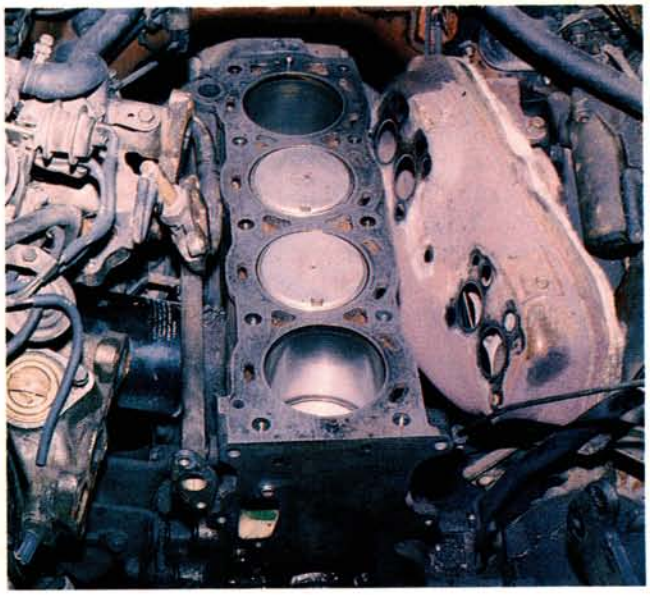
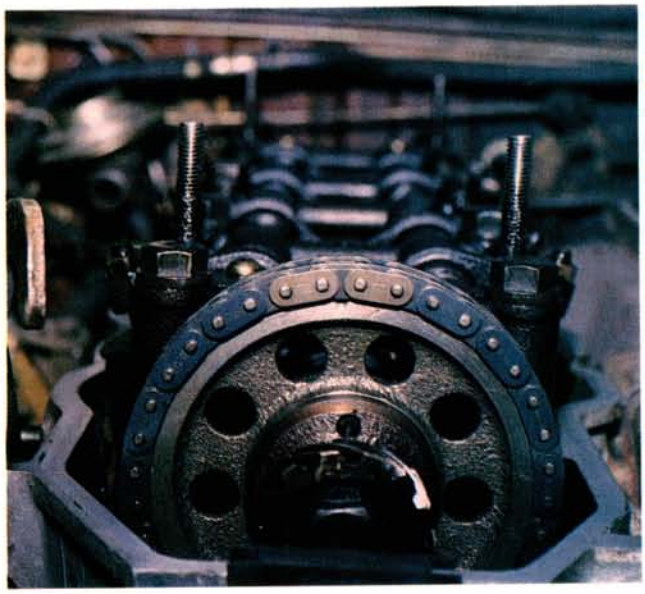
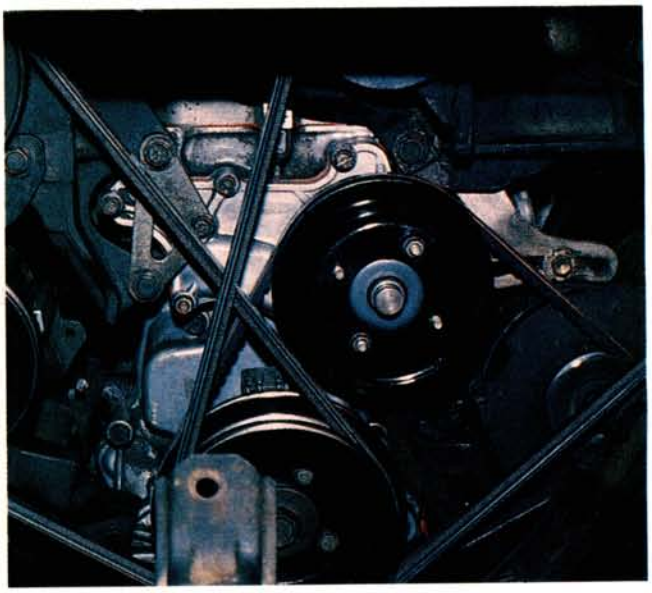


Toyota 20R Timing Chain

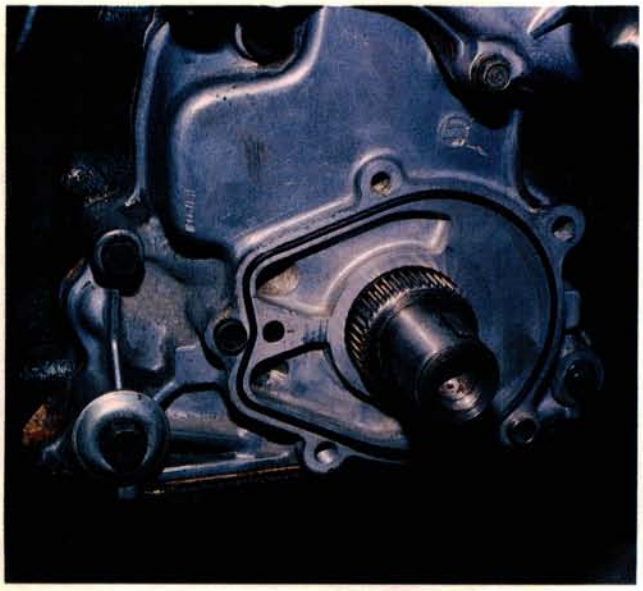




Toyota's workhorse 20R and 22R series engines have been with us for a long time. The 20R was first used in 1975 model Coronas, Celicas, and pickup trucks, and stayed in service until it was replaced by a larger, modified 22R engine in 1980.

The 20R used a double row timing chain that was virtually bulletproof. And even after the 22R went to a single row chain, many techs chose to retrofit early 22R engines with the 20R double row chains and sprockets. Finally, Toyota put an end to that fun by changing the front timing cover and removing two links from the chain in 22R engines produced after August 1984.

Both the double and single row chains before the change had 98 links. The modified single row chain had 96 links, not to mention that the new, modified timing cover was too shallow for a double row chain anyhow.



We're going to tackle an old 20R. The procedures involved in checking and replacing the timing chain and gears are similar to those of the 22R.

If you've never tackled an import OHC chain replacement, you'll be happy to know that there are a lot of similarities between this Toyota engine and other Japanese OHC engines with similar designs. And while there are certain specific precautions to note on the 20R, once you've mastered this engine, you'll find the others a lot easier.

Gaskets, Chains, and Seals

We did this job two ways. We replaced the timing chain without removing the head, just to see how tough it was. The shop manual simply suggests that you remove the cylinder head. We know this isn't always needed.

But since this was a high mileage engine, we also decided to remove the cylinder head and inspect the head gasket. How you do this job is a discretion call based on personal preference, vehicle mileage and general condition, and vehicle past history. We'll try to explain as we go along.

Let's get started:

- **We received more than one report of leaking front crankshaft seals on these engines**. We suggest that you always replace the crank seal and the oil pump rubber o-ring. Also check the front crankshaft pulley sealing surface where it rides on the seal for scoring or wear that could ruin the new seal.
- **The oil pump bolts to the front of the timing cover and it is driven by gear keyed to the crankshaft**. This is a very positive set up. But it also makes it very important that the pump-to-front cover, and front

cover-to-engine block mating surfaces be as clean and tight fitting as possible. A bad fit between the timing cover and engine block caused by leftover gasket material or dirt can cause a loss of engine oil pressure. Those of you who like doing those "red sealer test engines" can also run into trouble when a stray glob of sealer causes a bad fit or finds its way into the wrong hole.

- **Even though the head gasket on this engine wasn't leaking, we found that some of the coolant passages between the block and head were plugged by "gasket creep."** The scissor action between the aluminum cylinder head and cast iron block on this bi-metallic engine had moved some of the gasket material sideways, blocking the coolant holes. Since the engine in question came from a car with well over 100 big ones on the odometer, the gasket seemed to be a wise investment.

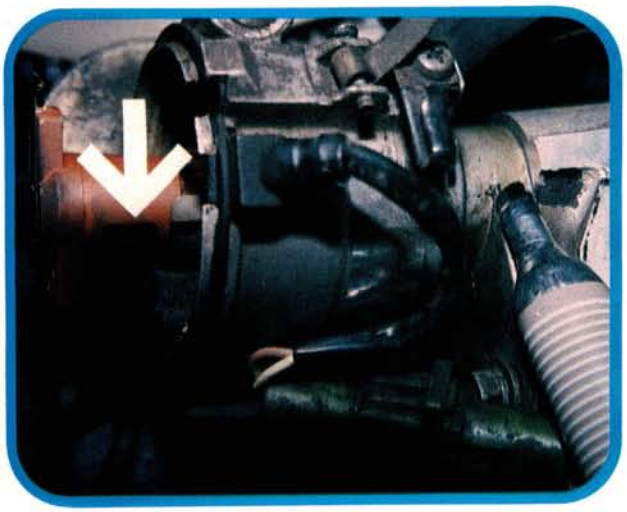
• **The timing cover bolts to the front of the block**. Just as importantly, it's sandwiched between the cylinder head overhang at its top, and the front of the oil pan at the bottom. If you do decide to replace the timing chain without removing the head, you'll probably have to drop the oil pan slightly to allow yourself enough room to slide the timing cover back in place between the head and oil pan when you're done.

• **Here's another discretion call**. We removed the air conditioning condenser and radiator to take pictures. Removing only the fan/clutch assembly and fan shroud might give you enough room to do the job, but it sure was a lot easier to work with all that stuff out of our way. Besides, the car needed hoses.

• **This car had all the goodies; air conditioning, power steering, and air pump**. There are a lot of mount brackets and a coffee can full of nuts and bolts holding these accessories and their various mounting brackets in place. Worst of all, there are a lot of different length bolts to keep track of. It was a real time-saver to place the bolts with the appropriate accessory or bracket as it was removed. The bolt-ons take at least as much time as the timing chain did, and throwing all the bolts in one pile can drive you bananas when you go to sort things out.

• **Finally**. This article won't replace the repair manual and some of the procedures used were not necessarily the speediest way to do things, but the boss says I have to take pictures. The order in which you do certain things may also vary somewhat. After you've done a few of these, you'll develop your own best way to do the job. Always refer to the appropriate specifications for the engine you're working on.

—By Ralph Birnbaum



1

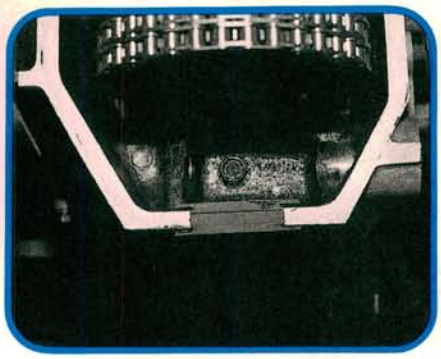
Save some reassembly time by turning the engine to TDC on number 1 cylinder and marking the distributor with a felt pen before removing it. Mark the rotor to dust cover position. Mark the distributor to cylinder head position. Later, you can just line up the marks when you reinstall the distributor.

2

Just getting to the timing cover is a chore on this particular engine. Japanese engineers love to cross bolt mounting brackets for added strength. They bolt the brackets to the engine timing cover, cylinder head, and block, with many bolts placed at right angles to one another.

3

Remove the front pulley. Clean it and inspect the surface where the front crank seal rides. Leaking oil from a heat-hardened seal will mix with dirt to form an abrasive paste that will eventually ruin the pulley sealing surface. This pulley showed a small amount of wear, but was reusable.

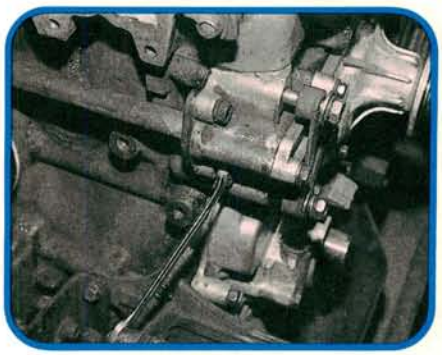


4

There are a couple of "trick" bolts on this timing cover. One is hidden below the valve cover at the front of the head. It goes through the head and head gasket and screws into the top of the timing cover. I always remove this one first so I don't forget it.

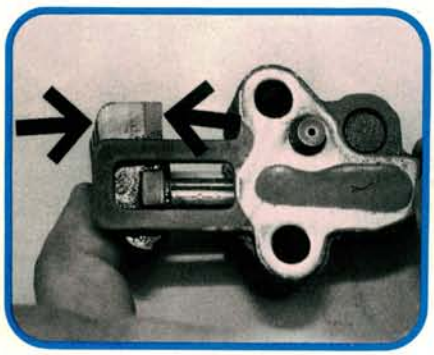
5

There's another hard to find bolt directly below the water pump. It's easy to see in this photo, but just as easy to miss when you're looking down on the front of the engine from an angle. If you think you've got all the bolts out, but the cover still fights back, check again.



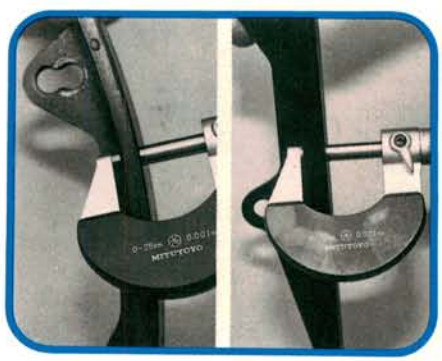
6

The coolant bypass tube also bolts to the timing cover. Please resist the temptation to drive your screwdriver between the timing cover and block when you remove the cover. If you've removed all the bolts, including the oil pan bolts, a few raps with a soft mallet should free the cover.



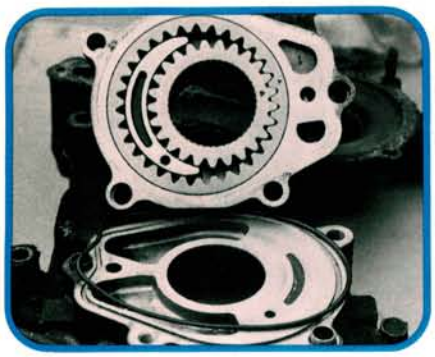
7

The chain tensioner is hydraulic. You'll note that there's a limiter bracket built into the tensioner. No matter how loose the chain gets, the tensioner shoe won't fall off as it would on some engines. Minimum thickness of the tensioner shoe is 11 mm.



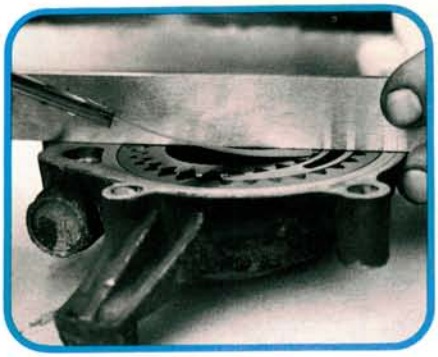
8

Maybe you call these chain guides. Toyota refers to them as dampers. Take your micrometer and measure the dampers. The damper on the tensioner side should be at least 4.5 mm thick. The other damper should be at least 5 mm thick. Replace them if they're worn beyond these limits.



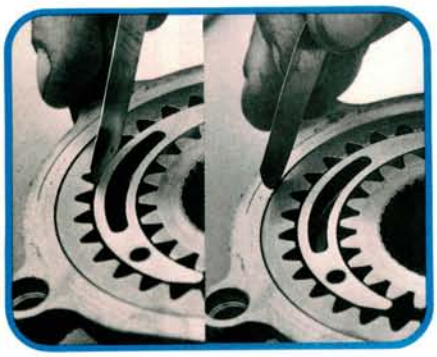
9

Even though you don't have to remove the oil pump to remove the timing cover, it only makes sense to disassemble and inspect the pump. Check the aluminum face of the timing cover for scoring or excessive wear. I always replace the sealing o-ring and hold the new ring in place with petroleum jelly.



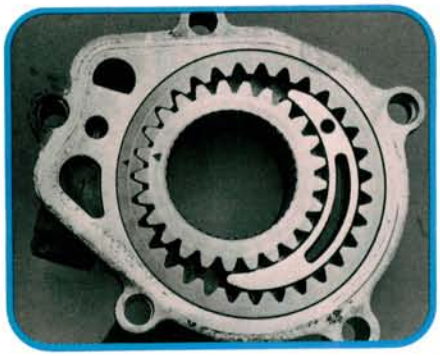
10

The procedure for checking the gear-to-pump cover clearance is similar to checking any other oil pump. Make sure the pump cover face is completely clean. Lay your straight edge across the pump cover face, and measure clearance at the gear faces with a feeler gauge as shown. Maximum clearance is 0.15 mm.



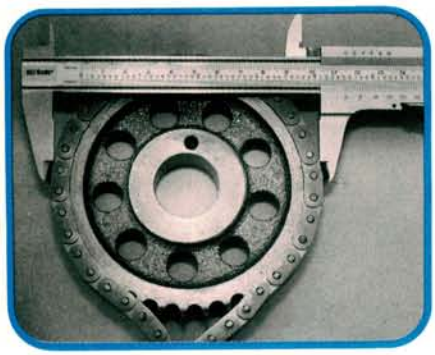
11

Now measure the clearance between the tips of the inner and outer gears and the pump crescent (left photo). Maximum allowable clearance is 0.3 mm. Measure the outer gear to housing clearance (right hand photo) which should be a maximum of 0.2 mm. If the pump's good, install a new crankshaft seal.



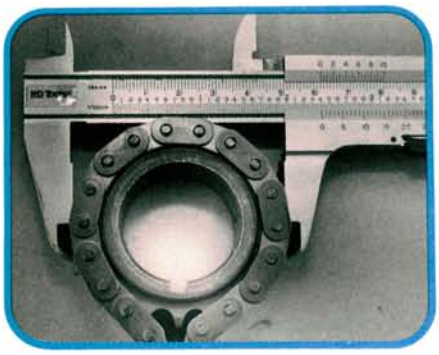
12

If you dumped the oil pump gears on the bench, and aren't sure which way they face, Toyota has kindly provided these marks on the gear faces. It doesn't matter how they line up, but you better be able to see both marks at the same time or somebody is facing the wrong way.



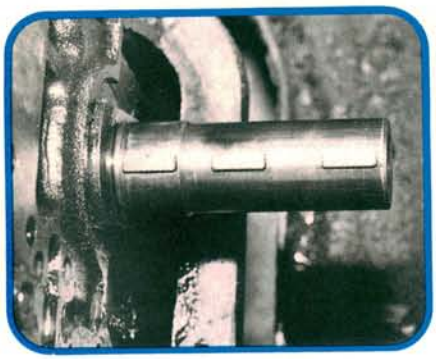
13

Let's say you tore into this engine to replace a head gasket. The timing chain wasn't the first thing on your mind, but you'd like to check the chain and gears while you're in there. Measure across the chain and sprocket as shown at the widest point. Minimum specification is 113.8 mm.



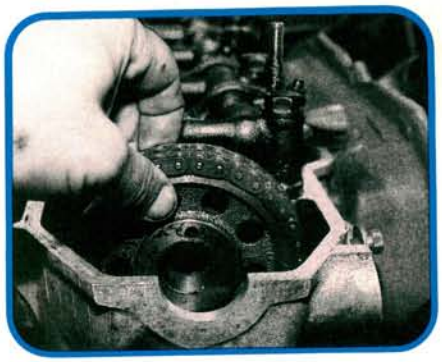
14

Use the same procedure with the smaller crankshaft sprocket. You should get a minimum reading of 59.4 mm this time. If either the camshaft or crankshaft sprocket measurements are below these minimums, replace the sprockets and timing chain as a set.



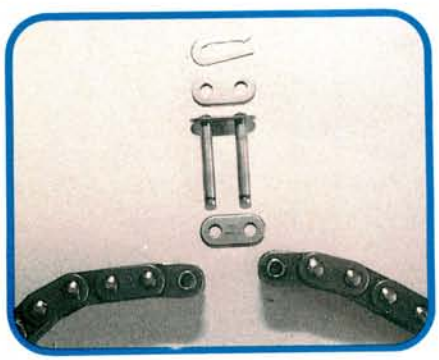
15

There are three woodruff keys on the snout of the crankshaft. They drive the crankshaft sprocket, oil pump drive gear, and front pulley. Make sure they fit square and tight in the crank. Can you imagine what would happen if any one of them fell on the floor or down in the oil pan and went unnoticed?



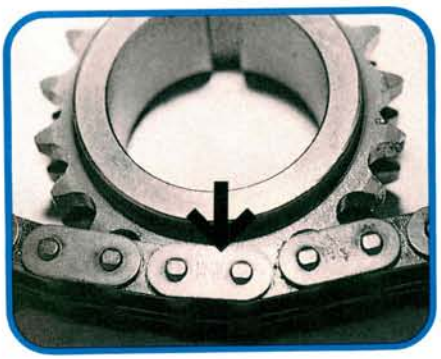
16

The TRW timing chain we used on this engine is a one piece chain. It has no master link. Some manufacturers provide chains with master links to ease installation. The one piece chain was easy to install. Chain and sprocket fit through the opening in the front cover and slipped over the end of the camshaft.



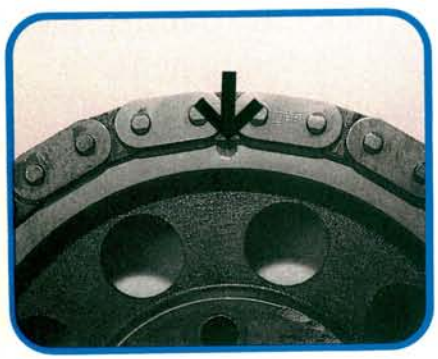
17

If you do get a chain with a master link from your supplier, make sure you install the fastener clip on the master link properly. Whenever you install a chain with a master link, make sure the closed end of the link points toward the direction of chain rotation.



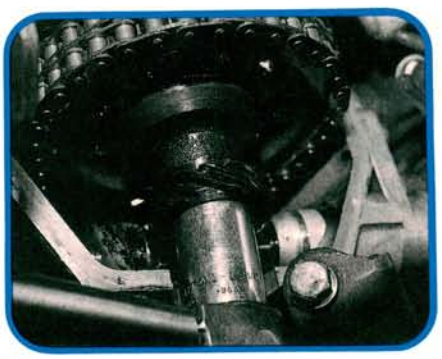
18

Chain timing is easy to set. Find the punch mark on the crankshaft sprocket. Now find the single shiny link in the timing chain. Install the chain so the punch mark is in the center of the single shiny link. Turn the crank so the woodruff keys are at 12 o'clock. Install the sprocket and chain.



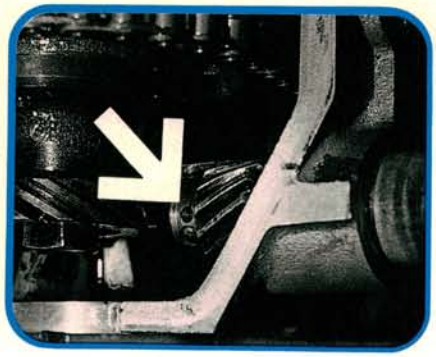
19

Set the camshaft for TDC on number 1 cylinder. The camshaft sprocket locator pin will be at 12 o'clock. Find the two shiny links farther down the chain. Place one link on each side of the punch mark, then slide the sprocket over the end of the camshaft while aligning the camshaft locator pin in the sprocket.



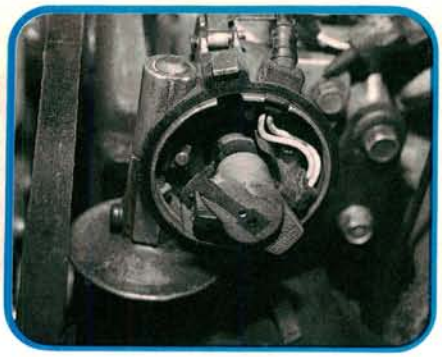
20

Install the chain dampers and tensioner. Torque the camshaft bolt to 78 Nm (58 ft-lb). On 22R engines with a mechanical fuel pump, you'll have to install the fuel pump drive cam behind the bolt. The shop manual doesn't mention putting thread locking compound on the cam or crank bolts, but we will.



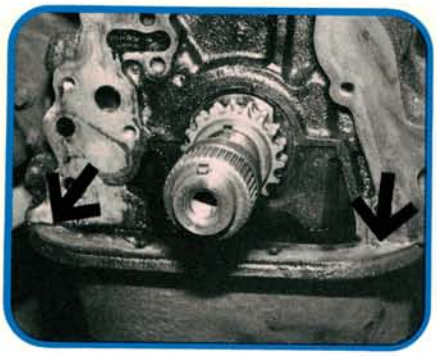
21

You say you forgot to mark the distributor before you removed it? The shop manual won't tell you this, but there's a punch mark on the distributor driven gear. With the engine at TDC on number 1 cylinder, set the mark at 12 o'clock with the distributor housing in its normal position.



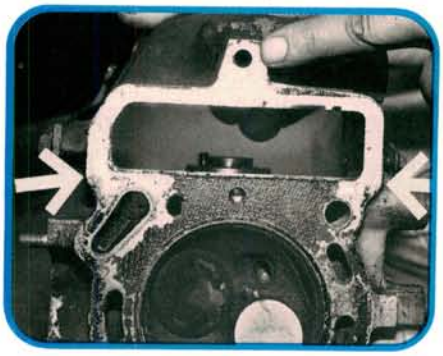
22

Now push the distributor straight in. The rotor will turn slightly as the distributor gear engages the camshaft gear teeth. The rotor will end up in the position shown. You may be off by one tooth on the first try, but this will give you a good starting point. Fine tune as needed.



23

Since the oil pan and cylinder head stick out over the engine block, you'll have four corners—two top and two bottom—where the front timing cover gaskets butt against the pan and head gaskets. Place a dab of sealer (arrows) in the two corners where the pan gasket meets the front cover gasket.



24

You'll also need a dab of sealer where the front cover gaskets meet the head gasket (arrows). Even if you didn't remove the cylinder head to replace the chain, you can still put a dab of sealer in these areas from below. We fingered the hole in the head for the bolt we removed back in our fourth photo.