

Swamp's Diesel Performance

Competition Parts For Your Diesel

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Tips to help remove and install Power Stroke injectors.

Removal:

After removing the valve covers and the valve cover gaskets, but before removing any injectors, drain the oil rails by removing the drain plugs inside the valve cover. On 94-97 trucks they're just under where the electrical connectors are on the gasket. These plugs are very tight; give them a sharp blow with a hammer and punch to help break them loose, then use a 1/8" Allen wrench. The oil will drain out into the valve train area and from there into the crankcase. Don't drop the plugs down the push rod holes!

Also remove one of the plugs on top of each oil rail, (beside where the lines from the High Pressure Oil Pump enter) for a vent to allow air to enter so the oil can drain. The plugs are 5/8". Inspect the plug O-rings and replace if necessary. If the plugs under the covers leak, it will cause a substantial loss of performance.

When removing the injectors, oil and fuel from the passages in the cylinder head drains down through the injector bore into the cylinders. If not removed, this can hydro-lock the engine when cranking.

There is a ~40cc dish in the center of each piston. Fluid accumulates in it, as well as in the corner on the outside of the piston between the piston top and the cylinder wall, due to the 45* slope of the cylinder bank. Quantities of fluid less than 1 Tablespoon (14cc) are not cause for concern.

Remove the lower (closest to exhaust manifold) bolt on the injector hold-down clamps with a 8mm 1/4" drive deep well socket and slide the clamp up and out from under the upper bolt. It is not necessary to remove the upper bolt.

Loosen the bolt that holds the oil deflector spout on the clamp 2-3 turns (5mm Allen), otherwise the deflector can hit the solenoid and either chip the solenoid or break the deflector.

Use a 12-18" long pry bar and placing the tip under the injector clamp and resting the bar on the cylinder head, gently pry the injectors out of their bores. **Be sure that the bar is under the clamp, and not prying on the solenoid.** Make certain you are prying them straight out in relation to the bore, not at an angle, which will wedge them against the bore.

The special Ford tools for injector removal and installation are not necessary.

Remove the rear-most injector from each side first; because the engine slopes down to the rear, this will allow the majority of the fuel and oil to drain into that cylinder. If the piston happens to be at top dead center and the exhaust valve is open slightly, the fluid may drain out the valve into the exhaust manifold, so if after starting the engine you have fluid leaking out the exhaust, this is probably what happened.

We strongly advise against trying to remove the fluids by cranking the engine with the starter with injectors or glow plugs removed. The fluid will come out under extreme pressure and at very high velocity, and there is also a risk of damaging the engine. It is safe to turn the engine over by turning the crankshaft with breaker bar and a 24mm socket; doing this with the injectors installed but the glow plugs removed will pump out some of the fluid, but not that which is in the piston dish.

A Mighty-Vac hand pump, available at auto parts stores for \$25-30, is the best way to remove the fluid from the cylinders, but the

hose supplied with the pump is too large to fit through the injector hole into the cylinder; push a piece of ¼" OD tubing into the supplied tube. Very large syringes are available from Farm or Veterinary supply stores for under \$5. Used with 12" of 1/4" OD poly tubing on the tip they work just fine. Lightly oil inside of the syringe and the rubber plunger before using.

After removing each injector, inspect the nozzle tip to verify that the copper gasket (washer) came out with the injector, and is not left inside the injector bore. If the portion of the injector between the tip and first O-ring is black with soot/carbon, this means that either the injector was not bolted down tightly, or the copper washer was not installed. If this has happened, give that bore careful inspection to be sure that the new washer will seal in the bottom of the cup. If the injector is a reddish brown there is no cause for concern; that's from small amounts of fuel leaking past the lower O-ring and filling the void between the O-ring and the washer.

Wipe the injector bores clean with a clean, lint-free cloth and inspect the copper sleeves in the bottom of the bores for signs of damage such as scratches or pitting. Carbon bits from the nozzle that remain in the bore can prevent the new injectors from sealing properly, and can enter the injector and plug the nozzle. Do not be concerned about bits of carbon falling inside the cylinder.

Installation:

If you receive your injectors with O-rings on them, they are brand new ones. If you are installing the O-rings yourself, follow the directions included with them.

Your injectors come numbered 1-8; please install them in their corresponding cylinder: driver's side is even-numbered, starting

from the front to the rear, 2,4,6,8 and passenger's side is odd, 1,3,5,7. All the injectors are identical, but we keep track of the injector serial number during our work, and number them for ease of tracking. If your injectors are split shot injectors for 1999-2003 7.3L Power Strokes and one of them is an "AE" or "LL" type injector with a blue colored electrical connector on the solenoid, it must be installed in cylinder #8.

We will appreciate it if you number your old injectors with their cylinder number.

Lightly coat the injector O-rings with engine oil before installation, and make sure everything is free from all grit or dirt. Firmly push the injector down into its bore with the palm of your hand, giving it gentle blows with a soft hammer if necessary. Listen for a ringing sound as the injector bottoms out in the bore of the head. The single biggest mistake while installing injectors is not having the injector fully seated, and failing to fully tighten the hold-down bolts. *You cannot damage the injector by over-tightening the bolts, but you can seriously damage both the injector and the engine if the injector is not securely bolted down because raw fuel will leak into the cylinder.*

Slide the clamp under the upper bolt head so the bolt head engages in the slot in the clamp, then install and tighten the lower bolt to 120 INCH pounds. Re-torque all the hold down bolts before installing the valve cover!

Install all the injectors in the heads and then fill the oil rails in the heads with new oil. If you need to replace the O-rings on the plugs, the size is 3/32" thick, 7/16" ID and 5/8" OD. Use the OEM replacements if possible, or Viton ones for hydraulic applications.

Before installing the valve covers, crank the engine continuously for 30-40 seconds, with the injector wires disconnected so the

injectors will not fire, to get oil and fuel circulating and pressurizing. Do this twice, waiting a few minutes between cycles to let the starter cool. This cycle of cranking and resting gives time for air in the injectors to bleed, and insures that there will be proper lubrication to the internal injector components. After the two primary cranking cycles, connect the wiring harness and crank the engine continuously until it starts. If you try to start it in the normal manner of cranking for 5 seconds or so at a time, it will not start! It is normal for the engine to run roughly when first started and to have an abnormally long cranking time until all the air is purged from the oil system. It takes a minimum of 15 miles of driving to purge the system, and occasionally up to 50 miles. If the engine is started while there is still air inside the nozzle, there may not be sufficient fuel to cushion the nozzle needle and it can crack the nozzle tips. Air inside the fuel cavity of the plunger and barrel can cause scoring or galling. Injectors returned for warranty work with scored plunger and barrels are not covered!

Note that cranking the engine with the wiring harness disconnected will cause the PCM to store a trouble code, usually 1271-1278 "Injector Circuit High to Low Side Open", code 1211 "ICP Pressure High/Low During Cranking" and possibly code 034x "CPS not detected" or something similar.

If you have problems during installation do not hesitate to call us at 1-866-595-8724. If you specifically state that you are having problems and need injector installation assistance, you will get it immediately.

Torque Specs:

Injector Hold-Down Bolts: 120 in/lbs
Fuel Rail End Plugs: 97 in/lb
Glow Plugs: 14 ft/lb

Oil Rail Plugs (side): 53 in/lb
Valve Cover Bolts: 97 in/lb