Fine Tuning The VW Diesel

What's with the metronome, you ask? What does a musical timing device have to do with a diesel engine? Well, with internal combustion engines and music, timing is everything.

Even though diesels don't have spark plugs and spark distributors, they do require some maintenance and adjustment from time to time. And when everything works together, that diesel clatter from pistons pounding oil into energy is music in itself.

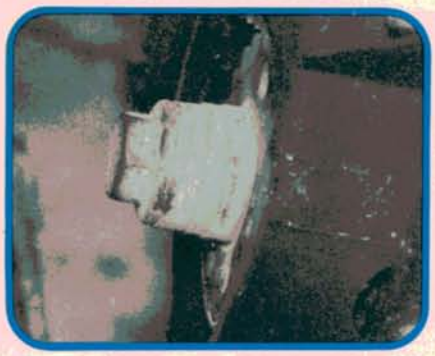
We chose the VW diesel for our first attack at diesel service for a couple of reasons. First there are a lot of them out there. Second, they use a rubber timing belt to orchestrate compression and fuel delivery. Replacement of the belt gives you a better idea of how it all comes together at the right moment.

We had originally planned on covering a lot more ground in our coverage of diesels, but found the subject to be a meaty one. As a result, we had to settle on belt replacement, cam timing, pump timing, and glow plug inspection. You can look for a follow-up article dealing with other aspects of diesel service in a coming issue, however.

There are some special tools required, but they're readily available. Ours, for example, came from Schley Products, Santa Ana, California. We highlight them to show their application.

Maestro! A little traveling music.

—By Ralph Birnbaum

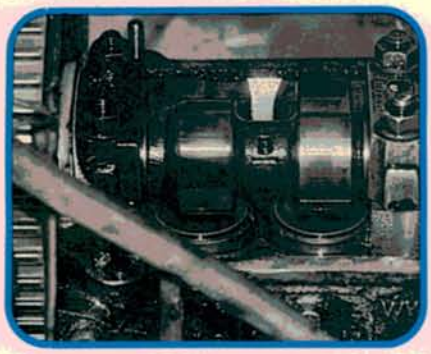


1

To remove the timing belt, start by removing the accesory belts and drive belt pulley. Be sure to clean the crud from those cheesehead bolts and use a tight-fitting socket. They just love to round out. The plastic guard will also have to go to expose the crank drive sprocket.

2

Next remove the plastic bell housing plug. Roll the engine to TDC on the number 1 cylinder. Align the flywheel timing mark with the pointed boss at the base of the threaded hole. You can't lock the crank in place, so you'll have to check back from time to time and make sure you haven't moved the crank off TDC.



3

Remove the valve cover. If you're not sure whether or not you're actually on number 1, look to see if the intake and exhaust valves are both closed as they are in this photo. We've removed the injector lines to improve your view.

4

Now insert the camshaft lock in the groove at the back of the cam. If the tool won't fit, you're not at TDC on number 1 cylinder. Check for excessive slop between the cam and tool. If it's sloppy, you'll have to measure total clearance and shim the tool to center it.

5

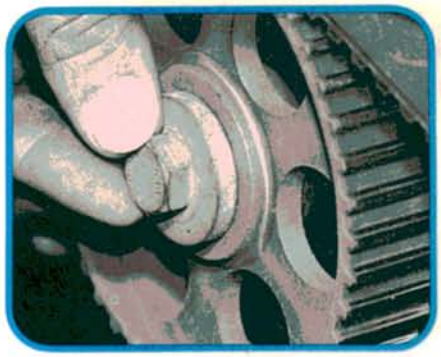
Now lock the pump by inserting this pin through the hole in the pump pulley and the corresponding hole in the plate behind it. This will keep the pump from turning as you install and adjust the timing belt. At TDC on number 1 you should be able to install both the pump and cam locks.

6

Now you can loosen the lock-nut on the belt idler. This is the adjustment for belt tension. Older engines did not require a special tool to turn the idler before tightening the lock nut. This engine will require a special wrench that we'll look at in a few moments.

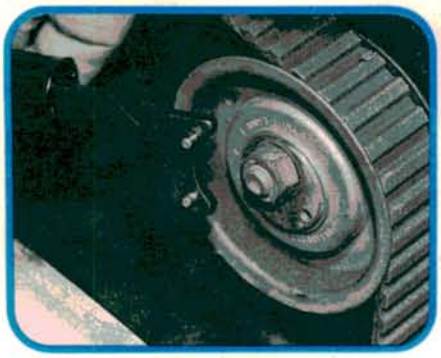
7

This is the intermediate shaft pulley. It drives the oil pump and vacuum pump on a diesel. (On a gas engine it must be timed since it drives the ignition distributor.) Once the belt is off, check this pulley for lateral or axial movement. Any signs of slop should be corrected now.



8

Now loosen the nut on the cam. The cam gear is not keyed to the cam. It is adjustable relative to the cam and relys on friction at a tapered fit to drive the cam. With the bolt loose, tap the backside of the gear to free it (soft mallet, please) and resnug the bolt with your fingers.

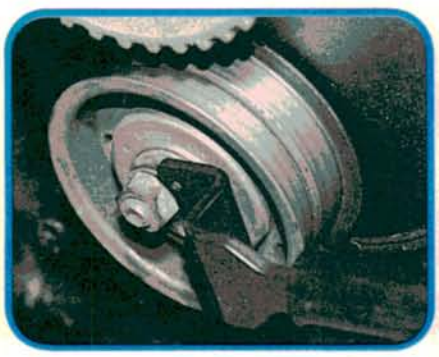


9

Here's a better view of the idler pulley and the tool require to turn it. The small pins of the tool fit into the holes in the idler. I suspect that this was designed to prevent some of the bulls in the field from overtightening the belts. Oh well.

10

The belt is removed. Take the special tool and make sure the idler turns snugly but smoothly on the pivot stud. Spin the idler on its bearing and check for bearing noise or unwanted slop. A few moments spent checking things here can save you from a lot of grief later.



11

The camshaft and pump are still locked in place. The camshaft drive gear is just loose enough to rotate on the cam. Install the belt being careful not to turn the crank. Use the tool we've been talking about to properly tension the belt. Tighten the lock nut to the specified torque.

12

Here's a real judgment call for you. While the manufacturer suggests that you always use a belt tension gauge, these fellows have done so many of these belt replacements, they do it by feel. They suggested that you should be able to turn the belt about this much with moderate pressure.

13

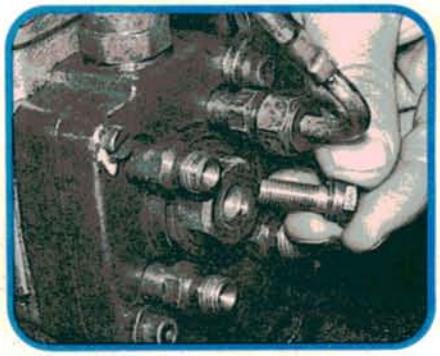
This is a very important step. You'll have to retorque the cam bolt to factory specs. The camshaft lock will keep the cam from turning. If you forget to tighten this properly, the gear will, of course, turn without the cam. And as we all know, the valves seal better unbent.

14

Remove the cam and pump locks after checking to be sure the crank is still at TDC. Rotate the engine 2 complete turns by hand to be sure there is no piston/valve interference. If you use the starter and something is out of synch, you may end up with bent valves.

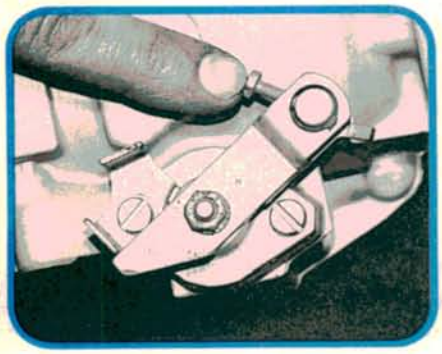
15

Before installing the belt covers and pulleys, double check the belt tension and timing mark alignments. Don't forget the protective cover for the crank gear. It's also a good idea to put a few drops of "stay-put" on those pulley bolts before you retorque them.



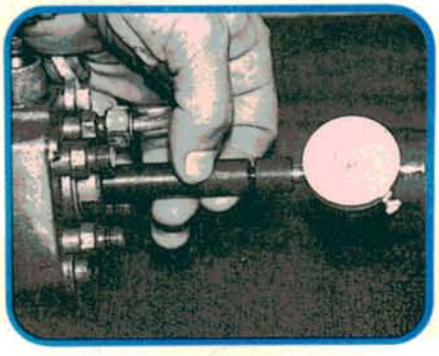
16

It's always a good idea to check pump timing as a part of any diesel service. It was difficult to show the back of the pump on the car, so we took a spare pump and shot it on the bench. Start by removing this plug in the back of the pump. You'll want to replace the seal on the plug.



17

Take a moment here to be sure the manual advance rod is not stuck in the "on" position. If the rod is stuck in the advance position and the cable is broken, you won't get anywhere by just pushing the advance button in. With the pump in the advance position, you'll get a false reading.



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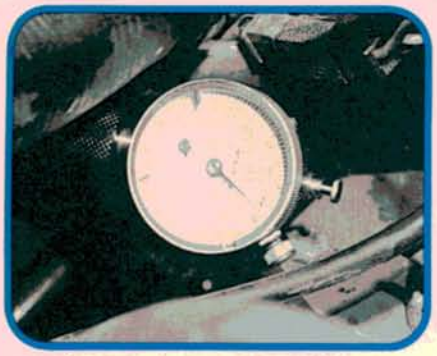
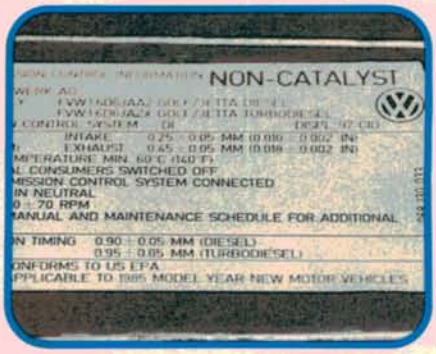
You'll need this threaded adapter and a dial indicator. Screw the adapter into the pump and snug it. Preload the dial indicator to about 2.5 mm and snug it. Turn the engine in a counter-clockwise direction until the needle stops moving. Zero the gauge.



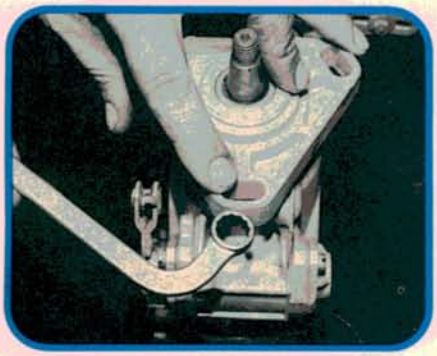
19

Here's the gauge in the car. Now turn the engine clockwise until the engine is at TDC. (Use the same flywheel mark we used in photo number 2.) Compare your reading with the specifications for your particular car.



20

This car had a nice little sticker under the hood giving us the proper pump settings. You'll have to find out what the specs are for your car and pump. This measurement tells us how much lift we're getting from the pump at TDC. It is very important to overall engine performance.

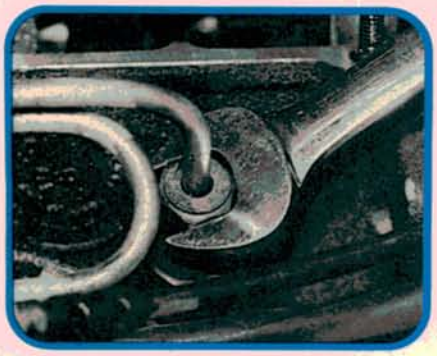


21

If the pump is out of adjustment, you'll have to loosen the pump mounting bolts and rotate the pump to get the proper readings. We've indicated the slotted holes in the pump that allow it to be turned. You'll need a wrench like the one shown to loosen and then retighten the bolts on the pump.

22

After correcting your readings, snug the bolts and recheck yourself. If the readings are still correct, finish tightening the pump bolts. Remove the gauge and adaptor and replace the pump plug using a new sealing washer. This adjustment doesn't change belt tension.

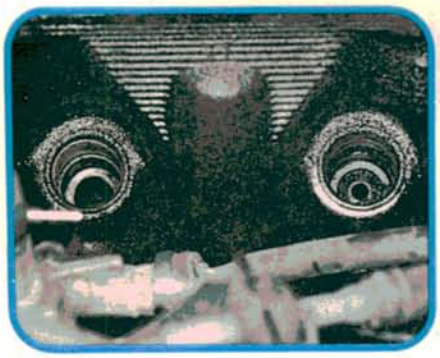


23

It's a good idea to check glow plugs on these engines, especially if the customer is complaining about hard starts in cold weather. The easiest way I know is to pull the injectors and heat shields and look down in the holes as you light 'em up. Start by removing the injector lines.

24

Occasionally you'll run into some badly corroded threads on the injectors. Those steel injector threads love to seize in the aluminum heads. Get a deep well socket that won't kink those small nipples at the injector neck and your impact. The impact will help "shake" them loose.



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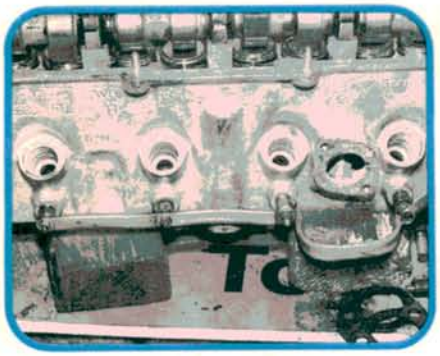
The injectors are removed. We've also removed the heat shield from the number 2 cylinder. The number 3 heat shield is still in place. Try not to knock any crud loose. This can be a lot tougher than it sounds when there's a heavy carbon build up near the base of the hole.

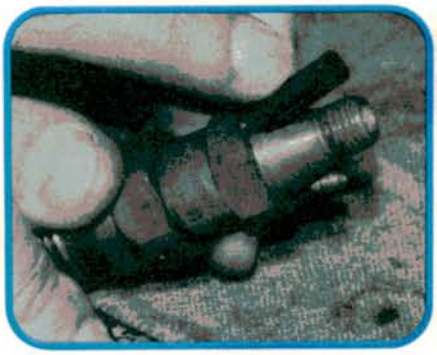
26

Now turn on the key and look for the glow plugs to light together and gradually go out together. Look for signs of broken or breaking tips. If none light, check for current. If individual glow plugs don't light or have missing or broken tips, replace them.



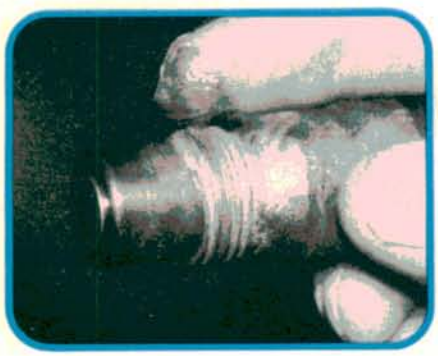
27

Here's a better view of a bare head showing the buss bar that feeds current to the glow plugs. Unfortunately, this is not nearly as accessible on the car. The size if the bar gives you some idea of how much current is required to light the glow plugs. Always check for clean connections.



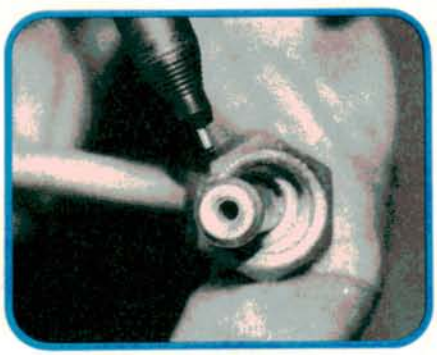
28

Save yourself some grief and always replace the small rubber cap at the injector nipple and all the braided rubber hose. The diesel fuel deteriorates the rubber pretty quickly. You don't need to see the customer back for a needless fuel leak.



29

Injector heat shield replacement is a good idea. They're not expensive and ensure a good job. It's also a good idea to coat the injector threads with an anti-seize compound before installing them. Screw them in by hand to be sure they're not binding or cross-threaded and torque them properly.



30

Carefully reinstall the injector lines. Start all the lines by hand before wrench-tightening any of them. Also note the compression fitting in the photo. Don't overtighten them or you'll distort them and have a leak. If they're clean and snug, they'll seal just fine.