

# Swamp's Diesel Performance

*Competition Parts For Your Diesel*

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## Tips to help remove and install Power stroke injectors

**Removal:** During removal of the injectors, oil and fuel from the passages in the cylinder heads drains down through the injector bore into the cylinders. If not removed, this can cause hydro lock when cranking and severely damage the engine.

There is a 32 cc 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 (14 cc) are probably not cause for concern.

We 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. If this is done, and fuel in the cylinder is expelled up into the valve train area, and it then drains into the crankcase and mixes with the oil.

After removing the valve covers, but before removing any injectors, drain the oil rails by removing the drain plugs inside the valve cover, just under where the electrical connectors are on the gasket (1/8" Allen). These plugs are usually very tight; to minimize the chances of stripping the heads, give them a sharp rap with a hammer

and punch to help loosen them.

Also remove one of the plugs in each oil rail, (besidewhere the lines from the High Pressure Oil Pump enter) for a vent to allow air to enter so the oil can drain. A Mity-Vac hand pump (\$60) is the best tool to remove the oil with. However, very large 60 cc 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 the syringe and the rubber plunger before using.

The special Ford tools for injector removal and installation are not necessary. Use a 12-18" long pry bar and placing the tip under the injector clamp, very, very, gently pry the injectors out of their bores. Make sure you are lifting them straight out in relation to the bore, not prying them at an angle, which will wedge them against the bore. Remove the bolt that holds the oil deflector on the clamp (5mm Allen) before prying, otherwise the deflector can hit the Solenoid and chip it. 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 in that head to drain into that cylinder.

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. 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.

Since the valve covers are off, this is a good time to check the glow plugs. Use an Ohmmeter to measure the

resistance from the tip of the glow plug to the cylinder head. Good plugs show about .5-.6 Ohms, bad ones several thousand.

**Installation:** If you receive your injectors with O-rings on them, they are brand new ones. We remove the old O-rings, but do not remove the steel backup rings unless they appear damaged. If you are installing the O-rings, follow the directions included with them. If your injectors come numbered 1-8, install them in their corresponding cylinders: 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.

The injector bore in the cylinder head has a copper cup or sleeve in the bottom, and the copper washer on the nozzle tip seats on the cup. It is common for bits of carbon to break loose during removal, and if they remain in the cup they can prevent the copper washer from completely sealing. This can allow fuel to leak into the combustion chamber and combustion pressure to enter the injector cup area.

Lightly coat the injector O-rings with engine oil before installation, and make sure everything is free from all grit or dirt. Make certain that the copper washer on the nozzle has not fallen off during shipping and handling. If it wants to fall off when you hold the injector downwards, put a dab of grease between the washer and nozzle to help hold it in place. Gently push the injector down into its bore with the palm of your hand, giving it a gentle blow if necessary. Install all the injectors in the heads and torque the injector hold-

down bolts, but before connecting the electronics or installing the valve covers, fill the oil rails and the pump's oil reservoir with new oil, and check that the fuel filter bowl is full of fuel. Then continue with installing the valve covers, etc.

After 10-15 minutes, check the oil level in the heads. If the level is still full, tighten down the plugs. If you wish 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 ones for hydraulic applications. (The original ones are Viton, which has a brownish color. Viton is more durable than Buna-N, which is black.) After checking the oil level, but with the injector wires disconnected so the injectors will not fire (You can also remove the #9 Maxi fuse in the under hood Power Distribution Box), crank the engine for 30-40 seconds to get oil circulating and pressurizing. Then continue with reassembly and crank the engine for 30-40 seconds every 15-20 minutes, or until you complete 4-5 cycles.

This cycle of cranking and resting gives time for air in the injectors to bleed out and work its way to the top of the rails. When everything is reassembled and you're ready to start the engine, top off the oil rail and reservoir one last time.

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 has similar effects on the piston. [An alternative method to fill the rails is to install the injectors and the small drain plugs, but remove one of the large plugs on top of each of the oil rails. (The plugs by where the oil lines from the oil pump enter the head.)

Then, with the electrical connections disconnected, crank the engine until oil begins to come out one of the plugs.

Install that plug, then crank until oil comes out the other one. This is best done with two people; one to turn the key, the other to watch the oil. If an assistant is not available, with the key removed from the ignition, put the transmission in Park (automatic) or Neutral (manual) and set the emergency brake. Then remove the small wire with the rubber "boot" on it from the ignition solenoid which is on the passenger's side inner fender beside the battery. Run a jumper wire from the battery "+" terminal to the terminal on the solenoid. This will cause the engine to crank over.]

**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  
Oil Rail End Plugs: ..... 60 ft/lb  
Valve Cover Bolts: ..... 97 in/lb

Apply thread lock/sealer to Oil Rail End Plug threads meeting Ford spec WSK-M2G351-A6, Part Number EOAZ-19554-AA or equivalent such as Loctite 545 Hydraulic Thread Sealant.

It is not necessary to remove these plugs, but some people prefer to drain the oil rails in this manner.