

Injection Pump Head Seal Replacement Procedure for 1996-2003 TDI engines only

(Do not attempt procedure on any other vehicle.)

Tools Needed

1. 17mm open end wrench or flare wrench.
2. High quality Torx T30 socket (to prevent stripping of screws)
3. 5mm Allen wrench
4. 13mm combination wrench or socket
5. Duct tape (12 inches)
6. Clean paper towels or rags
7. Clean automotive grease or Vaseline
8. 24mm or 15/16 inch open end wrench
9. 8mm or 5/16 inch wrench or socket
10. Ice pick or mechanics pick set
11. Small paper clip
12. Brake cleaner spray (optional for cleaning unions)
13. One 6mm x 55mm long Allen or hex cap screw with a 1.0 thread pitch (ask for this at specialty fastener store). Dieselgeek kits now include a custom made version of this screw with special features. (Figure 2)



Figure 1 - Tools Needed



Figure 2 - 6mm X 55mm Long Allen or Hex Cap Screw

Get Started

1. Always work on a cool car. These engines get hot! You will burn yourself otherwise. Before you start, review [this thread on TDIClub.com](https://www.tdiclub.com) to set injection pump "on cam" to reduce possibility of internal pump damage during this procedure. Please note that the 1Z and AHU engines have shorter internal springs and are statistically more likely to allow parts to fall out of place during

the head seal procedure. The internal springs of the ALH engine are longer and there is never any free play inside the pump unless you pull the head out too far.

2. Park car on level ground, set hand brake. Daylight really works best for seeing what you are doing. Also, try to work in a windless area or clean shop to prevent contamination of the innards of your injection pump. Pull hood latch and open hood.
3. Start by placing paper towels under the injection pump to catch all of the diesel fuel which will leak out during this procedure (Figure 3). Clean the injector line fittings by generously spraying brake cleaner on all of the fittings (Figure 4). You may use a toothbrush and compressed air to make sure these fittings are very clean. We do not recommend cleaning the cast iron injection pump head since the some of the dirt will wash into the gap between the pump head and aluminum pump body. It is our opinion that this dirt will be more likely to find its way into the injection pump during the seal change if you try to clean it off of the pump head. Of course, if your pump head is really filthy then you may want to clean it first.



Figure 3 - Paper Towels Under the Injection Pump



Figure 4- Spraying Brake Cleaner On All of the Fittings

4. Remove the hard metal injector lines with a 17mm flare wrench (Figure 5). Set aside. Even better: Set the lines inside a clean cardboard box and close the lid for added cleanliness (Figure 6). If present, place the opaque plastic ring or red plastic caps over the injector output valves on the end of the pump (Figure 7). Also, cap the fuel injectors with the red plastic caps if they are included with your seal kit. (Dieselgeek.com includes them.) This will keep dirt out of the injector lines.



Figure 5 - Remove the Hard Metal Injector Lines with a 17mm Flare Wrench



Figure 6 - Set the Lines Inside a Clean Cardboard Box



Figure 7 - Place the Opaque Plastic Ring or Red Plastic Caps over the Injector Output Valves

5. Remove the 8mm nut from the fuel supply solenoid valve (Figure 8). Next, with a 24mm open end wrench (some 15/16 inch wrenches will fit), remove the fuel supply solenoid valve from the top of the pump head (Figure 9). If it is not stuck, remove the black plastic plunger from the orifice and insert it into the solenoid over the little spring (Figure 10). Set the solenoid (with plunger) aside in a clean place such as a plastic bag or in the box with the injector lines (Figure 11, Figure 12). Next, with a clean, lint-free rag, carefully wipe away any dirt from around the edges of the fuel cutoff solenoid orifice by wiping from the center of this hole [outward](#) to prevent any dirt from entering the pump. Cover the hole with duct tape to keep dirt out (assuming the black plunger came out easily) (Figure 13).

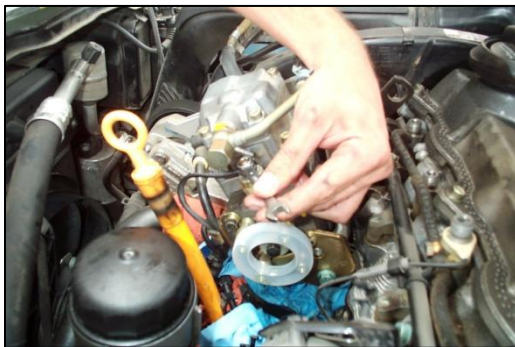


Figure 8 - Remove the 8mm Nut



Figure 9 – Use a 24mm Open End Wrench to Remove the Fuel Supply Solenoid Valve

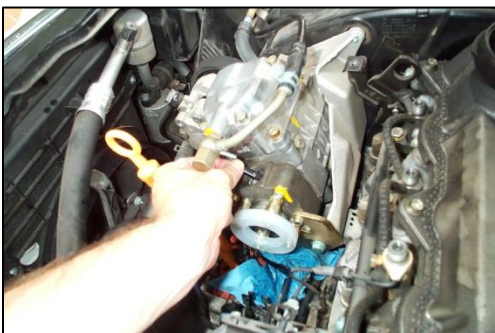


Figure 10 - Remove the Black Plastic Plunger from the Orifice



Figure 11 - Set the Solenoid (with Plunger) Aside in a Clean Place



Figure 12 - in the Box with the Injector Lines



Figure 13 - Carefully Wipe Away Any Dirt from Around the Edges of the Fuel Cutoff Solenoid Orifice by Wiping from the Center of this Hole Outward

6. Unplug the injection pumps 8 or 10 pin plug (also unplug the three pin plug on 1Z or AHU engines) (Figure 14). Next, unbolt the electrical harness bracket from the front side of the pump head (Figure 15). Unclip the pump side of the harness from any plastic retainers (Figure 16). Pull the pump-side part of the wiring harness forward and then toward the timing belt side to get it out of the way of the procedure area (Figure 17). Replace the top front black Torx screw if you have an AHU or 1Z engine but do not fully tighten it as it is slightly too long for the hole without the wiring bracket in place. Do not replace the top front black Torx screw if you have an ALH engine.



Figure 14 - Unplug the Injection Pumps 8 or 10 Pin Plug

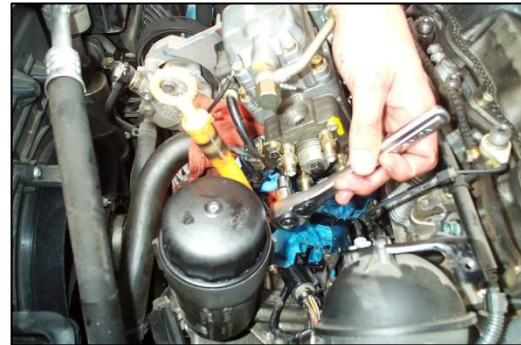


Figure 15 - Unbolt the Electrical Harness Bracket

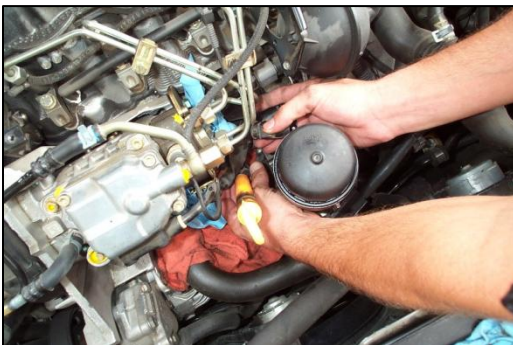


Figure 16 - Unclip the Pump Side of the Harness from Any Plastic Retainers



Figure 17 - Pull the Pump-Side Part of the Wiring Harness Forward and Then Toward the Timing Belt Side

7. Remove the lower yellow zinc-plated steel bracket from the lower rear corner of the pump head with a 5mm Allen wrench, 13mm box end wrench and a T30 Torx driver (Figure 18, Figure 19, Figure 20). Set bracket aside (Figure 21). Replace the lower front black Torx screw if you have an ALH engine (Figure 22). Do not replace the lower front black Torx screw if you have an AHU or 1Z engine.



Figure 18 – 5mm Allen Wrench



Figure 19 – 13mm Box End Wrench



Figure 20 - T30 Torx Driver



Figure 21 - Set the Bracket Aside

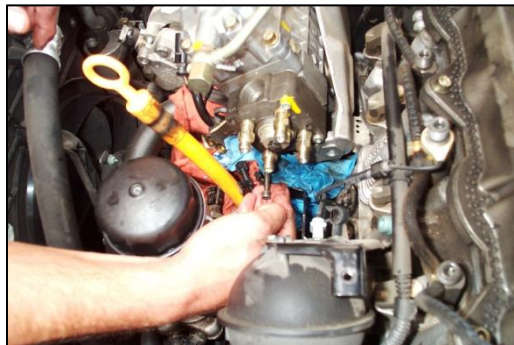


Figure 22 - Replace the Lower Front Black Torx Screw

8. Loosen and remove the silver Torx screw at the bottom rear of the pump head if you have an ALH engine. Loosen and remove the silver Torx screw at the top rear of the pump head if you have an AHU or 1Z engine. (ALH engine shown) (Figure 23, Figure 24)

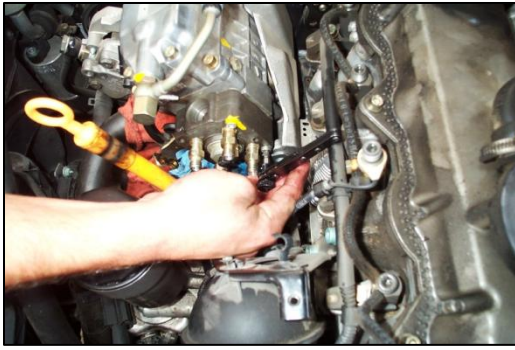


Figure 23 - Silver Torx Screw

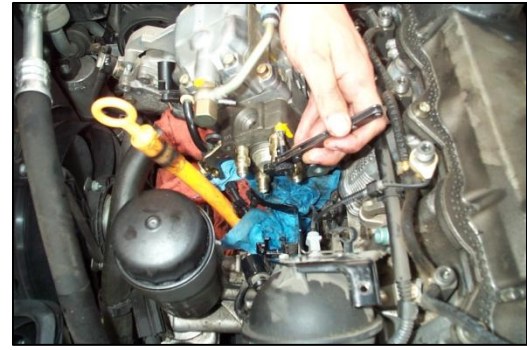


Figure 24 - Top Rear

9. At this point you should have two opposing Torx screws holding the pump head on at this stage. First, remove the topmost Torx screw from the pump head and replace it with the 55mm long Allen screw (or hex cap screw) (Figure 25). Snug the 55mm screw into the bottom of its hole but do not over tighten it as you are tightening into aluminum. Now, **loosen** the supplied 55mm screw by **One Half Turn (1/2) only**. Next, remove the opposite lower Torx screw. The internal springs should push the pump head out until the pump head o-ring is exposed (Figure 26). ***Do not unnecessarily jostle the pump head while it is being held on by one screw.***



Figure 25 - Replace It with the 55mm Long Allen Screw

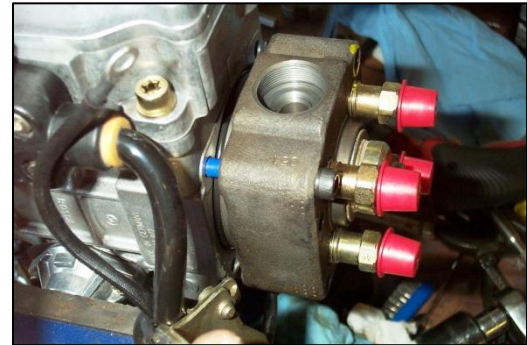


Figure 26 - Pump Head O-Ring Is Exposed

Disclaimer: You must leave one of these two remaining screws partially threaded at all times. Internal parts will fall out of place if the pump head is pulled back too far or removed from the pump! Removal of the injection pump will likely be necessary if you pull the pump head back too far or remove the pump head from the body of the pump. We do not have any procedure for reassembling the pump head to the pump if you remove it fully. If you suspect that the pump head has been pulled out too far and parts have fallen out of place you must investigate by pulling off the quantity adjuster or Middle section of the pump and looking inside. Remove the pump and have the pump professionally inspected and repaired if you cannot put the parts back into place yourself. Do not attempt to start the engine if you hear odd noises or if you suspect something has fallen out of place during this procedure. Likewise, do not continue to tighten the Torx screws if you encounter significant resistance (beyond the spring pressure pushing against the pump head). Please note that this procedure only applies to TDI injection pumps.

10. With a sharp pick or knife, gently pierce the old o-ring and pull it out of the groove (Figure 27). Cut the o-ring to remove it but **do not** cut the o-ring in the groove since you might damage the

sealing surface (Figure 28). On some cars, the o-ring will be so brittle that it will come out in hard little crescent-shaped pieces. In this case, make sure you extract all of the pieces from the o-ring groove.

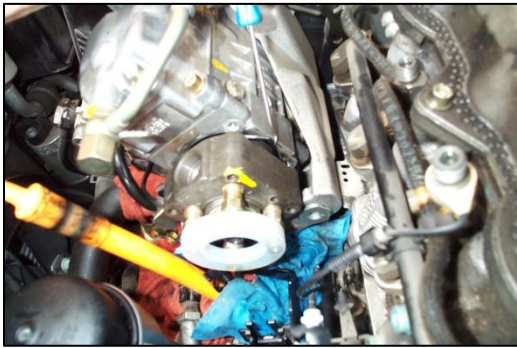


Figure 27 - Gently Pierce the Old O-Ring

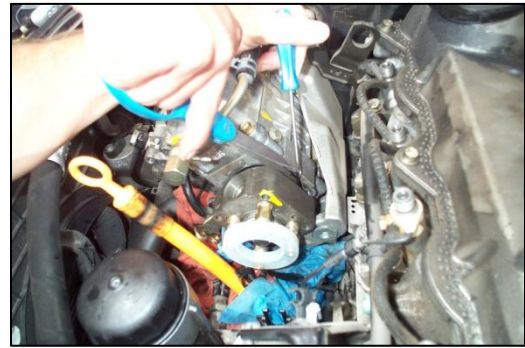


Figure 28 - Cut the O-Ring

11. Optional: Tear off a 12 inch section of duct tape and wrap the outer flat edge of the cast iron pump head with the tape (Figure 29). This will provide a clean surface for the new o-ring to slide over during install. (In addition, make sure that the surface of the duct tape-covered pump head is free of dirt just before installing the new o-ring.) Also, take care to leave the four Torx screw holes unobstructed as you will need to reinstall the lower Torx screw after the new o-ring seal is in place.

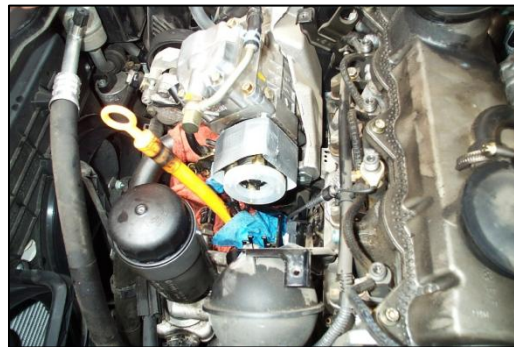


Figure 29 - Wrap the Outer Flat Edge

12. Grease the new pump head o-ring with any automotive grease or Vaseline. You must stretch the o-ring **hard** to get it over the pump head! First stretch the o-ring onto the bottom side of the pump head and hold it there (Figure 30). Next, stretch the seal over the pump head and slide it into the gap between the pump head and pump body (Figure 31). It will jump into the o-ring groove but it will rest on the last remaining 55mm tool screw. During the stretching process the seal will seem as though it is going to break but they are very tough. It is a good idea to use a mirror to make sure the o-ring has seated fully in its groove. You will pinch the new o-ring if it is not fully seated in the groove. (A pinched o-ring is manifested by a pump that will not prime on Step 21.)



Figure 30 - Hold It There

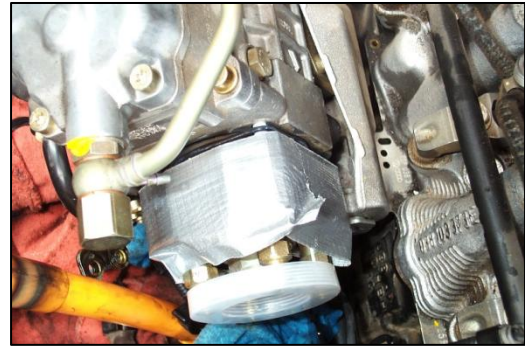


Figure 31 - Into the Gap

Note: It is our opinion that the non Bosch **Viton** seal that dieselgeek.com happens to sell is the only type of seal that will not stretch to a larger resting dimension during this process. On the other hand, the green Bosch seals seem to grow in diameter slightly when stretched over the pump head which means to us that they were not designed to be installed without removing the pump head. If you use a Bosch o-ring seal you should pay very close attention to Step 17 since this seal might hang out of its groove ever so slightly after it has been stretched over the pump head.

13. If you used it, remove the duct tape by gently pulling it off or cutting it with a razor blade. Pull the tape away from the pump (toward drivers side of car) to keep any dirt away from the o-ring gap (Figure 32). Use a Q-tip to carefully remove any dirt that falls into the o-ring gap.



Figure 32 - Pull the Tape Away from the Pump

14. Thread in three of the Torx screws by 5 to 6 turns to hold the pump head steady. Next, with a small bent paper clip, carefully hook the o-ring seal next to the front upper 55mm tool screw (Figure 33, Figure 34). Pull the o-ring gently away from this 55mm screw as you remove the screw from the pump. Once this screw is removed, unhook the o-ring from the paper clip so that it retracts into the groove in the pump head.



15. Thread the topmost Torx screw back into the pump head (Figure 35).



Figure 35 - Thread the Topmost Torx Screw Back into the Pump Head

16. All Torx screws should be threaded at this point. Slowly tighten all four pump head screws by alternating between them. You want the pump head to be drawn into the pump slowly and evenly without cocking. If you tighten one of the sides too much at a time you run a risk of cutting the edge of the new o-ring. When you are within one sixteenth of an inch from fully tightening the four Torx screws, remove the front top black screw and replace the electrical harness bracket around the top front pump head hole and re-thread the top front black Torx screw (Figure 36). Do the same for the yellow zinc-plated bracket by unthreading only the front lower pump head black Torx screw. Thread in all three of the M6 Allen screws (5mm Allen drive) which help secure the two brackets to the pump head (Figure 37). Do not tighten them fully yet.

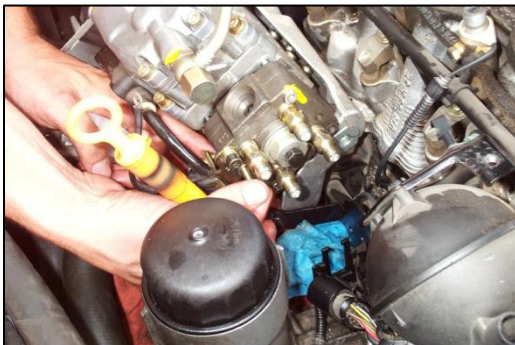


Figure 36 - Electrical Harness Bracket

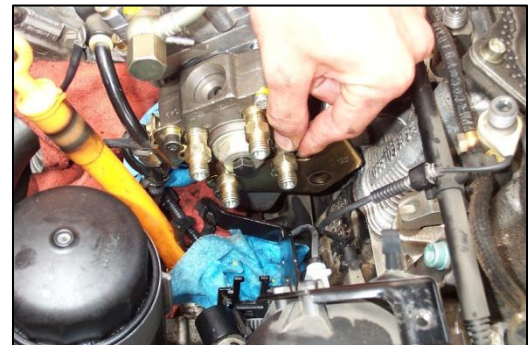


Figure 37 - M6 Allen Screws

17. Finish tightening the four Torx screws. You should alternate between them while you are doing so.

18. After the pump head has been fully tightened, replace the fuel cutoff solenoid. For the 1Z and AHU engines only, you will have to remove the electrical wiring harness bracket once again in order to tighten the solenoid. (Replace the wiring harness bracket once the shutoff solenoid has been tightened.) After the solenoid is reinstalled, make sure to reattach the electrical wire to the top of the solenoid with the 8mm drive nut. Do not over tighten the nut. Also, finish tightening the three 5mm drive Allen screws holding the two steel brackets to the pump head. Replace the 8mm bolt (13mm drive) which holds the lower yellow zinc-plated bracket to the large aluminum engine accessory bracket (Figure 38).

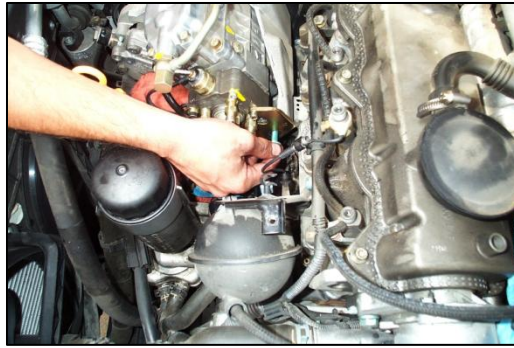


Figure 38 - Replace the 8mm Bolt Which Holds the Lower Yellow Zinc-Plated Bracket

19. Reconnect the electrical plug or plugs, checking the connection by gently trying to unplug it without engaging the safety catches. Make sure to clip the wiring harness back into any plastic keepers it was originally mounted in.
20. Replace the four injector lines while paying very close attention to keeping dirt out of the connections. Tighten lines in two steps to ensure that there is no preload on lines.
21. There is a plastic T-fitting at the fuel filter. On the T-fitting there is a line that has blue markings on it that goes toward the rear of the car. Detach this line. Place any vacuum-operated device (ex: Pela or Mityvac) on the exposed nipple of the T-fitting and apply a vacuum (Figure 39, Figure 40). Diesel fuel will be pulled through the injection pump by doing this which serves to prime the injection pump. Once you get a solid column of fuel in the line to your hand-held vacuum pump, detach the vacuum pump and let the fuel drain into a wad of shop rags. Quickly reattach the blue-marked fuel hose to the fuel filter T-fitting.



Figure 39 - Mityvac



Figure 40 – On the Exposed Nipple of the T-Fitting

22. Try to start engine. If the engine is slow to start you may crack open the injector lines at each of the fuel injectors to purge any remaining air in the injector pump and/or lines. Tighten lines once engine is running. Check for leaks at the fuel injector line unions and at the pump head unions. You may use brake cleaner spray (ex: Brakleen) to clean off any residual diesel fuel to help identify leaks. Check the pump and lines later to confirm that there are no leaks present. Feel free to report your experience to me at jim@dieselgeek.com. Any tips or suggestions will be considered carefully for possible procedure revisions.