1st Generation Ram Diesel Power Increase

1989 through 1993 Models with the Bosch VE injector pump

My disclaimer:

The torque capacity of the Getrag five speed, a well known weak link, will be exceeded by an increase in the engine output. Additional exhaust smoke will exceed pollution standards. Also remember, you can't make more power without adding more fuel.

YOU are responsible for any consequences of injector pump tampering!

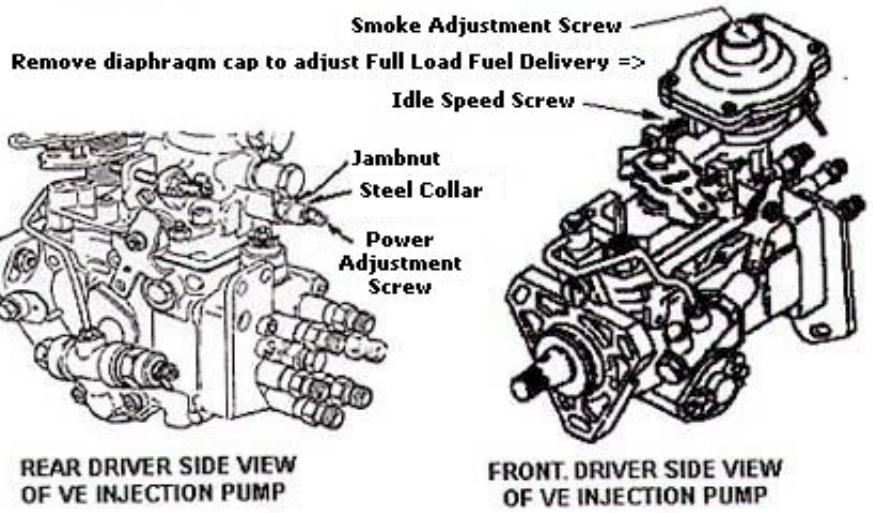


Figure 1

All Adjustments can be made without removing the pump from the engine.

Low manifold pressure (boost) fuel delivery adjustment.

See: Smoke Adjustment Screw in diagram

This adjustment is fairly simple and will help considerably around town at low engine speeds and low boost conditions.

There is a small cap in the center of the 'fuel-control device' atop the pump (the 'appendage' that is plumbed to the intake manifold and restricts the amount of fuel injected until the manifold pressure is above atmospheric). This cap can be readily removed with two small screwdrivers and a gentle rocking motion. Beneath the cap is a torx T-25 screw and a lock nut that holds it. The locknut is 13 mm and has a 'break-away torque' of around 100 in-lbs. Turn the T-25 screw 2 turns clockwise and tighten the

locknut to 125 in-lbs. For additional fuel (and smoke) the screw may be turned farther (CW). Back it off (CCW) to reduce smoke. NOTE: this will increase the exhaust temperature by about 75 degrees F on long grades. Clean the plug with CRC Brake cleaner and seal it with LocTite pipe thread sealant with teflon. Externally, it will appear stock.

Full load fuel delivery rate adjustment.

This adjustment will TURN UP THE POWER and smoke. (NOTE: this will raise the EGT very quickly at full throttle):

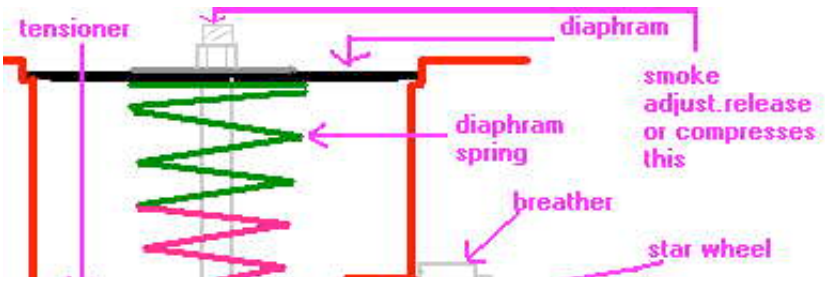
The main adjustment (effects are similar to swapping the torque plate on the P7100 pumps) is found under the AFC diaphragm that is held on with a 4-screw cover. MARK THE POSITION OF THE DIAPHRAGM, then remove the diaphragm -- there is a stamped tick mark on it, so use a magic marker or scribe to note the position of the diaphragm vs. housing. Remove the diaphragm and shaft, and note the shaft is both tapered and on an eccentric. Usually, rotating the shaft 120 degrees clockwise will cause the wear to go to the richest (smallest diameter, effectively) part of the shaft. You may want to start at 90 degrees and then go farther if that does not produce the power you want. The farther you go, the higher and faster EGT will climb. The fuel stop part rubs up and down along this shaft, and note the way to install the shaft that allows maximum travel of the fuel stop part that hits this shaft and is perpendicular to it.

Just pay attention and mark stuff so you can put it back the way it was, and you should be able to figure it out just fine. After adjusting the diaphragm eccentric, the low boost fuel rate may need to be adjusted slightly to reduce low speed smoke.

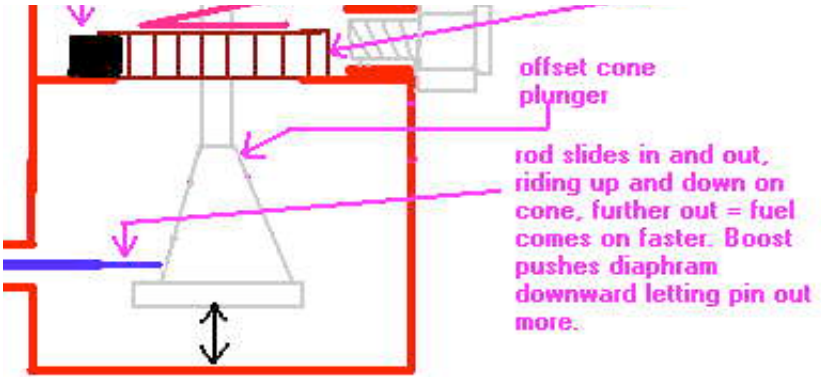
Clarification of how the full load diaphragm eccentric works - posted to the TDR forum by old school:

The eccentric tapered pin that's attached to the diaphragm is the FUEL DELIVERY RATE pin. Now from above, looking down at the pump, almost to the bottom of the bore that the delivery rate pin came out of, is the bore that the trigger or action pin rides in. The linear axis or centerline of the action pin is parallel to the axis of the pump drive shaft, or the engine crank shaft. The movement of the delivery rate pin (down with increasing boost levels) allows the action pin (which by internal spring pressure is contacting it) to contact the increasingly smaller diameter. This allows the action pin to move rearward, which increases the fuel delivery rate. As a note: according to my books, and Bosch injection manual, the "stock" or base line for the diaphragm position is 12:00 as you look at the pump. In other words, the tick mark is toward the valve cover, for the normal setting. I have seen this not to be true on at least two trucks, one of which was on my own. If you look at the underside of the diaphragm, and can see where the eccentric would push the pin in deepest toward the front of the pump, that is the LEAST delivery rate setting. Consider that 12:00. I've found that rotating the diaphragm clockwise from that point to 3:00 is a good place to go. Depending on the injectors that are in, and your turbo boost, you may want to turn a little more.

More From the TDR forum



BushWakr provided this excellent drawing for those who are confused by the eccentric configuration.
Shrimpy provided this description:
Here is something that will set you straight every time when dealing with the AFC diaphragm. When you remove the



cap, go ahead and put a reference mark on the rubber piece and part of the metal housing it is sitting in. Then very CAREFULLY, pull up on the rubber diaphragm and it will slide up. Look at how the shaft that the diaphragm is connected to is tapered towards the bottom. I refer to it as being cylindrical, but slightly off center. It has a "deep side" and a "shallow side". You want to position it so that the deep side (the one that will allow the pin that rides on the shaft, to move the most) to be oriented toward the front of the engine (radiator). Mine was set just the opposite, it had the shallow side toward the engine allowing the pin to move the least. Now that everyone is thoroughly confused grab your tools and get to Work!!!!

This assembly note comes from WestTN: "DON'T OVERTIGHTEN THE BANJO BOLT ON THE AIR LINE!!!!" This bolt is very thin walled. Take careful notice how loose the bolt actually is after breaking the paint loose.

While you have the diaphragm removed, here is another modification From hdm48:

After doing some serious testing and checking I've found a way to improve the around town power that doesn't require flooring it. Under the diaphragm there is a nylon stop. It looks like a thick washer. This stops the eccentric from traveling down too far. I noticed my fuel pin wasn't traveling all the way up the taper so I wanted to see what would happen if it did. So I shaved .090" off it. WOW!!! part throttle power went way up. I checked with Northland diesel and they said it would not effect my max power settings so it should be safe and no, the pin will not travel too far. It can't by design. I'm very happy with this little adjustment.

AFC Star Wheel Adjustment

posted to the TDR forum by old school:
Under the AFC diaphragm and spring is a star wheel adjustment which sets the spring tension on the fuel load delivery rate diaphragm. If your star wheel (under the AFC spring) is set too high, the delivery rate pin won't move downward as it should with increasing boost levels. Turning the star wheel up (counterclockwise) increases the spring pressure, and slows the delivery rate. I'd suggest turning the star wheel down (clockwise) in 1/4 turn increments until you smoke, then back off (counterclockwise) till smoke is gone to your satisfaction, or smoke on under power, a black haze, not a black soot cloud. The retaining lock spring doesn't have to be removed, the star wheel will rotate with a small screwdriver gently placed and pried between the wheel and it. Note the location of the wheel, mark it, and count any turns for reference. Remember: Star wheel down=less spring resistance=increased fuel delivery rate. This diagram of the location was posted to the TDR forum by joesoot.

Hey Guys!!! What the heck am I turning, I see a lock nut and a stud that looks like a torx bit, is this what I am supposed to be turning??? This thing I was turning is under a gray metal cap, I didn't see any star wheel???Is the smoke screw and star wheel two different things???

Yeah! Your turnin' the wrong screw too! That's what I was doing! You must remove that whole cap there with the 4 straight head screws. Under this cap, there is the "starwheel". It looks like a gear. It clicks

when you turn it. It adjusts the tension on that colorful spring under there. Turn that clockwise and always make sure to mark the original position so you can put it back if needed!

Full Power Adjustment

On the rear of the pump, partially concealed by the fuel lines, and under a plastic cap is an other adjustment screw. Remove the plastic cap, remove the metal collar tack-welded to the screw, loosen the jam-nut, and turn the power adjustment screw clockwise about 1 to 2 turns. After turning the Full Power Adjustment, you may need to re-adjust the Smoke Adjustment Screw to reduce low speed smoke, and the idle screw or throttle linkage to correct the idle speed.

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Does anyone have any tips on removing the "welded" on collar on the boost screw? I was able to turn mine in about 3/4 of a turn before the collar hit the locknut. Just that small turn made an incredible difference in performance and now I "NEED MORE "

From Dave Ellingson <d.ellingson@worldnet.att.net>
The easiest way to remove the collar is to back the whole unit out of the pump, put it in a vise and remove it (the collar). Be careful not to turn the screw in the lock nut as you are doing this or you will lose the "known" setting of the pump. After removing the collar simply reinstall the unit and adjust accordingly.

According to the TST webpage, a few engines can't be turned up with these adjustments and they must have larger injectors installed to increase engine power.

Idle Adjustment:

Any tricks to get at the idle adjustment?

R #1: The trick that I use was a hole punch and tapped the locknut a little to loosen it up. Then a small pair of pliers to turn the screw up or down. This seemed to work the best for me without pulling everything apart. Good luck, it is frustrating.

R #2: I took a 10mm box end wrench and bent the box end portion at 90 degrees to the rest of it and put it on the lock nut with the handle coming out toward the front of the pump. Then clamped a small pair of vise grips on and that allows enough of a turn on it to loosen and tighten the nut. Adjust idle with a small screwdriver.

R #3: I took the dremel grinder to the end of the idle screw after I got so aggravated at trying to fit the dern wrench in there to adjust my idle. Oops! It worked though, and I have plenty of adjustment if I ever need to turn it back up.

R #4: A "tubing" wrench will work on the nut, but turning the screw is another matter. You might try a rubber hose slipped over the screw if it isn't too tight.

R #5: I bought the special Cummins wrench for this job and it is still a pain! Once I get the locknut loose the screw will loosen itself (reduce idle) with the engine idling! I use a small jeweler's screw driver to turn the idle UP (engine off to allow progress).

R#6: Tap the edge of the idle lock nut with a small flat chisel to break it free. Once the idle is turned down tap the nut back the other direction to lock it back down.

To loosen and tighten the adjustment locknut

- Cornwell Tool wrench P/N 7268 used on a mid 80's ford escort timing belt adjuster works great.
- A chainsaw bar wrench works well too.

Injectors:

Many people with 1993 trucks like the Bosch part # 0432133875 injectors.

Additional Notes:

Found on the Land Rover Forums - A long discussion about VE pump adjustments and a link to a Land Rover VE pump adjustment page (in French) with good illustrations and photos. You can punch the French URL http://philippe.trinquet.free.fr/ into the Altivista Babelfish translator and view most of the information in English.

The injection pressure of the VE injector pump is not as high as the P7100 pump used on 94-98 models. For additional power with the VE, larger injectors can be installed. Some engines do not respond to pump adjustments. In cases like where the pump is maxxed out with no improvement, increasing the injector size will flow additional fuel. Non intercooled trucks built before January 1, 1991 have larger injectors and will get more boost with pump tweaking alone than the later model trucks.

From PowerWagon: Some of you may have noticed a little rubber "boot" on the upper part of the pump near the diaphragm. If you take that off and remove the little "nut" under it, you can use a WD40 can with the little red tube to squirt some lubricant and rust prevention in there. Do it annually. It may save you quite a bit of money on pump repairs on a rarely-driven truck. Make sure you put the boot back on and point it downward to keep dirt and moisture out.

From PowerWagon and OldSchool: If you have excessive smoke after making pump adjustments:

- If your smoke is only at full throttle load - back off the full load screw.
- If your smoke is at low end thru pull-up - Back off the smoke adjust screw on the top of the diaphragm housing. If you have dramatically adjusted the "star wheel" (the cogged adjusting wheel under the diaphragm) it can have the same effect, as even very slight boost will cause it to move to "full fuel", instead of waiting for the turbo to spool up a bit. Adjust the star wheel back a bit to reduce the smoke level.
- If smoke is heavy at immediate start-up - fine adjust the smoke setscrew.

89 to 93 Rams used 18 cm2 and 21 cm2 turbine housings on the turbocharger. These large housings do not produce enough boost at low RPM if you increase the fuel significantly. Consider replacing the turbo housing (available from TST) with a 16 cm2 turbine housing (Holset P/N 3521927) to improve boost and keep the EGT in the safe range. Some have been happier with a 14 cm2 wastgated housing because it provides more boost at low engine speeds.

The exhaust pipe leading down from the turbocharger is a known bottleneck. Exhaust improvements will reduce EGT significantly above 2000 RPM, and improve turbocharger spool-up at low RPM. Several companies offer a free flowing exhaust system.

Have fun. Dave

Posted to the Cummins List by Walt K.

I am sending these to the list and in public because I -strongly- doubt there is an early truck (pre-'94) left that is still under any warranty. I make absolutely no claims and accept absolutely no responsibility for anything that may happen if an owner of an older truck decides to make use of this information.

In order to increase the horsepower of the early trucks, one must carefully locate two adjustments, one is in the smoke-limiter and will be adjusted to allow greater fuel with low manifold pressure (initially, this is adjusted to minimize black smoke at low rpm/low manifold pressure conditions... but, we cannot build manifold pressure without fuel). You must remove the circular seal-plug from the center of the aneroid device. This reveals the first adjustment. This adjustment will markedly affect the feel of the truck's launch, making it pull from a stop more strongly. Adjust this in 1/4-turn increments until you 'like' the feel at launch and record the adjustment so you can return it to 'normal' in preparation for a smoke opacity test, if you reside in such a state.

The second adjustment is where the *real* gain comes from... There is a concealed adjustment on the 'back side' of the pump... essentially behind the fuel lines. [*See the power adjustment screw on fig 1 above*] You must uncover the adjustment screw and turn it 135-degrees clockwise. You may have to reduce idle speed back to 750 rpm after this adjustment. The 135-degrees will give you of the order of 230hp...

Remember two things -- this will void any remaining warranty and that I make no claims beyond assurance I *have* performed these two adjustments on my truck over 45,000miles ago. In short, if you chose to follow my example, you are on your own in event of breakage.

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