

Rebuilding IDI Injectors

by Brian Jordan (The Grampulator)

The Haynes Techbook says: "Do NOT disassemble fuel injectors! They are assembled to precision tolerances and may not work properly once you've taken them apart." I have a couple of comments. 1) When they are apart, they will definitely not work properly. 2) Nothing pisses me off more than running into stuff like that in repair manuals. Yes, they are built to precision tolerances, but once they've failed a pop test, there is nothing to lose by taking them apart. So if you have some spare injectors, a big vice, a 15mm 12 point socket, a micrometer or a caliper that can measure to the .001 of an inch and the will to do it, then lets rebuild some injectors!

First, lets look at the types of failures of injectors:

- 1) Low opening pressure
- 2) Bad spray pattern/poor opening
- 3) Leaky injector
- 4) High opening pressure/ injector does not pop open

In almost all cases, the problem is related to the wear on the spring. The spring will lose its pressure over time and also it will wear on the inside diameter where the button sits that keeps the pintle on its seat.

The number one cause of failed injectors is low opening pressure. Low pintle seat pressure will lead to leaky injectors and a poor opening/bad spray pattern.

High opening pressure is rare. If an injector does not pop open, it usually has a piece of something caught in it or has a varnish buildup.

Begin by clamping the injector in the vice and using the 15mm 12 point socket on the end of the injector. I used a snipe on my 3/8" drive ratchet. You will have to remove the copper washer for the socket to fit onto the injector barrel nut. Older injectors, like my BB code ones, use 6 point nuts. Remove the barrel it will contain 3 pieces, the pintle, the pintle housing, and an end piece that retains the pintle. The top part of the injector will have the button which acts on the pintle. It sits on the end of the spring, which is followed by the discs with the shim pack between them.

Spring lengths on the D and E code injectors are typically 1.170 to 1.160 inches, with 1.165" being normal. Pressure of the injectors is adjusted by shimming the spring. There are typically two end shim discs which are .0645" thick with a "shim pack" with some shims of varying thickness in between that are usually about .045" to .050" total thickness. I have noticed that adding .003" increases the opening pressure by about 50 PSI. Your results may vary.

So, if we have an injector that is opening at 1650 PSI and we desire it to open at 1750, then we would have to shim it about .006".

I happened to have an extra set of old injectors from an engine that I bought for parts. I disassembled them and took the springs and shim packs out. I then measured and inventoried the individual springs and shims. In the case above, if the shim pack were .042", I would want to shim it to .048". If the .042" shim pack were composed of a .036" shim and a .006" shim, then I may simply add another .006" shim or use two .024" shims instead. I try to use the minimum number of shims and keep the smaller ones for fine tuning.



Often getting the pressure right (about 1800 psi) cleans up a bad spray pattern and or a leaky injector. If it doesn't, try swapping the spring end for end. Sometime the button seems to move around too much in the spring causing a bad spray pattern. You can try swapping the button too, or even the whole pintle & housing. Label your injectors and keep notes on your pop test results and it will be easier to track the good parts.

It takes a lot of trial and error. Make a change, test. Make another change test again. Lots of testing. Depending on what your time is worth, it may not be worth doing, but if you are like me and have the time and want to know exactly what your injectors are doing, it is worth it.

A good injector should open cleanly, not leak or dribble, have a good spray pattern, and close cleanly. It will have a distinct chirp at it opens and sprays.

Change one thing at a time and keep track of your results. Remember: cleanliness is next to godliness, especially when it comes to fuel injectors!

I found that the longer springs worked better than shorter springs shimmed up.

I think the most important thing is to have all the injectors opening at the same pressure since the opening pressure affects the injector timing. An injector opening at a lower pressure will open sooner effectively advancing the injector timing for that cylinder.

When I reassembled them, I torqued them up pretty good. They are on tight to start with.

Disclaimer:
Your mileage may vary.

I have no idea what I'm doing, I am just naturally curious and have no compunction about taking things apart and putting them back together. I did a lot of trial and error and it worked for me. I have rebuilt 3 sets of injectors now: a D code set to 1750 PSI, a D code set to 1800 PSI and an E code set to 1800 PSI. I chose 1800 PSI for the second batch of injectors because I accidentally shimmed one up to 1800 PSI and it worked really well, plus I had enough .003 shims to do it. The D code injectors are currently in a 1992 F-250 7.3L auto running B50 and B100 depending on the weather/temperature. The E codes are going into a 6.9L with 5 speed in a 1991 F-350 crew cab. The BB code injectors that were in there were horrid. I'm not sure if they'll work, but hey, trial and error! Besides, they can't be worse than the BBs that were in there. :)

A few more thoughts about injectors. There's a lot of mystery around the differences between injectors codes. There are only 3 things that can be different:

- 1) Opening pressure
- 2) Flow rate
- 3) Spray pattern

Opening pressure can be controlled. Flow rate and spray pattern are dependant on the design of the pintle and seat. I suppose flow rate is somewhat dependant on the pressure, actually the square of the pressure if I recall correctly, which there would be very little difference between say 1800 and 1750 PSI.

The AA and BB appear to be for the 6.9l engines.

I have two sets of old Delphi BB injectors, and for the life of me I cannot get them to work properly. One set opened around 1800 PSI, the other at 2100 PSI. I can't tell the difference between the D and E code injectors. The G code injectors probably have a greater flow rate to accommodate the extra fuel for the extra air in the turbo engine.

If anyone out there can share some info regarding the above, that would be appreciated.

Remember, safety first and have fun rebuilding!