

Injection Pressure Regulator (IPR)

General Information:

A Powerstroke engine utilizes an electromagnetic valve to regulate the high pressure oil pressure on the engine to tailor the injection characteristics of the injectors. This valve is called the Injection Pressure Regulator or IPR. Actually, Cat and Ford and Navistar all use different names for it, but I call it the IPR.

IPR is generally fairly trouble free, but they have been known to become sticky if debris enters the valve or if it suffers from a blown O Ring.

IPR Removal:

With a little experience and the right tool, an IPR can be removed from a PSD in minutes.

The IPR is located on the back of the high pressure oil pump, which is located UNDER the fuel filter assembly, down in the V of the engine. The IPR valve has been largely unchanged since its introduction in 1994.

The easiest way to remove the IPR valve is to build a special IPR removal tool. Said tool is comprised of a 1/2" drive deep 6 point 29mm or 1 1/8" socket with a 4 inch piece of 1" flat iron welded across the back of it. (See picture.) Ordinarily one would just use a deep socket, but the IPR is too deep for the deepest sockets I was able to find. (See picture, not the relative lengths.) Using a 1/2" drive socket will allow the end of the IPR to go where the ratchet stub would have. Furthermore, there isn't much room between the back of the HP oil pump and the front of the turbo assembly, so the thin flat iron increases the available room.

Note: If one could find a deep enough socket, it could be used by itself.

- Locate the IPR. The easiest way to do this is to trace the wires from the ICP on the driver's side HP oil rail into the main harness and then out to the IPR deep in the engine valley or known as "V". You can identify the IPR by its shiny gold colored solenoid. (The ICP and the IPR are not connected, but the wires for both leave the harness at the same point.)
- Unplug the wire from the solenoid. To do so, you need to flip the connector bail down and pull the connector out. It should come out relatively easily.
- Remove the solenoid itself. Do this by removing the 3/4" nut that holds the solenoid on the back, followed by the spacer and the solenoid itself.
- Using the IPR wrench described above, place it on the IPR with the flat iron towards the driver's oil rail. Tap the flat iron with a small hammer towards the rail and the plug should loosen. Give it a few twists with the wrench and then use your hand to turn it out entirely.
- Removing the IPR will allow most of the HP oil reservoir to drain out into the engine valley or known as "V". Prepare for this by placing a large amount of paper towel in the valley or known as "V" to absorb the resulting oil. It is also handy to know that a plastic champagne cork fits nicely in the IPR thread and will keep the oil from leaking out.

IPR Disassembly

An IPR is a fairly robust yet intricate item. They are easy to service, but they can be damaged.

An IPR consists of two main parts: a pilot operated valve and an electromagnetic actuator. Each part has been known to give trouble. The electromagnetic actuator is in the end the solenoid was on. The pilot operated valve is the brown end.

To service the unit, first separate the pilot valve from the actuator. To do this, place the IPR in a vice. Then, use a sharp, good quality pipe wrench or similar tool to firmly grab the pilot valve body. (See picture). **DO NOT ATTEMPT TO SQUEEZE THE PILOT VALVE BODY TIGHTLY IE IN A VICE OR IT WILL CRUSH AND BE RUINED.** A decent working pipe wrench works well. I've opened many IPRs this way without damaging any. The pilot valve slides on the inside of the body, so if it is crushed, it will stick and not work well.

Loosening the IPR

Once loose, the body will separate easily. However, there is a tiny needle in between the body and the actuator that **MUST NOT BE LOST.** (See IPR Disassembly Picture for a view of the pin.) Normally this pin stays in the end of the body because of the oil that is present, but it has been known to come free. **DO NOT LOSE IT.**
IPR Disassembly

Once the pilot valve is free of the actuator, disassemble the actuator by loosening the internal screw inside it. (No picture for this, just look inside where the pilot body screwed in.) It takes a big flat screwdriver to remove the internal screw, which is actually a guide for the actuator pin. (See IPR Exploded View Picture). Once the pin and the internal screw is removed (guide actually), shake the actuator body firmly up and down several times to get the piston out.

IPR Exploded View

The IPR is now fully disassembled. It is possible to disassemble the pilot valve itself, but this takes a press and jigs to do it properly.

Servicing

Three things commonly go wrong with the IPR:

- Debris in the pilot valve: Using a small screwdriver, gently push in on the end of the pilot valve assembly. You should feel the valve move about 1/8" in and out and return to its seat with a bit of snap. Should the action of the valve be sticky at any point, use a combination of solvent, screwdriver motion and compressed air to clear any debris that may be trapped in its motion.
- Debris in the actuator piston area: Thoroughly clean the actuator body, piston, guide and pin. Lubricate them well with a very thin oil or solvent. Assemble the actuator only, but do not tighten. With the solvent as the lubricant, the piston should move freely. I.E. if you shake the actuator assembly, you should hear the piston sliding around freely. This will not happen with motor oil as the lubricant.
- Bad external O Rings.

Examine for wear/damage. There should be a backup ring and an O Ring. The backup ring should be nearest the actuator. Ford sells a rebuild kit consisting of the O Rings and a replacement solenoid nut.

Reassembly

Assemble the actuator end of things. Gently tighten the internal screw (guide). Don't over tighten this. It is difficult to describe how much torque it takes.

Place the pilot valve needle in the body. Screw the pilot valve body into the actuator body. Tighten, but don't over do it.

Reinstallation

Reverse of removal. Tighten, but don't over tighten the IPR nut.

NOTE: A PSD WILL RUN INCREDIBLY ROUGH IF THE IPR NUT IS LOOSE. The symptoms of this will make you think you've got multiple bad injectors among other things. You might want to check it for tightness after a few hours of use.

