## Timing the 6.9/7.3 IDI 101 or Timing is Everything

by Brian Jordan (The Grampulator)

I recently bought a 1992 F-250 with a 7.31 engine that the previous owner had replaced the head gaskets after overheating the engine. It was also sporting a new radiator since the old one caused the overheating problem. Sound familiar?

Anyway, the previous owner could not get the timing right so he sold the vehicle to me.

Well, after getting it to my garage, I found the timing was waaaaay out.

So how to set it right and get it all lined up properly? That is the purpose of this article.

Tools needed:

3/8" drive:

8mm (5/16") 12 point socket (for IP shaft to gear bolts)

ratchet

short extension

1/2" drive:

24mm (1") socket (to turn crankshaft)

breaker bar or ratchet with snipe

3" short extension

## Wrenches

14mm (9/16") wrench (modified for IP nuts)

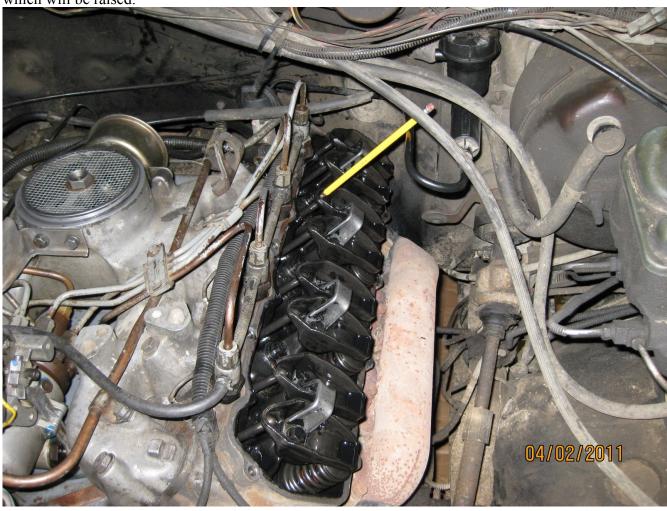


15mm (5/8") line wrench (for injector lines)

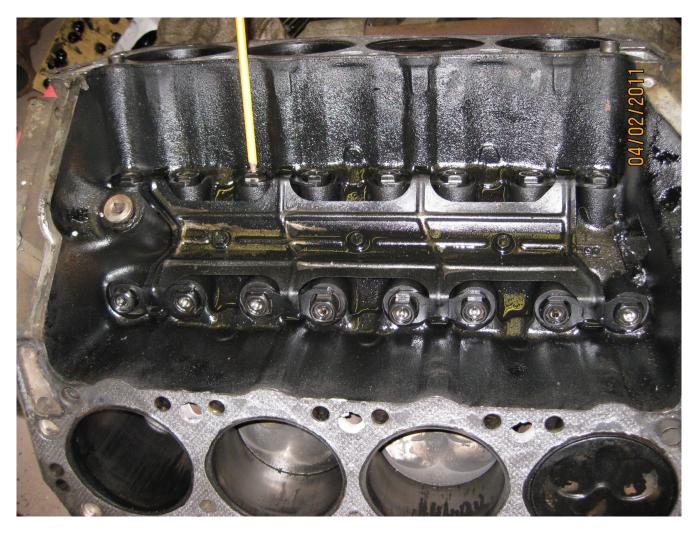
19mm (3/4") open end (to adjust IP)

The Haynes Techbook says to line up the crankshaft gear O mark with the O mark on the camshaft gear and then line up the Y mark on the camshaft gear with the Y mark on the IP (Injection Pump) gear. Well, that is all good and wonderful if you have the front of the engine all apart, but if you don't then here is what I did:

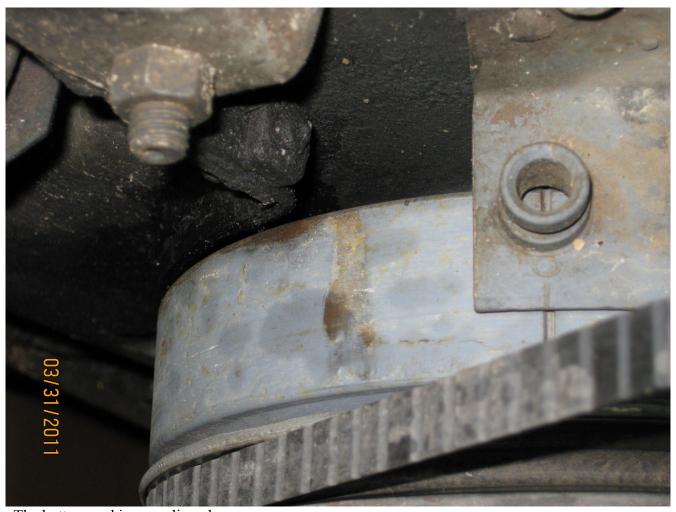
First you will want the crankshaft in the TDC (Top Dead Center) position. Unfortunately, since the 6.9/7.3 is a 4 stroke engine there are two TDC positions. One is where the Exhaust is closing and the Intake is opening, the other is on the power stroke just about the time the fuel injector does its thing. This is the TDC we want. So how can we tell which one it is? One method is to pull the glow plug on the #1 cylinder and check for compression, the other method that I discovered is pull the valve cover on the driver's side and look at the rocker arms. They should all be in the rest position except the 6th one which will be raised.



You can't really see the rocker arm raised in the last pic, so here is another of my parts engine:



Ok, so now we have the timing mark on the harmonic balancer in the middle of the lower timing alignment hole.



The bottom end is now aligned.

Now to line up the IP gear. The IP gear has 106 teeth and rotates once for every two rotations of the crankshaft (720 degrees). So 720/106 = 6.79245283.

We'll just call it 6.8 degrees per tooth. According to the Haynes Techbook "Diesel engines are very sensitive to slight changes in timing", so we'll want to make sure we get it right. We'll take advantage of the fact that when aligned properly, the timing marks on the crank, cam and IP gears are square with the surface of the IP timing gear cover. Take your jiffy marker and draw a line on the IP timing gear from the tooth with the Y mark on it to the 53rd tooth which is directly across the gear. I went clockwise with tooth 1 being the one after the Y mark.



Now carefully place the IP gear so it engages with the cam gear.



The jiffy marker line should be straight up and down.



The gear will move from side to side a bit, but in the center position it should be square with the block.



You will notice that the IP alignment dowel is in the 4 o'clock position, and the lower IP pump bolt lines up with the little slot in the timing cover plate.

Apply sealant to the timing cover and install over the IP timing gear. Thread the 4 bolts in very loosely to make installation of the IP easier. Align the slot in the IP to mate with the dowel in the 4 o'clock position. Install the IP to engage with the IP timing gear about half way.



I had to tilt the IP timing cover forward slightly to install the IP. Install the washers and nuts on the IP before fully engaging the IP. Install the IP shaft to timing gear bolts (the 12 point ones). Tighten the timing cover bolts. Now align the timing marks on the IP and timing gear cover.



If you didn't previously note the how your timing was set, this is a good place to start. Install the injector lines just snug, remember they will need to be bled. Tighten all the bolts and nuts. Congratulations, you should be able to get the engine started now.

BTW, to advance the injector timing turn the IP counter clockwise. To retard the timing turn the IP clockwise. This is in relation to standing in front of the engine looking at the engine.

See Timing the 6.9/7.3 IDI 201 (Using BioDiesel as a tuning aid).

http://www.blackwire.com/~bjordan/Tech/Timing the 6.9-7.3 IDI 201.pdf