different. On some pumps the valve is pressed in as an entire assembly and some kits give you new complete valves to replace those with. On this pump only the valve hat is removable, and my kit did not come with new ones. So I had to reuse them. To remove them I used a punch to drive the hat from its seat.



Here you can see where I have removed the two inlet valve hats. As you can see one of the seals was torn. Now I just flip over the assembly and drive out the outlet valve hat in the same manner.



Once all the valves are apart, I can toss the assembly into the parts washer to get all the varnish removed.



Moving back to the vacuum section (now that it's all cleaned up). The valves here are of the same construction. But you will notice that you do not have the same access to the back side of the valves as you did in the fuel section.



To get to the valves you would have to pry out these freeze plugs. Some kits include them, others do not. My kit included them, but the kit warned they are very difficult to get back in. Basically you should only tackle replacing the vacuum section seals if they are bad. I inspected my seals from the bottom side and they were still soft, in good shape, and provided a good seal. So I left them alone. This is why I did not toss the vacuum section into the parts washer. I didn't want those seals eaten away by any harsh chemicals.



My kit just included a new membrane for the diaphragm assembly, but not a complete assembly. So I have to rebuild the old assembly using the parts in the kit.



The first thing that has to be done is to grind off the top of the retainer rivet. Do not distort the metal plates of the assembly during the rebuild process.



Once the head was ground off, I used a punch to drive the rest of the center pin out.



With the center pin removed, you can see all the parts of the vacuum diaphragm assembly.



My kit came with a new center pin that is threaded to use a nut to secure the assembly. The only problem I had was that the threaded portion of this pin was larger than the center hole in the metal plates. So I had to slightly enlarge the holes in both plates with a drill bit.



Next the diaphragm assembly is put back together. Here is the assembly order:

Center Pin, metal plate bowed down, membrane, metal plate bowed up, fiber washer, metal washer, lock-nut, nut.

All I have left to do now is to tighten down the nut the rest of the way.



Moving back to the fuel section now that it is out of the parts washer. I first preassembled all the valve hats. I used the new valve springs and new seals from the kit.



The valve is placed back into its home and then is tapped back in to seat it until the center pin on the hat is level with backside of its seat. You are not trying to fully smash the hat against the seal, as a matter of fact the hat should not touch the seal. Just seat it to hold it in place. The spring holds the valve shut when needed, and the diaphragm pressure/vacuum opens the valve. So the seal needs room to open and shut. If you smash the hat down onto the seal, then basically just turned the valve into a plug. That is not a good thing.



Here I used the end of a large bolt that was the same size as the top of the valve hat and with a few soft taps from a hammer seated the hat back into the valve base.



Here on the back side you can see where all we want to do is seat the hat center pin roughly level with the bottom of the valve seat. We repeat with the other fuel valves. You will have two valves facing one direction, and on facing the other. It's pretty obvious which way each valve goes. But on some other pumps this may not be so obvious. So make sure you note the valve orientations during disassembly. If they are assembled wrong the pump will not work correctly.



With the valves back together, I put the screen back in place.



To make sure that the mounting surfaces are true, I rubbed each mounting surface on a piece of fine grade sandpaper/emery cloth that was laid on a flat surface to look for hi/low spots. It is essential that all the mounting surfaces are true and flat to prevent leaks. Next I added the lower section seal. Note do not use any type of gasket sealer or anything on this. It is not needed and you don't want that stuff ending up in your Carb.



Next I attached the bottom section of the valve housing and line it back up with my indexing mark.



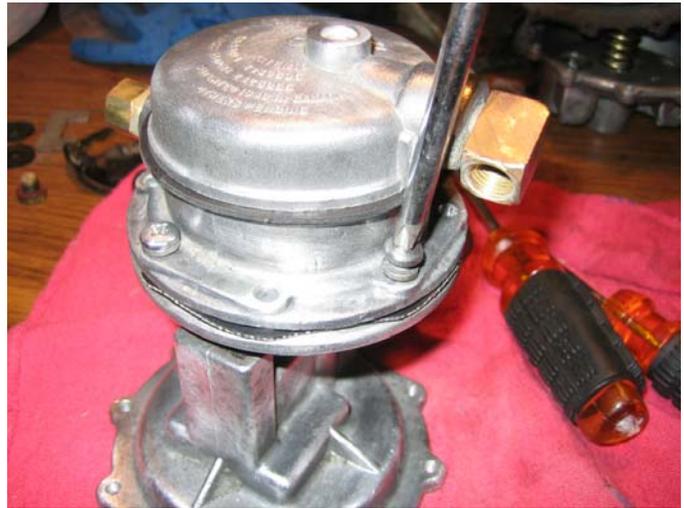
I flip the assembly over and attach with the original screws.



Next I take the new fuel diaphragm assembly that came with the kit and I apply a little PB Blaster to a shop cloth and condition the diaphragm. PB Blaster works well to recondition seals, so I apply just a little bit to dress to membrane for a good seal. I dress both the large membrane and also the upper shaft seal.



I put the diaphragm assembly back into place in the main body, add the fuel valve section (matching up my index marks), and then reassembly the unit with the screws in a cross pattern to assure a uniform seal. Before assembly I made sure both mounting surfaces were flat as I did previously.



Once the fuel section is back together, I found it is easier to put the rocker arm assemble back in at this point. First is spray the rocker with some yellow grease where the hinge pin is going to seat, and also where the rocker 'fork' engages the pump shaft,



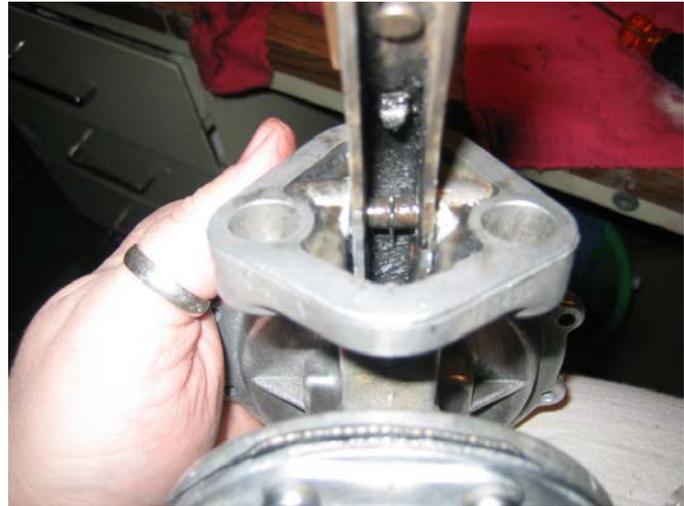
Make sure that the rocker fork seats between shaft seal, and the top seal/retainer on the fuel diaphragm assembly shaft



With the rocker arm back in place, you can now reinsert the hinge pin. My kit came with a new pin (top), but the pin did not have a center groove to hold the retainer pin. So I reused the original pin (bottom) as it was in good shape.



Once the pin is back in place, snap the retainer clip back on to it. If you have a hard time getting the pin back in, I find a little yellow grease works wonders and provides lubrication. Also reinstall the rocker arm spring.



Next reseal the plug back in the rocker hinge pin hole. That large bolt I used earlier once again proved to be the perfect size. Make sure that you fully seat this plug, otherwise you may have an oil leak from the where the camshaft splashes oil on the rocker arm.





Next I flip the pump over and reassemble the vacuum section. This starts with placing the vacuum diaphragm assembly back into the main body. Here you can see I dressed the membrane as I did earlier with the fuel section.

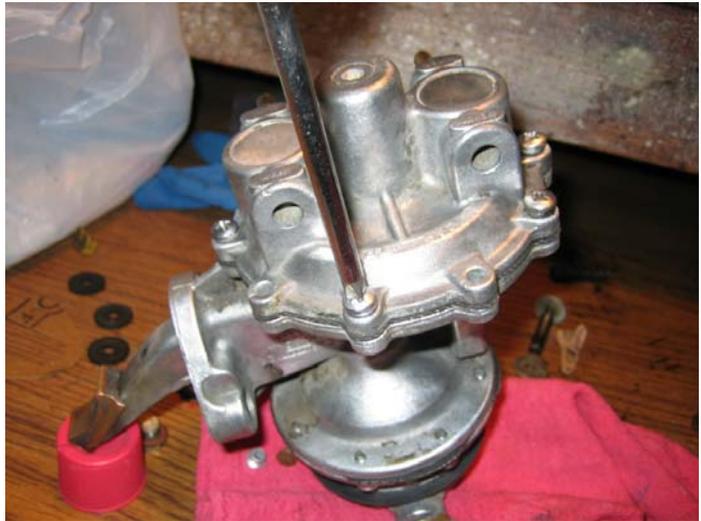


I added the spring back to the vacuum section and put the two halves back together on their index marks. Before I did this I also gave both halves the sandpaper treatment.



The vacuum section is the hardest to reassemble as you are fighting the spring tension while trying to get it together. If you have a helper, one person can hold it compressed together while the other starts all the screws.

I didn't have a helper, so I started two screws about half way in on one side, and then did two more the opposite side. Then I went around and added all the other screws, and finally tightened in a cross pattern. The reason I did two screws is that I was afraid that the very stiff spring tension might have stripped out a single half threaded screw from its hole.



With that last step we are now done. What we have here is a nicely rebuilt fuel pump that should provide years of faithful service with today fuels.



When remounting to your motor, I recommend a little gasket sealer on the flange gasket. Also pre-lubricate the rocket arm with a little more yellow grease. Also make sure the part of the arm that contacts the camshaft goes back in the correct way. You don't want to have the arm binding on the camshaft because you placed the arm on top of the camshaft, when it was supposed to ride along the bottom of the camshaft. My pump has a guide that follows the camshaft, most pumps do not. I pre-lubricated that guide also.

Remounting the pump to the engine is just the reverse process of removing it. Please make sure that any spacers, inserts, washers, etc are reused in their correct locations. Also follow the recommended torque specs for your application when remounting the pump. If your pump used safety wire, please use new safety wire keep the bolts from backing out.

A couple of notes here, every kit may be different based upon the pump and the vendor who provided the kit. If you have questions about your kit, you should call the vendor. My kit appeared to be a generic Carter kit so I had to adapt on the fly. The kit instructions told me to use brake style rivets in place of the valve hats. But the provided rivets had a shaft that was too large in diameter to work in my valve seat. So I reused the old hats as they seated nice and firm. Also I had to drill the metal plates larger in the vacuum section and also reuse my old

rocker hinge pin. Not sure if this was all due to the kit being generic in nature, or if I was just sent the wrong one, or perhaps it was packed incorrectly.

I hope this picture essay of my first fuel pump rebuild helps other out there to see that the process is not that hard and anyone can do this with simple hand tools and a good rebuild kit.

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